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Right-of-Way Ecological Effects Bibliography

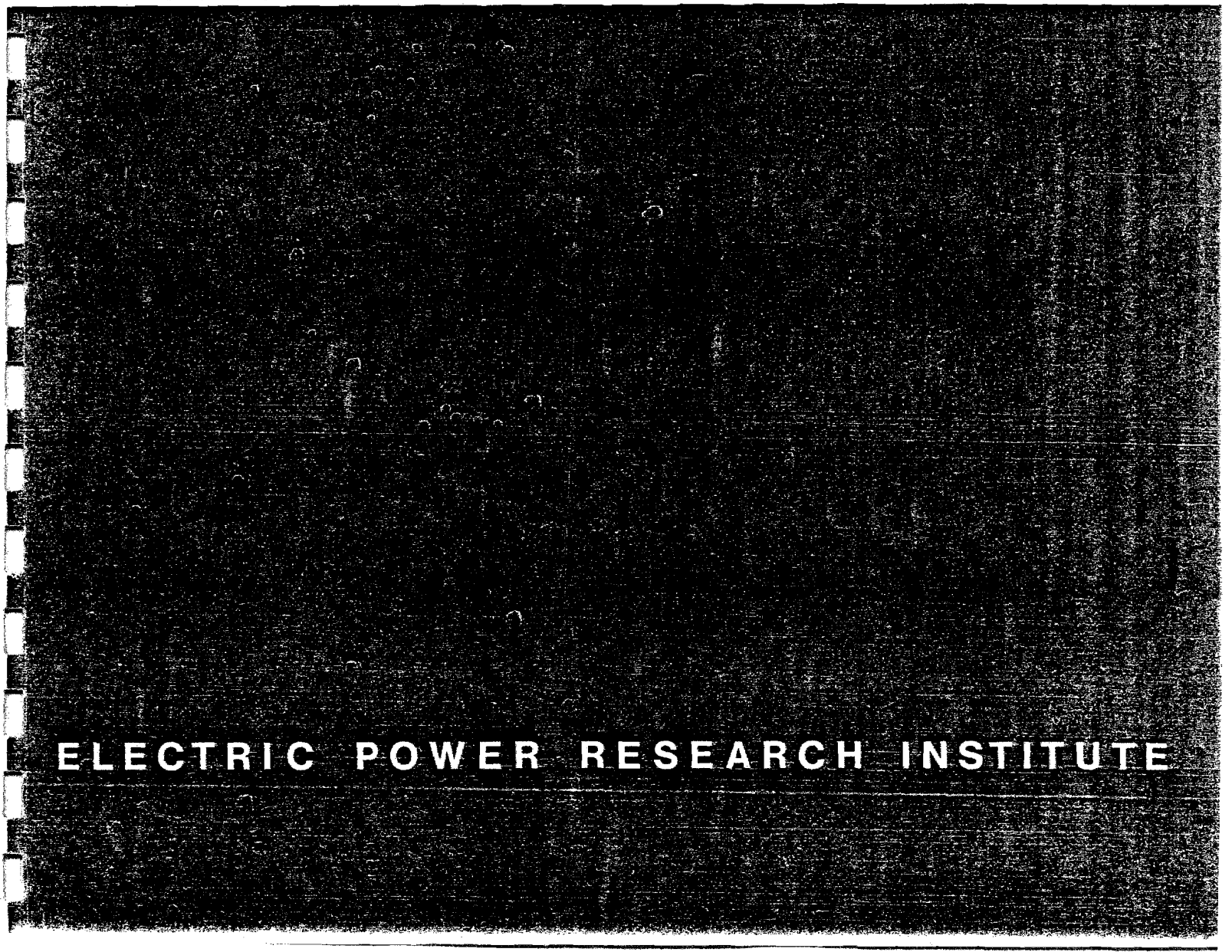
EPRI

EPRI EA-1080
Project 855-1
Topical Report
May 1979

Keywords:
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Transmission
Vegetation
Rights-of-Way
Wildlife
Ecoregion

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Prepared by
Asplundh Environmental Services
Willow Grove, Pennsylvania



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Right-of-Way Ecological Effects Bibliography

EA-1080
Research Project 855-1

Topical Report, May 1979

Prepared by

ASPLUNDH ENVIRONMENTAL SERVICES
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Willow Grove, Pennsylvania 19090

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EPRI Project Manager
R. A. Goldstein
Energy Analysis and Environment Division

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Prepared by
Asplundh Environmental Services
Willow Grove, Pennsylvania

ABSTRACT

This report consists of an annotated bibliography containing 824 citations of documents covering the published state-of-the-art through 1977 in describing ecological effects of overhead transmission line rights-of-way. The citations are indexed according to author, subject and ecological region.

EPRI PERSPECTIVE

PROJECT DESCRIPTION

This project deals with the ecological effects related to transmission and distribution of electricity, a matter of considerable public and environmental concern. Other supported research includes the effects of overhead transmission line rights-of-way on forested ecosystems (RP103, EPRI EA-491), the prevention of large raptor electrocution (RP1002), and effects of construction and maintenance of overhead transmission line rights-of-way on plant succession in the semiarid southwest (RP756). A project on the interactions between birds and power lines (RP1636) is just starting.

PROJECT OBJECTIVES

This project (RP855) was designed to survey the current status of information on ecological effects of rights-of-way for use in development of further research efforts and practical applications by utilities. Some of the costs in collecting and abstracting the literature included in the bibliography were shared with the Power Plant Team, Office of Biological Services, U.S. Fish and Wildlife Service. In addition to the bibliography, it is expected that RP855 will produce a review of the effects of overhead transmission line rights-of-way on wildlife. The project also surveyed utility right-of-way personnel with respect to their perception of environmental concerns. The results indicated that effects on land use and property values were of greatest concern. Other indicated areas of major concern included effects on natural vegetation, agricultural crops, human biology and wildlife.

PROJECT RESULTS

This report consists of an annotated bibliography containing 824 citations of documents covering the published state-of-the-art through 1977 in describing ecological effects of overhead transmission line rights-of-way. The citations are indexed according to author, subject and ecological region. The bibliography should be of value both to individuals involved in assessment of rights-of-way ecological effects and right-of-way managers. The Ecological Effects Program is currently exploring the possibilities

of periodically updating the bibliography and making it accessible through an on-line computer retrieval system.

Robert A. Goldstein, Project Manager
Energy Analysis and Environment Division

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- A. Construction and Maintenance Methods on Transmission Line Rights-of-Way 1
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Introduction

This bibliographic indexing and retrieval system was developed by Asplundh Environmental Services for the Electric Power Research Institute (EPRI). Ecological effects of overhead transmission line right(s)-of-way is the special subject area. All pertinent available literature sources, including libraries, automated systems, and individual researchers' literature collections, were reviewed in selecting documents for use in this computerized data base. Documents were abstracted by experts in various scientific fields familiar with right(s)-of-way. Documents were evaluated in terms of content and quality for discussing ecological characteristics of rights-of-way and related effects.

This bibliographic system provides information useful to the electric power industry in maximizing ecological compatibility of rights-of-way, based on existing knowledge. All sources of information were reviewed for applicability to the full scope of rights-of-way planning, construction, operation, and maintenance. Several information areas associated with right(s)-of-way were excluded, and other areas known to be poorly represented required use of a number of related subjects. Excluded subjects were methodologies for line routing, aesthetics of transmission lines, urban aspects of right(s)-of-way, and the effects of electrical and corona phenomena. Related subejcts were other types of right-of-way facilities (pipelines, etc.), general forestry activities, management principles of vegetation and wildlife, and general environmental assessment concepts.

Format for the presentation of the literature compilation was designed to best serve the needs of potential users, primarily utility personnel. Selected documents were identified using a comprehensive review process, then physically retrieved and abstracted. The abstracts were entered in a computerized indexing and retrieval system. The collection contains 824 citations of documents determined to represent, through 1977, the published state-of-the-art in describing the ecological effects of transmission line right(s)-of-way.

Subject indexing of the data base utilizes a wide range of terminology drawn from scientific, technological and engineering fields which are used interactively in describing ecological effects of transmission line right(s)-of-way. To permit flexibility in accessing the subject matter of the collected literature, abstracts included broad and narrow-term key words.

Explanation of Use

This bibliography report is designed as a reading guide to articles on the ecological effects of overhead transmission line right(s)-of-way. This report has been produced by computer photocomposition from a data base of selected article citations. The bibliography is divided into four sections:

Document Citation. This section contains the full display of the document citation: it is the body of the rights-of-way bibliography report. This section is sequenced primarily by "category" in alphabetical order and sequenced secondarily by "year published" in descending chronological order. The computer has automatically assigned a sequential document "location number" so that the alphabetic order of the category sequence corresponds to the ascending numeric order of the location number. This facilitates the location of a document citation which is referenced by one of the indices.

Each document has been assigned by abstractors to at least one "category." There are six major categories and 71 subcategories which represent various aspects of electric transmission rights-of-way activities and ecological concerns. A listing of categories is provided in Appendix A. No index of categories is provided because the "body" of this bibliography groups abstracts in the same order shown in Appendix A. Also the top of each page shows the category to which that page's abstracts belong.

Author Index. The author index is arranged in alphabetical order, by author surname. Each author for each article citation appears in this index in the appropriate alphabetic location. The author name is followed by the article citation location number.

Region Index. Regions are based on Bailey's "Ecoregions" (1976), described in a following section. Regions were assigned to abstracts when documentation was either researched in that region or the findings could be expected to apply throughout that region, and when information either originated from a region or could be generally applied to that region. Abstracts which are very general in application are indexed under "Applicable to the entire United States" within the region index. Under each region, subject terms (keywords) are listed alphabetically with location numbers for each applicable abstract.

Subject Index. The subject index is arranged in alphabetical order by keywords. The relevant citation titles and associated location numbers are also displayed for each keyword.

In order to use the rights-of-way bibliography report, the reader would typically search one of the indices (author, region, subject) and then, using the document citation location number, cross-reference to the document citation in the body of the report.

Explanation of Ecoregions

Each ecoregion covers a continuous geographical area and is characterized by the occurrence of one or more important ecological associations that differ, at least in proportional area covered, from the associations of adjacent regions. In general, ecoregions are characterized also by distinctive flora, fauna, climate, landform, soil, vegetation, and ecological climax. Within such a region, ecological relationships between plant species and soil and climate are essentially similar, and similar management treatments give comparable results. Thus, they are also considered biological productivity regions of specific potentials.

The classification scheme used on the map is an adaptation derived mostly from Crowley (1967) and has four levels of generalization.
A *domain* is a subcontinental area of broad climatic similarity, such as lands having the dry (B) climates of Koppen (Trewartha 1943) or Thornwaite (1931).
A *division* is a subdivision of a domain determined by isolating areas of differing vegetation and regional climates, generally at the level of the basic climatic types of Koppen. Usually, the zonal soils are related.
A *province* is a subdivision that corresponds to a broad vegetation region having a uniform regional climate and the same type or types of zonal soils. For example, the Boreal Forest Province is the ecoregion characterized by the subarctic continental-boreal coniferous forest-podzol ecosystem. Generally, each province is characterized by a single climax association, but two or more climaxes may be represented within a single province. This often happens on mountains where each altitudinal zone may have a different climax.
A *section* is a subdivision of a province and is based on local climatic variation. The section is characterized by a single

climax association and reflects climatic nuances within the broad regional climate. Variation in potential vegetation as mapped by Kuchler (1964) is used as the principle indicator of a section.

The boundaries between adjacent ecoregions are usually difficult to locate precisely. Frequently one region merges gradually into another. Any line separating the two must then be drawn more or less arbitrarily. A convenient way of roughly fixing the boundary between two adjacent regions is to draw the line where the dominant associations of the two regions cover approximately equal area.

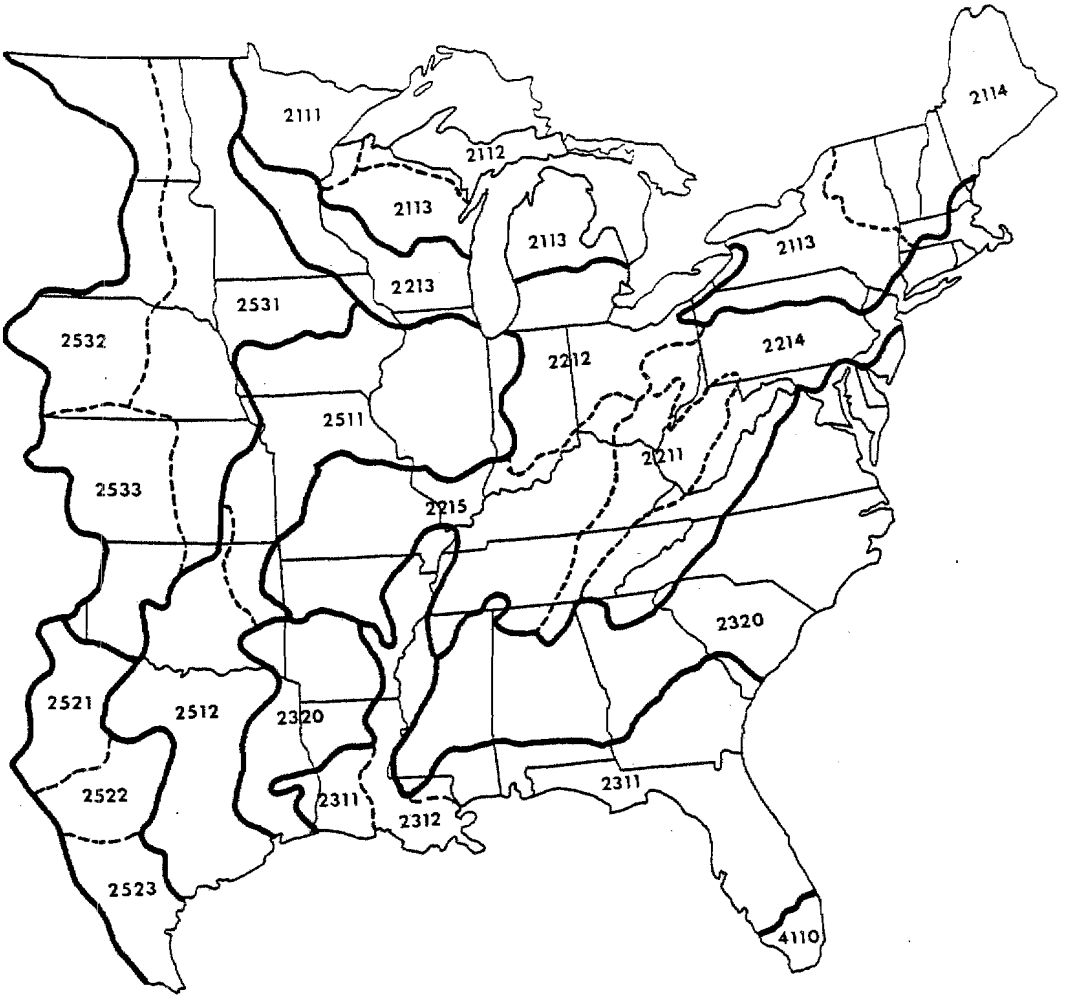
The geographic distribution of the ecoregions here is correlated in varying degrees with climatic types, physiographic provinces and agricultural regions and also with soil types. This correlation is not surprising when we consider that climate, physiography, and soil all affect one another, and that the distribution of plants and animals is dependent upon all these environmental factors.

The names assigned to each region retain the names of the most obvious vegetation indicator, such as, mixed forest, broadleaf forest, and desert. As a rule, designations of the geographic situations, such as Eastern Deciduous Forest, California Grassland, are added.

For the purpose of this bibliography, only the ecoregion levels of *province* and *section* have been assigned to abstracts. The broad levels of *domain* and *division* have not been used in the abstracts, but are shown below for clarification of map symbols.

Domain		Division	
1000	Polar	1200	Tundra
		1300	Subarctic
2000	Humid-Temperate	2100	Warm Continental
		2200	Hot Continental
		2300	Subtropical
		2400	Marine
		2500	Prarie
		2600	Mediterranean
3000	Dry	3100	Steppe
		3200	Desert
4000	Humid-Tropical	4100	Savanna
		4200	Rainforest

Additional information and references cited are presented in the publication "Ecoregions of the United States," by Robert G. Bailey, available from the U.S. Forest Service, Ogden, Utah 84401.



Ecoregions of the United States

by Robert G. Bailey, 1976.
(revision)

ECOREGION BOUNDS

Province

Section

SCALE

0 100 200 300 400 Miles

0 100 200 300 400 500 600 700 Kilometers

PROVINCE
SECTION

2110 Laurentian Mixed Forest
- 2111 Spruce-fir Forest
- 2112 Northern Hardwoods–Fir Forest
- 2113 Northern Hardwoods Forest
- 2114 Northern Hardwoods–Spruce Forest

2210 Eastern Deciduous Forest
- 2211 Mixed Mesophytic Forest
- 2212 Beech–Maple Forest
- 2213 Maple–Basswood Forest + Oak Savanna
- 2214 Appalachian Oak Forest
- 2215 Oak–Hickory Forest

2310 Outer Coastal Plain Forest
- 2311 Beech–Sweetgum–Magnolia–Pine–Oak Forest
- 2312 Southern Floodplain Forest

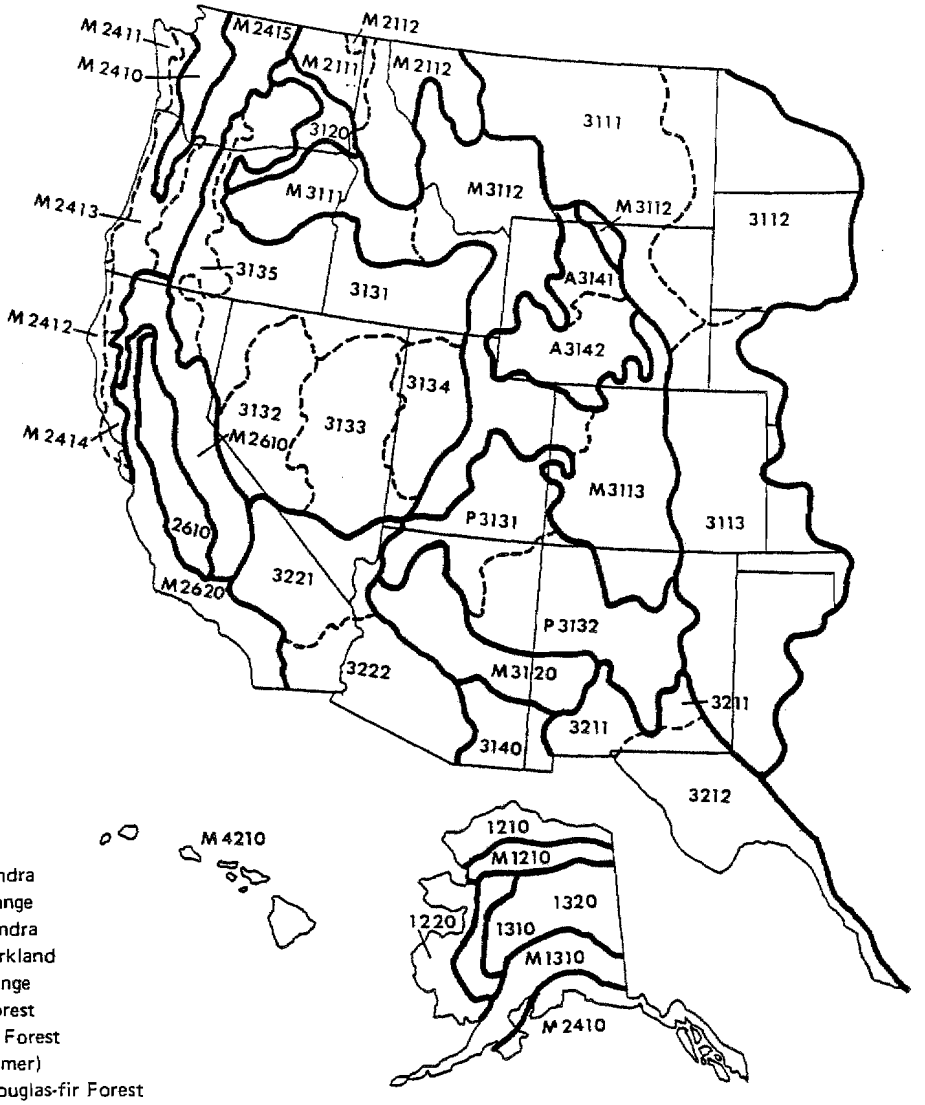
2320 Southeastern Mixed Forest

2510 Prairie Parkland
- 2511 Oak–Hickory–Bluestem Parkland
- 2512 Oak + Bluestem Parkland

2520 Prairie Brushland
- 2521 Mesquite–Buffalo Grass
- 2522 Juniper–Oak–Mesquite
- 2523 Mesquite–Acacia

2530 Tall-grass Prairie
- 2531 Bluestem Prairie
- 2532 Wheatgrass–Bluestem–Needlegrass
- 2533 Bluestem–Grama Prairie

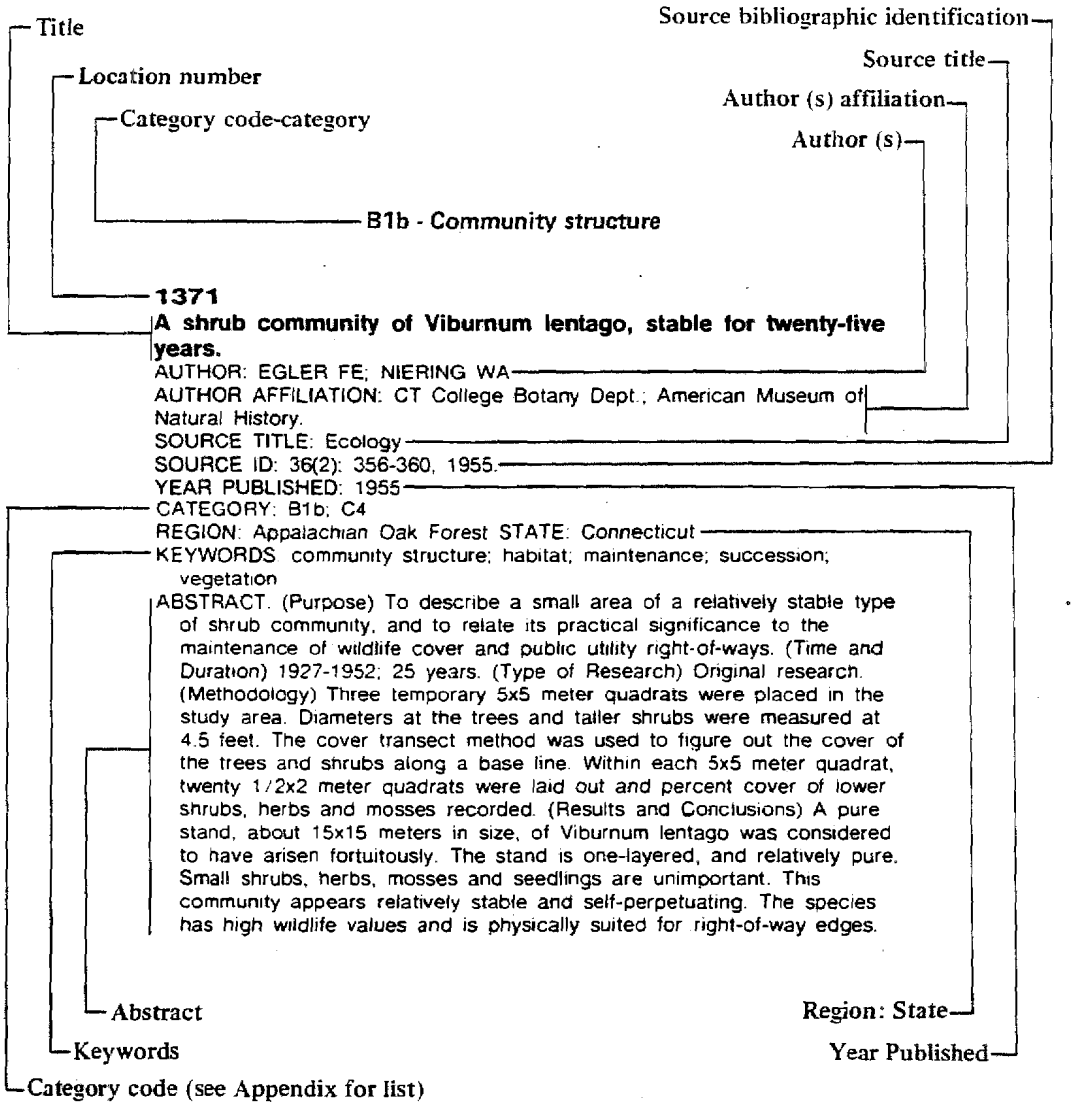
4110 Everglades



PROVINCE
SECTION

1210 Arctic Tundra
M1210 Brooks Range
1220 Bering Tundra
1310 Yukon Parkland
M1310 Alaska Range
1320 Yukon Forest
M2110 Columbia Forest (Dry Summer)
M2111 Douglas-fir Forest
M2112 Cedar–Hemlock–Douglas-Fir Forest
2410 Willamette-Puget Forest
M2410 Pacific Forest
M2411 Sitka Spruce–Cedar–Hemlock Forest
M2412 Redwood Forest
M2413 Cedar–Hemlock–Douglas-fir Forest
M2414 California Mixed Evergreen Forest
M2415 Silver Fir–Douglas-fir Forest
2610 California Grassland
M2610 Sierran Forest
M2620 California Chaparral
3110 Great Plains Shortgrass Prairie
3111 Grama–Needlegrass–Wheatgrass
3112 Wheatgrass–Needlegrass
3113 Grama–Buffalo Grass
M3110 Rocky Mountain Forest
M3111 Grand Fir–Douglas-fir Forest
M3112 Douglas-fir Forest
M3113 Ponderosa Pine–Douglas-fir Forest
3120 Palouse Grassland
M3120 Upper Gila Mountains Forest
3130 Intermountain Sagebrush
3131 Sagebrush–Wheatgrass
3132 Lahontan Saltbush–Greasewood
3133 Great Basin Sagebrush
3134 Bonneville Saltbush–Greasewood
3135 Ponderosa Shrub Forest
P3130 Colorado Plateau
P3131 Juniper–Pinyon Woodland + Sagebrush–Saltbush Mosaic
P3132 Grama–Galleta Steppe + Juniper–Pinyon Woodland Mosaic
3140 Mexican Highlands Shrub Steppe
A3140 Wyoming Basin
A3141 Wheatgrass–Needlegrass–Sagebrush
A3142 Sagebrush–Wheatgrass
3210 Chihuahuan Desert
3211 Grama–Tobosa
3212 Tarbush–Creosote Bush
3220 American Desert (Mojave–Colorado–Sonoran)
3221 Creosote Bush
3222 Creosote Bush–Bur Sage
M4210 Hawaiian Islands

EXPLANATORY KEY



A - ROW Construction/Maintenance Methods

1001
Clamor for economy may cause waste in right of way management.
AUTHOR: MIDDLETON JB
AUTHOR AFFILIATION: PA. Electric Co.
SOURCE TITLE: Proceedings Northeastern Weed Science Society
SOURCE ID: 32:270-271, 1978.
YEAR PUBLISHED: 1978
CATEGORY: A
REGION: Applicable to entire United States STATE: United States
KEYWORDS: management; right-of-way
ABSTRACT: (Purpose) To discuss ROW management through the years. (Type of Research) Discussion paper. (Results and Conclusions) Management must look ahead to future costs and long range results for real economy.

1002
Right of way management involves plants and people.
AUTHOR: OLENIK CJ
AUTHOR AFFILIATION: PA. Electric Co.
SOURCE TITLE: Proceedings Northeastern Weed Science Society.
SOURCE ID: 32:272-273, 1978.
YEAR PUBLISHED: 1978
CATEGORY: A
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: management; right-of-way; vegetation
ABSTRACT: (Purpose) To describe the relationship between ROW management and landowners. (Type of Research) Discussion paper. (Results and Conclusions) The ROW manager should work with the landowner to keep him informed about herbicide use on his land.

1003
Alternative electrical transmission systems and their environmental impact.
AUTHOR: SCHIEFELBEIN GF
AUTHOR AFFILIATION: Batelle Pacific Northwest Lab.
SOURCE ID: Richland, WA, Battelle Pacific Northwest Lab, 1977, 113 p.
YEAR PUBLISHED: 1977
CATEGORY: A, B
REPORT NUMBER: BNWL1774 NTISPB271652 NUREGO316
CONTRACT NUMBER: EY76CO61830
SPONSOR US Nuclear Regulatory Comm.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: construction; ecological; electrical effect; environment; impact; maintenance, transmission line; transmission, electric
ABSTRACT: (Purpose) To describe electrical transmission systems to help in determining environmental impacts. (Type of Research) Literature review. (Results and Conclusions) Overhead alternating current, overhead direct current, underground, and water crossings are the various transmission systems discussed. Environmental aspects of each system are discussed and include design, routing problems, aesthetics, land use, construction and clearing costs, ecological effects, electrostatic effects, and maintenance impacts. References and a bibliography are given.

1004
Application for a construction permit for a 500 kV EHV transmission line.
AUTHOR: ANDERSON JH
AUTHOR AFFILIATION: MN Power and Light.
SOURCE ID: Duluth, MN, MN Power and Light, 1977, 74 p.
YEAR PUBLISHED: 1977
CATEGORY: A, B
REGION: Spruce-fir Forest STATE: Minnesota
KEYWORDS: construction; endangered; impact; right-of-way; species
ABSTRACT: (Purpose) To apply for a construction permit from the Minnesota Environmental Quality Council. (Time and Duration) 2 years. (Results and Conclusions) A typical application which includes a description of the regional environment and details the expected environmental impacts and mitigating measures.

1005
Transmission lines: environmental and public policy considerations.
AUTHOR: JENKINS JC; SMITH TW; STEINHART JS
AUTHOR AFFILIATION: Institute for Environmental Studies, Univ of WI.
SOURCE ID: Madison WI, Institute for Environmental Studies, 1977, 165 p.
YEAR PUBLISHED: 1977
CATEGORY: A, B
REPORT NUMBER: IES79
REGION: Applicable to entire United States STATE: United States
KEYWORDS: bibliography; environment; impact; planning; transmission lines
ABSTRACT: (Purpose) To provide a general discussion of the engineering and environmental aspects of planning, building, and maintaining transmission lines. An annotated bibliography is included. (Type of Research) Literature review. (Results and Conclusions) General discussions are included on utility organization and regulation, physical features of transmission systems, environmental effects, planning, alternative electrical transmission, and energy conservation. A glossary of related terms and annotated bibliography of 196 entries are also included.

1006
The land use and environmental impacts associated with the development of high, extra high, and ultra high voltage transmission lines.
AUTHOR: ROWELL CH
AUTHOR AFFILIATION: Cornell Univ.
SOURCE ID: US Forest Service, Natural Resources Research and Extension Series 6.
YEAR PUBLISHED: 1976
CATEGORY: A
REGION: Applicable to entire United States
KEYWORDS: environment; impact; land use
ABSTRACT: (Purpose) To review and discuss the potential impact of electric transmission lines. (Type of Research) Discussion paper. (Results and Conclusions) A descriptive account is given of major impacts and their possible mitigation.

1007
Right-of-way management; transmission line maintenance standard no. 63040-50.
AUTHOR AFFILIATION: US Dept. of the Interior
SOURCE ID: Portland, OR, Bonneville Power Admin., 1976.
YEAR PUBLISHED: 1976
CATEGORY: A
REGION: Applicable to entire United States.
KEYWORDS: construction; maintenance; management; right-of-way
ABSTRACT: (Purpose) To describe the right-of-way management of Bonneville Power Administration. (Type of Research) Policy statement. (Results and Conclusions) A revised policy for ROW management is described which employs a more judicious use of herbicides, stresses used by landowners, suggests improved road design and maintenance, and establishes a new danger tree policy. In the latter, stable trees which tower well above the conductor may be left, as well as hazardous trees that just barely miss the wires without allowance for future growth. Also, an irregular backline will be developed according to swing clearance. Both selective and blanket herbicide sprays may be used to fit the situation. Road and river screens are left, and trees in ravines are not cut. A growth period of 15 years is allowed for trees to be left in clearing. The stated objective of this Standard, as it relates to the environment, is to produce a better land use program which incorporates the conservation and protection of the natural resource, while maintaining the facilities to maximum reliability.

1008
National forest landscape management; volume 2, chapter 2, utilities.
AUTHOR: US FOREST SERVICE
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Washington, DC, US Forest Service, 1975, 147 p.
YEAR PUBLISHED: 1975
CATEGORY: A
REGION: Applicable to entire United States
KEYWORDS: aesthetics; design; forest; management; planning
ABSTRACT: (Purpose) To describe how to plan, design, and construct utility lines to harmonize with the landscape. (Type of Research) A discussion and descriptive report. (Results and Conclusions) The visual characteristics of electric transmission lines and methods for reducing their contrast with surroundings through adaptations of form, line, color, and texture are described and illustrated. Vegetative manipulation is a key element in blending or screening impacts. Soil manipulation and seeding and planting are also used. Harmonizing of structures has a major effect on reducing visual impact. An example is given of blending a 115 kV transmission with natural landscape through selective clearing, tapered ROW vegetation, removal or topping of danger trees, and use of helicopters in construction. Methods for locating ROWs so as to blend with topography and vegetation are illustrated. Problems in use of underground cables for distribution lines are discussed.

A - ROW Construction/Maintenance Methods

1008

1009
Control of Vegetation succession by means of soil fabrics.
AUTHOR: GRIME JP; LOACH K; PECKHAM D
AUTHOR AFFILIATION: CT Agricultural Experiment Station.
SOURCE TITLE: Journal of Applied Ecology.
SOURCE ID: 8:257-263, 1971.
YEAR PUBLISHED: 1971
CATEGORY: A; D
REGION: Eastern Deciduous Forest
KEYWORDS: invasion; soil; succession
ABSTRACT: (Purpose) A study of the effectiveness of fabric mesh on controlling tree invasion. (Time and Duration) 1963-68. (Type of Research) Original research. (Methodology) Meshes of fused galvanized iron and woven fiber glass strands were tested at 3cm depth in glasshouse plots. A field test of plastic and hardware cloth was made in an abandoned field employing eight treatments of 22 plots each in five blocks. The plots were also sown with red oak acorns to add to natural invasion. (Results and Conclusions) Wire meshes caused swelling and root restriction, but no fatalities, in glasshouse tests. In field tests, white ash invaded in numbers and constriction and dieback of shoots occurred with galvanized meshes. It appeared that larger seeds may be excluded from germination sites. Herbaceous litter accumulated on the surface, and living cover was reduced. In no cases were ash seedlings completely controlled.

1010
A program for vegetation management.
AUTHOR: PENNSYLVANIA POWER AND LIGHT
AUTHOR AFFILIATION: PA. Power and Light Co.
SOURCE ID: Allentown, PA, PA Power & Light Co, 1971, 132 p.
YEAR PUBLISHED: 1971
CATEGORY: A
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: clearing; herbicides; maintenance; management; slash; vegetation
ABSTRACT: (Purpose) To describe methods for vegetation management. (Type of Research) Manual. (Results and Conclusions) Methods to reduce ecological impacts are described. Clearing is of two types: tailored (marked trees cut), and selective with irregular margins, no clearing in ravines. Slash is piled and crushed; it is burned only on order. Only selective sprays are used and these are applied at any season whenever possible. Shrubs and low trees are preserved.

1011
Brush and stump control on new rights-of-way.
AUTHOR: WETSCH AF
AUTHOR AFFILIATION: Bonneville Power Admin.
SOURCE TITLE: Pages 248-256 in symposium proceedings: herbicides and vegetation management in forests, ranges and noncrop lands.
SOURCE ID: Corvallis, OR, OR State Univ, 1967, 355 p.
YEAR PUBLISHED: 1967
CATEGORY: A
REGION: Silver Fir-Douglas-fir Forest STATE: Oregon; Washington
KEYWORDS: brush; management; rights-of-way
ABSTRACT: (Purpose) To describe the management plan developed at Bonneville Power Administration for ROWs. (Type of Research) Descriptive paper (Results and Conclusions) Brush control must be started shortly after initial clearing and continued at four to five year intervals. Standard techniques should be used.

1012
Programed right-of-way maintenance.
AUTHOR: JOHNS HR
AUTHOR AFFILIATION: Asplundh Environmental Services.
SOURCE TITLE: Pages 265-272 in symposium proceedings: herbicides and vegetation management in forests, ranges and noncrop lands.
SOURCE ID: Corvallis, OR, OR State Univ, 1967, 355 p.
YEAR PUBLISHED: 1967
CATEGORY: A
REGION: Applicable to entire United States STATE: United States
KEYWORDS: maintenance; management; right-of-way
ABSTRACT: (Purpose) To describe how to program right-of-way vegetation management. (Type of Research) Discussion. (Results and Conclusions) Programming ROW maintenance is defined as planning the right combination of chemicals and methods to insure continuity of utility service economically and aesthetically. Brush elimination is preferable to brush control. However, management is more than brush killing and involves a number of factors. Total programming calls for relating all factors, including management, human, and botanical.

1013
Special herbicide combinations for right-of-way brush control.
AUTHOR: KIRCH JH
AUTHOR AFFILIATION: AmChem Products.
SOURCE TITLE: Pages 273-280 in symposium proceedings: herbicides and vegetation management in forests, ranges and noncrop lands.
SOURCE ID: Corvallis, OR, OR State Univ, 1967, 355 p.
YEAR PUBLISHED: 1967
CATEGORY: A
REGION: Applicable to entire United States STATE: United States
KEYWORDS: brush; herbicides; right-of-way
ABSTRACT: (Purpose) To report studies to improve aerial and ground foliage sprays. (Type of Research) Discussion. (Results and Conclusions) Addition of invert carriers to reduce drift improves control. Proper mixtures of herbicides can be fitted to help control hard-to-kill species, in both aerial and ground applications.

A1 - ROW Clearing

1014
The southern tier interconnection: a case study.
AUTHOR: TILLMAN RE
AUTHOR AFFILIATION: Cary Arboretum.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS MS State Univ, 1976, 221-230 p.
YEAR PUBLISHED: 1976
CATEGORY: A1
REGION: Northern Hardwoods Forest STATE: United States
KEYWORDS: construction; environment; habitat; right-of-way; wildlife
ABSTRACT: (Purpose) A case history is described of the construction of a 345 kv line in southeastern New York from 1973-75, under evnironmental stipulations of the PSC. (Results and Conclusions) A plan was developed for environmental protection and wildlife management. Selective clearing of tall-growing trees was carefully supervised to insure compliance and to permit modifications. Public relations with the utility, the contractor, the public, and the PSC staff soon become a major consideration. The ROW was selectively cleared, except for tower pads and wire-pulling sites, with trees marked to be cut. A "drop and lop" method of brush disposal was used. Access roads were carefully constructed to minimize impacts and for low maintenance costs over a long period. Erosion control methods kept roads in excellent condition. Use of a "gin pole" technique to erect towers was used on the more inaccessible sites to reduce disturbance from heavy equipment. Habitat management on the ROW consisted of screens at roads and streams, retaining slash on steep slopes, topping in urban areas, leaving dead den trees, sod planting, stream protection, water impoundments, and restoration. Cost of the latter was minimized owing to retention of natural vegetation.

1015
Environmental aspects of construction on the AEP 765-kV transmission lines.
AUTHOR: SAMUELSON AJ
AUTHOR AFFILIATION: American Electric Power Service Corporation.
CATEGORY: A1
REGION: Beech-Maple Forest STATE: IN; OH
KEYWORDS: construction; right-of-way
ABSTRACT: (Purpose) To describe environmental aspects of clearing the ROW and constructing a 765 kV transmission line, particularly those actions taken to control erosion and in preserving aesthetic values. (Time and Duration) Five-years of observations. (Type of Research) Applied research based on observations of policies carried out during ROW construction. (Methodology) In 1969 AEP promoted the beautification and preservation of this ROW by feathering the edges, screening all highway crossings, preserving the trees and brush in valley bottoms, minimizing clearing on the down-hill side of the ROW, and selective clearing where flowering shrubs and hardwoods were present. The results of these were observed over the ensuing years and generally evaluated. (Results and Conclusions) When locating lines so they are not seen by the general public, such as the positioning of towers on slopes of hills, there occurs additional concern for avoiding land movement and landslides. Many landslides occur naturally due to nature, but many occur due to changes by man in the natural ground slope. Access roads should be so placed that heavy cuts and fills, sharp curves, steep grades, ledges, wet or swampy areas and unnecessary stream crossings can be avoided. Topographic maps and aerial maps are of great value in selecting construction road sites. Grading of construction areas, such as material yards, roads, conductor set-up locations and crane pads, are held to a minimum and adequate drainage of these sites is ensured at all times. Runoff is channeled to prevent accumulation.

1016
Effects of power transmission lines on vegetation of the Mojave Desert.
AUTHOR: BRUM GD; JOHNSON HB; VASEK FC
AUTHOR AFFILIATION: Univ of CA, Riverside.
SOURCE TITLE: Madrono
SOURCE ID: 23:114-130, 1975.
YEAR PUBLISHED: 1975
CATEGORY: A1; A5; B1
SPONSOR: Co.
REGION: American Desert (Mojave-Colorado-Sonoran) STATE: Arizona; California; Nevada
KEYWORDS: clearing; community structure; corridor; desert; disturbance; ecosystem; impact; resilience; right-of-way; structures; succession; transmission; vegetation
ABSTRACT: (Purpose) The purpose of this study is to describe and estimate the impacts of power line construction and maintenance on the study area vegetation. (Time and Duration) 33 years; 1937 to 1970. (Type of Research) Original field research. (Methodology) Vegetation was sampled by transects on and near a ROW constructed in the Lucerne Valley of southeastern California. One line was built in 1937, the other in 1970. Four transects were established at each of 11 study areas. Transects were established as: A. Control; B. Midway between pylons under the center wire; C. Edge of access road; and D. Under pylon. Perennial shrubs were the only ground cover evaluated. Data collected included species composition, vegetation density, and ground cover. Several statistical analysis methods are applied to interpret the data. (Results and Conclusions) Plant numbers generally increased on the older power line and decreased on the younger line with increased disturbance. The proportion of shortlived perennials was greater under pylons (areas of more severe disturbance). Community quality index (CQI) varies with the type of transect and with the age of the power line. Authors conclude the construction and maintenance of the lines studied have a slight enhancement effect on the vegetation, that is an increase in ground cover under the center wire, somewhat greater enhancement along the edge of the access road and highly variable response under the pylons.

1017
Transmission lines and the environment.
AUTHOR: HUTCHINSON HE
AUTHOR AFFILIATION: Allegheny Power Service Corporation.
SOURCE TITLE: IEEE Transactions Aerospace and Electronic Systems.
SOURCE ID: AES-9(2):296-299, 1973.
YEAR PUBLISHED: 1973
CATEGORY: A1
REGION: Applicable to entire United States STATE: United States
KEYWORDS: aesthetics; environment; right-of-way; routing; routing selection methodology
ABSTRACT: (Purpose) To describe the confused and conflicting state of environmental criteria for transmission lines which have been thrust upon the electric utilities by pressure groups and legislation, and to point out that realistic, flexible rules must be developed to balance the need for electric energy with ecology. (Type of Research) Observations and literature review (not direct results of research). (Methodology) The author states that because of some currently unacceptable past practices electric utilities must include environmental considerations into their current ROW projects. Utilities are being aided in changing their methods by conflicting pressures from concerned citizens' groups and environmental organizations, plus by legislation from all levels of government. The recommendations of the Working Committee on Utilities (December 1968), presented in the Report to the Vice President and the President's Council on Recreation and Natural Beauty, are discussed. (Results and Conclusions) The guidelines in the Report are based on the belief that the form and appearance of transmission lines will be improved by creative design and construction and by imaginative use of colors and materials. Further improvement will be made if lines are concealed by natural terrain and vegetation and by landscaping. These guidelines give the utilities the necessary criteria for the selection and clearing of ROW routes, location of towers and overhead lines, design of towers, maintenance of ROWs, and possible secondary uses of ROWs.

1018
The design of electric transmission lines.
AUTHOR: PACIFIC GAS ELECTRIC CO
AUTHOR AFFILIATION: Pacific Gas and Electric Co.
SOURCE ID: San Francisco, CA, Pacific Gas and Electric Co., 1972. 12 p.
YEAR PUBLISHED: 1972
CATEGORY: A1, A5
SPONSOR: Pacific Gas and Electric Co.
REGION: Applicable to entire United States STATE: California
KEYWORDS: construction; design; planning; right-of-way; siting; transmission line
ABSTRACT: (Purpose) To present the concepts of electric transmission line design used by Pacific Gas and Electric Co. (Time and Duration) Not specified. (Type of Research) Not research. (Methodology) Narrative. (Results and Conclusions) The following elements are discussed in general terms: time schedule for completion; direct effects (on society and the land); route selection; reconnaisance of project; regional analysis; environmental analysis; design of alternative corridors; comparisons of alternatives; line structure design; multiple uses of ROW; capital cost; reliability and maintenance; conclusions.

1019
Reducing damage to trees from construction work.
AUTHOR: FOWLER ME; GRAVATT GF; THOMPSON RA
AUTHOR AFFILIATION: USDA, Agricultural Research;; USDA, Agricultural Admin. Research;; USDI, Nat Park Service.
SOURCE ID: Washington, DC, US Dept of Agriculture, 1945, Farmer's Bulletin 1967, 26 p.
YEAR PUBLISHED: 1945
CATEGORY: A1; B2d; B2g
REGION: Applicable to entire United States STATE: United States
KEYWORDS: construction; impact; rights-of-way; trees; windthrow
ABSTRACT: (Purpose) Descriptive manual. (Results and Conclusions) The many hazards to which preserved trees are subject are intensified by mechanical injuries and environmental changes due to construction work, though the damage is not always immediately evident. Recommendations are made to include tree damage precautions in construction planning, preserve natural fertility near preserved trees, treat wounds immediately, prevent soil packing and erosion, maintain proper drainage, and locate access roads to preserve trees. Discussion is provided for each recommendation. The wind tunnel effect of clearcutting power lines and the benefits of selective cutting are noted. Specifications for tree work on distrubution lines are also included.

1020
Sunscald of eastern white pine, pinus strobus l.
AUTHOR: HUBERMAN MA
SOURCE TITLE: Ecology
SOURCE ID: 24(4):456-471, 1943.
YEAR PUBLISHED: 1943
CATEGORY: A1; B2c; B2d
REGION: Northern Hardwoods - Spruce Forest STATE: Connecticut; Massachusetts; New Hampshire
KEYWORDS: construction; edges; impact; sunscald; trees
ABSTRACT: (Purpose) To determine the size, age and position of trees most susceptible to sunscald injury, the nature and extent of the injury itself, and to obtain indications which would help avoid such injury. (Time and Duration) 1940-1942; 2 years. (Type of Research) Original research. (Methodology) One hundred forty-seven injured trees were selected and data recorded for 14 variables. Photomicrographs were made from wood samples of 15 of the trees growing in four areas. An exposure experiment used 12 natural white pines; varying degrees of shading were conducted in July and December of 1940, 1941, and 1942. A cambial temperature experiment was conducted in Connecticut, using a number of solar radiation measurement techniques. (Results and Conclusions) (1) Sunscald is a serious injury to the cambium on the southwest side of tree trunks. (2) It occurs on dark-colored smooth-bark trees on the north and east edges of openings made in forest stands. (3) Injury on the west-southwest side indicates high afternoon summer temperature or rapid temperature drop after sunset in winter. (4) Topography did not have a significant influence. (5) Time of injury is between October 1 and April. (6 Characteristics of day significantly affect cambial temperature. (7) Tree temperature on north side fluctuates less than other sides. (8) Air temperature is the most important factor in cambial temperature. (9) Sunscald in the north-east appears to be a winter injury with rapid freezing as a possible cause. (10) Sunscald can be avoided by making the smallest possible openings consistent with sound silviculture, by leaving screen trees on southern and western borders of woodlots, by not using extensive clearcuts, and by pruning young trees in two or more steps.

A1a - Mechanical/Manual

1021
The plight of the right-of-way domain: victim of vandalism; part I.
AUTHOR: EGLER FE
AUTHOR AFFILIATION: Aton Forest
SOURCE ID: Mt Kisco, NY, Futura Media SErvices, 1975, 294 p.
YEAR PUBLISHED: 1975
CATEGORY: A1a; A1b; A5a; A5b; A5e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: communities; ecology, applied; ecosystem; impact; rehabilitation; right-of-way; spraying, selective, succession; weeds, ecology of

1021

ABSTRACT: (Purpose) To explain the importance and role of sound ecological knowledge in managing the vegetation on ROWs. (Time and Duration) Research and experience over 25 years. (Type of Research) Original research and field experience. (Methodology) In this volume the author discussed five scientific principles: principle of vegetation zonation; principles of site-types; principle of intrinsic (natural) vegetation development; principle of extrinsic (man-induced) vegetation development; and the concept of the cover-type. He also discusses: species roles in vegetation changes including relay floristics, initial floristic composition, and combinations of these. Alternative uses of ROW land are cited, and the practice of multiple use is explored. (Results and Conclusions) Sound ROW management policies require persons trained in ecology and familiar with the local vegetation and successional trends. Every effort must be made to establish plant communities of low shrubs and trees which will resist invasion and eventually require less expenditure and upkeep that ROWs maintained by broadcast herbicide spraying. ROW areas should be managed to make them useful to community, and to accommodate various multiple-use interests. Much of the poor management on ROWs can be attributed not only to lack of knowledge of line managers, but to pressures from many varied groups.

1022
The plight of the right-of-way domain: victim of vandalism; part II.

AUTHOR: EGLER FE
AUTHOR AFFILIATION: Aton Forest.
SOURCE ID: Mt. Kisco, Futura Media Services, 1975, 160 p.
YEAR PUBLISHED: 1975
CATEGORY: A1a; A1b; A5a; A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: corridor; ecology, applied; ecosystem; herbicides; right-of-way; stability; transmission; wildlife
ABSTRACT: (Purpose) To explain the castes of social units interacting to produce the present forms of management that we have on our ROW domain. (Time and Duration) 25 years of research and field experience. (Type of Research) Original research and public contacts. (Methodology) The author describes the three castes of social units: 1. Right-of-way vegetation science and vegetation management; 2. Business influences and government influences, science, conservation and citizen groups, and the private land owners; 3. The Military, health and food, the farm, forest, pasture and range, wildlife habitat, riparian vegetation, reservoir shores, lakes and ponds, watershed vegetation, airports, transmitter sites, lawns, city parks, vacant city lots, gravel industry, and classical plant ecology. (Results and Conclusions) "The present art and science of ROW vegetation management are reflective of the ignorance, indifference and impudence of the land managers, who have been mis-led by the highly successful chemical industry, and disregarded by an ecological academia too aloof to be concerned with such mundane matters and too encased in hardened dogma to be practical even if they wished. On the one hand instant Ecologists are arising to skim off the greenbacks, and on the other hand are the environmental activists who must temper their emotional extremism with common sense and scientific facts.

1023
Herbicide use on electric utility rights-of-way; a review of recent literature on herbicides, their safety and use.

AUTHOR: CARVELL KL
AUTHOR AFFILIATION: WV Univ.
SOURCE ID: New York, NY, Edison Electric Institute, 1973, EEI Publication No. 72903 61 p.
YEAR PUBLISHED: 1973
CATEGORY: A1a; A1b; A1e
REPORT NUMBER: EE172903
CONTRACT NUMBER: EEIRP103
SPONSOR: Edison Electric Institute.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: chemicals; composition; ecosystem; environmental assessment; herbicides; impact; inhibitors; maintenance; mammals; public health; residues; right-of-way; succession, secondary; toxicity
ABSTRACT: (Purpose) To provide a handbook for ROW managers with information on vegetation control methods, safety, and environmental impact to allow electric personnel to do a better job managing ROW areas and protecting the environment. (Time and Duration) One year. (Type of Research) Literature review. (Methodology) Over 1000 articles were reviewed in preparing this publication. Many of these are cited in the "Literature Review" section of this report. The most pertinent information from this literature survey was used to prepare this handbook, using as a criteria for selection "those questions most frequently asked by ROW managers." (Results and Conclusions) Topics included in this publication are: importance of herbicides in American life; herbicide development, chemistry, safety and persistence; growth inhibitors; methods of treating vegetation; effect of season and time of day; drift and volatility; effects of herbicides on water quality; uses of herbicides by wildlife managers; the herbicide controversy; plant succession; improving vegetation control methods on ROWs; and effects of the herbicide controversy on research and development.

1024
Power line right-of-way management through selective use of herbicides.

AUTHOR: ROSSMAN WR
AUTHOR AFFILIATION: PA Electric Co.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 4(3):2-6, 1972.
YEAR PUBLISHED: 1972
CATEGORY: A1a; A1b; A1h
REGION: Eastern Deciduous Forest STATE: Pennsylvania
KEYWORDS: erosion; herbicides; management; phenoxies; right-of-way; seeding; soil; spraying, selective
ABSTRACT: (Purpose) To describe the vegetation management methods used on Pennsylvania Electric Company ROWS. and also their soil erosion control and seeding practices. (Time and Duration) Covers practices developed over two decades. (Type of Research) Original research (field). (Methodology) The author describes transmission and distribution line ROW clearing, soil erosion control with cross ditches for ROW maintenance roads, specifications for seeding and mulching graded roads and tower locations, ROW vegetation control through herbicides by both selective spraying and broadcast application, and precautions used during helicopter spraying of ROWs to protect adjacent land. (Results and Conclusions) Cross drains (waterbars) are installed on all construction roads and other disturbed areas as a part of the cleanup activity after line construction. Distance between waterbars varies with percent slope. Grass seed is applied at the rate of 100 pounds per acre with lime and commercial fertilizer added. The variety of herbicides and application methods used allows selection of the most effective method for each ROW area and vegetation problem. Their goal is to reinforce and extend the low-growing ground cover plant species most adaptable to the area.

1025
Experience plus ingenuity cut R/W clearing costs.

AUTHOR: SHULER EB
AUTHOR AFFILIATION: Duke Power Co.
SOURCE TITLE: Electrical World.
SOURCE ID: 50-51, 1968 (April 1).
YEAR PUBLISHED: 1968
CATEGORY: A1a; A1b; A1d; A4c
REGION: Appalachian Oak Forest STATE: North Carolina
KEYWORDS: brush; clearing; mowing; right-of-way; seeding; slash disposal; 2,4,5-T
ABSTRACT: (Purpose) To outline initial ROW clearing policies and brush control on older ROW areas as carried out by Duke Power Company in North Carolina. (Time and Duration) Covers 20 years of experience. (Type of Research) Original research (field). (Methodology) Clearing new ROW areas involved initially the bulldozing of two swaths down each edge of the proposed ROW in preparation for the piling of brush and commercial timber. These tractors work out into the ROW removing all undergrowth that is less than 4 inches dbh. Men with chain saws follow the tractors and fell larger trees. Bulldozers then pile tree tops and all debris in a brush line on the outer edge of the ROW, or in gullies if the property owner desires this. Hardwood stumps are treated with 2,4,5-T in fuel oil to eliminate sprouting. (Results and Conclusions) The lesson learned through years of experience and experimenting is that minimum maintenance costs result from proper preparation of the ROW. Seeding ROWs after clearing is done where practical. It acts as a cleanup operation on the line to prepare the ROW more ideally for future maintenance, and to exercise good soil conservation practices. Bulldozers, machine cutting, disking and hand cutting are all used in brush control work, each method used where the topographic and brush conditions dictate.

1026
Vegetation management for rights-of-way.

AUTHOR: US FOREST SERVICE
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: US Forest Service, 1966, 38 p.
YEAR PUBLISHED: 1966
CATEGORY: A1a; A1b; B1a; B1b
REGION: Applicable to entire United States STATE: Michigan; Missouri; United States
KEYWORDS: acquisition; checklist; ecosystem; flora; management; multiple use; right-of-way; spraying, selective; stability; weeds, ecology of; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To assist forest officers and managers of utility companies in planning, developing and maintaining rights-of-way across National Forest land, in order that this management be consistent with the multiple-use policy of the US Forest Service. (Time and Duration) Results of 20 years of herbicide research. (Type of Research) Literature

review. (Methodology) Review of past research and experience in managing vegetation, plus a synopsis of the findings: reports and discussion from two Forest Service training sessions in October 1965. (Results and Conclusions) We are directed by Congress to grant the use of land for right-of-way purposes and to manage them as well as the rest of the National Forest land for the renewable resources and in such a way as to best meet the needs of the public and make sure the productivity of the land is not impaired. All utility rights-of-way Special-Use Permits will contain a clause requiring the joint preparation of a management plan for the establishment and maintenance of vegetation, or the application of selective maintenance to the right-of-way in accordance with a management plan prepared by the Forest Supervisor. The aim of right-of-way vegetation management is to select vegetation requiring the least maintenance while affording the maximum benefit for wildlife and scenic values. Vegetation management should begin with initial clearing in order to avoid many of our present right-of-way problems. Herbicides are being used in wildlife habitat management to change plant succession for browse production, aquatic plant control, wildlife food patches, and to create or improve wildlife openings.

1027
Pesticides in our ecosystem.

AUTHOR: EGLER FE
AUTHOR AFFILIATION: Aton Forest.
SOURCE TITLE: Ecology.
SOURCE ID: 47(6):1077-1084, 1966.
YEAR PUBLISHED: 1966
CATEGORY: A1a; A1b; A5; B1
SPONSOR: Ecology magazine.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: ecology; ecosystem; herbicides; impact; pesticide; right-of-way
ABSTRACT: (Purpose) To offer a particular perspective regarding pesticides. (Time and Duration) Roughly 1950 to 1966. (Type of Research) Philosophical discussion; no research results are presented. (Results and Conclusions) The author covers a lot of ground in this article which is billed by Ecology as an essay type collective review of a timely topic. The author first deals with the general pesticide-related problems and uncertainties; with his own particular emphasis on the failure of pesticide advocates to appreciate the ecosystem concept. He also reviews the principal sources of literature and literature review outlets for pesticide-related subjects, finally getting into the politics of pesticides, pesticide bans, etc. His concluding remarks relate to vegetation management on ROWs. He argues for an ecological approach.

1028
A program for ecological rightofway vegetation management.

AUTHOR: NIERING W
AUTHOR AFFILIATION: CT College.
SOURCE ID: CT Botanical Society, 1956, 2 p.
YEAR PUBLISHED: 1956
CATEGORY: A1a; A5b; B1b
REGION: Appalachian Oak Forest STATE: Connecticut
KEYWORDS: clearing, selective; ecology; management; right-of-way; spraying, selective
ABSTRACT: (Purpose) To suggest the best methods of clearing ROWs, the most desirable physical structure of the vegetation, and the roles of mechanical and chemical methods of brush control in ROW MANAGEMENT. (Type of Research) Based on results of past research extending over a 10-year period. (Methodology) The author describes the best method of line clearing in order to obtain the least environmental disturbance, and also describes the most desirable physical structure of the ROW vegetation. The pros and cons of mechanical and chemical brush control are discussed. (Results and Conclusions) All sound programs of long-term brush control begin with initial clearing of the line. Complete clear-cutting should be limited to the narrowest possible width consistent with construction. Such clear-cutting is accompanied by considerable disturbance to the soil, which not only destroys desirable tree vegetation, but produces a suitable seed-bed for additional invasion by unwanted trees. Mechanical methods of brush control, involving various saws, grinders, bulldozers, scrapers, diskers, and other cutting devices affecting the plants and/or the soil are available, and have their uses in addition to herbicides, in special instances.

1029
Experimental plantings on power line rights-of-way and woodland roads.

AUTHOR: ARNER DH
AUTHOR AFFILIATION: MD Game and Inland Fish Com.
SOURCE TITLE: Transactions of the North American Wildlife Conference.
SOURCE ID: 16:331-338, 1951.
YEAR PUBLISHED: 1951
CATEGORY: A1a, A4c; B3a
REGION: Appalachian Oak Forest STATE: Maryland
KEYWORDS: conservation; habitat; management; revegetation; right-of-way; seeding; soil
ABSTRACT: (Purpose) To obtain information on the practicality of using power line rights-of-way and woodland roads as seeded areas beneficial to wildlife. Objectives include: will grasses and legumes beneficial to wildlife grow on an untreated power line right-of-way, to what extent do they retard succession, and what establishment techniques are best. (Time and Duration) Three years. (Type of Research) Original. (Methodology) During the growing seasons of 1948, 1949 and 1950, whirlwind-type seeders were used to distribute seed mix on open soil after bulldozing electric ROWs. The seed mix contained sericea lespedeza, Korean lespedeza, mammoth red clover, sweet clover, orchard grass, and redtop grass. Fifteen pounds were used per acre. Another seeding operation included orchard grass, rye grass, Alsike clover, redtop grass, buckwheat, and ladino clover. Periodic observations on survival and wildlife use were made using quadrat study plots. (Results and Conclusions) At the end of three growing seasons Korean lespedeza, orchard grass and mammoth red clover still composed a large percentage of the total ground cover. Native species that seeded in naturally were wild peanut, lespedeza stuvei, blackberry and blue grass. Sericea lespedeza, although not very palatable to wildlife due to its high tannic acid content, has aided in the development of native blue grass. It appeared that a combination of spraying and bulldozing would probably prove most economically feasible. This would allow spraying the steep, rocky slopes and bulldozing the more level slopes. Fertilizing and liming will delay invasion of woody species.

1030
Response of selected woody plants in the United States to herbicides.

AUTHOR: BOVEY RW
AUTHOR AFFILIATION: US Agricultural Research Service.
SOURCE ID: Washington, DC, Superintendent of Documents, 1977, 101 p.
YEAR PUBLISHED: 1977
CATEGORY: A1b; A5b
SPONSOR: US Agricultural Research Service. TX; Agricultural Experiment Stations
REGION: Applicable to entire United States STATE: United States
KEYWORDS: brush control; herbicides; selectivity
ABSTRACT: (purpose) The purpose of this book is to report current research standings regarding the character, use and precautions of specific herbicides and the response of many plant species to herbicides on a plant by plant, chemical by chemical basis. (Time and Duration) Not specified. (Type of Research) Literature review, personal observations and synthesis from experience. (Methodology) Narrative description of methods of herbicide application, herbicide characteristics, and precautions and tabular presentation of the effects of specific herbicides on specific species. (Results and Conclusions) Author devotes following numbers of pages to listed topics: application methods - 5 pages; characteristics of herbicides - 5 pages; selection and preparation of herbicides for use - 10 pages; susceptibility of plant species to specific herbicides approximately 70 pages of tables.

1031
A guide to killing woody plants in West Virginia.

AUTHOR: BERTHY HP; CARVELL KL
AUTHOR AFFILIATION: West Virginia University
SOURCE ID: Morgantown, WV, WV Univ. Agricultural Experiment Station, Circular 107, 8 p.
CATEGORY: A1b
REGION: Appalachian Oak Forest STATE: MD; PA; WV
KEYWORDS: brush; brush control; checklist; equipment; herbicides; safety; species; trees
ABSTRACT: (Purpose) To outline the most effective and safest methods of controlling woody plants with herbicides, and present recommendations on the use of these herbicides and application methods that will give the greatest control possible. (Time and Duration) Result of 5-years of research. (Type of Research) Original research (field). (Methodology) In formulating the recommendations included in this manual, only herbicides and application techniques which had been tried and proven by the authors were included. Recommendations were based on those that were safest to the environment, gave the greatest degree of control, and were relatively inexpensive. Recommendations are primarily of interest to those forest managers working in the southern Appalachians. (Results and Conclusions) Topics covered in this publication are: How to apply herbicides, when to apply, equipment, mixing chemical solutions, precautions. Recommendations are separated by season of application, and by size of vegetation (brush, saplings, trees, and such nuisance plants as grape, poison ivy, and japanese honeysuckle).

1031

1032
Picloram basally applied for brush control on utility rights-of-way.
AUTHOR: BYRD BC; WILLIAMS CS; WRIGHT WG
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 24:77-85, 1976.
YEAR PUBLISHED: 1976
CATEGORY: A1b; A5b
SPONSOR: Dow Chemical Co.
REGION: Eastern Deciduous Forest STATE: Indiana; Maryland; Michigan; Vermont; West Virginia
KEYWORDS: application methods; brush; herbicides; maintenance; picloram; right-of-way; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To determine the effectiveness of picloram plus 2,4,5-T on several species at various rates, locations and times of application when applied as a basal or overall dormant stem spray. (Time and Duration) 1966 through 1969. (Type of Research) Original field plot research. (Methodology) Basal or stem applications of herbicides were made using backpack sprayers. Diesel fuel was the carrier in all cases. The degree of control was rated approximately four and nine months after application. (Results and Conclusions) The use of picloram plus 2,4,5-T applied as a basal or a dormant stem spray adequately controlled most brush species on a utility ROW. Nearly complete control of strong resprouters such as aspen, locust, maple, oak, sassafras and sumac with one pound picloram plus 4 pounds 2,4,5-T per 100 gallons was noteworthy. Half this rate was also effective. Basal applications in winter and summer produced similar results. The results were reasonably uniform across locations and types of application equipment. Picloram plus 2,4,5-T at 1 plus 4 pounds per 100 gallons will substitute for 16 pounds per 100 gallons.

1033
Classification and characteristics of herbicides.
AUTHOR: WARREN GF
AUTHOR AFFILIATION: Purdue Univ.
SOURCE TITLE: Herbicides in Forestry (Proceedings of the 1975 John S Wright Forestry Conference).
SOURCE ID: Lafayette, IN, Purdue Univ, 1976, 1-9 p.
YEAR PUBLISHED: 1976
CATEGORY: A1b; A5b
SPONSOR: Purdue Univ.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: classification; herbicides; selectivity
ABSTRACT: (Purpose) The purpose of this paper is to present a classification of herbicides based on their chemical and biological characteristics. (Time and Duration) Not specified. (Type of Research) Not research; a review of state-of-the-art but with no literature cited. (Methodology) Narrative and tabular. (Results and Conclusions) The author has compiled a list of the herbicides which are used in forestry and classified them according to their primary modes of action including growth regulators, inhibitors of oxidative phosphoryiation, photosynthetic inhibitors, mitotic poisons, and a group for which the modes of action are not clearly known. Each of these major groups is then described in terms of its specific effects on plants and generalized behavior in the environment. Author also presents a brief summary of knowledge on absorption and translocation of herbicides in plants and finally regroups herbicides on the basis of how they translocate after foliage and soil application and their mobility in soil.

1034
Herbicides for rights-of-way, trails, and recreation areas.
AUTHOR: BARNHART JA; BRANDT SE; MILLER CH
AUTHOR AFFILIATION: Public Service Co. of IN.
SOURCE TITLE: Pages 128-135 in Herbicides in Forestry; proceedings of the John S Wright Forestry Conference.
SOURCE ID: West Lafayette, IN, Purdue Univ, Dept of Forestry and Natural Resources, 1976.
YEAR PUBLISHED: 1976
CATEGORY: A1b; A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; right-of-way; spraying, basal spraying, broadcast
ABSTRACT: (Purpose) To describe various herbicides, their method of application, and additives, which, when used in proper combination, can be effective in vegetation control on rights-of-way, on trails, and in recreation areas. (Type of Research) Based on field experience. (Methodology) The authors describe the herbicides commonly used on woody plants; such additives as adjuvants, surfactants and odor inhibitors; applications methods, including foliar applications, stem-foliage waterborne, low volume aerial application, basal applications. The also discuss tree injection, stump treatment, and soil application of pelleted herbicides. (Results and Conclusions) The development of herbicides has given ROW managers the capability of economically manipulating plant communities and the opportunity to establish and maintain relatively stable plant communities that are compatible with the operation of the primary facilities on the ROW. For effective control at the lowest cost and with the greatest safety, certain factors must be taken into consideration when determining the type of herbicide and application method. These factors include: species to be controlled, vegetation density and height, soil characteristics, terrain, adjacent land use, herbicide label restrictions and public opinion.

1035
Vegetation management on power line rights-of-way: a state of the knowledge report.
AUTHOR: CODY JB
AUTHOR AFFILIATION: State Univ of NY, College of Env Science and Forestry.
SOURCE ID: Syracuse, NY, Applied Forestry Research Institute, 1975, AFRI Research Report No. 28, 19 p.
YEAR PUBLISHED: 1975
CATEGORY: A1b; A5b; A5c; A5d; A5f
REPORT NUMBER: AFRI28
SPONSOR: Empire State Electric Energy Research; Corp.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: application methods; clearing; clearing, selective; community structure; ecology, applied; habitat; herbicides; management; multiple use; right-of-way; succession
ABSTRACT: (Purpose) The purpose of this state-of-the-art study was to bring together pertinent recent information by surveying literature and through personal contacts with knowledgeable individuals; and to provide a reference book with current information on sound vegetation management practices on electric rights-of-way. (Time and Duration) This survey was done between 1973 and 1975. (Type of Research) Literature survey, interview and on-site inspections. (Methodology) The literature survey was supplemented by interviews with chemical company representatives, tree service personnel, electric power company right-of-way managers, and research workers. The results were combined into a report covering major problems, plant community development, chemical methods, alternative approaches, wildlife, and multiple use of rights-of-way. (Results and Conclusions) Right-of-way vegetation management should start with initial clearing. While initial clearing is important, the greatest job confronting the right-of-way manager is maintenance of existing rights-of-way. The great variety of conditions existing on rights-of-way require a variety of treatments to achieve desired results. The need for maintenance should be determined by line examination, and treatment should be prescribed according to species and conditions. While mechanical methods of woody plant control are still needed, by far the most treatment is done using chemicals. Success is highly dependent on the preparation of good vegetation management plans.

1036
A discussion on herbicides and a statement on 2,4,5-T and TCDD.
AUTHOR: NEWTON M; NORRIS LA
AUTHOR AFFILIATION: OR State Univ.; US Forest Service.
SOURCE TITLE: Journal of Forestry.
SOURCE ID: 73(7):410-412, 1975.
YEAR PUBLISHED: 1975
CATEGORY: A1b; A5b; B1
SPONSOR: US Forest Service.; OR State Univ.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: brush control; environmental assessment; herbicides; toxic hazard; toxicity; 2,4,5-T
ABSTRACT: (Purpose) This reprint is in two parts. Part 1 is a discussion of some current issues regarding the use of herbicides in forestry. The second is a statement by four leading scientists on controversy surrounding 2,4,5-T and TCDD. The purpose of both parts is to provide a factual, rather than an emotional, basis for determining the propriety of using herbicides in forestry. (Results and Conclusions) The discussion portion of this article responds to some specific questions with nearly total emphasis on 2,4,5-T and TCDD. The origin and fate of both chemicals are discussed as are topics relating to toxicity. The consequences of not having herbicides available for use are also presented. The statement o 2,4,5-T and TCDD provides an excellent summary of (a) the role of herbicides in vegetation management; (b) the history of the TCDD controversy; (c) the toxicity of TCDD; and (d) the probability of significant exposure. The authors of the statement conclude that the registered use of 2,4,5 does not present a significant hazard to animals in the forest, or to man.

1037
Behavior and impact of some herbicides in the forest.
AUTHOR: NORRIS LA
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Herbicides in Forestry, Proceedings of John S. Wright Forestry Conference.
SOURCE ID: West Lafayette, IN, Purdue Univ, 1975, 159-176 p.
YEAR PUBLISHED: 1975

CATEGORY: A1b; A5b; B1
SPONSOR: US Forest Service.
REGION: Pacific Forest STATE: United States
KEYWORDS: aminotriazole; brush control; environmental assessment; herbicides; leaching; persistence; picloram; residue; toxic hazard; toxicity
ABSTRACT: (Purpose) To provide the basis for evaluating the toxic hazards of chemical brush control on forest land and to present data on herbicide behavior in the terrestrial ecosystem and herbicide toxicity to animals. (Time and Duration) 1962 to 1975. (Type of Research) Original and literature review. (Methodology) Concepts were developed from literature. Herbicide residue data was gathered using gas chromatography of field samples, except for some data on persistence in forest floor which came from lab studies. Toxicity data are all from the literature. (Results and Conclusions) Herbicide residues seldom exceed 100 ppm per pound per acre immediately after application. Half lives of one to two weeks on vegetation is common. Herbicides are relatively more mobile in soil than insecticides, but on an absolute scale herbicide mobility in terms of potential for ground or stream water contamination is slight. The decreasing order of persistence in forest floor is picloram, 2,4,5-T, amitrole, 2,4-D. No toxic effect levels for acute and chronic exposure are identified. The author concludes normal herbicide use in the forests does not exceed these values.

1038
Pesticide residue dynamics in a forest ecosystem: a compartment model.
AUTHOR: NORRIS LA; SCHROEDER HJ JR; WEBB WL
AUTHOR AFFILIATION: OR State Univ. US Forest Service.
SOURCE TITLE: Simulation.
SOURCE ID: 161-169, 1975.
YEAR PUBLISHED: 1975
CATEGORY: A1b; A5b; B1
SPONSOR: US Forest Service.; OR State Univ.
REGION: Pacific Forest STATE: California; Oregon; Washington
KEYWORDS: brush control; herbicides; impact; leaching; persistence; picloram; residue; vegetation; 2,4,5-T
ABSTRACT: (Purpose) To develop a mathematical model to describe the movement and persistence of 2,4,5-T and picloram herbicides in two markedly different environments. (Time and Duration) 1972 to 1975. (Type of Research) Original synthesis and analysis of data obtained from the literature. (Methodology) (1) Identify major compartments of forest ecosystem (terrestrial). (2) Collect available data on residue dynamics of two herbicides in compartments of the cool moist and the hot dry environments. (3) Develop a mathematical model to describe the movement and persistence of the herbicides from (2) and (4) Simulate residue dynamics from various environmental parameters using (3). (Results and Conclusions) The model is a mixture of theory and empirical observations. Its major contributions are a crude estimate of the interaction between the herbicides and their environment, including effects on vegetation, herbicide movement and persistence on vegetation, forest floor, and soil. The model can serve to guide research efforts and possibly give crude estimates of herbicide behavior in the environment, but it is not a strong tool for the manager to use in the decision making process.

1039
Benefits and hazards of herbicides.
AUTHOR: HARVEY RG
AUTHOR AFFILIATION: Univ of WI, Agronomy Dept.
SOURCE TITLE: Industrial Vegetation Management
SOURCE ID: 7(1):8-12, 1975.
YEAR PUBLISHED: 1975
CATEGORY: A1b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; impact; persistence; public health; 2,4,5-T
ABSTRACT: (Purpose) To point out the importance of weighing both the benefits and the hazards of using 2,4,5-T and 2,4,5-TP, and to illustrate that the risks are very insignificant compared to the great benefits to society. (Time and Duration) Contains a summary on safety and dangers of 2,4,5-T and 2,4,5-TP based on research findings between 1969 and 1975. (Type of Research) Literature review. (Methodology) Review of scientific literature. (Results and Conclusions) Toxicology data presently available indicates that 2,4,5-T has a relatively low acute oral toxicity while TCDD contaminant is highly toxic. TCDD has a much greater teratogenicity than the herbicide itself. The 2,4,5-T presently sold has less than 1 ppm TCDD. At this concentration, dosage levels of either 2,4,5-T or TCDD necessary to produce either toxicity or teratogenicity from normal applications are nearly impossible to achieve. 2,4,5-T has been shown to rapidly break down and thus does not persist or biomagnify. TCDD is more persistent but gradually breaks down. Plants do not readily remove TCDD from the soil and thus the chemical does not readily reach food chains.

1040
Toxicity of various formulations of 2,4-D to salmonids in southeast Alaska.
AUTHOR: MEEHAN WR; NORRIS LA; SEARS HS
AUTHOR AFFILIATION: US Forest Service.; US Nat Marine Fisheries Service.
SOURCE TITLE: Journal Fisheries Research Board of Canada.
SOURCE ID: 31(4):480-485, 1974.
YEAR PUBLISHED: 1974
CATEGORY: A1b; A5b; B1
SPONSOR: US Forest Service.; US Nat Marine Fisheries Service.
REGION: Pacific Forest STATE: Alaska
KEYWORDS: brush control; environmental assessment; fish, toxicity to; herbicides; pollution, water; residue; toxicity; 2,4-D
ABSTRACT: (Purpose) Determine toxicity characteristics of several forms of 2,4-D to Alaskan salmonid fishes and compare response to Oregon fish. (Time and Duration) Literature covers 1951 to 1972. Study covers 2 years. (Type of Research) Original research and laboratory bioassays. (Methodology) Coho, pink, chum and sockeye salmon and dolly varden trout were exposed to 2,4-D purified acid, butyl ester or isooctyl ester in static bioassays. These fish were all from Alaska. Coho were exposed to 2,4-D pure acid, and one of three different formulations of issooctyl ester, PGBE ester, or butyl ester in static bioassays. Similar range of tests were run on coho salmon from Oregon. No effect levels were identified. (Results and Conclusions) Various species of fish of comparable size responded similarly to similar concentrations of the various 2,4-D formulations. The 2,4-D acid had no effect at concentrations about 10 ppm. Isooctyl ester generally had no effect around 1 ppm. The butyl ester was substantially more toxic. The PGBE ester approached the butyl ester in toxicity. Oregon coho responded the same as Alaskan coho which means toxicity data from extensive tests in Oregon can generally be applied to the Alaskan environment.

1041
Assessment of the ecological consequences of herbicides used along transmission line rights-of-way and recommendation for such use.
AUTHOR: BUFFINGTON JD
AUTHOR AFFILIATION: Argonne Nat Lab.
SOURCE TITLE: Argonne, IL, Argonne Nat Lab, Report ANL/ES 34.
SOURCE ID: Springfield, VA, Nat Technical Information Service, 1974, 44 p.
YEAR PUBLISHED: 1974
CATEGORY: A1b; A5b; B1
SPONSOR: Argonne Nat Lab.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: brush control; degradation; ecology; environmental assessment; herbicides; impact; leaching; persistence; pesticide; picloram; residue; right-of-way; spray drift; toxic hazard; toxicity; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) The purpose of this paper is to review (1) levels of herbicide necessary to do damage, (2) the nature of the danger, (3) the behavior of the herbcide in the environment, (4) bioaccumulation, and (5) exposure pathways. (Time and Duration) Approximately 100 literature citations from 1947 to 1973. (Type of Research) Literature review. (Methodology) Major sections of data and concepts on: (1) vegetation management practices; (2) health and safety impacts, with primary emphasis on terratogenicity and effects on man; (3) herbicide persistence, mobility and degradation; (4) economic considerations. (Results and Conclusions) The author provides partial coverage of information on spray drift and volatility but does not offer a good synthesis of his findings. His recommendations follow those in Forest Service environmental impact statements of the period. After reviewing primarily the toxicity data relative to terratogenicity, including discussion of TCDD, he concludes that although conservatism dictates that herbicides be considered probable terratogens, this should not preclude their use as long as significant human exposure does not occur. The discussion of herbicide behavior is sound but treatment of TCDD behavior is out of date. Author concludes if his recommendations (enumerated in the paper) are followed, impacts on fauna should be unmeasurable.

1042
Brush control studies in rights-of-way.
AUTHOR: CHAPPELL WE; WILL JB
AUTHOR AFFILIATION: VA Polytechnic Institute.
SOURCE TITLE: Proceedings Southern Weed Science Society.
SOURCE ID: 27:259-265, 1974.
YEAR PUBLISHED: 1974
CATEGORY: A1b; A5b
REGION: Laurentian Mixed Forest STATE: Virginia
KEYWORDS: application methods; brush; herbicides; right-of-way; spray drift
ABSTRACT: (Purpose) To present results on the effectiveness of a large number of herbicides and herbicide combinations when applied to many species of woody plants, and to evaluate Pinoline and Nu-film for evaporation control. (Time and Duration) Three-year study. (Type of Research) Original research (field). (Methodology) In 1971 and 1972 a

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large number of herbicides and combinations of herbicides were tested on many species of hardwood brush. These herbicides include various combinations of banvel, 2,4,-D, 2,4,5-T, picloram, Tandex, Nalco. All of these herbicides and their combinations were also tested with evaporation control chemicals as additives. Tests were made using herbicides as foliage sprays and also with dormant applicatons. Control ratings for each treatment were given on a 1 to 10 scale. (Results and Conclusions) Most of the mixtures used in this study resulted in excellent control of most species of brush, which consisted mainly of oaks, red maple, sumac, pine and black locust. The results indicate that low volumes are effective when applied uniformly with hand guns. The addition of evaporation control agents has very little effect on overall kill of brush under the conditions of this experiment.

1043

Effect of 2,4-D on composition and production of an alpine plant community in Wyoming.

AUTHOR: BROWN GR; SMITH DR; THILENIUS JF
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Journal of Range Management
SOURCE ID: 27(2):140-142, 1974.
YEAR PUBLISHED: 1974
CATEGORY: A1b; A5b; B1a; B1d
SPONSOR: US Forest Service.
REGION: Rocky Mountain Forest
KEYWORDS: biomass; herbicides; impact; species diversity; spraying, selective; vegetation
ABSTRACT: (Purpose) The purpose of this study was to determine the effects of 2,4-D on species composition, above ground standing crop, and dry matter production of associated vegetation. (Time and Duration) 4 years, 1966-70. (Type of Research) Original field plot research. (Methodology) 10 randomly selected 1 foot x 1 foot quadrats were selected in six plots. A randomized block design was used. The treatments were (1) control; that is, no spray and (2) 2 lb per acre 2,4-D as low volatile ester. Standing crop, digestible dry matter, and species composition were determined. Analysis of variance was used to test for treatment effects. (Results and Conclusions) Use of 2,4-D in this alpine meadow setting in the Medicine Bow Mountains of Wyoming almost completely eliminated Geum rossii. The graminoid forb ratio of the vegetation was altered from approximately 3:7 to 8:2 without appreciably changing total standing crop or its digestible dry matter content. Resurgence of forbs could not be detected up to four years after treatment.

1044

Toxicity of 2,3,7,8-Tetrachlorodibenzo-dioxin (TCDD) in aquatic organisms.

AUTHOR: HAWKES CL; MILLER RA; NORRIS LA
AUTHOR AFFILIATION: OR State Univ.; US Forest Service.
SOURCE TITLE: Environmental Health Perspectives.
SOURCE ID: Experimental Issue 5:177-186, 1973.
YEAR PUBLISHED: 1973
CATEGORY: A1b; A5b; B1
SPONSOR: US Forest Service.
REGION: Great Plains Shortgrass Prairie STATE: Alaska; California; Colorado; Idaho; Montana; Nevada; Oregon; Utah; Washington; Wyoming
KEYWORDS: brush control; environmental assessment; fish, toxicity to; herbicides; pollution, water; residue; toxicity; 2,4,5-T
ABSTRACT: (Purpose) To establish the toxicity characteristics of TCDD in several aquatic organisms and the probability of toxic exposure from use of TCDD contaminated herbicides in the forest. (Time and Duration) Literature covers 1967 to 1973; study covers 2 years. (Type of Research) Original research and laboratory bioassays. (Methodology) Guppies and young coho salmon were exposed to TCDD in water at various concentrations for various periods of exposure, static bioass... An aquatic worm, a snail, and mosquito larvae were exposed to single concentrations, static bioassay. Young rainbow trout were exposed to various levels of TCDD in their diet daily for 35 days. Mortality was measured. (Results and Conclusions) (1) TCDD in food or water is toxic to fish. (2) Exposure in water to more than 23 ng/g is irreversible and death results in 10 to 80 days even though fish are placed in clean water. The critical exposure period is less than 24 hours. (3) Small fish are more sensitive than large fish. (4) TCDD in food at 2.3 ppm reduced growth of rainbow trout. Worms, snails, and mosquito larvae were not affected by exposure to 0.2 ppb but the reproductive success of the worm and snail were reduced. Brush control with 2,4,5-T should not result in toxic exposure of aquatics to TCDD based on the responses noted in this paper.

1045

Vegetation control from picloram-phenoxy combinations in invert emulsions.

AUTHOR: BYRD BC; REIMER CA
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Proceedings Southern Weed Science Society.
SOURCE ID: 26:310-315, 1973.
YEAR PUBLISHED: 1973
CATEGORY: A1b; A5b
SPONSOR: Monongahela Power Co.; Dow Chemical Co.
REGION: Eastern Deciduous Forest STATE: West Virginia
KEYWORDS: brush control; herbicides; picloram; right-of-way; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To evaluate the effectiveness of aerial applications of various high viscosity invert emulsions in controlling woody plants, and for safety of application and impact on environment. (Time and Duration) August 1970 to September 1972. (Type of Research) Original field plot research. (Methodology) Herbicides containing picloram, 2,4-D and/or 2,4,5-T in invert formulations were applied by helicopter to a ROW and results compared to those obtained with a commercial Tordon 101 mixture containing Norbak particulating agent as a drift control agent. Percent estimates of top kill were made several times after application. Observations for signs of various types of wildlife were also made but no numerical data on the latter is offered. (Results and Conclusions) Authors note the post-spray ROW vegetation appears able to sustain a substantially bigger wildlife population than the heavy woody overstory present pre-spray. The addition of both 2,4-D and 2,4,5-T esters to picloram increased effectiveness considerably. Authors note invert formulations were generally effective and gave a satisfactory degree of control. Unfortunately, the data tables don't separate all possible combinations of data, but a substantial amount of numerical data is present for the reader's use in selecting appropriate spray mixtures to control specific brush communities if species composition is known.

1046

Degradation of dicamba, picloram, and four phenoxy herbicides in soils

AUTHOR: ALTOM JD; STRITZKE JF
AUTHOR AFFILIATION: OK State Univ.
SOURCE TITLE: Weed Science.
SOURCE ID: 21(6):556-560, 1973.
YEAR PUBLISHED: 1973
CATEGORY: A1b; A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; picloram; soil; 2,4-D; 2,4,5-T; 2,4,5-TP
ABSTRACT: (Purpose) To compare the soil degradation of 2,4-D, 2,4-DP, 2,4,5-T, 2,4,5-TP, dicamba and picloram in three different soils under controlled environmental conditions. (Time and Duration) One-year study. (Type of Research) Original research (laboratory). (Methodology) Each of the soil samples from three areas were individually mixed and placed in styrofoam cups. The cups were kept moist in a growth chamber for two weeks prior to herbicide application to allow good microbial activity at the time of herbicide application. The growth chamber was set for a 16 hour day at 24oC and an 8 hour night at 18oC. Light intensity during day was 3.23 klux. Herbicides used were dicamba, picloram and the diethanolamine salt formulations of 2,4-D, 2,4-DP, 2,4,5-T, and 2,4,5-TP (silves). (Results and Conclusions) Herbicide breakdown was proportional to herbicide concentration, so half life of the various herbicides was calculated from linear regression of the logarithm transformed residue data. The average half life for 2,4-D, 2,4-DP, silvex, 2,4,5-T, dicamba and picloram were, respectively, 4 days, 10 days, 17 days, 20 days, 25 days, and greater than 100 days. The rate of degradation of 2,3-D was the same in all three soils, but for the other herbicides it was consistently faster in soil removed from under grass vegetation than from under trees.

1047

Individual white oaks treated with stem-injected and soil-applied herbicides — costs and effectiveness.

AUTHOR: SHIPMAN RD
AUTHOR AFFILIATION: PA State Univ.
SOURCE TITLE: Down to Earth
SOURCE ID: 28(4):19-25, 1973.
YEAR PUBLISHED: 1973
CATEGORY: A1b; A5b
SPONSOR: PA State Univ.
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: application methods; brush control; cost; herbicides; picloram; trees; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) The purpose of this paper is to report on the relative herbicide costs, percent crown reduction, and degree of sprout control obtained from treating individual stems of white oak with several herbicides. (Time and Duration) 2 years; 1960-70. (Type of Research) Original field plot research. (Methodology) Single stemmed white oaks 5 to 12 inches in diameter (approximately 55 years old) were treated with one of the following: 2,4-D plus 2,4,5-T; picloram plus 2,4-D; tenuron; or

bromacil. 180 trees were treated with each herbicide. The phenoxy and picloram herbicides were stem injected, with the following variables included: injection spacing of three inches, two inches, or totally connected; and two concentrations of herbicides, undiluted and diluted 50% by volume. The fenuron and bromacil herbicides were applied at three different rates as pellets on the ground. A completely randomized factorial design was used. (Results and Conclusions) Tree injected 2,4,5-T plus 2,4-D and soil applied fenuron caused the greatest crown reduction two years after application. Picloram plus 2,4-D and 2,4-D plus 2,4,5-T were most effective in reducing sprouts. To achieve complete control, the phenoxy and picloram herbicide treatments were several times less expensive than fenuron or bromacil. Author emphasizes owner objectives, environmental considerations, and some other factors that will also enter into the decision making process.

1048
The future role of chemicals in forestry.
AUTHOR: GRATKOWSKI HJ; TARRANT RF; WATERS WE
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Portland, OR, US Forest Service General Technical Report PNW 6, 1973, 10 p.
YEAR PUBLISHED: 1973
CATEGORY: A1b; A5b; A5g
SPONSOR: US Forest Service.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: brush control; chemicals; fertilizers; forest; herbicides; insecticides
ABSTRACT: (Purpose) Although not specifically stated, I believe this is a paper the senior author presented at the World Forestry Conference around 1972. It is intended to be a generalized treatment of the various uses of chemicals for the protection and enhancement of forest resource values. (Time and Duration) Not applicable; literature cited covers 1962-72. (Type of Research) Not research, very broad and general review of the subject with limited literature citation. (Methodology) Narrative. (Results and Conclusions) A short review of the development of the use of chemicals in forestry including the growing awareness of environmental concerns. The roles of herbicides, fertilizers, insecticides and fire retardants are described.

1049
Field application of herbicides — avoiding danger to fish.
AUTHOR: JUNTUNEN ET; NORRIS LA
AUTHOR AFFILIATION: OR State Univ.; US Forest Service.
SOURCE ID: Corvallis, OR, OR State Univ, Agricultural Experiment Station, 1972. Special Report 354, 26 p.
YEAR PUBLISHED: 1972
CATEGORY: A1b; A5b; B1
REPORT NUMBER: 354
SPONSOR: OR State Univ.; US Forest Service.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: chemicals; fish, toxicity to; herbicides; pollution, water; toxicity
ABSTRACT: (Purpose) To place specific herbicide formulations into four broad groups based on their toxicity to fish. To aid managers in selecting formulations of least hazard to fish when probability of herbicide entry to water is high. (Time and Duration) Literature covers 17 years, 1952 to 1969. (Type of Research) Literature review. (Methodology) Discusses principles of herbicide entry to water and herbicide toxicity to fish. Uses LD50 or TLm to divide specific herbicide formulations (products) into four broad groups defined as follows: group 1 -TLm 1 ppm or less; group 2 -TLm 1 to 5 ppm; group 3 -TLm 5 to 15 ppm; group 4 -Tlm more than 15 ppm. (Results and Conclusions) The specific formulations are identified by trade or brand name, manufacturer, common name (usually the Weed Science Society of America approved name), the chemical name, and the specific reference used to assign the product to a toxicity group.

1050
Toxicity of 45 organic herbicides to cattle, sheep, and chickens.
AUTHOR: PALMER JS
AUTHOR AFFILIATION: US Agricultural Research Service.
SOURCE ID: Washington, DC, US Dept Agriculture, Agricultural Research Service. 1972. Production Research Report 137, 41 p.
YEAR PUBLISHED: 1972
CATEGORY: A1b; A5b
SPONSOR: US Agricultural Research Service.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; herbicides; mammals; toxic hazard; toxicity
ABSTRACT: (Purpose) To establish the short term toxic effect of 45 herbicide formulations in chickens, sheep and cattle. (Time and Duration) Approximately one year. (Type of Research) Original laboratory research. (Methodology) Repeated doses of the herbicide were delivered in gelatine capsules, or as water diluted solutions by drench or pipette. Animals were usually dosed for 10 days or until toxic effects were noted. Observations continued for 60 days. Various dose levels were used in an effort to identify dose-response relationships. (Results and Conclusions) The signs of poisoning of most of the herbicides were anorexia and weight loss or reduced weight gain. Digestion was frequently impaired by congestion or redness of the intestinal mucosa. Macroscopic lesions varied among animals. Prominent and distended cranial vessels were often associated with depression and ataxia before death. Livers and kidneys were most often involved. The most common or moderate application rates of many of the herbicides studied are not a hazard to sheep, cattle or chickens.

1051
An ecological approach to right-of-way clearance.
AUTHOR: ANON
AUTHOR AFFILIATION: West Penn Power.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 4(3):17, 1972.
YEAR PUBLISHED: 1972
CATEGORY: A1b; B1d
SPONSOR: West Penn Power.
REGION: Aopalachian Oak Forest STATE: Pennsylvania
KEYWORDS: clearing, selective; ecological; herbicides; right-of-way; spraying, selective
ABSTRACT: (Purpose) To discuss West Penn Power's approach to ROW clearing that reduces maintenance and is beneficial to wildlife. (Type of Research) Narrative. (Results and Conclusions) West Penn Power uses selective dormant spraying on unwanted vegetation in clearing a ROW. This method creates a ROW of natural shrubs and perennial cover that provides many food sources for wildlife. The induced ROW cover then is helpful in keeping out invading trees and keeping maintenance cycles as far apart as 15 years.

1052
Chemical brush control: assessing the hazard.
AUTHOR: NORRIS LA
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Journal of Forestry
SOURCE ID: 69(10):715-520, 1971.
YEAR PUBLISHED: 1971
CATEGORY: A1b; A5b; B1
SPONSOR: US Forest Service.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: aminotriazole; brush control; herbicides; picloram; pollution, water; public health; toxic hazard; toxicity; 2,4-d; 2,4,5-t
ABSTRACT: (Purpose) Assess the toxicological hazards to non-target forest animals from the use of four brush control herbicides. (Time and Duration) Literature covers 1958 to 1970. (Type of Research) Literature review. (Methodology) (1) Establish the concept of making as assessment of toxic hazard. (2) Establish from the literature the magnitude and duration of probable exposure for various types of organisms. (3) Establish from the literature no effect, acute, and chronic toxic effect levels. (4) Establish probable toxic hazard by comparing exposure with toxicity data. (Results and Conclusions) An adequate assessment of toxic hazard requires consideration of both the toxic characteristics of the chemical and the probability organisms will receive exposure to a toxic dose. The author concluded that 2,4-D 2,4,5-T, picloram, and amitrole are not present in the forest environment in sufficient quantity to produce acutely toxic effects and their movement and persistence characteristics prevent chronic exposure. Therefore, chronic toxic effects will not occur.

1053
The entry and fate of forest chemicals in streams.
AUTHOR: MOORE DG; NORRIS LA
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Proceedings of a Symposium: Forest Land Uses and Stream Environment.
SOURCE ID: Corvallis, OR, OR State Univ, Forestry Extension, 1971, 138-158 p.
YEAR PUBLISHED: 1971
CATEGORY: A1b; A5b; B1
REGION: Pacific Forest STATE: California; Oregon; Washington
KEYWORDS: aminotriazole; brush control; ecosystem; environmental assessment; fertilization; herbicides; impact; leaching; nitrogen; persistence; picloram; pollution, water; public health; quality; residue; water; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) A state of the art exposition of the title subject. (Time and Duration) 1964 to 1970. (Type of Research) Literature review. (Methodology) Although this is a review paper, most of the concepts presented are illustrated by the author's own research. This research is approximately 30% lab studies of herbicide persistence in soil, 50% field studies of herbicide residues in streams, and 20% field studies of urea fertilizer nitrogen residues in streams. (Results and Conclusions) The amount of a particular chemical that enters a stream varies with topography, method of application, environmental parameters, and orientation of the spray area to streams. The single most important

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source of chemicals in streams is direct application to stream surfaces. In-stream persistence is brief unless chronic entry occurs. The following practices will minimize entry of chemicals to streams: (1) exclude streams from treatment areas; (2) use formulations which minimize vapor loss and drift; (3) select operating conditions, equipment, solvents, carriers, etc, to maximize placement of chemical on target; and (4) suspend operations when environmental or other conditions allow applied chemical to leave the target area.

1054
Fate of tordon herbicides containing picloram in the ecosystem.
AUTHOR: WILLIAMS CS
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 3(1):18-20, 1971.
YEAR PUBLISHED: 1971
CATEGORY: A1b; A5b; B1
SPONSOR: Dow Chemical Co.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: degradation; ecosystem; herbicides; leaching; persistence; picloram; residue
ABSTRACT: (Purpose) To summarize in popular form the fate of picloram in the environment, in vegetation, and in animals. (Type of Research) Popularized review of literature, but without reference to specific pieces of literature. (Results and Conclusions) Not a data paper. Entirely narrative generalizations about picloram degradation in soil, lack of vapor loss, mobility in soil, runoff, etc. Author concludes picloram should not be an environmental hazard when used according to directions for industrial weed control. Picloram persistence on vegetation is relatively brief. It is rapidly excreted in urine of animals receiving picloram in their diet. Picloram toxicity is low. Author discusses some concepts relating to successional stages in vegetation on ROWs and concludes picoram is a useful tool for developing an ecosystem which, while man-constructed, is both desirable and useful.

1055
Monongahela Power's attack on brush.
AUTHOR: FOREBACK CG
AUTHOR AFFILIATION: Monongahela Power Co.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 3(3):10-13, 1971.
YEAR PUBLISHED: 1971
CATEGORY: A1b
REGION: Eastern Deciduous Forest STATE: Virginia; West Virginia
KEYWORDS: brush; herbicides; picloram; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To describe the brush control methods used by Monongahela Power Company on their new transmission corridors, older transmission corridors, and along rural distribution lines. (Time and Duration) Four years. (Type of Research) Original research (field). (Methodlogy) On new transmission line areas the first chemical treatment is applied after the ROW has passed through one growing season, usually the second year after construction. This allows all new growth to be visible and of sufficient size to treat effectively. A ground hydraulic stem-foliage application is used. A combination of picloram, 2,4-D, and 2,4,5-T is used. Two years later a summer selective mist blower basal application with 2,4-D and 2,4,5-T is used. On existing ROW areas, if root-suckering species are abundant, aerial applications of 2,4-D, 2,4,5-T and picloram are used. (Results and Conclusions) No standard chemical mixture or method of application can be used on all ROW areas. The prescription method of vegetation management programming is best, whereby the proper technique, chemical, and season is selected to eradicate the particular problem species. Varying ROW conditions determine the choice of the proper method.

1056
Regulations governing industrial weed and brush control in the northeast
AUTHOR: DEWEY JE; PENDLETON RF
AUTHOR AFFILIATION: Cornell Univ.
SOURCE TITLE: Proceedings Northeast Weed Science Society.
SOURCE ID: 25:348-358, 1971.
YEAR PUBLISHED: 1971
CATEGORY: A1b; A5b; A5c
REGION: Northern Hardwoods - Spruce Forest STATE: Connecticut; Massachusetts; Maryland; Maine; New Hampshire; New York; Pennsylvania; Vermont
KEYWORDS: brush; herbicides; pesticide; regulations; right-of-way; water; weeds
ABSTRACT: (Purpose) To present a compilation of state and federal regulations governing the use of herbicides and certain pesticides in the Northeast. (Type of Research) Literature review (Methodology) Laws and regulations controlling the use of industrial weed and brush killers were compiled for the New England states, New York, New Jersey, Pennsylvania, and Maryland. Federal registration and labeled uses for all woody brush killers are also tabulated, thus giving a source for all of the regulations governing a herbicide's use by states. (Results and Conclusions) Increasingly restrictive regulations for pesticide control and usage are presently being established at both state and federal levels. Federal laws apply universally, but state laws are often more restrictive as to specific uses. Laws vary greatly from state to state. Although this listing is believed to be complete at the present time (1971), it is imperative that the user keep abreast of new developments.

1057
Studies of the safety of organic arsenical herbicides as precommercial thinning agents: a progress report.
AUTHOR: NORRIS LA
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Precommercial thinning of coastal and intermountain forests in the Pacific Northwest.
SOURCE ID: Pullman, WA, WA State Univ, 1970, 63-74 p.
YEAR PUBLISHED: 1971
CATEGORY: A1b; A5b; B2
SPONSOR: US Forest Service.
REGION: Columbia Forest (Dry Summer) STATE: Idaho; Washington
KEYWORDS: arsenicals; clearing, selective; ecosystem; environmental assessment; herbicides; impact; pesticide; residues; silviculture; toxic hazard
ABSTRACT: (Purpose) The purpose of this paper is to summarize the objectives and preliminary results from a large interagency cooperative study on the behavior and impact of arsenical herbicides used for precommercial thinning in forest stands. (Time and Duration) One year, 1970. (Type of Research) A summary of original research, both field and laboratory. (Methodology) Not applicable. (Results and Conclusions) This paper summarizes cooperative studies under the following major headings: studies of human health; studies of arsenical residues and their impact on cattle and small animals; studies of the behavior of arsenical compounds in the forest. Following are some preliminary conclusions. (1) No apparent significant human health effects in applicators. (2) Arsenic in urine is a good index of applicator exposure. (3) No cattle mortality occurred in areas thinned in 1970. (4) Arsenic residues were not found in several tissues from cattle and deer from grazed areas. (5) MSMA appears to be more toxic to cattle than previously believed. (6) Several species of forest animals show elevated arsenic levels after thinning but the level declines after about one month.

1058
Herbicide action in the forest.
AUTHOR: NORRIS LA
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Society of American Foresters Annual Meeting, 1971, 22 p.
YEAR PUBLISHED: 1971
CATEGORY: A1b; A5b; B2
SPONSOR: US Forest Service.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: forest; herbicides; persistence; pesticide; pollution, water; residues; toxic hazard; Environmental assessment
ABSTRACT: (Purpose) The purpose of this paper is to review herbicide behavior in the forest in the context of establishing the magnitude and duration of exposure of nontarget organisms. (Time and Duration) Literature cited covers 1966-71. (Type of Research) Literature review. (Results and Conclusions) Herbicide action is the direct effect of an herbicide on both target and nontarget organisms. Direct action requires the organisms be exposed to a biologically significant dose of the chemical. Organisms' response depends on both the toxicity of the chemical and the nature of the exposure. Aerially applied herbicides are distributed among the four major components of the environment - air, water, soil and vegetation. The author reviews literature for specific data on the movement, persistence, and fate of forest herbicides in each of these compartments. There is little emphasis on air but the other components are covered. The author concludes the key to safe use is to maximize exposure of target organisms and minimize exposure of nontarget species.

1059
The significance of herbicides to non-target organisms.
AUTHOR: MULLISON WR
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 24:111-147, 1970.
YEAR PUBLISHED: 1970
CATEGORY: A1b; A5b; B1
SPONSOR: Dow Chemical Co.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: arsenicals; degradation; herbicides; impact; leaching; persistence; picloram; residue; spray drift; toxic hazard; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) The purpose of this paper is to present concepts and data on herbicide persistence, degradation, leaching and residues in

the environment; and some toxicity data which together can be used to assess toxic hazard. (Time and Duration) Literature includes 123 references from 1946 to 1969. (Type of Research) Literature review. (Methodology) Presents concepts and some data with extensive citations regarding spray drift and volatility; herbicide disappearance in soil; degradation of herbicides; effects of herbicides on water, fish and plankton; and ecological relationships as they interact with herbicide use. (Results and Conclusions) Organic herbicides have been extensively used and studied for about the last 30 years. Their ecological effects in modifying the environment have been recognized, in fact that is the reason they are used. Most herbicides used commercially are low in toxicity to all forms of life except plants. Their patterns of use and behavior in the environment are such that accumulation to create a toxic hazard is unlikely. The principle effect of herbicides on animals comes not through direct toxic effects on the animals but indirectly through modification of the density and composition of vegetation.

1060
Poison oak control at Fort Ord.
AUTHOR: PRICE LG
AUTHOR AFFILIATION: US Dept of Defense.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 2(1):15-17, 1970.
YEAR PUBLISHED: 1970
CATEGORY: A1b; A5b
SPONSOR: US Dept of Defense.
REGION: California Chaparral STATE: California
KEYWORDS: brush control; herbicides; picloram; plants, poisonous
ABSTRACT: (Purpose) To evaluate the effectiveness of several herbicides in controlling poison oak. (Time and Duration) 1965-1969. (Type of Research) Original field plot research. (Methodology) No data is given; this article recaps the author's general experiences in controlling poison oak with several different herbicides. (Results and Conclusions) 2,4,5-T, 2,4-D, silvex, and aminotriazole at rates of 1 to 2 pounds per acre in 100 gallons gave immediate but not longlasting control. Tordon 22K and Tordon 101 were also tried, but for reasons not specified the author now finds Tordon 212 the material of choice. The effect of the operational program has been a marked decrease in the amount of lost job time from poison oak effects on humans.

1061
Effect of tordon on microbial activities in three Willamette Valley soils.
AUTHOR: BOLLEN WB; TU CM
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Down to Earth.
SOURCE ID: 52(2):15-17, 1969.
YEAR PUBLISHED: 1969
CATEGORY: A1b; A5b; B2b
SPONSOR: OR State Univ.
REGION: Pacific Forest STATE: California; Oregon; Washington
KEYWORDS: brush control; ecosystem; herbicides; impact; microorganisms; nutrient cycle; picloram; toxicity
ABSTRACT: (Purpose) Determine effects of various levels of Tordon potassium salt (picloram) on soil microorganisms. (Time and Duration) Literature covers 1941 to 1968. (Type of Research) Original research and laboratory study of dose response relationships. (Methodology) Three different types of agricultural soils were fortified with K salt of picloram at 1 or 10 ppm. After 30 days incubation, bacteria and streptomyces were enumerated by agar plating. Ammonification of peptone was determined after 5 days, nitrification of ammonium sulfate and oxidation of sulfur and dextrose after 30 days incbation at 28C in a growth chamber (Results and Conclusions) (1) Tordon K salt at 10 ppm had only minor effects on the numbers and kinds of organisms after 30 days. (2) There was no pronounced effect on ammonification or sulfur oxidation (3) Nitrification was inhibited but the nitrification potential was so low that the inhibition measured was not important. (4) Carbon oxidation was stimulated but the changes were too small to be of practical significance. (5) Overall, the effects of picloram at 10 ppm were unimportant in terms of the well being of the microorganisms and their processes important in maintaining soil fertility.

1062
Herbicide mixtures promising for hardwood control by foliar spraying.
AUTHOR: BRADY HA
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Proceedings Southern Weed Science Society.
SOURCE ID: 22:245-250. 1969.
YEAR PUBLISHED: 1969
CATEGORY: A1b, A5b
SPONSOR: US Forest Service.
REGION: Outer Coastal Plain Forest STATE: Alabama; Florida; Georgia; Louisiana; Mississippi
KEYWORDS: brush control; herbicides; picloram; 2,4,5-T
ABSTRACT: (Purpose) To demonstrate the effectiveness of several herbicides applied by foliar spray on a variety of hardwood brush species. (Time and Duration) Fourteen months, 1967-1968. (Type of Research) Original field plot research. (Methodology) Herbicides were applied by back pack mist blower, singly or in various combinations, in June or August. Carrier volume varied from 5 to 10 gallons per acre. Applications were made in three different studies but in each case plots were 20 x 216 feet with 20 foot buffers between plots. Top kill was estimated visually on ten plants of the ten most common species in each area. Duncan's multiple range test for statistical significance, was used. (Results and Conclusions) Results of tests show several of the herbicide combinations are synergistic. Five gallons per acre is not sufficient to achieve satisfactory control of most species. Specific efficacy data on species controlled by particular herbicides are included. It is important to note the author's caution that the tests were intended to determine possible interactions between herbicides in mixtures, therefore the rates were low to prevent total kill which would have obscured synergistic results.

1063
Brush control in rights-of-way.
AUTHOR: CHAPPELL WE
AUTHOR AFFILIATION: VA Polytechnic Institute.
SOURCE TITLE: Proceedings Southern Weed Science Society.
SOURCE ID: 22:277-282, 1969.
YEAR PUBLISHED: 1969
CATEGORY: A1b; A5b
SPONSOR: Amchem Products.; VA Polytechnic Institute.
REGION: Southeastern Mixed Forest STATE: Virginia
KEYWORDS: brush; brush control; herbicides; picloram; right-of-way; 2,4-D
ABSTRACT: (Purpose) To determine the effectiveness of several herbicides and combinations of herbicides in replacing 2,4,5-T. (Time and Duration) 1967 - 1968. (Type of Research) Original field plot research. (Methodology) Various herbicide treatment mixtures were applied by ground equipment or helicopter in four different experiments. In addition to the herbicides as variables, rates, type, and season of application were evaluated. A 10 point rating system was used to evaluate top kill in the fall of 1968. Test areas were on ROWS. (Results and Conclusions) Ground applications gave slightly better control than most helicopter applications, but the costs were substantially greater. Many of the formulations and treatments resulted in acceptable levels of brush control. In several instances high rates of 2,4-D were as effective as normal rates of 2,4,5-T. In ground applications, invert emulsions with 2,4-D were particularly effective.

1064
Chemical brush control proves itself.
AUTHOR: STENBERG JN
AUTHOR AFFILIATION: Consumers Power Co.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 1(2) :14-17,1969.
YEAR PUBLISHED: 1969
CATEGORY: A1b; A5b
REGION: Beach-Maple Forest STATE: Michigan
KEYWORDS: brownout; brush; herbicides; pellets; picloram; picloram + 2,4-D
ABSTRACT: (Purpose) To describe chemical brush control methods currently used on the ROWS of Consumer Power Company, Jackson, Michigan. (Time and Duration) Describes the evolution of their program over a 20-year period. (Type of Research) Original research. (Methodology) Herbicide sprayings for brush control were started in the early fifties. This paper describes the various phases of their treatment of new rights-of-way, spray chemicals involved, their equipment (including Bombardiers), and their method of schedule adjustment. (Results and Conclusions) Chemical herbicides have been firmly established as the most effective tool in Consumers Power Company's ROW maintenance program after over two decades of experimental field work. The present program on new ROW areas consists first of application of Tordon 10K pellets; second, a spray application to control woody vegetation that has grown up later (this involves the use of Tordon 101); third, a re-spray operation. Scheduling takes into consideration species, density, and height of brush. After the second phase it has been found that regular maintenance spraying from then on is at 4 to 8 year intervals.

1065
Chemical control of brush and trees.
AUTHOR: US DEPT OF AGRICULTURE
AUTHOR AFFILIATION: US Dept of Agriculture.
SOURCE ID: Washington DC, Superintendent of Documents, 1969, Farmers' Bulletin No. 2158, 23 p.
YEAR PUBLISHED: 1969
CATEGORY: A1b; A5b
REPORT NUMBER: 2158

A1b - Chemical application

1065

REGION: Applicable to entire United States STATE: United States
KEYWORDS: aminotriazole; application methods; brush; herbicides; trees; Ammonium sulfamate; 2,4-D; 2,4,5-T; 2,4,5-TP
ABSTRACT: (Purpose) To provide a popular guide for the use of herbicides in controlling brush and trees around pastures, rangelands, forests recreational areas and orchards. (Type of Research) Literature review. (Methodology) This bulletin summarized the results of continuous research in chemical control of brush and trees, as conducted by scientists, private industries, and state and federal agencies. This bulletin is revised and updated periodically. Every effort has been made to put instructions on selection of proper herbicide, method of application, mixing instructions, dosages and precautions into layman's language. (Results and Conclusions) Among the points emphasized in this bulletin are the following: some herbicides are effective if applied in small amounts. Others are effective only in large amounts. In general those that are effective in small amounts are cheaper to use, but those that are effective only in large amounts are safer, in the sense that there is less likelihood of accidentally spraying desirable plants with damaging amounts of them. Apply spray when wind velocity is less than 6 miles per hour and the air temperature is 90 degrees C or less. Use a coarse spray and a slowly vaporizing formulation.

1066
Preservation of desirable species through selective use of herbicides.
AUTHOR: CRAN HJ JR
AUTHOR AFFILIATION: CT Light and Power Co.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 23:294-297, 1969.
YEAR PUBLISHED: 1969
CATEGORY: A1b; A5b
SPONSOR: CT Light and Power Co.
REGION: Appalachian Oak Forest STATE: Connecticut
KEYWORDS: brush control; community structure; herbicides; maintenance; right-of-way
ABSTRACT: (Purpose) To emphasize the possibilities of using herbicides on ROWs in a positive program to favor desirable species, rather than to nonselectively devegetate. Time and duration 1962 to 1968. Type of research not research; philosophical and descriptive presentation of company program in cooperation with the CT Shade Tree Council. (results and Conclusions) Describes a program of education and property owner vegetation control programs emphasizing herbicides to achieve selective control of undesirable vegetation, while at the same time favoring desirable species. A key part of the program is use of phenoxy herbicides in oil carriers applied as basal sprays at any time of the year when root collars are not covered by ice or snow. Stem and foliage sprays are allowed on only a few of the most resistant species. Selected rather than broadcast application is emphasized. The author also reports that many desirable species respond vigorously once they are released from the competition of tall overstory trees which were a hazard on the ROW.

1067
Has the herbicide really killed the animal?
AUTHOR: KALISON SL
AUTHOR AFFILIATION: VA Polytechnic Institute.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 22:141-143, 1968.
YEAR PUBLISHED: 1968
CATEGORY: A1b; A5b; B1
SPONSOR: VA Polytechnic Institute.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; impact; livestock; toxic hazard
ABSTRACT: (Purpose) Present concepts and philosophies important in developing educational programs for livestock owners regarding the toxic hazards of herbicide use. (Type of Research) NOt research; a philosophical and educational paper. (Results and Conclusions) The author sets in perspective five major points concerning common allegations that herbicide use has resulted in the deaths of domestic animals. He stresses the importance of having an autopsy performed by a competent veterinarian in alledged poisoning cases. Author offers four actions needed to strengthen apparent weaknesses in the area of herbicide toxicology.

1068
Handling animal poisoning complaints.
AUTHOR: DITMAN WD
AUTHOR AFFILIATION: Appalachian Power Co.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 22:139-140, 1968.
YEAR PUBLISHED: 1968
CATEGORY: A1b; A5b; B1
SPONSOR: Appalachian Power Co.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; impact; livestock; right-of-way; toxic hazard
ABSTRACT: (Purpose) To relate recent experience of the author's company in dealing with claims of herbicide damage to domestic animals. (Time and Duration) 1965 to 1968. (Type of Research) Not research. Reports on approach company has taken to problems of damage claims involving herbicides. (Methodology) descriptive. (Results and Conclusions) Original company was to handle animal damage claims or complaints as they did claims for plant damage. Now they investigate each incident, document it carefully, and attempt to determine the exact cause of animal death or damage. This approach has reduced the number of damage claims. The author reports two key elements to the system. 1. Retain professional help; inspection, diagnosis or autopsy by a vet is invaluable. 2. Establish an alert system to insure that professional help reaches the scene of an incident as soon as possible. Prompt inspection insures accurate diagnosis.

1069
Chemical clearing of transmission line right-of-way in Quebec.
AUTHOR: BARIBEAU J
AUTHOR AFFILIATION: HYDRO-QUEBEC.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 22:334-341, 1968.
YEAR PUBLISHED: 1968
CATEGORY: A1b; A5b
REGION: Laurentian Mixed Forest
KEYWORDS: clearing; herbicides; maintenance; right-of-way
ABSTRACT: (Purpose) Discussion of Hydro Quebec's chemical spray program. (Time and Duration) 1948 - 1968; 20 years of chemical spraying. (Methodology) A survey was conducted to determine the total wooded area, noting species, height, density, soil, and adjoining forest type. All growth above 12 feet must be sprayed. (Results and Conclusions) Five different chemical treatments are now being used, depending on adjoining land use and/or the type of vegetation that is coming back. The cost of spraying is about $8.00 per acre. Mechanical cutting would cost about $15.00 per acre.

1070
Some factors affecting the disappearance of TORDON in soil.
AUTHOR: MOFFAT RW
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Down to Earth.
SOURCE ID: 23(4) :6-10, 1968.
YEAR PUBLISHED: 1968
CATEGORY: A1b; A5b; B1
SPONSOR: Ivon Watkins - Dow Limited.
REGION: Applicable to entire United States
KEYWORDS: degradation; herbicides; leaching; persistence; picloram; soil
ABSTRACT: (Purpose) To present data on the disappearance of picloram from soil at various locations in New Zealand. (Time and Duration) 21 weeks in 1966. (Type of Research) Original field research. (Methodology) Tordon herbicide (formulation not specified) was applied by hand sprayer to experimental plots located across a gradient of climatological and edaphic conditions in New Zealand. At intervals after application, soil samples were taken and herbicide residue levels estimated by a clover bioassay. The data was subjected to statistical analysis. (Results and Conclusions) Author reports the factors which affected picloram disappearance were rainfall, soil drainage patterns, characteristics of plant cover, and rate application. Rates up to 2 ounces per acre for crop and pasture weed control should not injure clovers seeded after the crop is harvested or in the fall after spring application. Residues at rate higher than this up to three lbs per acre would require at least one year dissapation time before clover can be safely seeded. Author suggests degracation and leaching are the primary processes of picloram dissappearance.

1071
Chemical brush control and herbicide residues in the forest environment.
AUTHOR: NORRIS LA
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Symposium Proceedings: Herbicides and Vegetation Management in Forests, Ranges, and Noncrop Lands.
SOURCE ID: Corvallis, OR, OR State Univ, 1967, 103-123 p.
YEAR PUBLISHED: 1967
CATEGORY: A1b; A5b; B1
SPONSOR: US Fed Water Pollution Control Admin.
REGION: Pacific Forest STATE: California; Oregon; Washington
KEYWORDS: aminotriazole; brush control; environmental assessment; fish, toxicity to; herbicides; persistence; quality; toxic hazard; toxicity; water; 2,4-D; 2,4,5-t
ABSTRACT: (Purpose) To establish persistence characteristics of herbicides in soil and herbicide residues found in streams after operational brush control projects and to evaluate probable toxic impact or hazard. (Time and Duration) 1963-1967. (Type of Research) Original field and laboratory

A ... heavy emphasis on residue determinations in field samples. Methodology) Persistence of herbicides in forest floor material was determined in laboratory studies using carbon 14 or gas chromatography to establish residue levels at various times after application. Gas chromatography was used in an extensive survey of herbicide residue levels in streams after brush control operations. Sampling covered periods up to 10 months after application. (Results and Conclusions) 2,4-D and 2,4,5-T are rapidly degraded in forest floor. Rate of herbicide loss is not influenced by the presence of other pesticides but herbicide formulation influences the rate of loss. Herbicide residues in streams seldom exceed 0.1 ppm except where marshy areas are sprayed. Herbicide persistence in streams is short (less than one week) and long term runoff was not detected. Herbicide concentrations in streams were not hazardous to fish, man or downstream water users.

1072
The logistics of chemical brush control.
AUTHOR: RUSSELL SS
AUTHOR AFFILIATION: Monongahela Power Co.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 21:434-437, 1967.
YEAR PUBLISHED: 1967
CATEGORY: A1b; A5b
REGION: Mixed Mesophytic Forest STATE: West Virginia
KEYWORDS: aerial; application methods; brush; brush control; cost; herbicides; maintenance; right-of-way
ABSTRACT: (Purpose) To relate present experience with recent past experience of the subject company with chemical brush control on their Row. (Time and Duration) Sporadically from 1947 to 1967. (Type of Research) Not research, mostly relating a few company experiences. (Metholology) No methodology applied in this discourse. Author mostly rambles from point to point without making any telling blows. (Results and Conclusions) Author reports 20 years of brush control experience on about 18,000 acres of brush under Row. Brush control on one Row required aerial application one year to remove dense tall sensitive species, followed up two years later by a dormant basal application of 2,4-D and 2,4,5-T in diesel oil. Results 4 years later appear successful with a heavy grass and fern cover.

1073
The effect of TORDON on vine maple.
AUTHOR: FINNIS JM
AUTHOR AFFILIATION: WA Dept of Natural Resources.
SOURCE TITLE: Down to Earth
SOURCE ID: 22(4):22 23, 1967.
YEAR PUBLISHED: 1967
CATEGORY: A1b; A5b
SPONSOR: WA Dept of Natural Resources.
REGION: Pacific Forest STATE: California; Oregon; Washington
KEYWORDS: brush control; herbicides; impact; picloram; 2,4,D; 2,4,5,T
ABSTRACT: (Purpose) To determine if Tordon herbicide was effective in controlling vine maple. (Time and Duration) 2 years. June 1964 to May 1966. (Type of Research) Original field plot research. (Methodology) Tordon 101 and Tordon 22K were applied as foliar sprays by mist blower to clumps of vine maple. Effective control of the aerial portion of the plant was estimated using a 10 point scale. Costs of spray treatments were estimated. (Results and Conclusions) All treatments were effective with more than 95% of all clumps removed as competitors after two years. Chemical cost per clump was less than $2. Tordon may damage some conifers. Author recommends testing of some lower rates of application.

1074
Chemical brush control offers the best economics for the Potomac Edison Company.
AUTHOR: DALTON RL
AUTHOR AFFILIATION: Potomac Edison Co.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 21:429-433, 1967.
YEAR PUBLISHED: 1967
CATEGORY: A1b; A5b
SPONSOR: Potomac Edison Co.
REGION: Eastern Deciduous Forest STATE: Connecticut; Massachusetts; Maine; New Hampshire; New Jersey; New York; Pennsylvania; Rhode Island; Vermont; West Virginia
KEYWORDS: brush; brush control; chemicals; clearing, mechanical; clearing, selectives; cost; herbicides; mantenance; right-of-way
ABSTRACT: (Purpose) To compare the costs of achieving an effective brush control level on a ROW with hand clearing, several mechanical methods, and chemicals. (Time and Duration) With varying intensity from 1954 to 1967; mostly from 1962 to 1967. (Type of Research) Original field research, primarily case histories. (Methodology) Methods are not explicitly stated but they appear to involve actual application of the various methods on sections of ROW ranging from 2 to 20-plus acres. Cost figures and, in some cases, estimates of time until needed retreatment were accumulated. The data are not necessarily from side by side tests, so direct comparisons should be made cautiously. Data comparing hand clearing with chemical brush control is much stronger, involving thousands of acres and several years. (Results and Conclusions) The cost of hand clearing was about 2.5 times greater than chemical brush control. Projected over a 19 year period to account for the required frequency of retreatment, the average costs per acre per year were chemical - $2.69 and hand clearing - $8.54. Right of way clearing with a 9000 pound disc cost $102 per acre. Bulldozer costs for a similar type job were $132 per acre, and a "Tree Eater" cost $143 for the same work. The author estimates chemical clearing of this same line would have cost $80 to $90 per acre.

1075
A study of additives to the aqueous phase of aerially applied invert emulsions.
AUTHOR: ESPOSITO JE; KIRCH JH
AUTHOR AFFILIATION: Amchem Products.
SOURCE TITLE: Proceedings Southern Weed Control Conference.
SOURCE ID: 20:251-255, 1967.
YEAR PUBLISHED: 1967
CATEGORY: A1b; A5b
SPONSOR: Amchem Products.
REGION: Eastern Deciduous Forest STATE: Connecticut; Delaware; Florida; Georgia; North Carolina; New Jersey; New York; Rhode Island; South Carolina; Virginia; Vermont; West Virginia
KEYWORDS: aerial; application methods; arsenicals; herbicides; maintenance; picloram; spray drift; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To evaluate the effects of several spray additives (normally used to reduce spray drift) on several common brush control chemicals. (Time and Duration) 1964 to 1966. (Type of Research) Original field research. (Methodology) Various herbicides with various spray additives were applied by helicopter to a ROW in NY, VT, GA and WV. Two years after application percent stem kill of selected species was recorded. Average percent stem kill for two to six plots is reported but each plot is a different treatment and not a replicate. Envert, an Amchem product used to form invert emulsions, was the primary spray additive material tested. (Results and Conclusions) In the NY tests 2,4-D plus 2,4,5-T plus dicamba or 2,3,6-TBA gave the best overall control of hardwood species. In the VT tests 2,4-D plus 2,4,5-T plus picloram or 2,3,6-TBA gave best control. The same results were found in the GA test but overall control level achieved was only half as great as in the previous two tests. In the WV tests only 2,4-D plus 2,4,5-T alone or with MSMA were used. Neither of these combinations gave particularly good control. The authors conclude that both the nonvolatile emulsavert and low volatile invert systems provide a low drift 2,4-D/2,4,5-T invert carrier system that can broaden the control spectrum for species resistant to these herbicides. Although aerial applications are stressed here, ground applications can make use of the same additives.

1076
If used properly tree injectors are effective.
AUTHOR: CARVELL KL; CECH FC
AUTHOR AFFILIATION: WV Univ.
SOURCE ID: Morgantown, WV, WV Univ Agricultural Experiment Station, 1967, Bulletin 552, 6-10 p.
YEAR PUBLISHED: 1967
CATEGORY: A1b; A5b
SPONSOR: WV Univ.
REGION: Eastern Deciduous Forest
KEYWORDS: application methods; brush control; cost; herbicides; trees; 2,4-D
ABSTRACT: (Purpose) The purpose of this test was to determine species sensitivity and optimum distance between injections for stem injected 2,4-D. (Time and Duration) 18 months; 1965-66. (Type of Research) Original field plot research. (Methodology) A 30 year old even-aged hardwood stand containing numerous eastern hardwood species was treated with 2,4-D amine by stem injection. A standard micro tree injector was used and applications were made in April. Undiluted 2,4-D triethyl amine was used with 1 ml of concentrate being released in each injection. Injection spacing was equal to the width of the injector blade (about 1.25 inches). In the fall of 1966, eighteen months after application, the number of dead, dying, and live trees was tallied by species and by apparent injection distances. Sprouting and cost data were also collected. (Results and Conclusions) The rate of application was satisfactory for most species tested with more than 85% kill reported for all but 4 of the 19 species tallied. Only red maple was largely unaffected. Author emphasizes proper application techniques; that is, controlled spacing of injections and depth of penetration are necessary to obtain these results. About five species sprouted to a suffient degree that some followup treatment would be required. Cost figures show injection is more expensive than frilling but the authors' data only included the cost of the chemical and not labor.

1076

1077
Using phenoxy herbicides effectively.
AUTHOR: KLINGMAN DL; SHAW WC
AUTHOR AFFILIATION: US Agricultural Research Service.
SOURCE ID: Washington, DC, US Dept of Agriculture, 1967, Farmers' Bulletin 2183, 23 p.
YEAR PUBLISHED: 1967
CATEGORY: A1b; A5b
SPONSOR: US Agricultural Research Service.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: application methods; brush control; herbicides; silvex; weeds; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) The purpose of this paper is to educate phenoxy herbicide users about these chemicals, how they are used and what species they control. (Time and Duration) Not specified. (Type of Research) Not research; an educational bulletin. (Methodology) Narrative descriptions of how plants react, the nature of the herbicides, application methods, sprayer calibration and cleanup, and tabular data on species sensitivity to 2,4-D, 2,4,5-T, silvex, MCPA, and 2,4-DB. (Results and Conclusions) In layman's terms, authors describe the selectivity and systemic nature of these herbicides, their various formulations, and methods of application. Methods of application are covered for both agricultural and non-cropland situations. Particular emphasis on controlling drift and volatility is made. Sprayer calibration and cleanup are given with specific how-to-do-it instructions. Susceptibility to foliage applications on more than 400 species is given.

1078
Stream contamination with amitrole from forest spray operations.
AUTHOR: NEWTON M; NORRIS LA; ZAVITKOVSKI J
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Research Progress Report, Western Weed Control Conference.
SOURCE ID: Pages 33-35, 1967.
YEAR PUBLISHED: 1967
CATEGORY: A1b; A5b; B2a
CONTRACT NUMBER: WP00477
SPONSOR: Federal Water Pollution Control; Administration. OR State Univ.
REGION: Pacific Forest STATE: California; Oregon; Washington
KEYWORDS: aerial; amitrole; application methods; forest; herbicides; pollution, water; stream
ABSTRACT: (Purpose) The purpose of this study was to determine the amitrol concentrations in streams which flow through or by forest areas sprayed with this herbicide. (Time and Duration) Approximately 5 months in 1966. (Type of Research) Original field research. (methodology) Water samples were taken at various intervals from four locations downstream from forest areas sprayed with 2 lbs per acre amitrole-T by helicopter. Water samples were analyzed chemically for the herbicide. Sampling continued at various intervals over 150 days after application. (Results and Conclusions) Maximum concentrations of herbicide were less than 50 parts per billion. Peak concentrations occurred less than 3 hours after application at the point closest to the spray unit. Peak concentrations were later and smaller at downstream locations. Herbicide was not detectable (less than 1 ppb) one mile downstream. Heavy rains in the fall approximately 4 to 5 months after application did not introduce measureable concentrations of herbicide in the stream.

1079
The physiological and biochemical bases of selective herbicide action.
AUTHOR: NORRIS LA
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Herbicides and vegetation management in forest, ranges and noncrop lands (symposium proceedings).
SOURCE ID: Corvallis, OR, OR State Univ, 1967, 56-66 p.
YEAR PUBLISHED: 1967
CATEGORY: A1b; A5b
CONTRACT NUMBER: WP00477FWPCA
SPONSOR: State Univ.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: amitrole; atrazine; herbicides; selectivity; 2,4-D, 2,4,5-T
ABSTRACT: (Purpose) The purpose of this paper is to present to a technical audience the factors which are responsible for selective herbicide action. (Time and Duration) Not applicable, literature cited covers 1949-66. (Type of Research) Literature review and summary of knowledge. (Results and Conclusions) Author presents concepts of selective herbicide action often at the organism level. Three types of selectivity are used to explain the role of various factors. These types are: 1. Different species respond differently to one herbicide; 2. One species responds differently to different herbicides; 3. Plants of one species but in different areas respond differently to one herbicide. The factors important in determining selectivity are interception, absorption, translocation, herbicide resistance to metabolism and the inherent toxicity of the herbicide to the target tissues of the plant in question.

1080
Some toxicological aspects of silvex.
AUTHOR: MULLISON WR
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Proceedings Southern Weed Control Conference.
SOURCE ID: 19:420-435, 1966.
YEAR PUBLISHED: 1966
CATEGORY: A1b; A5b; B1
SPONSOR: Dow Chemical Co.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: environmental assessment; herbicides; toxic hazard; toxicity
ABSTRACT: (Purpose) To discuss the toxicological literature related to silvex. (Time and Duration) Ten literature citations from 1959 to 1965. (Type of Research) Literature review. (Methodology) Reviews and condenses literature on acute oral toxicity, chronic oral toxicity and tests with aquatics. (Results and Conclusions) Foliage or water treated with kuron herbicide (a specific formulation containing silvex) should not present a hazard from ingestion or skin contact by humans or farm animals. Game birds also should not be affected, but there may be some impact on fish. The potassium salt formulations of silvex are substantially less toxic to fish than Kuron.

1081
Effect of TORDON herbicides on aquatic organisms.
AUTHOR: HARDY JL
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Down to Earth.
SOURCE ID: 22(2):11-13, 1966.
YEAR PUBLISHED: 1966
CATEGORY: A1b; A5b; B1
SPONSOR: Dow Chemical Co.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: animals, aquatic; environmental assessment; fish, toxicity to; herbicides; impact; picloram; water
ABSTRACT: (Purpose) To evaluate the toxicity characteristics of picloram in various formulations of Tordon herbicides on aquatic food chain organisms. (Type of Research) Original laboratory biassay research. (Methodology) Daphnia, goldfish and guppies were directly exposed to picloram in water. Also, daphnia exposed in water were used as food for the fish. In addition, a few samples of water, sediment, and organisms were analyzed chemically by GC to determine herbicide residues. (Results and Conclusions) Daphnia in water containing 1 ppm picloram developed and reproduced normally over a long period of time with no buildup of herbicide residues. Guppies in water containing 1 ppm picloram, and fed the daphnia exposed to picloram, also developed and reproduced normally. Picloram at 1 ppm in water did not retard the growth of algae, the growth of daphnia which fed on algae, or the fish which consumed the daphnia.

1082
Five years of mistblower brush control.
AUTHOR: HAMPSON RJ
AUTHOR AFFILIATION: Nat Lead Co.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 20:406-413, 1966.
YEAR PUBLISHED: 1966
CATEGORY: A1b; A5b
SPONSOR: Nat Lead Co.
REGION: Northern Hardwoods Forest STATE: Connecticut; New Jersey; New York; Pennsylvania; Rhode Island
KEYWORDS: brush; herbicides; maintenance; picloram; right-of-way; 2,4,5-T
ABSTRACT: (Purpose) To evaluate use of mist blower method of herbicide application on a powerline right of way. (Time and Duration) The literature includes eight citations covering 1959 to 1965. The research sporadically covers 1959 to 1964. (Type of Research) Original field research, but not hypothesis testing; rather it is several case study types of research. (Methodology) 2,4,5-T and picloram were applied in different types of mist blowers during the summer months. Costs were recorded, and although not stated, they also probably recorded effectiveness of chemical treatments in some way. It should be emphasized the author is not reporting the results of comparative experiments, but rather subjective observations. (Results and Conclusions) The author finds the mist blower is particularly well adapted for the brush control maintenance problem on 500 acres of right-of-way in upper NY state. The size of the job limits the company's options regarding the type of application equipment economically available to them. The unit cost was too high from most contractors because of the small size of the job, so they employed laborers to make applications with mist blowers. They found the larger, more powerful models best, and initial results appear to favor picloram over 2,4,5-T. Cost using 1964 figures were $28 per acre.

1083
Stream contamination with amitrole following brush control operations with Amitrole-T.
AUTHOR: NEWTON M; NORRIS LA; ZAVITKOVSKI J
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Research Progress Reports. Western Weed Control Conference.
SOURCE ID: Pages 20-22, 1966.
YEAR PUBLISHED: 1966
CATEGORY: A1b; A5b; B2a
CONTRACT NUMBER: WP00477
SPONSOR: Federal Water Pollution Control; Administration. OR State Univ.
REGION: Pacific Forest STATE: California; Oregon; Washington
KEYWORDS: aerial; amitrole; application methods; brush; herbicides; pollution, water; stream
ABSTRACT: (Purpose) The purpose of this study is to determine the magnitude and duration of stream contamination by amitrole after treating nearby forest areas with herbicide for brush control. (Time and Duration) One month in 1965. (Type of Research) Original field research. (Methodology) Streams flowing from or through areas treated with amitrole-T herbicide applied by helicopter were sampled at various locations and times after application. Water samples were analyzed chemically and the concentration of amitrole reported. (Results and Conclusions) All of the streams sampled in this study contained measureable residues of amitrole. The peak concentrations occurred immediately after application at the sampling locations closest to the treated area. The maximum concentration was 400 parts per billion. Maximum concentrations were lower and occurred later at points downstream. One mile below the treated area herbicide was barely detectable. No residues were found between 3 and 35 days after application when the sampling stopped. Authors indicate amitrole pollution measured did not represent a dangerous exposure to fish or downstream water users.

1084
Effects of herbicides on estuarine fauna.
AUTHOR: BUTLER PA
AUTHOR AFFILIATION: US Bureau of Commercial Fisheries.
SOURCE TITLE: Proceedings Southern Weed Control Conference.
SOURCE ID: 18:576-580, 1965.
YEAR PUBLISHED: 1965
CATEGORY: A1b; A5b; B1
SPONSOR: US Bureau of Commercial Fisheries.
REGION: Outer Coastal Plain Forest STATE: Alaska; Alabama; Florida; Georgia; Louisiana; Mississippi
KEYWORDS: animals, aquatic; benthos; environmental assessment; fauna; fish, toxicity to; herbicides; impact; marine; toxic hazard; toxicity
ABSTRACT: (Purpose) To determine the toxicity of herbicides to several marine animals which might be exposed to herbicides used for aquatic weed control upstream from estuaries. (Time and Duration) Not stated, but appears to be late 50's or early 60's. (Type of Research) Original bioassay research conducted in the lab. (Methodology) Oysters, shrimp, fish and phytoplankton were exposed to a wide variety of herbicides in static water bioassays or, in several cases, in flowing water systems designed to simulate the changes in water quality with the change in tide. The aquatic equivalent of LD 50 were calculated and presented. (Results and Conclusions) Tests include specific data for 9 phenoxy herbicides, 4 carbamates, 3 phosphates, 4 ureas, 4 triazines, and 13 miscellaneous compounds. Data is too extensive to summarize or to make generalizations. Its real value is in evaluating the toxic hazard to marine species from exposure to a specific herbicide.

1085
Further progress in the control of Kudzu.
AUTHOR: BRENDER EV; MOYER EL
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Down to Earth.
SOURCE ID: 20(4):16-17, 1965.
YEAR PUBLISHED: 1965
CATEGORY: A1b; A5b
SPONSOR: US Forest Service.
REGION: Southeastern Mixed Forest STATE: Alabama; Florida; Georgia; Mississippi; North Carolina; South Carolina
KEYWORDS: brush control; herbicides; picloram
ABSTRACT: (Purpose) To determine the effectiveness of various formulations of Tordon herbicide containing picloram for control of kudzu. (Time and Duration Fourteen month ending in October 1964. (Type of Research) Original field plot research. (Methodology) Tordon 101, 22K or 10K pellets were applied at rates ranging from 1 to 7.5 pounds per acre in one or two sprays. The number of kudzu crowns surviving and the effects on residual and planted loblolly pine were noted. (Results and Conclusions) Tordon herbicide is effective in controlling Kudzu. The liquid formulations were more effective than the pellets but in areas where drift may be a problem the pellets offer a distinct advantage. Residual trees were also killed, but loblolly pine could be planted six months after application and survive for two years.

1086
Chemical Control of Bracken Fern in the British Isles with TORDON.
AUTHOR: LAWSON HM
SOURCE TITLE: Down to Earth
SOURCE ID: 20(4): 13-15, 1965.
YEAR PUBLISHED: 1965
CATEGORY: A1b; A5b
SPONSOR: Dow Chemical Co.
REGION: Applicable to entire United States
KEYWORDS: brush control; community structure; herbicides; picloram
ABSTRACT: (Purpose) To determine the effectiveness of Tordon herbicide in controlling bracken fern injury to the understory grass community. (Time and Duration) 2 years, ending in 1964. (Type of Research) Original field plot research. (Methodology) Tordon herbicide (formulation not specified) was applied by ground sprayer to 6x4 yard plots in eastern England. Rates of application varied from 3/4 to 6 pounds per acre. The percentage of ground covered by bracken fern at 1.5 and 2 years after application were estimated. (Results and Conclusions) None of the treatment rates injured the grass understory. Indications of grass improvement after treatment are present. The optimum growth for control is preemergence or just post emergence. Early season treatment means grazing animals continue to have access to the site. Variability in bracken response is not a problem, according to the author.

1087
Herbicide treatment of rights-of-way.
AUTHOR: PENNSYLVANIA ELECTRIC COMPANY
AUTHOR AFFILIATION: Pennsylvania Electric Company
SOURCE ID: Johnstown, PA, Electric Compnay, 13 p.
CATEGORY: A1B
REGION: Appalachian Oak Forest STATE: MD; PA
KEYWORDS: herbicides; right-of-way
ABSTRACT: (Purpose) To explain the vegetation management policies of General Public Utilities Corporation, and the objectives, considerations and research that have resulted in formulating these policies. (Time and Duration) 20 years of field experience. (Type of Research) Original research (field). (Methodology) The policy objectives recognize that development, use and management of electric line right-of-way can deter or enhance values related to aesthetics, erosion, wildlife food and cover and competing uses of the land for recreational, agricultural or other desirable purposes. A significant part of the implementation of this policy is in the development, publication and distribution of detailed procedures, rules and specifications to which contractors must commit themselves before being awarded a contract for right-of-way treatment. (Results and Conclusions) Through the use of synthetic hormones and mechanical management, rights-of-way are developed into vegetative units of lower growing trees, shrubs, herbaceous materials and grasses. Over the diverse geographic area that is occupied by General Public Utilities Corporation, it is necessary to discriminately utilize the different techniques and materials that will do the best job and leave the environment improved or the least disturbed in any situation.

1088
TORDON herbicide...disappearance from soils.
AUTHOR: GORING CAI; HAMAKER JW; YOUNGSON CR
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Down to Earth.
SOURCE ID: 20(4):3-5, 1965.
YEAR PUBLISHED: 1965
CATEGORY: A1b; A5b; B1
SPONSOR: Dow Chemical Co.
REGION: Applicable to entire United States STATE: California; Kansas; Minnesota; South Dakota
KEYWORDS: herbicides; persistence; picloram; residue; soil
ABSTRACT: (Purpose) To report in popular form the sil behavior of picloram in several major agricultural areas. (Time and Duration) Two and a half years ending in 1964. (Type of Research) Original field plot research. (Methodology) Picloram, at rates ranging from 1.5 to 4.2 pounds per acre, was applied to small plots in CA, MN, SD, and KS. Samples of soil were collected at depths to 54 inches. Herbicide residue levels were estimated by bioassay with safflower which were rated on a 0 to 6 scale for herbicide effects. (Results and Conclusions) Losses of picloram ranged from 58 to 96% within the first year after application and from 78 to 100% after two years. Estimated half lives ranged from 1 to 13 months. For all locations except one the highest herbicide concentrations were in the top 12 inches of soil. Measurable levels to 48 inches were found only at two locations.

A1b - Chemical application

1088

1089
The effects of SILVEX on aquatic vegetation and plankton in central New York farm ponds.
AUTHOR: COWELL BC
AUTHOR AFFILIATION: Cornell Univ.
SOURCE TITLE: Down to Earth.
SOURCE ID: 20(4).3-5, 1965.
YEAR PUBLISHED: 1965
CATEGORY: A1b; A5b; B1
SPONSOR: Cornell Univ.
REGION: Laurentian Mixed Forest STATE: Maine; New Hampshire; New Jersey; New York; Pennsylvania; Vermont
KEYWORDS: aquatic; benthos; herbicides; impact; plants; toxicity; water
ABSTRACT: (Purpose) Describe the effects of silvex herbicide, used for aquatic weed control, on aquatic plants, plankton, dissolved oxygen and fish. (Time and Duration) Estimated one year, 1961-1962. (Type of Research) Original field plot research. (Methodology) Silvex herbicide was applied to achieve 2ppm in several ponds in NY. The degree of aquatic plant control was estimated and plankton were measured. Dissolved oxygen was also observed and visual evidence of dead or distressed fish was sought. (Results and Conclusions) Herbicide applications gave complete control of pondweed and duckweed and partial control of other plants. Several species of algae were not controlled. There was no difference in pre-and post-spray levels of plankton; however, the author's language implies variability in the data was substantial, thus statistically significant results may have been obscured. Later tests removed much of the variability and no treatment effects were observed. Dissolved oxygen levels remained fairly constant except in those ponds where large amounts of vegetation had been killed. In the latter cases DO dropped 2 to 4ppm but fish were not apparently affected.

1090
Science, industry, and the abuse of rights of way.
AUTHOR: EGLER FE
SOURCE TITLE: Science.
SOURCE ID: 127:673-680, 1958.
YEAR PUBLISHED: 1958
CATEGORY: A1b; A5b; B1a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: application methods; clearing; community structure; ecology, applied; ecosystem; herbicides; impact; land use; right-of-way; spraying, broadcast; spraying, selective; stability
ABSTRACT: (Purpose) To show how industry has failed to use sound scientific principles in managing the vast acreage tied up in rights-of-way, and discuss the numerous factors influencing the slow adoption of sound biological principles in right-of-way vegetation management. (Time and Duration) Observations made over a decade of vegetational management practices. (Type of Research) Largely observational, with literature review. (Methodology) This article is based largely on observations, but the author sites some previously published research. (Results and Conclusions) The term "brush control" is misleading. "Brush" is used to refer to any woody vegetation including trees and shrubs, but not all brush is undesirable right-of-way cover. "Control" is also not an apt term, since the goal of most control programs is elimination. A basic question in any vegetation management program is "whose goals should be met?" Persons interested in brush control can be segregated into four groups: chemical manufacturers, utility corporations, landowners, and the general public. The basic scientific factors related to a sound management program are stressed. These include applied phytosociology, herbicides and plant-kill, commercial brush control, conservation interests and research and development. The cheapest means of achieving brush control for the future is by the encouragement and utilization of other plants.

1091
Control of brush on rights-of-way.
AUTHOR: BEATTY RH
SOURCE TITLE: Proceedings North Central Weed Control Conference.
SOURCE ID: 12:163-165, 1955.
YEAR PUBLISHED: 1955
CATEGORY: A1b; A5b
REGION: Applicable to entire United States STATE: Michigan; Minnesota; Ohio; Oklahoma
KEYWORDS: brush; brush control; herbicides; right-of-way; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To present brief research progress reports from several authors. (Time and Duration) 1953 to 1955. (Type of Research) Original field plots, mostly. (Methodology) This paper includes abstracts of papers presented by eight authors at the 1955 North Central Weed Control Conference. All the papers deal with questions of efficacy of various herbicides towards various brush species found on ROWs. Generally, each study involved application of one or more herbicides, often at various rates and various times of the year, or in different carriers. Effects of the chemical treatments were evaluated by estimating degree of kill. (Results and Conclusions) The author presents conclusions of studies in general terms, such as 4 pounds of amizol was less effective than 6 pounds which gave nearly complete control of oak and cherry. Specific herbicides tested include 2,4-D, 2,4,5-T, CMU, silvex, 2,4-DP, aminotriazole, 2,3,6-TBA.

1092
Summary of toxicological information on 2,4,5-T type herbicides and an evaluation of the hazards to livestock associated with their use.
AUTHOR: HYMAS TA; ROWE VK
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: American Journal of Veterinary Research.
SOURCE ID: 622-629, 1954 (October).
YEAR PUBLISHED: 1954
CATEGORY: A1b; A5b; B1
SPONSOR: Dow Chemical Co.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; impact; livestock; toxic hazard; toxicity; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To make available the acquired toxicological information on phenoxy herbicides relative to warm blooded animals. (Time and Duration) Thirteen literature citations from 1946 to 1953. (Type of Research) Literature review. (Methodology) Results of acute, subacute and chronic toxicity tests are reported, partly in narrative and partly in a series of tables. Specific toxicity values are offered. An evalutation of toxic hazard to livestock follows the toxicity data. (Results and Conclusions) An excellent collection of early literature on the toxicity of phenoxy type herbicides to a wide variety of animals. Data on experiments are often given with specific commercial formulations, which means it is easily associated with specific products. The authors deal also with the problem of some plant species increasing in toxicity to cattle after they have been sprayed. Authors conclude the hazard to livestock from phenoxy herbicides is negligible, but they caution that improper storage, handling and use of the herbicides may permit animals to receive toxic exposure.

A1c - Danger tree identification

1093
Environmental management during power transmission line construction: operational considerations.
AUTHOR: DOHRENWEND R
AUTHOR AFFILIATION: Cary Arboretum
SOURCE TITLE: Pages 58-71 in Power Lines and the Environment.
SOURCE ID: Millbrook, NY, The Cary Arboretum of the New York Botanical Gardens, 1973, 170 p.
YEAR PUBLISHED: 1973
CATEGORY: A1c; A1h
REGION: Applicable to entire United States STATE: United States
KEYWORDS: access road; clearing; danger trees; routing; structure site
ABSTRACT: (Purpose) To discuss various considerations during transmission line construction such as access road location, danger tree identification, tower site selection and general routing. (Time and Duration) Based on one-year experience. (Type of Research) Field experience and observations. (Methodology) The author discusses many considerations necessary in route selection for lines, selection of tower heights and line clearance, access roads, and danger tree evaluation. (Results and Conclusions) In routing you must use the following guidelines: 1) avoid areas of tall forest vegetation; 2) avoid marshy or other low, wet areas; 3) keep the route off steep side slopes; 4) do not let the line run parallel to stream banks; 5) cross streams where the terrain helps get maximum line clearance; 6) stick to terrain where access roads can remain in the ROW; 7) avoid areas of high recreation use; 8) keep the route in farm country as much as possible. Several factors enter into determination of adequate clearance limits: 1) adequate electric clearance between line at peak voltage and ground; 2) growth rates of the vegetation beneath the line; 3) anticipated maintenance schedule; 4) length of span, which determines the maximum swing of the conductors in response to wind pressure. In locating tower keep towers out of wet, low areas, keep the limit of tower pads at least 100 feet from any stream and 100 feet from any public road; stay out of rocky areas because of electrical grounding considerations.

A1d - Slash disposal

1094
Air curtain combustion device evaluated for burning heavy fuels.
AUTHOR: MCLEAN HR; WARD FR
AUTHOR AFFILIATION: US Forest Service Pacific Northwest Forest and Range Experiment Station.
SOURCE TITLE: R-6 Fuels Management Notes
SOURCE ID: 4(1):1-4, 1976.
YEAR PUBLISHED: 1976
CATEGORY: A1d
REGION: Applicable to entire United States STATE: United States
KEYWORDS: burning; damage; pollution; slash disposal; soil
ABSTRACT: (Purpose) To determine if an air curtain combustion device (made by Camran Corporation, Seattle) would provide an acceptable method for disposal of concentrated forest residues. (Time and Duration) One-year study. (Type of Research) Original research (field). (Methodology) The air curtain combustion device (a large boxlike incinerator mounted on wheels, made of heat-resistant refractory material) was used. Total material loaded into the burner from the logging operation was determined by 12 sample periods. Sample periods started with the burner full, and elapsed times for burning and reloading were recorded. Each piece was measured for the total cubic-foot volume of debris loaded. Visible smoke emissions were evaluated during various stages of the operation. Spot fire potential was also estimated, and the extent of soil disturbance observed. (Results and Conclusions) The air curtain combustion device proved to be practically smoke free during this study. Small amounts of smoke were visible at times during the loading operations only. Some spot fires were started during the project. Many glowing embers were discharged, particularly when the curtain of air was broken during loading operations or when burning debris extended through the curtain. This problem could be corrected. Safety hazards present were similar to those encountered on any timber harvest operation using heavy equipment for skidding and loading, plus some special items related directly to burning. Hard hats and fire-resistant shirts are a must for the operator of the burner.

1095
Management and research implications.
AUTHOR: JEMISON GM; LOWDEN MS
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Environmental effects of forest residues management in the Pacific Northwest; a state-of-knowledge compendium.
SOURCE ID: Portland, OR, US Forest Service, 1974, General Technical Report PNW-24, A-1 - A-33 p.
YEAR PUBLISHED: 1974
CATEGORY: A1d; A5; B2; C4
SPONSOR: US Forest Service.
REGION: Pacific Forest STATE: Oregon; Washington
KEYWORDS: clearing; disposal; ecosystem; impact; slash disposal; vegetation
ABSTRACT: (Purpose) The purpose of this paper is to introduce 18 chapters of the residue management compendium which follow, and to synthesize the products of these chapters with respect to management and research implications. (Time and Duration) Not specified. (Type of Research) A summary; not research. (Methodology) Synthesis of other chapters in compendium into a management decision-making framework and with listing of research needs. (Results and Conclusions) The quality of the forest environment is tied to the presence, kind, distribution and amount of residue, and hence to the management of the residue. Residues are scrutinized from the standpoint of their impact on biological, physical and social processes and values. Similarly the impact of residue treatments on these same items are reviewed. The preparation of residue management guidelines is described. The high priority research and development needed to provide a base for the expanding residue management framework are also presented.

1096
Soil Microbes.
AUTHOR: BOLLEN WB
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Environmental effects of forest residues management in the Pacific Northwest; a state-of-knowledge compendium.
SOURCE ID: Portland, OR, US Forest Service, 1974, General Technical Report PNW-24, B-1 - B-41 p.
YEAR PUBLISHED: 1974
CATEGORY: A1d; A5; B1
SPONSOR: US Forest Service.
REGION: Pacific Forest STATE: Idaho; Oregon; Washington
KEYWORDS: ecosystem; habitat change; impact; nutrient cycle; slash disposal; soil; soil microbes; vegetation
ABSTRACT: (Purpose) The purpose of this paper is to outline the basic properties of the environment which affect soil microbes and their processes with respect to soil structure and fertility. (Time and Duration) Not specified; literature cited from 1935 to 1974 with preponderance of references in early 1970's and late 1960's. (Type of Research) Literature review. (Results and Conclusions) Interactions between soil microbes and forest residues are controlled by six environmental factors: water, temperature, aeration, pH, food supply and biological interrelationships. The author describes how these properties are influenced by various residue treatments and how the microbes may in turn respond with respect to soil texture and fertility. Microbial interactions with residues, residue treatments, and with various chemicals (like pesticides) are also described. Substantial amounts of data are included along with a research needs section.

1097
Soil processes and introduced chemicals.
AUTHOR: MOORE DG; NORRIS LA
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Environmental effects of forest residues management in the Pacific Northwest; a state-of-knowledge compendium.
SOURCE ID: Portland, OR, US Forest Service, 1974, General Technical Report PNW24, C-1 - C-33 p.
YEAR PUBLISHED: 1974
CATEGORY: A1d; A5; B1
SPONSOR: US Forest Service.
REGION: Pacific Forest STATE: Idaho; Oregon; Washington
KEYWORDS: chemicals; fertilizers; herbicides; pesticides; slash disposal; soil
ABSTRACT: (Purpose) The purpose of this paper is to discuss the effects of forest residues and residue treatments on soil processes and on the many chemicals used in the forest. (Time and Duration) Not specified, literature cited from 1957-74. (Type of Research) Literature review. (Results and Conclusions) Forest residue management is not likely to have a significant impact on soil formation. Clearcutting and burning temporarily interrupts nutrient cycling but cycling is restored as revegetation occurs. All types of burning result in the loss of some nitrogen capitol. Burning will temporarily make many other elements available for uptake by plants and soil microbes. The effects of pit burning, burial, chipping and some other disposal practices are also discussed. Authors conclude the probability of significant interaction between forest chemicals and forest residues or residue treatments is remote.

1098
Soil stability and water yield and quality.
AUTHOR: LOPUSHINSKY W; ROTHACHER J
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Environmental effects of forest residues management in the Pacific Northwest; a state-of-knowledge compendium.
SOURCE ID: Portland, OR, US Forest Service, 1974, General Technical Report PNW 24, D-1 - D-23 p.
YEAR PUBLISHED: 1974
CATEGORY: A1d; A5; B2a; B2b
SPONSOR: US Forest Service.
REGION: Pacific Forest STATE: Idaho; Oregon; Washington
KEYWORDS: flow; slash disposal; soil; stability; stream; water
ABSTRACT: (Purpose) The purpose of this paper is to discuss the effects of natural and manmade forest residues on soil stability, water yield, and water quality. (Time and Duration) Not specified; literature cited from 1952-74. (Type of Research) Literature review. (Results and Conclusions) Forest residue activities influence soil and water resources in proportion to the amount they increase soil disturbance. Drastic disturbance of litter and soil surface can lead to surface erosion and stream sedimentation. Residue treatments would not normally increase soil mass erosion or water yields. The quantity of natural chemicals (nutrients) in streams increases when the rate of residue decomposition exceeds the rate of uptake by vegetation. Burning of residues increases the chemical load of streams roughly in proportion to the amount of residue burned.

1099
Fish habitat.
AUTHOR: BROWN GW
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Environmental effects of forest residues management in the Pacific Northwest; a state-of-knowledge compendium.
SOURCE ID: Portland, OR, US Forest Service, 1974, General Technical Report PNW 24, E-1 - E-15 p.
YEAR PUBLISHED: 1974
CATEGORY: A1d; A5; B1
SPONSOR: US Forest Service.
REGION: Pacific Forest STATE: Idaho; Oregon; Washington
KEYWORDS: fish; habitat; slash disposal; streams; water
ABSTRACT: (Purpose) The purpose of this paper is to discuss the impact of logging (clearing) residues and residue treatments on a stream and its capability to produce fish. (Time and Duration) Not specified, literature cited from 1963-74. (Type of Research) Literature review. (Results and

1099

Conclusions) Forest residues in streams may triple after clearing operations, particularly if buffer strips are not left. Large debris can be removed but fine debris at levels substantially higher than previous levels will remain. Large debris affect primarily stream hydraulics but can also be the source of substantial stream damage if flushed out during periods of high flow. Fine residues affect dissolved oxygen levels and the circulation of water in the gravel. Streamside vegetation is important in providing food, cover and temperature control in small forest streams.

1100
Air quality influences.
AUTHOR: CRAMER OP
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Environmental effects of forest residues management in the Pacific Northwest; a state-of-knowledge compendium.
SOURCE ID: Portland, OR, US Forest Service, 1974, General Technical Report PNW 24, F-1 - F-51 p.
YEAR PUBLISHED: 1974
CATEGORY: A1d; A5; B2
SPONSOR: US Forest Service
REGION: Pacific Forest STATE: Idaho; Oregon; Washington
KEYWORDS: air; burning; clearing; pollution; quality; slash disposal
ABSTRACT: (Purpose) The purpose of this paper is to describe the impact of forests on air quality and the impact of residues and residue treatments on ambient air quality. (Time and Duration) Not specified, literature cited from 1959-74. (Type of Research) Literature review. (Results and Conclusions) The amount of smoke from any burning operation is inversely correlated with the completeness of the combustion process. Emission characteristics of fire startup, full fire, and burn down are described, as are different fuel arrangements and burning procedures. Local excessive concentrations of smoke from forest residue burning may occur, but on a global scale removal mechanisms are keeping pace with output with the exception of CO2. Air pollution nuisance from residue burning can be minimized with a smoke management system which the author describes.

1101
Fire hazard and conflagration prevention.
AUTHOR: BRACKEBUSCH AP; MARTIN RG
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Environmental effects of forest residues management in the Pacific Northwest; a state-of-knowledge compendium.
SOURCE ID: Portland, OR, US Forest Service, 1974, General TEchnical Report PNW 24, G-1 - G-30 p.
YEAR PUBLISHED: 1974
CATEGORY: A1d; A5; C4
SPONSOR: US Forest Service.
REGION: Pacific Forest STATE: Idaho; Oregon; Washington
KEYWORDS: burning; fire; fire hazard; slash disposal
ABSTRACT: (purpose) The purpose of this paper is to discuss the fundamental characteristics of fuel particles, fuel beds, and the management of fuels. (Time and Duration) Literature cited from 1930-74 with most papers in 60's and 70's. (Type of Research) Literature review. (Results and Conclusions) Development of conflagrations is dependent, among other factors, on weather, terrain and large accumulations of fuel. Fuels accumulate in natural and undisturbed (by man) forest systems but man's activities can greatly modify the amount, kind and distribution of fuels and thus the hazard of a conflagration. Integration of fuel management planning with other forest management planning will achieve a pattern of fuels which minimizes conflagration potential while protecting other resource values.

1102
Animal populations and damage.
AUTHOR: DIMOCK EJ
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Environmental effects of forest residues management in the Pacific NOrthwest; a state-of-knowledge compendium.
SOURCE ID: Portland, OR, US Forest Service, 1974, General Technical Report PNW 24, O-1 - O-28 p.
YEAR PUBLISHED: 1974
CATEGORY: A1d; A5; B1
SPONSOR: US Forest Service.
REGION: Pacific Forest
KEYWORDS: animals; birds; burning; clearing; mammals; slash disposal
ABSTRACT: (Purpose) The purpose of this paper is to discuss the interactions between animals and birds and forest residues and their treatments. (Time and Duration) Literature cited from 1923-74. (Type of Research) Literature review. (Results and Conclusions) Forest residues, live and dead, remaining after clearing operations exert both favorable and unfavorable effects on forest animal populations. Residue situations usually improve habitats for animals likely to damage future forest crops. Practical treatments that modify residues appear most promising for attaining timber, range, and wildlife production goals with a minimum of interference by damaging animals.

1103
Habitat of grazing animals.
AUTHOR: GARRISON GA; SMITH JG
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Environmental effects of forest residues management in the Pacific NOrthwest; a state-of-knowledge compendium.
SOURCE ID: Portland, OR, US Forest Service, 1974, General TEchnical Report PNW 24, P-1 - P-10 p.
YEAR PUBLISHED: 1974
CATEGORY: A1d; A5; B1
SPONSOR: US Forest Service.
REGION: Pacific Forest STATE: Idaho; Oregon; Washington
KEYWORDS: animals, game; animals, nongame; grazing; grazing capacity; mammals; slash disposal
ABSTRACT: (Purpose) The purpose of this paper is to discuss the effects of forest residues and residue treatments on the habitat for grazing animals. (Time and Duration) Literature cited from 1940-74. (Type of Research) Literature review. (Results and Conclusions) Forest residues in the Pacific Northwest have varied effects on grazing habitat including occupation of growing sites, obstruction of access to forage and water, and alteration of the forest environment such that plant succession is altered. Residue treatments that remove the large debris favor production of forage and therefore the carrying capacity of the site for grazing animals.

1104
Insects and other arthropods.
AUTHOR: MITCHELL RG; SARTWELL C
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Environmental effects of forest residues management in the Pacific NOrthwest; a state-of-knowledge compendium.
SOURCE ID: Portland, OR, US Forest Service, 1974, General Technical Report PNW 24, R-1 - R-22 p.
YEAR PUBLISHED: 1974
CATEGORY: A1d; A5; B1
SPONSOR: US Forest Service.
REGION: Pacific Forest STATE: Idaho; Oregon; Washington
KEYWORDS: burning; clearing; insects; slash disposal
ABSTRACT: (Purpose) The purpose of this paper is to describe the residue relationships of both pests and beneficial insects. (Time and Duration) Literature cited from 1918-74. (Type of Research) Literature review. (Results and Conclusions) Forest residues are utilized by a variety of insects - pests as well as beneficial insects. The most serious pests are the bark beetles whose marked increases in population levels frequently are the result of large increases in forest residues. Many natural enemies of pest insects also utilize residues. However, of substantially more benefit to the forest is the group of organisms responsible for fragmenting fine debris preliminary to nutrient recycling. Authors conclude some residues in ponderosa pine and Douglas-fir forests can offer significant pest insect problems and their management needs to be included in the planning process.

1105
Some effects of logging and associated road construction on northern California streams.
AUTHOR: BURNS JW
AUTHOR AFFILIATION: CA Dept of Fish and Game.
SOURCE TITLE: Transactions of the American Fisheries Society
SOURCE ID: 101(1):1-17, 1972.
YEAR PUBLISHED: 1972
CATEGORY: A1d; A1e; B2a
SPONSOR: CA Dept of Fish and Game.
REGION: Pacific Forest STATE: California; Oregon; Washington
KEYWORDS: clearing, mechanical; construction; disturbance; erosion; fish; impa** right-of-way; riparian; stabilization; stream
ABSTRACT: (Purpose) The purpose of this study is to determine the effects of logging and road construction on stream salmonids. (Time and Duration) 4 years, 1966-69. (Type of Research) Original field plot. (Methodology) Four small streams on the north coast of CA were chosen for study. The watersheds were characterized. Streamflow, stream dimensions, water quality, sedimentation, species abundance (fish) and fish food were all recorded before, during and after logging and road building operations. (Results and Conclusions) Logging was found to be compatible with anadromous fish production when adequate attention was given to stream bank protection and channel clearance. The carrying capacity for juvenile salmonids of some stream sections increased when high temperatures, low dissolved oxygen and adverse sedimentation did not accompany the logging. Extensive use of bulldozers on steep slopes, streambanks and in narrow channels during debris removal caused excessive sedimentation.

1106
Spawning bed sedimentation studies in northern California streams.
AUTHOR: BURNS JW
AUTHOR AFFILIATION: CA Dept of Fish and Game.
SOURCE TITLE: California Fish and Game
SOURCE ID: 56(4):253-270, 1970.
YEAR PUBLISHED: 1970
CATEGORY: A1d; A1e; B2a
SPONSOR: CA Dept of Fish and Game.
REGION: Pacific Forest STATE: California; Oregon Washington
KEYWORDS: clearing, mechanical; disturbance; erosion; fish; riparian; sediment; stabilization; streams
ABSTRACT: (Purpose) The purpose of this study was to describe changes in spawning bed composition (for salmon and trout) accompanying logging and road building. (Time and Duration) 4 years, 1966-69. (Type of Research) Original field plot research. (Methodology) Seven stream sections on six small watersheds were studied. Four of the seven were logged using methods specific to their locale. The other three remained undisturbed as controls. Size and composition of spawning bed materials were systematically sampled before, during and after logging and these were related to logging and road building practices. (Results and Conclusions) Spawning bed composition in the four disturbed test streams changed after logging roughly in porportion to the amount of stream bank disturbance. The heaviest sedimentation occurred when bulldozers operated in narrow channels having pebble bottoms. In larger streams with boulder and cobble bottoms bulldozer operations did not influence sedimentation greatly. Road construction and stream debris removal had marked impacts on sedimentation. Control streams changed little during the study period.

1107
Clear 150 miles of transmission R/W by windrowing.
AUTHOR: ANON
SOURCE TITLE: Electrical World
SOURCE ID: Page 48, 1962 (February 12).
YEAR PUBLISHED: 1962
CATEGORY: A1d
REGION: Oak-Hickory Forest STATE: Missouri
KEYWORDS: clearing; right-of-way; slash; wildlife
ABSTRACT: (Purpose) To describe plans for use of windrowing for slash disposal on ROWs. (Type of Research) Descriptive account. (Results and Conclusions) Windrows are to be made on ROW edges and are broken every 200 feet for firebreaks and access. Separate piles, ten feet high and fifteen feet wide, will be made of logs and brush, and tree stumps will be chemically treated. These techniques are expected to provide excellent cover for wildlife.

1108
Decay of logging slash in the northeast.
AUTHOR: HANSBROUGH JR; SPAULDING P
AUTHOR AFFILIATION: Agricultural Research Admin.
SOURCE ID: Washington, DC, US Dept of Agriculture, 1944, Technical Bulletin 876, 22 p.
YEAR PUBLISHED: 1944
CATEGORY: A1d
REGION: Laurentian Mixed Forest STATE: Maine; New Hampshire; New York; Vermont
KEYWORDS: burning; slash; slash disposal
ABSTRACT: (Purpose) To report on methods of hastening logging slash decay, based on systematic observations on experimental plots in different situations in New York and New England, and to consider the fungi most important in causing decay in this area. (Time and Duration) Observations and research over 20 years. (Type of Research) Original research (field studies). (Methodology) Two methods were used: extensive reconnaissance, and intensive investigation of limited areas. The extensive reconnaissance included slash of all species, of all ages, variously disposed as left by all types of logging, and at elevations ranging from less than 1,000 to more than 4,000 ft., and it covered all kinds of material from defective logs to the smallest twigs and foliage. The intensive studies were on 4 series of plots, some of which have been maintained since 1926. The stands on these plots were primarily mature northern hardwoods. (Results and Conclusions) The average periods required for slash to disintegrate are 15 years for hardwood, 17 years for eastern white pine, and 29 years for red spruce. Under the most favorable conditions for decay, these periods can be shortened by about one-fifth. Unfavorable moisture and temperature conditions retard decay, often for many years. Hundreds of fungi help to disintegrate slash, but about 50 species cause the decay of the greater part. The primary factors controlling the work of the slash-decay fungi are moisture, temperature, and the decay resistance of the wood.

A1e - Sensitive ecosystem considerations

1109
Geotechnical features.
AUTHOR: DAMES AND MOORE
AUTHOR AFFILIATION: Dames and Moore.
SOURCE TITLE: Sundesert Nuclear Plant Units 1 & 2 Environmental Report, Section 2 of Appendix I.
SOURCE ID: Los Angeles, CA, Dames & Moore, 1976, 37 p.
YEAR PUBLISHED: 1976
CATEGORY: A1e; B2b
SPONSOR: Wirth Associates.
REGION: California Chaparral STATE: California
KEYWORDS: environmental assessment; erosion; geology; impact; right-of-way; soils; stability; transmission line
ABSTRACT: (Purpose) To prepare a comprehensive review of the geotechnically related environmental impacts that may be associated with construction and operation of EHV transmission lines across southern CA. (Type of Research) Environmental analysis - field. (Methodology) The study area comprises four natural provinces; Peninsular Ranges, Colorado Desert, Mojave Desert, and Transverse Ranges. Environmental analysis consisted of a regional study of geologic features and phenomena that could affect or be affected by construction and operation of the EHV transmission line. Procedure was to identify information sources, collect data, evaluate data, compile 1:250,000 scale base maps, and analyze sensitivity of environmental features and hazards to the transmission line. Analysis included inventory and mapping of seismic activity and faulting, slope stability, erosion potential, aeolian deposits, areas susceptible to windblown sand, expansive soils, subsidence potential, liquefaction, hydrocompaction, rock collapse, flood hazard and debris flow potential, and rare or unique geologic features. (Results and Conclusions) Sensitivity analysis based on environmental assessment was classified in four levels: Maximum Sensitivity, areas to be avoided due to an unacceptable magnitude of potential impact; Major Sensitivity, areas to be avoided or contact minimized; Moderate Sensitivity, most suitable for an EHV transmission line. Many geotechnical features are distributed over such extensive areas that they cannot be avoided by the transmission line. Analysis revealed that only a small portion of the study area exhibits a major sensitivity; the most significant being the active fault zones, narrow canyons, and the Sand Hills, a unique geologic feature. The major faults are Elsinore, San Jacinto, and San Andreas. It was indicated, however, that fault zones and narrow canyons can be avoided by careful tower siting.

1110
Phase II corridor study, geotechnical features.
AUTHOR: DAMES AND MOORE
AUTHOR AFFILIATION: Dames and Moore.
SOURCE TITLE: Sundesert Nuclear Plant Units 1 & 2 Environmental Report, Section 2 of Appendix J
SOURCE ID: Los Angeles, CA, Dames & Moore, 1976, 58 p.
YEAR PUBLISHED: 1976
CATEGORY: A1e; A2a; B2b
SPONSOR: Wirth Associates.
REGION: California Chaparral STATE: California
KEYWORDS: environmental assessment; erosion; geology; impact; right-of-way; soil; transmission line
ABSTRACT: (Purpose) To inventory and assess geotechnically related environmental conditions within and adjacent to all alternate 500 kV transmission routes under study for the proposed Sundesert Nuclear Project. (Type of Research) Environmental analysis - field. (Methodology) Environment along the alternate routes was described with respect to faulting, seismic activity, settlement potential, liquefaction potential, shrink-swell potential and expansive soils, slope instability, sand dunes and areas susceptible to windblown sand, erosion potential, flooding hazard, water quality, subsidence, collapsible soils and hydrocompaction potential, and rare or unique geologic features. Environmental features were evaluated to identify geotechnical hazards that could affect construction of the transmission line, especially siting and foundation problems, and impacts resulting from the transmission line with emphasis on erosion potential. Erosion potential was based on soil and rock types, local gradient and relief, and precipitation intensity, duration, and frequency. (Results and Conclusions) Hazards considered to be of significant potential to the project are faulting and seismic activity, settlement, liquefaction, shrink-swell and expansive soils, slope instability, erosion, sand dunes, windblown sand areas, flooding, subsidence, and collapsible soils and hydrocompaction. Geotechnical hazards rated high to moderate potential for either siting or foundation problems, or both, were incorporated in a map of the transmission system. Most hazards could be accommodated by proper tower spacing or by modification of standard tower designs. Of several geologic features, only erosion potential will be impacted. Other features will not be impacted but may present design constraints. Erosion potential is controlled by soils, vegetation, topography, and rainfall. Removal of vegetation and disruption of surface

1110

soil associated with construction and maintenance of access roads and tower sites may increase erosion rates and lead to increased sedimentation.

1111
Guidelines for the protection of the fish resources of the Northwest Territories during highway construction and operation.
AUTHOR: DRYDEN RL; STEIN JN
AUTHOR AFFILIATION: Environment Canada.
SOURCE ID: Canadian Dept of the Environment, Fisheries and Marine Science, 1975. Technical Report Series CENT751, 32 p.
YEAR PUBLISHED: 1975
CATEGORY: A1e; A1i; B1
SPONSOR: Directorate, Central Region.
REGION: Applicable to entire United States
KEYWORDS: access road; construction; crossing; ecosystem; fish; impact; right-of-way; sedimentation; stream
ABSTRACT: (Purpose) The purpose of this report is to give guidelines for highway designers in meeting environmental requirements of the Canadian Government with respect to maintenance of fish habitat. (Time and Duration) Not specified. Literature cited from 1961-74. (Type of Research) Not research; a handbook to be used during road planning, design and construction. (Methodology) Largely narrative, with some tables and figures. (Results and Conclusions) The authors describe the problem in terms of the Northwest Territories of Canada. They include description of alteration of the natural river regime from erosion, gravel removal, construction activities and icing in shaded areas (like culverts). Impacts on the aquatic resource through blockage of fish passage, reduced spawning success, physical condition and benthos are described. Design and construction procedures are given under heading of: hydrologic design, fish passage requirements, culvert design, bridge design, and several specific construction and operating procedures. The later section includes scheduling, gravel removal, clearing, revegetation, slope stabilization, drainage, silt retention, culvert steaming, disposal of excavated and slash material.

1112
Fish migration and fish passage; a practical guide to solving fish passage problems.
AUTHOR: EVANS WA; JOHNSTON FB
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: US Forest Service, Region 5, 1976. 43 p.
YEAR PUBLISHED: 1974
CATEGORY: A1e; A2f; B2a
SPONSOR: US Forest Service.
REGION: Pacific Forest STATE: Alaska; California; Oregon; Washington
KEYWORDS: crossing; fish; flow; migration; stream
ABSTRACT: (Purpose) This report is intended as a working guide for biologists and engineers confronted with practical problems of providing fish passage through, over, or around man made or natural barriers in streams. (Time and Duration) Not applicable. (Type of Research) Not research, a handbook with approximately 12 references. (Methodology) Narrative. (Results and Conclusions) The authors have attempted to provide both the background knowledge and how-to-do-it methodology for analyzing and solving fish passage problems in streams with particular emphasis on roads and culverts. The following are major topics presented: types of barriers, principles of fish passage; general requirements for upstream fish passage; recognizing fish barrier problems; culvert investigation procedures. The handbook contains substantial amounts of hard engineering data which can be used in designing fish passage facilities either of a temporary or permanent nature.

1113
Pipelines in forested wetlands.
AUTHOR: BOELTER DH; CLOSE GE
AUTHOR AFFILIATION: US Forest Service
SOURCE TITLE: Journal of Forestry.
SOURCE ID: Pages 561-563, 1974 (September).
YEAR PUBLISHED: 1974
CATEGORY: A1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: habitat change; water table; wetland
ABSTRACT: (Purpose) To discuss how small but prolonged rises in water tables due to pipeline construction can saturate the rooting zone, and reduce tree growth or even kill trees. (Time and Duration) One-year study. (Type of Research) Original research (field study). (Methodology) A corduroy road was built parallel to a pipeline, about 1.5 feet higher than the normal swamp surface. It effectively blocked water movement because the normally porous surface material was compacted and corduroyed. Water tables were observed on both sides of the road on 10 dates between April and November, 1972. (Results and Conclusions) There was a consistently higher water table (0.68 to 0.86 ft) on the upslope side of the road during the entire period. Timber had been killed, primarily black spruce, tamarack, and northern white-cedar, for a distance 0.5 mile back from the pipeline. The extent of flooding damage upslope depends on the slope of the wetland surface and the amount of water table rise. Cross ditches to provide drainage beneath pipelines should be constructed at least every 150 feet, and should be at least 18 inches deep. It may be necessary to clean vegetative growth from these ditches periodically.

1114
How Do You Quantify Power-line Impact?
AUTHOR: VOYTKO JD
AUTHOR AFFILIATION: Westinghouse Electric Corp. Env Systems Dept.
SOURCE TITLE: Electrical World
SOURCE ID: McGraw-Hill, 1972, Reprint 120, 3 p.
YEAR PUBLISHED: 1972
CATEGORY: A1e; A4a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: agriculture; ecology; impact; land use; wildlife
ABSTRACT: (Purpose) To describe some factors that can be used to quantify power line impact when preparing environmental impact statements. (Results and Conclusions) The author states that it is obvious that the shortest route that bypasses all of the major overriding constraints will have the lowest quantitative impact. Identifying these constraints and assigning appropriate values is probably the most important step in environmental analysis (e.g., ecology, engineering, cultural, agronomy, aesthetic, socioeconomics, and land use).

1115
Effects of logging and logging roads on erosion and sediment deposition from steep terrain.
AUTHOR: KIDD WJ; MEGAHAN WF
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Journal of Forestry.
SOURCE ID: 70(3): 136-141, 1972.
YEAR PUBLISHED: 1972
CATEGORY: A1e; A1h; B2a; B2b; C4
SPONSOR: US Forest Service.
REGION: Rocky Mountain Forest STATE: Idaho
KEYWORDS: clearing; erosion; forest; impact; logging; right-of-way; sediment; soil; stability; yield
ABSTRACT: (Purpose) The purpose of this study was to compare the effects of jammer and skyline logging systems with respect to on-site erosion and subsequent sediment movement into ephemeral stream channels. (Time and Duration) Study initiated NOvember 1960 and last series of measurements made September 1967; 7 years. (Type of Research) Original field research. (Methodology) Sediment dams and erosion plots were installed in connection with the establishment of two types of logging systems (skyline and jammer) in a small high elevation watershed on the highly erosive soils of the Idaho batholith. After logging, erosion from the plots and sediment deposition behind the dams were used to compare the impact of the two logging systems. (Results and Conclusions) Five years of erosion plot data showed there was no difference in the erosion resulting from the two skidding systems studied. Sediment dam data obtained concurrently showed that the logging operations alone (exclusive of the roads needed for the jammer system) increased sediment production by a factor of 0.6 over the natural rate of sediment deposition. Roads associated with the jammer system increased sediment production an average of about 750 times over the natural rate for the six years following construction.

1116
Industrial waste guide on logging practices
AUTHOR: US FEDERAL WATER POLLUTION CONTROL ADMIN
SOURCE ID: 1970, 40 p.
YEAR PUBLISHED: 1970
CATEGORY: A1e; A1h; A4b
REGION: Applicable to entire United States STATE: California; Idaho; Montana; Oregon; Washington
KEYWORDS: buffer strips; burning; clearcutting; construction; leaching; logging; road; sedimentation; temperature; water
ABSTRACT: (Purpose) To set forth guidelines to minimize impacts of logging, forest roads, and slash disposal on water quality. (type of Research) Literature review. (Methodology) Review literature and general principals developed by land managers. (Results and Conclusions) Degradation of water quality by sedimentation, thermal effects, and organic matter leachates as a result of logging and road construction may be minimized by careful forest practices. Guidelines for road location, design, and maintainance may reduce road impacts. Suggested guidelines for tree cutting, yarding methods, and unit lay-out will reduce impacts of timber harvest.

A1g - Clearing specifications

1117
R/W clearance can be economical and environmentally sound.
AUTHOR: DOLTON RL
SOURCE TITLE: Electric Light and Power.
SOURCE ID: 52(1):42 43, 1974.
YEAR PUBLISHED: 1974
CATEGORY: A1g
SPONSOR: Potomac Edison CO.
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: clearing; costs; environment; right-of-way
ABSTRACT: (Purpose) To review costs and environmental assessments of selective clearcutting of rights of way and of low cover selective clearance with chemicals. Review of literature. A review of the use of clearcutting with screening on low cover vegetation selection by herbicides. Author believes only low cover selection by herbicides is practical and aesthetically acceptable. Basic clearing and mantenance cost data are provided.

1118
Pre-logging a right-of-way cuts clearing costs.
AUTHOR: ANON
AUTHOR AFFILIATION: BC Hydro and Power Authority.
SOURCE TITLE: Eiectircal World T/D Edition
SOURCE ID: page 48, 1973 (April 1)
YEAR PUBLISHED: 1973
CATEGORY: A1g
REGION: Pacific Forest STATE: Oregon; Washington
KEYWORDS: clearing; right-of-way; slash
ABSTRACT: (Purpose) To describe plans for pre-logging rights-of way. (Type of Research) Descriptive paper. (Results and Conclusions) Pre-logging will clear a ROW of trees and facilitate building access roads. Returns may average about $10,000 per mile from timber sold.

A1h - Access roads

1119
Reducing erosional impacts of roads.
AUTHOR: MEGAHAN WF
AUTHOR AFFILIATION: US Forest Service, Intermountain Forest and Range Experiment Station.
SOURCE TITLE: Guidelines for watershed management; FAO Conservation Guide
SOURCE ID: Rome, Italy, Food and Agriculture Organization of the United Nations, 1977, 237-261 p.
YEAR PUBLISHED: 1977
CATEGORY: A1h; A1j; C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: construction; erosion; erosion control; forest; impact; mulch; revegetation; right-of-way; roads
ABSTRACT: (Purpose) To present information on erosion processes, basic principles, and guidelines for reducing erosional impacts of roads. (Time and Duration) Literature references from 1948 to 1974. (Type of Research) Guidelines from published literature. (Methodology) Guidelines for reducing erosional impacts of roads are developed based upon concepts and techniques that have been applied in the temperate climates of the United States, mostly in mountainous terrain. Includes guidelines on land use planning, route location, road design, road drainage, slope stabilization with vegetation and mulches, construction, maintenance, and road closure. (Results and Conclusions) Surface erosion is a function of magnitude of forces available, inherent erosion hazard at the site, and amount of protective material, such as vegetation and litter, on the soil surface. The four principles to reduce road erosion impacts are: minimize amount of disturbance in construction, avoid high hazard areas, use control practices on disturbed areas, and minimize off-site impacts by reducing sediment delivery to streams. In planning, evaluate environmental and economic trade-offs, and select and review alternative routes using soil surveys, etc. Include control practices such as revegetation and future maintenance needs in road design. Road drainage is highly important; use fords, culverts or bridges to cross natural drainageways and roadside ditches to remove water before it concentrates. Stabilize disturbed slopes immediately with vegetation and mulch. Deep-rooted vegetation, such as trees and shrubs, helps in surface erosion control and is an important deterrent to mass erosion. Diligent road maintenance is an absolute necessity.

1120
Environmental guidelines for development roads in the subarctic.
AUTHOR: HELMERS AE; LOTSPEICH FB
AUTHOR AFFILIATION: Env Protection Agency.; US Forest Service.
SOURCE ID: Corvallis, OR, US Environmental Protection Agency, 1974, EPA 660374009, 63 p.
YEAR PUBLISHED: 1974
CATEGORY: A1h; A4b; B2b
SPONSOR: Environmental Protection Agency. Forest Service.
REGION: Yukon Forest STATE: Alaska
KEYWORDS: access road; clearing; disturbance; environment; erosion; permafrost
ABSTRACT: (Purpose) The purpose of this report is to provide a set of guidelines for the development of access roads in the subarctic. It is intended for groups with limited or no engineering staffs. The guidelines are intended to result in roads with reduced erosion, better stability and greater aesthetic quality. (Time and Duration) Not specified. (Type of Research) Observational with synthesis to establish conclusions and guidelines. (Methodology) Authors draw on personal experience and observation rather than on data collection techniques. From this base of knowledge they determine what kinds of problems occur on access roads and what types of planning, construction and maintenance techniques can be used to minimize impacts. (Results and Conclusions) Road planning should take advantage of planning tools like aerial photos, engineering data and long range management objectives. Permafrost should be avoided or crossed high on the slope, cleared trees should be cut close to the ground and felled into the ROW. Organic mats should not be disturbed, particularly on muskeg and permafrost. Proper drainage is of primary importance. Road and drainage system maintenance will reduce erosion. Techniques for road retirement are given.

1121
Presentation to the Solandt Commission on the procedures to be followed for the construction of the Lennox G.S. to Oshawa 500 kV transmission line.
AUTHOR: ONTARIO HYDRO
AUTHOR AFFILIATION: Ontario Hydro.
SOURCE ID: Toronto, Ontario, Ontario Hydro, 1974, 12 p.
YEAR PUBLISHED: 1974
CATEGORY: A1h; A2a; A4
REGION: Applicable to entire United States
KEYWORDS: construction; environment; impact; protection; restoration; right-of-way; transmission line
ABSTRACT: (Purpose) To present procedures for planning and construction of a transmission line by Ontario Hydro. (Type of Research) Review of policies and procedures based on company experience and knowledge. (Methodology) Discusses field procedures for line construction after route selection, location of towers, and settlement of property agreements. Procedures include a plan to identify access road needs, construction methods suitable for terrain and soil types, storage areas, equipment needs, etc. Attention is focused on access to the right-of-way and tower locations with emphasis on water crossings, existence of public roads, and gates for private fences. Construction stages include installation of tower foundations, tower delivery and erection, installation of line conductors, and right-of-way clean-up. Criteria are presented to preserve and enhance the natural environment. (Results and Conclusions) Ontario Hydro recognizes that use of heavy equipment and transport of heavy materials in transmission line construction does damage the terrain. Procedures were developed to minimize damage and carry out restoration measures. These include selection of proper equipment, planning seasonal activities, avoiding destruction of trees, minimal grading to avoid erosion, and control of noise and air pollution. Access roads are routed, constructed, and maintained to minimize rutting, soil mixing, and erosion. Vegetation clearing and grading at tower sites is minimized and topsoil segregated for future restoration use. Diversions are used for runoff water to prevent initiation of erosion. All disturbed land is restored upon completion of construction in a given area.

1122
Soil erosion control structures on skid trails.
AUTHOR: KIDD WJ JR
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Ogden, UT, US Forest Service Research Paper INT-1, 1963, 8 p.
YEAR PUBLISHED: 1963
CATEGORY: A1h; B2b; C4
SPONSOR: US Forest Service.
REGION: Applicable to entire United States STATE: Idaho
KEYWORDS: erosion; erosion control; road; soil
ABSTRACT: (Purpose) The objectives of the study were to: (1) determine the optimum spacing distances between man made structures for preventing excessive rilling; and (2) determine which of several structures provide the most effective dispersal of sediment laden water that originates on skid trails (small roads). (Time and Duration) 1953-1957, 4 years. (Type of Research) Original field research. (Methodology) 70 skid

1122

trails on the Idaho batholith and 16 on Columbia River basalt derived soils were studied in four areas. Slash dams or diagonal log water bars were constructed. On 14 skid trails logging slash was lopped and scattered. Hand or machine dug ditches were installed on five others. Spacing between structures varied. All trails were seeded with several species of clover and grass. Quantitative data on volume of soil eroded was obtained in 1955. A qualitative ranking was used in 1957 to compare treatment effects. (Results and Conclusions) Erosion measurements on 569 intervals of 105 skid trails revealed the following: 1. Erosion is greater and the rate of healing slower on soils derived from granite than on soil derived from basalt. 2. More soil is eroded from skid trails located in ravine bottoms than from trails on sidehills. 3. Control structures that divert the water off the skid trail onto undisturbed forest floor are superior to those that only retard water movement and filter sediment out along the skid trail. 4. Any increase in spacing between structures increases soil loss.

1123
Road and slope characteristics affecting sediment movement from logging roads.
AUTHOR: HAUPT HF
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Journal of Forestry.
SOURCE ID: 57:329-332, 1959.
YEAR PUBLISHED: 1959
CATEGORY: A1h
REGION: Sagebrush-Wheatgrass STATE: Idaho; Oregon
KEYWORDS: drainage; road; sediment; slope
ABSTRACT: (Purpose) To report on a study to determine the length of slope required to dissipate this drainage from logging roads situated on steeply sloping granitic soils in southwestern Idaho. (Time and Duration) Two-year study. (Type of Research) Original research (field study). (Methodology) The amount of erosion and sediment occurring below logging roads on steeply sloping granitic soils in ponderosa pine lands of southwestern Idaho was studied. Seven road and slope characteristics amenable to quantitative evaluation were investigated to determine their relationship to the distance that sediment moved downslope from a road embankment. (Results and Conclusions) Four characteristics—the slope obstruction index, cross ditch interval squared, embankment slope length, and the product of the cross ditch interval and road gradient—were found to influence sediment flow distance significantly. These characteristics were incorporated into an equation that is of value in determining the safe width of buffer strips necessary to protect lower roads or stream channels from sediment damage emanating from road construction activities.

A2 - Structure Design and Location

1124
Environmental guidelines.
AUTHOR: WESTERN SYSTEMS COORDINATING COUNCIL
SOURCE ID: Western Systems Coordinating Council, 1971, 96 p.
YEAR PUBLISHED: 1971
CATEGORY: A2; A3; A4; A5
REGION: Applicable to entire United States STATE: United States
KEYWORDS: clearing; environment; environmental assessment; multiple use; planning; right-of-way; route selection methodology; structure design; structure spotting
ABSTRACT: (Purpose) To establish guidelines for electric utility companies for enhancing and maintaining a high quality environment, while continuing to provide reliable electric service in the areas served by the Western Systems Coordinating Council. (Time and Duration) One year. (Type of Research) Literature review plus discussions between environmental consultants and electric utility personnel. (Methodology) The Environmental Committee that prepared this report included 12 utility members and eight advisory members who have land-use expertise and broad experience in the environmental quality management field. Committee discussions with utility members gave them the opportunity to learn firsthand from advisory members the environmental impact resulting from the installation and operation of major electric facilities as seen by the public and the advisory members of the committee. (Results and Conclusions) This report covers such pertinent subjects as policies and objectives; generating plants, thermal, hydroelectric and pumped storage; major transmission lines, major substations, regulatory jurisdiction and communications. Specific and practical guidelines related to each of these subjects are presented and illustrated pictorially.

A2b - Conductor configurations

1125
Power lines and birds of prey.
AUTHOR: NELSON M
SOURCE TITLE: Aware Magazine.
SOURCE ID: 52:9-12, 1975.
YEAR PUBLISHED: 1975
CATEGORY: A2b; B2e; B3a
SPONSOR: ID Power Co.
REGION: Columbia Forest (Dry Summer) STATE: Idaho
KEYWORDS: bird kills; conductor clearance; contruction; eagle; management; raptor; transmission line; wildlife
ABSTRACT: (Purpose) To suggest possible solutions to reduce raptor mortality due to electrocution from power lines and increase raptor habitat by providing perching and nesting sites on power structures. (Type of Research) Original, and statement of Idaho Power's regarding raptors. (Methodology) Using mock poles and lines, live eagles' landing and perching methods were observed using slow motion photography. Different pole designs with varying placements of conductors and ground wires were tried to find a design that would minimize electrocutions. Specifications for conductor clearances are given to help reduce raptor electrocutions. Young eagles using conductors when learning to fly, and birds using poles readily adopted specially built perches at the top of poles. Suggestions are given for protecting raptors on utility lines.

1126
Environmental considerations in design of transmission lines.
AUTHOR: BRENMAN H; COVINGTON DA
AUTHOR AFFILIATION: US Dept of the Interior.
SOURCE TITLE: Journal of the Power Division, Proceedings of the American Society of Civil Engineers.
SOURCE ID: Pages 369-381, 1970 (June).
YEAR PUBLISHED: 1970
CATEGORY: A2b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: aesthetics; design; environment; structure design; structure spotting
ABSTRACT: (Purpose) To discuss various environmental considerations affecting transmission line design and tower spotting and tower site selection. (Type of Research) Based on observations and experience, not the result of original research. (Methodology) The author outlines the major impact on existing environment from ROW clearing. His criteria include: clearing and construction should preserve natural beauty to the maximum extent; trees should be selectively cleared, topped, trimmed, or pruned, but only to the extent necessary to maintain the required electrical clearances; all trees, brush and stumps within a radius of 25 feet of any transmission tower should be cut close to the ground; access roads should be located to preserve natural beauty and minimize erosion. (Results and Conclusions) The prime objective of transmission lines must be to establish and maintain reliable electric service. However, we have reached the time when we must also concern ourselves with the environment. Many past clearing projects and tower structure designs have not considered environmental quality of aesthetics.

A3b - Aerial stringing

1127
Suggested practices for raptor protection on powerlines.
AUTHOR: MILLER D
SOURCE ID: Raptor Research Foundation for Edison Electric Institute, 1975, 19 p.
YEAR PUBLISHED: 1975
CATEGORY: A3b
REGION: Applicable to entire United States STATE: Colorado; Idaho; Nevada; Utah; Wyoming
KEYWORDS: bird kills; birds; conductor; eagle; ecology; endangered; impact; predator; raptor; right-of-way; species; structure design; transmission line
ABSTRACT: (Purpose) To summarize suggested practices for protection of raptors on power lines. (Time and Duration) 1972 to 1975. (Type of Research) Literature review. (Methodology) Literature review. (Results and Conclusions) Electrocution of raptors, primarily golden eagles, is a problem in western US during the winter. Powerlines in flat, broad valleys where natural perch sites are absent are the most likely sites for use. Most of the eagles electrocuted were young and inexperienced birds just learning to fly. A series of problem designs along with suggested modifications are presented since the solution to the problem lies more with engineering expertise than with a biolgical approach.

1128
Wires, poles, and birds.
AUTHOR: BENTON AH; DICKINSON LE
SOURCE TITLE: Birds in our lives.
SOURCE ID: US Dept Interior and US Fish and Wildlife Service, 1966, 390-395 p.
YEAR PUBLISHED: 1966
CATEGORY: A3b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; control; corridor; habitat manipulation; impact; mortality; plants; right-of-way; transmission
ABSTRACT: (Purpose) To review some of the interactions between birds, rights-of-way and transmission lines. (Type of Research) Literature review. (Methodology) To report a series of case studies and solutions to management problems. (Results and Conclusions) Transmission line problems are reviewed in reference to electrocution of gulls, eagles and ospreys. Many of these problems have been resolved by altering designs. Other topics included in the discussion are woodpecker damage to utility poles and use of selective herbicides for right-of-way maintenance.

A4 - ROW Restoration Methods

1129
The wild gardener in the wild landscape.
AUTHOR: KENFIELD WG
SOURCE ID: New York, NY, Hafner Publishing Co, 1970, 232 p.
YEAR PUBLISHED: 1970
CATEGORY: A4; A5; C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: grasses; plants; shrubs; trees; vegetation; weeds
ABSTRACT: (Purpose) To provide assistance in maintaining or creating landscaping with natural vegetation. (Results and Conclusions) Methods and treatments are discussed for encouraging various species of natural vegetation, either as a hobby or for functional, inexpensive vegetation management. Mechanical as well as chemical methods are discussed. The second half of the book gives a short analysis of the various plant families (in the northeastern US) including information on ease of establishment, growth behavior, aesthetics, and animal utilization.

1130
Rights-of-way for wildlife.
AUTHOR: HILL CE
SOURCE TITLE: Wildlife in North Carolina.
SOURCE ID: Pages 8-10, 1963 (February).
YEAR PUBLISHED: 1963
CATEGORY: A4; B3
REGION: Southeastern Mixed Forest STATE: North Carolina
KEYWORDS: food plots; planting; right-of-way; wildlife
ABSTRACT: (Purpose) To provide a general discussion on how utility rights-of-way may be converted to suitable wildlife habitat through planting and seeding. (Type of Research) General discussion. (Results and Conclusions) With thousands of acres in ROWs available for wildlife in North Carolina, site preparation followed by planting and seeding is recommended. Site clearing with a bulldozer removes woody vegetation and leaves a ready seedbed for wildlife food and cover plants. A suggested planting for quail would be approximately five-400 foot rows of shrub lespedeza on either side of the ROW. Fescue or sericea may be planted between the rows. This pattern is recommended every two miles along the ROW. Other areas of the ROW may be planted with clover, fescue, or grass-clover combinations to benefit rabbits, deer, turkey and grouse. Cooperative planning among utilities, wildlife agencies, the SCS, and the interested public is urged.

A4b - Soil stabilization

1131
Hardwood bark mulch for revegetation and erosion control on drastically disturbed sites.
AUTHOR: EMANUEL DM; SARLES RL
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Journal of Soil and Water Conservation.
SOURCE ID: Pages 209-214, 1977 (September-October).
YEAR PUBLISHED: 1977
CATEGORY: A4b; A4c; C
REGION: Eastern Deciduous Forest STATE: West Virginia
KEYWORDS: erosion; erosion control; mulch; revegetation; roadside; stabilization
ABSTRACT: (Purpose) To investigate the use of hardwood bark mulch for revegetation and erosion control on disturbed sites typical of the mountain region of southern WV. (Time and Duration) 1969 to 1972; 4 years. (Type of Research) Original field research. (Methodology) Bark mulch application rates, performance compared with other mulches, and performance of existing equipment when used for applying bark mulch were studied at fire sites: two roadsides, two coal surface mines, and one watershed dam. Sites varied in elevation, slope gradients, and soil properties. Experimental design was randomized; complete blocks with .10 and .05-acre plots replicated two to six times. Commercial specifications were used for site grading, liming, fertilizing, and seeding. Bark, straw, and wood-fiber mulches were applied by machine and hand. Vegetative cover, estimated as a percentage of plot area and plant density, and expressed as an index, was determined by counting plants along line transects. Species composition, plant vigor, and erosion were observed. (Results and Conclusions) Hardwood bark residue was an effective mulch for establishing vegetative cover and controlling erosion on drastically disturbed sites. Bark was equivalent to or better than straw or wood-fiber and all were superior to no mulch when evaluated by vegetative cover, plant density and plant height. Hardwood bark was not toxic and did not retard germination or growth of seeded grasses and legumes. It is recommended that bark mulch be applied at 30 cubic yards per acre on north- and east-facing slopes that are 2:1 or less, and 50 cubic yards on south and west slopes or slopes greater than 2:1. Machine application of bark mulch requires a product that is uniform in size and free of trash and dust; shredded and screened bark is recommended.

1132
Sediment yield from soil erosion and channel storage after clearcutting and logging road construction, central western Cascade Range, Oregon.
AUTHOR: FREDRIKSEN RL; SWANSON FJ; SWANSTON DN
AUTHOR AFFILIATION: US Forest Service, Pacific Northwest Forest and Range Experiment Stationn
SOURCE TITLE: Soil Science Society of America, Abstracts, 1976 Annual Meeting.
SOURCE ID: 184 PAGES
YEAR PUBLISHED: 1976
CATEGORY: A4b; B2b
REGION: Silver Fir-Douglas-fir Forest STATE: Oregon
KEYWORDS: avalanche; burning; clearcutting; construction; debris; erosion, soil; logging; road; sedimentation; slumping; watershed
ABSTRACT: (Purpose) Determine effects of timber harvest and forest road construction on soil erosion from small watersheds (Time and Duration) 1957-1976. (Type of Research) Original research. (Methodology) Three experimental watersheds of 150 to 300 acres were established in virgin old-growth forest. Bedload and suspended sediment yield were monitored before and after complete cutting of one watershed and road construction and 25% clearcutting of a second watershed. The third watershed was left undisturbed as a control. (Results and Conclusions) Road construction and clearcutting markedly increased sediment yield from disturbed watersheds. Mean annual sediment yield was 5000kg/ha from the roaded and 25% clearcut watershed, 682kg/ha from the clearcut watershed without roads, and 126kg/ha from the control. Debris avalanching accounted for much of the increase. Sediment yield from disturbed watersheds remained higher than the control 15 years after disturbance.

1133
Guidelines for characterizing naturally unstable or potentially unstable slopes on western national forests.
AUTHOR: SWANSTON DN
AUTHOR AFFILIATION: US Forest Service, Pacific Northwest Forest and Range Experiment Stationn
SOURCE TITLE: Proceedings: New Requirements in Forest Road Construction.
SOURCE ID: 122-136, 1974.
YEAR PUBLISHED: 1974
CATEGORY: A4b; B2b
SPONSOR: Professional Foresters.; Univ of British Association of British; Columbia Columbia.
REGION: Applicable to entire United States STATE: California; Idaho; Montana; Oregon; Washington
KEYWORDS: clearcutting; construction; erosion, soil; geomorphology; logging; mass wasting; road; slope; stability
ABSTRACT: (Purpose) Describe characteristics of sloping terrain indicative of ongoing and potential instability with respect to surface erosion and mass erosion processes. (Time and Duration) Not applicable. (Type of Research) Review of general principals. (Methodology) Summarizes experiences of author and others in the form of a set of guidelines for erosion hazard identification. (Results and Conclusions) The stability of slopes in terms of surface erosion and soil mass movement potentials may be judged by assessment of landform features, soil characteristics, bedrock lithology and structure, vegetation, soil hydrology, and climate. Most of these factors are easily assessed by aerial photo and field observations.

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1134
Stability of steep land
AUTHOR: DYRNESS CT; SWANSTON DN
AUTHOR AFFILIATION: US Forest Service Pacific Northwest Forest and Range Experiment Station.
SOURCE TITLE: Journal of Forestry
SOURCE ID: 71(5):1973.
YEAR PUBLISHED: 1973
CATEGORY: A4b; B2c
REGION: Applicable to entire United States STATE: United States
KEYWORDS: avalanaches; burning; clearcutting; construction; debris; erosion, accelerated; logging; mass wasting; road; slope; slumping; stability
ABSTRACT: (Purpose) Review effects of disturbance, primarily by forestry activities, on the stability of steep land. (Time and Duration) Not applicable. (Type of Research) Literature review. (Methodology) Review of the authors' published works and collective experience, a geologist and a soil scientist. (Results and Conclusions) An understanding of erosion processes is essential to effective identification, prediction, and control of erosion problems on forest land. Key factors affecting slope stability are bedrock geology, soil properties, slope angle, root strength, and hydrologic effects of vegetation. Slope stability problem areas can be identified, mapped, and treated appropriately (avoiding extremely fragile sites or employing engineering control measures).

1135
Terrain evaluation with respect to pipeline construction, MacKenzie Transportation Corridor, central part.
AUTHOR: HANLEY PT; HUGHES OL; PILION J
AUTHOR AFFILIATION: Canadian Dept of Energy, Mines and Resources.
SOURCE ID: Environmental-Social Committee, Northern Pipelines, 1973, Report 7337, 74 p.
YEAR PUBLISHED: 1973
CATEGORY: A4b; C1; D
REPORT NUMBER: 7337
SPONSOR: Government of Canada.
REGION: Applicable to entire United States
KEYWORDS: engineering; geology; geomorphology; glacial deposits; inventory; mapping; pipeline; soil; stability
ABSTRACT: (Purpose) To inventory surficial deposits, associated land-forms, and engineering properties of surficial materials in a corridor along the MacKenzie River for pipeline routing. (Time and Duration) 1969 to 1972; 3 years. (Type of Research) Field inventory, classification and mapping. (Methodology) Inventory was conducted by airphoto interpretations supplemented with helicopter-supported field checking, core drilling to determine active-layer thickness and near-surface ice content, and reference to published bedrock and geology maps. Maps were prepared at a scale of 1:125,000 with surficial materials delineated by classification system of map-units based on genesis, texture and landform. Physical and engineering properties were determined for materials comprising various map units. (Results and Conclusions) The survey area was comprised of glacial till, alluvial flood plains, glacialfluvial deltas, kames and eskers, and organic deposits. Continuous permafrost occurred in the northern fringe. Sand and gravel deposits were the most stable surficial materials, while ice-rich sediments were highly unstable. Permafrost had high bearing strength while frozen; fenlands and wet peatlands had very low bearing strength. Texture and ground ice were properties of special engineering importance. Overall, till plains offer the best potential for pipeline routing and glacialfluvial plains the poorest.

1136
Accelerated mass wasting after logging and slash burning in western Oregon.
AUTHOR: DYRNESS CT; MERSEREAU RC
AUTHOR AFFILIATION: US Forest Service, Pacific Northwest Forest and Range Experiment Stationn
SOURCE TITLE: Journal of Soil and Water Conservation.
SOURCE ID: 27(3):112-114, 1972.
YEAR PUBLISHED: 1972
CATEGORY: A4b; A4c; B2b
REGION: Pacific Forest STATE: California; Idaho; Oregon; Washington
KEYWORDS: burning; clearcutting; erosion, accelerated; erosion, soil; mass wasting; sediment; yield
ABSTRACT: (Purpose) Quantify surface erosion for one year following clearcut logging and slash burning in western Oregon. (Time and Duration) July, 1967 through September, 1968. (Type of Research) Original research. (Methodology) Erosion collection boxes were placed on bare and vegetated, north and south aspect, 60 and 80 percent slopes. Boxes were cleaned and the contents weighed at one to three month intervals over a 14 month period. (Results and Conclusions) Erosion rates were highest on the steeper, unvegetated, south aspect slopes. Most movement occurred as dry gravel. By the second growing season following burning revegetation had markedly reduced erosion.

1137
Judging impact and damage of timber harvesting to forest soils in mountainous regions of western North America.
AUTHOR: SWANSTON DN
AUTHOR AFFILIATION: US Forest Service, Pacific Northwest Forest and Range Expenment stationn
SOURCE TITLE: Western Reforestation Cordinating Committee, Western Forestry and Conservation Associationn
SOURCE ID: US Forest Service, 1971, 7 p.
YEAR PUBLISHED: 1971
CATEGORY: A4b; B2b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: avalanche; clearcutting; construction; debris; erosion, accelerated; erosion, soil; logging; mass wasting; road; slope; slumping; stability
ABSTRACT: (Purpose) Review general nature of soil erosion in mountainous terrain and the impact of timber harvest on soil erosion. (Type of Research) Review of both published and unpublished work. (Methodology) Review of published and unpublished work. (Results and Conclusions) Shallow and deep-seated soil mass movements are the dominant erosion processes in steep mountainous terrain. Timber cutting, road building and slash burning increase mass movement erosion. Impact reduction may be accomplished by identifying problem areas and either avoiding them or taking special precautions to minimize impact.

1138
Runoff and erosion control by seeded and native vegetation on a forest burn: Black Hills, South Dakota.
AUTHOR: ORR HK
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Fort Collins, CO, US Forest Service, 1970. Research Paper RM-60, 12 p.
YEAR PUBLISHED: 1970
CATEGORY: A4b; A4c; C4
REPORT NUMBER: RM
REGION: Wheatgrass-Needlegrass STATE: South Dakota
KEYWORDS: cover; erosion; erosion control; forest burns; grasses; revegetation; stabilization
ABSTRACT: (Purpose) To evaluate rehabilitation measures for soil stabilization and erosion control on a forest burn in the Black Hills of South Dakota. (Time and Duration) 1960 to 1964 - four years. (Type of Research) Original field research. (Methodology) Two study areas were selected on a 4500 acre burned area rehabilitated by seeding a grass-legume mixture. Eight series of 2-square-foot plots, at intervals of 50 to 100 feet along cross-country transects, were used for vegetation analysis. Vegetation on runoff and transect plots was surveyed and photographed during the period of maximum plant development each year. Percentage of live vegetation, litter, exposed rock, and bare soil on all plots were estimated visually. Numerical ranking of the three most dominant species on each plot was used to define ground-cover density and composition trends. (Results and Conclusions) Rapid establishment of seeded species, especially timothy, smooth brome, and Kentucky bluegrass, in association with reestablishment of native plants provided soil stabilization and reduced runoff and erosion to acceptable levels within one to four growing seasons. Seeded grasses were considered especially important because of their dispersion and abundance, and persistent litter production. Native vegetation alone did not provide adequate cover density within 4 years. It was postulated that total ground cover, live vegetation and litter, must equal or exceed about 60 percent density for minimum tolerable runoff control and soil stability.

1139
Engineering techniques and principles applied to soil erosion control.
AUTHOR: HEEDE BH
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Fort Collins, CO, US Forest Service, 1968, Research Note RM102, 7 p.
YEAR PUBLISHED: 1968
CATEGORY: A4b; C4
REPORT NUMBER: RM
REGION: Rocky Mountain Forest STATE: Colorado
KEYWORDS: check dams; erosion; erosion control; gully; soil; waterway
ABSTRACT: (Purpose) To present some of the engineering principles and techniques that are applicable to treatment of gullies and unstable hillsides. (Time and Duration) 1930's to 1966. (Type of Research) Based on original field studies by the author and other scientists. (Methodology) The author discusses principles and design of erosion control devices and evaluates effectiveness of Forest Service installations in the Rocky Mountains over a 30 year period. Engineering approaches to erosion control were classified as measures that check the erosive forces of water, such as check dams and grassed waterways, and erosive forces to stabilize a watershed such as Italian hydraulic reclamation. The intent of both approaches is to establish a vegetation cover. Check dams were

of two types: porous dams built of logs or loose rocks and solid dams built of concrete or masonry. In Italian hydraulic reclamation, erosive forces of water are utilized and intensified to reshape the land to a more erosion-resistant topography. (Results and Conclusions) Check dams transform the original turbulent gully flow to more tranquil flow by slowing the water velocities at the upstream face of the structure, and by dissipating the water energies on the structural aprons. Treatments by waterways change the topography immediately and strive to establish a vegetation cover when land reshaping is finished. For gully control on the same watershed, the construction cost was $1.26 per linear foot of gully for grassed waterways and $1.37 for rock check dams; however, maintenance costs were higher for waterways and the erosion risk was still present. The author concludes that available engineering techniques and principles are limited in applicability to soil erosion control and that judgement must still assume a considerable role in structure design.

1140
Grass-legume mixtures for roadside soil stabilization
AUTHOR: DYRNESS CT
AUTHOR AFFILIATION: US Forest Service, Pacific Northwest Forest and Range Experiment Station
SOURCE ID: Portland, OR, US Forest Service Pacific Northwest Forest and Range Experiment Station, 1967, PNW71, 19 p.
YEAR PUBLISHED: 1967
CATEGORY: A4b; A4c; C2
REPORT NUMBER: PNW71
REGION: Pacific Forest STATE: California; Idaho; Oregon; Washington
KEYWORDS: access road; bank; erosion control; erosion, sheet; erosion, soil; maintenance; revegetation; sediment; stabilization; vegetation; yield
ABSTRACT: (Purpose) To evaluate eight legume species for usefulness in grass-legume mixtures employed in stabilizing road banks, and to compare several grass-legume mixtures grown on roadside slope locations (Time and Duration) Phase 1 - September, 1964 through July, 1966; Phase 2 - November, 1965 through November, 1966. (Type of Research) Original research. (Methodology) Phase 1) Seeds mixed with commercial inoculant were sown in four 25 foot rows 30 inches apart in plots on bare mineral soil. Fertilizer was applied. Transplanting was carried out for each species. Phase 2) Four grass-legume mixtures and a straw mulch were placed in replicated 6x25 foot plots on 1:1 slopes. Percent cover and soil loss or gain were measured over one year. (Results and Conclusions) Phase 1) Big trefoil and New Zealand white clover had best sustained vigor and were used in phase 2. Frost heaving and poor soil nutrition resulted in high mortality. Phase 2) All four mixtures and the mulch significantly reduced soil loss, although legume components failed to develop.

1141
Effects of parent material and vegetation on properties related to soil erosion in central Washington.
AUTHOR: WOOLDRIDGE DD
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Soil Science Society Proceedings
SOURCE ID: Pages 430-434, 1964.
YEAR PUBLISHED: 1964
CATEGORY: A4b; B2b; C4
SPONSOR: US Forest Service.
REGION: Ponderosa Shrub Forest STATE: Washington
KEYWORDS: erosion; impact; soil; stability; vegetation
ABSTRACT: (Purpose) The purpose of this study was to determine the influence of soil parent material, and forest and grass cover, as these influence soil properties which in turn determine erosion potential. (Time and Duration) About 1 year, date not specified. (Type of Research) Original field plot and laboratory research. (Methodology) At five sampling locations on three different parent materials and with paired plots between different vegetation types, soil, physical, and chemical properties were determined. The relation of soil properties to erosion hazard as judged by the average size of water stable aggregates was determined with multiple regression analysis. (Results and Conclusions) Several of the measured soil physical properties were significantly related to type of parent material and horizon depth. Effects of vegetation cover type were not evident in average responses although some trends are evident (according to the authors) when data is grouped by parent materials or by horizons. In any case, the differences were not consistent. More than 40% of the variation in soil erosion hazard is accounted for by multiple variation in soil organic matter content, pH, total porosity and bulk density.

1142
Vegetative and nonvegetative materials to control wind and water erosion.
AUTHOR: CHEPIL WS; SIDDOWAY FH; WOODRUFF NP
AUTHOR AFFILIATION: US Dept of Agriculture, Agricultural Research Service
SOURCE TITLE: Soil Science Society America Proceedings
SOURCE ID: 27:86-89, 1963.
YEAR PUBLISHED: 1963
CATEGORY: A4b; B2b; C2
SPONSOR: Docks.
REGION: Applicable to entire United States
KEYWORDS: erosion; erosion control; erosion, soil; mulch; restoration; roadside; soil; stabilization; water; wind
ABSTRACT: (Purpose) Determine materials and methods to stabilize bare soil against wind and water erosion using non-vegetative materials. (Time and Duration) 1959 and 1961. (Type of Research) Original field research. (Methodology) Replicated randomized design experiments were conducted on 15 by 20 foot plots of Sarpy sandy loam for wind erosion and on silty clay alluvial subsoil on highway slopes for water erosion control. Treatments included gravel and crushed rocks, resin-in-water emulsion, cutback asphalt, asphalt-in-water emulsion, water-soluble starch, latex-in-water emulsion and a wheat straw check. Effectiveness was evaluated by portable wind tunnel and amount of rill erosion. (Results and Conclusions) Gravel at 20 to 100 T/A adequately controlled wind erosion on sandy loam. Resin emulsion, asphalt, emulsion, cutback asphalt and roller packed wheat straw were equally effective, but straw was less expensive. Latex emulsion did not control wind or water erosion and starch was ineffective in wind erosion control. Prairie hay anchored with asphalt was equally effective as other materials at less cost for rill erosion control on construction slopes. None of the nonvegetative materials excelled well-anchored hay and straw mulches in cost and effectiveness for wind and water erosion control.

A4c - Revegetation technique

1143
Right-of-way restoration: mitigating the impact.
AUTHOR: KRAEGER RH
AUTHOR AFFILIATION: Robert H Kraeger Co.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 231-240 p.
YEAR PUBLISHED: 1976
CATEGORY: A4c
REGION: Applicable to entire United States STATE: United States
KEYWORDS: construction; impact; restoration; right-of-way
ABSTRACT: (Purpose) Restoration techniques used in ROW construction are discussed in light of current environmental problems. (Results and Conclusions) Impact of construction can be reduced by quick stabilization by hydroseeding grasses, even on poor sites. Legumes and shrubs may be included in the slurry for wildlife or ornamental values. Where erosion is severe, swales, water bars or drainage ditches may be needed; or soil binders may be used where erosion is slight. Earth forms can be shaped to provide pleasing visual effects. Sterile soil types present special problems in restoration which can be solved by special techniques such as hydroseeding an ash bank with a processed garbage mulch along with seed, adhesives, and fertilizers followed by a lime application in about eight weeks.

1144
Vegetative cover for highway rights-of-way (final report).
AUTHOR: ROSENTHAL RN
AUTHOR AFFILIATION: WA State Dept of Highways.
SOURCE ID: Olympia, WA, WA State Dept of Highways, 1976, 16 p.
YEAR PUBLISHED: 1976
CATEGORY: A4c; C2
REPORT NUMBER: FHWAWA7614
CONTRACT NUMBER: HR465
SPONSOR: WA State Dept of Highways.
REGION: Willamette-Puget Forest STATE: Washington
KEYWORDS: cover; erosion control; highway; planting; right-of-way; seeding; soil moisture; survival
ABSTRACT: (Purpose) To study the effects of environmental conditions on plant establishment and survival on highway rights-of-way in eastern and western Washington. (Time and Duration) 1970 to 1976; 6 years. (Type of Research) Original field research. (Methodology) The study was conducted in three sections. Section I compared spring and fall plantings of vine maple, salal, shore pine, Douglas fir and Oregon grape at 14 sites using bare-root seedlings for all plants except salal, which was planted in contained clumps. Site data collected were percent slope and exposure; soil pH, texture, temperature, and moisture; and percent ground cover. Section II included studies on effects of partial shade from

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a native red alder stand on planted species, survival of native rhododendron planted in mature Douglas fir, and establishment of seeded grasses. Section III was an inventory of ground cover percentage of erosion control grasses planted throughout the state. (Results and Conclusions) The major factors affecting survival and growth of planted seedlings were those which influenced soil moisture. Fall-planted Douglas fir, shore pine, and vine maple had a higher survival rate than spring plantings, while salal survived best in spring plantings. Fall-planted seedlings survived best on areas with soil moisture of 5 percent or greater in early August. Survival decreased for all species when grass cover was 80 percent or more. Douglas fir and salal planted within a red alder stand survived better than those planted next to it, while vine maple survival was best outside but adjacent to the red alder. Ground cover of perennial erosion-control grasses was highest on flat areas and north exposures and lowest on east and south exposures. Annual grass cover was about equal for all exposures.

1145
Prairie grasses the vista-makers.
AUTHOR: WEBSTER AH
SOURCE TITLE: Weeds Trees and Turf.
SOURCE ID: 18-35, 1975 (February).
YEAR PUBLISHED: 1975
CATEGORY: A4c
REPORT NUMBER: 1100
SPONSOR: Boener Botanical Gardens.; Wide Skies Press.
REGION: Tall-grass Prairie STATE: Colorado; Kansas; North Dakota; Nebraska; South Dakota
KEYWORDS: disturbance; erosion control; grasses; herbs; native; soil; trails
ABSTRACT: (Results and Conclusions) Revegetation of disturbed areas through the us of native grasses is recommended by persons who presumably have demonstrated or observed the success of stabilizing soils using native species in place of exotics. Mowing is not required and vegetation created has greater beauty. Native plant cover can be achieved in three years.

1146
Grass-leguma mixtures for erosion control along forest roads in western Oregon.
AUTHOR: DYRNESS CT
AUTHOR AFFILIATION: US Forest Service;; Pacific Northwest Forest and Range Experiment Stationn
SOURCE TITLE: Journal of Soil and Water Conservation
SOURCE ID: 30(4):169-173, 1975
YEAR PUBLISHED: 1975
CATEGORY: A4c; B2b; C2
REGION: Pacific Forest STATE: California; Idaho; Oregon; Washington
KEYWORDS: access road; bank; erosion control; erosion, sheet; erosion, soil; maintenance; revegetation; sediment; stabilization; vegetation; yield
ABSTRACT: (Purpose) Evaluate effectiveness of various grass-legume mixtures for erosion control along forest roads (Time and Duration) 1965 - 1973. (Type of Research) Original research. (Methodology) Two sets of 6x20 to 25 foot plots were established on 1:1 road backslopes. Each set of plots contained replicated treatments with a straw mulch and five types of grass-legume mixtures, plus untreated control plots. Percent cover of live foliage and soil loss or gain were measured over eight year period. (Results and Conclusions) Mulch and seeding substantially reduced erosion. Erosion from bare slopes was about 0.2 inches per year. Erosion was higher on freshly constructed backslopes than on several year old surfaces. Percent cover declined after three years, but increased in response to refertilization. Legume components of vegetation failed to develop.

1147
Early stages of plant succession following logging and burning in the western Cascades of Oregon.
AUTHOR: DYRNESS CT
AUTHOR AFFILIATION: US Forest Service, Pacific Northwest Forest and Range Experiment stationn
SOURCE TITLE: Ecology
SOURCE ID: 54(1):57-69, 1973
YEAR PUBLISHED: 1973
CATEGORY: A4c; B1a; B1c
REGION: Silver Fir-Douglas-fir Forest STATE: Oregon
KEYWORDS: burning; clearcutting; ecosystem; invasion; logging; restoration; succession, secondary
ABSTRACT: (Purpose) To follow early successional stages of vegetation recovery following clearcutting and slash burning in western Oregon. (Time and Duration) 1962-1968. (Type of Research) Original research. (Methodology) 61 permanent milacre (0.0004 ha) plots were established before logging and slash burning in old-growth forests in western Oregon. Percent cover and frequency were determined before logging, after logging but before burning, and annually for 5 years following burning. Degree of logging and burning disturbance were noted for each plot. (Results and Conclusions) Total plant cover was 15.2, 49.3, and 79.5% in the first, second, and fifth years after cutting and burning. Cover and species composition depended strongly on degree of logging and burning disturbance. Greater disturbance resulted in higher proportion of invading to residual species. Invading species dominated in the second through fourth years after burning. In the fifth year residual herbaceous species became dominant.

1148
Selective planting for the encouragement of wildlife.
AUTHOR: ZUCK R
AUTHOR AFFILIATION: Drew Univ.
SOURCE TITLE: Pages 72-77 in Powerlines and the Environment.
SOURCE ID: Millbrook, NY, The Cary Arboretum of the New York Botanical Gardens, 1973, 170 p.
YEAR PUBLISHED: 1973
CATEGORY: A4c
REGION: Appalachian Oak Forest STATE: New Jersey
KEYWORDS: birds, game; mammals, small game; planting; shrubs; wildlife
ABSTRACT: (Purpose) To describe revegetation experiments with various species of shrubs that have been done on electric and gas ROWs to enhance this habitat for game birds and mammals. (Time and Duration) 5-year study. (Type of Research) Original research (field study). (Methodology) Various shrubs native to New Jersey and having wildlife value were selected. Since the cover of coarse perennial herbaceous plants are severe competition to shrubs planted in the dry root stage, plants with vigorous growing roots and shoots were produced from cuttings or seed and were not planted until sturdy enough to withstand field competition. These were planted in the field with tar paper containers. A motorized earth auger of 8 inches diameter was used to prepare planting holes. (Results and Conclusions) Elderberries, blueberries and a low-growing species of persimmon proved useful in plantings for wildlife. Various low species of viburnums and dogwoods are also being tried, but are surprisingly difficult to grow from seed. Cuttings, nowever, are easy to grow. The kinds of plant material chosen so far can compete with established perennial herbaceous vegetation when planted out as two or three year old specimens, with fertilizer sometimes necessary.

1149
The effect of logging and slash burning on understory vegetation in the H. J. Andrews experimental forest.
AUTHOR: DYRNESS CT
AUTHOR AFFILIATION: US Forest Service Pacific Northwest Forest and Range Experiment Stationn
SOURCE ID: Portland, OR, US Forest Service, Pacific Northwest Forest and Range Experiment Station, 1965, Research Note PNW-31, 13 p.
YEAR PUBLISHED: 1965
CATEGORY: A4c; B1a; B1c
REGION: Cedar-Hemlock-Douglas-fir Forest STATE: Oregon; Washington
KEYWORDS: burning; clearcutting; cover; revegetation; succession, secondary
ABSTRACT: (Purpose) To document the response of understory vegetation to clearcutting and burning of a Douglas-fir forest. (Time and Duration) Samples taken before logging (1962), after logging (1963), and after burning (1964). (Type of Research) Original research. (Methodology) Sixty-three permanent milacre (6.6 ft square) plots were established on 3 clearcuts prior to disturbance. Crown cover by species was noted for all shrubs and trees up to 20 ft high. Percent cover of herbs and grasses was estimated in nine 1.1 square ft subplots. (Results and Conclusions) Site disturbance (severity of burning and compaction, amount of residual vegetation) is as important as predisturbance species composition in determining plant distribution on clearcut areas. Logging generally reduces cover of understory species, but many herb species, both residual and invading, increase cover rapidly after burning.

1150
Hardwood reoccupation of bulldozed sites.
AUTHOR: GRANO CX
AUTHOR AFFILIATION: US Forest Service Southern Forest Experiment Station.
SOURCE ID: New Orleans, LA, US Forest Service Southern Forest Experiment Station, 1960, 7-8 p.
YEAR PUBLISHED: 1960
CATEGORY: A4c
REGION: Southeastern Mixed Forest STATE: Arkansas; Louisiana
KEYWORDS: clearing; revegetation; sprouting; trees
ABSTRACT: (Purpose) To study the rate at which hardwood sprouts reinvade after hardwood thickets have been bulldozed from a site. (Time and Duration) 6 year study (field). (Type of Research) Original research. (Methodology) Very dense hardwood thickets were bulldozed clean, down to mineral soil, and observed for seven years thereafter to follow the rate of site reoccupation by these sprouts. Before bulldozing there were 24,000 hardwood stems per acre under 3.5 inches in diameter. Some of these were more than 15 feet tall. Species present included southern red

oak, post oak, mulberry, witch-hazel, red maple, sweetgum, blackgum, sassafras, dogwood, sumac, hickory, persimmon, elm, ash, wild plum. (Results and Conclusions) A sparse growth of small sprouts appeared one year after treatment; the taller ones average 1.8 feet. At the end of the second year they were 3 feet. In 1956, 24% of the area was overtopped by hardwood sprouts, the tallest averaging 4 feet. By the sixth year sprouts had increased in number and size to such an extent that they overtopped 52% of the area, and some were 15 feet high. Less drastic mechanical treatment than bulldozing clean resulted in much greater and more rapid hardwood reoccupation; with 92 percent reoccupation at the end of the sixth year.

1151

Occurrence of shrubs and herbaceous vegetation after clear cutting old-growth Douglas-fir in the Oregon Cascades.

AUTHOR: YERKES VP
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Portland, OR, US Forest Service, Pacific Northwest Forest and Range Experiment Station, Research Paper 34, 1960, 12 p.
YEAR PUBLISHED: 1960
CATEGORY: A4c; B1a; C4
SPONSOR: US Forest Service.
REGION: Silver Fir-Douglas-fir Forest STATE: Oregon; Washington
KEYWORDS: checklist; clearcutting; clearing; community structure; flora; habitat; restoration; revegetation; shrubs; species; vegetation
ABSTRACT: (Purpose) The purpose of this research was to determine the frequency of occurrence of shrub and herbaceous vegetation during the first 6 years after clearcut logging and slash burning in the west slopes of the Oregon Cascades. (Time and Duration) 6 years, from 1952 to 1957. (Type of Research) Original field plot research. (Methodology) Small circular plots (40 on each of 14 clearcut units) were located mechanically and plant species tallied periodically after the units had been clearcut logged and the logging slash burned. Several groupings of data were used to contrast such things as the difference between burned and unburned areas, the effect of elevation, aspect, etc. (Results and Conclusions) 104 species or species groups were found on the clearcut and burned units following removal of the old growth Douglas-fir timber. Of these, 101 were on north slopes, whereas 65 were on south slopes. Species under the forest canopy tended to be more prominent on unburned areas while invader species predominated on burned areas. After five years, however, species frequency differences were slight between burned and unburned areas. Little consistent difference in species frequency was evident between elevation classes (although the elevation range of this study was only 2000 feet).

1152

Windthrow around staggered settings in old-growth Douglas-fir.

AUTHOR: GRATKOWSKI HJ
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Forest Science
SOURCE ID: 2:60-74, 1956.
YEAR PUBLISHED: 1956
CATEGORY: A4c; B2g; C4
SPONSOR: US Forest Service.
REGION: Pacific Forest STATE: Oregon; Washington
KEYWORDS: clearcutting; forestry; windthrow
ABSTRACT: (Purpose) The purpose of this study was to determine the relative importance of some factors which influence windthrow around clearcut settings in the Cascade Range. (Time and Duration) 2 years, 1950-51. (Type of Research) Original field plot research. (Methodology) Eight clearcut areas on the HJ Andrews Experimental Forest in the Oregon Cascades were surveyed to determine the factors important in determining windthrow of trees around the edges of cut units. 885 individual windfalls were studied, most of which blew down during two severe storms. Species, size, direction of fall, rot, soil condition, topographic location, and other factors were tallied. (Results and Conclusions) About 90% of the windthrown trees were blown down by strong storm winds from the Southwest. The remaining trees were blown down by winds from the East. Windfall was least in sheltered units and greatest in mid- and up-slope units. Windfall was greatest on the lee edge of the unit. The author gives numerous specific recommendations regarding the location and shape of cutting units to minimize windthrow patterns.

1153

Some observations on wind damage.

AUTHOR: CURTIS JD
AUTHOR AFFILIATION: Univ of ME.
SOURCE TITLE: Journal of Forestry
SOURCE ID: 41:877-882, 1943.
YEAR PUBLISHED: 1943
CATEGORY: A4c; B2g; C4
SPONSOR: Univ of ME.
REGION: Appalachian Oak Forest
KEYWORDS: clearcutting; clearing; forestry; logging; windthrow
ABSTRACT: (Purpose) The purpose of this study was to describe the physical characteristics of some conifer and hardwood stands which were affected by severe windstorms and ascertain if guides in silvicultural practices could be developed to minimize storm damage. (Time and Duration) Approximately 1 year, early 1940's. (Type of Research) Original field plot research. (Methodology) Three stands of white pine and one of hardwoods were chosen for study. Height, diameter of stem, length of green crown, and width at bottom of crown were measured for the various species in both standing and blow-down timber. The study areas had been affected by the 1938 hurricane which devastated forest areas in New England. (Results and Conclusions) As stem diameter increases the strength of the wind required to blow it down increases. Crown diameter is more important than stem diameter. Trees with low form points (something like a low center of gravity) for the crown are more windfirm than trees with crowns restricted to the tops of the stems. Hardwoods were substantially more windfirm than conifers. Northern white pine is more resistant than Norway spruce. The author makes specific recommendations about cutting patterns.

A5 - ROW Maintenance/Methods, Impact

1154

Foresters keep the vegetation in vegetation management.

AUTHOR: OLENIK CJ; ROSSMAN WR
AUTHOR AFFILIATION: PA Electric Co.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 9(2):3-6, 1977.
YEAR PUBLISHED: 1977
CATEGORY: A5
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: herbicides; management; spraying, basal; spraying, selective
ABSTRACT: (Purpose) To describe right of way management policy and programs. (Type of Research) Descriptive paper. (Results and Conclusions) Selective basal application of herbicides has become the preferred method, and its use has increased over the past ten years. Stem-foliage and aerial sprays are also used when the situation calls for them.

1155

R-O-W aesthetics call for selective tree control.

AUTHOR: WETSCH AF
AUTHOR AFFILIATION: Bonneville Power Admin.
SOURCE TITLE: Electrical World.
SOURCE ID: 45-46, 1968 (April 1).
YEAR PUBLISHED: 1968
CATEGORY: A5
SPONSOR: US Dept of Intenor.; Bonneville Power Admin.
REGION: Columbia Forest (Dry Summer) STATE: Oregon; Washington
KEYWORDS: aesthetics; brush control; herbicides; maintenance; public relations; right-of-way; trees
ABSTRACT: (Purpose) To review BPA approach to brush control with particular attention to aesthetics. (Time and Duration) Late 1960's. (Type of Research) Not research, generalized discussion of procedures. (Results and Conclusions) The author reports BPA encourages multiple use of ROWs where other users agree to maintain vegetation below specified heights. ON many other areas, herbicide application by hand, Roto-mist, helicopter, and high volume sprayers are required. 2,4-D, 2,4,5-t, trichloroacetic acid and tordon meet their requirements. Author addresses problems of drift, brownout, and resprouting. He encourages consideration of landscape appearance when planning vegetation control programs.

A5a - Ecological objectives

1156

Guidelines for maintaining and enhancing wildlife habitat in forest management in the Blue Mountains of oregon and Washington.

AUTHOR: BLACK H; MILLER RJ; THOMAS JW
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Transactions of the 41st North American Wildlife and Natural Resources Conference.
SOURCE ID: 41:452-476, 1976.
YEAR PUBLISHED: 1976
CATEGORY: A5a; B1a; B1e
REGION: Grand Fir-Douglas-fir Forest STATE: Oregon; United States; Washington
KEYWORDS: ecology, applied; ecosystem; forest; habitat; habitat change; management; management, land; model; wildlife

1156

ABSTRACT: (Purpose) Need for a working tool to predict the consequences of timber management activities on wildlife populations. A "thumbnail sketch" of a system developed for the Blue Mountains is presented since concepts are adaptable to any forested area. (methodology) The relationships are divided into three sections: 1) The relationships of all resident vertebrates to forest communities and their successional stages. Four levels of information; gross response of all 16 life forms to habitat, responses of each species, detailed biological data of each, and guidance to appropriate literature is presented. 2) Demonstrates how a particular species can be emphasized (example, snag). (Results and Conclusions) Enough information is available to make predictions about the welfare of most vertebrates in relation to forest management, and it can be out in a framework useful to both biologists and foresters. Such a system is useful in: 1) preparation of environmental impact statements, 2) land use planning, 3) judging consequences of silvicultural activities, 4) as a checklist, 5) as a brief summary of habitat preferences. Can be computerized and updated.

1157

Aerial application of herbicides on utility rights-of-way.

AUTHOR: ASPLUNDH EK
AUTHOR AFFILIATION: Asplundh Tree Expert Co.
SOURCE TITLE: Proceedings Northeast Weed Science Society.
SOURCE ID: 26:61-62, 1972.
YEAR PUBLISHED: 1972
CATEGORY: A5a: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: aerial; application methods; brown out; herbicides; right-of-way
ABSTRACT: (Purpose) To review some of the problems currently facing agencies who use aerial herbicide application on utility ROWs. (Type of Research) This is a general talk presented to the Northeast Weed Science Society. (Methodology) The author reviews several of the problems encountered in aerial application. These include brown out, odor, public distrust of pesticides in general and legislation (pressure to ban all aerial spraying). The author discusses methods of handling spraying damage complaints and the need for making fair settlements; and also the proper training of helicopter spray pilots. (Results and Conclusions) The author concludes that if we all work together the vegetation managers can solve some of these problems and utilities can continue to benefit from the speed, effectiveness and economy of aerial spraying. If these problems can not be solved, then we'd better go home and sharpen up our axes. There's going to be a lot of brush to cut!!!

1158

Experts provide Rx for transmission R/W work.

AUTHOR: JACOBS KS
AUTHOR AFFILIATION: Electric Light and Power Magazine.
SOURCE TITLE: Electric Light & Power.
SOURCE ID: T/D Edition, pages 45-51, 1971 (March).
YEAR PUBLISHED: 1971
CATEGORY: A5a: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: clearing; herbicides; maintenance; right-of-way
ABSTRACT: (Purpose) To emphasize the need for knowledgeable people, well-trained crews, and reasonable specs in order to get the jobs of ROW clearing and maintenance done correctly and at reasonable costs. (Type of Research) Results of interviews with a large number of ROW managers concerning their methods of ROW clearing, planning and maintenance. (Methodology) The author interviewed transmission line managers from several electric utilities on the procedures they use to get efficient and effective operations in ROW clearing and ROW maintenance. Their comments cover the use of herbicides, mist blowing, maintaining cost records, intervals between treatment, and methods of selecting contractors and controlling their efficiency. (Results and Conclusions) Some transmission line managers agree that costs can be held down, or even reduced if certain things are done. Their first recommendation is to avoid "gold-plated" specifications, and instead use the selective approach, limiting work to the minimum that will provide good operating conditions and reasonable environmental quality. Extending clearing and maintenance activities over the entire year will help to hold experienced crew members. Capable ROW managment involves proper planning, schedules and supervising.

1159

Right-of-way management program a challenge for the 70's.

AUTHOR: FARMER JD JR
AUTHOR AFFILIATION: VA Electric and Power Co.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 2(1):4-7, 1970.
YEAR PUBLISHED: 1970
CATEGORY: A5a: A5f
REGION: Applicable to entire United States STATE: United States
KEYWORDS: application methods; brush control; herbicides; management; right-of-way
ABSTRACT: (Purpose) To review vegetation management practices on electric ROWs during the past decade, and stress the need for a flexible management program during the seventies which can meet the needs of a variety of conditions and that will utilize the most modern techniques. (Type of Research) Literature review. (Methodology) The author stresses the following trends: 1) City growth will probably maintain its present rate, meaning some rural areas will become urban. Elctric load growth will be concentrated in the urban centers. 2) Many power stations will be built in remote areas, meaning that transmission lines will be constructed in areas difficult to reach. 3) Labor costs will continue to increase rapidly dictating line maintenance methods that draw heavily on chemicals or equipment. 4) Interest in conservation will continue. (Results and Conclusions) Due to these factors, a two program concept has arisen. Transmission lines will continue to be built in urban areas. These lines will need to be given a different treatment from rural lines. Chemicals are out in most cases, and a program of mowing and trimming offers the best solution. A high standard of maintenance with frequent mowings and trimmings will be needed. Thus, a vegetation management program will require flexibility, initiative, and foresight, since no single material, equipment, or technique can meet all of the vegetation management requirements of the future.

1160

Principles of plant and animal pest control , volume 2: weed control. (chapters 11, 18, 19).

AUTHOR: NATIONAL RESEARCH COUNCIL
AUTHOR AFFILIATION: Nat Research Council, Subcommitte on Weeds.
SOURCE ID: Washington DC, Nat Academy of Sciences, 1968, Publication 1597.
YEAR PUBLISHED: 1968
CATEGORY: A5a; A5b; B2a; B2b; B2d
REGION: Applicable to entire United States STATE: United States
KEYWORDS: ammonium sulfamate; environment; forest; herbicides: impact: persistence; picloram; right-of-way; weeds; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To bring together useful information concerning weed control, including preventive, biological, and physical means, as well as herbicidal control; to show the place of each in the environment; to provide a practical and usable reference manual. (Type of Research) This work brings together the results of applied research covering a period of many years. (Methodology) The Discussion of the "Interaction of Herbicides with the Environment" includes such topics as "Herbicides in the Atmosphere." "Herbicides in the Soil," "Herbicides in Water." "Weed Control on ROWs and Industrial Land" includes: "Utility ROWs," "INdustrial Areas," and "Special ROWs Problems." "Weed Control in Forests and Woodlands" includes discussion of "Revegetation," "Site Preparation," " Control During Establishment," "Established Stands," "Secondary Effects of Control Procedures on Multiple Use of Woodlands," and "Christmas Tree Plantations." (Results and Conclusions) Among the many summary statements, one related to utility ROWs says, "Effects of chemical treatment vary, depending on the site, the plant species, and the chemicals employed. Many chemical treatments lead to the establishment of low-growing vegetation that maintains itself for long periods of time with a minimum of chemical treatment. Often, one or more woody species on a site prove particularly resistant to chemical treatment. Suppression of other vegetation may favor establishment of a resistant species and even lead to its becoming the dominant vegetation. Red maple and pine are notable for their ability to become established under conditions created by various chemical treatments."e

1161

R/W Maintenance data optimized by computer.

AUTHOR: ALLEN P; MANN RA
AUTHOR AFFILIATION: TN Valley Authority.
SOURCE TITLE: Electrical World.
SOURCE ID: 66, 1968 (April 1).
YEAR PUBLISHED: 1968
CATEGORY: A5a; A5f
REGION: Applicable to entire United States STATE: United States
KEYWORDS: computer; maintenance; right-of-way
ABSTRACT: (Purp se) To show how the computer can bring new efficiency, consistency and savings to a right-of-way maintenance program. (Time and Duration) 4 years. (Type of Research) Original research. (Methodology) Progress reports were formerly compiled by hand in the field. The foreman collected pertinent data, made computations by hand, and submitted the results daily to one of the 14 area offices. Now the computer program takes the length and width of each span plus the percentage of the span treated and computes the acres and miles. Both mechanical and chemical maintenance are punched into the same Port-A-Punch card. Columns on this card show the ester and diesel oil combination, type of chemical and amount. (Results and Conclusions) TVA began to apply the computer on ROW maintenance in 1965. The program was designed to compile and compute data on work performed by some 30 seasonal crews on 14,000 circuit miles of transmission line. It has provided better analysis, control, and projection of maintenance over an area averaging 18,000 acres yearly. Information from printouts

can be used for determining the least expensive method, cost analyses of materials, labor, equipment, and damage claims. The program evaluates crew productivity, productive time and chemical inventories.

1162
Principles of sound right-of-way vegetation management.
AUTHOR: NIERING WA
AUTHOR AFFILIATION: CT College, Botany Dept.
SOURCE TITLE: Economic Botanist
SOURCE ID: 12:140-144,1958.
YEAR PUBLISHED: 1958
CATEGORY: A5a; A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: habitat; herbicides; maintenance; management; right-of-way; spraying, selective
ABSTRACT: (Purpose) To point out the results of indiscriminate use of chemical weed killers on right-of-way areas even though sound ecological techniques are readily available; also that sound management of right-of-way areas would benefit the utility and reduce costs on a long-range basis. (Time and Duration) Review of literature published over a 7-year period. (Type of Research) Literature review. (Results and Conclusions) The reasons why sound ecological principles are not used on more of the nation's rights-of-way are due to a more severe problem-the integration of scientific knowledge into our national economy. One is immediately confronted with industrial profits versus that which will be of greatest benefit to the nation. Many utilities entrust their vegetation management programs to persons with inadequate biological training. With today's chemicals, such radical destruction and modification of the environment may result that persons with biological training are needed to manipulate the right-of-way vegetation advantageously for the agency and for the general public.

1163
Programming right-of-way brush control.
AUTHOR: FARMER JD
AUTHOR AFFILIATION: VA Electric and Power Co.
SOURCE TITLE: Down to Earth.
SOURCE ID: 15(4):10-20, 1956.
YEAR PUBLISHED: 1956
CATEGORY: A5a; A5b
REGION: Beech-Sweetgum-Magnolia-Pine-Oak Forest STATE: Virginia
KEYWORDS: application methods; brush; herbicides; planning; right-of-way
ABSTRACT: (Purpose) To discuss the complete planning program followed by Virginia Electric and Power Company in their brush control program. (Time and Duration) 3 years of experience and observations. (Type of Research) Field study. (Methodology) On 4,200 acres of transmission line area, in order to budget work for the coming year, a survey is made during the previous August using special printed forms for recording the condition of brush on each line area. In the planning stage all field data is used to compute the average height and density. Factors influencing the choice of chemicals are time of application, predominant species, relationship to vulnerable crops, and number of previous chemical treatments. (Results and Conclusions) The methods and records kept by this company have proven invaluable in ROW management planning. Essential records are 1) cost of ROW maintenance per pole/mile; 2) cost per acre for spraying brush on the ROW: 3) a separate record showing time of application, type of chemical and concentration, number of acres on line, name of contractor.

1164
Everyone benefits from proper vegetation management on rights-of-way.
AUTHOR: IBBERSON JE
SOURCE TITLE: Pennsylvania Forests.
SOURCE ID: 45(4):97-10, 1955.
YEAR PUBLISHED: 1955
CATEGORY: A5a; A5b
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: communities; community structure; management; right-of-way; spraying, selective; stability
ABSTRACT: (Purpose) To report results of studies involving selective spraying on electric ROW areas, and discuss differences in vegetation between these areas and locations which have been managed by broadcast spraying. To outline a method of sound ROW management for ROW areas. (Time and Duration) Four-year study. (Type of Research) Original research (field). (Methodology) 103 acres of a ROW were managed using basal spraying of tree species and tall-growing shrubs. The herbicide used was a mixture of 2,4-D and 2,4,5-T in an oil carrier. One year after initial treatment a follow-up spraying was used. General records were made of vegetational changes, and vegetation on the selectively treated area was compared with that on other parts of the same ROW, where broadcast sprayings were used. (Results and Conclusions) As a result of selective spraying, which left a nucleus of shrubs, a complete tight cover of shrubs and herbaceous species continued to spread and become more lush with each passing year. Invasion of tree species is practically completely excluded. Vegetation maintenance costs during the foreseeable future should be low and no treatment is scheduled for some time. The appearance from the aesthetic standpoint is highly desirable and has not been otherwise since soon after the original selective basal spraying.

1165
Vegetation management for rights-of-way and roadsides.
AUTHOR: EGLER FE
SOURCE TITLE: Smithsonian Institute Annual Report.
SOURCE ID: 1953:299-322, 1954.
YEAR PUBLISHED: 1954
CATEGORY: A5a; A5b; A5e; A5f
SPONSOR: American Museum of Natural History.
REGION: Southeastern Mixed Forest STATE: Connecticut; Delaware; Maryland; North Carolina; West Virginia
KEYWORDS: management; right-of-way
ABSTRACT: (Methodology) A series of observation or research areas are located and described briefly. The process of "relay floristics," in which there is a progressive addition of new species is assumed in most investigations. However, the behavior of species present at the time of initial disturbance creates a characteristic termed "initial floristic composition" which controls vegetation change. (Results and Conclusions) This author is the leading ecologist in the realm of applying ecological principles and methods to the construction and maintenance of ROWs. He oescribes and evaluates the roles and values of various procedures in different types of ROWs. He recommends use of natural processes whenever possible and suggests efforts to avoid weeds and forests in favor of grassland and shrubland vegetation. Each region, however, has its own set of needs and potentials. The classical ecological principles of succession must be modified for use on ROWs.

1166
Herbicide effects in Connecticut vegetation, 1948.
AUTHOR: EGLER FE
SOURCE TITLE: Ecology.
SOURCE ID: 30(2):248-256, 1949.
YEAR PUBLISHED: 1948
CATEGORY: A5a; A5b; B1a
REGION: Beach-Maple Forest STATE: Connecticut; United States
KEYWORDS: application methods; checklist; herbicides; impact; species; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To present 1948 field test results after applying several combinations of 2,4-D and 2,4,5-T in light and shade using various types of bud, wound, and bark application. (Time and Duration) One year, 1948. (Type of Research) Original research. (Methodology) Herbicide methods used included stump painting, trunk-wound painting, bark painting, early bud-painting of herbs, stem-painting of herbs, mist-spraying of foliage, droplet-spraying of foliage (very early spring), and droplet-spraying of foliage (spring and summer). (Results and Conclusions) It is entirely feasible and practical to produce and maintain a variety of semi-natural herbaceous and shrubby plant communities derived from scrub and old-fields. Control can be exercised through at least six months of the year, from April through September, and to a limited extent through the winter months. Mist-spraying was unsuitable because of drift and broadcast-spraying was unsuitable because of the large number of susceptible wanted species. Effects of the ester of 2,4-D, as contrasted with the mixed esters of 2,4-D and 2,4,5-T were similar, but with a few very important and notable exceptions. All Rubus species showed little significant kill with 2,4-D, whereas complete kill was attained with the mixture. Acer, Fagus, Fraxinus, Gaylussacia, Kalmia, Lyonia and Pyrus showed greatly increased herbicidal effects with the mixed esters. For these reasons the mixture of both esters is considered the most desirable.

A5b - Chemical

1167
Transmission line rights-of-way management.
AUTHOR: ARNER DH
AUTHOR AFFILIATION: US Fish and Wildlife Service.
SOURCE ID: Ann Arbor, MI, National Power Plant Team, 1977, FWS/OBS-76/20.2, 12 p.
YEAR PUBLISHED: 1977
CATEGORY: A5b; A5f; B1a
REPORT NUMBER: FWSOBS76202
REGION: Applicable to entire United States STATE: United States
KEYWORDS: fish; management; mowing; prescribed burning; right-of-way; species diversity; spraying, selective; wildlife
ABSTRACT: (Purpose) To present some current ROW management practices and their costs, the bases of selecting a specific management technique, and some possible management goals to benefit fish and

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wildlife in various local situations. (Time and Duration) Review of literature covers publications over a 37 year period. (Type of Research) Literature review. (Methodology) The author reviews literature on ROW maintenace techniques, herbicide use, mechanical equipment, prescribed burning, and ROW treatment for wildlife enhancement. (Results and Conclusions) The major emphasis on ROW maintenance should be toward developing diverse plant communities containing substantial amounts of choice food plants for local game species. On any lengthy segment of ROW more than one maintenance technique will usually be required. Burning or chopping on level to gently sloping land and selective spraying on hilly areas have proven merit. In some soils seeding and fertilizing may be necessary. A hay crop type plant community is not necessary; scattered swards of choice herbaceous plants along the ROW will suffice in most situations.

1168

How to predict and manage right-of-way vegetation types so to become master of the domain.

AUTHOR: DAVIS JA
AUTHOR AFFILIATION: NY State Dept of Public Service.
SOURCE TITLE: Third New York R/W Management Symposium.
SOURCE ID: Lake George, NY, May 1977.
YEAR PUBLISHED: 1977
CATEGORY: A5b
REGION: Northern Hardwoods Forest STATE: New York
KEYWORDS: economics; ecosystem; management; right-of-way; shrubs; spraying, selective; stability
ABSTRACT: (Purpose) To shed light on this business of "prediction" of future ROW vegetation types, and to show that these predictions can be made with enough accuracy, and at low enough cost, to make the endeavor worthwhile. (Type of Research) Review of literature and field observations. (Methodology) The author develops a basis for projecting a botanical end product, which is a vegetation inventory done by a competent field botanist. Competence implies: knowledge of floristics, interest and enthusiasm for the job, and budget support. First inventory only the vegetationally important species; second, estimate ocularly the relative abundance of the important species; third, the inventory should be "site specific." The most important part of the inventory is the desirable species list. This list most likely represents the composition of your future stable ROW vegetation. (Results and Conclusions) The concepts presented can form the backbone of a sound long-term program. "Through implementation on an operational basis you can learn to handle the exceptions to the rulex

1169

The wonderful power of selectivity to power line rights of way.

AUTHOR: OLENIK CJ
AUTHOR AFFILIATION: PA Electric Co.
SOURCE TITLE: Journal of Arboriculture
SOURCE ID: 3(9):173-176, 1977.
YEAR PUBLISHED: 1977
CATEGORY: A5b
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: checklist; helicopter; right-of-way; species; spraying, basal; spraying, selective
ABSTRACT: (Purpose) To describe the right-of-way management methods used on Pennsylvania Electric Company's electric corridors to show how they manage these areas to provide an aesthetically pleasing appearance and a land area useful for wildlife and recreation. (Time and Duration) Describes policies developed over the past 20 years. (Type of Research) Original research (field). (Methodology) Field surveys of ROW areas are used to gather information on: density of undesirable tree species, density of desirable vegetation, height of brush to be treated, terrain, access, agricultural activities in and near the ROW as well as State and Federal lands that cross the areas to be treated, population, main road and highway crossings, and stream and river crossings. This information plays a major part in making a final decision as to the type of chemical technique deemed necessary. (Results and Conclusions) Selective basal application (summer and dormant application) has the advantages of selectivity in choosing stems to be treated, elimination of foliage "brown out", and year-round application, and it is most acceptable to the public. Water-borne, stem-foliage application has the advantages of being economical in dense brush, giving moderate to good control in dense stands of brush. Helicopter application has the advantages of being economical, and effective in killing dense stands of tall brush, and it can be used where access and terrain are problems. With information from field surveys, a decision can be made as to which is the proper technique for each area.

1170

Low cost of power line right of way maintenance for beauty and use.

AUTHOR: MIDDLETON JB
AUTHOR AFFILIATION: PA Electric Co.
SOURCE TITLE: Proceedings Northeastern Weed Science Society
SOURCE ID: 31:302-305, 1977.
YEAR PUBLISHED: 1977
CATEGORY: A5b
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: aesthetics; maintenance; right-of-way; spraying, selective
ABSTRACT: (Purpose) To describe ROW maintenance practices used by Pennsylvania Electric Company which produce attractive and safe corridors at minimum cost. (Time and Duration) Results of 20 years of experience. (Type of Research) Original research (field). (methodology) In the 1950's a large portion of waterborne material was being used, and some selective spraying was being tried. The trend has been away from the waterborne and helicopter applications because of their disturbance to the environment and their undesirable appearance. Selective basal is now the main method of treatment, and this is used year round. Helicopter application is used on a limited basis on areas that are not open to public scrutiny. (Results and Conclusions) Selectivity has been accomplished through the use of a list of plants not to be treated on the ROW. These include: all grasses, ferns, and herbaceous plants; all annual weeds and annual plants; and all forbs. A list of low-growing shrubs saved on each line area is included. There are 24 of these ranging from such low covers as partridge berry to taller shrubs such as rhododendron, scrub oak and holly. Thirteen small trees which can be left during selective spraying have been identified.

1171

The effect of forest conversion with herbicides on pine (Pinus spp.) establishment, soil moisture, and understory vegetation.

AUTHOR: ADAMS RE; STERRETT JP
AUTHOR AFFILIATION: US Agricultural Research Service.; VA. Polytechnic Institute.
SOURCE TITLE: Weed Science
SOURCE ID: 25(6):521-523, 1977.
YEAR PUBLISHED: 1977
CATEGORY: A5b; B1a; C4
SPONSOR: US Agricultural Research Service.; VA Polytechnic Institute.
REGION: Applicable to entire United States STATE: Virginia
KEYWORDS: brush control; forest; herbicides; soils; species diversity; succession, secondary; vegetation; 2,4,5-T
ABSTRACT: (Purpose) The purpose of this study was to determine the effects of soil applied and stem injected herbicides on pine seedling establishment, soil moisture, and understory vegetation. (Time and Duration) Hardwood control tallied after 28 months; white pine seedling survival 4 months after planting; and species composition 40 months after treatment. (Type of Research) Original field plot research. (Methodology) 2,4,5-T ester in oil was stem injected with overlapping cuts which were filled to overflowing with herbicide. Fenuron pellets were applied to the soil at 5.6 and 11.2 kg/ha. One year after treatment pine seedlings were planted. Soil moisture was determined gravimetrically three times during the year of planting. White pine seedling survival was tallied after one season, pine height after two seasons, hardwood survival after three seasons, and understory vegetation after three seasons. Treatment area was in a mixed hardwood forest in Virginia. (Results and Conclusions) Fenuron at 11.2kg/ha was as effective as the 2,4,5-T treatment in controlling hardwoods. Pine survival was highest (equal) for 2,4,5-T and fenuron at 5.6 kg/ha. Height growth was greater on all treated plots as was soil moisture. There was little difference among herbicides in conserving soil moisture. Herbaceous vegetation and understory woody plants increased after herbicide treatment. The numbers of some species declined after treatment, but there was a striking increase in the numbers of other species as well as in the number of species present. Twenty-seven species not present on the control area were recorded in the treated areas.

1172

The use of herbicides in the eastern region; draft environmental statement.

AUTHOR: YURICH S
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Missoula, MT, US Forest Service Eastern Region, 1977, USDAFSR9DESADM7710, 157 p.
YEAR PUBLISHED: 1977
CATEGORY: A5b
REGION: Applicable to entire United States
KEYWORDS: herbicide use policies; herbicides; policies
ABSTRACT: (Purpose) To outline guidelines and policies affecting the use of herbicides on National Forest System lands in the Eastern Region of the Forest Service, USDA. This includes lands in the states of Illinois, Indiana, Maine, Michigan, Minnesota, Missouri, New Hampshire, New

York, Pennsylvania, Vermont, West Virginia, and Wisconsin. (Type of Research) Literature survey. (Methodology) The document was prepared in response to the National Environmental Policy Act of 1970. It discusses the proposed use of herbicides in the 20-state Eastern Region of the Forest Service only, and is written to give a general view of the alternatives available for vegetation management and the possible effects of herbicide use on the natural, social, and economic environments. (Results and Conclusions) Vegetation management is important on National Forests for timber management, forest roads and facilities maintenance, special use permit administration, fish and wildlife habitat management, range management, and recreation management. The land manager must consider numerous factors before choosing one or more of the seven alternative vegetation control methods. Modern technology has resulted in the availability of several alternative methods for vegetation management. These include: manipulation through biological agents, fire, herbicides, hand-operated tools, motorized equipment, no action at all, and the use of radiation.

1173

Woody brush efficiently controlled through use of helicopters.

AUTHOR: DAVIS T
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 8(1):10-13, 1976.
YEAR PUBLISHED: 1976
CATEGORY: A5b
SPONSOR: Penn Line Service.
REGION: Eastern Deciduous Forest STATE: West Virginia
KEYWORDS: aerial; application methods; brush; herbicides; picloram + 2,4-D; picloram + 2,4,5-T; right-of-way
ABSTRACT: (Purpose) To compare the precision and effectiveness of aerial herbicide application from Bell 47G4A helicopters equipped with microfoil booms to ground application methods. (Time and Duration) This report describes 1975 aerial spraying methods compared to traditional ground spraying. (Type of Research) Original, but this popular article is descriptive, based on observations rather than on detailed field studies. (Methodology) Observation. (Results and Conclusions) In the past, ground applications using picloram and 2,4-D gave more complete control than did aerial methods. With today's herbicides, specifically picloram and 2,4,5-T, and improved application devices, comparable vegetation control can be obtained with helicopters at comparable prices, and application is much faster. Herbicides with picloram are particularly effective against root-suckering species including sassafras, black locust and sumac.

1174

Distribution of 2,4-D and picloram applied by a mist blower.

AUTHOR: MONTGOMERY ML; NORRIS LA; WEBB WL
AUTHOR AFFILIATION: US Forest Service.; OR State Univ.
SOURCE TITLE: Bulletin of Environmental Contamination & Toxicology.
SOURCE ID: 16(6):631-639, 1976.
YEAR PUBLISHED: 1976
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: brush control; equipment; herbicides; spray drift; spraying
ABSTRACT: (Purpose) To report on the distribution of two herbicides in a test grid and an evaluation of three methods for estimating the total amount of herbicide deposited in the sampling area after a mist blower application. (Time and Duration) One-year study. (Type of Research) Original research (field tests). (Methodology) A truck-mounted John Bean Rotomist mist blower was used to apply the chemicals to a vegetation-free section of ROW. The single D-4 jet nozzle (without spinners or screens) was elevated 10 degrees above the horizontal and was rotated slowly back and forth between the far left-and right-hand corners of the grid. Application of 8.5 pounds of solution was made at 200 psi over a period of 2 minutes while truck was stationary. Spray solution contained 296ml of Tordon 101 and 44ml Lo-Drift (adjuvant) in 9.46 liters of water. The rectangular test grid was 32.9m by 46m. (Results and Conclusions) It is not clear why more picloram was lost in this experiment than was 2,4-D, since both chemicals are amine salts and are intimately mixed in the spray solution. Possibly some photodecomposition of the picloram occurred while the spray was in the air or briefly exposed to the sun on filter paper. The data indicate it is possible to safely apply herbicides on ROWs using a truck-mounted mist blower. However, adequate attention must be given to atmospheric conditions, method of application and the use of effective drift control agents.

1175

Weed control on rights-of-way.

AUTHOR: EVANS TM; FOOTE LE; SWAN DG
AUTHOR AFFILIATION: Washington State University
SOURCE ID: Pullman, WA, WA State Univ Cooperative Extension Service, 1976, Extension Bulletin 669, 26 p.
YEAR PUBLISHED: 1976
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: application methods; herbicides; persistence; right-of-way; weeds
ABSTRACT: (Purpose) To produce a popular publication on weed control that will offer administrators, supervisors, and applicators information that can lead to safer use of herbicides and alternative control procedures. (Type of Research) Literature review. (Methodology) Topics reviewed include: classification of weeds, methods of control, selective vegetation management, nonselective vegetation control, classification and types of herbicides, herbicide formulations, timing of herbicide treatments and rates, factors affecting chemical weed control, woody plant control, drift, herbicide application equipment, aquatic vegetation management on rights-of-way, operational procedures and administration. This coverage is simple, straight-forward, and in a popular style. (Results and Conclusions) The principal goal of right-of-way vegetation management is to provide maintenance practices for the right-of-way vegetation that will economically insure the protection, operation, stability, continuance, and safety of the common transport involved. Other goals of a well-planned vegetation management program are: naturalize the right-of-way to the extent desirable with the adjacent land areas; encourage the regeneration of operationally acceptable natural vegetation indigenous to the area; with the aid of the above two, make the right-of-way appear to be more of a natural entity blended into its landscape; and reduce maintenance costs.

1176

Herbicide transport in plants.

AUTHOR: HAY J
AUTHOR AFFILIATION: Research Station Agriculture, Canada.
SOURCE TITLE: Pages 365-396 in Herbicides; physiology, biochemistry, ecology (volume 1).
SOURCE ID: New York, NY, Academic Press, 1976, 608 p.
YEAR PUBLISHED: 1976
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; translocation
ABSTRACT: (Purpose) To discuss the current knowledge on upward and downward movement of herbicides in plants, and critique methods of studying translocation of herbicides. (Time and Duration) Literature review covering 35 years of research. (Type of Research) Literature review. (Methodology) The author reviews pertinent findings on the current knowledge of herbicide translocation including the symplast-apoplast concept, downward movement, and upward movement. He also critiques methods of studying translocation of herbicides, including amitrole, dalapon, dicamba, phenoxies, picloram, 2,3,6-TBA, urea herbicides, triazines and bipyridylium herbicides. (Results and Conclusions) A supply of carbohydrate is needed for movement of herbicides from leaves. This is to set up an assimilate flow or to supply energy for phloem loading. This "push" from the leaves is effective in getting the herbicide out of the leaf and into the stem. Once in the stem the main "pull" is that of the transpiration stream. Downward translocation has been increased when the relative humidity is raised. This may be due to better penetration but increasing absorption with surfactants has not always led to greater translocation. Thus the higher humidity probably allows greater downward movement by reducing the transpiration pull in the stems.

1177

Internal factors affecting toxicity.

AUTHOR: AVERG E; STECKO V
AUTHOR AFFILIATION: Agricultural College of Sweden
SOURCE TITLE: Pages 175-201 in Herbicides; physiology, biochemistry, ecology (volume 2).
SOURCE ID: New York, NY, Academic Press, 1976, 564 p.
YEAR PUBLISHED: 1976
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: growth rate; herbicides; vegetation; vigor
ABSTRACT: (Purpose) To discuss internal factors of plants which affect the toxicity of herbicides. (Time and Duration) Literature review spans articles from a 25 year period. (Type of Research) Literature review. (Methodology) The authors discuss such topics as sensitivity of the plant and its ontogenesis, relation between vigor and nutrient status of the plant and its susceptibility, cultivation practices and susceptibility of the plant, influence of the health of the plant and its nutrition, and selective toxicity in relation to the genetic make-up of the plant and its related morphology and physiology. (Results and Conclusions) Generally the best effects of herbicides are obtained if they are applied when the plant or parts of the plants are either rapidly growing or have been weakened by a rapid growth which has temporarily depleted or exhausted their reserves. Vigor is undoubtedly of great importance in determining the effects of herbicides. Vigor may depend on nutrient status or other factors. It has been noticed that the effect of herbicides on plants which have been damaged by the wheels of tractors is more marked than on undamaged plants. Cultivation before chemical treatment will cause weed seeds to germinate increasing the effectiveness of the chemicals, and will bring roots and stolons to the surface.

1177

1178
Influence of environmental factors on toxicity to plants.
AUTHOR: MUZIK T
AUTHOR AFFILIATION: WA State Univ.
SOURCE TITLE: Pages 203-247 in Herbicides; physiology, biochemistry, ecology (volume 2).
SOURCE ID: New York, NY, Academic Press, 1976, 564 p.
YEAR PUBLISHED: 1976
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: environment; herbicides; toxicity
ABSTRACT: (Purpose) To discuss the influence of environmental factors on the toxicity of plants to various herbicides. (Time and Duration) Literature review of articles spanning 25 years. (Type of Research) Literature review. (Methodology) The author reviews the literature on toxicity of plants to herbicides as influenced by such environmental factors as: atmospheric conditions, influence of environment on morphology and physiology as related to susceptibility, and differences for specific groups of herbicides. (Results and Conclusions) Stunted, slowly growing plants of susceptible species with small leaves and thick cuticle will be more tolerant to herbicides than rapidly growing plants. Wind and rain before treatment will enhance phytotoxicity but may reduce selectivity to the point of serious crop damage. Plants which have recently undergone severe water stress to the point of wilting will be more resistant and should be allowed to recover before spraying. A photoperiod unsuited for initiation of flowering will maintain the plants in a susceptible condition. Chronological age is less important than physiological age. For best results most suceptible species should be treated during a period of active growth and high humidity.

1179
The impact of timber harvest, fertilization, and herbicide treatment on streamwater quality in western Oregon and Washington.
AUTHOR: FREDRIKSEN RL; MOORE DG; NORRIS LA
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Quebec, CN, Les Presses de l'Universite Laval, 1975. 283-313 p.
YEAR PUBLISHED: 1975
CATEGORY: A5b; B2a; C4
REGION: Pacific Forest STATE: California; Oregon; Washington
KEYWORDS: aminotriazole; burning; clearcutting; discharge; environmental assessment; erosion; fertilization; herbicides; management, land; mass wasting; nitrogen; nutrient cycle; pollution, water; sediment; slope; stability; watershed; 2,4,D; 2,4,5-T
ABSTRACT: (Purpose) To provide the forest manager with a better scientific basis for selecting management options for Pacific northwest forests. (Time and Duration) 16 years, from 1957 to 1973. A synthesis of the author's original field and lab research with an extensive citation of supporting literature. (Methodology) The paper has one major section which deals with studies of sedimetation and nutrient input and outflow in forest watersheds; and two minor sections, one on the effects of urea fertilization and one on herbicides. The watershed studies were conducted on several small calibrated watersheds ranging in size from 25 to 250 acres. After several years calibration period various land management treatments were applied on the different watersheds and data compared with data from undisturbed watersheds. The fertilizer and herbicide sections are brief case histories. (Results and conclusions) See abstract 0110 for more extensive treatment of the herbicide and fertilizer data. Watershed studies lead to the following conclusions: (1) sedimentation of forest streams after timber harvest increases exponentially with increasing angle of slope. Ridgetop roads cause less sedimentation than mid-slope roads. In moderately steep areas stabilization after logging may be achieved wthin five years if revegetation is rapid. On steep land the effects of harvest may last much longer; (2) nutrients are lost following clearcutting but the loss decreases rapidly with revegetation. Nutrient losses from erosion are most important in steep areas.

1180
An evaluation of chemically sprayed electric transmission line rights of way for potential wildlife use.
AUTHOR: CARVELL KL; MAYER TD
AUTHOR AFFILIATION: WV Univ, Div of Forestry.
SOURCE TITLE: Industrial Vegetation Management
SOURCE ID: 7(1):5 7, 1975
YEAR PUBLISHED: 1975
CATEGORY: A5b; B1a; B1d
SPONSOR: Electric Power Research Institute.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: habitat; herbicides; impact; mammals; management; right-of-way; wildlife
ABSTRACT: (Purpose) To contrast major plant communities on three herbicidally managed electric rights of way with plant species on unsprayed old fields, and to determine differences in preferred food plants for the three major wildlife species in each area. Time and Duration one year, 1972. Type of Research Original research. Methocology The plant communities on 27 study plots in West Virginia, New Hampshire and Georgia were rated for food preference for the three major game species, using existing food preference ratings. These ratings were compared to ratings for communities on nearby unsprayed old field areas. Results and Conclusions statistical tests indicated that power line areas are comparable, or superior in some cases, in preferred food plants to the species found on adjacent old field areas.

1181
Aerial application of herbicide pellets for brush control on power line rights-of-way.
AUTHOR: MEDICKY EJ
AUTHOR AFFILIATION: Ontario Hydro.
SOURCE TITLE: Proceedings Northeast Weed Science Society.
SOURCE ID: 29:331-335,1975.
YEAR PUBLISHED: 1975
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: aerial; application methods; brush; equipment; herbicides; pellets; picloram; right-of-way
ABSTRACT: (Purpose) To review information from field trials in dispersing picloram pellets for brush control on power line rights-of-way using aerial application. (Time and Duration) One-year study. (Type of Research) Original research (field). (Methodology) In 1973, Ontario Hydro evaluated three pellet dispersal systems to arrive at a system which could deliver 35 to 50 pounds product (3.5 to 5.0 pounds ai) on target from flying heights ranging from 100 to 300 feet. Grumman Venturi and Field Aviation Pellet Dispersal Systems were used. (Results and Conclusions) The on-target application of picloram pellets (Tordon 10K) from aircraft poses increasing difficulties as flying height and speed increase. The grumman Venturi and the Field Aviation Pellet Dispersal Systems indicated that good dispersal was provided with respect to swath width, distribution, and delivery rate. Difficulties were encountered with respect to swath width and delivery rate in the Simplex Seeder System.

1182
The phenoxy herbicides.
SOURCE ID: Ames, IA, Council for Agricultural Science and Technology, 1975, Report No. 39, 21 p.
YEAR PUBLISHED: 1975
CATEGORY: A5b
REPORT NUMBER: 39
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; phenoxies; MCPA; 2,4-D; 2,4,5-T; 2,4,5-TP
ABSTRACT: (Purpose) To meet the need for an accurate, objective, and authoritative statement of the properties, uses and effects of phenoxy herbicides and alternatives to their use. (Time and Duration) One-year study. (Type of Research) Literature review, and the experience of the individuals on the committee. (Methodology) The report was prepared by a task force of 17 scientists representing the states of MD, AL, ID, WI, MO, IL, AR, TX, AZ, OR and CA. Subject matter areas included agricultural engineering, agronomy, agricultural economics, botany, forestry, horticulture, pesticide chemistry, plant pathology, plant physiology, range science, toxicology and weed science. (Results and Conclusions) The phenoxy herbicides are widely used because they are more efficient and usually less hazardous and less injurious to the environment than alternative methods. They are primarily toxic to green plants and are much less toxic to mammals, birds, fish, reptiles, shellfish, insects, worms, fungi and bacteria. When properly used, they do not occur in soils and water at levels harmful to animals and microorganisms. They do not concentrate in the food chain and do not persist from year to year in croplands. They are detectable only rarely in food, and then only in insignificant amounts.

1183
Aerial application techniques, systems, and precautions.
AUTHOR: CHAPPELL WE; COARTNEY JS; WEIDHAAS JA
AUTHOR AFFILIATION: VA Polytechnic Institute.
SOURCE TITLE: Weeds Trees and Turf.
SOURCE ID: Pages 20-36, 1975 (NOvember).
YEAR PUBLISHED: 1975
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States

KEYWORDS: helicopter; herbicides; microfoil boom; safety; spraying precautions
ABSTRACT: (Purpose) To describe aerial applicating systems and techniques, precautions that should be used in aerial application, and methods of calibrating aerial sprayers. (Type of Research) Based on experience and observations (field). (Methodology) The authors describe aerial applicating systems including the microfoil boom, conventional boom, and spray disk. Factors considered essential for safe and effective aerial spraying are described. The influence of air speed, pressure, swath width and volume are discussed in regard to calibrating the aerial sprayers. (Results and Conclusions) Because of the need for good public relations and the fact that the foliage of brush turns brown after spray treatment, it is advisable that no brush over 4 feet in height be treated with foliage spray. The best treatment for brush of this size is to cut first, and then give a basal spray to avoid brown foliage and public criticism. Due to inaccessible terrain and other factors, aerial application may often be the most practical method of controlling vegetation. However, aerial treatment has no place in urban and suburban areas.

1184
Control of brush with a new growth regulator.
AUTHOR: BINGEMAN CW; WEED MB; WELCH AW
AUTHOR AFFILIATION: El duPont and Co.
SOURCE TITLE: Proceedings Southern Weed Science Society.
SOURCE ID: 22:145-150, 1974
YEAR PUBLISHED: 1974
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: brush; growth inhibitor; herbicides; spraying, foliage
ABSTRACT: (Purpose) To report on the effectiveness of a new growth regulator, ammonium ethyl carbamoylphosphonate (Krenite), its method of application, season and spectrum of kill. (Time and Duration) Two-year study. (Type of Research) Original research (field). (Methodology) Krenite was applied to brush at various points in eastern United States. Application rates varied from 3 to 9 pounds per acre, applied in water. In some treatments, surfactants were added to increase effectiveness. Response of sprayed woody material was evaluated periodically at the end of the first growing season and during the second growing season. (Results and Conclusions) Application of this growth regulator, after the main flush of annual growth has hardened, usually causes only a slight visible effect on the foliage. Normal leaf drop occurs during the fall, but leaf bud development the following spring is either severely limited or prevented entirely. The stems and roots eventually die as little if any food or new tissue is produced. All oaks treated have been sensitive, and maples have responded readily. Wild plum, black locust, multiflora rose, hickories, hawthorn, and Malus species have been susceptible, and ash species have usually been controlled. Herbaceous plants do not respond significantly.

1185
Soil moisture affects absorption of 2,4,5-T sprays.
AUTHOR: BRADY HA
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Proceedings Southern Weed Science Society.
SOURCE ID: 27:206-210, 1974.
YEAR PUBLISHED: 1974
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; soil; soil moisture; 2,4,5-T
ABSTRACT: (Purpose) To explore the range of soil moisture most favorable for foliar spraying, and determine if prolonged drought early in the season reduces the response of woody brush to sprays applied after sufficient moisture is again present. (Time and Duration) One year study. (Type of Research) Original research (laboratory). (Methodology) Moisture content of a greenhouse potting soil at tensions of 1, 5, and 10 atmospheres was determined with a pressure plate. One-year-old seedlings were planted singly in pots containing 2.5 kg of this soil. Species included in this study were smooth sumac, sweetgum, post oak, water oak, red maple, bitter pecan and loblolly pine. After the seedlings were established, 15 of each species were placed in a growth chamber, and the soil brought to predetermined moisture levels. Each plant was treated with 0.5 ml solution of 2,4,5-T. (Results and Conclusions) Sumac absorbed 2,4,5-T ester at soil moisture tensions of 1 to 10 atmospheres. For sweetgum, red maple, and bitter pecan, absorption was greatest at tensions of 1 to 5 atmospheres, and for post oak, water oak, and loblolly pine at 5 to 10 atmospheres. Translocation usually paralleled absorption. Sweetgum, cherrybark oak, green ash, and red maple were resistant to 2,4,5-T applications that followed a prolonged drought.

1186
"Invert emulsions" "versitility and precision."
AUTHOR: HUSSEY WL
AUTHOR AFFILIATION: Riverside Chemical Co.
SOURCE TITLE: Proceedings Southern Weed Science Society.
SOURCE ID: 27:239-243, 1974.
YEAR PUBLISHED: 1974
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: dicamba; herbicides; phenoxies; picloram; spray drift; invert emulsion
ABSTRACT: (Purpose) To explain what "invert emulsions" are, their early history and recent developments in the invert line. (Time and Duration) Covers 15 years of development. (Type of Research) Literature review. (Methodology) The author explains Stokes Law, and the need for spraying materials with large particle size to avoid drift. Pressures, nozzle selection and arrangement are also discussed. The chemistry of invert emulsions and the relationship of this emulsion to innovative new nozzles are explained. Formerly only the phenoxy herbicides were applied as inverts, but now most herbicides including dicamba and picloram can be inverted. (Results and Conclusions) Invert emulsion spraying has not replaced or eliminated conventional water spraying, but is superior in the following situations. 1) Strip or spot spraying Johnsongrass on outer edges of ROW. Many county and state highway departments have had intensive Johnsongrass control programs for the past 5-8 years. 2) Chemical trimming of over-hanging limbs. Invert spraying with phenoxy oil-soluble amine salts or AMS is superior to conventional water treatment because of control over the spray pattern. 3) Better control on certain resistent or hard-to-kill weeds and brush.

1187
Behavior of pesticides in plants.
AUTHOR: NORRIS LA
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Portland, OR, US Forest Service General Technical Report PNW-19, 1974, 6 p.
YEAR PUBLISHED: 1974
CATEGORY: A5b
SPONSOR: US Forest Service
REGION: Applicable to entire United States STATE: United States
KEYWORDS: absorption; herbicides; insecticides; metabolism; translocation; vegetation
ABSTRACT: (Purpose) The purpose of this paper is to educate the reader regarding the bases of chemical behavior and the behavior of pesticides in plants. The paper was presented at a 1969 symposium "Environmental and Physiologic Chemodynamics" at Oregon State Univ. (Time and Duration) Literature cited from 1956-67. (Type of Research) Generalized literature review, but with limited literature cited. (Methodology) Narrative. (Results and Conclusions) The behavior of a chemical is its characteristic movement, persistence, and fate. Behavior is determined by the interaction between the properties of the chemical and the properties of the environment. This interaction is guided by the laws of physics, chemistry and biology to produce the chemical behavior observed. The author uses this basis to describe the absorption, translocation and metabolism of pesticides in plants as these are important in determining the effects of the chemical on the plant and on the environment.

1188
The behavior and impact of organic arsenical herbicides in the forest; final report on cooperative studies.
AUTHOR: NORRIS LA
AUTHOR AFFILIATION: US Forest Service, Pacific Northwest Forest and Range Experiment Station.
SOURCE ID: Corvallis, OR, US Forest Service Pacific Northwest Forest and Range Experiment Station, 1974, 98 p.
YEAR PUBLISHED: 1974
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: arsenicals; ecology; forest; herbicides; impact; safety
ABSTRACT: (Purpose) To report on studies designed to measure the exposure of applicators to organic arsenic compounds and evaluate the hazards of exposure; measure the initial distribution of organic arsenic compounds among components of the forest environment; determine persistence and fate of these. (Type of Research) Both literature survey and field studies. (Methodology) The investigators explore: exposure and effects on human health; arsenic in blood and urine of forest workers applying dimethylarsinic acid; patterns of arsenic elimination in urine of applicators during one work week. They also explore the behavior of arsenicals in the forest, i.e., leaching of cacodylic acid and MSMA in forest floor material and soil; distribution of arsenic in vegetation, forest floor, soil, and streamwater after injection of forest trees with arsenicals; and the fate of organic arsenic herbicides in chemically-thinned forests. (Results and Conclusions) These arsenic studies demonstrate that from a technical standpoint the arsenicals can be safely used by US Forest Service thinning crews. A urine monitoring program should be a part of

1188

any operational thinning program using MSMA or cacodylic acid. If more than 5 percent of urine samples from a given crew have arsenic levels exceeding 0.3 ppm, thinning operations should be suspended until their application methods have been identified and improved. Only experienced crews should apply arsenicals in important grazing and hunting areas.

1189
Modified basal spray control of red maple in southern forest during dormant season.
AUTHOR: PRINE EL; STARR JW
AUTHOR AFFILIATION: MS State Univ.
SOURCE TITLE: Proceedings Southern Weed Science Society.
SOURCE ID: 26:302-305, 1973.
YEAR PUBLISHED: 1973
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: forest; herbicides; picloram + 2,4,5-T; spraying, basal; trees; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To test various standard formulations of herbicides using a mist blower to apply these chemicals as a basal spray. (Time and Duration) One-year study. (Type of Research) Original research (field). (Methodology) Using a mist blower, the leaves and duff were blown away from the base of the tree with the blower at high speed and the chemical tank cut off. The herbicide was then applied to the lower 12 inches of the stem with the blower at idle speed. By wetting the lower 12 inches of stem in this matter, but not to runoff, only a portion of the total chemical solution was used. Eight different combinations of 2,4-D, 2,4,5-T, and picloram were used, and in some instances a surfactant was added. (Results and Conclusions) Tordon 155 (picloram + 2,4,5-T) in an oil carrier proved to be significantly better than the other treatments tested. From these results it was concluded that the method of application described proved to be acceptable and treatment can be done with considerably less volume than conventional basal spraying equipment.

1190
Continued evaluation of the hypo-hatchet for woody species control.
AUTHOR: HOLT HA; VOELLER JE
AUTHOR AFFILIATION: AR Agricultural Experiment Station.
SOURCE TITLE: Proceedings Southern Weed Science Society.
SOURCE ID: 26:354-360, 1973.
YEAR PUBLISHED: 1973
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: brush; brush control; frilling; herbicides; hypo-hatchet; picloram; 2,4-D
ABSTRACT: (Purpose) To report the greater effectiveness of the hypo-hatchet in controlling hard-to-kill woody plants when a combination of 2,4-D and picloram is used instead of the traditional 2,4-D alone. (Time and Duration) Two-year study. (Type of Research) Original research (field). (Methodology) Ten randomly selected trees of three hardwood species, black hickory, post oak and red maple, were assigned to one of eight different treatments at two treating dates, September 1971 and May 1972, for a total of 160 trees of each species. These trees ranged from 2 to 12 inches dbh. Herbicides tested included: 2,4-D amine, 2,4,5-T amine, Tordon 101, Tordon 22K, cacodylic acid. These were applied with a hypo-hatchet at a rate of one injection per inch at a convenient height above the ground. (Results and Conclusions) Tordon 101 (picloram + 2,4-D) in water continues to be very effective on oaks and hickory, as well as red maple and red cedar. Tordon 22K and water dilutions also were effective on all species tested. 2,4-D amine is very effective on oak and hickory, but gives little control on red maple. Diluted Tordon 101 can be economically attractive because of the broad spectrum of susceptible species. Increased production over basal injection is a strong point in favor of the hypo-hatchet in forest management.

1191
Precommercial thinning with chemicals
AUTHOR: FINNIS JM
AUTHOR AFFILIATION: WA Dept of Natural Resources.
SOURCE TITLE: The use of herbicides in vegetation management.
SOURCE ID: Missoula, MT, US Forest Service Region 1, 1973, 40 p + 5 appendices.
YEAR PUBLISHED: 1973
CATEGORY: A5b
REGION: Cedar-Hemlock-Douglas-fir Forest STATE: Oregon; Washington
KEYWDRDS: herbicides; improvement; silviculture; thinning
ABSTRACT: (Purpose) To describe experience in removing excess trees from forest stands in precommercial thinnings using various chemicals and treatment methods. (Time and Duration) Five-years (estimate). (Type of Research) Original research (field study). (Methodology) Several herbicides were tested on Douglas-fir in 15-20 year-old natural stands. These include Ammate X, 2,4,5-T amine, silvisar 510, Tordon 101, and Tordon 22K. At present they are testing Silvisar 510, Tordon 101, Torcon 22K and Ansul's L-2505 in more extensive tests. (Results and Conclusions) Tordon 101 and Tordon 22K look good at all seasons. Ansul's L-2505 also looks promising and is much cheaper than Silvisar and without a disagreeable odor. Chemical thinning has several important advantages over conventional felling methods. Cost is the major benefit, since chemical treatment eliminates the major task of pulling down cut stems, cuts down investment in equipment, improves safety, and eliminates long-distance packing of heavy supplies and equipment. Cost of chemical treatment increases rapidly with increasing density of stems to treat. Another benefit of chemical thinning is the reduction of fine fuel on ground.

1192
Drift control systems
AUTHOR: WARREN LE
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: The use of herbicides in vegetation management.
SOURCE ID: Missoula, MT, US Forest Service Region 1, 1973, 40 p + 5 appendices.
YEAR PUBLISHED: 1973
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: drift control; herbicides; spray drift
ABSTRACT: (Purpose) To provide information on the possible methods and systems available to reduce drift from sprays to "insignificant" levels. (Type of Research) Original research and experience. (Methodology) The author discusses viscosity modifiers, including invert emulsions and particulating agents, including newer inverting agents that permit reliable use of flash mixing (bi-fluid) systems. Foaming agents are also discussed which entrain air and produce expanded droplets of heavy foam. The effects of droplet size and wind velocity are also explored. (Results and Conclusions) One must accept a compromise between the droplets large enough that they will settle to the target readily and having them small enough that they will provide sufficient coverage to achieve the desired control of the vegetation. Herbicides require different degrees of coverage depending on their nature, carrier and surfactants. Contact herbicides and some systemic herbicides require very good coverage whereas some hormone type herbicides can be more sparsely distributed. One of the most important ingredients in controlling drift is the judgment of the spray applicator.

1193
Volatility and drift of herbicides.
AUTHOR: WARREN LE
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: The use of herbicides in vegetation management.
SOURCE ID: Missoula, MT, US Forest Service Region 1, 1973, 40 p + 5 appendices.
YEAR PUBLISHED: 1973
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; spray drift; volatility
ABSTRACT: (Purpose) To explain what volatility and drift are, the relative volatility of various herbicides, and how volatility and drift can be controlled. (Type of Research) Personal experience. (Methodology) The author explains the differences between drift and volatility, and the relative volatility of the most commonly used herbicides in brush control work. Factors that increase the amount of drift are explored, including droplet size, nozzle type and capacity, orifice size and shape, surface tension, spray density and viscosity. (Results and Conclusions) Factors affecting drift of aerially applied herbicides in order of decreasing importance are: 1) the herbicide - nature and rate; 2) nature and volume rate of carrier; 3) spray drop size spectrum, as affected by nozzle type, nozzle orientation to air stream boom location (wing or rotor), speed or aircraft and viscosity; 4) application conditions including flight path, height of release, wind speed and direction, air stability, width of swath and number of passes; 5) distance and direction to problem areas; 6) screening effects of barriers (trees, etc.), and turning area and technique.

1194
Pacific Power & Light's vegetation control program.
AUTHOR: MCCUTCHEON LR
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 4(3):18-20, 1972.
YEAR PUBLISHED: 1972
CATEGORY: A5b
REGION: Pacific Forest STATE: Oregon
KEYWORDS: herbicides; maintenance; picloram; public relations; right-of-way
ABSTRACT: (Purpose) To discuss in popularized form a particular ROW maintenance operation invoiving the use of picloram. (Results and Conclusions) A narrative description of a day's activities of a ROW maintenance crew working on brush control in the Oregon coast range.

A popularized article with lots of Quotations from various members of the three man crew. Beyond the theatrics, the article does convey the actual mechanics of the operation including those parts frequently neglected, like landowner relations, careful application, and awareness of environmental concerns. The utility of chemical brush control is emphasized.

1195
Movement and persistence of picloram in soil.
AUTHOR: HUNTER JH; STOBBE EH
AUTHOR AFFILIATION: Univ of Manitoba.
SOURCE TITLE: Weed Science.
SOURCE ID: 20(5):486-489, 1972.
YEAR PUBLISHED: 1972
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; leaching; persistence; picloram; soil
ABSTRACT: (Purpose) To determine the movement and persistence of picloram herbicide in a clay soil. (Time and Duration) 4-year study, 1967-1970. (Type of Research) Original research. (Methodology) Field experiments were conducted on an Osborne clay soil, a reasonable well-drained, dark-colored, fine lake-bed soil. PLots were seeded to Manitou wheat. Plots were tilled once in the spring with a one-way disk and harrowed, and worked twice in the fall with a one-way disk. Each plot was also cultivated to a depth of 13cm. In the first experiment a split plot design was used with four replications of eight treatments. In the second experiment the treatments were conrol and picloram at 17.5, 35 and 70 g/ha in a random block design. (Results and Conclusions) Movement and dissipation of picloram were negligible under low soil moisture conditions, but under high rainfall conditions picloram was leached into the 30 to 60cm depth. A greater percent of the picloram was leached at the higher application rates. Dissipation increased with temperaure (days over 27 oC) and decreased with increasing depth in the soil profile. Two applications of picloram at 70 g/ha applied in two successive years showed no detectable accumulation, but accumulatin occurred from two applications of 350/ha 32 percent of the activity remained after approximately two years.

1196
Responses of woody species to rates, formulations, placements and times of application of karbutilate.
AUTHOR: GREHLINGER PM
AUTHOR AFFILIATION: Niagara Chemical Div.
SOURCE TITLE: Proceedings Northeast Weed Science Society.
YEAR PUBLISHED: 1972
CATEGORY: A5b
REGION: Oak-Hickory Forest STATE: New Jersey
KEYWORDS: checklist; herbicides; impact; pellets; season; species
ABSTRACT: (Purpose) To present data on the effectiveness of karbutilate (Tandex) for killing woody species, and the most effective rates, formulations, methods of placement and season for good brush control. (Time and Duration) Three-year study. (Type of Research) Original research (field). (Methodology) Fifteen species of hardwoods and pitch pine were treated with karbutilate as a wettable powder basal spray using a back-pack sprayer during either June of November 1970. Tandex 4 and Tandex 10 granules were also applied by tossing the selected rates by hand at the base of the trees. Evaluation of brush and tree kills were made several times to determine rapidity of action and time of kill. Kill was identified by the condition of the cambium. (Results and Conclusions) Certain species are more susceptible and are killed quicker than others. Conifers were susceptible and died quickly. Sassafras was a more tolerant deciduous species. Treated species varied in their ability to initiate new foliage. Death occurred over a period of 12 to 15 months depending on the time of year the chemical was applied. Conditions such as frozen soil may retard the entry and subsequent movement of this herbicide. Heavy soil types may also delay the time required to produce plant injury or kill, while woody vegetation growing on sands is killed rapidly.

1197
Teratological potential of 2,4,5-T.
AUTHOR: WILSON JG
AUTHOR AFFILIATION: Univ. of Cincinnati
SOURCE TITLE: Southern Weed Science Society.
SOURCE ID: 25:26-30, 1972
YEAR PUBLISHED: 1972
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: dioxin; teratogenic potential; toxicity; Herbicides
ABSTRACT: (Purpose) To review the research results related to 2,4,5-T, dioxin and teratogenic effects, compare results of tests performed since the original tests showing teratogenic effects in 1969, and to put all of these data in their proper perspective. (Time and Duration) Based on four years of research, from various laboratories. (Type of Research) Literature review. (Methodolcgy) The author describes in chronological order the results of the various tests with 2,4,5-T, dioxin on various mammals. The results of these tests are compared to indicate trends, and separate fact from fiction. Tests from Canada and Germany are also included in this analysis. (Results and Conclusions) The May 1971 report of the EPA's Scientific Advisory Committee on 2,4,5-T stated that the Committee agreed in a ratio of 8:1 that acceptable data on the embryotoxicity of 2,4,5-T were available for six mammalian species. None of these showed adverse effects at a dosage of 40mg/kg/day during the period of organogenesis. The author feels that new information available since the Committee's report represents refinements and moderate extensions of information that was already available, or that could be reasonably deduced. The new data do not indicate that a single one of the recommendations made in the original report needs to be changed.

1198
Cytogenetic effects of 2, 4, 5-T Trichlorophenoxyacetic acid on Oogenesis and early embryogenesis in Drosophila Melanogaster.
AUTHOR: DAVRING L; SUNNER M
AUTHOR AFFILIATION: University of Lund.
SOURCE TITLE: Hereditas
SOURCE ID: 68:115-122, 1971.
YEAR PUBLISHED: 1971
CATEGORY: A5b
KEYWORDS: chemicals; herbicides; impact; research; toxicity; 2, 4, 5-T
ABSTRACT: (Purpose) To determine genetic effects of herbicide 2, 4, 5-T on oogenesis and embryogenesis of Drosophilia Melanogaster. (Type of Research) Original. (Methodology) A concentration of 2, 4, 5-T, 40-60 times lower than that recommended for shrubs, was mixed with corn agar medium. Flies less than 24 hours old and flies older than 24 hours from a wild type population, canton-S109, were exposed for 5-6 days. The females were then decalpitated and instanteously deposited their eggs. The eggs and the prepared ovaries were fixed and embedded in whole mounts and the preparations analyzed. (Results and Conclusions) No exterior effects on adults were seen even when exposed for 15 days. However, there was an effect upon the very early stages of egg cell development and chromosome disturbances which may result in sterility. Egg production was severely suppressed in the younger flies. Sterility in older flies was not immediately observed since more cells had matured. Tests to determine toxicity of a chemical on Drosophila are discussed and recommendations made, some of which are: use populations that lack resistant genes to poisons; to determine log dosage curves, use adults less than 24 hours old.

1199
Showcase brush control for Arkansas Power and Light.
AUTHOR: HEIN N
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 3(3):14-15, 1971.
YEAR PUBLISHED: 1971
CATEGORY: A5b
REGION: Applicable to entire United States STATE: Arkansas
KEYWORDS: application methods; brown out; brush; herbicides; pellets; picloram; picloram + 2,4-D; picloram + 2,4,5-T; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To describe the brush control methods used by Arkansas Power and Light, their herbicide preferences, concentrations, application methods, and equipment. (Time and Duration) 20 years of experience. (Type of Research) Original (field). (Methodology) Beginning in 1950, various herbicides were employed to control brush and troublesome oaks, sweet gum, pines, and willows on Rows. 2,4-D and 2,4,5-T were used first and company crews employed in this work. Later Tordon 101 (picloram + 2,4-D) was adopted and brush control work was contracted out. To avoid brown out, dormant sprays with picloram and 2,4,5-T have been used. Six-wheel drive Army GMC trucks have been useful in this work, and a flextrac Nodwell vehicle for use in swampy areas. (Results and Conclusions) Herbicides for brush control on transmission ROW areas have proven effective, economical and practical. By using the proper herbicide and application method, and the right season of application, attractive, well-manicured ROW areas have been maintained with a minimum of criticism or claims against the Company's policy.

1200
The degradation and movement of picloram in soil and water.
AUTHOR: GORING CAI; HAMAKER JW
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Down to Earth.
SOURCE ID: 27(1):12-15, 1971.
YEAR PUBLISHED: 1971
CATEGORY: A5b; B2b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: degradation; herbicides; impact; picloram; soil; water
ABSTRACT: (Purpose) To review the literature on the degradation and movement of picloram in soil and water. (Time and Duration) Review of

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articles covering a six year period. (Type of Research) Literature review. (Methodology) Literature was reviewed covering: the pattern of degradation, rates of degradation in soil, sorption and leaching, movement under field conditions, persistence under field conditions. (Results and Conclusions) Picloram (4-amino3,5,6-trichloro-picolinic acid) is a widely used herbicide and plant growth regulator. It is low in toxicity to mammals, fish and birds, aquatic chain organisms, and soil micro-organisms.

1201
Influence of ph on the phytotoxicity of herbicides in soil.
AUTHOR: CORBIN FT; SELMAN FL; UPCHURCH RP
AUTHOR AFFILIATION: NC State Univ.
SOURCE TITLE: Weed Science.
SOURCE ID: 19(3):233-239, 1971.
YEAR PUBLISHED: 1971
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; ph; soil
ABSTRACT: (Purpose) To determine the influence of soil ph (4.3 to 7.5) on the phytotoxicity of herbicides incorporated into high organic soils. (Time and Duration) One-year study. (Type of Research) Original research. (Methodology) Two high-organic-matter soils were collected from the lower Coastal Plain and screened with 4mm screen. Two weeks before seedling transplant, the soils were titrated to four ph levels (4.3, 5.3, 6.5 and 7.5) by adding specific amounts of a base mixture. Six dosages of commercial formulatons of each herbicide were pipetted into the soil samples on the date of seedling transplant and allowed to dry for two hours. Seedlings were placed in a growth chamber maintained at 26 oC, 1200 ft-c of light, and 12 hour photoperiod. (Results and Conclusions) Phytotoxicity increased as the soil ph increased and reached a maximum at ph 6.5 for the weak aromatic acids dicamba, 2,4-D and the weak bases Prometone and amitrole. Conversely, phytotoxicity increased as soil ph decreased and reached a maximum at ph 4.3 for the weak aliphatic acid dalapon, the cationic herbicides diquat and paraquat, and a nonionic herbicide vernolate. Soil ph levels between 4.3 and 7.5 had no effect on the phytotoxicity of the weak aromatic acids chloramben, picloram, and the nonionic herbicides dichlorobenil, isocil, diuron and nitralin.

1202
The adsorption of some S-Triazines in soils.
AUTHOR: FLETCHALL OH; TALBERT RD
AUTHOR AFFILIATION: University of MO.
SOURCE TITLE: Weeds
CATEGORY: A5b
KEYWORDS: adsorption; herbicides; soils
ABSTRACT: (Purpose) To determine the effects of various factors on the adsorption of five S-Triazines. (Time and Duration) One-year study. (Type of Reseerch) Original research (Laboratory). (Methodology) The extent of adsorption of five C14-labeled S-Triazines, Simazine, Atrazine, Propazine, Prometone and Prometryne, from aqueous solutions by soil constituents was expressed as a KD (distribution coefficient), which is the ratio of the amount of herbicide adsorbed to the amount in the equilibrium solution. (Results and Conclusions) The KD value for a given S-Triazine and exchanger remained relatively constant over a range of concentrations. The adsorption reaction was essentially at equilibrium within 1 hour. Increasing the temperature and PH resulted in decreased adsorption of Simazine and Atrazine. The order of increasing adsorption of these compounds by soils was Propazine, Atrazine, Simazine, Prometrone and Prometryne. Increased amounts of organic matter and/or clay in a soil generally were associated with increased adsorption of these S-Triazines. The order of decreasing water solubility is prometone, atrazine, prometryne, propazine, and simazine. There seems to be little relationship between water solubility and adsorption of these compounds. The adsorption of prometone and prometryne varied more with soil type than the chloro-s-triazines as indicated by the higher coefficient of variation for Kd values. In an attempt to relate the soil characteristics affecting the adsorption of these compounds, correlation coefficients were determined. Of the soil characteristics determined, adsorption of the triazines was most closely related to organic matter content, clay content, cation exchange capacity and exchangeable magnesium and hydrogen.

1203
Creating wildlife habitat on utility rights-of-way.
AUTHOR: WAGNER JF
AUTHOR AFFILIATION: West Penn Power Co.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 3(1):15-17, 1971.
YEAR PUBLISHED: 1971
CATEGORY: A5b; B1e
REGION: Eastern Deciduous Forest STATE: Pennsylvania
KEYWORDS: habitat; herbicides; picloram + 2,4,5-T; right-of-way; spraying, selective; wildlife
ABSTRACT: (Purpose) To report on selective spraying techniques used in creating wildlife habitat on ROWs of West Penn Power Company an describe the results of these sprayings in increasing the number of desirable wildlife food plants. One year study (1967-1968) Original research (field). (Methodology) Tordon 155 mixture (1 gallon in 100 gallons of fuel oil) was used for selectively spraying (basal treatment) tall-growing timber species that have the potential of growing into the electric lines. Spraying was done in cooperation with the State Game Commission. Wildlife species left during spraying included witch-hazel, filbert, Hercules club, bracken fern, grasses, sedges, sumac, berry plants. (Results and Conclusions) After the desirable wildlife food plants were released by removal of competing vegetation, they increased in numbers due to natural seeding. They also provided ground cover and shade that slows the growth process of sun-loving, tall-growing seedling trees.

1204
TORDON 101 mixture on New England Power Company right-of-way.
AUTHOR: FLANNERY RF; MCCUTCHEN L
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 3(1):6-8, 1971
YEAR PUBLISHED: 1971
CATEGORY: A5b
REGION: Northern Hardwoods Forest STATE: Vermont
KEYWORDS: brush control; cost; herbicides; picloram; picloram + 2,4-D; right-of-way; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To determine the incremental effects of 2,4-D, 2,4,5-T, and picloram on mixed brush; the most suitable spray volume to assure proper coverage, and efficacy for the treatments employed; if the standard Tordon 101 mixture herbicide performed as well or better than various phenoxies. (Time and Duration) 3-year study. (Type of Research) Original (field) research. (Methodology) In September, 1967, a study was begun on a New England Power Company ROW near Bellows Falls, VT to determine the effectiveness of Tordon 101 mixture applied aerially at various rates an volumes. Several other formulations of herbicides were also used for comparison. Vegetation included ash, aspen, alder, beech, birch, hawthorn, dogwood, hazel, hickory, maples, oaks, pines and sumac. The brush was 5 to 15 feet tall. Species were evaluated for three seasons subsequent to treatment. (Results and Conclusions) Picloram had to be 1.5 lb/A or more for adequate brush control. Addition of 2,4,5-T was of no apparent assistance. The 2,4-D + 2,4,5-T plots provided little additional control over Tordon 101 alone. The best performance cost product appeared to be Tordon 101 mixture herbicide at 3 gallons in 15 gpa total spray volume. This treatment has afforded excellent brush control for three seasons.

1205
Growth control in trees.
AUTHOR: GARDNER MR
AUTHOR AFFILIATION: Hydro Electric Power Com of Ontario.
SOURCE TITLE: Proceedings Northeast Weed Science Society.
SOURCE ID: 25:332-344, 1971.
YEAR PUBLISHED: 1971
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: brush; growth; growth inhibitor; right-of-way; trees
ABSTRACT: (Purpose) To compare the effectiveness of four growth control chemicals on apical and lateral growth of three species of forest trees. (Time and Duration) One-year study. (Type of Research) Original research. (field). (Methodology) An experimental nursery for growth retardation studies was established by Ontario Hydro in 1969. Three tree spcies were included in this study, white ash, silver maple and Carolina poplar. Trees were planted in rows 3 meters apart with indivdual trees 2.5 meters apart. Retardants were applied in June, 1970, to randomly selected trees. The retardants included CF125, NIA10637, DP1108 and MH30T. Trees were measured at 3 points one day prior to treatment. (Results and Conclusions) MH30T (diethanolamine salt of 1,2-dihydro-2, 6-pyridazinedione) gave the most complete control with least foliar damage. NIA0637 (ethly hydrogen 1-propylphosphonate) gave adequate control at one rate, but increased bud formation was noted. CF125 (methyl 2-chloro-9hydroxyfluorene-9-carboxylate) did not indicate good control at the rates used. DP1108, the structure of which is not known, gave promising results.

1206
Potomac Electric Power Company's experience with herbicides on federal wildlife lands.
AUTHOR: PARSONS JH
AUTHOR AFFILIATION: Potomac Electric Power Co.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 25:362-364, 1971.
YEAR PUBLISHED: 1971
CATEGORY: A5b; A5c; A5f

REGION: Eastern Deciduous Forest STATE: District of Columbia; Maryland
KEYWORDS: herbicides; spraying; spraying, basal; wildlife; 2,4-D; 2,4-DP; 2,4,5-T
ABSTRACT: (Purpose) To describe a selective basal treatment for brush on a transmission line right-of-way which passed through the Patuxent Wildlife Research Center. (Time and Duration) Three-year study. (Type of Research) Original research (field). (Methodology) The Potomac Electric wildlife biologists and forester agreed that pine should be cut and chipped to eliminate fire hazard. The hardwoods were basal sprayed with 27 gallons per acre of 2,4-D and 2,4,5-T. Respraying two years later, because of restrictions placed on 2,4,5-T, was done using 2,4-D and 2,4-DP at a rate of 65 gallons per acre. The wildlife people employed a botanist to work with the crew, and he identified wildlife food plants to be left in the brush control operation. (Results and Conclusions) The author feels that to be able to continue using chemcials, right-of-way managers will have to do the contact work described in this article. They cannot sit back and ask chemical manufacturers and contractors to promote all of the publicity. Power companies will have to prove to federal and state personnel that they can be trusted to use these chemicals in as safe and sane manner.

1207
What a well-planned utility chemical brush control program looks like.
AUTHOR: EFIRD TE
AUTHOR AFFILIATION: Davey Tree Expert Co.
SOURCE TITLE: Down to Earth.
SOURCE ID: 2(1):18-20, 1970.
YEAR PUBLISHED: 1970
CATEGORY: A5b
SPONSOR: Davey Tree Expert Co.
REGION: Applicable to entire United States STATE: Alabama; Florida; Georgia; South Carolina
KEYWORDS: brush; brush control; herbicides; maintenance; picloram; right-of-way
ABSTRACT: (Purpose) To present the author's concept of a well-planned chemical brush control program on a ROW. (Type of Research) Observations of operational projects. (Methodology) Description of vegetation management on ROWs with strong emphasis on chemical programs. (Results and Conclusions) No data. Narrative description of the establishment and maintenance of a new ROW on the Duke Power System. Planning, logistics, and coordination are stressed. Stumps are sprayed with 2,3,4-T and 2,4-D. After the capital construction phase the maintenance phase begins. Tordon herbicide plays a prominent role in vegetation control. The author also discusses maintenance, equipment requirements, training of personnel, and contracting.

1208
Risks and responsibilities in the use of herbicides.
AUTHOR: KEARNEY PC; TSCHIRLEY FH
AUTHOR AFFILIATION: US Agricultural Research Service.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 24:223-228, 1970.
YEAR PUBLISHED: 1970
CATEGORY: A5b; A5g; B1
SPONSOR: US Agricultural Research Service.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: degradation; environmental assessment; herbicides; impact; leaching; persistence; pesticide; residue; toxic hazard; toxicity; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) The purpose of the paper is to review some of the environmental and health related aspects of herbicides. (Time and Duration) No date or literature citations. (Type of Research) Not research — a review of existing knowledge without specific citations. (Methodology) Discusses specifics of risks and responsibilities of herbicide use; soil persistence; herbicide metabolism; pesticide mobility; and some opinions on the probable risks to society from not having "safe" pesticides available for use. (Results and Conclusions) This paper was prepared as a timely discussion primarily of the 2,4,5-T, TCDD question for the 1970 Northeastern Weed Control Conference. It is not intended to be a data paper and offers little substantive data that is not available in better form and completeness in other papers in the AES collection. Principle value of the paper is in discussion of the risks, the acceptable risks, dangers of strict application of the Delaney amendment, and the concepts of this amendment. The author's discussion of the "risks" society faces by restricting or removing from use those herbicides which are safe is particulary pertinent for ROW public relations efforts.

1209
Progress report on 1 percent NAA growth inhibitor tree paint.
AUTHOR: CRAN HJ JR
AUTHOR AFFILIATION: CT Light and Power Co.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 24:271-278, 1970.
YEAR PUBLISHED: 1970
CATEGORY: A5b
SPONSOR: CT Light and Power Co.
REGION: Eastern Deciduous Forest STATE: Connecticut; Delaware; New Hampshire; New York
KEYWORDS: chemicals; growth inhibitor; trees
ABSTRACT: (Purpose) To report results of experiments with napthaleneacetic acid paste to promote wound healing of pruned trees and to retard rapid regrowth. (Time and Duration) 1963 to 1968. (Type of Research) Original field-oriented research. (Methodology) Tested concentration of NAA in three different forms on sprout formation and length in several eastern hardwood species. (Results and Conclusions) (1) 75 to 100% reduction in amount of new wood which needed to be removed at next trimming after application of subject material. (2) Spring or summer treatments about equal in most respects except some strong species differences and summer treatments less effective in reducing sprout length. (4) A 50% reduction in sprouting, sprout elongation observed in Norway maples treated with 1% formulation. (5) An economic study showed following savings after use of sprout inhibitor: trimming cycle reduced from six months to four years; cost of pruning programs down 30% despite 15% increase in manhour costs.

1210
Utilization of knapsack mist blowers for chemical brush control.
AUTHOR: DOLTON RL
AUTHOR AFFILIATION: Potomac Edison Co.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 2(3):10-13, 1970.
YEAR PUBLISHED: 1970
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: application methods; brush; checklist; herbicides; species; spraying, basal; spraying, foliage
ABSTRACT: (Purpose) To report the results of using a knapsack mist blower for chemical brush control on ROWs of Potomac Edison Company. (Time and Duration) Three year study. (Type of Research) Original research (field). (Methodology) A Solo mist blower was used to make stem-foliage applications during the growing season using 1 gallon of Asplundh 182A brush killer (216) to 3 gallons of water for some areas and 1/2 gallon of Asplundh D and T Brushkiller (416) to 3-1/2 gallons of water on other areas. Results were checked periodically classifying stems as dead or dead to ground line. In 1968 studies were made using dormant season basal sprays of 14 gallons of Ester D and T brushkiller to 86 gallons of No. 2 fuel oil or transformer oil. (Results and Conclusions) Best results for stem-foliage application were obtained using 12 1/2 gallons of picloram plus 2,4-D in 87 1/2 gallons of water. 88 percent of stems were dead one year later. For dormant season basal spraying, best results were obtained when using 3 1/2 gallons of Tordon 155 Mixture to 96 1/2 gallons of oil. 88 percent of stems were dead one year later. Cost economy is the factor which makes mist blower basal applications so important. Line areas with tall, dense brush can now be handled more economically by mist blower than any other method of treatment.

1211
Tordon 155 mixture herbicide for brush control on utility rights-of-way.
AUTHOR: WILLIAMS CS
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 2(3):21-24, 1970.
YEAR PUBLISHED: 1970
CATEGORY: A5b
SPONSOR: Dow Chemical Co.
REGION: Applicable to entire United States
KEYWORDS: brush; brush control; herbicides; maintenance; picloram; right-of-way; 2,4,5-T
ABSTRACT: (Purpose) To describe the effectiveness of Tordon 155 on numerous vegetation communities in a wide array of states in the eastern US. 3 years, 1966 1969. Original field plot research. Described in general terms only. Tordon 155 was applied as a basal or an overall stem spray in oil to a variety of plant species at rates ranging from 0.5 to 3 gallons herbicide per 100 gallons of spray. Applied from May through August. Percent plant kill was estimated from four months to two years after application. (Results and Conclusions) evaluations made within the first year after application are meaningless for foliage sprays. Tordon 155 at one gallon per 100 gave good control on many species. Dormant stem treatments at the time of bud break gave better control than basal treatments. Rates of 0.5 to 1 gallon Tordon 155 per 100 gave results

1222

(original research). (Methodology) With the change from handcutting of brush to herbicidal control and mechanical control, beginning in 1955, various methods have been tried and evaluated to discover the most effective methods under different slope conditions and considering the use of the land surrounding the ROW. Methods tested and effective included bulldozing, broadcast and spot treatment with 2,4-D and 2,4,5-T, broadcast and spot treatment with picloram in pellet form. Data on percent kill and costs has been kept to identify the most effective methods. (Results and Conclusions) A realistic schedule for the application of an chemical-picloram pellets or foliage spray-is a must in order to get the most for the money spent. Yearly adjustments must be made so that the program will be effective. More information is required for good brush control than was needed previously when other methods were used. Timing of the application is very important, as is the supervision of the work.

1223
Why a right-of-way management plan?
AUTHOR: GROSS FH
AUTHOR AFFILIATION: Bonneville Power Admin.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 1(2):6-8, 1969.
YEAR PUBLISHED: 1969
CATEGORY: A5b
SPONSOR: Bonneville Power Admin.; US Dept Of Interior.
REGION: Pacific Forest STATE: Oregon; Washington
KEYWORDS: aesthetics; brush control; management; planning; public relations; right-of-way
ABSTRACT: To discuss the merits of good ROW management planning and to present the essential elements of good planning. Narrative. (Results and Conclusions) The following elements are guiding principles of the BPA management plan: (1) encourage multiple use of the land, thereby promoting conservation of natural resources; (2) determine the impact of new lines on surrounding countryside; (3) minimize erosion and stream pollution caused by new construction; and (4) present to the public ROWs which are pleasing to the eye but reliable. Each guideline is discussed.

1224
The effects of pesticides.
AUTHOR: NIERING WA
AUTHOR AFFILIATION: CT College.
SOURCE TITLE: BioScience
SOURCE ID: 18(9):869-875, 1968.
YEAR PUBLISHED: 1968
CATEGORY: A5b; B1a; B1d
REGION: Beach-Maple Forest STATE: Connecticut; United States
KEYWORDS: ecosystem; food chain; growth distortion; herbicides; impact; insecticides; pesticide; residue; spraying, selective; weeds, ecology of; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To summarize some effects of two pesticides, insecticides and herbicides, on our total environment, and to point out research and other educational opportunities for students of environmental science. (Time and Duration) Summarizes 15 years of herbicide research on ecosystems at the Connecticut Arboretum. (Type of Research) Literature review of effect of insecticides on ecosystem plus a summary of original research with herbicides at the Connecticut Arboretum. (Methodology) Literature review. (Results and Conclusions) Negative effects of insecticides on target organisms include: killing of nontarget organisms, accumulation in food chain, lowered reproductive potential, resistance to sprays, synergistic effects, chemical migration, accumulation in the ecosystem, and delayed response. Non-selective spraying of herbicides results in the removal of many desirable plants, and produces a monotonous grassy cover free of colorful wildflowers and interesting shrubs. Selective removal of undesirable plants by basal or stump treatment, following sound ecological principles, preserves wildlife and aesthetic values at a minimum long-range cost, and tends to encourage a shrub cover which resists invasion of tree species.

1225
Fate of Atrazine, Kuron, Silvex, and 2, 4, 5-T in the dairy cow.
AUTHOR: LISK DJ; ST JOHN LE JR; WAGNER DG
AUTHOR AFFILIATION: Cornell University
SOURCE TITLE: Journal of Dairy Science
CATEGORY: A5B
KEYWORDS: herbicides; impact; public health; residue; toxic hazard; 2, 4, 5-T
ABSTRACT: (Purpose) The purpose was to demonstrate the residue dynamics of the subject herbicides in cattle. The authors project their study to the possibility cattle may consume contaminated food. (Time and Duration) Six days covered in test procedures, four days of exposure, and a total of six days observations of residue dynamics. (Type of Research) Original Laboratory research; a feeding study with the pattern of herbicide elimination in urine and milk determined. (Methodology) Four cows were fed daily rations containing 5 ppm herbicide (Atrazine, Kuron, and 2, 4, 5-T) for four days. Milk samples were collected morning and evening and total daily urine excretion was also collected. These materials were analyzed for herbicide residues, primarily by gas chromatography or calorimetric procedures. (Results and Conclusions) About 1.8% of the Atrazine was excreted in urine but no residues were found in milk. Kuron was rapidly hydrolyzed to Silvex and 67% was excreted in urine and no residues were found in milk. Authors speculate feces may have contained much of the rest of the Kuron fed. 2, 4, 5-T followed a similar pattern. These results indicate that these phenoxy herbicides are rapidly excreted in urine. Residue levels in urine dropped rapidly when exposure ceased. Residues in milk are not expected. The authors speculate the atrazine was probably converted to the water-soluble Hydroxy Atrazine and excreted in urine. Atrazine [2-chloro-isopropylamino-6-ethyl-amino-s-triazine], kuron [propylene glycol butyl ether esters of 2-(2,4,5-trichlorophenoxy) propionic acid], silvex [2-(2,4,5-trichlorophenoxy) propionic acid], and 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) are often used for weed and brush control in the vicinity of forage crops. The reality of contamination of forage by drift or uptake prompted the study of the fate of these herbicides in the dairy cow.

1226
Convert R/W from woody to herbaceous cover.
AUTHOR: ASBAUGH FA
SOURCE TITLE: Electrical World.
SOURCE ID: 63, 1968 (April 1).
YEAR PUBLISHED: 1968
CATEGORY: A5b; A5e; B1a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: aesthetics; brush; cover; herbaceous; plants; right-of-way
ABSTRACT: (Purpose) To point out the changes that take place on a well managed ROW under broadcast spraying, and that these changes are not in conflict with an attractive vegetation cover. (Time and Duration) No set time period, but author's observations cover a decade or longer. (Type of Research) Observational field research (original). (Methodology) Observational research on many different ROWs showing the general trends that take place after regular broadcast sprayings, converting areas from largely woody plants to areas where herbaceous plants dominate. (Results and Conclusions) Many species of wild flowers are found along ROW areas, yet very few are found in adjacent untreated areas containing woody plants. The reason for this is that as chemicals are sprayed, woody plants die, their leaves turn brown and eventually fall. Sunlight is then able to penetrate to the ground. Flower seeds which have been lying dormant in the soil awaiting the opportunity to develop suddenly germinate, grow and flower. In other cases, flowers and ferns which have been repressed by shade of woody plants are suddenly given freedom to develop abundatly.

1227
Chemicals "cut" overhead limbs.
AUTHOR: BARKER J
SOURCE ID: 64, 67, 1968 (April 1).
YEAR PUBLISHED: 1968
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: ammate-x; chemicals; equipment; herbicides; pruning; trimming; 2,4,5-T
ABSTRACT: (Purpose) To explain the use of herbicides for removing overhanging limbs in the ROW, and the equipment that has been developed to use in these chemical trimmings operations. (Time and Duration) 8 years. (Type of Research) Original research (field). (Methodology) Overhanging limbs were doused with chemical spray. Two men working each side of the ROW cover up to five miles of line in a day. The work is done from the ground, eliminating sawing and climbing, and there is no longer need to shut down power to get at limbs hanging close to wires. Spraying may be started as soon as trees are in full leaf. Two 300 gallons John Bean sprayers which pump out 25 gallons pr minute are now used. These are trailer mounted. (Results and Conclusions) Chemical trimming has proven effective and inexpensive in side pruning trees adjacent to electric rights-of-way. These chemicals may be applied by helicopter or by ground crews. Leaves usually turn brown within hours after being sprayed. Limbs gradually die back from the tip to the point where spraying stopped and drop off in sections during the winter. By spring most of these limbs have fallen off.

1228
Growth analysis of red maple and white ash seedlings treated with eight herbicides.
AUTHOR: PERRY PW; UPCHURCH RP
AUTHOR AFFILIATION: NC Agricultural Experiment Station.
SOURCE TITLE: Weed Science.
SOURCE ID: 16(1):32-37, 1968.
YEAR PUBLISHED: 1968
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: ammonium sulfamate; herbicides; phytotoxicity; trees; 2,4,5-T; 2,4,5-TP

ABSTRACT: (Purpose) To test eight technically pure herbicides for their relative phytotoxicity to hydroponically-grown seedlings of red maple and white ash. (Time and Duration) One year. (Type of Research) Original research. (Methodology) Six of the herbicides (acids) were prepared as the triethylamine salts to provide formulation uniformity. Foliar treatments were applied with a 50ml chromatographic atomizer using 4ml of treatment solution per plant. Root treatments were made by pipetting the herbicides directly into the culturing jars. A shoot rating system and plant dry weight were used in evaluating treatments. Each seedling was rated on a classification of 1 to 5 indicating no damage to dead plants, respectively. (Results and Conclusions) The 2,4,5-trichlorinated phenoxyaliphatic acids. 2,4,5-T, 2,4,5-TP, were consistently more toxic on a mole basis when applied to the roots of both species than when applied to the shoots. The opposite effect was observed with ammonium sulfamate where shoot treatments were always more toxic. Shoot and root treatments were equally effective for the compounds 2,4-D, dicamba, picloram and amitrole. Differential species susceptibilities to certain compounds were observed.

1229

Herbicide combinations for woody plant control.

AUTHOR: BOVEY RW; DAVIS FS; MORTON HL
AUTHOR AFFILIATION: US Agricultural Research Service.
SOURCE TITLE: Weed Science.
SOURCE ID: 16(3):332-335, 1968.
YEAR PUBLISHED: 1968
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; picloram; picloram + 2,4,5-T; 2,4,5-T
ABSTRACT: (Purpose) To test the effectiveness of picloram alone, and of picloram/2,4,5-T and picloram/paraquat combinations in controlling certain hard-to-kill woody plants. (Time and Durations) Two-year study (1964-1966). (Type of Research) Original research (both greenhouse and field tests). (Methodology) All herbicides were sprayed on 22 by 100 foot, or 22 by 200 foot field plots with a truck mounted sprayer. Herbicides were applied in water using a surfactant. Brush, 6 to 12 feet tall, was treated. Similar herbicide combinations were applied to greenhouse-grown plants. Herbicide effectiveness was measured by estimating percentage defoliation 1 or more years after treatment. (Results and Conclusions) Picloram/paraquat combinations improved the control of some species, such as yaupon, over picloram alone at equal rates; but it had an antagonistic effect on huisache and honey mesquite. Evaluations of picloram/2,3,5-T combinations suggested that 2,4,5-T sometimes could be added in equal amounts to picloram to increase control or reduce picloram rates proportionately on huisache, honey mesquite and live oak.

1230

Herbicides and their toxicity to livestock.

AUTHOR: MCINTOSH IG
AUTHOR AFFILIATION: ANZIC, Wallaceville Animal Research Centre.
SOURCE TITLE: New Zealand Veterinary Journal.
SOURCE ID: 15:70-72, 1967.
YEAR PUBLISHED: 1967
CATEGORY: A5b
REGION: Applicable to entire United States
KEYWORDS: herbicides; impact; livestock; toxicity
ABSTRACT: A discussion of toxicity of herbicides to livestock. (Type of Research) Literature review. (Results and Conclusions) Only two herbicides are considered liable to be directly toxic, sodium arsenite and dinitro-butyl phenol. As hormone weed killers can make plants attractive to livestock, it is considered wise not to leave cattle where 2,4,5-T has been sprayed on tutu, hemlock, and thistles. Correct use of weedkillers is necessary to these assessments.

1231

Effects of some herbicides on fertilized fish eggs and fry.

AUTHOR: HILTIBRAN RC
AUTHOR AFFILIATION: IL Natural History Survey.
SOURCE TITLE: American Fisheries Society Transactions.
SOURCE ID: 96:414-416, 1967.
YEAR PUBLISHED: 1967
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: fish; herbicides; impact; 2,4-D; 2,4,5-T; 2,4,5-TP
ABSTRACT: (Purpose) To determine the effects of 2,4,5-T, 2,4,5-TP, sodium endothall, dalapon, and 2,4-D, on the development of fertilized fish eggs and fry. (Time and Duration) One year (1966). (Type of Research) Original research (laboratory). (Methodology) Sexually ripe male and female fish from the same body of water were brought to the lab and the eggs fertilized. After the eggs were hatched, the number in each test jar was determined. Concentrations of herbicides were added to each jar containing 10 fry. Controls were used in all experiments, and two or more experiments were run for each herbicide concentration. Since exposure of fertilized eggs to herbicides did not prevent their development, only fry were used in the later experiments. (Results and Conclusions) Apparently the fry were more subsceptible to the toxic action of some herbicides than were fertilized eggs. Concentrations above 5 ppm of silvex and 10 ppm of fenuron TCA reduced the number of fry produced from fertilized eggs, suggesting that high dosages of some herbicides does affect fry development. When water soluble derivatives of silvex, 2,4,5-T and 2,4-D were used, the toxicities of these herbicides to the fry and adult fishes were less than their ester derivatives. Endothall, because of its low toxixicity to fish, eggs, and fry, and rates of aquatic use, appears to be one of the safest herbicides to use during the spawning season.

1232

Control of woody and herbaceous vegetation with soil sterilants.

AUTHOR: BOVEY RW; DAVIS FS; MEYER RE
AUTHOR AFFILIATION: Texas A & M Univ.
SOURCE TITLE: Weeds
SOURCE ID: 15:327-330, 1967.
YEAR PUBLISHED: 1967
CATEGORY: A5b
REGION: Oak + Bluestem Parkland STATE: Texas
KEYWORDS: brush; brush control; soil sterilants
ABSTRACT: (Purpose) To find the effectiveness and residual properties of several soil sterilant herbicides on a variety of woody plants and associated vegetation. (Time and Duration) Two-year study; 1964-1966. (Type of Research) Original research (field study). (Methodology) Field plots were established at five locations in Texas. In Victoria a thick stand of live oak, 3-6 feet tall was used. At the Refugio site, huisache and honey mesquite were the major woody species on the plots. Near Llano the primary brush species was white brush with scattered mesquite and persimmon. The predominant brush at the Caroos site were yaupon, post oak and blackjack oak. At Livingston the main brush species was sumac. Bromacil, fenuron, fenuron-TCA, monuron TCA, prometone and picloram were tested. (Results and Conclusions) A majority of the herbicides controlled most brush species. However, bromacil, prometone and picloram were most effective at all locations. Most herbicides controlled herbaceous vegetation for one year or less. Bromacil controlled herbaceous vegetation for approximately two years at most locations.

1233

An improved helicopter system for the aerial application of sprays containing TORDON 101 mixture particulated with NORBAK.

AUTHOR: BYRD B C; DAVIDSON JH; REIMER CA
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Down to Earth.
SOURCE ID: 22(1) :3-6, 1966.
YEAR PUBLISHED: 1966
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; picloram + 2,4-D
ABSTRACT: (Purpose) To present information on spray drift control, especially with particulated sprays, using a newly-developed helicopter-boom system. (Time and Duration) About 10 years of development. (Type of Research) Original research. (Methodology) Basic research included consideration of mechanical, physical and chemical factors affecting droplet formation and movement. This led to the use of a small wind tunnel to study the drift potential inherent in different methods of viscosity modification as opposed to particulated, which in turn, led to the development of mathematical equations. To determine spray movement in the wind tunnel quantitatively a suitable tracer dye was used. (Results and Conclusions) Tordon 101 mixture (picloram + 2,4-D) particulated with Norbak and applied through the system described provides a new tool for effective aerial herbicide application. Although this system permits more precise spray placement by the pilot, it is still imperative that the operator exercise continuous care to follow all precautions used in the past to insure a minimum spray drift outside the target area.

1234

Degradation of 2,4-D and 2,4,5-T in forest litter.

AUTHOR: NORRIS LA
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Journal of Forestry.
SOURCE ID: 64(7):475-476, 1966.
YEAR PUBLISHED: 1966
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: degradation; forest; forest litter; herbicides; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To determine the rates and pathways of degradation of 2,4-D and 2,4,5-T in the litter layers of the forest, and the forms of herbicides and their metabolites which might move into streams. (Time and Duration) One-year study. (Type of Research) Original research (laboratory). (Methodology) One inch of forest litter, collected from an

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alder stand in western Oregon, was placed on an elevated platform in a three liter glass chamber which served as a respiration study chamber. The triethanol amine salt of labeled 2,4-D or 2,4,5-T was applied in water to the surface of the litter at two pounds acid equivalent per acre. Carbon dioxide free air was introduced into the system, and outgoing air was tested for carbon dioxide content. (Results and Conclusions) The herbicides 2,4-D and 2,4,5-T are degraded in forest litter at different rates. 2,4-D is metabolized at an increasing rate with time while the rate of degradation of 2,4,5-T shows only a slight increase. More than 85 percent of the 2,4-D was decarboxylated in 300 hours. Less than 25 percent of the 2,4,5-T was decarboxylated in the same period.

1235
Aerial spraying of low-grade hardwood stands with 2,4,5-T in West Virginia.
AUTHOR: WENDEL GW
AUTHOR AFFILIATION: US Forest Service Northeastern Forest Experiment Station.
SOURCE ID: Upper Darby, PA, US Forest Service Research Note NE45, 1966, 4 p.
YEAR PUBLISHED: 1966
CATEGORY: A5b
REGION: Appalachian Oak Forest STATE: West Virginia
KEYWORDS: communities; ecosystem; herbicides; impact; trees; 2,4,5-T
ABSTRACT: (Purpose) To describe the results of an aerial application of 2,4,5-T by helicopter to a hardwood stand on a site where partial conversion to white pine by aerial seeding is planned. (Time and Duration) One-year study. (Type of Research) Original research (field study). (Methodology) Two cutover plots and two uncut plots, each 8 acres in size, located near each other on a steep southwest-facing slope, were sprayed by helicopter with 2 lbs of 2,4,5-T acid equivalent per acre in oil (iso-octyl ester formulation). A conventional boom-type spray rig was used. Twenty-five 4- by 5-inch oil-sensitive cards were placed in a line at 20-foot intervals to check on the distribution of the herbicide. A year later the plots were checked to determine the effectiveness of the herbicide treatment. (Results and Conclusions) The overall killing effect of the spray on the overstory was good. It was most effective on the four oak species; more than 90% of the trees were dead or severely defoliated. Red maple, black locust and basswood were the next most susceptible group; 69% dead or severely defoliated. Sugar maple was intermediate; 39% dead or severely defoliated. The hickories, serviceberry, dogwood, and hawthorn showed no damage. Pitch pine and Virginia pine showed no effect from the spraying. No relationship between tree size and susceptibility to the spray treatment was apparent.

1236
4-amino-3,5,6 Trichloropicolinic acid pellets for brush control in the northeastern United States.
AUTHOR: SCHWARTZBECK RA
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 19:385-392, 1965.
YEAR PUBLISHED: 1965
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: brush; checklist; herbicides; pellets; picloram; right-of-way; species
ABSTRACT: (Purpose) To give results of experiments using picloram pellets to control woody species on electric rights-of-way, and some of the precautions that must be followed for effective control. (Time and Duration) Two-year study. (Type of Research) Original research (field). (Methodology) Tordon 10K pellets containing 10% tordon as the potassium salt incorporated in extruded clay pellets were distributed by hand in early spring to duplicate 5000 square foot plots at rates of 3.0, 4.5, 6.0, 7.5 and 8.0 pounds acid equivalent per acre. Observations were made throughout the balance of the year through the following year's growing season. In two other locations applications were made throughout the year. The major species used in this study were 2 to 12 feet tall, and included both deciduous trees and conifers. (Results and Conclusions) Tordon pellets are effective for the control of woody plants when applied to soil in the root zone. Pelleted formulations are easily applied by hand or mechanical equipment, either as broadcast application or spot treatment. Both of these applications, when made during spring or early summer, are more effective than applications made during other seasons. Rainfall following treatment is needed to obtain maximum control.

1237
Herbicides pose no threat except to vegetation.
AUTHOR: LINCICOME RA
AUTHOR AFFILIATION: Electric Light & Power magazine.
SOURCE TITLE: Electric Light & Power
SOURCE ID: 43(3):1-4, 1965.
YEAR PUBLISHED: 1965
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; toxicity; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To discuss various controversial topics related to herbicide use on ROWs to show that, when properly used, they present no real problem to animals and man. (Type of Research) Literature review. (Methodology) Such questions as herbicide safety, laboratory research on toxicity, herbicide use on ROWs, and toxicity levels, are discussed in light of the most recent literature. (Results and Conclusions) Misinformation about utility use of herbicides on ROWs poses public-relations problems more than two years after "Silent Spring." Rachel Carson's book condemning the use of pesticides shocked the nation. Continued opposition to herbicide brush control now is strengthening and could present legal problems for utility managers.

1238
Persistence and biological reactions of pesticides in soils.
AUTHOR: ALEXANDER M
AUTHOR AFFILIATION: Cornell Univ.
SOURCE TITLE: Soil Science Society of America Proceedings
SOURCE ID: 29:1-7, 1965.
YEAR PUBLISHED: 1965
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: degradation; herbicides; persistence; soils
ABSTRACT: (Purpose) To discuss the persistence and biological reactions of pesticides in soils, and the possibility of altering molecular configuration of certain pesticides so they do not build up in soils or break down into harmful residues. (Type of Research) Literature review. (Methodology) The author discusses such topics as pesticide persistence, structure and biodegradability, metabolism of pesticides, and microbial fallibility. Particular concern is expressed for those agricultural pesticides that do not break down readily; a group that contains many synthetic chemicals that enter the soil. (Results and Conclusions) Although microorganisms are often considered to be omnivorous and biochemically omnipotent, they seem unable to destroy at significant rates many synthetic chemicals that enter soil. This unexplained microbial fallibility recently has assumed prominence because of the long persistence of a variety of pesticides. With at least certain compounds, the chemical, physiological, or environmental basis of the biological failings can be established, as illustrated with substituted phenols and phenoxy herbicides. Microorganisms may detoxify pesticide-treated soil by metabolizing or degrading the added substance.

1239
Effects of the herbicide silvex on benthos of a farm pond.
AUTHOR: CAMPBELL RS; HARP G
AUTHOR AFFILIATION: Univ of MO.
SOURCE TITLE: Journal of Wildlife Management.
SOURCE ID: 28(2) : 308-317, 1964.
YEAR PUBLISHED: 1964
CATEGORY: A5b; B1
SPONSOR: Univ of MO.
REGION: Oak-Hickory-Bluestem Parkland STATE: Illinois; Missouri
KEYWORDS: benthos; community structure; environmental assessment; herbicides; impact; pollution, water; pond; toxic hazard; toxicity
ABSTRACT: (Purpose) To describe the composition and density of benthos community in a farm pond and to enumerate the changes in the community after treatment with silvex herbicide. (Time and Duration) 7 months ending early 1962. (Type of Research) Original research conducted in the field. (Methodology) The benthic community of a 0.26 acre pond was described and then seven plastic enclosures were placed in the pond. Individual enclosures were treated with various levels of silvex as the potassium salt. At intervals after treatment benthos were again sampled and described. (Results and Conclusions) There was a pronounced decline in the plant biomass in the treated enclosures. Different treatments gave different degrees of plant control. Extensive numerical data on species composition and density for benthos is given in the paper. Benthos varied both with pond depth and season of the year. There was a marked numerical increase in benthos in the silvex treated enclosures. Not all species were affected equally. The authors attribute the numerical increase to enrichment from decaying vegetation killed by the herbicide. Snails and Chrysops are detritus feeders. Their levels were reduced by herbicide treatment, but 11 months after treatment they were recovering.

1240
A substitute for 2,4,5-T in eastern hardwood sprout and brush control.
AUTHOR: CAMPBELL J; PATRIC JH
AUTHOR AFFILIATION: (US Forest Service) Northeastern Forest Experiment Station.
YEAR PUBLISHED: 1964
CATEGORY: A5b

REGION: Appalachian Oak Forest STATE: West Virginia
KEYWORDS: brush; herbicides; trees; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To report on an herbicide mixture that could be used in place of 2,4,5-T, due to the shortage of 2,4,5-T for civilian use during the Viet Nam war. (Time and duration) One-year study. (Type of Research) Original research (field study). (Methodology) A mixture of TBA, 2,4-D and 2,4-DP was prepared using 1.0 ae pounds per gallon of TBA; 1.0 ae pounds per gallon, 2,4-D; and 0.75 ae pounds per gallon of 2,4-DP. The herbicides were amine formulations that minimized problems of volatility. 130 gallons per acre of this mixture, or 32.5 lbs. acid equivalent, was used to control a variety of hardwoods and deciduous shrubs. 130 gallons per acre of the same mix, used twice during the season at 10 lbs acid equivalent, was also tested. (Results and Conclusions) This study suggests that the mixture of TBA, 2,4-D and 2,4-DP is at least as effective as 2,4-D and 2,4,5-T for controlling revegetation after clearcutting of eastern hardwoods. Timing of application may be fully as critical as the herbicide concentration. For optimum control, two applications of the mix at 10 lbs ae in 130 gallons of water per acre was used. The first application should come as soon as leaves are fully developed, and the second application in late summer.

1241

Right-of-way maintenance with selective brush management.
AUTHOR AFFILIATION: WI Natural Resources Committee of State Agencies.
SOURCE ID: Madison, WI, WI Natural Resources Committee of State Agencies, 1964, 22 p.
YEAR PUBLISHED: 1964
CATEGORY: A5b
REGION: Applicable to entire United States STATE: Wisconsin
KEYWORDS: brush; maintenance; management; right-of-way; spraying, selective
ABSTRACT: (Purpose) To describe a practical approach to the management of ROWs for multiple use, recognizing that scenic areas are in great demand and that wildlife and pollinating insects are in short supply. (Time and Duration) Results of 10 years of study and observation. (Type of Research) Literature survey and observations. (Methodology) This study was based on the agreement of the agencies represented on a Working Group appointed by the Natural Resources Committee of State Agencies. The results are largely the best thinking of the members of this Group, all of whom had some experience in weed control and brush management on road, power, and communication line ROWs. A pilot field study was then established to test the feasibility and costs of their recommendations. (Results and Conclusions) Through selective brush management programs: 1) trees which grow into power and communication lines and which in some sites shade roads, resulting in icy conditions, can be eliminated in ROWs; 2) valuable shrubby cover for wildlife and pollinating insects will increase and help to prevent further tree encroachment; 3) exposed soils will be covered as low-growing shrubs and woody vines develop; 4) noxious weeds can be controlled; 5) herbaceous plant species will not increase but will gradually give way to low-growing shrubs; and 6) selective brush management can be considerably less expensive than other practices.

1242

"Program, methods and results of 10 years of chemical brush control by Central Hudson Gas & Electric Corporation""
AUTHOR: ABBOTT RE
AUTHOR AFFILIATION: Central Hudson Gas and Electric Corp.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 17:360-364, 1963.
YEAR PUBLISHED: 1963
CATEGORY: A5b
REGION: Appalachian Oak Forest STATE: New York
KEYWORDS: ammonium sulfamate; brown out; brush; herbicides; impact; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To describe the evolution of the present ROW vegetation management practices on the transmission and distribution line areas of Central Hudson Gas and Electric Corporation. (Time and Duration) 25 years of experience. (Type of Research) Original research. (Methodology) Beginning in 1952 a dormant selective basal spray was adopted on transmission lines. This method involved using combinations of 2,4,5-T. Since 1955, all brush control on transmission ROW areas has been by chemical methods. On distribution lines selective basal spray is used to minimize brown out and remove only those species that grow tall enough to interfere with the distribution line. In order to program and evaluate brush control, each year all transmission lines are reviewed on the routine monthly right-of-way patrol. (Results and Conclusions) A series of test plots utilizing several chemical growth inhibitors has been under observation for several years. Results have been encouraging and more tests are planned. Chemical spraying has drastically reduced the costs of brush control. In the future it is possible that chemical growth inhibitors may have the same effect on tree trimming costs. The chemical techniques used are effective and there has been excellent public acceptance of the program, costs, and a marked reduction in the interruptions of electric service.

1243

Vegetation changes and animal use of a power line right-of-way after the application of an herbicide.
AUTHOR: GYSEL LW
AUTHOR AFFILIATION: MI State Univ.
SOURCE TITLE: Down to Earth.
SOURCE ID: 18(1):7-10, 1962.
YEAR PUBLISHED: 1962
CATEGORY: A5b; B1; E3; E4
SPONSOR: MI State Univ.
REGION: Laurentian Mixed Forest STATE: Michigan
KEYWORDS: animals, wild; birds; habitat; habitat change; herbicides; impact; right-of-way; 2,4,5-T
ABSTRACT: (Purpose) To establish changes in various vegetation communities and indications of animal use of ROW areas after spraying with 2,4,5-T. (Time and Duration) Four years, 1957-1961. (Type of Research) Original field plot research. (Methodology) A one mile section of ROW was treated with 2,4,5-T as a broadcast spray, 100 gallons per acre of low volatile ester. Eight plant communities were delineated and mapped, and 70 permanent plots were established for noting plant cover, number of stems, height and diameter of trees and shrubs. Animal census work involved visual sightings and snap and box trapping. (Results and Conclusions) Detailed narrative observations of changes in specific plant communities are in the text. The most marked change in plant density and species composition occurred in communities of sassafrass treated with foliage sprays. Only minor changes occured in communities where basal applications were made. Sixteen species of mammals and 19 species of birds were recorded. Animals were in all plant communities both treated and untreated.

1244

Toxicology of herbicides.
AUTHOR: MIKKELSEN DALGAARD SV; POULSEN E
AUTHOR AFFILIATION: Royal Veterinary & Agricultural College Denmark
SOURCE TITLE: Pharmacological Review
SOURCE ID: 14:225-250, 1962.
YEAR PUBLISHED: 1962
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; toxicity
ABSTRACT: (Purpose) To review the toxicology data on herbicides, using for this survey a classification according to chemical configuration. (Time and Duration) Literature survey covering articles spanning a 30 year period. (Type of Research) Literature survey. (Methodology) The authors review the toxicology data on: 1) Inorganic herbicides, arsenites, sodium chlorate and sulphuric acid; 2) Organic herbicides, chlorinated phenoxy-acids, chlorinated aliphatic acids and their sodium salts, carbamates and allyl alchohol, substituted ureas, triazines, substituted phenols; and 3) Miscellaneous organic herbicides, tributyl phosphoro-trithioate, maleic hydrazide, endothal sodium, diquat and aminotriazole. (Results and Conclusions) It is important that attention not be confined to the toxicity of the original compounds. Their influence on plant metabolism might, for instance, block synthetic chains, leading to the accumulation of endogenous toxic products in vegetables. In this respect it has been shown that 2,4-D, applied in subtoxic amounts to such plants as sugar beets, increases the concentration of nitrate to twenty times the normal level. Consequently, feeding with the foliage involves a risk of poisoning. A knowledge of persistent metabolites in crops for consumption especially will be of great importance in studying long-term actions, including carcinogenic effects.

1245

AUTHOR: MCQUILKIN WE; STRICKENBERG LR
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Upper Darby, PA, Northeastern Forest Experiment Station, 1961, Station Paper No 148, 24 p.
YEAR PUBLISHED: 1961
CATEGORY: A5b
REPORT NUMBER: NE148
REGION: Laurentian Mixed Forest STATE: United States
KEYWORDS: brush; forest; herbicides; right-of-way; roadside; 2,4,5-T
ABSTRACT: (Purpose) To give a resume of the testing phase of the roadside brush control program in regard to chemicals and application methods; a description of the equipment used; and a general appraisal of

1245

chemical control in practice on the eastern national forests. (Time and Duration) Summary of results over a 7-year period. (Type of Research) Original research (field). (Methodology) 2,4,5-T was the herbicide used in these tests. Beginning in 1953 roadside work with water-foliage sprays (4 pounds ahg) and oil-basal sprays (12 pounds) were started in Virginia, Kentucky, and West Virginia. July, November and March applications were tried. Treatment units in all these tests included several miles of roadside, enough to provide some preliminary indications of time and cost. Altogether some 78 miles of roadside were treated in these tests. Selective spraying was used whenever possible. Spraying was done with manually operated nozzles by men on foot. (Results and Conclusions) Roadside brush can be satisfactorily controlled by an oil-basal spray of 2,4,5-T, selectively applied, and the costs are less than those for annual mowing. Relatively simple modifications of standard model, slip-on fire pumpers have been perfected for converting the pumpers into power sprayers. Most properly sprayed roadsides can stand at least 5 years, and often longer, before retreatment is required. With a 5-year interval, brush control costs with chemicals are averaging about 40% less than mowing costs.

1246
Vegetation management on utility rights-of-way.
AUTHOR: BYRNES WR
AUTHOR AFFILIATION: PA State Univ.
SOURCE TITLE: Recent advances in botany.
SOURCE ID: 12:1426-1430, 1961.
YEAR PUBLISHED: 1961
CATEGORY: A5b; B1
SPONSOR: PA State Univ.
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: brush control; community structure; ecological: ecology, applied; herbicides; management; right-of-way; succession; vegetation
ABSTRACT: (Purpose) The purpose of this paper is to review the techniques being used for chemical brush control in 1961 and to report the effects of chemical treatments on vegetative communities in central PA, including herbicide efficacy and changes in community structure. (Time and Duration) 8 years: 1953 to 1961. (Type of Research) Review of current (1961) practices and original field plot research. (Methodology) Review of current practices is narrative with no citations. In the community structure study, before and periodically after application of six commercial vegetation control techniques (five chemical, one mechanical), percent ground cover and species composition were recorded. (Results and Conclusions) Prior to 1946 mechnical techniques were used almost exclusively to control vegetation on rights-of-way. About 150 acres were sprayed chemically in 1946, and more than 500,000 acres were sprayed in 1958. Broadcast foliage, stem-foliage basal, cut stump, and soil application techniques are described. In the vegetation community structure test, phenoxy herbicides and ammate were the primary treatments employed. The nature of the communities formed and their structure eight years after application are described in narrative. No quantitative data is given. The author notes that the long term trend on all plots has been toward the development of a plant community similiar to the one existing before spraying.

1247
Effects of rights-of-way techniques on vegetation.
AUTHOR: ARNER DH
AUTHOR AFFILIATION: Soil Conservation Service.
SOURCE TITLE: Transactions of the North American Wildlife Conference.
SOURCE ID: 25:378-386, 1960.
YEAR PUBLISHED: 1960
CATEGORY: A5b; A5d; A5f
REGION: Eastern Deciduous Forest STATE: Alabama; Maryland; Pennsylvania; West Virginia
KEYWORDS: chemicals; costs; fertilization; impact; maintenance; revegetation; right-of-way; wildlife
ABSTRACT: (Purpose) To illustrate the effects of various ROW management techniques on the vegetation that eventually dominates these areas, and to evaluate these plants for wildlife value. (Time and Duration) 12 years. (Type of Research) Original research. (Methodlogy) To find practical and economical maintenance techniques that would serve the dual purpose of (1) retarding the invasion of woody plants, and (2) providing highly nutritious food for wildlife, the following were tried: bulldozing and seeding with various seed mixtures; use of cultivator and heavy duty brush mower with seed and fertilizer; use of pelleted and unpelleted seeds on areas previously sprayed with herbicides; and use of controlled burning, fertilizer, and seed. (Results and Conclusions) A greater amount of nutritious wildlife food can be produced and a more economical reduction of woody plants obtained through the use of mechanical equipment (Bulldozing and cultivator) or controlled burning when these are combined with the use of fertilizer and seed, than with any other techniques now in current use. Before selecting the proper ROW managment techniques, topographic conditions, types and quality of vegetation present, width of the ROW, and the landowners' desires must be taken into consideration.

1248
Aerial application of herbicides for right-of-way brush control.
AUTHOR: BENNETT JM; GRUNDY WM
AUTHOR AFFILIATION: Hydro-electric Comm of Ontario.
SOURCE TITLE: Down to Earth
SOURCE ID: Pages 6-10, 1960 (Fall).
YEAR PUBLISHED: 1960
CATEGORY: A5b
SPONSOR: Hydro-electric Comm of Ontario.
REGION: Applicable to entire United States
KEYWORDS: aerial; application methods; brush; brush control; herbicides; right-of-way
ABSTRACT: (Purpose) To describe the history and current methods (1960) of chemical brush control on Ontario Hydro ROWs. (Time and Duration) 9 years; 1951-60. (Type of Research) Not research; narrative of company operations. (Methodology) Narrative. (Results and Conclusions) Author describes the development of the Company's chemical brush control program from 1951 to about 1960. Author then describes the equipment, spray materials and mixtures, spray operations, results, and costs of the current program involving aerial application of herbicides. Author notes helicopters are used primarily in the more remote locations with ground spray equipment predominating in the more settled areas of the province.

1249
The key to effective basal spraying of woody plants: wet the root collar.
AUTHOR: MCQUILKIN WE
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Journal of Forestry.
SOURCE ID: 55(2):143-144, 1957.
YEAR PUBLISHED: 1957
CATEGORY: A5b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; spraying, basal; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To explain the correct technique for obtaining good results from basal spraying of woody plants, and also to explain reasons for differences in percentage kills between species. (Time and Duration) One-year (1953). (Type of Research) Original research (field). (Methodology) Fifteen scrub oak clumps with root crowns exposed by scraping away litter and the upper 1 to 2 inches of soil were wetted on top and sides with herbicide spray, using 2,4,5-T ester at 8 pounds acid equivalent per 100 gallons of diesel oil. A similar number of clumps were treated without exposing crowns, but with conscious effort to get run-down over and around the crown to all areas possibly having dormant buds. Fifteen other clumps were treated without exposing crowns, according to usual procedure, spraying only the lower 12-18 inches of the base. (Results and Conclusions) The most effective treatments were where the root crown was exposed by scraping away the litter and the upper 1 to 2 inches of soil, and where the top and sides of root crowns were thoroughly wetted. However, where root crown was not exposed but a conscious effort was made to get run-down over and around the crown, excellent control was obtained. Thus, it is important to apply herbicide solution so that all dormant buds at and below the ground line, are treated with chemical during basal spraying.

1250
Recent advances in woody brush control on rights-of-way.
AUTHOR: BRAMBLE WC
AUTHOR AFFILIATION: PA State Univ.
SOURCE TITLE: National Shade Tree Conference.
SOURCE ID: 33:180-185, 1957
YEAR PUBLISHED: 1957
CATEGORY: A5b
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: brush; herbicides; right-of-way; spraying, basal; spraying, broadcast; spraying, foliage
ABSTRACT: (Purpose) To describe present spraying application methods of value on electric ROWs, and to suggest a standardized nomenclature for these application methods to avoid confusion in the literature. (Type of Research) Literature survey and experience (field). (Methodology) The author explores the present methods of herbicide application to vegetation on electric rights-of-way, and under which conditions each is most effective. He suggests that the terms broadcast foliage spray, stem-foliage spray, and basal spray be adopted for these application methods to avoid confusion in the literature. The characteristics, effects, and proper chemicals to use with each method are discussed. (Results and Conclusions) A number of chemical spraying techniques have come into common use in the past decade, for which a definite set of terms has not yet been commonly accepted. As a result, a number of different names have been applied to the same technique and the same name has been used for vastly different techniques. This has caused confusion in both scientific circles and in practice. The author proposes the terms: broadcast foliage spray, stem-foliage spray, semi-basal spray, and basal spray for these application methods.

1251
Stimulating regrowth of mountain maple for deer browse by herbicides, cutting, and fire.
AUTHOR: HANSEN HL; KREFTING LW; STENLUND MH
AUTHOR AFFILIATION: US Fish and Wildlife Service.; Univ of MN.; MN Div of Game and Fish
SOURCE TITLE: 20(4):434-441,. 1956.
YEAR PUBLISHED: 1956
CATEGORY: A5b; B1e; E3; E4
SPONSOR: Univ of MN. MN Div of Game and Fish.; US Fish and Wildlife Service.
REGION: Laurentian Mixed Forest STATE: Minnesota
KEYWORDS: animals, game; clearing; community sturcture; deer; food; habitat manipulation; herbicides; mammals, big game; wildlife; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To evaluate the effectiveness of several herbicides, fire and cutting in reducing the regrowth of mountain maple, and to determine if deer would browse on the regrowth. (Time and Duration) Some treatments and observations span 20 years; herbicide treatments cover a two year period. Study completed in 1955. (Type of Research) Original field plot research. (Methodology) The herbicides 2,4-D and 2,4-5-t applied as basal or stem sprays in diesel oil, diesel oil alone, a propane torch and axe cutting were used to top kill mountain maple in the hopes of stimulating sprout regrowth which would be used for browse by deer. The number of stems produced and the height of regrowth were used to evaluate browse production. Deer browsing was also reported but the methods for measuring were not reported. (results and conclusions) At early bud burst time, 2,4-D was better than 2,4,5-t, and stem sprays were better than basal sprays in stimulating browse production. Heavier herbicide applications promoted more browse production. Fire treatments were not particularly effective, but they were essentially nothing more than a heat girdling technique. Axe cutting produced the most regrowth. After cutting not only were the sprouts used for food, but the tops of felled trees were used also. Deer used all browse available and showed some preference for herbicide treated clumps.

1252
Creating and maintaining wildlife openings in wooded areas by use of herbicides.
AUTHOR: RUCH LC
AUTHOR AFFILIATION: MI Dept of Conservation.
SOURCE TITLE: Down to Earth.
SOURCE ID: 12(4):2-3, 16, 1956.
YEAR PUBLISHED: 1956
CATEGORY: A5b; B1
SPONSOR: MI Dept of Conservation.
REGION: Laurentian Mixed Forest STATE: Michigan
KEYWORDS: animals; clearing; community structure; habitat manipulation; herbicides; maintenance; wildlife
ABSTRACT: (Purpose) To discuss the use of herbicides for manipulating animal habitat. (Time and Duration) 1954-56. (Type of Research) Observations of herbicide use. (Methodology) Describes operational use of herbicides for title subject. (Results and Conclusions) Not a data paper. Primarily a narrative on the specific equipment and logistics of herbicide use for creating openings for game use. Several observations are made regarding the particular effects of 2,4-D and 2,4,5-T on specific types of vegetation. No data or observations are offered on the effects of such treatments on animals, or their use of treated areas.

1253
Right-of-ways management: a growing problem.
AUTHOR: GROVE AR
AUTHOR AFFILIATION: PA State Univ.
SOURCE TITLE: Virginia Wildlife.
SOURCE ID: 10-11, 1956 (August).
YEAR PUBLISHED: 1956
CATEGORY: A5b; A5e; A5f
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; management; right-of-way; spraying, broadcast; spraying, selective; succession
ABSTRACT: (Purpose) To compare the benefits of blanket (broadcast) spraying with selective spraying, including economic, aesthetic, and wildlife benefits. (Type of Research) Observational study not based on studies of the author. Would probably classify as a literature review. (Methodology) The article was written after the author made a field trip to the Bald Eagle Forest Area in Pennsylvania. He observed blanket-sprayed areas and selectively sprayed areas. (Results and Conclusions) Selective spraying improved the appearance of the rights-of-way, provided more food for wildlife, decreased fire danger by providing a living plant cover, caused less erosion. The shrub cover present in the selectively sprayed areas competition preventing the reinvasion of tree seedlings. As this was achieved at the same or less cost to the utility, there should be little argument that selective spraying is much more sensible than blanket spraying.

1254
effect of certain common brush control techniques and materials on game food and cover on a power line right-of-way. No. 1.
AUTHOR: BRAMBLE WC; BYRNES WR
AUTHOR AFFILIATION: PA state Univ.
SOURCE ID: State College, PA, PA State Univ. Agricultural Experiment Station, 1955, Progress Report 126, 4 P.
YEAR PUBLISHED: 1955
CATEGORY: A5b
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: brush; cover; food; impact; right-of-way; wildlife
ABSTRACT: (Purpose) To discuss the results of several common herbicides and spray techniques on game food and cover. (Time and Duration) One-year study. (Type of Research) Original research (field study). (Methodology) The six treatments used were: No spray (control); broadcast foliage (D + T) in water carrier; summer basal spray (D + T), oil and water carrier; general summer basal spray (D + T) in oil carrier; selective winter basal (T) in oil carrier; and broadcast foliage spray (Ammate) in water carrier. These treatments were applied between June 9 and July 1, 1953. Within each treatment, two types of sample plots were used for detailed analysis of the plant communities on treatment areas. (Results and Conclusions) All sprays caused foliage kill of from 80 to 100 percent, but stem kill varied. The highest percent of stem kill was obtained from the summer and winter basal sprays with the highest number of seedlings and single sprouts being missed in the winter application.

1255
Frill treatment with 2, 4, 5-T and 2, 4-D effective for killing Northern Hardwoods.
AUTHOR: MCQUILKIN WE
AUTHOR AFFILIATION: US Forest Service
SOURCE ID: Upper Darby, PA, US Forest Service Northeastern Forest Experiment Station, 18 p.
CATEGORY: A5B
KEYWORDS: application methods; brush control; herbicides; trees; 2, 4, 5-T
ABSTRACT: (Purpose) The purpose of this paper is to report on the efficacy of various methods for applying 2, 4, 5-T for timber stand improvement work. (Time and Duration) 3 years; 1952-1955. (Type of Research) Original field research. (Methodology) 2, 4-D and/or 2, 4, 5-T were applied by frilling, painting, basal spraying, and some minor modifications of these techniques. Oil and water carriers were compared as were two concentrations of herbicides. A variety of hardwood species were included. Precent kill was tallied at the end of three growing seasons. (Results and Conclusions) The frill method was most effective. A combination of 2, 4-D and 2, 4, 5-T was as effective as 2, 4, 5-T alone. Eight lbs. acid equivalent per 100 gallons was as effective as 24 lbs. Oil was the better carrier. Beech, Red Maple, and Sugar maple were more resistant than all other species, most of which were quite sensitive. In resistant species larger trees were harder to kill. Winter treatments were less effective. Authors make following recommendation: with mixed species and sizes of Northern Hardwoods, top kills of 85% may be expected after frill treatments with 2, 4, 5-T at 8 lbs/100 gal oil applied during the growing season. The chemicals were definitely more effective in an oil carrier than in water; this finding is supported by several other investigations in northern states. November treatment was less effective on beech and maple than July treatment, but this seasonal effect is only partly supported by other northern studies. In a supplemental test, basal spraying gave approximately the same kills as frill treatment; but, since basal sprays are more expensive, they have little place in treating woody plants of tree stature.

1256
Herbicide effects in Connecticut vegetation, 1950.
AUTHOR: EGLER FE
AUTHOR AFFILIATION: American Museum of Natural History.
SOURCE TITLE: Journal of Forestry.
SOURCE ID: 50:198-204, 1952.
YEAR PUBLISHED: 1952
CATEGORY: A5b; A5e; A5f
REGION: Beech-Maple Forest STATE: Connecticut
KEYWORDS: application methods; habitat manipulation; herbicides; impact; spraying, basal; spraying, broadcast; spraying, selective
ABSTRACT: (Purpose) To report the results of herbicides, particularly 2,4-D and 2,4,5-T, when applied as foliage sprays and as bark-basal sprays to particular species of plants. Only species and sizes of plants which offer specific problems are considered. (Time and Duration) One year; primarily a report of 1950 research, although summarizes results from past four years research. (Type of Research) Original. (Methodology) Herbicidal techniques used for herbaceous plants included: early spring foliage spraying, summer basal-stem spraying, and ground spraying. The technique used for woody plants was basal-bark spraying, with an oil carrier. Spraying was done with a knapsack sprayer using nozzles varying in pattern and capacity. (Results and Conclusions) A number of plants can be killed in their winter rosette stage by ground-spraying with 3 to 5 percent solutions of esters of 2,4-D and 2,4,5-T in water. During

1256

May, and until the plants are 15cm in height, most species can be root-killed by foliage applications of 0.3 percent in water. In midsummer, tall goldenrods, asters, and similar plants are treated with basal sprays of 4 to 6 percent in oil or water with reasonable chance of root kill. All grassland ferns are highly resistant. Basal-bark spraying of woody plants under 2m in height appears to result in greater root-kill than does foliage spraying. Thick-barked trees, however are resistant to this treatment and require frilling, trunk-wounding, or unusually high volumes of spray.

1257

Apparent kill of persimmon and sassafras by application of 2,4-D and 2,4,5-T.

AUTHOR: MARTIN SC
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: St. Paul, MN, US Forest Service, Central States Forest Experiment Station, 1952. Technical Paper 132, 8 p.
YEAR PUBLISHED: 1952
CATEGORY: A5b
REPORT NUMBER: 132
REGION: Oak-Hickory Forest STATE: Missouri
KEYWORDS: herbicides; impact; sprouting; trees; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To determine the effectiveness of various formulations of 2,4and 2,4,5-T at controlling root sprouts of persimmon and sassafras on old fields and pasture land. (Time and Duration) Two-year study (1950-52). (Type of Research) Original research (field). (Methodology) The study was conducted on a ridge old field in Boone County, Missouri. It was limited to persimmon and sassafras saplings in the 1-inch, 2-inch, and 3-inch dbh classes. Fifteen formulations of 2,4-D, 2,4,5-T or a mixture of 2,4-D and 2,4,5-T were tested. All herbicides were applied June 1-2, 1950, at concentrations of 2.0 percent (acid equivalent basis), and at the rate of 1 quart of solution per 10 trees. The two carriers were kerosene and paste. The paste was composed of 4 parts water and 1 part kerosene thickened with wheat flour. (Results and Conclusions) Ester forms of 2,4-D and 2,4,5-T were superior to non-ester formulations for killing persimmon but the two forms were equally effective on sassafras. Likewise, 2,4,5-T was superior to 2,4-D for persimmon but not for sassafras. There was no difference in the effectiveness of alkyl esters of 2,4-D and 2,4,5-T and the more expensive glycol ester formulations. Kerosene was a more effective carrier than paste for almost all 2,4-D and 2,4,5-T formulations on both persimmon and sassafras. Sassafras generally responded to treatment more quickly than persimmon and showed consistently higher apparent kill. The difference between species in apparent kill became smaller with each succeeding observation.

1258

Persistence of 2,4-D toxicity in Hawaiian soils.

AUTHOR: AKAMINE EK
AUTHOR AFFILIATION: Univ of HI.
SOURCE TITLE: Botanical Gazette
SOURCE ID: 112:312-319, 1952.
YEAR PUBLISHED: 1952
CATEGORY: A5b
REGION: Hawaiian Islands STATE: Hawaii
KEYWORDS: herbicides; persistence; soils; 2,4-D
ABSTRACT: (Purpose) To study factors influencing the persistence of 2,4-D toxicity in various Hawaiian soils. (Time and Duration) One-year study. (Type of Research) Original research (field tests). (Methodology) Soils from 5 locations were used. These represented typical agricultural soils of the island and were obtained from areas continuously under vegetable cultivation. To determine the influence of climatic factors, indicator crops were planted at 2-week intervals in 2,4-D treated soils in three series during the year. At the end of two weeks the crops were harvested, and the number of normal and injured seedlings was recorded. A new crop was planted in the same soils immediately. (Results and Conclusions) Depending on soil type, environment, and indicator crop used, 2,4-D toxicity was dissipated from soils in 2-14 weeks. Bean was more sensitive than tomato as an indicator plant. The higher the soil temperature, the more rapid the rate of 2,4-D dissipation. Soils high in pH value inactivated 2,4-D more rapidly than those low in pH. Organic matter content, fertility and absorptive capacity of the soils were not correlated with the degree of persistence of 2,4-D.

1259

Right-of-way maintenance by the selective application of selective herbicides; managed plant community lowers maintenance costs and provides food and cover for wildlife.

AUTHOR: EGLER FE; IBBERSON JE
AUTHOR AFFILIATION: PA Bureau of Forests. American Museum of Natural History.
SOURCE TITLE: Pennsylvania Forests and Waters
SOURCE ID: 3(6):114-115, 125, 1951.
YEAR PUBLISHED: 1951
CATEGORY: A5b
REGION: Appalachian [illegible] Massachusetts; New Jersey; New York [illegible]
KEYWORDS: cover; food; [illegible]; right-of-way; spraying, selective; wildlife
ABSTRACT: (Purpose) [illegible] 2,4-D and 2,4,5-T in selective application for [illegible] vegetation to provide wildlife food and cover [illegible] the cost of vegetation control substantially by [illegible] cutting. (Time and Duration) One-year study [illegible] research (field study). (Methodology) Selective [illegible] with 2,4-D and 2,4,5-T mixture in oil was begun [illegible] on a ROW OF THE Pennsylvania Power and [illegible] crosses the Bald Eagle State Forest in Centre and Mifflin Counties. Shrubs not exceeding 6-10 feet were left, and particularly such shrubs as blueberry, azaleas, rhododendron, laurel and juniper. (Results and Conclusions) The herbicides 2,4-D and 2,4,5-T when used as basal sprays can be used on electric ROW's to meet the varied demands of numerous kinds of wildlife, and with far less future cost [illegible] applications, if proper planning, based on sound botanical principles is used in shaping the species composition.

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August burning for maintenance of utility line rights of way (abstract, summary and conclusions).

AUTHOR: CLIBURN LE
SOURCE ID: State College, MS. MS State Univ., 1967. MS Thesis, 35 p.
YEAR PUBLISHED: 1967
CATEGORY: A5c; B1; B3b
REGION: Southeastern Mixed Forest STATE: Alabama; Mississippi
KEYWORDS: fire; maintenance; right-of-way
ABSTRACT: (Purpose) To evaluate summer burning techniques for ROW maintenance and compare them to herbicide spraying as to effectiveness in controlling undesirable woody species and providing wildlife habitat. (Type Of Research) Original field research. (Methodology) ROW plots from an August burned ROW were compared to those on an adjacent ROW that had been maintained with a mixture of 2,4-D and 2,4,5-T herbicides. Clip samples and rabbit pellet counts were taken on both ROWs to determine potential and actual wildlife use. Woody plant growth was also monitored after burning. (Results and Conclusions) The burned ROW produced 125.2 lbs /acre of succulent vegetation growth, comprised mainly of preferred deer and rabbit forage. Herbicide treated plots produced little valuable wildlife food. Burning killed hardwoods and pines up to 2.5" in diameter. Cottontail rabbit utilization increased on all the burned areas, indicating better food choices.

A5d - Mechanical

1261

Right-of-way maintenance through seeding and wildlife planting - an economical answer with multiple use benefits.

AUTHOR: BAYNES AS; WOODHOUSE CB
AUTHOR AFFILIATION: NC Wildlife Resources Com. Div of Game.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management. January 6-8, 1976.
SOURCE ID: Mississippi State, MS. MS State Univ, 1976. 303-306 p.
YEAR PUBLISHED: 1976
CATEGORY: A5d
REGION: Southeastern Mixed Forest STATE: North Carolina
KEYWORDS: maintenance; management, multiple use; right-of-way; seeding; wildlife
ABSTRACT: (Purpose) A discussion of the North Carolina Wildlife Commission's approach to improving wildlife habitat on ROWs. (Time and Duration) 1965-68. (Type of Research) Discussion paper. (Results and Conclusions) Most ROWs in the state are maintained by bulldozing and chopping with a heavy disc, allowing natural vegetation to develop. To improve on this, 10 ROW seeding demonstrations were set up over the state at an average cost of $50 per acre. A mixture of tall fescue and sericea lespedeza was used; fertilizer is applied to well-established plantings the second year at 200 pounds per acre of 18-46-0 with a helicopter. This entire program costs $123.50 per acre on a 5-year rotation, or $24.70 per year. Other methods are more expensive and the Duke Power Co is now seeding 2,000-3,000 acres per year. In one case, a conservation group also seeded an edge of shrub lespedeza for several miles.

1262
Puckerbrush forestry.
AUTHOR: YOUNG HE
AUTHOR AFFILIATION: Univ of ME.
SOURCE TITLE: Proceedings Northeast Weed Science Society.
SOURCE ID: 28:335-339, 1974.
YEAR PUBLISHED: 1974
CATEGORY: A5d
REGION: Applicable to entire United States STATE: United States
KEYWORDS: mowing; pulping; shrubs; trees; utilizaton
ABSTRACT: (Purpose) To present and discuss the feasibility of harvesting brush on right-of-way areas and using this material for wood fiber. (Time and Duration) 14-year study. (Type of Research) Original research. (Methodology) Puckerbrush is a Maine term to characterize dense young hardwood stands comprised of shrubs and tree species. A puckerbrush harvester is presently being developed which will harvest the trees and brush, chip it, and blow it into a van. Laboratory pulping studies have been completed on methods of cooking puckerbrush chips. Puckerbrush need only be cooked for 30 minutes. (Results and Conclusions) There are more than 25 million acres of puckerbrush on abandoned farm lands, and also on ROWs of highways, railroads, and transmission lines. Much of this material is as accessible or more accessible than most forest land. We should learn to think of these weed species as puckerbrush species and harvest them for useful purposes By this we can change an enormous cost into a profit, and at the same time take some of the great pressure off of our forests as pulp producing areas.

1263
Environmental consideration in planning a brush control program on utility right of ways.
AUTHOR: FRANCISCO DC
AUTHOR AFFILIATION: TN Valley Authority.
SOURCE TITLE: Proceedings Southern Weed Conference.
SOURCE ID: 21:326-328, 1973.
YEAR PUBLISHED: 1973
CATEGORY: A5d
REGION: Eastern Deciduous Forest STATE: Alabama; Tennessee
KEYWORDS: brush; environment; mowing; right-of-way
ABSTRACT: (Purpose) To describe the present brush control program on ROW areas of the Tennessee Valley Authority, and the environmental considerations involved in establishing these policies. (Time and Duration) 4 years of field practice. (Type of Research) Original research (field experience). (Methodology) The author describes the experience that TVA has had with herbicides. Analysis of the combined cost of stump treatment and "clean-up" operations after construction indicated that the ROWs could be prepared and seeded at approximately the same cost, so TVA began seeding all initially cleared ROWs where feasible. Experiments in mowing areas formerly maintained with herbicides have shown that mowing is practical on all but the steepest sites, and is readily accepted by the public. (Results and Conclusions) In 1969 TVA began to change from an almost exclusively chemical program to other methods which would be more effective in controlling brush and more attractive from an environmental standpoint. Seventy percent of their ROW maintenance is now mechanical. Mechanical maintenance techniques, ROW seeding, and cooperative ROW treatment have been enthusiastically accepted by wildlife, forestry, agricultural, and resource development groups, as well as by individual property owners and the general public.

1264
Woody fiber farming: an ecologically sound and productive use of rights-of-way.
AUTHOR: YOUNG HE
AUTHOR AFFILIATION: Univ of ME.
SOURCE TITLE: Highway Research Record
SOURCE ID: Washington, DC Highway Research Board, 1972, No. 411, 15-23 p.
YEAR PUBLISHED: 1972
CATEGORY: A5d
REGION: Appalachian Oak Forest STATE: Maine
KEYWORDS: brush; ecology; fertilization; maintenance; right-of-way; root; sprouting; utilization; wood fiber farming
ABSTRACT: (Purpose) To explain the concept of wood fiber farming, a method involving the periodic removal of small trees and brush from ROW areas to be harvested as fiber for paper board products. (Type of Research) Review of literature. (Methodology) Since the present annual national maintenance costs for mowing, cutting, burning, and spraying is estimated to be at least $200 million, an amount that increases each year, and since there is national concern about air and water pollution and thus some legislative action to eliminate burning and spraying, the concept of woody fiber farming is explored and explained. pertinent related references are used to substantiate the validity of this use of right-of-way brush and small trees. (Results and Conclusions) ROW species will produce useful paper and paper board products in less pulping time than commercial tree species. Because these stems are not large, 10 to 30 feet in height, and because there are many stems per acre, special harvesting equipment must be developed. Naturally occurring woody vegetation on ROW areas can be harvested in 10 to 15 year cycles. Growth can be augmented by use of fertilizers and by deliberately developing genetically superior species. Thus it should be possible to derive from woody fiber farming of ROW areas a net profit that will drastically reduce the overall ROW maintenance cost.

A5e - Succession stabilization

1265
Control of brush by grassing of transmission rights-of-way.
AUTHOR: LEITH RH JR
AUTHOR AFFILIATION: GA Power Co.
SOURCE TITLE: Proceedings Southern Weed Science Society.
SOURCE ID: 27:234-235, 1974.
YEAR PUBLISHED: 1974
CATEGORY: A5e; A5f
REGION: Applicable to entire United States STATE: United States
KEYWORDS: brush; fertilization; grasses; right-of-way; seeding
ABSTRACT: (Purpose) To describe the effectiveness of lespedeza and grasses, seeded on new electric ROWs, in delaying the invasion of brush. (Time and Duration) Two-year study. (Type of Research) Original research (field). (Methodology) On new 500 KV ROWs, after clearing land with K-G blades, it is necessary to seed with various grasses and lespedeza to prevent erosion. On some ROWs Sericea lespedeza is used with browntop millet. On others, rye grass and Sericea has been used. On some areas harrowing was done before seeding to eliminate sprouting from stumps. Fertilization is also done just prior to seeding. (Results and Conclusions) Grassing with annual rye and Sericea lespedeza gives benefits other than erosion control alone. Almost complete elimination of brush sprouts, as well as seedlings, is one important benefit. The soil building capability of Sericea helps reconstruct top soil damaged by heavy clearing equipment. One other important benefit is the extremely attractive appearance of the ROW. The mature Sericea is three to four feet tall at maturity, covers rough areas on the ROW, and gives the impression of a well maintained, carefully managed ROW.

1266
Old field vegetation as an inhibitor of tree vegetation.
AUTHOR: RICHARDS N
AUTHOR AFFILIATION: State Univ of NY, College of Environmental Science and Forestry.
SOURCE TITLE: Pages 78-88 in Power Lines and the Environment.
SOURCE ID: Millbrook, NY, The Cary Arboretum of the New York Botanical Gardens, 1973, 170 p.
YEAR PUBLISHED: 1973
CATEGORY: A5e
REGION: Northern Hardwoods Forest STATE: New York
KEYWORDS: communities; ecosystem; herbaceous; stability
ABSTRACT: (Purpose) To discuss the stability of many old field herbaceous communities, and their resistence to change. (Time and Duration) 18 years of research and observations. (Type of Research) Original research (field study). (Methodology) Many perennial meadow areas in New York have been observed for many years to detect changes and to evaluate their successional stability. The changes during each growing season have been observed, as each species has its time. (Results and Conclusions) The high stability of perennial meadows, due to their complex of elements inhibiting tree invasion and their increasingly appreciated aesthetic and biotic values in the rapidly reforesting Northeast, warrant their use for minimum-maintenance cover on many ROW strips. From all of these phytochemical complexities, a reasonable general hypothesis might be that the successional stability of oldfield vegetation depends on a vegetation system in homeostasis with its resources, and successful invasion of woody plants depends on establishment of a viable woody vegetation system; not just the woody plants.

A5f - Combinations of methods

1267
Selective clearing and maintenance of rights-of-way.
AUTHOR: ULRICH ES
AUTHOR AFFILIATION: Metropolitan Edison Co.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 205-219 p.
YEAR PUBLISHED: 1976
CATEGORY: A5f
REGION: Appalachian Oak Forest STATE: United States
KEYWORDS: clearing; clearing, selective; maintenance; right-of-way

A5f - Combinations of methods

1267

ABSTRACT: (Purpose) Selective clearing and maintenance were described which have been used to produce and maintain electric transmission lines in Pennsylvania since about 1969. (Results and Conclusions) In selective clearing, tall-growing trees are removed, except for screening roads and rivers, where smaller, slow-growing trees are left. Screens are also left where land use changes occur and at skylines. Where ravines and side hills cause lines to be above tree height, the ROW may be narrowed to conductor width plus 20 feet. Trees such as pasture trees, fruit trees and nut trees can often be left in special locations. About 15% of the ROWs are given selective cutting with the remaining 80% being clearcut. In addition, all structure locations, access roads, and brush disposal areas are clearcut. Trees to be cut are pretreated before selective cutting to a 3-inch height, stumps are then treated with 2,4,5-T in oil. Brush is disposed of by piling in selected spots and crushed with a dozer; logs are either piled on top, or in neat piles. Erosion control measures are taken and streams protected by fords and culverts. Selective basal spray maintenance, only, is used in the dormant season to avoid brown-outs. A list of desirable woody plants to be left has been developed, and careful control and records of spray operations is a key to success. The selective ROW has an unkept look which must be sold to company and workers as effective and environmentally sound. There was a definite trend towards longer periods of time between spraying since about 1958, averaging an increase to 4 years from 2-3 years.

1268
Ecological and economic aspects of right of way vegetation management.
AUTHOR: SORENSEN RW
AUTHOR AFFILIATION: MN Power and Light Co.
SOURCE TITLE: Industrial Vegetation Management
SOURCE ID: 7(2):2-6, 1975.
YEAR PUBLISHED: 1975
CATEGORY: A5f
REGION: Spruce-fir Forest STATE: Michigan; Minnesota; Wisconsin
KEYWORDS: chemicals; cost; impact; maintenance; right-of-way; vegetation
ABSTRACT: (Purpose) To test the effectiveness of controlling unwanted woody vegetation on utility rights-of-way by use of selective dormant season basal spraying (Time and Duration) Two years. (Type of Research) Original research. (Methodology) Based on preliminary study and literature, this article goes into the management system for Minnesota Power and Light's rights-of-way. (Results and Conclusions) A selective basal spraying program results in a 80-90% root kill of the undesirable tree species and maintains the desirable shrub and herbaceous components of vegetation within the right-of-way. The interval between treatments in a selective maintenance program can be lengthened to between 10 and 15 years. This approach is both ecologically sound and economically feasible on many of our utility right-of-way systems.

1269
Achieving stream protection in electric and gas transmission line construction and management.
SOURCE ID: NY State Public Service Com. , Office of Env Planning, 1974, 63 p.
YEAR PUBLISHED: 1974
CATEGORY: A5f; B2a
REGION: Applicable to entire United States STATE: New York; United States
KEYWORDS: construction; maintenance; right-of-way; stream; watershed
ABSTRACT: (Purpose) To provide guidelines for meeting and resolving stream impact issues within the context of the Article VII process. (Methodology) This handbook was written to meet requirements of New York state law. It provides an analytic method for determining stream sensitivity upon which construction and management decisions can be based. Goes into detailed discussion about conservation engineering guidelines for stream protection.

1270
Maine Public Service Company transmission spray program.
AUTHOR: COLLINS D
AUTHOR AFFILIATION: ME Public Service Co.
SOURCE TITLE: Industrial Vegetation Management.
YEAR PUBLISHED: 1970
CATEGORY: A5f
SPONSOR: ME Public Service Co.
REGION: Laurentian Mixed Forest STATE: Maine
KEYWORDS: brush control; herbicides; maintenance; right-of-way
ABSTRACT: (Purpose) To describe the Maine Public Service Co vegetation management program with strong emphasis on chemical control. (Time and Duration) 4 to 6 years ending in 1969. (Type of Research) Not research, observations of operational program. (Methodology) Various Tordon formulations are applied to ROWs and the results described in general terms. (Results and Conclusions) No data other than the author's narrative. Various Tordon formulations gave good to excellent control of the species under treatment. Experience with Tordon 101 at different rates and with Norbak particulating agent are described.

1271
Right of way beautification through the use of vegetation.
AUTHOR: MIDDLETON B J
AUTHOR AFFILIATION: PA Electric Co.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 21:421-433,1967.
YEAR PUBLISHED: 1967
CATEGORY: A5f
REGION: Applicable to entire United States STATE: United States
KEYWORDS: aesthetics; maintenance; right-of-way; vegetation
ABSTRACT: (Purpose) To discuss what Pennsylvania Electric Company has done in terms of improving the appearance of their facilities and transmission lines. (Results and Conclusions) This paper deals with Pennsylvania Electric Company's vegetation management program and gives a lot of detail and specifications.

A5g - Public relations programs

1272
Regulatory aspects of management of rights-of-way.
AUTHOR: JOHNS HR
AUTHOR AFFILIATION: Asplundh Tree Expert Co.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS MS State Univ, 1976, 189-204 p.
YEAR PUBLISHED: 1976
CATEGORY: A5g
REGION: Applicable to entire United States STATE: United States
KEYWORDS: management; pesticide; regulations; right-of-way
ABSTRACT: (Purpose) Relation of new amendments to the FIFRA which apply to proper use of pesticides is duscussed. (Results and Conclusions) These include registration and classification of all pesticides of which 5-6% active ingredients may be classified for "Potentially restricted use." Storage and disposal of pesticides are also regulated by this legislation. Certification standards for commercial applicators have been adopted for state use, and training manuals are being contracted by EPA. Rules for experimental use permits have been set up by EPA with such permits to be described in the Federal Register. To enforce the new regulations, EPA has also set up policies which make the label on pesticides a legal requirement and a system for reporting pesticide accidents and problems. While environmental problems exist, and new pesticides are being sought, care must be taken not to accept inferior substitutes which may not be an improvement. To avoid excessive future regulations, orderly management planning and documentation of long and short term ecological effects will be necessary.

1273
The public relations of public spraying.
AUTHOR: HANSEN J
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 3(1):9-11, 1971.
YEAR PUBLISHED: 1971
CATEGORY: A5g
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; planning; public relations
ABSTRACT: (Purpose) To outline a sensible approach to a public relations program for electric companies who use herbicides in vegetation management on their rights-of-way. (Methodology) The author outlines the steps in developing an effective public relations program. Topics discussed include: pinpointing the problem areas; chronic complainers; visibility of the spraying area; public awareness; opposition to herbicides in general; training of spray crew leaders. Public information programs are discussed. These deal with cooperation with the local newspaper, garden clubs, conservation organizations and ecologists. (Results and Conclusions) Handling the public relations side of a spray program is as important as any other phase of the operation, and, in these days of "ecoactivism", may be the factor that determines whether the job gets done at all. Help is available and you should use it. The National Agricultural Chemicals Association is preparing new material to help you tell the pesticide story, and companies like Dow are available to provide help in training your personnel to do a better job.

1274
Efforts to remove the "ugly" from transmission rights-of-ways.
AUTHOR: MIDDLETON B J
AUTHOR AFFILIATION: PA Electric Co., Metropolitan Edison Co.
SOURCE TITLE: Proceedings Northeastern Weed Control Control Conference.
SOURCE ID: 23:382-390. 1969.
YEAR PUBLISHED: 1969
CATEGORY: A5g
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: clearing; herbicides; impact; maintenance; right-of-way
ABSTRACT: (Purpose) To discuss a program that two power companies are undertaking to beautify their rights-of-way. (Results and Conclusions) Discussed seven different items that are being used in an attempt to remove the visual impact of right-of-ways. Some of the items being used are selective cutting during clearing, use of herbicides.

B - ROW Construction/Maintenance - Ecological Considerations

1275
Powerline corridors as possible barriers to the movements of small mammals.
AUTHOR: GRAVES JH; SCHREIBER RK
AUTHOR AFFILIATION: Oak Ridge Nat Lab.
SOURCE TITLE: The American Midland Naturalist.
YEAR PUBLISHED: 1977
CATEGORY: B
REGION: Appalachian Oak Forest
KEYWORDS: impact; mammals, small; right-of-way; wildlife
ABSTRACT: (Purpose) To determine the effect of two widths of powerline rights-of-way as potentail barriers to movements of small mammals. (Time and Duration) Summer of 1975. (Type of Research) Original research. (Methodology) Trapping grids were located in various common forest types and on two ROWs. Sherman live traps were set at 15.2m intervals on three rows of six traps each on a 48.8m ROW and at 12.2m intervals on four rows of ten traps each on a 103.6m ROW. Homing success for released animals was recorded. (Results and Conclusions) The white-footed mouse (Peromyscus leucopus) and short-tailed shrew (Blarina brevicauda) successfully returned from release sites to home sites on both narrow and wide ROWs. These small mammals, therfore, will cross both the narrow and wide ROWs tested. The shrews took longer to return and were slightly less successful than the mice.

1276
Compatibility of fish, wildlife and floral resources with electric power facilities.
AUTHOR: EDISON ELECTRIC INSTITUTE
SOURCE ID: Edison Electric Institute, Publication 7760.
YEAR PUBLISHED: 1977
CATEGORY: B
REGION: Applicable to entire United States STATE: United States
KEYWORDS: fish; flora; wildlife
ABSTRACT: (Purpose) To study the compatibility of fish, wildlife, and floral resources with electric power facilities. (Time and Duration) 1976-77; 2 years. (Type of Research) Questionnaire survey. (Methodology) Questionnaire. (Results and Conclusions) 112 electric utilities responded. Of these 70 have conducted studies, 83 have management plans, and 50 have observed voluntary uses.

1277
EPRI's research program on biological effects of electric fields.
AUTHOR: KORNBERG HA
AUTHOR AFFILIATION: Electric Power Research Institute.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-WaY Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 135-141 p.
YEAR PUBLISHED: 1976
CATEGORY: B
REGION: Applicable to entire United States STATE: United States
KEYWORDS: environment; impact; right-of-way
ABSTRACT: (Purpose) A comprehensive state-of-the-art review on biological effects of electric fields which was completed in 1975. (Results and Conclusions) The maximum vertical field under a typical 765 kv line at four feet above ground is about 9 kv/m. While Russian reports indicate biological effects of high voltage among workers, these have not been confirmed by research in the US and western Europe, which indicated that factors other than electric fields were operative. EPRI and other agencies in the US and abroad are now actively carrying out research in this area.

1278
Keynote address - environmental concerns in right-of-way management: an electric utility viewpoint.
AUTHOR: THORSELL RS
AUTHOR AFFILIATION: Edison Electric Institute.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976. 3-6 p.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976. 3-6 p.
YEAR PUBLISHED: 1976
CATEGORY: B
REGION: Applicable to entire United States STATE: United States
KEYWORDS: environment; management; right-of-way
ABSTRACT: (Purpose) Environmental concerns of EHV ROW are discussed from the utility viewpoint. (Results and Conclusions) Vegetation must be controlled economically; but many uses can be permitted such as farming, wildlife, and compatible recreation. Effect on wildlife is often favorable due to an increase in food and cover, and use of towers and tower sites by wildlife.

1279
The effects of high voltage electric fields on the growth and development of plants and animals.
AUTHOR: BANKOSKE JW; GRAVES HB; MCKEE GW
AUTHOR AFFILIATION: Westinghouse Electric Corp.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 111-123 p.
YEAR PUBLISHED: 1976
CATEGORY: B
REGION: Applicable to entire United States STATE: United States
KEYWORDS: environment; fauna; flora; habitat; impact; right-of-way
ABSTRACT: (Purpose) A discussion of research being conducted in Pennslyvania to determine if EHV and UHV transmission lines affect plants, animals, and soils. (Time and Duration) In progress - 3 year program. (Type of Research) Original research. (Methodology) Electric grids were developed for use in environmental plant chambers. (Results and Conclusions) A study performed on germinated corn using 60 Hz, 50 kV/m electric fields showed no injuries or gross abnormalities after 11 days of exposure. However, some minor leaf tissue damage was noted on corn, bluegrass, and alfalfa plants exposed for seven days, and a corona was observed. Causes of injury were investigated to develop methodology. Meadow voles exposed to 50 kV/m for four to 14 days showed no effect. Also no effects of consequence were shown by chicken eggs and chicks. Additional experiments on large test populations are required and are in process.

1280
Environmental problems in extra high voltage transmission.
AUTHOR: YOUNG LB
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 125-133 p.
YEAR PUBLISHED: 1976
CATEGORY: B
REGION: Applicable to entire United States STATE: United States
KEYWORDS: environment; impact; right-of-way
ABSTRACT: (Purpose) Results reported by the Soviet Union are discussed. (Results and Conclusions) Reports have indicated that the health of workers in 500 and 700 kv substations has been adversely affected by continuous exposure to 25 kv/m. Only 5 kv/m is considered safe for unlimited exposure. Difficulties in translating the Russian reports into US measurements are discussed and the conclusion is reached that levels under 765 kv lines in the US are above those considered safe by the Russians. Some theoretical implications of ozone and nitrogen compounds are also discussed. Underground transmission is suggested as a solution to most problems.

1281
The present status of underground electric power transmission.
AUTHOR: MILLER CF
AUTHOR AFFILIATION: Fed Power Com.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, Mississippi State University, 1976, 143-152 p.
YEAR PUBLISHED: 1976
CATEGORY: B
REGION: Applicable to entire United States STATE: United States
KEYWORDS: right-of-way; underground
ABSTRACT: (Purpose) A description is given of the essential features of underground cable systems for transmission of electric power. (Results and Conclusions) Cost of an underground AC system is estimated to be considerably more than an overhead line. R & D research cites the year

1281

2000 as the approximate date when utilities will be able to accept superconducting, cryoresistive underground cables. Environmental impact of underground installations will be high as the ROW must be completely cleared for its entire length at a width sufficient to provide for an access road for heavy excavation equipment. The shorest, straightest route without rapid changes in elevation, sharp bends, or rocky terrain must be selected for underground transmission. Repairs to cables require excavation and may take weeks or even months, when the line will be inoperative. Underground cables have a use mostly in densely populated urban areas, at airports, at river crossings, and at crossings with overhead transmission corridors.

1282
The land use and environmental impacts associated with the development of high, extra high, and ultra high voltage transmission lines.
AUTHOR: ROWELL CH
AUTHOR AFFILIATION: Dept of Natural Resources, Cornell Univ.
SOURCE ID: Ithaca, NY, Cornell Univ Dept of Natural Resources, 1976, Natural Resources Research and Extension Series #6, 42 p.
YEAR PUBLISHED: 1976
CATEGORY: B
REGION: Applicable to entire United States STATE: United States
KEYWORDS: aesthetics; environment; impact; land use; right-of-way; transmission lines
ABSTRACT: (Purpose) To review the variety of potential impacts associated with transmission lines. (Type of Research) Literature review. (Results and Conclusions) A general explanation is given of basic transmission line design and physical properties. Also discussed are the major impacts lines have on aesthetics, the environment, and land use. Related to the last topic is also a discussion of implications transmission lines have on land use planning.

1283
Southern Tier Environmental protection and management plan (wildlife management plan).
AUTHOR: CARY ARBORETUM
AUTHOR AFFILIATION: NY Botanical Garden
SOURCE ID: Millbrook, NY, The Cary Arboretum, 1973, 190 p.
YEAR PUBLISHED: 1974
CATEGORY: B
REGION: Northern Hardwoods Forest STATE: New York
KEYWORDS: environment; management; planning; right-of-way; wildlife
ABSTRACT: (Purpose) A report is made to describe a wildlife and environmental management plan for a new 345 kV transmission line in southeast New York state. (Time and Duration) 1972-73. (Type of Research) Report. (methodology) A ground survey and a series of transects were used to inventory existing vegetation and to describe 12 forest types and some nonforest types. A wildlife inventory was made from direct observations and signs from ground surveys; local foresters and biologists were consulted. Small mammals were sampled by a limited trapping program. Literature on wildlife apt to be present and rare and endangered species were considered. Both formal and informal human response inventories were made. (Results and Conclusions) A description is made of existing communities; replacement communities were designated as a planning guide. A fire plan and conversion techniques were set up along with guidelines for construction. The wildlife management plan basically aimed to maintain the present diversity of wildlife. The plan prescribed general recommendations and specific practices for line segments. Special attention was paid to stream and wetland crossings.

1284
Wildlife management plan for the Southern Tier Transmission Line Ramapo to Rock Tavern, New York: staff review and comment.
AUTHOR: NY STATE DEPT OF PUBLIC SERVICE
AUTHOR AFFILIATION: NY State Dept of Public Service.
SOURCE ID: NY State Dept of Public Service, 1974 (rev.), 28 p.
YEAR PUBLISHED: 1974
CATEGORY: B
REGION: Northern Hardwoods Forest STATE: New York
KEYWORDS: management; planning; right-of-way; wildlife
ABSTRACT: (Purpose) A critical review of a wildlife management plan prepared by Cary Arboretum for an electric transmission line ROW in southeast New York. (Results and Conclusions) The plan falls short of PSC staff's expectations primarily owing to its emphasis on the protection of the environment in line construction, and failure to spell out long term management planning in maintenance. A qualified professional should be assigned to carry out management planning and execution, and a period of 12-15 months allowed for preparing a wildlife plan.

1285
Energy and environment.
AUTHOR: ROBINETTE G.
AUTHOR AFFILIATION: [illegible]
SOURCE ID: [illegible] 1973. 302 p.
YEAR PUBLISHED: [illegible]
CATEGORY: B
REGION: Applicable to entire United States STATE: United States
KEYWORDS: aesthetics; [illegible] energy; environment; impact; land use; mapping; right-of-way; routing; siting; transmission lines
ABSTRACT: (Purpose) To review the environmental impacts and aesthetics involved with man's use of electrical energy from generation through distribution. (Type of Research) Literature review. (Results and Conclusions) A comprehensive breakdown and present status are given for environmental concerns from generation of electrical energy to its final distribution points. Discussed are environmental considerations in siting, routing, aesthetics, construction, maintenance, and multiple use for power generation, transmission, and transformation.

1286
A consultant report to the Pennsylvania Power & Light Co. on ecological aspects of the proposed Wallenpaupack-Indian Orchard 66 kV line.
AUTHOR: HALMA JR
AUTHOR AFFILIATION: Cedar Crest College.
SOURCE ID: Allentown, PA, Cedar Crest College, 1973, 42 p.
YEAR PUBLISHED: 1973
CATEGORY: B
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: ecology; right-of-way; routing
ABSTRACT: (Purpose) To make recommendations concerning route selection to avoid unusual or unique ecological areas and the possible adverse ecological results from a right-of-way. (Time and Duration) Summer of 1973. (Type of Research) Consultant report. (Results and Conclusions) Development of edges was recommended as a general management goal. Certain changes in route were suggested to avoid some adverse impacts, and a study of wildlife diversity recommended. The PP&L management was commended for use of selective stump sprays after clearing. The McHarg approach to route selection was recommended for trial.

1287
Power line wildlife.
AUTHOR: WOODHOUSE C
AUTHOR AFFILIATION: NC Wildlife Com.
SOURCE TITLE: Wildlife in North Carolina.
SOURCE ID: 36(10):10-11, 1972.
YEAR PUBLISHED: 1972
CATEGORY: B
REGION: Outer Coastal Plain Forest STATE: Alabama; Florida; Georgia; Louisiana
KEYWORDS: right-of-way; seeding; wildlife
ABSTRACT: (Purpose) A description of seeding and fertilizing transmission ROWS in NC. (Time and Duration) 1964-72 (Results and Conclusions) Seeding fescue combined with lespedeza is being done by the Duke Power Company on 2000-3000 acres per year. Undesirable brush is controlled by machine cutting every 5 years. Well-established plantings are top-dressed the second year with two pounds per acre of 16-48-0. The cost is about $24.70 per acre. A strip of shrub lespedeza seeded on one edge is used to provide a dependable, permanent wildlife food supply.

B1 - Short and Long Term Effects on Biological Communities

1288
Environmental and Economic Aspects of Contemperaneous Electric Transmission Line Right-Of-Way Manage ent Techniques, Volume 1: General Methods, Special Studies, Discussion of Trends, and Conclusions.
AUTHOR: ASPLUNDH ENVIRONMENTAL SERVICES
AUTHOR AFFILIATION: Asplundh Env Services.
SOURCE ID: Willow Grove, PA, Asplundh Env Services, 1977, 209 p, Vol 1 of 3.
YEAR PUBLISHED: 1977
CATEGORY: B1; B2; B5
SPONSOR: Empire State Electric Energy Research; Corporation (ESEERCO).
REGION: Laurentian Mixed Forest STATE: New York
KEYWORDS: Construction; Environment; Land use; Maintenance; Restoration; Soil; Vegetation; Water; Wildlife
ABSTRACT: (Purpose) To document both the existing ROW site conditions and the conditions and events which could have produced those

conditions. Also, to describe the impacts of the construction and management techniques used on each site. (Time and Duration) 1975-1977. 2 years. (Type of Research) Original research. (Methodology) Field selection was made of 22 ROW sites located in the principal forest regions of New York. Habitat areas located on sites included hydric, mesic, and xeric conditions. Vegetation plots, 1/5 acre each, were mapped in each habitat and a plant community analysis was made both on the ROWs and in the adjacent forests. Special vegetation studies were also made on selected sites. Soils were mapped and erosion and organic matter data were collected for each site. Water studies were made of streams and swamps crossing the ROWs. Wildlife observations were recorded on all ROWs and special browse and pellet group studies were made on selected sites. Land use and value comparisons were made before and after ROW construction to date. Clearance and maintenance treatments used are given for each site. (Results and Conclusions) Results were analyzed for specific sites, major regions, and state-wide. A complex shrub-herb-grass community has replaced the former forest. Trees still invade the ROWs in large numbers and must be controlled. Characteristic communities developed were described as: Blackberry-Goldenrod or Sumac-Goldenrod on mesic habitats; Blueberry-Sweetfern or Blueberry-Bracken on xeric habitats; and Willow-Sensitive Fern, Red Osier Dogwood-Sensitive Fern, or Spirea-Sensitive Fern on hydric habitats. Species diversity was higher on ROWs than in adjacent forests. Shrub species formed an important part of ROW plant cover. Herbaceous species on ROWS included forest plants as well as those typical of open areas. Soil impact was negligible over the general ROW. Construction disturbances have caused erosion where not fully restored. Soil and topography were closely related to ROW habitats and plant communities. Impact on stream temperatures was slight and occasional sedimentation was related to road crossings and construction. Wildlife food and cover were improved by ROWs and common wildlife species freely used all ROWs. There was little land use change attributable to ROWs and slight negative visual impact was caused. Multiple-use was made of ROWs.

1289
Effect of power line clearance and maintenance on vigor of adjacent stand and composition of bordering understories.
AUTHOR: CUNNINGHAM EL
AUTHOR AFFILIATION: WV Univ.
SOURCE ID: Morgantown, WV, WV Univ, 1976, Masters Thesis, 146 p.
YEAR PUBLISHED: 1976
CATEGORY: B1
REGION: Southeastern Mixed Forest STATE: Minnesota; New Jersey; Oregon
KEYWORDS: clearing; edge; impact; maintenance; right-of-way
ABSTRACT: (Purpose) To evaluate vigor and condition of trees adjacent to rights-of-way and to describe the nature of changes in adjacent understory vegetation. (Time and Duration) 1975-76. (Type of Research) Original research. (Methodology) Study areas were located on ROWs in New Jersey, Minnesota, and Oregon. Dry, average, and wet sites were included in each state. Edge trees were evaluated and compared with interior trees. Understory vegetation was studied on milacre plots established at 5, 20, and 40 feet from the ROW margin. Vigor of trees was determined from increment cores. (Results and Conclusions) In New Jersey, growth was better on interior plots on average sites; while growth on dry sites was best on edges. Edge tree damage was primarily due to epicormic sprouts which lower timber value. Regeneration was greatest on the edges but was mostly young seedlings which will not survive. In Minnesota, there was no significant difference in growth on edges and interior. Damage on edges was caused by epicormic sprouts, construction, windthrow and sunscald. Most reproduction was on the edges and would not survive. In Oregon, edge trees on wet sites had lower growth; on average and dry sites there was no difference. As trees were young there was little edge damage.

1290
Considerations for wildlife in industrial development and reclamation.
AUTHOR: WY GAME AND FISH DEPT
AUTHOR AFFILIATION: WY Game & Fish Dept.
SOURCE ID: Cheyenne, WY, WY Game and Fish Dept, 1976, 65 p.
YEAR PUBLISHED: 1976
CATEGORY: B1
REGION: Wyoming Basin STATE: Wyoming
KEYWORDS: construction; habitat; wildlife
ABSTRACT: (Purpose) To aid in determination of considerations for wildlife in industrial activities and reclamation. (Type of Research) Discussion paper. (Results and Conclusions) During exploration and development various habitats are described which should be carefully treated to preserve naturalness. Disrupted lands may be reclaimed to a variety of purposes and in doing this diversity is the key to restoring wildlife communities. It is also important that wildlife receive consideration during project activity. Specific measures are given for protection and reclamation of various habitats including aquatic, riparian, arid shrub, rimrocks, and high density wildlife areas.

1291
Secondary succession along major transmission lines rights-of-way: a progress report.
AUTHOR: BALDA RP; JOHNSON CD
AUTHOR AFFILIATION: Northern AZ Univ.
SOURCE ID: Flagstaff, AZ, Northern AZ Univ, 1976, 190 p.
YEAR PUBLISHED: 1975
CATEGORY: B1
REGION: Intermountain Sagebrush STATE: Arizona
KEYWORDS: impact; right-of-way; succession
ABSTRACT: (Purpose) To describe secondary succession and other effects along a transmission line right-of-way in woodland, grassland, and desert. (Time and Duration) 4 years. (Type of Research) Original research. (Methodology) Soil samples were analyzed for texture, organic matter, and salts. Foliage cover for trees, shrubs and succulents was measured on six 50x50 foot subplots and herbs along 25 foot line transects. Absolute and relative density, cover, and frequency were calculated along with total plant cover. Bird censuses were done by using a modified strip transect. (Results and Conclusions) Disturbance by construction did not have a significant effect on soils. Revegetation in general varied with site and was attributed mostly to weedy invaders. Long-lived perennials were slow to return. Plant communities in grasslands and deserts are recovering at a moderate to rapid rate while recovery in woodlands is slow. Vegetation on unseeded areas in woodlands recovers at a more rapid rate than seeded areas on access roads and tower sites. Successful revegetation is essential for arthropod recovery. A transient change occurred on all sites in mammalian species diversity and density with no species eliminated.

1292
The impact of deer browsing on Allegheny hardwood regeneration.
AUTHOR: MARQUIS DA
SOURCE ID: Upper Darby, PA, US Forest Service, 1974, Research Paper NE308, 8 p.
YEAR PUBLISHED: 1974
CATEGORY: B1; B2
REPORT NUMBER: NE308
SPONSOR: US Forest Service.
REGION: Beach-Maple Forest STATE: Pennsylvania
KEYWORDS: food; impact; regeneration; trees; wildlife
ABSTRACT: (Purpose) To evaluate the importance of deer browsing on Allegheny hardwood regeneration. (Time and Duration) Enclosures initiated in 1950's and 1960's. Vegetative surveys made in 1971. (Type of Research) Original. (Methodology) Deer enclosures were installed in the 1950's and 1960's in various hardwood stands, with a majority of enclosures in recently cutover areas. A cluster of sample plots was located inside and another outside. The plots were circular with a radius of 6 feet. Trees were reported by species and height class. (Results and Conclusions) Showed that browsing by white-tailed deer resulted in regeneration failures in 25% to 40% of the study areas. Pin cherry and sugar maple were the species most severely reduced by browsing.

1293
Herbicide report: chemistry and analysis, environmental effects, agricultural and other applied uses.
AUTHOR: HAZARDOUS MATERIALS ADVISORY COMMITTEE
AUTHOR AFFILIATION: US Env Protection Agency.
SOURCE ID: Washington, DC, Environmental Protection Agency, 1974, EPASAB74001 (NTIS PB266006), 196 p.
YEAR PUBLISHED: 1974
CATEGORY: B1
REGION: Applicable to entire United States STATE: United States
KEYWORDS: agriculture; brush control; environment; fish; herbicides; land use; toxicity; weeds
ABSTRACT: (Purpose) To assess the usage patterns and benefits of using herbicides and to gain greater knowledge of the environmental effects of these compounds. The discussion covers herbicide use, available alternatives, and approaches to understanding and solving problems. (Type of Research) Literature review. (Methodology) The Hazardous Materials Advisory Committee was asked to prepare a comprehensive report on herbicide use and their environmental effects. The study was to serve as a background for EPA decisions. The study was inaugurated in May 1972; four sections were organized, each consisting of scientists from various disciplines. These consultants prepared drafts for review by the Hazardous Materials Advisory Committee. (Results and Conclusions) This summary report presents detailed and well-organized information on herbicide chemistry, environmental effects, and agricultural and other applied uses. Under the section on environmental effects, sources and movement of herbicides in the environment, residues of herbicides, ecological effects, and economic and ecological consequences of

1293

alternative weed-control practices are discussed. Other topics include aquatic uses of herbicides, forest management uses, range and pasture uses, and agricultural uses.

1294
Power over people.
AUTHOR: YOUNG LB
SOURCE ID: New York, NY, Oxford Univ Press, 1973, 216 p.
YEAR PUBLISHED: 1973
CATEGORY: B1; B2; B4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: aesthetics; electrical effect; environmental change; impact; landowner; ozone; power; public relations; right-of-way; transmission lines
ABSTRACT: (Purpose) To present a general discussion of the negative impacts of a transmission line and ROW on people, the environment, and land uses. (Type of Research) General text, opinions, literature survey. (Results and Conclusions) A collection of referenced citations, personal communications, and experiences dealing with landowner concerns and problems when faced with a proposed transmission line through their lands. Negative impacts of the line discussed are property values, environmental effects, electrostatic effects, ozone, aesthetics, and public disapproval. A detailed account of one community's fight against a proposed line is given. Alternatives to overhead electric transmission are also discussed.

1295
Transmission and distribution rights-of-way selection and development.
AUTHOR: JOHNSON JOHNSON AND ROY
SOURCE ID: Jackson, MI, Consumers Power, 1970, 55 p.
YEAR PUBLISHED: 1970
CATEGORY: B1; B2
SPONSOR: Consumers Power Co.
REGION: Applicable to entire United States STATE: Michigan
KEYWORDS: aesthetics; design; distribution; land use; right-of-way; selection; transmission
ABSTRACT: (Purpose) To provide guidelines to Consumers Power Co in Michigan on minimizing aesthetic and environmental impacts of transmission line ROW selection. (Results and Conclusions) Structure design and ROW configurations aimed specifically at typical Michigan land use types are discussed. With the aid of numerous diagrams and overlays, routing guidelines to minimize visual and ecological impacts are given, as well as suggestions for screening towers and poles utilizing existing vegetation. Desirable ROW plants for Michigan are also listed.

1296
Effects of herbicides on the environment.
AUTHOR: JOHNS HR
AUTHOR AFFILIATION: Asplundh Tree Expert Co.
SOURCE ID: New York, NY, Edison Electric Institute, 1970, 12 p.
YEAR PUBLISHED: 1970
CATEGORY: B1
REGION: Applicable to entire United States
KEYWORDS: environment; herbicides; impact; management; 2,4,5-T
ABSTRACT: (Purpose) To put 2,4,5-T and other herbicides into perspective, to present data on 25 year's experience, and to suggest ROW programs on a practical, prescription basis. (Type of Research) Discussion paper. (Results and Conclusions) Use of 2,4,5-T has been curtailed owing to some dubious tests; however, 2,4,5-T can still be used on ROWs. Some of the myths regarding effects of 2,4,5-T have been debunked by scientific evidence. An ecological study at Penn State has shown that herbicides produced a low stable cover which increased wildlife use of the abundant food and cover. Other tests across the country have agreed with this. Use of helicopters in spraying has reduced complaints owing to careful application. Licensing of applicators is now required by most states. Recommendations for use of herbicides include: using precise methods, have a qualified person available to deal with technical questions, plan and budget a year-round operation, cooperate with agencies, maintain good public relations,keep abreast of legislation, have multiple-use objectives, and ally with other industrial users.

1297
Substation site selection and development.
AUTHOR: JOHNSON JOHNSON AND ROY
SOURCE ID: Jackson, MI, Consumers Power, 1969, 64 p.
YEAR PUBLISHED: 1969
CATEGORY: B1; B2
SPONSOR: Consumers Power Co.
REGION: Applicable to entire United States STATE: Michigan
KEYWORDS: aesthetics; design; development; siting; substation
ABSTRACT: (Purpose) To establish criteria for functional and aesthetic design and location of electric substations in Michigan. (Results and Conclusions) Design principles and siting guidelines are discussed for electric substations in M[illegible] aesthetics and minimal environmental impact[illegible] suburban, and rural sites.

B1a - Species composition

1298
Ecology of transmission line corridors.
AUTHOR: CARVELL KL; JOHNSTON RA
AUTHOR AFFILIATION: WV Univ.
SOURCE ID: Morgantown, WV, WV Univ., 1978, EPR: Research Project 103-3.
YEAR PUBLISHED: 1978
CATEGORY: B1a; B1b; B1e; B2a, B2g
CONTRACT NUMBER: RE1033
SPONSOR: Electric Power Research Institute
REGION: Applicable to entire United States STATE: United States
KEYWORDS: communities, competition; ecology; herbicides; right-of-way; spraying, broadcast; spraying, selective; streams; topping; water; wildlife
ABSTRACT: (Purpose) To obtain factual information on the ecological impact of vegetation management practices on electric transmission line areas. (Time and Duration) Five-year study. (Type of Research) Original research (field study). (Methodology) Nine transmission line clearings were used for this study. These were located in New Hampshire, West Virginia, New Jersey, Virginia, Georgia, Louisiana, Minnesota, Oregon, and California. Studies include: ecological effects of herbicide treatments on the composition of plant communities, influence of electric transmission corridors on edge trees; response of forest-grown trees to topping; comparison of preferred wildlife food plants on electric corridors to old field areas; songbird utilization of power line corridors; and effects of power line clearance on streams. (Results and Conclusions) Repeated broadcast herbicide sprayings produced a low plant cover dominated by sedges, grasses, ferns, or herbicide-resistant woody species. Selective herbicide treatment, where shrubs and small trees were left, caused a gradual increase in woody plant communities. Mechanical damage to edge trees varied depending on the age of the right-of-way and the location of maintenance roads. Sunscald occurred on edge trees of certain species, particularly if tree trunks were directly exposed to the hot afternoon sun. Topped trees grew rapidly in height, and mortality of topped trees was uncommon unless topping removed nearly the complete crown. Plant communities where herbicides are used contain many preferred wildlife food plants.

1299
Long-term responses of cistus and certain other introduced shurbs on disturbed wildland sites in southern California.
AUTHOR: JUHREN MC; MONTGOMERY KR
AUTHOR AFFILIATION: Los Angeles State and County Arboretum.
SOURCE TITLE: Ecology.
SOURCE ID: 58(1):129-138, 1977
YEAR PUBLISHED: 1977
CATEGORY: B1a
REGION: California Chaparral STATE: California
KEYWORDS: competition; erosion; impact; introduction; invasion; shrubs
ABSTRACT: (Purpose) Evaluating the long-term responses of introduced shrubs at 12 sites planted for erosion control. (Time and Duration) 10-20 years; 1954-1974 (Type of Research) Original. (Methodology) Quantitative observations made of shrubs. Weather records of temperature, precipitation and evaporation were studied and extremes noted. Soils examined and analyzed. An experiment conducted on importance of light to Cistus seedlings. (Results and Conclusions) The plantings of Atriplex, Rosmarinus, and Baccharis species generally declined probably because climatic conditions were too extreme. Three species of Cistus did well for 3-5 years on most sites, 10 years or longer on some, and in some cases spreading with promise of permanent self-maintenance. Length of the effective life of the Cistus stands depended on availability of water, especially sufficiency and timing of the winter rains and high light intensity needed for seedlings declined when overtopped by high chaparral. On some sites, Cistus bushes became woody and senescent in 12 years, presenting a fire hazard. Potential for Cistus to spread across level, disturbed land presents a danger to range lands in california.

1300
Effects of herbicides on species diversity of two plant communities.
AUTHOR: GRANT WF; TOMKINS DJ
AUTHOR AFFILIATION: McGill Univ.
SOURCE TITLE: Ecology.
SOURCE ID: 58(2):398-406, 1977.
YEAR PUBLISHED: 1977
CATEGORY: B1a; B1b; B1c
REGION: Beach-Maple Forest

KEYWORDS: communities; herbicides; impact; management; plants; right-of-way; roadside; succession; vegetation
ABSTRACT: (Purpose) To compare three indices of species diversity (the number of species, community dominance, and the Brillouin information index); to compare the effects of selective auxins and nonselective herbicides on species diversity in herbaceous communities; and to compare the responses of communities of different ages to perturbation by herbicides. (Time and Duration) Three-year study. (Type of Research) Original research (field). (Methodology) The study was made on an electric right-of-way. Twenty-four 4m x 4m plots, each separated from adjacent plots by a 1m border strip, were marked with wooden stakes in the recently disturbed area; 32 plots were marked in the mature community. Each plot was assigned to a particular block, eight experimental treatments were applied at random within each block (2,4-D, picloram, picloram + 2,4-D, 2,4-D + 2,4,5-T, paraquat, simazine, diuron and control). Data collected included the number of plant species, number of individuals, height, and phenological state of each. (Results and Conclusions) Auxin herbicides caused an increase in the number of grasses with marked and persistent simplification of both community types. The nonselective herbicide, Diuron, also induced a very simplified community, but with no change in graminoid: forb ratio. Simazine treatment also had long-lasting effects on species diversity, but resulted in a more complex vegetation than found on the control plots with a much lower cover of broadleaf weeds. Paraquat initially eliminated both monocots and dicots, but vegetation recovered rapidly. The resistance to modification was greater in the old field community than in the recently disturbed one.

1301
Fuelbreaks and other fuel modification for wildland fire control.
AUTHOR: GREEN LR
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Washington, DC, US Forest Service, 1977, Agriculture Handbook 499, 79 p.
YEAR PUBLISHED: 1977
CATEGORY: B1a; B1b; B1c
REGION: Applicable to entire United States STATE: United States
KEYWORDS: burning, controlled; fire; fire hazard; fuelbreak; herbicides; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To describe the theory, practice and effectiveness of creating fuelbreaks for wildland fire control. (Time and Duration) Twenty years of research. (Type of Research) Original research (field). (Methodology) A large part of the information in this handbook is drawn from experience in fire control in California. In that area, fuel modification is a response to particularly hazardous conditions produced by a combination of climate, fire weather, and terrain. Where new vegetation patterns can be developed, fires can be more readily controlled. The possible reduction in the high costs of suppressing conflagrations and damage from such fires gives fuel modification efforts priority in management of California wildlands. (Results and Conclusions) The fuelbreak concept and fuel modification practices have been developed extensively since the 1950's. Fuelbreak system planning is integral to land use and fire control planning. Fuel modification practices include cleaning of original cover by hand or machine; prescribed burning with preparation of brush by cruising or desiccation with herbicides; control of brush regrowth with herbicides; as sprays or pellets; and establishment of new ground covers immediately after clearing. Perennial grasses are preferred as new cover where possible; low-growing shrubs are also used.

1302
Impact of chemical and mechanical site preparation on wildlife habitat.
AUTHOR: CARTER MC; KENNAMER JE; MARTIN JW
AUTHOR AFFILIATION: Auburn Univ.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 8(1):5-9, 1976.
YEAR PUBLISHED: 1976
CATEGORY: B1a; B1d
SPONSOR: Auburn Univ Agricultural Experiment; Station.
REGION: Beech-Sweetgum-Magnolia-Pine-Oak Forest STATE: Alabama
KEYWORDS: ecosystem; habitat; habitat change; herbicides; impact; wildlife; 2,4,5-T
ABSTRACT: (Purpose) This study was designed to compare plant communities on sites which had been prepared for pine planting using herbicides with sites prepared mechanically. (Time and Duration) Field evaluations were made in 1974, four years after site preparation and planting. (Methodology) Vegetation surveys were conducted using randomly located transects on which all overstory shrubs and trees were tallied by size, species and numbers. Understory plants and vines were tallied on randomly chosen, milacre subplots. Study areas included sites prepared chemically with an aerial spraying of 2,4,5-T or tree injection using undiluted 2,4-D. Mechanical methods included shearing, raking, piling and burning, and broadcast burning. (Results and Conclusions) Chemical site preparation did not eliminate all vegetation, as the general public often believes. Frequently the abundance and diversity of vegetation on chemically-prepared sites was greater after site preparation, and was higher than on those sites prepared mechanically. On chemically-prepared areas many of the woody mast producers escaped injury, recovered, or resprouted. If regeneration areas are well interspersed with mature stands, the long term effect of chemical site preparation on wildlife should not be detrimental.

1303
Cut frill herbicide treatments control hardwood weed trees.
AUTHOR: WURM R
SOURCE TITLE: Industria: Vegetation Management.
SOURCE ID: 8(1):21-24, 1976.
YEAR PUBLISHED: 1976
CATEGORY: B1a; B1d
REGION: Redwood Forest STATE: California
KEYWORDS: ecosystem; herbicides; maintenance; picloram; productivity; trees; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To find methods of eliminating tanoak, a weed tree, from former redwood and Douglas-fir sites, and to reestablish conifers on these areas. (Time and Duration) Herbicide-treated plots were established in 1965 and evaluated in 1975. (Type of Research) Original research. (Methodology) Amine forms of 2,4-D, 2,4,5-T and pelleted picloram were applied to dense sprout stands on tanoak on former redwood and Douglas-fir sites. The 10-year results include data on percent of hardwood control and on response of Douglas-fir regeneration. (Results and Conclusions) The cut-frill method of applying herbicides to tanoak and other brush species showed greater effectiveness with 2,4,5-T than with 2,4-D or pelleted picloram. Removal of hardwood shade and competition has allowed native Douglas-fir to become established and grow rapidly.

1304
Development of a stable, low cover on a utility right-of-way.
AUTHOR: BRAMBLE WC; BYRNES WR
AUTHOR AFFILIATION: Purdue Univ.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976.
YEAR PUBLISHED: 1976
CATEGORY: B1a
REGION: Eastern Deciduous Forest
KEYWORDS: cover; environment; management; right-of-way
ABSTRACT: (Purpose) An analysis was made of the invasion of vegetation components of a plant community by trees on a transmission line ROW in central PA on which woody brush had been under control for 23 years. (Time and Duration) 1953 - 1975. (Type of Research) Original research. (Methodology) Data was collected on chart transects, 3 x 165 feet. Community components were mapped and tree seedlings under 3 feet plotted. For trees over 3 feet, strip transects, 99 x 165 feet, were used and all trees were tallied by components. Transects were located at random in all five sprayed areas in four randomized blocks. (Results and Conclusions) A stable low cover existed on the ROW which was a mosaic of patches of single and mixed species. Components most resistant to tree invasion were pure patches of meadow fescue, rough goldenrod, bear oak, blueberry; and meadow fescue mixtures with other species. Most heavily invaded were pure patches of huckleberry, blackberry, and hayscented fern with other species. The most common mixture on the ROW, bracken-sedge-loosestrife-blueberry, was heavily invaded. While there were numerous seedlings in the ground layer, only a few slowly emerged to require control. The most common emerging species were black cherry, red maple, and sassafras. Some shrubs proved to be less resistant to invasion than some grasses and herbs.

1305
Effects of herbicidal management of electric transmission line rights-of-way on plant communities.
AUTHOR: CARVELL KL
AUTHOR AFFILIATION: WV Univ.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississppi State, MS, MS State Univ, 1976, 177-181 p.
YEAR PUBLISHED: 1976
CATEGORY: B1a
SPONSOR: Electric Power Research Institute
REGION: Applicable to entire United States STATE: United States
KEYWORDS: communities; herbicides; impact; management; right-of-way
ABSTRACT: (Purpose) Studies of plant communities on sprayed ROWs were begun in 1972 to determine their dominant plant communities and how these differ from those of adjacent open fields. (Time and Duration) 1972 - 1975. (Type of Research) Original research. (Methodology) Nine study areas were located in New Hampshire, West Virginia, Georgia, New Jersey, Minnesota, Oregon, Virginia, Louisiana, and California. Vegetation maps were made of 81 ROW plots which covered moist, average, and dry sites in each location. Plant community names were assigned

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according to dominant species within a plot. An equal number of open field plots were established and mapped within 1/4 mile of the ROW in each state. Mapping was done either in spring or early summer and again in later summer. After 5 years each plot will be remapped. (Results and Conclusions) Broadcast-sprayed ROWs had less perennial herb than open fields, while nearly the same annual and perennial herbs and shrubs were on selective-sprayed ROWs and unsprayed fields. Spring wildflowers were equally abundant on all types of areas where phenoxy herbicides were used. Picloram sprays, however, eliminated many spring wildflowers. Broadcast spraying resulted in communities of herbicide-tolerant species and perennial species spreading by stolons or roots. Selective spraying is expected to produce a line dominated by shrubs.

1306

Avian communities, energetics, and functions in coniferous forest habitats.

AUTHOR: WIENS JA
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975.
SOURCE ID: 1975, 226-261 p.
YEAR PUBLISHED: 1975
CATEGORY: B1a; B1b; B1c
REGION: Applicable to entire United States STATE: United States
KEYWORDS: biomass; birds; ecosystem; forest; habitat; productivity
ABSTRACT: (Purpose) To discuss avian community patterns and theoretical aspects of avian community structure, such as niche relationships, competitive regimes, optimization strategies; to show how decisions regarding avian habitat alteration can be made. (Time and Duration) One year study. (Type of Research) Original research and literature review. (Methodology) Consists of a review of avian breeding communities in North American coniferous forests to reveal a number of characteristic features of these forests. (Results and Conclusions) North American coniferous forests contain relatively rich breeding avifaunas. Censuses taken in 5-25 ha plots record 6-32 breeding species, with the richest avifaunas occuring in Northeastern, Southeastern and Sierra Nevada forests. Breeding densities in various forest regions average 329-1,456 individuals/km2. Standing crop biomass averages 65-283 g/ha: values are greatest in Pacific Northwest forests, and lowest in immature stands of northeastern forests. Foliage-feeding insectivores overwhelmingly dominate the avifaunas of forests in the Northeast, Southeast and North, but their proportionate contribution to density and biomass decreases towards the west and Northwest. In many northeastern forests, more than half of the individuals present in a stand are warblers, while in most western forests less than 10 percent of the individuals are warblers.

1307

Dominant patterns in bird populations of the eastern deciduous forest biome.

AUTHOR: ANDERSON SH; SHUGART HH; STRAND RH
AUTHOR AFFILIATION: Oak Ridge Nat Lab. Kenyon College.
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975.
SOURCE ID: 1075, 90-95 p.
YEAR PUBLISHED: 1975
CATEGORY: B1a; B1b; B1c
SPONSOR: Energy Research and Development Admin.
REGION: Eastern Deciduous Forest STATE: Connecticut; Massachusetts; Maryland; Maine; New Hampshire; New York; Pennsylvania; Rhode Island; Vermont
KEYWORDS: avifauna; birds; forest; population; succession, secondary; trends
ABSTRACT: (Purpose) To generalize on the pattern of bird populations in eastern forests and identify one research method of potential utility in non-game bird management research. (Time and Duration) One-year study. (Type of Research) Original research. (Methodology) Discusses past work done to determine bird habitat preferences, and illustrates the advantages of discriminant function analysis as a potential research tool for determining bird habitat preference. (Results and Conclusions) Several general patterns of variation are evident in bird populations of the eastern deciduous forest biome. The avifauna is typically dominated by migrants, with a pronounced importance of birds as components of ecosystems arising from their mobility and their high trophic position on many food webs. During secondary succession, bird populations typically increase in density, diversity, and standing crop with time. Habitat selection is an important determining factor for bird distributions, and habitat factors are generally more important than food-availability factors in avian resource division.

1308

National forest nongame bird management.

AUTHOR: SCHNEEGAS ER
AUTHOR AFFILIATION: US Forest Serv.
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975
SOURCE ID: 1975, 314-318 p.
YEAR PUBLISHED: 1975
CATEGORY: B1a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; birds, nongame; forest; habitat; management; species
ABSTRACT: (Purpose) To explain the US Forest Service policy of developing an effective balanced program for all wildlife and fish species, and to stress that the key to planning management for all wildlife species is to know the species habitat requirements. (Time and Duration) A review of literature covering a 12 year period. (Type of Research) Literature review. (Methodology) Review of literature and discussion of current Forest Service policy. (Results and Conclusions) Present US Forest Service wildlife programs emphasize nongame species more than ever before. The Endangered Species Act of 1973 has been one of the greatest influences on our wildlife efforts recently. They do not forget that 800-900 other species also depend on Forest Service management policies. Nongame program development will be hampered by a lack of basic data for some years to come.

1309

Water management practices and their effect on nongame bird habitat values in a deciduous forest community.

AUTHOR: CURTIS RL; RIPLEY TH
AUTHOR AFFILIATION: TN Valley Authority
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975
SOURCE ID: 1975, 128-141 p.
YEAR PUBLISHED: 1975
CATEGORY: B1a; B1c; B2a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; birds, nongame; ecosystem; forest; habitat; impact; management; productivity; water
ABSTRACT: (Purpose) To examine available information concerning the effect of various water management practices on nongame birds. Documented studies are cited to illustrate the effect of forest management for water quality and yield on bird habitats and populations. (Time and Duration) Literature review covering a 42 year period. (Type of Research) Literature review. (Methodology) Literature review. (Results and Conclusions) The techniques utilized to manage forest lands for increased water yield and quality will modify existing forest ecosystems. Consequences of these modifications on nongame birds are largely unknown. A synthesis of available information concerning the effects of water management practices on nongame birds is presented.

1310

The Bureau of Land Management Wildlife Habitat Management Program, with special emphasis on nongame bird habitats.

AUTHOR: CRAWFORD JE; MEANS RL; OLENDORFF RR
AUTHOR AFFILIATION: US Bureau of Land Management, Div of Wildlife.
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975.
SOURCE ID: 1975, 305-313 p.
YEAR PUBLISHED: 1975
CATEGORY: B1a; B1b; B1c
REGION: Applicable to entire United States STATE: United States
KEYWORDS: avifauna; birds; birds, song; habitat; habitat manipulation; management; wildlife
ABSTRACT: (Purpose) To describe the wildlife habitat management program of the Bureau of Land Management with special emphasis on habitat management for nongame birds. (Time and Duration) One year. (Type of Research) Literature review. (Methodology) Reviews literature of past work done, primarily, by Bureau of Land Management research workers. (Results and Conclusions) Wildlife habitats on the NRL (national resource lands) are producing far below potential. The Bureau of Land Management intends to provide stabilizaton of unsatisfactory or declining habitats and to protect, enhance and intensify management on all NRL. Examples of nongame bird habitat provides projects, such as the Snake River Birds of Prey Natural Area, the Blanca Wildlife Habitat Area, and the San Simon Cienega Wildlife Habitat Area are used to illustrate the habitat management capabilities of the Bureau.

1311
Avian communities, energetics, and functions in coniferous forest habitats.
AUTHOR: WIENS JA
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975.
SOURCE ID: 1975, 226-261 p.
YEAR PUBLISHED: 1975
CATEGORY: B1a; B1b; B1c
REGION: Applicable to entire United States STATE: United States
KEYWORDS: biomass; birds; ecosystem; forest; habitat; productivity
ABSTRACT: (Purpose) To discuss avian community patterns and theoretical aspects of avian community structure, such as niche relationships, competitive regimes, optimization strategies; to show how decisions regarding avian habitat alteration can be made. (Time and Duration) One year study. (Type of Research) Original research and literature review. (Methodology) Consists of a review of avian breeding communities in North American coniferous forests to reveal a number of characteristic features of these forests. (Results and Conclusions) North American coniferous forests contain relatively rich breeding avifaunas. Censuses taken in 5-25 HA plots record 6-32 breeding species, with the richest avifaunas occuring in Northeastern, Southeastern, and Sierra Nevada forests. Breeding densities in various forest regions average 329-1,456 individuals/km2. Standing crop biomass averages 65-283 g/ha; values are greatest in Pacific Northwest forests, and lowest in immature stands of Northeastern fobests. Foliage-feeding insectivores overwhelmingly dominate the avifaunas of forests in the Northeast, Southeast, and North, but their proportionate contribution to density and biomass decreases towards the West and Northwest. In many Northeastern forests, more than half of the individuals present in a stand are warblers, while in most Western forests less than ten percent of the individuals are warblers.

1312
Deer find what they need on a sprayed utility right-of-way.
AUTHOR: BRAMBLE WC; BYRNES WR
AUTHOR AFFILIATION: Purdue Univ.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 7(3):7-11, 1975.
YEAR PUBLISHED: 1975
CATEGORY: B1a
REGION: Appalachian Oak Forest
KEYWORDS: deer; food; habitat; right-of-way; wildlife
ABSTRACT: (Purpose) A research project was carried out in central Pennsylvania from 1953-1973 to follow development of food and cover for wildlife and wildlife use. (Time and Duration) 1953-73. (Type of Research) Original research. (Methodology) Development of vegetation was followed on strip transects in four randomized blocks. Deer use was studied by pellet group counts and direct observations. A standard feed analysis was made to determine the nutritive value of browse. (Results and Conclusions) Basal sprays in 1953 did not alter the typical ROW plant community appreciably while broadcast sprays changed the Bracken-Sedge-Herb-Blueberry to a grass-weed or fireweed community. However, all spray areas returned to the original community in about 15 years. Subsequent basal sprays did not alter the plant community. Deer use of the ROW over a period of 20 years was studied by pellet group counts on strip transects and direct observations. While deer use was highest on brushy, unsprayed control areas, use increased and became constant on sprayed areas as food and cover developed and was higher than in the adjacent forest. Common plants on the ROW were eaten by deer and were of acceptable feed value.

1313
Effects of clearcutting on the diversity of breeding birds.
AUTHOR: ADKISSON CS; CONNER RN
AUTHOR AFFILIATION: VA Polytechnic Institute.
SOURCE TITLE: Journal of Forestry
SOURCE ID: 73(12):781-785, 1975.
YEAR PUBLISHED: 1975
CATEGORY: B1a; B1b; B1c
REGION: Appalachian Oak Forest STATE: Virginia
KEYWORDS: birds; birds, breeding; clearing; diversity; impacts
ABSTRACT: (Purpose) To study the effects of clearcutting on the species diversity of breeding birds, and to observe changes in this diversity over a period of years. (Time and Duration) One year study. (Type of Research) Original research (Methodology) Six study areas were selected: a 1-year-old clearcut, a 3-year-old, a 7-year-old, a 12-year-old, a pole stand, and a mature forest stand. The areas were from 20 to 35 ha, and were located in mixed oak stands. Breeding birds were censused between 0600 and 1000 hours EST on two transects 100m long and 100m wide in each of the different study areas. (Results and Conclusions) Clearcutting initially reduced breeding bird species' diversity and number of birds seen in the 1-year-old clearcut and the pole stand. However, both species diversity and number of birds seen greatly increased in the 3-,7-, and 12-year-old clearcuts. Likewise, clearcuts provided nesting habitat for many species of birds not found in mature forests. A well supervised clearcutting program that leaves dead snags and some live trees, and does not disc or burn slash will have the effect of increasing the number of birds and bird species diversity over the entire area being managed.

1314
Rangeland avifaunas: their composition, energetics, and role in the ecosystem.
AUTHOR: DYER MI; WIENS JA
AUTHOR AFFILIATION: OR State Univ.; CO State Univ.
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975.
SOURCE ID: 1975, 146-182.p.
YEAR PUBLISHED: 1975
CATEGORY: B1a; B1b; B1c
REGION: Applicable to entire United States STATE: United States
KEYWORDS: avifauna; biomass; birds; composition; ecosystem; habitat; range land
ABSTRACT: (Purpose) To review attributes of breeding bird communities in several types of North American rangeland habitats, emphasizing dominant species, community organization, energy flow and trophic dynamics, and to show within these natural contexts how decisions regarding habitat and nongame bird populations must be made. (Time and Duration) One year study. (Type of Research) Original research. (Methodology) These analyses drew, in large part, research conclusions from other avifauna studies. The various methods of handling these data were unique and original contributions of these authors. (Results and Conclusions) Rangeland avifaunas are characterized by few breeding bird species; only 20 species occur with moderate frequency in these habitats. The number of breeding species in 10 ha plots averages 3 to 5. There is substantial seasonal and annual variation in density and biomass, but not in species composition of breeding avifaunas. Grazing at high intensity generally reduces species numbers, but has variable effects on density and biomass; agricultural cultivation produces major changes in all community attributes.

1315
Selecting plants to rehabilitate disturbed areas.
AUTHOR: MONSEN SB
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Improved Range Plants.
SOURCE ID: Denver, CO Society of Range Management, Range Symposium Series 1, 1975 76-90 p.
YEAR PUBLISHED: 1975
CATEGORY: B1a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: checklist; habitat; mammals, big game; mammals, small game; management; planting; restoration; shrubs; species
ABSTRACT: (Purpose) To describe progress made in selecting woody and herbaceous plants to use in rehabilitating wildlands and rangelands characterized by adverse climatic or edaphic conditions. (Time and Duration) Summarizes work done over a 20-year period. (Type of Research) Primarily a literature review (Methodology) Problems in rehabilitating disturbed areas are discussed, including livestock and wildlife ranges, watersheds, mining sites, highways, rights-of-way and recreation areas. The advantages and problems encountered in using native and introduced species in rehabilitation work are reviewed. Progress in the propagation of desirable plant materials is outlined. (Results and Conclusions) A wide array of plants is needed to revegetate disturbed areas in western US. Recent developments in selection and propagation have provided useful plants of improving wildlands and rangelands, characterized by adverse climatic or edaphic conditions. Disturbances can be improved if specific plants and site treatment practices are utilized. Through the development of nursery stock and seed orchards, many native shrubs and herbs are now being produced for wildland plantings. The selection and breeding of specific ecotypes provide improved strains for revegetation.

1316
Woody plants for rehabilitating rangelands in the intermountain region.
AUTHOR: CHRISTENSEN DR; MONSEN SB
AUTHOR AFFILIATION: US Forest Service.; UT Div of Wildlife Resources.
SOURCE TITLE: Proceedings of "Wildland Shrubs" Symposium and Workshop.
SOURCE ID: Provo, UT, 1975, 72-119 p.
YEAR PUBLISHED: 1975
CATEGORY: B1a
REGION: Intermountain Sagebrush STATE: Idaho; Nevada; Oregon; Utah
KEYWORDS: checklist; habitat; mammals, big game; mammals, small game; management; planting; restoration; shrubs; species
ABSTRACT: (Purpose) To present the results of studies dealing with the selection and propagation of woody plants for big game and livestock

1316

rangeland rehabilitation in the intermountain region. (Time and Duration) Summarizes work done over a 20-year period. (Type of Research) Primarily a literature review. (Methodology) Selection of shrubs for range restoration has been based primarily on three criteria: (1) plants must be adapted to planting sites; (2) species must also provide such desirable vegetative resources as forage, ground cover, and protection to animals; and (3) seedlings must be highly successful in establishing and surviving to maturity. (Results and Conclusions) A considerable number of native and exotic shrubs and trees can be successfully established within most major rangeland communities. The principal species used in rangeland plantings have been selected for their herbage and cover values, productivity, adaptability, and the success or ease of mechanical plantings and rearing of stock. Most shrubs and trees have been successfully reared under nursery, greenhouse and rangeland conditions. However, slow-growing shrubs and tree seedlings are difficult to establish on arid sites. Steep slopes are also difficult to plant with conventional equipment.

1317

Environmental impact of herbicides on electric transmission line rights-of-way.

AUTHOR: CARVELL KL
AUTHOR AFFILIATION: WV Univ.
SOURCE TITLE: Journal of Arboriculture
SOURCE ID: 1(7):129-130, 1975.
YEAR PUBLISHED: 1975
CATEGORY: B1a; B1b; B1e
REPORT NUMBER: RP103
SPONSOR: Electric Power Research Institute.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: aesthetics; communities; community structure; environment; herbicides; impact; right-of-way; wildlife
ABSTRACT: (Purpose) To determine the impact of repeated herbicide application on electric ROWs on such environmental parameters as plant communities, aesthetics, wildlife habitat and food. (Time and Duration) Three-year study. (Type of Research) Original research (field study). (Methodology) Nine ROW areas, scattered throughout the US, were used for long-term studies to discover the impact of past herbicide treatments. Nine study plots were established on each line area. On these, detailed vegetation maps were constructed, identifying each plant community by composition and structure. Aesthetic problems were described. Each plant community was rated for its wildlife value. Similar study plots were established on nearby old field areas to use for comparison purposes. (Results and Conclusions) Present plant communities on broadcast sprayed areas are largely composed of species somewhat resistant to herbicides. Orderly changes are gradually taking place in the communities now present. The more resistant plants now present on these lines are gradually spreading and driving out other more sensitive species. Thus, over a long period a "herbicide climax" will develop. Selectively-sprayed areas often contain a nucleus of showy shrubs that spread gradually. Comparison of plant communities on ROW areas with those on old fields shows that ROW communities are equal to, or in some cases superior to, old fields for wildlife.

1318

Songbirds of the right-of-way.

AUTHOR: BRAMBLE WC
AUTHOR AFFILIATION: Purdue Univ.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 6(3):12-14, 1974.
YEAR PUBLISHED: 1974
CATEGORY: B1a
REGION: Appalachian Oak Forest
KEYWORDS: birds; habitat; right-of-way
ABSTRACT: (Purpose) Songbirds were observed and photographed on a herbicide-sprayed ROW in central Pennsylvania in July, 1974. (Time and Duration) 1974. (Type of Research) Original research. (Methodology) Observations were made of bird species using the ROW on six treatment areas in four randomized blocks. (Results and Conclusions) Thirteen species of songbirds were observed commonly using the ROW which had been maintained with 2,4-D, 2,4,5-T, and Ammate sprays since 1953. The vegetative cover had been converted from forest to an open shrubland with a mosaic pattern made up of shrubs intermingled with herbs, grasses, and ferns. The songbirds were mostly species typical of brushlands and forest edges and included: rufous-sided towhee, catbird, indigo bunting, eastern robin, song sparrow, brown thrasher, common goldfinch, yellowthroat warbler, myrtle warbler, crow, yellow-shafted flicker, hairy woodpecker.

1319

Creation of relatively stable shrublands with herbicides: arresting "succession" on rights-of-way and pastureland.

AUTHOR: GOODWIN RH; NIERING WA
AUTHOR AFFILIATION: CT College. Botany Dept.
SOURCE TITLE: Ecology.
SOURCE ID: 55(4): 784-795. 1974
YEAR PUBLISHED: 1974
CATEGORY: B1a; B1b; B1c
REGION: Eastern Deciduous Forest STATE: Connecticut
KEYWORDS: ecosystem; herbicides; right-of-way; shrubs; stability; succession
ABSTRACT: (Purpose) To determine plant communities which are relatively stable and resist invasion of tree species. (Time and Duration) Two decades beginning in 1953. (Type of Research) Original. (Methodology) Prior to selective spraying of the right-of-way study area, major vegetation types were mapped and the percent cover contributed by various species was estimated. In 1967 shrub clones of low bluebery, huckleberry and greenbrier were planted on abandoned pastureland to study their ability to resist invasion. In 1972 these areas were resurveyed for tree reproduction and growth rates of various shrub clones were measured. (Results and Conclusions) Two decades of selective herbicide management on a right-of-way within the Connecticut Arboretum has resulted in a mosaic of relatively stable shrub communities, and less stable herbaceous communities. Areas of dense shrubs on the right-of-way have resisted tree invasion for 15 years. Pastureland plantings of shrub clones have remained essentially stable for five years. Creating stable shrub communities by selective use of herbicides has practical application in right-of-way and wildlife management.

1320

Herbicide residues and weed species shifts on modified-soil field plots.

AUTHOR: BEST JA; WEBER JB; WITT WW
AUTHOR AFFILIATION: NC State Univ.; Velsicol Chemical Corp.
SOURCE TITLE: Weed Science.
SOURCE ID: 22(5):427-433, 1974.
YEAR PUBLISHED: 1974
CATEGORY: B1a; B2b
REGION: Southeastern Mixed Forest STATE: North Carolina
KEYWORDS: changes, effect of; communities; herbicides; soil; weeds
ABSTRACT: (Purpose) To determine the amount of each herbicide present in the surface soils and prometryne present in the subsoils of the modified-soil study; the influence of the soil additives on the total and biologically active herbicides present; and measure changes in the weed population influenced by herbicides. (Time and Duration) Five-year study. (Type of Research) Original research. (Methodology) A Shubata soil was modified by adding organic matter or montmorillonite clay. Three annual applications of fluometuron, prometryne and trifluralin were made and soil samples analyzed at the end of the third year. Population densities of the various weed species occurring on each plot were determined by weed counts and by visual estimates of the amount of weed cover and the proportion of each weed species present. Ratings were made in 1970, 1971 and 1972. (Results and Conclusions) Prometryne and fluometuron greatly decreased the large crabgrass population and increased the proportion of yellow nutsedge and crowfootgrass. Trifluralin greatly decreased large crabgrass and crowfootgrass populations, but the plots became completely infested with yellow nutsedge. Horseweed became the overall dominant species starting the first year and increasing in the second and third years. Yellow nutsedge, bermudagrass and other grasses were also prevalent.

1321

Chaparral shrub control as influenced by grazing, herbicides and fire.

AUTHOR: LEONARD OA; MURPHY AH
AUTHOR AFFILIATION: Univ of CA.
SOURCE TITLE: California Agriculture
SOURCE ID: Pages 10-13, 1974 (Jan).
YEAR PUBLISHED: 1974
CATEGORY: B1a
REGION: California Chaparral STATE: California
KEYWORDS: fire; fire hazard; herbicides; shrubs
ABSTRACT: (Purpose) To understand the part played by fire, herbicides and grazing in shrub management. (Time and Duration) 14 year study. (Type of Research) Original research (field study). (Methodology) In southeastern Mendocino County, CA, on an extensive brush-field area, different methods of shrub control were tried starting in 1956. Fencing was placed around part of the area; part was left unfenced. Within both the fenced and non-fenced areas, some of the resprouting brush plots were treated with herbicides and fire, while others received no treatment. The herbicide used was standard brush killer (2,4-D and 2,4,5-T) at 4 lbs active ingredients per 100 gal of water with 1% diesel oil. (Results and Conclusions) The best control of chaparral shrubs on rangeland was

achieved by using herbicides. In both grazed and ungrazed areas chemical control reduced the brush to less than 1% of the plant cover within 4 years and maintained a very low level for the 14-year period of the experiment. Grazing without other controls had little influence on the results except for the reoccurrence of poison oak in ungrazed areas. Fire reduced the composition of brush for the first 2 years, but peaked out in the sixth year with a gradual decline thereafter.

1322
Nutrient loss from clearcuttings in New Hampshire.
AUTHOR: MARTIN CW; PIERCE RS; REEVES CC
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: National Symposium on Watersheds in Transition.
SOURCE ID: US Forest Service.
YEAR PUBLISHED: 1973
CATEGORY: B1a; B1b
REGION: Appalachian Oak Forest STATE: New Hampshire
KEYWORDS: clearing; impacts; nitrogen cycle; nutrient removal; watersheds
ABSTRACT: (Purpose) To present data on nutrient outflow from streams draining lands that have been clearcut or devegetated, and specifically on increased streamflow, and ecological changes related to nutrient release. (Time and Duration) 6 years, 1965-1971. (Type of Research) Original. (Methodology) Data on nutrient loss on cleared and herbicide-treated watersheds was compared to nutrient loss on nearby uncut watersheds. All water samples were quantitatively analyzed for nitrate, ammonium, sulfate, choride, calcium, magnesium, potassium, sodium, conductivity, and acidity. (Results and Conclusions) Substantial changes in ion concentration were found in all streams draining clearcut areas. Indications are that clearcutting on shallow, infertile, podzolized soils subject the site to nutrient losses for several years after exposure. In undisturbed forests about 20 percent of the annual nitrogen turnover is recycled as nitrate nitrogen. On clearcut areas, 1/3 to 1/2 of the total amount of nitrogen normally recycled in the uncut forest was removed in stream water, but 1.5 to 3 times the normal recycled nitrate nitrogen was lost. Nitrate and ammonium ions are readily available to plants, but they are also exceedingly vulnerable to removal in drainage water.

1323
Use of fire: comments from the northeast.
AUTHOR: LITTLE S
SOURCE TITLE: Journal of Forestry.
SOURCE ID: 71(10):633-634, 1973.
YEAR PUBLISHED: 1973
CATEGORY: B1a
SPONSOR: US Forest Service, Northeastern Forest; Experiment Station.
REGION: Beach-Maple Forest STATE: Connecticut; Maryland; New Jersey; Pennsylvania
KEYWORDS: ecology; fire; succession
ABSTRACT: (Purpose) To discuss some aspects of fire in the northeastern United States. (Type of Research) Review of literature. (Methodology) Reviewed 16 papers concerning the ecological effects of fire in the Northeastern United States. (Results and Conclusions) Some forest types can play a desirable role in certain fire regimes to bring about certain ecological conditions.

1324
The effect of clear cutting and burning on pinus banksiana forests on the populations of small mammals in southeastern Manitoba.
AUTHOR: BUCKNER CH; SIMS HP
AUTHOR AFFILIATION: Canadian Forestry Service.; Chemical Control Research Institute.
SOURCE TITLE: The American Midland Naturalist.
SOURCE ID: 90(1):228-231, 1973.
YEAR PUBLISHED: 1973
CATEGORY: B1a; B1c; B1e
REGION: Spruce-fir Forest
KEYWORDS: clearing; forest; habitat; impact; invasion; mammals, small; population; seeding; slash disposal; wildlife
ABSTRACT: (Purpose) To obtain information on changes in small mammal populations after slash burning which might affect seeding success. (Time and Duration) Three years (1965, 1966, 1967). (Type of Research) Original. (Methodology) Three areas (two of 50 acres each) supporting pure stands of jack pine were clearcut, one each winter, and the slash burned the following summer. A 5x10 chain trapping plot was located on each area about 200 feet from stand edge. On larger 240 acre area, second plot located 600 feet in. Control plots selected in adjacent uncut stands. Trapping done for three nights in May and late September for three years. (Results and Conclusions) Dominant species show distinct habitat preferences. Peromyscus maniculatus captured almost exclusively on burns and invaded from the surrounding forest soon after fire. Microtus pennsylvanicus did not regain its original number until the autumn of the second year and population remained stable, probably due to lack of cover. Peromyscus not so dependent on surface runways, but require a more permanent nesting site such as under roots or rocks available on burned areas. More distant plot invaded as rapidly as near plot, with a higher percent of juveniles. Rapid reestablishment of large population of Peromyscus maniculatus represents a hazard to direct seeding of jack pine in southeast Manitoba.

1325
Ecological effects of herbicide sprayings in shaping plant communities on transmission line rights-of-way.
AUTHOR: JOHNSTON PA
AUTHOR AFFILIATION: WV Univ.
SOURCE ID: Morgantown, WV, WV Univ, 1973, Masters Thesis, 196 p.
YEAR PUBLISHED: 1973
CATEGORY: B1a; B1b
CONTRACT NUMBER: 3
SPONSOR: Edison Electric Institute
REGION: Applicable to entire United States STATE: United States
KEYWORDS: communities; community structure; coppice; ecology; ecosystem; erosion, soil; forbs; herbicides; impact; right-of-way
ABSTRACT: (Purpose) To determine differences between plant communities on herbicide-treated transmission line areas and natural communities on adjacent unsprayed old fields, and to assess certain aesthetic qualities of those plant communities now dominating herbicide-treated ROWs. (Time and Duration) Two-year study. (Type of Research) Original research (field). (Methodology) Fifty-four permanent study plots were established on six transmission lines, located in New Hampshire, West Virginia, Georgia, New Jersey, Minnesota and Oregon. An equal number of plots were located on hydric, mesic and xeric sites. These ROWs were selected for their long, and well-documented herbicide history. An equal number of plots were established on old field areas where herbicides had never been used. Detailed mapping of plant communities was done on each study plot to contrast the composition of the ROW communities with that of old-field areas. (Results and Conslusions) All plant communities on sprayed ROWs differ from those on adjacent unsprayed areas. Herbicide communities had fewer perennial herbs, particularly showy summer and fall wildflowers. Present plant communities on blanket-sprayed ROWs are largely composed of species somewhat resistant to herbicides. Those communities spreading most rapidly at present on broadcast spraying areas are those that invade by vegetative means, particularly those that occupy new areas by root extension. This group includes many perennial grasses, certain shrubs, and some herbaceous perennialss

1326
Without consent.
AUTHOR: HAWKINS J
SOURCE TITLE: Defenders of Wildlife News.
SOURCE ID: 606-611, 1973 (October).
YEAR PUBLISHED: 1973
CATEGORY: B1a; B1d; B2a; B2b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds, game; cover; habitat manipulation; mammals; right-of-way; spraying, broadcast; spraying, selective; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To point out many environmental problems that occur with the use of various herbicides on ROW areas, and point out that better methods of brush control, with less dangerous impact on the ecological balance of an area, are known. (Type of Research) A review of selected literature. (Methodology) The author reviews articles on the impact of herbicides and spraying methods on plant communities, habitat, and animals; and the danger of contamination of the environment with the breakdown of these herbicides, to illustrate that the electric power companies, pesticide manufacturers, government agencies, and equipment manufacturers are not being responsive to the public in properly caring for the environment of ROW areas. (Results and Conclusions) The author concludes that "perhaps the rights of individual citizens must be submerged for some purposes when population problems and pressures are considered. But the continued use of harmful chemicals when better, ecologically sound, although less simple methods are available, is not in the long-range best interests of the people as a whole."

1327
Natural plant recolonization of surficial disturbances, Tuktoyaktuk Peninsula Region, Northwest Territories.
AUTHOR: HERNANDEZ H
AUTHOR AFFILIATION: Univ of Alberta.
SOURCE TITLE: Canadian Journal of Botany.
SOURCE ID: 51(11):2177-2196, 1973.
YEAR PUBLISHED: 1973
CATEGORY: B1a; B2f; C4
SPONSOR: Arctic Petroleum Operators Association; and Artic Land Use Research Program.
REGION: Applicable to entire United States
KEYWORDS: disturbance; impact; permafrost; plants; recolonization; roads; soil; tundra

1327

ABSTRACT: (Purpose) To assess the impact of surface soil and plant disturbances on plant cover and depth of permafrost thaw and to evaluate natural plant recolonization of disturbed areas. (Time and Duration) 1970 to 1972 - two years (Type of Research) Original field research. (Methodology) Studies were conducted on areas disturbed by seismic lines and winter roads in the Mackenzie Delta and Tuktoyaktuk Peninsula, Northwest Territories. Principal plant communities in forest and tundra were identified by aerial and ground surveys. Plant cover was determined on parallel 30 meter transects on disturbed and adjacent undisturbed control areas. Two permafrost thaw depth measurements were made on each quadrat. Observations were made on type, appearance and amount of disturbance, slope and exposure, and soil properties by exposing shallow profiles. Height, diameter and age was measured on forest trees. Twenty nine different combinations of disturbance and plant community sites were sampled. (Results and Conclusions) Winter seismic lines caused less disturbance to plant communities than summer lines. Winter roads removed most plant cover but peat layers remained intact, so effects were minimal on soil energy budgets. Summer disturbance affected wetland sedge meadows more than winter disturbance. Forest and shrub communities recovered quicker than similarly disturbed upland tundra communities. Summer seismic lines graded to permafrost resulted in exposure of mineral soil that led to secondary succession in tundra communities. Plant cover was 30 to 50% within six years after mineral soil was exposed. Permafrost thaw was increased 80 to 100 percent where mineral soil was exposed, 30 to 50 percent if peat remained intact, and 10 percent if plant cover was altered. Disturbance did not lead to erosion due to low precipitation in the area.

1328

The revegetation of a Rhode Island right-of-way, Exeter, Rhode Island.

AUTHOR: STALTER R
AUTHOR AFFILIATION: St John's Univ
SOURCE TITLE: Castanea: The Journal of the Southern Appalachian Botanical Club.
SOURCE ID: 37(2):77-83, 1972.
YEAR PUBLISHED: 1972
CATEGORY: B1a; B1b; B1c
REGION: Appalachian Oak Forest STATE: Rhode Island
KEYWORDS: herbicides; revegetation; right-of-way; spraying, selective; 2,4,5-T
ABSTRACT: (Purpose) To describe changes in ROW vegetation after arborescent and frutescent species were clearcut from the area in 1963 and the stumps treated with 2,4,5-T in fuel oil. (Time and Duration) Two-year study. (Type of Research) Original research (field). (Methodology) Three pairs of study sites were sampled during May 1965. The ROW sites were compared with three sites in the adjacent forest by using line intercept method. Cover estimates by eye were made on each plant intersecting the line both above and below it. Thirty 80 foot transects were made and the spacing and positioning of the transects varied according to the study site. (Results and Conclusions) The chemical treatment of tree stumps with 2,4,5-T has little effect on red maple, white oak, black oak, blackgum and white ash, while yellow birch was killed by the treatment. The increase or decrease of certain taxa on the ROW might be due to several reasons. First, it might be a response to the application of 2,4,5-T. A concentration of a particular strength might initiate sprouting of certain taxa and decrease that of others. Moreover, the concentration of 2,4,5-T was probably not the same on all parts of the ROW being of greater concentration near the treated stumps and less concentration farther from them. Secondly, the frutescents may have varied in sprouting ability after cutting.

1329

Clearcutting: detrimental aspects for wildlife resources.

AUTHOR: PENGELLY WL
AUTHOR AFFILIATION: Univ of MT.
SOURCE TITLE: Journal of Soil and Water Conservation.
SOURCE ID: 27:255-258, 1972.
YEAR PUBLISHED: 1972
CATEGORY: B1a; B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: clearcutting; clearing; diversity; ecosystem; forest; habitat; habitat change; impact; stability; succession; wildlife
ABSTRACT: Not a research paper, but an article in which some research is cited. (Results and Conclusions) Wildlife is an important component of the forest ecosystem and their diversity and abundance is related to the habitat diversity and abundance. Clearcutting followed by regeneration activities radically alters this ecosystem. Some of the stated ecosystem effects of clearcutting are: 1) increase in snow accumulation — may bury forage and discourage animal travel; 2) increased moisture loss by isolation; 3) barriers to movement — windrows of logs, roadcuts, debris should be broken in draws and at ridgepoint; 4) increase in wind velocities in clearings; 5) forage clearcut provided varies along a moisture gradient — on dry sites, timber more valuable as cover; 6) slash burning, especially light broadcast burning, can be desirable for native understory species and thus beneficial for animals. Suppression of fire questionable. Concerned about simplification of ecosystems — stability usually associated with diversity. Natural regeneration preferable to attempts to reforest by eliminating "weeds" and replanting. Several stages of succession more productive for wildlife and should last longer. Concludes that intensive forest management is seldom compatible with wildlife interests.

1330

Clearcutting: beneficial aspects for wildlife resources.

AUTHOR: RESLER RA
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Journal of Soil and Water Conservation.
SOURCE ID: 27:250-254, 1972.
YEAR PUBLISHED: 1972
CATEGORY: B1a; B1d; B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: clearcutting; clearing; forest; habitat; impact; management; wildlife
ABSTRACT: (Purpose) To discuss beneficial aspects of clearcutting to wildlife. (Type of Research) Literature review. Introductory discussion of forest management techniques. Cites research which demonstrates benefits to fish, game animals, small mammals, and birds. (Results and Conclusions) The many variations in methods of clearcutting can determine end result of "good" or "bad." Research only on specifically selected species — has no analysis of all animals affected. Most work has been done on game animals, especially deer and elk. The benefits usually reported concern increase in food and "edge effect." In general, small scattered clearings seem preferable. One study found strip-cutting better for deer, especially when uncut paths are left for travel during times of deep snows. Author concludes that relationships of clearcutting and wildlife are complex. Any benefits can only be realized through careful advanced planning and execution.

1331

Invasion of trees in secondary succession on the New Jersey piedmont.

AUTHOR: BUELL HF; BUELL MF; SMALL JA
AUTHOR AFFILIATION: Rutgers Univ.
SOURCE TITLE: Torrey Botanical Club Bulletin
SOURCE ID: 98:67-74,1971.
YEAR PUBLISHED: 1971
CATEGORY: B1a; B1b
REGION: Oak-Hickory Forest STATE: New Jersey
KEYWORDS: freeze-thaw cycles; succession; trees
ABSTRACT: (Purpose) To follow succession on specific areas over a period of time with the view of learning more precisely the sequence of events during the course of vegetational change. (Time and Duration) 12 year study. (Type of Research) Original. (Methodology) The studies, made at the Hutcheson Memorial Forest preserve on fields abandoned from cultivation, involved sampling of vegetation using quadrats. Measurements were made every two years. (Results and Conclusions) As a rule, tree seedlings do not become established during the first year but begin to appear the second year, with new ones continuing to appear in successive years. Mortality of previously established individuals is common during the early stages of succession. At that time, when much bare soil is exposed, heaving due to winter freeze-thaw cycles is one of the major influences in hindering early establishment of tree seedlings.

1332

Forest cuttings raise temperatures of small streams in the southern Appalachians.

AUTHOR: MESSER JB; SWIFT LW JR
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Journal of Soil and Water Conservation.
SOURCE ID: 26(3):111-116, 1971.
YEAR PUBLISHED: 1971
CATEGORY: B1a; B1e; B2a
REGION: Appalachian Oak Forest STATE: North Carolina
KEYWORDS: clearing; fish; forest; stream; temperature
ABSTRACT: (Purpose) To study changes in quantity and timing of streamflow and to demonstrate both good and poor land management practices. (Time and Duration) 1939; summer of 1940 and 1949; 1947; 1954-1958. (Type of Research) Original. (Methodology) Stream temperatures were measured during six forest-cutting treatments on small (23 to 70 acre) watersheds in the southern Appalachian Mountains. Where forest trees and all understory vegetation were completely cut, maximum stream temperatures in summer increased from the normal 66oF to 73oF or more. Some extreme treatments raised temperatures more than 12o above normal. Where streambank vegetation was uncut or had regrown, summer maximums remained unchanged or declined from temperatures measured under uncut mature hardwood forest. (Results and Conclusions) Increases in stream temperature were judged to degrade

water quality and constitute thermal pollution because, after each clearcut, water temperatures exceeded optimum levels for trout habitat.

1333
Ecological effects of military defoliation on the forests of South Vietnam.
AUTHOR: WESTING AH
AUTHOR AFFILIATION: Windham College.
SOURCE ID: 21(17):893-898, 1971.
YEAR PUBLISHED: 1971
CATEGORY: B1a
REGION: Applicable to entire United States
KEYWORDS: ecology; forest; herbicides; impact
ABSTRACT: (Purpose To assess the ecological consequences of the military use of herbicides against the forests of South Viet Nam. (Time and Duration) Two-year study, 1969-1970. (Type of Research) Observations on two trips to South Viet Nam, plus interviews and a literature review. (Methodology) Figures on total acreage sprayed were obtained from the Department of Defense and from the National Liberation Front. Descriptions of the natural forests of Viet Nam and their composition were obtained through a review of the botanical literature and from observations on two trips to that country. Estimates of damage to these forests are based on his brief examination of these forests, and on data obtained by interviews with others. (Results and Conclusions) The herbicide operations (together with other military assaults on the environment) have greatly diminished the forest resource, both present and future. The economic loss to South Viet Nam by forest defoliation operations amounts to roughly 47 million cubic meters of merchantable timber plus an indeterminate amount of fuelwood, charcoal, and other secondary products—for an approximate total cash value of 0.5 billion.

1334
Roads and the conservation of wildlife.
AUTHOR: WAY JM
AUTHOR AFFILIATION: England Nature Conservancy.
SOURCE TITLE: The Journal of the Institution of Highway engineers.
SOURCE ID: 17(7):5-11, 1970.
YEAR PUBLISHED: 1970
CATEGORY: B1a; B1b
REGION: Applicable to entire United States
KEYWORDS: aesthetics; browse; habitat; maintenance; mowing; revegetation; right-of-way; roadsides; wildlife
ABSTRACT: (Purpose) To explain a concept of vegetation along roadsides in England. These management practices are designed to minimize maintenance, increase aesthetic values, and provide suitable habitat for game. (Type of Research) Observations and literature survey. (Methodology) Observations were made on a large number of rights-of-way, including both new roads and older roads, to determine what the composition and structure was on roadsides of different ages. The number of agricultural weeds present on roadsides, the diversity of species, and their height were considered. Observations were also made on roadsides where herbicides and mowing to various heights were used to control vegetation. (Results and Conclusions) Grasses along roadsides may be kept to a height of 12 inches or less if cut (or suppressed by maleic hydrazide) at an early state in May. There is no further growth of the stem with most grasses, and the height to which they grow will then be related to the length of their leaves. This should be perfectly adequate for the front verges of most roads. Back from the road, management is less intensive, allowing taller vegetation. The timing of the cutting on this vegetation is not critical but probably the worst time to cut is in mid-summer when plants are in flower, and the cut vegetation will be noticeable.

1335
Effects of herbicides on water and its inhabitants.
AUTHOR: MULLISON WE
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Weed Science.
SOURCE ID: 18(6):738-750, 1970.
YEAR PUBLISHED: 1970
CATEGORY: B1a; B2b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: chemicals; fish; food chain; herbicides; impact; persistence; pollution; residue; toxicity; water
ABSTRACT: (Purpose) To survey the possible occurrence of herbicides in water and to summarize present knowledge concerning their effects on fish, plankton, and other water dwellers. Concerned with the ultimate fate of herbicides after use. (Type of Research) Literature review. (Methodology) Literature survey of 150 studies of herbicides, organized alphabetically according to common names of chemicals. (Results and Conclusions) Evidence at hand shows few signs of either a contamination problem or an accumulation in our waters if presently available weed killers are used according to label directions. There is no evidence of a biological magnification problem with herbicides in the food chain organisms. Most herbicides now commonly used are low in toxicity to man and animals and they break down in soil and disappear from water. Fish tolerance is complex and varies with size and species as well as site. Other components in the formulation may be more toxic than the herbicide, thus the LD50 of different formulations should be determined.

1336
Root exudation of herbicides by woody plants: allelopathic implications.
AUTHOR: HURTT W; REID CPP
AUTHOR AFFILIATION: CO State Univ.
SOURCE TITLE: Nature
SOURCE ID: 225:291, 1970
YEAR PUBLISHED: 1970
CATEGORY: B1a; B2b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: ecology; impact; picloram; root exudation; soil; 2,4,5-T
ABSTRACT: (Purpose) To report on measured root exudation of 2,4,5-T and picloram from plants foliar-treated with these herbicides, and on the implications of this exudation on the rhizosphere. (Time and Duration) One-year study (laboratory study). (Type of Research) Original research (laboratory study). (Methodology) 14C-picloram and 14C-2,4,5-T, both labelled at the carboxyl position, were applied in sublethal dosages to the foliage of red maple and green ash seedlings grown in nutrient solution under controlled environmental conditions. Exudation of the herbicide from the roots was monitored by removing samples from the root-bathing solution periodically and counting for 14C in liquid scintillation. (Results and Conclusions) Significant quantities of herbicide were lost from the roots in all treatments. Results from paper co-chromatography of the nutrient solutions suggested that the 14C activity was associated with the unaltered 14-C labelled herbicide molecule for both 2,4,5-T and picloram. Because of the reported persistence of picloram in the soils, the exudation of this growth regulator may be of greater ecological consequence than the exudation of previously reported compounds. Consideration must be given to the possibility that significant amounts of herbicides may be exuded from roots into the rhizosphere.

1337
Fifteen years of ecological research on a utility right-of-way.
AUTHOR: BRAMBLE C W; BYRNES R W
AUTHOR AFFILIATION: Purdue Univ. Dept of Forestry.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 23:270-278, 1969.
YEAR PUBLISHED: 1969
CATEGORY: B1a; B1e
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: brush; ecology; herbicides; right-of-way; wildlife
ABSTRACT: (Purpose) To study the effects of chemical brush control on game food and cover, game usage of treatment areas, and the effectiveness of brush control. (Time and Duration) 1953 - 1968; 15 years. (Type of Research) Original research. (Methodology) Five original treatments were applied in 1953. These areas were resprayed in 1966, and the control areas were recut in 19958-59 and 1966-67. At the time of retreatment in 1966, the total number of woody plants were measured. (Results and Conclusions) At the beginning of the study the ground layer (vegetation under 3 feet) was predominately Bracken-Sedge-Herb-Blueberry Community. In 1968, sweet-fern had developed into a dominant shrub on all treatment areas. Red maple seedlings were common invaders under the sweet-fern. On the right-of-way, sweet fern was browsed heavily, but the adjoining forest was not utilized as much.

1338
Defoliation in Vietnam.
AUTHOR: TSCHIRLEY FH
AUTHOR AFFILIATION: US Dept of Agriculture.
SOURCE TITLE: Science.
SOURCE ID: 163(3869):779-786, 1969.
YEAR PUBLISHED: 1969
CATEGORY: B1a; B1d; B2b
REGION: Applicable to entire United States
KEYWORDS: arsenicals; ecosystem; habitat change; herbicides; impact; pesticide; picloram + 2,4-D; public health; residue; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To assess the ecologic consequences of the defoliation program in Vietnam. (Time and Duration) One month (mid-March to mid-April, 1968). (Type of research) Original research (largely observational and interviews). (Methodology) An assessment of the ecological consequences was made based on observations, discussions with foresters and others knowledgeable about the local situation. The observations were supported by scientific reports and personal research experience in ecology and the effect of herbicides on vegetation in temperate and tropical America. (Results and Conclusions) The defoliation program has caused ecologic changes and complete recovery may take a long time. The mangrove type is killed with a single herbicide treatment. Regeneration of the mangrove forest to its original condition

1338

require about twenty years. A single treatment on semideciduous forest would cause an inconsequential ecologic change. Repeated treatments result in invasion of many sites by bamboo. Dense bamboo stands retard regeneration of the forest. The effect of defoliation on animals is unknown, but it does not appear to have been extreme. Large mammals have been seen recently in war zones C and D, the areas of greatest defoliation activity.

1339
Herbicide treatment of north Idaho browse evaluated six years later.
AUTHOR: LYON LJ; MUEGGLER WF
AUTHOR AFFILIATION: US Forest Service Intermountain Forest and Range Experiment Station.
SOURCE TITLE: Journal of Wildlife Management
SOURCE ID: 32(3):538-541, 1968.
YEAR PUBLISHED: 1968
CATEGORY: B1a; B1b; B1d
SPONSOR: US Forest Service.
REGION: Rocky Mountain Forest STATE: Idaho
KEYWORDS: browse; food; habitat; habitat manipulation; herbicides; mammals, big game; restoration; wildlife; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To determine whether foliage sprays using a mixture of 2,4-D and 2,4,5,-T can be used to reduce crown height, induce basal sprouting, and thus keep browse within the reach of big game animals. (Time and Duration) Six years, 1960-1966. (Type of Research) Original research. (Methodology) In 1960 five shrub species, Rocky Mountain maple, Scouler willow and redstem ceanothus (desirable browse plants), and mallow ninebark and creambush rockspirea (species considered undesirable competitors) were treated with 2,4,-D and 2,4,5-T herbicide mixture, applied at five different phenological stages. Ten plants of each species were sprayed each month from May through October. In 1966 these sprayed shrubs were evaluated for crown kill and recovery, amount of basal sprouting, and mortality. (Results and Conclusions) There was some time-lag in shrub mortality of undesirable species coupled with generally poor persistence of sprouting and relatively quick recovery from crown dieback of the desirable shrub species. Redstem ceanothus, the most desirable browse plant tested, was killed by all treatments.

1340
Succession of abandoned fields in the Shawnee Hills, southern Illinois.
AUTHOR: BAZZAZ FA
AUTHOR AFFILIATION: Univ of IL.
SOURCE TITLE: Ecology.
SOURCE ID: 49(5):924-936, 1968.
YEAR PUBLISHED: 1968
CATEGORY: B1a; B1b
REGION: Oak-Hickory Forest STATE: Illinois
KEYWORDS: community structure; population; quadrat; succession; trends
ABSTRACT: (Purpose) To determine the trend and rate of secondary succession from abandoned field to a climax forest, and identify some of the factors that control the rate of succession. One year study. Original research. (Methodology) Old fields used in this research were located in Pope County. The 21 old fields represented 8 different age classes since abandonment, from 1 t 40 years. Quadrats were used in vegetation sampling. In addition, laboratory studies on seed germination were made for Ambrosia and Aster. (Results and Conclusions) Past history of abandoned fields has a definite effect on early stages of succession. In heavily fertilized fields, Ambrosia plants reached a height of more than 1.5m, but no more than 0.6m on poorly fertilized fields. Previous crop was also important. Rubus first appeared in 3-year fields. Shrubby sprouts of Sassafras and Diospyros were found on all fields. The dissemination of climax species of this area, oaks and hickories, depends largely on rodents. Thus, they are delayed until plant cover provides food and shelter attractive to these animals.

1341
Chemical vegetation control manual for fish and wildlife management programs.
AUTHOR: DEVANEY TD
AUTHOR AFFILIATION: US Bureau of Sport Fisheries and Wildlife.
SOURCE ID: US Bureau of Sport Fisheries and Wildlife, 1968, Research Publication 58 42 p.
YEAR PUBLISHED: 1968
CATEGORY: B1a
REPORT NUMBER: 58
REGION: Applicable to entire United States STATE: United States
KEYWORDS: checklist; environment; herbicides; management; persistence; pesticide; residue; species; wildlife
ABSTRACT: (Purpose) To act as a guide for vegetation control operations on the Bureau of Sport Fisheries and Wildlife lands, and for programs approved by the Bureau for Federal Reimbursement. It is intended also to provide the management biologist with information about chemical, physical and biological properties of herbicides. (Type of Research) Literature review and observations. (Methodology) The guidelines established here in regulating a pest situation are more than a manufacturer's list. Recommendations are based on an understanding of control as an ethical or moral issue. This includes an appreciation of the natural beauty of the environment, an understanding of the role of aesthetic values in man's well-being, a conviction that the integrity of plant and animal communities must be maintained, and a recognition of the material and spiritual needs of other men. (Results and Conclusions) Among the many conclusions the following are particularly important: Application of a specific herbicide must consider not only the chemical composition of the compound itself, but also the formulation: certain ester and amine forms of phenoxy herbicides result in undesirable contamination of the environment more serious than the herbicide acid itself. The carrier, petroleum solvent, may also pollute the environment. Thus, certain formulations of each herbicide are considered safer than others. In addition, the carrier must be selected with much thought as to its impact on that particular environment.

1342
Assessment of ecological effects of extensive or repeated use of herbicides.
AUTHOR: GADERRY HM; GOODSON LH; HOUSE WB
AUTHOR AFFILIATION: Midwest Research Institute.
SOURCE ID: Kansas City, MO, Midwest Research Institute, 1967, MRI Project No. 3103-B, 369 p.
YEAR PUBLISHED: 1967
CATEGORY: B1a; B1b; B1d
REPORT NUMBER: MRI3103B 3103B
CONTRACT NUMBER: DAHC1568C0119
SPONSOR: US Dept of Defense, Advanced Research; Projects Agency.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: application methods; decomposition; ecology; ecosystem; environmental assessment; environmental impact; herbicides; impact; microorganisms; persistence; residue; toxicity; toxicology
ABSTRACT: (Purpose) To summarize all pertinent scientific data in order to assess the ecological effects of extensive and repeated use of herbicides. (type of Research) Literature review. (Methodology) An extensive review of the literature was made covering the topics: herbicide production, usage and trends, herbicide application on various land areas, herbicide application on waterways, ponds, lakes and reservoirs, military application of herbicides, toxicological effects of herbicides, herbicide residues and their persistence, the fate of herbicides, ecological consequence of herbicide use, and evaluation of some of the major ecological factors involved in the use of herbicides. (Results and Conclusions) A study of the effects of herbicides on the ecology of an area involves a multiplicity of factors that in the final analysis must be dealt with on a broad and qualitative basis. The relating of multiple variables for quantification of an ecosystem is a formidable task. Regulatory agencies have been concerned for some time with the problems that have developed from herbicide use. Herbicides have been used for 20 years and their rate of commercial use has increased sharply in the last 5 years. Herbicides have not presented the problems that have been characteristic of some of the insecticides. Basically, by design, herbicides exert their primary action on relatively simple systems.

1343
The relation of understory vegetation to cutting treatments and habitat factors in an east Texas pine-hardwood type.
AUTHOR: SCHUSTER JL
AUTHOR AFFILIATION: TX Technological College
SOURCE TITLE: The Southwestern Naturalist
SOURCE ID: 12(4):339-364, 1967.
YEAR PUBLISHED: 1967
CATEGORY: B1a; B1b; B1c
REGION: Beech-Sweetgum-Magnolia-Pine-Oak Forest STATE: Texas
KEYWORDS: forbs; habitat; management; soil; stand density; succession, secondary; trees; understory
ABSTRACT: (Purpose) To determine the amount and character of understory vegetation on timbered plots having different stand densities brought about by various timber harvesting systems; and to determine the relations of occurrence, composition and herbage yields of grasses forbs, and browse to forest habitat factors. (Time and Duration) Eleven year study (1949-1961). (Type of Research) Original research (field). (Methodology) In 1949 various timber harvesting systems were initiated by the Southern Forest Experiment Station in loblolly-shortleaf pine-hardwood timber stands. These included progressive clearcut, selection cut and shelterwood cut. In 1960 species composition, herbaceous plant density and overstory crown cover were determined. Forage yields per acre were taken in 1960 and 1961 by clipping all current-season growth up to five feet high from quadrats. All woody species were classified as browse. (Results and Conclusions) The composition, frequency of occurrence, and production of understory vegetation under various stands of loblolly-shortleaf pine-hardwood forest is described. Variations in timber stand brought about differences in species composition and frequency of

occurrence, with wood and forb species being favored under denser timber stands and grasses favored in stands opened by cutting. Forage production of all forage classes increased in proportion to reduction of timber stand factors. Soil and topographic factors influenced production, but were apparently overshadowed by stand factors.

1344
Forest site conversion with soil applied herbicides.

AUTHOR: EICHERT JP; SHIPMAN RD
AUTHOR AFFILIATION: PA State Univ
SOURCE TITLE: Journal of Forestry
SOURCE ID: 65:328-334, 1967.
YEAR PUBLISHED: 1967
CATEGORY: B1a
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: communities; community structure; forest; herbicides
ABSTRACT: (Purpose) To determine the effectiveness of four chemicals in controlling low-quality hardwoods, and thus preparing these sites for the planting of coniferous seedlings. (Time and Duration) One-year study. (Type of Research) Original research (field studies). (Methodology) In April 1964, prior to herbicide application, each of three study sites was underplanted with 1000 three-year-old red pine and 1000 two-year-old white pine seedlings. The study sites were 2.5 acres in size. Within three weeks after planting, the experimental areas were treated, using either fenuron, picloram, fenuron TCA or dicamba. A prescribed burn was used on one area prior to the planting operation and herbicide treatment. (Results and Conclusions) Pelleted fenuron and related fenuron TCA, either broadcast or applied to individual stems, were superior to other herbicide treatments for killing unwanted northeastern hardwoods. Excellent overstory kill was achieved with minimum rates of 20 lbs of pellets per acre, and adequate first-year white and red pine survival was simultaneously attained. Red, white and chestnut oaks were among the tree species least resistant to fenuron herbicides. The light prescribed surface fire, used on one study area, killed most stems three inches or less in diameter, but did not improve the kill on larger stems.

1345
Early stages of secondary succession on the coastal plain, New Jersey.

AUTHOR: LEVIN MH
AUTHOR AFFILIATION: Univ. of Nortre Dame.
SOURCE TITLE: The American Midland Naturalist
SOURCE ID: 75:101-131,1966.
YEAR PUBLISHED: 1966
CATEGORY: B1a; B1b; B1c
SPONSOR: Rutgers Research Council.; RESA Research Fund of the Society of; Sigma XI.
REGION: Outer Coastal Plain Forest STATE: New Jersey
KEYWORDS: succession; succession, secondary; successional stage; weeds, ecology of
ABSTRACT: (Purpose) To describe seasonal and yearly changes of the first and second year vegetation,to determine whether a "weed" stage was present during the first year within the Pine Region, and to interpret the role of the environment and land use history in producing such vegetation. (Time and Duration) Three year study. (Type of Research) Original. (Methodology) The year prior to site clearing was devoted to reconnaissance of selected sites, collection of flora, and examination of sociomorphology. First and second years after clearing were devoted to floristic survey, and quadrat studies of vegetation on the seven cleared sites. (Results and Conclusions) Herbaceous vegetation on the seven cleared sites was separable into five categories: (1) dominance by annuals during the first year and perennials the second; (2) dominance by annuals first and second year; (3) dominance by perennials first year and by annuals the second; (4) dominance by perennials first and second year; (5) no dominance. No first-year field in the Pine Region supported an annual "weed" stage. It appeared that land use was the factor principally responsible for the vegetation patterns. Each community appeared to represent a special example made possible by the species present prior to clearing and the degree of clearing disturbance to the vegetation.

1346
Effect of an intensive clearing on deer-browse production in the southern Appalachians.

AUTHOR: DELLABIANCA L; JOHNSON FM
SOURCE TITLE: Journal of Wildlife Management.
SOURCE ID: 29(4):729-733,1965.
YEAR PUBLISHED: 1965
CATEGORY: B1a
SPONSOR: US Forest Service, Southeastern Forest; Service.
REGION: Appalachian Oak Forest STATE: North Carolina
KEYWORDS: clearing; food; impact; wildlife
ABSTRACT: (Purpose) To determine the effects of intensive clearing on white-tail deer browse production. (Time and Duration) Fall and winter, 1959; July-August, 1960; January, March, April, May, July and October,1961; January, 1962. (Type of Research) Original. (Methodology) The study area was divided into five blocks with each block including an upper and lower slope unit. The slope units were divided into two compartments randomly designated to be cleared of hardwood saplings or remain untreated. Browse was sampled and weighed from four 2x4.805 foot plots; circular plots .01 acre in size were used to determine utilization, frequency, and density for individual tree and shrub species. After clearing, two 10x10 foot imprint plots were used in each compartment to determine total track count. (Results and Conclusions) Treated lower slopes contained 10 times more browse than upper slopes (805:81 pounds per acre); untreated stands had only three pounds per acre on both slope positions. A high quality mixed hardwood stand resulted from the treatment.

1347
The effects of five herbicides on the numbers of certain invertebrate animals in grassland soil.

AUTHOR: FOX CJS
AUTHOR AFFILIATION: Canada Dept of Agriculture.
SOURCE TITLE: Canadian Journal of Plant Science.
SOURCE ID: 44:405-409, 1964.
YEAR PUBLISHED: 1964
CATEGORY: B1a; B2b
REGION: Northern Hardwoods - Spruce Forest
KEYWORDS: grassland; herbicides; impact; invertebrates; soil; 2,4-D
ABSTRACT: (Purpose) To observe the effects of several herbicides on the numbers of certain invertebrates in grassland soil. (Time and Duration) 1955-1956; 1962-1963 — four summers. (Type of Research) Original. (Methodology) In first experiment, Dalapon, Monuron, TCA, and 2,4-D were applied as a spray at 30 gallon water/acre to plots 33 feet square. In the second experiment, 2,4-D omitted and atrazine included, and applied in the same manner to plots 1 rod square. Soil samples were taken each summer for two summers following treatment to evaluate numbers of wireworms, millipedes, earthworms, springtails, and mites. One year after treatment a vegetation analysis was made. (Results and Conclusions) Concludes that herbicides can exert a considerable effect on soil fauna, probably indirectly through changes in floristic composition. Grasses increased where 2,4-D applied, and wireworms also increased in these plots. In plots treated with atrazine, wireworms, earthworms, and springtails declined. Dalapon increased millipedes, springtails, and mites. Monuron reduced all. TCA increased millipedes, springtails and mites and decreased number of earthworms.

1348
Use of herbicides in forestry and game management.

AUTHOR: STAMM K
AUTHOR AFFILIATION: Univ of WI.
SOURCE ID: Madison, WI, Univ of WI, 1964, 98 p.
YEAR PUBLISHED: 1964
CATEGORY: B1a; B1b; B1e
REGION: Laurentian Mixed Forest STATE: Michigan; Minnesota; Wisconsin
KEYWORDS: checklist; forest; habitat change; habitat manipulation; herbicides; management; species; wildlife
ABSTRACT: (Purpose) To set up some guidelines for use of herbicides in game management and forestry. These guidelines have been suggested by research. (Time and Duration) Survey of literature over 12 year range. (Type of Research) Literature survey. (Methodology) Literature was surveyed covering the use of herbicides in forest and game management, with particular emphasis on research completed in the Lake States, or which was applicable to this area. Information, both on the chemicals and their proper use, and also on the deleterious herbicidal influences, was obtained. Both obvious and subtle hazards of herbicide use are stressed throughout the manual. (Results and Conclusions) Game management herbicide treatments can include site preparation for ROW shrub plantings, spot treatment with herbicides for specimen shrubs, and use of herbicides to prepare food patches. Recommendations for the latter include planting small patches of corn-with herbicides these food patches can be prepared inexpensively, and with little additional care after planting. Wet, stony or steep sites can be planted in less time, and with less cost, than by any other site preparation method.

1349
If nature had the right-of-way.

AUTHOR: DILL NH
SOURCE TITLE: New Jersey Nature News.
SOURCE ID: 17:123-130, 1963.
YEAR PUBLISHED: 1963
CATEGORY: B1a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: management; right-of-way; vegetation
ABSTRACT: (Purpose) To review the ecological effects of using selective and non-selective herbicides. (Type of Research) Literature review. (Results and Conclusions) Large acreage of potentially good wildlife

habitat is being converted to a wildlife desert. Selective spraying is most desirable

1349

1350
Aerial and mist-blower application of herbicides in southern forests as related to wildlife management.
AUTHOR: CHAMBERLAIN EB JR; GOODRICH TK
AUTHOR AFFILIATION: US Fish and Wildlife Service.
SOURCE TITLE: Twenty-seventh North American Wildlife Conference.
SOURCE ID: 27:384-391,1962.
YEAR PUBLISHED: 1962
CATEGORY: B1a; B1b; B1c; B1e
REGION: Southeastern Mixed Forest STATE: Alabama; Georgia; Mississippi; South Carolina; Tennessee
KEYWORDS: ecosystem; forest; habitat; herbicides; management; productivity; silviculture; wildlife; 2,4,5-t
ABSTRACT: (Purpose) To determine if aerial and mist-blower herbicide applications to southern forests are sufficiently general to be important in wildlife management, and if so, the nature and extent of their effect on habitat and populations. (Time and Duration) A survey of research literature covering a 20 year period, 1943-1962. (Type of Research) Literature review. (Methodology) Literature and inspection of large-scale and experimental brush control programs. From these sources, conclusions were made, and three prime areas of research were outlined. (Results and Conclusions) Aerial application of herbicides is widely used to control oak sprouting on mechanically-cleared areas. Oak control may be 85-90% effective and control of other vegetation 75% effective. Aerial appplication of herbicides is frequently used to convert a commercially worthless type to pine. Variable amounts of resprouting occur. Understory vegetation can be expected to increase considerably after the second year so that it may be much more dense than originally. In no case was there found to be any direct animal mortality from the chemicals used.

1351
Vegetation and animal use of a power line right-of-way in southern Michigan.
AUTHOR: GYSEL LW
AUTHOR AFFILIATION: MI Dept of Fisheries and Wildlife.
SOURCE TITLE: Michigan Quarterly Bulletin
SOURCE ID: 44(4):697-713, 1962.
YEAR PUBLISHED: 1962
CATEGORY: B1a; B1e
SPONSOR: Dow Chemical Co.
REGION: Beach-Maple Forest STATE: Michigan
KEYWORDS: animals; communities; right-of-way; vegetation; 2,4,5-T
ABSTRACT: (Purpose) To study the various plant communities on a mile of power line right-of-way through the Kellogg Forest to determine plant composition and density. (Time and Duration) 5 years; 1957 to 1961. (Type of Research) Original research. (Methodology) Six different plant communities were mapped. Seventy permanent plots were mechanically spaced in order to sample the Right-of-way. In each plot area, the percent of cover number of stems height and diameter of trees and shrubs were measured. In 1957, a foliage spray of 2,4,5-T was applied to tree species. Trap lines were placed in each plant community and a record of birds and animals trapped was kept. (Results and Conclusions) The most marked changes in vegetation during a 5-year period occurred in communities where sassafras was a dominant species and where a foliage spray was used. Regrowth of sassafras was common. All vegetation communities had a variety of dry and fleshy fruits, much browse and generally dense ground cover during the summer that could be used by wildlife species. All of the communities of the right-of-way were used by a variety of animal species.

1352
The effects of herbicides on the wild flora and vegetation in the Netherlands.
AUTHOR: WESTHOFF V; ZONDERWIJK P
AUTHOR AFFILIATION: Institute for Nature Conservation, Bilthoven, Netherlands.
SOURCE TITLE: The ecological effects of biological and chemical control of undesirable plants and animals.
SOURCE ID: Leiden, E. J. Brill, 1961, 59-78 p.
YEAR PUBLISHED: 1961
CATEGORY: B1a
REGION: Applicable to entire United States
KEYWORDS: endangered; flora; habitat change; herbicides; impact; species
ABSTRACT: (Purpose) To discuss the effects of herbicide use in the Netherlands and the danger of eliminating many species of the wild flora on river ridges, dikes, road verges, swamps and osieries. (Time and Duration) Review of 10 years of literature. (Type of Research) Literature review and field observations. (Methodology) The authors review the literature on herbicides and their spectrum of kill to show how many native species are threatened by the wide use of weedkillers. A review of these endangered species is presented by sites they occupy. (Results and Conclusions) The wild flora counts about 1,300 species, not considering adventitious species and the microspecies of Rubus, Taraxacum and such-like. Among this number about one-third are either directly hit by weedkiller control or are threatened as companion species in the controlled vegetation. Most seriously threatened are the landscapes of the river valleys, especially their dry pastures in river forelands, their basins, river ridges, dikes, road verges, swamps and osieries. Directly menaced in the river valleys are 15 species of herbaceous plants.

1353
Effect of vegetational cover of fence rows on small mammal populations.
AUTHOR: FURMAN T; OGILVIE RT
AUTHOR AFFILIATION: State College of WA
SOURCE TITLE: Ecology.
SOURCE ID: 40:140-141, 1959.
YEAR PUBLISHED: 1959
CATEGORY: B1a
REGION: Palouse Grassland STATE: Idaho; Washington
KEYWORDS: cover; fences; mammals, small; population; rodent; wildlife
ABSTRACT: (Purpose) Investigation was made to obtain an indication of the differences in small mammal populations of fence rows having different vegetational cover. (Time and Duration) One-year study. (Type of Research) Original research (field study). (Methodology) The study was made in the farmlands south of Pullman, WA; three types of fence lines were studied: shrubby fence lines, weedy fence lines, and fence lines which were virtually bare of vegetation. Transect samples were used along each of the three types. PLant species present in each transect sample were recorded. Mouse traps were placed at 1 m intervals under each fence. Fall-traps were also placed at each end of every line. (Results and Conclusions) Trapping of small mammals along shrubby, weedy and bare fence lines showed that the small mammal populations were nearly equal in the first two, but lower in the last. Peromyscus maniculatus was present in almost equal numbers in each fence type. Microtus montanus was most abundant in the weedy fence rows, sparsely present in the shrubby fence rows, and rare in the bare fence rows. The differences are attributed to differences in cover.

1354
A preliminary study of vegetation on North Carolina Piedmont and mountain power transmission line rights-of-way.
AUTHOR: SMITH ER
AUTHOR AFFILIATION: NC State Univ.
SOURCE TITLE: NC
SOURCE ID: Raleigh, NC, NC State Univ, 1959, Masters Thesis, 137 p.
YEAR PUBLISHED: 1959
CATEGORY: B1a; B1b; B1c
REGION: Appalachian Oak Forest
KEYWORDS: bulldozing; community structure; erosion; maintenance; right-of-way; succession, secondary; water table
ABSTRACT: (Purpose) To identify and record the vegetation present on ROWs and list communities in which they occur; to study shrub and small tree species in natural brushy and forested areas and ascertain the permanence of these aggregations, emphasizing the variations in site quality. (Time and Duration) Two years. (Type of Research) Original research. (Methodology) Four ROWs which had been bulldozed once, were investigated as to the floristic composition, value to game, and soil and site quality. These four varied in lapsed time since bulldozing from three to six years. Besides these ROWs, one hand-cleared transmission line was included in this study. (Results and Conclusions) Succession was dominated by such plants as blackberry, broomsedge, aster and pine. These dominants were present on all aspects and soil types independent of time lapsed since bulldozing. Only two factors controlled species composition; high water levels and erosion. The course of this succession was towards an arborescent community, with only honeysuckle retarding this trend in some areas. Bulldozing as a maintenance measure appears to drastically reduce the site quality and future productivity of the slope and ridge segments of ROWs, ***UPDATE DATE: 78054 CREATE DATE: 78029T

1355
Effects of shrub removal on the vegetation of a semidesert grass-shrub range.
AUTHOR: CABLE DR; SCHMUTZ EM; WARWICK JJ
AUTHOR AFFILIATION: Univ of AZ.; US Forest Service, Rocky Mountain Forest and Range Experiment Station.
SOURCE TITLE: Journal of Range Management.
SOURCE ID: 12:34-37, 1959.
YEAR PUBLISHED: 1959
CATEGORY: B1a; B1c
REGION: Creosote Bush-Bur Sage STATE: Arizona
KEYWORDS: clearing, mechanical; ecology; ecosystem; impact; shrub; stability

ABSTRACT: (Purpose) To report results of a cabling operation carried out on an area dominated by jumping cholla on the Papago Indian Reservation which was done hopefully to reduce the number of shrubs and increase the number of herbs and grasses. (Time and Duration) Three-year study. (Type of Research) Original research (field study). (Methodology) The study area covered 15 acres. One part was cleared of brush by chaining, the other not chained. Prior to treatment, the area was covered by shrubs. The overstory was predominantly jumping cholla, burroweed was the most abundant perennial species in the understory. Other shrubs present in small amounts were whitethorn, creosotebush, pencil cholla, snakeweed and zinnia. Forbs made up a very minor part of the total vegetation. The most abundant forbs were white horsenettle and ironplant goldenweed. Grasses constituted only a small part of the total vegetation. (Results and Conclusions) Analysis of the vegetation, two and one-half years after treatment, indicated a general opening up of the shrub stand. There was a 73 percent reduction in the numbers of live, old, jumping-cholla plants, and a large increase of young jumping-cholla plants on the chained area, presumably from joints which fell off during chaining. A 34 percent increase in the number of burroweed plants occurred. No significant change in the number of forbs or in basal intercept of perennial grasses. It was concluded that the effect of this chaining was temporary, and the future stand of cholla may be denser than the original stand.

1356
Wildlife food and cover by the mile.

AUTHOR: RICHTER WC
AUTHOR AFFILIATION: PA Game Com.
SOURCE TITLE: Pennsylvania Game News.
SOURCE ID: 29(5):43-44, 1958.
YEAR PUBLISHED: 1958
CATEGORY: B1a; B1b; B1c
REGION: Eastern Deciduous Forest STATE: Pennsylvania
KEYWORDS: habitat; habitat change; right-of-way; shrubs; wildlife
ABSTRACT: (Purpose) To compare the number of high wildlife food value shrubs that occur along the ROW edge with those in the adjacent forest understory. (Time and Duration) Four-year study, 1954-1958. (Type of Research) Original research. (Methodology) The production record of shrubs along the edge of the ROW was compared with that occurring in an adjacent forest. Sections of both pipe lines and power lines were included in this study. (Results and Conclusions) Greater production of shrubs occurred along the ROW edge than under the forest canopy, the shrubs occurring along these edges do not realize their full potential because of a number of factors. These include direction and width of the ROW, height of surrounding trees, and the location of these shrubs to the trees. Observations emphasize that complete release of these shrubs from the shading effect of the overshadowing growth is important for maximum production.

1357
Wildlife implications of hardwood and brush controls.

AUTHOR: GOODRUM PD; REID VH
AUTHOR AFFILIATION: US Fish and Wildlife Service.
SOURCE TITLE: Twenty-first North American Wildlife conference.
SOURCE ID: pages 127-141, 1956.
YEAR PUBLISHED: 1956
CATEGORY: B1a; B1d; B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: habitat; habitat manipulation; mammals; management; silviculture; spraying, broadcast; wildlife; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To show the growth and development of means to control environments and the lack of parallel studies to show the possible impact of such efforts on wildlife. (Time and Duration) Survey of literature over a 25 year period. (Type of Research) Literature review. (Results and Conclusions) Increasing demands for forest, range and other agricultural products since World War II have focused greater attention on ways and means of getting more efficient use of farm, range and forest lands. Thus, better methods of reducing or ridding land of so-called undesirable hardwoods and brush have been developed. The control of hardwoods and brush by mechanical methods is rapidly being augmented by herbicides, particularly 2,4-D and 2,4,5-T. It has been assumed, in the absence of research, that reduction of certain "weed" species has little or no effect on wildlife. The non-selective application of herbicides, especially by air, may be particularly hazardous to mast-bearing species like the oaks since it is known that top-kill usually occurs. Mast constitutes an important source of wildlife food.

1358
Effect of 2,4-D on some herbaceous range plants.

AUTHOR: HURD RM
AUTHOR AFFILIATION: US Forest Service, Rocky Mountain Forest and Range Experiment Station.
SOURCE TITLE: Journal of Range Management.
SOURCE ID: 8(3):126-128, 1955.
YEAR PUBLISHED: 1955
CATEGORY: B1a; B1d
REGION: Douglas-fir Forest STATE: Montana; Wyoming
KEYWORDS: ecosystem; grazing; herbicides; impact; species diversity
ABSTRACT: (Purpose) To report changes in the number of various rates of 2,4-D on range plants. (Time and Duration) One-year study. (Type of Research) Original research (field study). (Methodology) In 1952 the isopropyl ester of 2,4-D was applied at the rate of 1, 2 and 4 lbs AE per acre to range plants. Some species were in full bloom and others had not yet bloomed. Treatments included unsprayed controls. All plots were 12 rod-square, in three replications. Vegetation was sampled two weeks after spraying and again in July of the next year. The percent of ground covered by the vertical projection of the foliage was estimated for each species. Herbage production was obtained in green weight and air-dried weight. (Results and Conclusions) Total forb cover as well as herbage production showed a greater reduction with the 2- and 4-pound rates of 2,4-D than with the 1-pound rate. However, no significant difference in ground cover or herbage production was found between the three rates. Spraying decreased the ground cover and herbage production provided by avens and silky lupine, the two most abundant forbs. One year later herbage production had increased 6 percent on the sprayed plots, but declined on the unsprayed plots. Grasses and sedges on the sprayed plots did not decline in cover or production on the sprayed areas—but did decline on the unsprayed areas.

1359
Ecological succession on abandoned farm lands and its relationship to wildlife management.

AUTHOR: BECKWITH ST
AUTHOR AFFILIATION: Univ of FL.
SOURCE TITLE: Ecology Monographs
SOURCE ID: 24:349-376,1954.
YEAR PUBLISHED: 1954
CATEGORY: B1a; B1b; B1c
REGION: Oak-Hickory Forest STATE: Michigan
KEYWORDS: ecology; mammals, small; management; succession; succession, secondary; weeds, ecology of; wildlife
ABSTRACT: (Purpose) To study the succession of both plant and animal communities upon abandoned agricultural uplands, the effects of succession on wildlife populations(especially upland game populations),and the use of abandoned lands in each successional stage by various wildlife species. (Time and Duration) 8 years. (Type of Research) Original. (Methodology) Data used in this study were secured from a total of 115 areas varying from currently cultivated fields to fields that had been last cultivated 25 years ago. Study areas were classified according to final crop and length of abandonment. The size of each study area averaged about 5 acres. Detailed analyses of the vegetation of abandoned lands were undertaken on 861 plots laid out on 100 study areas. Sample plots were distributed with respect to time, type, final crop and burning. Milacre quadrats were used to determine the species of plants present an abundance. (Results and Conclusions) Plant cover on farm lands passes through a definite series of successional stages. Early stages, and the rate of succession, are influenced largely by the character of the last crop. Later successional stages are influenced primarily by soil type and by such disturbance factors as fire. Bird and mammal populations vary according to changes in the vegetation. Bird populations show a tendency to change from granivorous forms in the early states of succession, to insectivorous forms during the middle stages, and then to forms that are fructivorous, insectivorous, or even omnivorous in still later stages of succession.

1360
Selective application of selective herbicides in the study of vegetation development.

AUTHOR: EGLER FE
AUTHOR AFFILIATION: American Museum of Natural History.
SOURCE TITLE: Science.
SOURCE ID: 115(2978):98-99, 1952.
YEAR PUBLISHED: 1952
CATEGORY: B1a
REGION: Appalachian Oak Forest STATE: Connecticut
KEYWORDS: herbicides; spraying, selective; succession, secondary; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To document the effects of selective application of selective herbicides in delaying normal plant succession on a 40-acre study area of the Aton Forest, Litchfield County, Connecticut. (Time and Duration) Six-year study (1946-51). (Type of Research) Original research (field). (Methodology) The selective aplication of herbicides was used on

1360

a total of 40 acres. Various formulations of 2,4-D and 2,4,5-T were used in removing the unwanted elements of the vegetation. Permanent charted quadrats were used to document changes in vegetation. (Results and Conclusions) Vegetation development with the use of chemicals is sufficiently unprecedented to merit tests of this technique by other researchers. Following local elimination of over 100 species of plants, reinvasion is resulting in a subsequent development totally different from that anticipated. Among the 70 kinds of woody plants eliminated, fewer than five give any evidence of staging a significant comeback even in the more open of the covers, and these five are returning in different proportions than they originally held.

1361

The edge effect of the lesser vegetation of certain Adirondack forest types with particular reference to deer and grouse.

AUTHOR: BARICK FD
AUTHOR AFFILIATION: US Forest Service, Roosevelt Wildlife Forest Experiment Station.
SOURCE TITLE: Roosevelt Wildlife Bulletin
SOURCE ID: 9(1):146, 1950.
YEAR PUBLISHED: 1950
CATEGORY: B1a; B1b; B1c; B1d
REGION: Spruce-fir Forest STATE: New York
KEYWORDS: checklist; edge effect; game; habitat; species; species diversity; wildlife; wildlife relationships
ABSTRACT: (Purpose) To analyze the wildlife supporting potentialities of forest vegetation. This study was organized so as to analyze the comparative habitat values of certain forest types and the edges between them. (Time and Duration) Long-term study, no indication of when it began. (Type of Research) Original research (field). (Methodology) Data on composition, density and structure were obtained using a modification of the belt transect, in that a series of plots instead of a continuous strip was used. Underbrush-herb plots were spaced at 24.8 foot intervals along the transect. The diameter of the tree plot was 74.4 feet. Underbrush plots were 6.6 feet square. On tree plots, trees were tallied by species and size. On underbrush plots two groups of data were recorded: (1) young trees under 1 inch in diameter, and (2) shrub species. Herbs were tallied on 3.3 foot square plots. (Results and Conclusions) The most striking feature of Adirondack forest vegetation is the small variety of dominant species. Most of the tree cover is composed of spruce, balsam, yellow birch, red maple, beech, and sugar maple. The great bulk of shrub cover is made up of witch hobble. The major herbaceous cover is composed of wood fern, wood sorrel and dwarf dogwood. Differences in forest types result from varying composition of these species plus additions of small amounts of others. The edges between forest types are composed primarily of the constituents of the two adjacent types. The variety of species across any transition is greater than that at any part of the transition.

1362

Causes of succession on old fields of the Piedmont, North Carolina.

AUTHOR: KEEVER C
SOURCE TITLE: Ecology Monographs
SOURCE ID: 20:131-250, 1950.
YEAR PUBLISHED: 1950
CATEGORY: B1a; B1b; B1c
REGION: Appalachian Oak Forest STATE: North Carolina
KEYWORDS: environmental, change; succession; succession, secondary; successional stage; weeds, ecology of
ABSTRACT: (Purpose) Determine the causes of succession on old fields of the Piedmont, North Carolina. (Time and Duration) Three years. (Type of Research) Original research. (Methodology) The three major dominants of old field succession, horseweed, aster and broomsedge, were observed in the field during two seasons to determine the time at which the seeds of each species germinate. Mature seeds of these species plus ragweed were tested for germination under varying conditions. Quadrats were used in sampling vegetation on nine old fields to study life cycles, survival and growth of initial invaders. (Results and Conclusions) Horseweed usually assumes dominance in first-year fields because the seeds are ready to germinate when much farm land is being cultivated for the last time in a season. Ragweed, a summer annual, may replace horseweed as the dominant of first-year fields, if the normal crop of horseweed is eliminated by late fall plowing or by severe erosion. Horseweed loses its dominance after the first year because it is stunted in the seedling stage by decay products from horsewood roots and also because it cannot compete successfully with the large number of individuals of the same species and with young asters which are abundant in the second-year fields.

1363

Effect of several herbicides on soil microorganisms.

AUTHOR: KRATOCHVIL DE
SOURCE TITLE: Proceedings North Central Weed Control Conference.
SOURCE ID: 7:102-103, 1950.
YEAR PUBLISHED: 1950
CATEGORY: B1a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; impact; microorganisms; soil; 2,4-D
ABSTRACT: (Purpose) To determine the effect of several compounds, now being used as herbicides, on soil microorganisms. (Time and Duration) One-year study. (Type of Research) Original research (laboratory). (Methodology) For these determinations, soil of known quantity was kept at a constant temperature in a water bath using 250 cc Erlenmeyer flasks. Dextrose was added to the soil to bring it to a high media level for microorganic acitvity. Soil was incubated for 48 hours at 30.5 degrees centegrade. Flasks were then closed. Chemicals tested were 2,4-D, TCA, PCP, Endothal, 2,4,5-T and IPC. A range of rates equivalent to recommended field rates were tested. (Results and Conclusions) 2,4-D at field rates of application had little effect on activity of soil microorganisms. This agrees with findings of other scientists. Trichloroacetate showed a significant difference in the number of microorganisms at all rates applied. This difference was significant at both the 1% and 5% level when compared to the control (no TCA added). Rates of PCP in excess of 4 pounds to the acre have a marked effect on the activity of soil microorganisms. This is most reasonable when we consider the extensive use of this compound as a wood preservative.

1364

Effects of 2,4-D on woody plants in Connecticut.

AUTHOR: EGLER EE
SOURCE TITLE: Journal of Forestry.
SOURCE ID: 45(6):449-452, 1947.
YEAR PUBLISHED: 1947
CATEGORY: B1a
REGION: Northern Hardwoods Forest STATE: Connecticut
KEYWORDS: brush control; herbicides; impact; 2,4-D
ABSTRACT: (Purpose) To determine the effects of 2,4-D on woody weed plants of meadows, pastures, and reforestation areas. (Time and Duration) 1946, one-year study. (Type of Research) Original. (Methodology) 2,4-D acid was diluted with water to 1500ppm and applied as a foliage spray to woody plants. Test sprayings were started in mid-May and continued throughout the summer. Field observations were conducted periodically for each species. General notes were also made on climatic conditions. (Results and Conclusions) Plants responded more slowly in cool periods than in warm periods, although eventually they would catch up with those that had been accelerated by warm weather. Plants responded more quickly when growing in full sunlight than in shade. Hardness and age of foliage was a chief factor in herbicidal action. Distance from foliage to rootstocks is also a factor in complete kill; the greater the distance between leaves and roots, the less likely the spraying will result in complete kill. Birch, willow, and sumac are killed rapidly, but white ash, red and sugar maples, and black cherry are highly resistant.

1365

An ecological analysis of the plant communities of Piedmont, North Carolina.

AUTHOR: OOSTING HJ
AUTHOR AFFILIATION: Duke Univ.
SOURCE TITLE: The American Midland Naturalist
SOURCE ID: 28(1):1-127,1942.
YEAR PUBLISHED: 1942
CATEGORY: B1a; B1b; B1c
REGION: Southeastern Mixed Forest STATE: North Carolina
KEYWORDS: community structure; ecology; ecosystem; flora; stability; succession; succession, secondary; weeds, ecology of
ABSTRACT: (Purpose) To determine, for the North Carolina Piedmont, the natural groupings of plants with respect to their habitats and the changes in these communities with respect to time; to learn why these communities occur as they do;and to discover possible plant indicators of the various habitats. (Time and Duration) Seven-year study. (Type of Research) Original research. (Methodology) Plant communities were selected which were evenly stocked and in which there was little evidence of disturbance of any kind. Following preliminary counts, all detailed work was done on a quadrat basis. In all sampling procedures the quadrats were distributed along lines, usually two, which traversed the stand paralleling its longest axis. (Results and Conclusions) Almost without exception, upland communities have developed on abandoned fields. They are characterized by a few distinct and easily recognized stages of dominance which regularly succeed each other. Fields abandoned for one year are dominated by Leptilon canadense and Digitana sanguinalis. The second year, Aster ericoides with a mixture of Ambrosia artemisiifolia is the important species. By the third year

Andropogon is dominant and maintains itself until shaded out by pine. Pine overtops the broomsedge and may form closed stands in 10-15 years. By age 40 these pine stands support an understory of subordinate hardwoods.

B1b - Community structure

1366
The use of plant growth regulators in rights-of-way maintenance.
AUTHOR: CHAPPELL WE; COARTNEY JS; WILL JB
AUTHOR AFFILIATION: VA Polytechnic Institute
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 183-188 p.
YEAR PUBLISHED: 1976
CATEGORY: B1b
REGION: Southeastern Mixed Forest STATE: United States; Virginia
KEYWORDS: growth inhibitor; maintenance; right-of-way
ABSTRACT: (Purpose) A study of growth regulators for control of undesirable woody plants, weeds, and grasses was carried out in 1972-1975 in Virginia. (Time and Duration) 1972 - 1975. (Type of Research) Original research. (Methodology) Treatments were applied on 250 square feet plots using a backpack sprayer; 17 treatments were applied when plots were in full bloom and at petal fall stage in 1975 on multiflora rose. For grass and herbs, plots were 500 square feet in two replications and treatments applied either in early spring or midsummer; 11 treatments were used. For brush, 1/10 acre plots were sprayed nine times in mid-September using Krenite. (Results and Conclusions) Control of multiflora rose berry production was best with Maleic hydrozide and Amidthin of the seven materials tested. However, most sprays that removed berries also injured the plants. Early spring spraying considerably reduced growth of grasses; no reduction in growth occurred after midsummer mowing. Foliar sprays with Krenite at 6-8 pounds per acre plus surfactants, drift control agents, and carriers in mid-September caused most woody species to fail to leaf out the following spring without affecting growth of annual plants.

1367
A system for wildlife habitat management on southern national forests.
AUTHOR: HOLBROOK HL
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: The wildlife Society Bulletin.
SOURCE ID: 2(3):119-123, 1974.
YEAR PUBLISHED: 1974
CATEGORY: B1b; B1d; B1e
REGION: Outer Coastal Plain Forest STATE: Alabama; Georgia; Mississippi; North Carolina; South Carolina
KEYWORDS: forestry; habitat; management; management, even-aged; silviculture; wildlife
ABSTRACT: (Purpose) To explain how both timber and wildlife needs on southern National Forests can be met through even-aged silviculture following a system of management called the "featured species concept." (Type of Research) Not research, but an explanation of policy. (Methodology) The featured species is selected by four major considerations: habitat capability, compatibility with other resources, public interest and needs, and cooperator and public involvement. After the featured species has been selected, its habitat requirements and mobility are used to (1) guide timber-wildlife habitat coordination, (2) point out habitat shortcomings that must be met through direct habitat improvement, and (3) establish a perspective for making or reviewing environmental analyses and statements. (Results and Conclusions) Under the featured species concept the southern National Forests manipulate and control predictable food and cover conditions to meet recognized habitat requirements. The concept is a postive approach to wildlife habitat management. The featured species concept does not imply "dominant use" or "single species management." The featured species concept was developed with timber and wildlife inputs so that management needs of both resources are accomplished simultaneously through direct, nonconflicting guidelines.

1368
Maintaining wildlife openings with pellets containing picloram.
AUTHOR: JOHNSON FL; MARTOGLIO LD; MCCAFFERY KR
AUTHOR AFFILIATION: WI Dept of Natural Resources.
SOURCE TITLE: Industrial Vegetation Management
SOURCE ID: 6(3):2-7, 1974.
YEAR PUBLISHED: 1974
CATEGORY: B1b; B1d; B3c
SPONSOR: Fed Aid to Wildlife Restoration Funds.
REGION: Northern Hardwoods - Spruce Forest STATE: Wisconsin
KEYWORDS: clearing; habitat; herbicides; maintenance; mammals, big game; management; mowing; picloram; restoration; spraying selective; wildlife
ABSTRACT: (Purpose) To compare picloram pellets, broadcast spraying of 2,4-D or 2,4-DP, and mechanical treatments as methods of controlling unwanted woody vegetation invading wildlife openings in order to halt the invasion of woody plants and assure that re-treatment will not be necessary for 10 years. (Time and Duration) Four year study, 1971-74 (Type of Research) Original research. (Methodology) Between 1971 and 1973 many unwanted woody plants on small openings within the forest were treated with pelleted picloram, or received broadcast sprayings with liquid herbicide. Other openings were mechanically treated to remove woody plants. Accurate cost data was obtained for each treatment. Observations were made on percent kill by species for each vegetation control method. (Results and Conclusions) Pelleted picloram was more convenient, economical, and effective than mechanical and liquid herbicide methods. Ease of picloram application has greatly increased the scope of opening maintenance programs. Broadcast application of picloram for wildlife purposes is not recommended because of the effect on desirable herbs and shrubs.

1369
Roadsides for wildlife.
AUTHOR: MONTAG D
AUTHOR AFFILIATION: Madelia Research Unit.
SOURCE TITLE: The Minnesota Volunteer.
SOURCE ID: 26-32, 1975 (March-April).
YEAR PUBLISHED: 1973
CATEGORY: B1b; B1c; B3c
REGION: Oak-Hickory Forest STATE: Minnesota
KEYWORDS: birds, game; game; nesting; right-of-way; roadsides; seeding; wildlife
ABSTRACT: (Purpose) To outline a program whereby roadsides can become a major source of permanent nesting habitat by providing the needed cover. (Time and Duration) One-year study. (Type of Research) Original research (field) (Methodology) With voluntary assistance of students a survey was made of randomly selected roadsides. Less than 30 percent of the roadside acres provided good nesting cover. To demonstrate the effectiveness of managed roadsides for wildlife, an experimental roadside seeding project was initiated in two study areas. Alfalfabrome was seeded in some areas. Landowners were requested not to mow these areas until July 31. To evaluate the success of the project wildlife use of managed areas will be compared with unmanaged roadsides. (Results and Conclusions) Today, roadsides comprise the only major source of permanent nesting habitat remaining in southern and western Minnesota. There are strong indications that roadsides, if properly managed, can provide the needed nesting cover for many wildlife species. Once the results of the various roadside research projects are completed, a roadside management plan, agreeable to both the general public and state, county and township governments, will be written.

1370
Establishment of firebreaks on forest and rangeland with herbicides.
AUTHOR: BOVERY RW; MCCARTY MK
AUTHOR AFFILIATION: US Dept of Agriculture.; Univ of NE.
SOURCE TITLE: Journal of Range Management
SOURCE ID: 18(5):282-283, 1965.
YEAR PUBLISHED: 1965
CATEGORY: B1b
REGION: Wheatgrass-Bluestem-Needlegrass STATE: Nebraska
KEYWORDS: fire; fire control; forests; herbicides
ABSTRACT: (Purpose) To determine the effectiveness of herbicides in establishing firebreaks in the Nebraska Sandhills, hoping that some herbicide would prove more effective than their previous practice of creating firebreaks by disking. (Time and Duration) Two-year study. (Type of Research) Original research (field study). (methodology) Thirty-one soil sterilant herbicides were investigated for firebreak establishment in the Nebraska Sandhills on the Bessey National Forest. All herbicides were applied near the first of June, 1961. The herbicides were sprayed with a hand boom sprayer on square-rod plots in triplicate using a random block design. Herbicides include erbon, atrazine, dalapon & atrazine, paraquat & atrazine, amazine & simazine, simazine, atrazine, diuron. (Results and Conclusions) Diuron gave most effective control of all the compounds tested. Diuron was effective for at least two years at rates of 7.5 lb/acre and higher.

1371
A shrub community of Viburnum lentago, stable for twenty-five years.
AUTHOR: EGLER FE; NIERING WA
AUTHOR AFFILIATION: CT College Botany Dept.; American Museum of Natural History.
SOURCE TITLE: Ecology
SOURCE ID: 36(2): 356-360, 1955.
YEAR PUBLISHED: 1955

B1b - Community structure

1371

CATEGORY: B1b C4
REGION: Appalachian Oak Forest STATE: Connecticut
KEYWORDS: community structure; habitat; maintenance; succession; vegetation
ABSTRACT: (Purpose) To describe a small area of a relatively stable type of shrub community, and to relate its practical significance to the maintenance of wildlife cover and public utility right-of-ways. (Time and Duration) 1927-1952; 25 years. (Type of Research) Original research. (Methodology) Three temporary 5x5 meter quadrats were placed in the study area. Diameters at the trees and taller shrubs were measured at 4.5 feet. The cover transect method was used to figure out the cover of the trees and shrubs along a base line. Within each 5x5 meter quadrat, twenty 1/2x2 meter quadrats were laid out and percent cover of lower shrubs, herbs and mosses recorded. (Results and Conclusions) A pure stand, about 15x15 meters in size, of Viburnum lentago was considered to have arisen fortuitously. The stand is one-layered, and relatively pure. Small shrubs, herbs, mosses and seedlings are unimportant. This community appears relatively stable and self-perpetuating. The species has high wildlife values and is physically suited for right-of-way edges.

1372

The vegetational structure of an abandoned field in southeastern Michigan and its relation to environmental factors.
AUTHOR: DAHL E; EVANS FC
AUTHOR AFFILIATION: Univ of MI.; Botanisk Institute, Norway.
SOURCE TITLE: Ecology.
SOURCE ID: 36(4):685-706, 1955.
YEAR PUBLISHED: 1955
CATEGORY: B1b
REGION: Beach-Maple Forest STATE: Michigan
KEYWORDS: communities; community structure; environment; soil; topography
ABSTRACT: (Purpose) To report the results of vegetation studies on a 50-year-old abandoned field in southeastern Michigan. (Time and Duration) One-year study. (Type of Research) Original research (field). (Methodology) The field used in this study is a 15-acre tract which lies on a large glacial outwash plain in north-central portion of the Edwin S George Reserve. Information on the physiography, climate, and soils of the study area were obtained. On sample plots the total cover for each stratum of vegetation was assessed. Two strata were recognized, one which included all forbs and grasses, and one which included the mosses and lichens. The total cover for a given stratum was estimated in terms of the percent of the total plot area occupied by a vertical projection onto the ground surface. (Results and Conclusions) Topographic variability was considered to be primarily responsible for the major vegetational subdivisions. The vegetation of the depressions was found to occur on silt loams; that of the upland areas on sandy loams and sands. Significant differences between the types in respect to soil texture and in depth to the plow line were also demonstrated. Comparison of the field soil with undisturbed soils from the adjacent woods supported the hypothesis that the differences among the field soils was due to to effects of clearing and plowing, followed by differential erosion.

B1c - Species diversity

1373

The effect of transmission-line corridors on bird populations.
AUTHOR: ANDERSON SH; MANN K; SHUGART HH JR
AUTHOR AFFILIATION: Oak Ridge Nat Lab.
SOURCE TITLE: The American Midland Naturalist.
SOURCE ID: 97(1):216-221, 1977.
YEAR PUBLISHED: 1977
CATEGORY: B1c; B1e; F
REGION: Eastern Deciduous Forest STATE: Alabama; Georgia; Mississippi; South Carolina; Tennessee
KEYWORDS: birds; impact; population:; right-of-way
ABSTRACT: (Purpose) This study documents the effect of transmission-line corridor width and the effect of the forest-corridor edge on bird populations in a deciduous forest. (Time and Duration) April-June 1974; 3 months. (Type of Research) Original research. (Methodology) Seven sites were selected along four transmission-line corridors which were bounded by typical eastern Tennessee deciduous forest. The corridor widths were 12, 30.5, 61, 91.5 meters. Observations of bird populations were made along the corridors. In addition, detailed grid-mapping of individual birds was conducted in forest and in a 30.5 m wide corridor habitat. (Results and Conclusions) Narrow corridors (12m) had reduced bird species diversity, but the 30.5m corridor had high bird density and diversity. The wide corridors were less diverse but attracted several open-country bird species not characteristic of surrounding forest. The highest species diversity was associated with the forest habitat. Density of territorial males associated with the 30.5m transmission-line corridor was several times higher than density in the forest.

1374

Microbial transformations in the soil.
AUTHOR: KAUFMAN D; KEARNEY P
AUTHOR AFFILIATION: US Dept of Agriculture
SOURCE TITLE: Pages 29-64 in Herbicides: physiology, biochemistry, ecology (volume 2).
SOURCE ID: New York, NY, Academic Press, 1976, 564 p.
YEAR PUBLISHED: 1976
CATEGORY: B1c
REGION: Applicable to entire United States STATE: United States
KEYWORDS: decomposition; degradation; herbicides
ABSTRACT: (Purpose) To discuss the basic evidence of biological breakdown of herbicides in the soil; the kinetics of biological breakdown; the soil micro-organisms and enzymes involved; the persistence of herbicides; and biochemical mechanisms of breakdown. (Time and Duration) Literature review covering articles over a 40 year span. (Type of Research) Literature review. (Methodology) The authors review many topics related to chemical decomposition including: biological breakdown, kinetics of biological breakdown, soil micro-organisms and enzymes involved, persistence of herbicides, acylation, alkylation, amide or ester hydrolysis, condensate-conjugate formation, dehalogenation, and significance of herbicide metabolites. (Results and Conclusions) Soil micro-organisms are responsible for the degradation and ultimate dissipation of most herbicides from soil. Micro-organisms have the potential for adapting to the metabolism of a vast array of synthetic organic chemicals. Most herbicides are degraded by direct attack of the adapted microbes; however, enzymic degradation of some herbicides may occur by cometabolic processes. Microbial metabolism of herbicides tends to proceed toward ecologically acceptable products, i.e., natural products which serve as cellular building material for growth of the microbial population involved.

1375

Nonbiological degradation of herbicides in the soil.
AUTHOR: CROSBY D
AUTHOR AFFILIATION: Univ of CA
SOURCE TITLE: Pages 65-97 in Herbicides; physiology, biochemistry, ecology (volume 2).
SOURCE ID: New York, NY, Academic Press, 1976, 564 p.
YEAR PUBLISHED: 1976
CATEGORY: B1c
REGION: Applicable to entire United States STATE: United States
KEYWORDS: decomposition; degradation; herbicides
ABSTRACT: (Purpose) To discuss modes of nonbiological degradation of herbicides including the soil environment, degradation in soil organic matter, degradation by soil minerals, degradation by water, and photodegradation in water and soil. (Time and Duration) Literature review covering articles over a 25 year span. (Type of Research) Literature review. (Methodology) The author reviews many significant factors determining the rate of nonbiological degradation of herbicides in the soil. These include degradation by soil minerals, degradation by water, photodegradation in water and soil, and other nonbiological degradation processes. (Results and Conclusions) It is surprising that most pesticides are as persistent as they are, considering all the possibilities for reaction in or on the soil. One factor may be lack of contact. Pesticides are usually bound tightly to soil particles, and movement (in water, for example) often takes place largely by means of this insoluble support. Reagents and substrates, side-by-side, just never meet. It is likely that micro-organisms, too, degrade primarily those substances which come to them in aqueous solution; at least it is known that strongly adsorbed compounds and dry conditions greatly impede the microbial breakdown of pesticides. As pesticides are usually bound tightly to soil particles, we know where to find a significant part of the chemicals we apply; they often await out convenience in the top few inches of the soil.

1376

Ecological distribution of breeding birds.
AUTHOR: PETERSON SR
AUTHOR AFFILIATION: US Fish and Wildlife Service.
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975.
SOURCE ID: 1975, 22-38 p.
YEAR PUBLISHED: 1975
CATEGORY: B1c
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; ecology; migration; population; trends
ABSTRACT: (Purpose) To analyze the ecological distribution of breeding birds in the United States and southern Canada using several diversity indices. (Time and Duration) Data used of a six-year period. (Type of Research) Original research (actually the author did not collect the data, but his statistical work with the data was original). (Methodology) The Breeding Bird Survey made annually by the US Fish and Wildlife Service provided the basis for making this quantitative and qualitative analysis of breeding bird distribution. This survey was started in 1965 and since 1968 has encompassed the 48 contiguous states and southern Canada. The

survey is essentially a stratified random sample of roadside habitats. It is based on all birds seen or heard within 1/4 mile during fifty 3-minute stops spaced at half-mile intervals along randomly selected 24.5-mile routes. (Results and Conclusions) Average species recorded per route and average species diversity indices calculated with the Shannon-Weiner function were lowest in the West and Southwest and highest in the forested areas of the East and Northeast. Significant differences were noted among strata but little difference was recorded among years. In central US and Canada, average species per route was positively correlated with latitude but the average species diversity index showed no significant correlation.

1377
Determinants of local distribution and abundance in white-footed mice.
AUTHOR: LAJOIE DT; MCCLOSKEY RT
AUTHOR AFFILIATION: Univ of Windsor.
SOURCE TITLE: Ecology.
SOURCE ID: 56:467-472, 1975.
YEAR PUBLISHED: 1975
CATEGORY: B1c
REGION: Laurentian Mixed Forest
KEYWORDS: habitat; mammals, small; wildlife
ABSTRACT: (Purpose) To investigate the relationship between the population density of Peromyscus leucopus and the structure and plant composition of habitats. (Time and Duration) 1971-1972; 2 years. (Type of Research) Original research. (Methodology) Live trapping every two weeks was carried out during July and August in grasslands, prairie beach, deciduous forest, and abandoned apple orchards. (Results and Conclusions) White-footed mice are shrubland-woodland inhabitants and were absent from grasslands; meadow voles prefer grasslands. White-footed mice did occur in dense populations in brush habitats that extended into grasslands. Density of low cover (0-7.6 cm) and foliage profiles are more important than stages in succession. Habitat structure was important, but floristic composition was not.

1378
Effects of range treatment with 2,4-D on rodent populations.
AUTHOR: HANSEN RM; JOHNSON DR
AUTHOR AFFILIATION: CO State Univ.
SOURCE TITLE: Journal of Wildlife Management.
SOURCE ID: 33(1):125-132, 1969.
YEAR PUBLISHED: 1969
CATEGORY: B1c; B1e
REGION: Juniper-Pinyon Woodland + Sagebrush-Saltbush Mosaic STATE: Colorado; Utah
KEYWORDS: herbicides; impact; population; rodents; wildlife
ABSTRACT: (Purpose) To determine the effects of habitat alteration with 2,4-D on the density and reproduction of deer mice, least chipmunk, and montane vole populations inhabiting shrub-grass and perennial forb ranges. (Gophers not included, but results given for them.) (Time and Duration) 1959-1962; 4 years. (Type of Research) Original. (Methodology) Five study areas of shrub-grass and perennial forbs were treated with 2,4-D at rates of 2 or 3 lb/A using diesel oil as a carrier. Vegetation analyses were made on treated and control plots. Rodents were collected on traplines and records made of weight, sex, body measurements, number and length of visible embryos, number of placental scars, and position and length of testes. (Results and Conclusions) Treated areas generally produced an increase in grass cover and a decrease in cover of most forbs and shrubs. Recovery time varied — big sagebrush showed little recovery five years later. Changes in litter size were not considered significant in any species. Density of deer mouse was little affected. Northern pocket gopher population was reduced, but after reestablishment of forbs, returned to pre-treatment levels. Least chipmunk decreased in number probably because of changes in both food and cover. Montane voles increased due to increase in grass cover — diet in both treated and controls primarily forbs. Treatment probably had no direct toxic effect on rodents, but rather, affected them through changes in availability of food and cover.

1379
The lesser prairie chicken in the Texas panhandle.
AUTHOR: DEARMENT R; JACKSON AS
AUTHOR AFFILIATION: TX Game and Fish Com.
SOURCE TITLE: Journal of Wildlife Management.
SOURCE ID: 27(4):733-737, 1963.
YEAR PUBLISHED: 1963
CATEGORY: B1c; B1e
REGION: Grama-Buffalo Grass STATE: New Mexico; Oklahoma; Texas
KEYWORDS: birds; habitat; impact; population
ABSTRACT: (Purpose) To present results of annual census of drumming grounds on two study areas and compare them with results of a census made 10-20 years earlier. (Time and Duration) 1942; 1952-1962. (Type of Research) Original. (Methodology) Censusing of drumming grounds annually on two study areas during a 10 year period for comparison with data from a census of same areas in 1942. (Results and Conclusions) Severe drops in populations came in 1952, triggered by the onset of a major drought lasting through 1956, but populations did not increase during a series of good rainfall years starting with 1957. Changing land use practices are responsible for keeping lesser prairie chickens at low population levels. The more important of these are: overgrazing of cattle particularly in dry weather, resulting in displacement of the tall grasses; accelerated programs of aerial spraying with herbicides for brush control, and combine harvesting of grain sorghum instead of storage by stacking and shocking in the field.

1380
Effect of 2,4-D on abundance and foods of pocket gophers.
AUTHOR: HANSEN RM; KEITH JO; WARD AL
AUTHOR AFFILIATION: CO State Univ.; US Fish and Wildlife Service.
SOURCE TITLE: Journal of Wildlife Management.
SOURCE ID: 23(2):137-145, 1959.
YEAR PUBLISHED: 1959
CATEGORY: B1c; B1d
REGION: Colorado Plateau STATE: Colorado
KEYWORDS: food; forbs; grasses; herbicides; impact; mammals; population; wildlife; 2,4-d
ABSTRACT: (Purpose) To provide evicence of the effect of 2,4-D spraying on gopher populations and food habits. (Time and Duration) July 1956 to October 1957. (Type of Research) Original. (Methodology) Ten study plots 200 feet square were established on Grand Mesa, five of which were control plots in area not aerial-sprayed with 2,4-D. Records of ground cover, herbage production, gopher abundance, and gopher food habits were taken just prior to spraying in 1956 and again a year later. (Results and Conclusions) Pocket gopher populations reduced by 87% on sprayed areas for unknown reasons. Total herbage production declined 35% on sprayed plots and 14% on control plots. Drastic changes occurred in gopher food habits. Whereas 82% of diet consisted of forbs before spraying, they ate nearly equal amounts of grass and forbs a year later.

B1d - Productivity

1381
Vermont's winter deer habitat protection program.
AUTHOR: DICKINSON NR
AUTHOR AFFILIATION: NY Dept of Env Conservation.
SOURCE TITLE: Presented at: Northeast Wildlife Conference, Boston, 1977.
YEAR PUBLISHED: 1977
CATEGORY: B1d; B3a
SPONSOR: VT Fish and Game Dept.
REGION: Northern Hardwoods - Spruce Forest STATE: Vermont
KEYWORDS: deer; deer yard; habitat; impact; land use; management, land, restoration
ABSTRACT: (Purpose) To explain Vermont's program of identifying and protecting critical winter deer ranges. To suggest new approaches to problems and public cooperation. (Type of Research) Statement and evaluation of policy. (Results and Conclusions) Vermont's methods of identifying winter habitats for deer are discussed and evaluated, with the need for recognizing physiographic differences being stressed. Cases are shown regarding legal ruling for development on a critical habitat. Cooperation involving various agencies is discussed, including utility companies. New aproaches are discussed and one problem recognized: quantifying amount of tolerance a critical deer range has for development.

1382
Soil compaction: why the controversy??
AUTHOR: FROEHLICH HA
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Loggers Handbook.
SOURCE ID: 37:20-22, 1977.
YEAR PUBLISHED: 1977
CATEGORY: B1d; B2b; C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: compaction; forests; impact; logging; productivity; soils
ABSTRACT: (Purpose) To review what is known about soil compaction from logging, discuss alternatives available to loggers and forest owners, and determine what can be done to resolve the conflict. (Type of Research) Review (Methodology) The author presents an unreferenced general review of soil compaction due to logging based on his own research and the work of other scientists mainly in the Pacific Northwest. Several questions posed and discussed are: "Does Soil Compaction Make A Difference?", "What Are The Alternatives?", "What About Dry Weather Logging?", and "Where Do We Go From Here?." Exposed mineral soil in skid trails often provides a good seedbed for germination, but seedling growth usually is reduced. After clearcutting or partial cutting with

1382

tractors, from 20 to 40% of the cutting units are covered by skid trails. Alternatives available to overcome soil compaction while tractor harvesting include a determination of additional logging costs needed to balance losses in growth and wood value, soil restoration by tillage, prebunching to reduce area occupied by skid trails, and use of ground-based equipment designed to reduce soil impact. Other alternatives are to limit logging to periods of optimum moisture levels for given soils or restricting skidding to pre-selected trails on critical soils. More research on actual growth impacts and a better understanding of soil behavior under various moisture levels and types of logging machines are needed.

1383

The use of fire, fertilizer and seed for right-of-way maintenance in the southeastern United States.

AUTHOR: ARNER DH; CLIBURN LE; THOMAS DR
AUTHOR AFFILIATION: Soil Conservation Service.; MS Game and Fish Com. MS State Univ.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 155-165 p.
YEAR PUBLISHED: 1976
CATEGORY: B1d
REGION: Outer Coastal Plain Forest STATE: Alabama; Florida; Georgia; Mississippi; South Carolina
KEYWORDS: fertilizer; fire; maintenance; right-of-way; seeding
ABSTRACT: (Purpose) Investigations to compute the use of fire, fertilizer, and seeding in ROW maintenance with other conventional methods were carried out on power and gas lines in Alabama and Mississippi over 2-year periods. Providing food for quail and wild turkey was the principal objective. (Time and Duration) 1954-1974. (Type of Research) Original research. (Methodology) Prescribed burning was carried out on old ROWs previously maintained by hand cutting and mowing on six different soil areas. Fertilizer was used on six areas and seed was sown directly on four areas. (Results and Conclusions) Winter burning with fertilizer treatment significantly increased annual foods on all except the rich brown loam. Seeding increased quail food on a majority of winter burn plots. Temperatures twelve feet above the plots during burning were not hazardous to power lines. Winter burning was cheaper than mowing and selective basal spraying. However, selective basal may be more practical on hilly areas where fire lanes are difficult to construct. Fertilizing and seeding burned ROWs is recommended and most upland areas should be burned at least every third year. Satisfactory summer burns were obtained on only three of the five areas tried.

1384

Impact of herbicides upon game food and cover on a utility right-of-way.

AUTHOR: BRAMBLE WC; BYRNES WR
AUTHOR AFFILIATION: Purdue Univ.
SOURCE TITLE: Purdue University, Agricultural Experiment Station Research Bulletin No. 918.
SOURCE ID: West Lafayette, IN, Purdue Univ, 1974, 16 p.
YEAR PUBLISHED: 1974
CATEGORY: B1d; B1e
REGION: Appalachian Oak Forest
KEYWORDS: cover; food; herbicides; impact; right-of-way; wildlife
ABSTRACT: (Purpose) A long-term study of the effects of herbicide sprays containing 2,4-D 2,4,5-T, and Ammate has been carried out on a ROW in central Pennsylvania since 1953. (Time and Duration) 1953-1973. (Type of Research) Original research. (Methodology) Six treatments were applied in 1953 on four randomized blocks, plus a follow-up basal in 1954 on 1/2 of each plot. The herbicides used were 2,4-D, 2,4,5-T and Ammate. Data on vegetation was taken on 33x150 foot transects in each treatment area from 1953-1973. Wildlife use was studied by random direct observations and by pellet group counts on 3x100 foot transects, one in each treatment area. Basal selective spray applications were compared with broadcast stem-foliage applications. (Results and Conclusions) A stable low cover developed and has resisted invasion by trees for more than 20 years. The major components of this plant cover offer food of high feed value and cover, particularly valuable during the winter season. Common game species, including deer, grouse, turkey, and cottontail rabbit, have used the ROW. Deer population and use has been consistently high on the ROW. Broadcast sprays brought about a temporary fireweed stage or a grass-sedge cover as compared with undisturbed Bracken-Sedge-Herb-Blueberry community on selective spray areas and on unsprayed controls. Important plants of the ROW were not common at the beginning but became part of the dominant plant cover; these are sweetfern, goldenrod, and blackberry.

1385

Some options for managing forest land in the central Appalachians.

AUTHOR: GILL JD; PATRIC JH; TRIMBLE GR JR
AUTHOR AFFILIATION: US Forest Service
SOURCE ID: Upper Darby, PA. Northeastern Forest Experiment Station, 1974. General Technical Report NE-12, 42 p.
YEAR PUBLISHED: 1974
CATEGORY: B1d
REPORT NUMBER: NE12
REGION: Eastern Deciduous Forest STATE: West Virginia
KEYWORDS: ecosystem; forest; impact; management; multiple use; quality; silviculture; temperature; water
ABSTRACT: (Purpose) To evaluate the general effects of different forest practices on the following resources: timber, water, visual appeal, and wildlife. To establish a series of options from which choices can be made to meet a particular owner's objective. (Time and Duration) One-year study. (Type of Research) Literature review. (Methodology) For seven different ecosystems, three generalized forest management methods were rated: (1) even-aged management, (2) uneven-aged management, and (3) no commerical forest cutting, leaving the stand intact. For the seven different ecosystems and the three generalized management methods, the impact on timber, water, visual appeal and wildlife was considered. (Results and Conclusions) The user of this paper is presented with a series of forest management options, from which he may choose those silvicultural cutting practices best suited to his peculiar combination of forest resources and land ownership objectives. Examples show how options might be selected in actual forest management.

1386

Looks can be deceiving-herbicide injury?

AUTHOR: BAUMAN TT; ROSS MA; WILLIAMS JL JR
AUTHOR AFFILIATION: Purdue Univ.
SOURCE TITLE: Down to Earth
SOURCE ID: 19(1) :11-14, 1973.
YEAR PUBLISHED: 1973
CATEGORY: B1d
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; impact
ABSTRACT: (Purpose) To define a logical sequence of steps in diagnosing herbicide injury to plants, and methods of distinguishing herbicide injury from damage from other causes. (Type of Research) Literature review (plus extensive field experience). (Methodology) Several plant diseases and environmental conditions which produce symptoms similar to those associated with herbicide injury are discussed. Possible causes of herbicide injury are also discussed. If herbicide injury is the diagnosis, a method of detecting the probable herbicide responsible for those symptoms is outlined. Identification of the specific herbicide is based on three groupings—growth deformation, chlorosis, and necrosis, and stunting. (Results and Conclusions) Important advice on analyzing plant damage to detect possible herbicide role is don't stretch your knowledge too far. One must analyze the total situation. This requires examining the roots as well as the tops. Check the field patterns and time the symptom appeared relative to the farming practices utilized. Don't be partial to any plant, look at them all.

1387

Browse selection by deer and hares.

AUTHOR: TELFER ES
SOURCE TITLE: Journal of Wildlife Management.
SOURCE ID: 36(1):1344-1349, 1972.
YEAR PUBLISHED: 1972
CATEGORY: B1d
SPONSOR: Canadian Wildlife Service.
REGION: Beach-Maple Forest
KEYWORDS: food; wildlife
ABSTRACT: (Purpose) To determine the weight of browse available, utilized, and preferred by white tailed deer and snowshoe hares in two forest zones, one in Nova Scotia and one in New Brunswick. (Time and Duration) Summers of 1966-1967. (Type of Research) Original. (Methodology) A total of 133 plots 1.89 x1.89 m were examined in one forest type and 140 plots in another forest type. Browsed and unbrowsed twigs were counted. Weight of the browse was estimated by Shafer's method, using the assumption that if all twigs were taken, the main diameter at the point of browsing (dpb) would remain the same. Mean ovendry weights corresponding to the mean dpb's were obtained and mulitplied by the total number of browsed and unbrowsed twigs for each plot. (Results and Conclusions) Conifers comprised a large part of the diet of deer and hares with considerable overlap of some species. Hares usually browsed lightly on many items of a species while deer fed more heavily on a fewer number of items. The inaccuracies of preference factors determined from counts of browsed stems were strong enough to suggest that future work should base preference ratings on at least approximations of the weights of browsed and unbrowsed vegetation.

1388
Safety in the development of herbicides.
AUTHOR: JOHNSON JE
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Down to Earth.
SOURCE ID: 27(1):1-7, 1971.
YEAR PUBLISHED: 1971
CATEGORY: B1d
REGION: Applicable to entire United States STATE: United States
KEYWORDS: dioxin; herbicides; teratogen; 2,4,5-T
ABSTRACT: (Purpose) To explain the results of tests on 2,4,5-T from the Bionetics Laboratory, and report on later tests by Dow using 2,4,5-T with less than 1 ppm of dioxin. Also to explain the problems of pesticide development and registration faced by industry. (Time and Duration) Review of research over a 2-year period. (Type of Research) Literature review. (Methodology) The review of the 2,4,5-T controversy begins with October 29, 1969, when certain uses of this herbicide were removed. Tests by Dow Chemical with 2,4,5-T with low dioxin content are reviewed, and also the chemistry of dioxins. No dioxin has been found in silvex or in 2,4-D. Research on burning 2,4,5-T samples with high dioxin content is reviewed to show that no dioxin is formed from the heat of combustion. Finally the author reviews the costly procedure that industry must use to develop and test potential new pesticides. (Results and Conclusions) The samples of 2,4,5-T tested by the Bionetics Laboratory were heavily contaminated with 2,3,7,8-tetrachlorodibenzo-p-dioxin. Dow Chemical tests on 2,4,5-T with less than 1 ppm of dioxin did not produce teratogenic effects on rats. Dioxin is rapidly degraded by ultraviolet light at wavelengths that appear in the spectrum of the sun. Dioxin has 1/5 the solubility of DDT in water, and there is little tendency for it to concentrate in fat. Combustion of 2,4,5-T sprayed material does not cause dioxin formation. Dioxin is extremely immobile in the soil. 2,4,5-T produced at less than 1 ppm dioxin thus does not present a health hazard.

1389
Air pollution: injury to vegetation.
AUTHOR: HINDAWI IJ
AUTHOR AFFILIATION: US Dept of Health, Education and Welfare.
SOURCE ID: Raleigh, NC, National Air Pollution Control Administration, 1970. 44 p.
YEAR PUBLISHED: 1970
CATEGORY: B1d
REGION: Applicable to entire United States STATE: United States
KEYWORDS: damage; flora; impact; pollution, air
ABSTRACT: (Purpose) To describe how air pollution damages plant tissues and to illustrate specific effects of different common types of air pollution on plant foliage. (Time and Duration) Summary of major studies over past 20 years. (Type of Research) Literature review. (Methodology) Information on specific injuries to plant tissues, foliage, and roots was compiled from a large number of research reports. These were summarized to provide a popular reference on this subject for the general public. Excellent color photographs were obtained to illustrate air pollution effects on plants. (Results and Conclusions) For the past 20 years scientists have been growing plants under controlled conditions and exposing them to various concentrations and combinations of certain chemicals. Now characteristic injuries to certain plants can be interpreted not only to determine the presence, but even the relative concentration of aerial pollutants that cause injury. In some instances when analytical techniques and measuring instruments are inadequate, plant injury alone may be used to determine the presence of pollutants.

1390
Prediction of the persistence and activity of TORDON herbicide in soils under field conditions.
AUTHOR: GORING CAT; HAMAKER JW; YOUNGSON CR
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Down to Earth.
SOURCE ID: 23(2) :30-36, 1967.
YEAR PUBLISHED: 1967
CATEGORY: B1d; B2b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; persistence; picloram; soil
ABSTRACT: (Purpose) To present methods of predicting the persistence and activity of Tordon herbicide (picloram) in soils under field conditions. (Time and Duration) One-year study. (Type of Research) Original research. (Methodology) The amounts of picloram herbicide recovered from soil at varying time periods after various rates of application were measured for a number of field locations in 18 states and provinces of the United States and Canada. The soil samples were obtained through the cooperation of the many investigators who conducted field experiments. The bioassay method used was sensitive to 0.001 ppm. (Results and Conclusions) Rate of herbicide loss was found to be correlated with days over 90 degrees farenheit and annual precipitation. Using regression analysis and the national climate statistics, average half-order constants are presented for 46 states.

1391
The effect of TORDON on microorganisms and soil biological processes.
AUTHOR: GORING CAI; GRIFFITH JD; OMELIA FC
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Down to Earth
SOURCE ID: 22(4) :14-17, 1967.
YEAR PUBLISHED: 1967
CATEGORY: B1d; B2b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; impact; microorganisms; picloram; soil
ABSTRACT: (Purpose) To determine whether picloram significantly affects the populations and biological processes of soil microorganisms. (Time and Duration) One-year study. (Type of Research) Original research. (Methodology) The potassium salt of picloram at acid equivalent concentrations of 10, 100, 1000, and ppm in water were prepared. 2 ml aliquots of the solutions and 2 ml aliquots of suspensions of the organisms were mixed at 45 degrees centigrade with 16 ml aliquots of an agar suitable for growth of the organism to be evaluated. The plates were incubated for 3 days at 23 degrees centigrade and then observed for growth and number of colonies. In other studies the chemical and organism were mixed in a liquid medium; or for soil microorganisms, picloram was added to soils. (Results and Conclusions) Even at dosages as high as 1000 ppm acid equivalent in soil, picloram herbicide did not appear to significantly affect carbon dioxide evolution from soils, urea hydrolysis or gross counts of bacteria and fungi in the soil. While it is impossible to conclude that the life processes of the microorganisms in soil are not in any way affected, it seems fairly certain that if there are effects, they must be very subtle for most soil organisms.

1392
Chemical control of vegetation on areas bordering public water supplies.
AUTHOR: BOYD WI
AUTHOR AFFILIATION: El duPont, de Menours and Co.
SOURCE TITLE: Northeastern Weed Control Conference, January 5-7, 1966.
SOURCE ID: 20:400-405, 1966.
YEAR PUBLISHED: 1966
CATEGORY: B1d
REGION: Applicable to entire United States STATE: United States
KEYWORDS: ammonium sulfamate; brush control; herbicides; reservoir; toxicity; water
ABSTRACT: (Purpose) To document the effectiveness and safety of ammonium sulfamate (formulated as Ammate-X-NI) in controlling woody growth bordering reservoirs, and give specific recommendations for the use of this herbicide around potable water. (Time and Duration) Three-year study (1962-64). (Type of Research) Original research. (Methodology) Two New England reservoirs were used for these tests. One had a surface area of 400 acres and the second a surface area of 30 acres. In mid-July 300 pounds of Ammate-X-NI was applied at normal use rates as foliar treatment on brush growing around the margin of one section of the larger reservoir. Water samples were taken and analyzed for residue. In 1963 and 1964, similar tests were made spraying from the water margin to a distance of 30 feet from the shore. Water samples were taken from four locations in each reservoir one day before, one week, and one month after treating. (Results and Conclusions) Analyses of over 40 samples during the course of the field program demonstrated that no residues of sulfamate were detectable in the water - that is less than 0.1 ppm. During these tests no kill of aquatic plants was observed. There was no evidence of harm to fish following application of this herbicide.

1393
Fruit-producing Trees and Shrubs in Missouri's Ozark Forests.
AUTHOR: EHRENREICH HJ; MURPHY DA
AUTHOR AFFILIATION: MO Conservation Com.; US Forest Service, Forest Experiment Station.
SOURCE TITLE: Journal of Wildlife Management
SOURCE ID: 29(3):497-503, 1965.
YEAR PUBLISHED: 1965
CATEGORY: B1d
REGION: Oak-Hickory Forest STATE: Missouri
KEYWORDS: forest; fruit; shrubs; trees; wildlife
ABSTRACT: (Purpose) To determine the relative abundance of some fruit-producing trees and shrubs in Missouri's Ozark forests. (Time and Duration) One-year study, 1961. (Type of Research) Original research (field). (Methodology) The survey was made between June 19 and September 1, 1961. Forage production was measured on 1348 one-fifth-acre plots located at 5-chain intervals along predetermined compass lines. Occurrence of fruiting species was measured on four randomly located 0.01-acre plots within each 0.2-acre plot. Field crews were provided with a list of species to be tallied and criteria for the minimum-size limitation for each species to be recorded. (Results and Conclusions) Field crews recorded 8032 plants of 21 species. Dogwood, sassafras, fragrant sumac and dwarf sumac were the most abundant species and

1393

made up 80 percent of the sample. Abundance varied by forest type. The greatest variety (19 species) and density (194 plants per acre) occurred in the bottomland hardwood type. The two species with highest density were dogwood and fragrant sumac. None of the fruiting species had a high percentage of plants with fruit. The data indicated that abundance and fruiting were influenced by crown cover of overstory trees, aspect, and position on slope.

1394
Effects of clearcut openings on quality of hardwood border trees.
AUTHOR: SMITH HC
AUTHOR AFFILIATION: US Forest Service Northeastern Forest Experiment Station.
SOURCE TITLE: Journal of Forestry
SOURCE ID: 63:933-937, 1965.
YEAR PUBLISHED: 1965
CATEGORY: B1d
REGION: Appalachian Oak Forest STATE: Pennsylvania; Virginia; West Virginia
KEYWORDS: clearing; impact; sprouting; trees
ABSTRACT: (Purpose) To determine the effects of clearcut openings on the epicormic branching and quality of pole- and sawlog-size border trees; and obtain information on the relationships of species, crown class, and log position to branching and quality. (Time and Duration) 15 year study. (Type of Research) Original research (field study). (Methodology) Seventeen openings, cut-over in 1951, were used for this study. The minimum width of these openings was 25 feet and most were 80 to 100 feet across. Three tree species were included in the study, yellow-poplar, northern red oak and black cherry. Measurements on edge trees included number of epicormic branches on each of four faces, height to first epicormic branch, log grade on the open face and on the opposite face. (Results and Conclusions) Epicormic branching was generally more prevalent on trees of lower crown class and on the upper stems. Among the three species studied, northern red oak had the most epicormic branching and yellow-poplar the least. For this reason, yellow-poplar probably should be left as border trees in preference to other species.

1395
Relation of ecological succession to farm game in Cumberland County in the Virginia Piedmont.
AUTHOR: BYRD MA
SOURCE TITLE: Journal of Wildlife Management
SOURCE ID: 29(2):188-195,1956.
YEAR PUBLISHED: 1956
CATEGORY: B1d, E2
SPONSOR: VA Agricultural Experiment Station.
REGION: Appalachian Oak Forest STATE: Virginia
KEYWORDS: ecology; succession; wildlife
ABSTRACT: (Purpose) To determine the trend of natural plant succession on abandoned fields in the VA Peidmont, and to interpret this data in terms of wildlife management. (Time and Duration) 2 years. (Type of Research: Original. (Methodology) Three old fields were selected form each of the following groups: those abandoned 1-10 years; those abandoned for 15 years; for 20 years and for 25 years. Quadrats were established 4.66 feet on each side and at 50 foot intervals along a line crossing from corner to corner. Plant items were counted, and density, frequency, and occurrence computed. (Results and Conclusions) One year fields were dominated by annuals of crabgrass, horseweed, and Korean lespedeza. Fields 2-4 years old were characterized by a number of perennials an reseeding annuals with ragweed, Korean Lespedeza and asters common. Fields 5-10 years old were dominated by broomsedge, and perennial composites with Virginia pine invading. Fields 11-25 years old were dominated by Virginia pine. Abandoned fields were most desirable to quail and rabbits during the first, second, third, and fourth years after abandonment.

1396
Survival and growth of shrubs planted for wildlife in New York.
AUTHOR: COOK DB; EDMINSTER FC
AUTHOR AFFILIATION: NY State Conservation Dept. Soil Conservation Service.
SOURCE TITLE: Journal of Wildlife Management
SOURCE ID: 8(3):185-191, 1944.
YEAR PUBLISHED: 1944
CATEGORY: B1d
REGION: Northern Hardwoods Forest STATE: New York
KEYWORDS: checklist; planting; shrubs; site; site preparation; species; wildlife
ABSTRACT: (Purpose) To determine the best methods of planting hardwood trees and shrubs, known to be of high value as wildlife food, to ensure good survival and rapid growth. (Time and Duration) Three-year study, 1941-43. (Type of Research) Original research (field). (Methodology) Thirteen species of shrubs and trees were selected for planting. These included northern bayberry, Thunberg barberry, multiflora rose, American plum, early shrub lespedeza, silky dogwood, arrowwood, nannyberry, black haw and snowberry. Three site treatments were used in bands paralleling the contours: (1) plowed and harrowed a week prior to planting; (2) 12-inch scalps 3 inches thick cut with a shovel; and (3) undisturbed. Two grades of stock were used, standard and cull. (Results and Conclusions) Standard stock showed definite and consistent superiority. The extra cost of plowing is more than offset by greater ease of planting and better growth and survival. At the end of the third growing season, the most promising species were arrowwood, multiflora rose, early shrub lespedeza, silky dogwood, black chokeberry, and bayberry.

B1e - Habitat destruction

1397
Introduction — forest wildlife habitat management: ecology, management and data systems. (Draft)
AUTHOR: THOMAS JW
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Forest-wildlife relationships in the Blue Mountains of Washington and Oregon.
SOURCE ID: Portland, OR, US Forest Service, Pacific Northwest Forest and Range Experiment Station.
YEAR PUBLISHED: 1977
CATEGORY: B1e
SPONSOR: Wildlife Management Institute.; OR Dept of Fish and Wildlife.; US Forest Service.; Bureau of Land Management.
REGION: Grand Fir-Douglas-fir Forest STATE: Oregon; United States; Washington
KEYWORDS: ecology; ecology, applied; forest; habitat; habitat manipulation; management; wildlife
ABSTRACT: (Purpose) Introduction discusses general ecological principles and concepts which can be used to tie forest management and wildlife together. (Methodology) Two systems of forest wildlife management incorporating ecological concepts are: (1) Management for species richness. The goal here is to insure that most or all species of wildlife are maintained, by manipulating vegetation so that stages of each primary plant community are represented. Diversity is most easily achieved under even-aged timber management (Example: Mark Twain National Forest in MO). (2) Featured-species management — favors a particular species. Manipulate vegetation so that limiting factors of food, cover and water for featured species are made less limiting. (Example: forests of the southeast.) (Results and Conclusions) Must recognize that timber management is wildlife management. With intensified forest use, it is urgent that present knowledge be applied, especially in predicting consequences to wildlife. Describes a system designed for the Blue Mountains in which developed wildlife timber relationships show, or can be utilized to show, consequences. The common ground for planning is plant communities and their stages or condition.

1398
Edges - their interspersion, resulting diversity and its measurement. (Draft).
AUTHOR: MASER C; RODIEK JE; THOMAS JW
AUTHOR AFFILIATION: US Forest Service. Bureau of Land Management. Univ of AZ.
SOURCE TITLE: Forest-wildlife relationships in the Blue Mountains of Washington and Oregon.
SOURCE ID: Portland, OR, US Forest Service, Pacific Northwest Forest and Range Experiment Station.
YEAR PUBLISHED: 1977
CATEGORY: B1e
SPONSOR: US Forest Service;; Wildlife Management Institute;; OR Dept of Fish and Wildlife;; Bureau of Land Management;
REGION: Applicable to entire United States STATE: United States
KEYWORDS: communities; diversity; edge; forest; habitat; index; management; Wildlife
ABSTRACT: (Purpose) Discussion of edges —definition, kinds, importance, causes, attributes, and as a measure of diversity. (Results and Conclusions) Edges are where plant communities or where successional stages meet, and are rich in wildlife. They may be inherent long term components or induced temporary features. The length, width and configuration of edges influence amount of edge, and the contrast and stand size influence degree of richness. When average size of habitat blocks becomes smaller than size required to maximize number of species present, increasing edges leads to decreased diversity. Diversity is considered related to stability (ability of ecosystem to withstand disaster) and thus a desirable goal. It can be expressed mathematically as a product of edge. Computations are given for determining the Inherent Diversity Index, the Induced Diversity Index and the Total Diversity Index. To account for the amount and characteristics of particular edges in a planning area, mapping codes are suggested.

Primary uses of the diversity index in land management are: 1) following trends in habitat diversity; 2) evaluating management alternatives; 3) evaluating shapes of vegetation treatment blocks. Cautions that diversity as a measure of habitat condition must be considered in combination with the needs of particular species so as to preclude the loss of any species and to insure desired yields of feature species (game or endangered).

1399
Relationships of Rocky Mountain mule deer and Rocky Mountain elk habitat to timber management in the Blue Mountains. (Draft))
AUTHOR: BLACK H; SCHERZINGER RJ; THOMAS JW
AUTHOR AFFILIATION: US Forest Service. OR Dept of Fish and Wildlife.
SOURCE TITLE: Forest-Wildlife relationships in the Blue Mountains of Washington and Oregon.
SOURCE ID: Portland, OR, US Forest Service, Pacific Northwest Forest and Range Experiment Station.
YEAR PUBLISHED: 1977
CATEGORY: B1e
SPONSOR: US Forest Service. Bureau of Land; Wildlife Management Institute.; Management. Dept of Fish and Wildlife.
REGION: Grand Fir-Douglas-fir Forest STATE: Oregon; Washington
KEYWORDS: deer; elk; forest; habitat; management; planning; wildlife
ABSTRACT: (Purpose) To provide forest-land and managers with a system to quantitatively evaluate the consequences for deer and elk. (Methodology) Ecological principles and research results were used to form a framework on which models of deer and elk responses to altered habitat were constructed. Where research data was lacking, consensus of specialists was used. (Results and Conclusions) Ratio and arrangement of forage areas to cover is the key to forecasting interrelations. Paper is divided into method of describing land-type, definition of terms, procedures for predicting animal response, tips for improvement of habitats, and discussion. Animals need juxtaposition of vegetation types. Cover serves for hiding and for thermal control. It is emphasized that timber management decisions have profound effects on deer and elk.

1400
Unique habitats. (Draft)
AUTHOR: MASER C; RODIEK JE; THOMAS JW
AUTHOR AFFILIATION: Bureau of Land Management. Univ of AZ. US Forest Service.
SOURCE TITLE: Forest-wildlife relationships in the Blue Mountains of Washington and Oregon.
SOURCE ID: Portland, OR, US Forest Service, Pacific Northwest Forest and Range Experiment Station.
YEAR PUBLISHED: 1977
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: behavior; habitat; nesting; species; threatened wildlife
ABSTRACT: (Methodology) The authors group cliffs, talus, and caves under heading of "unique habitats"; each one provides animals with relatively high security, distinctive internal environments, predictable airflow patterns, diversity, and abrupt, stable edges. Cliffs produce concentration of animals. Cliffs within a quarter mile of water are most valuable, as they provide for rearing young and some physical protection. (Results and Conclusions) Talus of igneous rocks is more important than talus of sedimentary rocks; it provides protection and an edge of herbaceous vegetation. Caves (and mine shafts and railroad tunnels) provide shelter, stable environment, shades of darkness, and solitude. These are used by a variety of animals. Unique habitats cannot be "improved" nor can they be rebuilt if destroyed. Each one contains animals with special adaptations which cannot be accommodated in other habitats. Disaster may result when access to a unique habitat is prevented by use of travel corridors.

1401
Waterfowl collisions with power lines at a coal-fired power plant.
AUTHOR: ANDERSON WL
YEAR PUBLISHED: 1977
CATEGORY: B1e
REGION: Applicable to entire United States STATE: Illinois
KEYWORDS: bird kills; birds; corridor; ducks; ecological; impact; mortality; right-of-way; transmission; transmission line; waterfowl
ABSTRACT: (Purpose) To estimate the relative impact on waterfowl populations resulting from collisions with power lines. (Time and Duration) October to December 1973-1975. (Type of Research) Original research. (Methodology) Observations of waterfowl near two 345-kv power lines, which included a weekly census of all birds in the area and a search for dead and crippled birds. (Results and Conclusions) An estimated 200 to 400 waterfowl were killed each fall from colliding with high-voltage transmission lines; about 0.2-0.4 percent of maximum number of birds present. Mallards, blue-winged teal and coots were the most common victims. The rate of mortality was influenced by numbers present, climatic conditions, behavior, degree of disturbance and the familiarity of the birds with the area.

1402
Geese hit power transmission line.
AUTHOR: SCHROEDER CH
SOURCE TITLE: North Dakota Outdoors
SOURCE ID: 40(2): 1977.
YEAR PUBLISHED: 1977
CATEGORY: B1e
REGION: Applicable to entire United States STATE: North Dakota
KEYWORDS: bird kills; birds; ecological; impact; mortality; right-of-way; transmission line; waterfowl
ABSTRACT: (Purpose) A case study of snow goose mortality resulting from a collision with a power line. (Time and Duration) Spring 1977. (Type of Research) Original research. (Methodology) Condensed field report of snow goose mortality. (Results and Conclusions) Forty-six snow geese died on April 22, 1977, from colliding with a power line near Lidgerwood, North Dakota.

1403
Transmission line audible noise and wildlife.
AUTHOR: GRIFFITH DB; LEE JM JR
AUTHOR AFFILIATION: Bonneville Power Admin. Western Interstate Comm for Higher Education.
SOURCE ID: Madrid, Spain, The Ninth International Congress on Acoustics, 1977, 33 p.
YEAR PUBLISHED: 1977
CATEGORY: B1e
REGION: Columbia Forest (Dry Summer) STATE: Idaho
KEYWORDS: noise; right-of-way; wildlife
ABSTRACT: (Purpose) To describe characteristics of transmission line audible noise (AN) and to relate its effects on wildlife to overall line characteristics. (Time and Duration) 1975; 1 year. (Type of Research) Original research and discussion paper. (Methodology) A 500 kV line in a heavily forested area was used with 5 paired ROWs and controls. Direct observations, time lapse photography, track counts and vegetation analyses were made. A General Radio Type 1551-C sound level meter was used to detect AN. (Results and Conclusions) Elk movement was not affected by a 500 kV line with 55-60 dB(a) noise. In discussing the literature, it was concluded that transmission lines do not pose a significant problem with respect to long term exposure to low intensity electric fields. Ozone produced is not measurable above the ambient levels. Corona-produced a-c noise is highest when conductors are wet and is also highest when the line is new. Ecological effects observed can largely be explained by physical changes in habitat rather than AN or electric fields. Effects of AN on wildlife in wet weather are difficult to identify, owing to unusual behavior of wildlife.

1404
Riparian zones - their importance to wildlife and their management. (draft).
AUTHOR: MASER C; RODIEK JE; THOMAS JW
AUTHOR AFFILIATION: US Forest Service.; Bureau of Land Management.; Univ of AZ.
SOURCE TITLE: Forest-wildlife relationships in the Blue Mountains of Washington and Oregon.
SOURCE ID: Portland, OR, Us Forest Service, Pacific Northwest Forest and Range Experiment Station.
YEAR PUBLISHED: 1976
CATEGORY: B1e
SPONSOR: OR Dept of Fish and Wildlife.; US Forest Service.; Bureau of land Management. Wildlife; Management institute.
REGION: Grand Fir-Douglas-fir Forest STATE: Oregon; Washington
KEYWORDS: diversity; edge; habitat; management; micorclimates; microclimates; migration; riparian; sensitivity; water; wildlife
ABSTRACT: (Purpose) To raise a "red flag" where riparian zones are concerned because habitat alterations will have an effect on wildlife far in excess of that indicated by the size of impacted area. (Methodology) A discussion of characteristics of riparian zones that make them valuable to wildlife, value to other users, sensitivity of zone, and management tips. (Results and Conclusions) Riparian zones are the most important wildlife habitat in the Blue Mountains, because there is more use per unit area. Great diversity is created by vertical and horizontal stratification of vegetation, contrast to surrounding vegetation, their linear shape which maximizes edge, and their microclimates. They also provide travel lanes as migratory routes or "connectors" between habitats. They are sensitive to any alterations. A land manager should consult a wildlife and a fisheries biologist in the planning stage since each zone is different. Logging may have great impact, but this can be lessened by simple tree selection or group selection harvest. Timber management outside a riparian zone may affect it by changes in water quanity and quality.

1404

1405
Movement and home range of cottontail rabbits along a power line right-of-way maintained by periodic treatments with mechanical means.
AUTHOR: MATTHEWS WL
AUTHOR AFFILIATION: Clemson Univ.
SOURCE TITLE: State Wildlife Research Project.
SOURCE ID: Columbia, SC, SC Wildlife and Marine Resources Dept, 1976, 107 p.
YEAR PUBLISHED: 1976
CATEGORY: B1e
REPORT NUMBER: W3812
SPONSOR: SC Wildlife and Marine Resources Dept.; Duke Power Co.
REGION: Southeastern Mixed Forest STATE: South Carolina
KEYWORDS: clearing, mechanical; game, small; rabbit; right-of-way; utilization
ABSTRACT: (Purpose) To determine movement and home range size of cottontail rabbits on ROWs through forested areas. (Time and Duration) 2 years (1974-1976). (Type of Research) Original research plus literature review. (Methodology) 26 rabbits were live-trapped, equipped with telemetric transmitters and released at point of capture. Rabbits were followed at night, located by triangulation, and points marked on a map to determine home range. Transmitters were recovered when possible. Vegetation types were mapped for both the ROW and control area so habitat types utilized by rabbits were constantly monitored. (Results and Conclusions) Rabbits utilized shrub and woodland areas during the day for resting. At night, the rabbits moved into the blackberry-serecia community on the ROW, probably to forage. Pure serecia communities had little utilization, indicating poor food and cover potential. Home ranges were greater in the wooded area than on the ROW, indicating requirements were better met on the ROW. Mortality rates were 53% on the ROW and 66% on the control area, the majority being predator-caused.

1406
Songbird utilization of powerline rights-of-way.
AUTHOR: FERGUSON CF
AUTHOR AFFILIATION: WV Univ.
SOURCE ID: Morgantown, WV, WV Univ., 1976, Masters Thesis, 63 p.
YEAR PUBLISHED: 1976
CATEGORY: B1e
SPONSOR: Edison Electric Institute.
REGION: Northern Hardwoods - Spruce Forest STATE: New Hampshire; West Virginia
KEYWORDS: animals, non-game; birds, song; management; right-of-way; utilization
ABSTRACT: (Purpose) To determine the effects of ROWs on songbird species and numbers and to suggest methods for utility companies to improve songbird habitat through regular maintenance activities. (Time and Duration) 2 years (1973-1974). (Type of Research) Original research. (Methodology) Strip censuses were conducted through three different habitat types in WV and two types in NH. The census was conducted on power line ROWs through the various habitat types. At periodic census stations throughout the strip, songbirds were identified and counted with notes recorded about their habitat, activities, etc. In winter, a nest census was conducted in the study areas. Using references and vegetation maps, potential food sources on the ROWs were identified. (Results and Conclusions) In WV, poorly-moderately drained ROW sites had more songbird species and a higher index of breeding males than the well-drained sites. In NH, there was no significant difference between sites relative to number of species. Moisture and vegetation control were the main factors affecting songbird populations in WV, while vegetation control was important in NH. Selective application of herbicides was more beneficial to songbird habitat than broadcast spraying, which tended to reduce vegetative layering, thus reducing nesting sites. Recommendations for herbicide use in ROW management to increase songbird habitat are given.

1407
Effects of powerline rights-of-way on small, nongame mammal community structure.
AUTHOR: JOHNSON WS; SCHREIBER RK; STORY JD
AUTHOR AFFILIATION: Oak Ridge Nat Lab.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 263-273 p.
YEAR PUBLISHED: 1976
CATEGORY: B1e
REGION: Appalachian Oak Forest STATE: Tennessee
KEYWORDS: impact; mammals, small; right-of-way; wildlife
ABSTRACT: (Purpose) A study was made to describe small mammal distribution and abundance in habitats on a ROW in eastern Tennessee. (Time and Duration) 1975. (Type of Research) Original research. (Methodology) A trapping census was made of small mammal populations on a 500 kV ROW 91m wide and in the adjacent woods. The ROW is maintained by brush hogging on a three to four year cycle. (Results and Conclusions) Results suggest that a ROW through a forested area produces a new and distinct small mammal community differing from that of the original forest. In hardwood habitats, small mammals were more abundant on the edges and on the ROW than in the forest. In pine habitats, nearly the opposite occurred with abundance highest in the forest where there was abundant honeysuckle. Small mammal species were similar in both hardwood and pine habitats on the ROW with the greatest number of species on the edges. Some possible negative impacts were suggested.

1408
Wildlife use and management of powerline rights-of-way in New Hampshire.
AUTHOR: CAVANAGH JB; MACRIGEANIS SN; OLSON DP
AUTHOR AFFILIATION: Univ of NH., Univ. of NH, Public Service Co. of NH.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-Of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 275-285 p.
YEAR PUBLISHED: 1976
CATEGORY: B1e
REGION: Northern Hardwoods - Spruce Forest STATE: New Jersey; Pennsylvania
KEYWORDS: maintenance; management; right-of-way; wildlife
ABSTRACT: (Purpose) A research study was made in New Hampshire from 1973-75 to compare wildlife use of a clearcut ROW with a selective cut ROW. (Time and Duration) 1973-75. (Type of Research) Original research. (Methodology) Measurements of wildlife use were made on clearcut and selective cut 235 foot-wide ROWs on 100-foot segments. The clearcut ROW had been given five 2,4-D + 2,4,5-T foliage sprays since clearance in 1926 and had developed a grass-fern-shrub community. The selective cut ROW and new clearcut were given a Tordon stump spray. A control was selected in an undisturbed forest similar to that adjacent to the ROW. Observation points were set up in the center of ROW study strips and observations were taken within four hours after sunrise. (Results and Conclusions) Sixty-three percent of wildlife observations were birds. Wildlife usage in general was significantly higher on the selectively cut ROW than on the newly clearcut ROW and lowest on the old clearcut ROW. The selective cut ROW also showed the highest browse use. Data supported the concept that ROWs provide edge habitat for a diversity of wildlife; and maximum diversity was found on the selective cut ROW. High use of wildlife food was associated with good cover which included brush piles and taller vegetation interspersed with low cover and bare ground. Dense low ground cover on the old clearcut ROW was the least used by wildlife. The cost of selective clearing and maintenance, however, was very high in comparison with clearcut and selective spray management.

1409
An evaluation of chemically-sprayed electric transmission line rights-of-way for actual and potential wildlife use.
AUTHOR: MAYER TD
AUTHOR AFFILIATION: Asplundh Env Services.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 287-294 p.
YEAR PUBLISHED: 1976
CATEGORY: B1e
REGION: Northern Hardwoods - Spruce Forest STATE: Connecticut; Florida; Massachusetts; Maine; New Hampshire; New Jersey; Pennsylvania; Rhode Island; Vermont
KEYWORDS: habitat; herbicides; maintenance; right-of-way; wildlife
ABSTRACT: (Purpose) A study was made to determine the actual and potential wildlife use of rights-of-way in New Hamoshire, Georgia and West Virginia. (Time and Duration) 1972-73. (Type of Research) Original research. (Methodology) Plant cover was mapped on 1/5 acre plots, nine in each state. Wildlife values of plants were taken from published ratings for potential use. To get actual use, browse data were taken on 100 x 2 foot transects and pellet group counts on 1/50 acre plots. Direct observations were also recorded. (Results and Conclusions) Wildlife use was extensive in all three study regions; chemically maintained ROWs showed significantly greater potential wildlife use than adjacent old fields and woodlots for two game species in New Hampshire, one in Georgia, and none in West Virginia. The three major game species in each state appeared to benefit from edges developed on the ROWs.

1410
Population dynamics and habitat preference of cottontail rabbits along a seeded and mechanically maintained power line right-of-way.
AUTHOR: BETSILL CW
AUTHOR AFFILIATION: Clemson Univ.
SOURCE ID: Clemson, SC, Clemson Univ, 1976. Masters Thesis, 52 p.
YEAR PUBLISHED: 1976
CATEGORY: B1e; B3b
SPONSOR: Clemson Univ
REGION: Southeastern Mixed Forest STATE: South Carolina
KEYWORDS: habitat; maintenance; population; right-of-way; wildlife
ABSTRACT: (Purpose) To evaluate the effects of a fertilized, seeded and mechanically maintained right-of-way on the population of cottontail rabbit. (Time and Duration) 1974, 1975, and 1976. (Type of Research) Original research. (Methodology) Two study areas, one a seeded, fertilized segment of a powerline right-of-way, and the other an adjacent forested area of similar size were selected for comparison of cotton-tail rabbit population. Box traps were used on 120 sites on the right-of-way and on 56 sites in the control area. Captured rabbits were sexed, weighed, and ear tagged. Lincoln Index calculations were used to determine population. (Results and Conclusions) Post-winter trapping indicated approximately equal rabbit populations in both righ-of-way and control acreage. Live weight of rabbits on the right-of-way was significantly greater than on the control area during both winter and post-winter periods. A distinct lack of preference for Sericea lespedeza dominated area was indicated.

1411
Dead tree ("snag") requirements for dependent wildlife species in the Blue Mountains of Washington and Oregon. (Draft))
AUTHOR: ANDERSON R; MASER C; THOMAS JW
AUTHOR AFFILIATION: US Forest Service.; Bureau of Land Management.
SOURCE TITLE: Forest-wildlife relationships in the Blue Mountains of Washington and Oregon.
SOURCE ID: Portland, OR, US Forest Service, Pacific Northwest Forest and Range Experiment Station.
YEAR PUBLISHED: 1976
CATEGORY: B1e
SPONSOR: OR Dept of Fish and Wildlife.; Wildlife Management Institute.; Bureau of Land Management.; US Forest Service.
REGION: Grand Fir-Douglas-fir Forest STATE: Oregon; Washington
KEYWORDS: avifauna; cavity users; forest; habit; habitat; management; model; nesting; snags; wildlife
ABSTRACT: (Purpose) Development of a tool for forest/wildlife management of cavity-using species. (Type of Research) Literature review. (Methodology) Requirements of snag-using species in the Blue Mountains were determined and information tabulated. A series of models was developed one for each general timber type: 1) territorial requirements of each species of woodpeckers (assumed management would accomodate cavity-nesters that don't excavate in direct proportion). 2) Potential maximum population of each species determined. 3) Levels of possible management were derived as percent of potential maximum population. 4) Snag requirements for each species at each management level. (Results and Conclusions) Use of the moodels allows for consideration of number of options for manager, such as: management on a species-by-species basis; selection of population level; snag requirements. Man's activities (tendency to eliminate old-age stands and remove dead trees) make snag-users a vulnerable wildlife group, most of which are valuable in insect control. Management, over time, will be required to meet any snag level selected. Possibilities include killing of trees, long rotations of stands, purposeful retention of snags. Bird-boxes not considered a good alternative.

1412
Wildlife use and management of power line rights of way in New Hampshire.
AUTHOR: CAVANAGH JB
AUTHOR AFFILIATION: Univ of NH.
SOURCE ID: Durham, NH, Univ of NH, 1976, 92 p.
YEAR PUBLISHED: 1976
CATEGORY: B1e
REGION: Northern Hardwoods - Spruce Forest STATE: Connecticut; Maine; New Hampshire; New York; Vermont
KEYWORDS: clearcutting; cutting, selective; edges; management; right-of-way; wildlife
ABSTRACT: (Purpose) To measure actual wildlife usage on powerline rights of way and to compare those managed by clearcut with management by selective cut. (Time and Duration) 1973-75; 1 1/2 years. (Type of Research) Original research. (Methodology) Three ROWs were studied: an old(1926) and a new (1973) clearcut ROW, and a selective cut (1973) ROW. An undisturbed natural forest area some distance away was used for comparison. Observations on wildlife were made in reference to points 150 feet apart at the ROW centerlines, 90 in total. Direct wildlife observations and signs were recorded within 4 hours after sunrise. About 2 observation days per week was average. Small mammal abundance was obtained by trapping; and a woodcock singing count was made. Vegetation was evaluated on 5 mil-acre plots at each observation point. Cover type maps and rating of habitat patterns were also made. Statistical analyses were made of the data. (Results and Conclusions) In general, most observations were made on birds (63%). Fifty percent of the total observations were seen on the selective cut ROW and 61 of the 71 total wildlife species were seen using this area. Increased food in recent selective cut was used by deer and grouse. On the recently clearcut area, 22% of the total observations were made on 37 species. Much of the wildlife activity was associated with brush piles. On the old clearcut ROW, only 9% of total observations were made on 20 wildlife species. Twenty-nine percent of the total observations were made in the forest area on 29 species. No single plant species was found most important to number of observations but rather interspersion was preferred. Over one-half of the observed wildlife were in vegetation less than 3 feet high. Habitat with interspersion of bare areas from construction were utilized more by wildlife than any other areas. Small mammal trapping gave similar results on the selective cut and new clearcut and both were greater than the old clearcut. Woodcock were found singing at all of 5 selected ROW/road intersections. More shrubs were located in the selective cut (28) than in new clearcut (19) and old clearcut(20) with fewest in the forest (6). The greatest diversity in herbaceous cover was in the selective cut (27) with fewer (16 each) in the clearcuts. Only 7 herbaceous species were listed in the forest. The highest browse was in the selective cut. Homogeneity made the old clearcut a poor habitat; @high degree of interspersion, edges, and patches made the selective cut a good habitat.

1413
Diversity of small mammals in a powerline right-of-way and adjacent forest in east Tennessee.
AUTHOR: BURGESS RL; JOHNSON WC; SCHREIBER RK
AUTHOR AFFILIATION: Oak Ridge National Lab.
SOURCE ID: Oak Ridge, TN, Oak Ridge National Lab, 1978, ORNL
CATEGORY: B1E
REGION: Appalachian Oak Forest STATE: Tennessee
KEYWORDS: mammals, small; right-of-way
ABSTRACT: (Purpose) To report changes in small mammal diversity on a powerline ROW. (Time and Duration) 1 year. (Type of Research) Original research. (Methodology) Study sites where loblolly pine and oak hickory, and a 91M wide ROW maintained by periodic bush-hogging. ROW had a grass-shrub cover. Live trapping on transects in a grid system. (Results and Conclusions) Small mammal diversity was highest in the corrider and on edges; values were the same for both hardwood and pine habitats.

1414
Toxic hazards in the use of herbicides.
AUTHOR: BARNES J
AUTHOR AFFILIATION: Medical Research Council Toxicology Unit, England.
SOURCE TITLE: Pages 373-391 in Herbicides; physiology, biochemistry, ecology (volume 2).
SOURCE ID: New York, NY, Academic Press, 1976, 564 p.
YEAR PUBLISHED: 1976
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; toxicity; wildlife
ABSTRACT: (Purpose) To review the toxic hazards in the use of herbicides, both to animals and to man. (Time and Duration) Literature review spanning 25 years of research. (Type of Research) Literature review. (Methodology) the author reviews the general toxicity of herbicides, exposure to herbicides, and the basis for predicting hazards. He also discusses the nitro- and halophnol compounds, bipyridylium herbicides, phenoxyacetic acids, carbamates and thiocarbamates, maleic hydrazide and aminotriazole. (Results and Conclusions) While restriction of access to crops recently treated with the more toxic insecticides is occasionally recommended, no herbicides are of sufficient toxicity to make such a restriction necessary. None of the modern herbicides are sufficiently persistent to provide the basis of any real threat through build-up in the environment or concentration down a food chain. There is little published on the toxic effects of herbicides on wildlife. The main hazard here appears to be that arising from the effects of the herbicides on vegetation acting as habitats or food supplies.

1415
Terrestrial assessment: birds.
AUTHOR: DANIELS EW; FERRANTE JG; MURARKA IP
AUTHOR AFFILIATION: Argonne Nat Lab.
SOURCE TITLE: Pages 8-11 in an evaluation of environmental data relating to selected nuclear power plant sites: Prairie Island Nuclear Generating Plant Site.
SOURCE ID: Argonne, IL, Argonne National Lab, Div of Environmental Impact Studies, 1976, 54 p + 3 appendices.
YEAR PUBLISHED: 1976

1415

CATEGORY: B1e; B2e
REPORT NUMBER: ANL
REGION: Maple-Basswood Forest + Oak Savanna STATE: Minnesota
KEYWORDS: bird kills; birds; collision; impact; transmission line
ABSTRACT: (Purpose) To identify environmental impact of a nuclear power plant and associated power lines on birds. (Time and Duration) 3 years; 1973-1975. (Type of Research) Original field research. (Methodology) Transects were run to record bird species up to 8500 feet distance from the plant. Bird mortality was also recorded in the plant vicinity. (Results and Conclusions) A comparison of breeding birds in the area before and after plant operation showed a decline in numbers within a mile of the plant. However, data on numbers was considered insufficient to judge the true effect of the plant operation on bird populations. Data collected on 3 days in 1974 revealed a total of 96 birds killed after striking the present 345 kV lines and towers. It was concluded these data were not sufficient to determine the percent kill relative to the total number of bird kills in fall and spring migrations. It was suggested the lines should be checked at least once daily during months of peak waterfowl concentrations.

1416
Raptors in range habitat.
AUTHOR: SNYDER HA; SNYDER NFR
AUTHOR AFFILIATION: US Forest Service.; US Fish and Wildlife Service.
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975.
SOURCE ID: 1975,190-209 p.
YEAR PUBLISHED: 1975
CATEGORY: B1e; B2e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: bird kills; birds; habitat; pesticide; raptor; residues
ABSTRACT: (Purpose) To discuss the diverse goals of raptor management; to evaluate the present, past, and future human impacts on wild raptor populations; and to make suggestions for positive conservation measures. (Type of Research) Literature review. (Methodology) Literature review. (Results and Conclusions) Although positive interest in raptor management has developed, the methods and goals of this management are still unclear. Humans affect raptor populations in the areas of lost or gained habitat, toxic chemicals, shooting, falconry, and miscellaneous impacts. Management effort should be made in all impact areas, but the most significant would be to safeguard and improve habitat.

1417
The occurrence of nongame wildlife in Piedmont transmission corridor rights-of-way.
AUTHOR: CLONINGER RA; CUMBIE PM; GARTON JS
AUTHOR AFFILIATION: Duke Power Company
SOURCE ID: Charlotte, NC., Duke Power CO., 21 p.
CATEGORY: B1E
REGION: Southeastern Mixed Forest STATE: NC; SC
KEYWORDS: right-of-way; wildlife
ABSTRACT: (Purpose) To determine what species of non-game wildlife inhabit ROWs in the central Piedmont, the adjoining habitats, or both. (Time and Duration) Three years (1974-1976). (Type of Research) Original Research. (Methodology) Five corridors of varying habitats and size were selected in the central Piedmont area of SC and NC near Charlotte, NC. Bird censuses were conducted by walking the corridor and then the adjacent woodlands. Both live and snap trapping were used on the ROWs and adjoining woodlands to census small animals. Large mammals, reptiles, and amphibians were recorded when observed. (Results and Conclusions) Species composition of birds varied greatly between ROWs and adjoining habitat with a greater diversity being found in the nearby woodlands. Species composition of small mammals also differed between the two habitats with no significant difference in number of species. Several species of large mammals were observed both on and off the ROW with foxes exhibiting a great use of the ROW. Occasional sitings of reptiles and amphibians were made both on and off the ROWs. Species recorded on the ROWs are those that typically prefer open herbaceous and low brushy habitats.

1418
Big game movement near a 500 kv transmission line in northern Idaho.
AUTHOR: GOODWIN JG JR
AUTHOR AFFILIATION: WICHE
SOURCE ID: Boulder, Co, WICHE, 1975, 57 p.
YEAR PUBLISHED: 1975
CATEGORY: B1e
SPONSOR: Bonneville Power Admin.
REGION: Douglas-fir Forest STATE: Idaho
KEYWORDS: behavior; clearing; deer; elk; hunting; mammals, big game; right-of-way; transmission line; wildlife
ABSTRACT: (Purpose) To determine if an energized 500 kv transmission line affects elk movement and to observe movements of other wildlife. To compare vegetation on and off the ROW. To observe human activity on or near the ROW. (Time and Duration) Fall 1974 to summer 1975 (Type of Reseach) Original (Methodology) Comparisons made of animal use and movements (emphasis on elk and deer) along five segments of ROW with nearby natural control clearings by means of direct observations, time-lapse photography, track counts, and vegetation analysis. Audible noise levels were recorded when wildlife was observed in ROW, and electric field strengths were measured under outer conductors. Observations of hunter activity recorded. (Results and Conclusions) Animal behavior and length of use of ROW and control clearings were not significantly different. Most intensive use during later winter and spring; low in fall. Deer and elk came to ROW primarily to feed. ROW and natural clearings had more understory vegetation than forest. Many species not disturbed by transmission line audible noise which was more than 60dB at times. Presence of deer, elk, bighorn sheep, black bear, cougar, coyote, and bobcat in ROW. Also many songbirds, grouse, ravens, hawks, owls, and eagles were seen in it or nearby. Only possible negative impact found was intense hunting pressure of deer and elk along access roads. Hunter activity caused elk to move away from clearings.

1419
Raptor electrocutions.
AUTHOR: BOEKER EL; NICKERSON PR
SOURCE TITLE: Wildlife Society Bulletin
SOURCE ID: 3(2):79-81, 1975.
YEAR PUBLISHED: 1975
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: bird kills; birds; conductor clearance; eagle; ecological; endangered; impact; mortality; predator; raptor; right-of-way; species; structure; transmission; transmission line
ABSTRACT: (Purpose) To report on the electrocution of raptors along power lines throughout the US. (Time and Duration) 1971-1973. (Type of Research) Literature review. (Methodology) Field reports of state and federal personnel and ground and air searches for electrocuted birds under suspected problem power lines. (Results and Conclusions) Documented electrocution losses of raptors totaled 153 in 1972 and 128 in 1973. The mountainous western states with the large eagle populations were most critical. Although golden eagles are the most common species killed, red-tailed hawks, great horned owls and bald eagles have also been victims. Nearly all electrocutions have occurred on smaller distribution lines. Actions by private and governmental agencies to reduce raptor electrocution losses are reviewed.

1420
Wildlife response to rights-of-way management; report for July 1974 - June 1975.
AUTHOR: DRIVER CH; SCOTT DRM; TABER RD
AUTHOR AFFILIATION: Univ of WA.
SOURCE ID: Corvallis, OR, OR State Univ, 1975, Research Project 631145, 13 p.
YEAR PUBLISHED: 1975
CATEGORY: B1e
REGION: Pacific Forest STATE: Washington
KEYWORDS: elk; mammals, game; management; right-of-way; wildlife
ABSTRACT: (Purpose) To describe enhancement of ROWs for elk. (Time and Duration) 2 1/2 years. (Type of Research) Original research. (Methodology) Radio collars were used to study elk movements. (Results and Conclusions) Elk are selective in their use of the landscape. On a ROW, elk used a 200-yard zone at a river, and a low flat region where forage can be improved by fertilizer. Also recommended is a ROW with a cleared center zone in herb vegetation and a low-brush border with an edge of low bushy trees. Pilot plant studies of this will be established.

1421
Corridors that streak across the land.
AUTHOR: SPENCER DA
AUTHOR AFFILIATION: Nat Agricultural Chemical Assoc.
SOURCE TITLE: Journal of Arboriculture
SOURCE ID: Pages 173-175, 1975 (September).
YEAR PUBLISHED: 1975
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: multiple use; plantings; right-of-way; wildlife
ABSTRACT: (Purpose) To describe the great potential of electric ROW areas for multiple use, and describe some of the progress that has been made to-date on multiple-use of ROW areas. (Type of Research) Based on experience and literature review. Not the result of specific research. (Methodology) The author explores the present and possible uses of ROW areas, including their wildlife value to both game and nongame species, the "edge" effect and its importance to animals, cooperative projects between state conservation departments and electric companies for improving ROW habitat, and the important bid man's recreational programs are making for these corridors. The latter includes cross-country trails for hiking, bicycle, skiing, motorcycling, snowmobiling.

(Results and Conclusions) Electric and gas corridors in the United States are headed for multiple purpose use. The competition for their supplemental use is apt to be keen, for many of these uses are not compatible, one with another.

1422
Pheasant use of roadsides for nesting in northeast COlorado.
AUTHOR: SNYDER WD
AUTHOR AFFILIATION: CO Div of Wildlife.
SOURCE ID: CO Div of Wildlife, 1974 Special Report No. 36, State Publication Code W-R-S 36, 24 p.
YEAR PUBLISHED: 1974
CATEGORY: B1e
REPORT NUMBER: CDW36
SPONSOR: CO Div of Wildlife.
REGION: Wheatgrass-Needlegrass STATE: Colorado
KEYWORDS: birds; farm; grasses; habitat; land use; nests; pheasant; right-of-way; roadside; seeding
ABSTRACT: (Purpose) To develop procedures to establish optimum roadside cover for nesting pheasants and to evaluate the success of those efforts. (Time and Duration) 4 years, 1970 - 1973. (Type of Research) Original and literature review. (Methodology) Comparisons were made of ring-necked pheasant nesting and production under existing roadside conditions (farmed and unfarmed) with production where grass and grass-legume covers were seeded. Wheatgrasses and alfalfa were the primary species used for seeding. Nesting attempts and successful nests per acre and per mile were determined. (Results and Conclusions) Average nest density in seeded roadside plots was significantly greater than that in either the unfarmed or farmed controls, and unfarmed significantly greater than in farmed plots. However, there was no significant difference in number of young produced in the seeded and the unfarmed, both of which produced significantly more than the farmed. Predators destroyed 55% of all nests. Previous studies indicate most production occurs in small grain fields where density is lower and opportunities for predation less.

1423
Using wildlife values in benefit/cost analysis and mitigation of wildlife losses.
AUTHOR: NORMAN RL; OLSON PD; ROPER LA
AUTHOR AFFILIATION: CO. Div. of Wildlife.
SOURCE ID: Denver, CO., CO. Div of Wildlife, 17 p.
CATEGORY: B1E
REGION: Grama-Buffalo Grass STATE: Colorado
KEYWORDS: value/ wildlife
ABSTRACT: (Purpose) To provide a methodology for establishing the dollar value of wildlife for use in preserving or replacing wildlife resources destroyed. (Type of Research) Original compilation. (Results and Conclusions) Seven steps are given to develop information for a basic file of dollar values. Application of this system involves following flowcharts. The aim is to demonstrate that wildlife values may be worth more than a proposed development, or that wildlife value can be regained through mitigation if a project is approved. It is believed this procedure will provide a reasonable estimate of wildlife resource values so that: 1) conservation agencies can compete via benefit/cost analysis and obtain fair consideration for the wildlife resource, 2) conservation agencies can mitigate a wildlife resource, in perpetuity, either in dollars or habitat, and 3) it will increase the understanding of others with respect to the magnitude of wildlife economic values. Since most negotiations with private industry involves economics, it is imperative that wildlife management agencies translate wildlife and habitat values, through the use of this system, to the value used by industry. The medium best understood by industry is the dollar. The authors recommend that wildlife agencies use this dollar value when communicating with industry.

1424
Effects of highways on red-tailed hawks and sparrow hawks.
AUTHOR: FERRIS CR
AUTHOR AFFILIATION: WV Univ.
SOURCE ID: Morgantown, WV, WV Univ, 1974, Masters Thesis, 61 p.
YEAR PUBLISHED: 1974
CATEGORY: B1e
SPONSOR: WV Univ.
REGION: Mixed Mesophytic Forest STATE: West Virginia
KEYWORDS: mammals, small; raptor; right-of-way; road; utilization
ABSTRACT: (Purpose) To determine type and extent of highway ROW use by red-tailed and sparrow hawks and how they respond to a highway and the various factors associated with it. (Time and Duration) 1 year. (Type of Research) Original research. (Methodology) A drive census approximately 21.3 miles long was driven on I-79 in northern WV from one to four times a week. Identification and location of hawks with respect to the highway were made. General habitat types and other relevant information were recorded. While the bird was in sight, its activity was observed. Small mammals were trapped to determine their relative abundance on and near the ROW as a food source. (Results and Conclusions) Winter observations revealed sparrow-hawks associated with lespedeza habitats while red-tails associated with wooded areas. Approximately 45% of the sparrow hawks and 35% of the red-tail winter observations were within the ROW. Summer activity decreased for the ROW. Lespedeza cover provided good hunting for hawks as long as density was low. The highway seemed to have little effect on hawks, but cars stopping near them caused them to flush. Little mortality due to cars was observed, but sparrow hawks frequently just missed being hit while diving after insects over the highway.

1425
An evaluation of chemically-sprayed electric transmission line rights-of-way for actual and potential wildlife use.
AUTHOR: MAYER TD
SOURCE ID: Morgantown, WV, WV Univ, 1974, Masters Thesis, 96 p.
YEAR PUBLISHED: 1974
CATEGORY: B1e
SPONSOR: Edison Electric Institute.
REGION: Northern Hardwoods - Spruce Forest STATE: Georgia; New Hampshire; West Virginia
KEYWORDS: birds,song; chemicals; food; herbicides; right-of-way; utilization; wildlife
ABSTRACT: (Purpose) To determine actual and potential food supply on ROWs for the major game animals in each of three study areas. (Time and Duration) 2 years (1972 and 1973). (Type of Research) Original plus literature review. (Methodology) Three ROWs (NH, WV, GA) where herbicidal control was used 15 years or longer, were surveyed for existing plant communities and major game species use. Actual wildlife use was measured through pellet counts, nest counts, drumming counts (grouse), and flushing observations. Potential use was evaluated on existing vegetation maps (both on and off ROW), using Martin, et al (1951) wildlife value ratings. Overlays were prepared for 27 vegetation maps of the 3 study areas showing the potential wildlife use. T-tests were used to contrast the desirability of power line vegetation with adjacent old field vegetation. (Results and Conclusions) Power line plant communities on ROWs were comparable or superior in certain wildlife value to communities in adjacent old fields. More browse was available on the ROWs than in the adjacent woods, although actual use was greater in the woods on 2 of the 3 study areas. Small game animals utilized ROWs in all 3 study areas. Woodcock would not utilize a ROW in NH although habitat requirements seemed to have been met. Many songbirds were observed on the ROWs.

1426
Patch cutting increases deer and elk use of pine forest in Arizona.
AUTHOR: PATTON DR
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Journal of Forestry
SOURCE ID: 72(12):764-766, 1974.
YEAR PUBLISHED: 1974
CATEGORY: B1e
REGION: Ponderosa Pine-Douglas-fir Forest STATE: Arizona
KEYWORDS: clearcutting; clearing; mammals, big game; mammals, small game; management; wildlife
ABSTRACT: (Purpose) To determine the effects of various harvesting methods in increasing vegetation diversity in the ponderosa pine type, and thus providing better habitat for deer and elk. (Time and Duration) Nine year study, 1964-1972. (Type of Research) Original research. (Methodology) The study area was originally inventoried in 1964 and the amount of browse plants, pellet groups, and cow chips determined. Herbage was clipped at the same time. Twelve patches, 2 to 32 acres in size, were cut. Larger patches had an irregular outline. Beginning in 1967, pellet group counts were used to estimate days use per acre. Browse plants, before and after cutting, were also recorded. (Results and Conclusions) Maximum opening size for deer and elk is about 45 acres. Total acreage may not be important as long as the cut area is not more than 1600 feet across. Managers have the choice of either creating many openings with varying sizes or creating fewer openings in long, narrow, contoured strips. Either design would benefit deer and elk, but the long, narrow strip probably would not enhance small game and nongame habitat because it does not provide a maximum edge effect compared to a large number of small openings with the same acreage. Both types of openings can be designed to blend in with the landscape.

1427
Effect of chemical brush control on deer distribution.
AUTHOR: SMITH RH
AUTHOR AFFILIATION: AZ Game and Fish Dept.
SOURCE TITLE: Statewide Investigations Project @-78-R-18+19.
SOURCE ID: AZ Game and Fish Dept, 1974, 8 p.
YEAR PUBLISHED: 1974
CATEGORY: B1e

1427

SPONSOR: AZ Game and Fish Dept
REGION: Creosote Bush-Bur Sage STATE: Arizona
KEYWORDS: brush; brush control; deer; herbicides; impact; water; watershed; wildlife
ABSTRACT: (Purpose) To determine response of white-tailed deer to chemical brush control on a small group of chaparral watersheds. (Time and Duration) 1961-64; 1968; 1971-1972. (Type of Research) Original. (Methodology) Destruction of brush in three watersheds by application of 2,4,5-T, Fenuron, Tordon, or Tandex. One left as control. Observations made of two belled deer to determine feeding behavior, bedding sites and home range. Deer pellet group transects established. Seasonal collections made of deer and rumen contents analyzed. Movie camera monitored use of water sites. (Results and Conclusions) Large increase in grass and forbs in treated areas. Some indication there is a preference for intensively treated areas in winter. Width of treated area and proximity of other areas of natural vegetation probably critical. However, use by whitetailed deer of treated watersheds remains unclear. Brush control created a potential on-site benefit to wildlife in form of perennial stream flow.

1428
Wildlife management of rights-of-way.
AUTHOR: CERRETANI D; HARDIN D; WEBB WL
AUTHOR AFFILIATION: State Univ of NY, Env Science and Forestry.
SOURCE ID: Syracuse, NY, State University of New York, College of Environmental Science and Forestry, 1973, 22 p.
YEAR PUBLISHED: 1973
CATEGORY: B1e
REGION: Mixed Mesophytic Forest STATE: New York
KEYWORDS: habitat; management; revegetation; right-of-way; spraying selective; wildlife; wildlife relationships
ABSTRACT: (Purpose) To show how a program of wildlife management can be implemented on electric transmission line rights-of-way, and to stress particularly the need for judicious use of the land as a valuable and limited resource. (Time and Duraton) One-half year study (1974) (Type of Research) Literature review and field obserations. (Methodology) This report was prepared by the Advanced Wildlife Management class at the New York College of Environmental Science and Forestry, as a term project. In addition to reviewing the ROW management literature and related wildlife literature, they received assistance from Niagara Mohawk Power Corp. personnel. Power company personnel were helpful in orienting this class to the problems and in developing an understanding of Company policy and programs. (Results and Conclusions) Concern for wildlife must be considered a natural part of the concern for environmental quality. In the near future utility companies will be expected to include wildlife management as an integral part of their transmission line. There are two persuasive reasons which make change in ROW management practices imperative: (1) the public's dissatisfaction with the old methods, and (2) the reasonably conclusive evidence that many of the old methods are not the cheapest in the long run.

1429
Influence of 2,4-D and 2,4,5-T on in vitro digestion of forage samples.
AUTHOR: SMITH AE
AUTHOR AFFILIATION: Univ of GA.
SOURCE TITLE: Journal of Range Management.
SOURCE ID: 26(4):272-274, 1973.
YEAR PUBLISHED: 1973
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: chemicals; degradation; diet; food; herbicides; impact; toxicity
ABSTRACT: (Purpose) To determine: 1) the influence of 2,4-D and 2,4,5-T on the in vitro dry matter digestibility of corn and bermuda grass forage samples; 2) the influcience of these herbicides on rumen microbiota growth; and 3) the in vitro degradation of 2,4-D and 2,4,5-T by rumen microbiota. (Type of Research) Original. (Methodology) Samples of dried bermuda grass and ensilage co. were ground and incubated with buffered rumen liquor. Quantities of each technical grade of herbicide were added to give final herbicide concentrations ranging from 10-8 to 10-4M solutions and the percent of digestibility determined. To determine effect on growth of microbiota in rumen liquor, dry weights of treated and untreated rumen liquor developed in sucrose solutions were obtained periodically over an eleven day treatment period. After a series of treatments to determine influence of rumen microorganisms on degradation of herbicides, that remaining was extracted and quantified after incubation. All experiments were repeated twice and data statistically evaluated. (Results and Conclusions) 2,4-D and 2,4,5-T do not alter rumen microbial functions or development and these herbicides are not readily degraded by rumen microorganisms. Thus, herbicide residues remaining on or in forage samples following spray treatments with these herbicides apparently will not influence the herbage digestion by ruminants.

1430
Some field and court experiences with waterfowl and electric powerlines.
AUTHOR: HUNT RA
AUTHOR AFFILIATION: WI Dept of Natural Resources.
SOURCE TITLE: Midwest Fish and Wildlife Conference Proceedings.
SOURCE ID: Page 60, 1972.
YEAR PUBLISHED: 1973
CATEGORY: B1e
REGION: Northern Hardwoods Forest STATE: Wisconsin
KEYWORDS: impact; rights-of-way; waterfowl
ABSTRACT: (Purpose) To describe effects of powerlines on waterfowl. (Type of Research) Discussion. (Results and Conclusions) Steel towers and cables create visual pollution, cause bird mortality, and eliminate waterfowl hunting. No geese were shot by hunters within 1/4 mile of powerlines. Geese in normal flight never flew under powerlines; however, they landed within 1/2 mile and fed near them, walked under them, and occasionally flew under them. Duck shooting success declined about 2/3 after a powerline crossed a private marsh. Juries have awarded damages for adverse effects of 1/4 mile or more from powerlines.

1431
Sagebrush control with herbicide has little effect on elk calving behavior.
AUTHOR: WARD AL
AUTHOR AFFILIATION: US Forest Service, Rocky Mountain Forest and Range Experiment Station.
SOURCE ID: Fort Collins, CO, US Forest Service, 1973, Research Note RM240, 4 p.
YEAR PUBLISHED: 1973
CATEGORY: B1e
REGION: Douglas-fir Forest STATE: Idaho; Montana; Wyoming
KEYWORDS: brush; brush control; herbicides; mammals, big game; wildlife
ABSTRACT: (Purpose) To discuss how sagebrush control with herbicides on ranges where elk have their calves affects calving behavior. (Time and Duration) Three-year study. (Type of Research) Original research (field study). (Methodology) The study was conducted between 1968 and 1971. The study area had a southwest aspect; vegetation was a mixture of forbs, grasses and big sagebrush. Two areas, one 85 acres and the other 45 acres, were sprayed by helicopter with 2 lbs AE per acre of 2,4-D after the elk calving season. Only the more gentle slopes and areas away from trees were sprayed. Considerable acreage of sagebrush type remained between and around the sprayed areas. Calving sites and behavior were observed from remote vantage points by telescopes and cameras. (Results and Conclusions) Elk did not change their calving behavior or grazing activity patterns on a site where 96.7 percent of the big sagebrush cover was killed with herbicide. Analysis of fecal samples from the study site showed no large changes due to spraying in grass-forb ratios consumed. Feeding elk showed no indication they preferred to stay close to timber. Hence, it appeared that sagebrush control, if confined to limited and scattered areas, has no detrimental impact on elk during the calving period.

1432
The response of animals to herbicide-induced habitat changes.
AUTHOR: BORRECCO JE
AUTHOR AFFILIATION: OR State Univ.
SOURCE ID: Corvallis, OR, OR State Univ, 1973, MS Thesis, 92 p.
YEAR PUBLISHED: 1973
CATEGORY: B1e
REGION: Cedar-Hemlock-Douglas-fir Forest STATE: Oregon
KEYWORDS: deer; habitat; habitat change; herbicides; mammals, small
ABSTRACT: (Purpose) To examine the changes in vegetation resulting from application of herbicides, and to study the effects of these vegetative changes on the abundance and composition of small-mammal populations, and on deer usage of treated and untreated plots. (Time and Duration) Two-year study. (Type of Research) Original research (field study). (Methodology) Three areas in western Oregon were selected for study and half of each was treated with a combination of herbicides designed to control grasses and forbs without injuring Douglas-fir. The effects of herbicide treatments were to eliminate or suppress grasses, control forbs, and to promote growth of shrubs and trees. Deer activity was measured using pellet counts. (Results and Conclusions) Small mammals primarily associated with grass or meadow habitats decreased in abundance. The Oregon vole was the species most affected by the reduction in grassy vegetation. Species that find optimum habitat in brushy areas increased in abundance on treated plots. The deer mouse was the most common species to demonstrate a positive response on treated plots. The community response depended on the relative species composition. Deer activity was greater on treated plots during the growing season. Herbicide treatments improved deer habitat during the growing season without significantly increasing the browsing of Douglas-fir seedlings.

1433
A long-term ecological study of game food and cover on a sprayed utility right-of-way.
AUTHOR: BRAMBLE C W; BYRNES R W
AUTHOR AFFILIATION: Purdue Univ.
SOURCE ID: Lafayette, IN, Purdue University Agricultural Experiment Station. 1972, Research Bulletin 885, 20 p.
YEAR PUBLISHED: 1972
CATEGORY: B1e
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: cover; ecology; food; herbicides; right-of-way; wildlife
ABSTRACT: (Purpose) To study the effects of herbicide sprays on game food and cover on power line rows. (Time and Duration) 1953 - 1972; 19 year study. (Type of Research) Original research. (Methodology) Six different treatments were applied in 1953. The area was retreated in 1966. The treatment area was evaluated from time to time, with effectiveness of the spraying, wildlife usage, species of plants, and their number being noted. (Results and Conclusions) The original plant community of Bracken-Sedge-Herb-Blueberry changed to one with sweet fern as a major component with an invasion of fireweed. A diversity of plant food useful to wildlife developed on the right-of-way following spraying. The right-of-way was heavily used by common wildlife species such as white-tailed deer, rabbit, grouse and wild turkey.

1434
Forage use by mule deer relative to logging in Colorado.
AUTHOR: REGELIN WL; REICHERT DW; WALLMO OC
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Journal of Wildlife Management.
SOURCE ID: 36(4):1025-1033, 1972.
YEAR PUBLISHED: 1972
CATEGORY: B1e
REGION: Rocky Mountain Forest STATE: Colorado
KEYWORDS: browse; clearcutting; clearing; ecosystem; food; impact; mammals, big game; wildlife
ABSTRACT: (Purpose) Concerned with what plants are deer forage, where do they occur and in what amounts, and what is their importance to deer? (Time and Duration) Three summer periods in 1970 June 25-July 4, August 1-11, and September 14-20. (Type of Research) Original (Methodology) An area of lodgepole pine and spruce-fir was clear-cut in narrow strips alternating with uncut strips. Fifteen years after cutting, grazing by trained tame mule deer was observed and records made of species eaten, relative use of species, and preferred areas for grazing. To sample frequency of occurrence of species, quadrats were located along a length-wise transect on each strip. Estimates of relative amounts of total herbage and major forage were determined by clipping, drying and weighing samples from quadrats. (Results and Conclusions) Production of deer forage was 47% greater on cut strips. Deer obtained 63.3% of their forage from cut strips, 27.4% from uncut strips, and 9.3% from logging roads. These sites comprised 44.2, 49.4, and 6.4% respectively of the study area. The deer grazed 72 species in cut strips, 44 species in uncut strips, and 32 species on roads.

1435
Residues in milk and meat and safety to livestock from the use of phenoxy herbicides in pasture and rangeland.
AUTHOR: LENG ML
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Down to Earth.
SOURCE ID: 28(1):12-20, 1972.
YEAR PUBLISHED: 1972
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; impact; residue; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To determine whether residues of various phenoxy herbicides occur in milk and meat after livestock use of sprayed pasture and rangelands. (Time and Duration) Two-year study (1969-1970). (Type of Research) Original research (laboratory and field). (Methodology) Feeding studies were conducted with 2,4-D, MCPA, silvex and 2,4,5-T at levels from 10 to 2000 ppm in the total diet of dairy cows, beef cattle or sheep for intervals of two to four weeks. All studies were conducted under the supervision of veterinarians. Records were kept of feed intake, milk production and weight gain. All samples of milk and cream, and all samples of muscle, fat, liver and kidney of cattle and sheep were analyzed by chemists at Dow laboratories. All methods were validated to a sensitivity of 0.05 ppm for each phenoxy compound. (Results and Conclusions) Residues of phenoxy compounds and of their respective phenolic moieties are not likely to occur in milk, meat, fat, or meat byproducts of cattle and sheep from agricultural use of these herbicides. Such residues would occur only in the unlikely circumstance of animals being milked or slaughtered while actually ingesting forage freshly treated at high rates of application. No harmful effect is likely to occur in livestock from grazing areas treated with phenoxies even at exaggerated rates of use.

1436
Bird deaths from power lines at Dungeness.
AUTHOR: CADBURY CJ; ROBERTS LJ; SCOTT RE
SOURCE TITLE: British Birds
SOURCE ID: 65(7):273-286, 1972.
YEAR PUBLISHED: 1972
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: bird kills; birds; birds, song; corridor; ecological; impact; migration; mortality; nocturnal; passerine; transmission; transmission line
ABSTRACT: (Purpose) To evaluate the effects of transmission lines on migrant passerines and to test methods of protection. (Time and Duration) 1964-1970. (Type of Research) Original research. (Methodology) An area 2160m long beneath two parallel sets of transmission lines was searched 188 times over a 6-year period. (Results and Conclusions) A total of 1285 birds of 74 species were found dead beneath the transmission lines. Scavengers removed many of the small species and true casualty total probably exceeded 6,000. Nocturnal migrants such as starlings, rails, thrushes and warblers formed the highest proportion of casualties; gulls were also common victims. Corks and colored balls placed on the lines to increase visibility did not decrease mortality. Placing power lines parallel to, rather than across, regularly used flight paths, or burying lines is recommended to reduce mortality.

1437
Right-of-Way resources of the prairie provinces.
AUTHOR: OETTING RB
AUTHOR AFFILIATION: Manitoba Dept of Mines.
SOURCE TITLE: The Blue Jay.
SOURCE ID: 29:179-183, 1971.
YEAR PUBLISHED: 1971
CATEGORY: B1e
REGION: Grama-Needlegrass-Wheatgrass
KEYWORDS: birds; cost; grasses; habitat; maintenance; mowing; right-of-way; roadside; wildlife
ABSTRACT: (Purpose) To show that ROWs are a valuable potential wildlife habitat resource. (Type of Research) Literature review and research (Methodology) A review of the literature shows that the percent of game bird nests along roadside ROWs is significantly higher when compared to other areas. Research is cited which indicates that there is greater nest density and success of ring-necked pheasants and ducks along unmowed areas of ROWs than along mowed. By means of a research questionnaire, the acres of various types of ROW lands in the prairie provinces were found to total more than two million acres, more than half of which are along roadsides. Most of this acreage is in agricultural areas. The maintenance practices (primarily times and frequencies of mowing) and costs are summarized for each of the three provinces. (Results and Conclusions) Discussion of the probable comparative value of various types of ROWs. Author considers the greatest potential for wildlife habitat is along trunk highways, roads, and railroads. Utility transmission lines across brush areas are also very important. He concludes this large public-owned piece of real estate can no longer be ignored. By proper management, wildlife can be increased so as to create living laboratories and preserves and money would be saved in maintenance.

1438
Waterfowl nesting on interstate highway right-of-way in North Dakota.
AUTHOR: CASSEL JF; OETTING RB
AUTHOR AFFILIATION: ND State Univ, Dept of Zoology.; North Prairie Wildlife Research Center.
SOURCE TITLE: Journal of Wildlife Management
SOURCE ID: 35(4):774-781, 1971.
YEAR PUBLISHED: 1971
CATEGORY: B1e; B2e; B3a; C2
SPONSOR: Nat Wildlife Federaton.
REGION: Wheatgrass-Needlegrass STATE: North Dakota
KEYWORDS: birds; habitat; right-of-way
ABSTRACT: (Purpose) To access wildlife values of mowed and unmowed highway rights-of-way to determine and compare snow build-up and wildlife killed by traffic on the study area. (Time and Duration) 1968 through 1969. (Type of Research) Original research. (Methodology) Alternate one-mile blocks of the study area were not mowed in fall 1968. Nests were located with a cable chain drag, and data on stage of incubation recorded. Data on wildlife killed by traffic were recorded for May, June, and July, 1968 and 1969. Four snow measurements from 48 stations were taken during the winter of 1968-69. Interviews were conducted with motorists at rest areas. (Results and Conclusions) Twenty-two duck nests per 100 acres or six nests per mile were located. Success of duck nests in unmowed vegetation was 62 percent, compared with 51 percent in mowed vegetation. Wildlife killed by traffic did not increase when half of the mile blocks were unmowed; no significant difference was found in buildup of snow between mowed and unmowed

areas. Of 182 motorists interviewed, 82% had not noticed the unmowed rights-of-way

1438

1439
Reaction of reindeer to obstructions and disturbances.
AUTHOR: KLEIN DR
AUTHOR AFFILIATION: Univ of AK.
SOURCE TITLE: Science
SOURCE ID: 173(3995):393-397, 1971.
YEAR PUBLISHED: 1971
CATEGORY: B1e
REGION: Applicable to entire United States STATE: Alaska
KEYWORDS: disturbance; habitat perturbation; impact; migration; road; wildlife
ABSTRACT: (Purpose) To document the reaction of reindeer in northern Europe to obstructions and disturbances and to give insight into anticipated problems with caribou in Canada and Alaska. (Time and Duration) Literature review covering articles over a 15-year period. (Type of Research) Literature review and personal communication with wildlife biologists from Scandinavia; personal observations. (Methodology) Articles and personal communications from Scandinavian wildlife biologists are reviewed to provide a basis for anticipating the problems to be encountered with caribou, and to offer proven solutions to specific problems. (Results and Conclusions) Highways and railroads do not generally create obstructions to the movement of domesticated reindeer, but thousands of animals are killed each year in accidents. Some disruption in the movement of wild reindeer in Norway has been associated with railroad and highway construction through an alpine plateau area. Hydroelectric projects have had the greatest detrimental effect on reindeer by flooding rangelands and obstructing migraton routes. Reindeer have strong traditions for migrating along specific routes, and realignment of these routes is difficult. Herbicides used in forestry work have been implicated in the death of some reindeer.

1440
Waterfowl nesting on a railroad right-of-way in North Dakota.
AUTHOR: CASSEL JF; PAGE RD
AUTHOR AFFILIATION: ND State Univ Dept of Zoology.
SOURCE TITLE: Journal of Wildlife Management.
SOURCE ID: 25(3):544-549, 1971.
YEAR PUBLISHED: 1971
CATEGORY: B1e; B3b; C3
SPONSOR: Bureau of Sports Fisheries
REGION: Wheatgrass-Needlegrass STATE: North Dakota
KEYWORDS: birds; habitat; right-of-way
ABSTRACT: (Purpose) To assess the nesting waterfowl utilization of a portion of the Northern Pacific main line right-of-way in the MO coteau of ND. (Time and Duration) Early May to the end of July, 1969. (Type of Research) Original research. (Methodology) Nest searches were made with a 175 foot cable chain as described by Higgins et al (1969). After nests were located, species identification of eggs, clutch size, and stage of incubation were noted. A cover board modeled after Jones (1968) was used to obtain cover height and concealment scores of vegetation. Nests were revisited on, or shortly after, the calculated hatch dates to determine fate of eggs. (Results and Conclusions) On a 21.5 mile section of railway right-of-way nests of principally dabbling duck were found, with a density of 9.6 nests per 100 acres on hayed areas and 55.6 nests per 100 acres of unhayed area. There was a production of 0.64 ducklings per acre on the mowed areas and 3.93 ducklings per acre on the unmowed area.

1441
Powerline clearing through upland mixed forest.
AUTHOR: LEGRAND EK
SOURCE TITLE: American Birds.
SOURCE ID: 25(6):1000-1001, 1971.
YEAR PUBLISHED: 1971
CATEGORY: B1e
REGION: Southeastern Mixed Forest STATE: North Carolina
KEYWORDS: birds, nongame; clearing; forest; right-of-way
ABSTRACT: (Purpose) To census birds using a powerline ROW. (Time and Duration) 3 months. (Type of Research) Original research. (Methodology) A strip on the ROW was walked for 10 days, four times each day. The ROW was 120 feet wide with a 50-foot center in grasses and shrubs, and margins in trees 15-20 feet high. (Results and Conclusions) Seven species were recorded on the ROW, eight were recorded on the edges, and there were 16 visitors. More visitors than breeders used the ROW. Woods birds used the ROW for singing and foraging, and other birds used the wires and towers for perching.

1442
The effects of controlled burning on arthropod density and biomass in relation to bobwhite quail brood habitat of a right-of-way.
AUTHOR: HURST GA
AUTHOR AFFILIATION: MS State Univ., Dept of Wildlife and Fisheries
SOURCE TITLE: Proceedings Tall Timbers Conference on Ecological Animal Control by Habitat Management, February 26-28, 1970.
SOURCE ID: 173-183 p.
YEAR PUBLISHED: 1970
CATEGORY: B1e
SPONSOR: MS State Univ.
REGION: Southeastern Mixed Forest STATE: Mississippi
KEYWORDS: birds; clearing; habitat; impact; population; right-of-way; wildlife
ABSTRACT: (Purpose) To determine the effects on arthropod density of controlled burning on an andropogon-dominated powerline right-of-way, and to determine the food selection of bobwhite quail chicks feeding in the study area. (Time and Duration) Summers of 1968 and 1969. (Types of Research) Original. (Methodology) Ten burned and ten unburned 40mx25m plots were established on a 4 year old right-of-way. Arthropod populations were sampled 7 times at bi-weekly intervals from June to late August, using sweep netting and a D-Vac insect suction machine. The arthropods were identified, counted, oven-dried, and weighed. Quail chicks with broody bantam hens were used in the study area. The chicks were allowed to feed and then sacrificed. The contents were removed from the crop and gizzard, and food items recorded. (Results and Conclusions) The burned area had significantly larger numbers of arthropods and biomass than the unburned area. Data collected from 126 quail chicks aged 2 days to 2 weeks showed beetles and ants as the most frequently taken insects.

1443
Green ribbons of hope.
AUTHOR: SMITH ER
AUTHOR AFFILIATION: Soil Conservation Service.
SOURCE TITLE: Forests and People
SOURCE ID: 20(1):22-23, 42, 1970.
YEAR PUBLISHED: 1970
CATEGORY: B1e
REGION: Eastern Deciduous Forest STATE: Louisiana; North Carolina
KEYWORDS: edge effect; food plots; habitat; management; planting; right-of-way; wildlife
ABSTRACT: (Purpose) To point out the opportunities that electric ROWs present for establishing game food plantings, and that these corridors provide ideal conditions for many species of game due to the edge effect. (Time and Duration) Based on general field observations, not a scientific study over a specified period. (Type of Research) Field observations. (Methodology) A general "popular" article, not based on the author's scientific research. (Results and Conclusions) The form for wildlife plantings should be in blocks, wth intervening blocks of natural vegetation. Within the planted blocks several types of vegetation should be established, keeping the lower form to the middle with the higher form toward the edges. example of this would be a block, about 100 yards long, with sericea lespedeza near the center and shrub lespedeza next to the woods. In between these a strip of browntop millet could be planted. This alternate pattern of planting and native vegetation is very desirable because it offers a wide range of foods.

1444
On the reactions of ducks and geese to high voltage lines.
AUTHOR: FOG AJ
AUTHOR AFFILIATION: Wildlife Biology Station, Denmark.
SOURCE ID: Saetryk af "Flora og Fauna", 76 arg. 4. heafte 1970.
YEAR PUBLISHED: 1970
CATEGORY: B1e
REGION: Applicable to entire United States
KEYWORDS: birds; right-of-way; waterfowl
ABSTRACT: (Purpose) To observe reactions of waterfowl to high-voltage lines. (Time and Duration) 1968-69; 2 years. (Type of Research) Original observations. (Methodology) Carried out in the fall and spring as birds approached a 150 kV line with 30m tall towers. (Results and Conclusions) No fear was observed at anytime. Birds flew over and under the wires, or even between them. Ducks also rested and fed under the wires. It is known that birds are sometimes killed but this was not studied.

1445
Small mammal populations in cut and uncut northern hardwood forests.
AUTHOR: KRULL JN
AUTHOR AFFILIATION: Syracuse Univ. College of Forestry.
SOURCE TITLE: NY Fish and Game Journal.
SOURCE ID: 17(2):128-130, 1970.
YEAR PUBLISHED: 1970

CATEGORY: B1e
REGION: Northern Hardwoods Forest STATE: New York
KEYWORDS: clearcutting; forest; impact; mammals, small; population; wildlife
ABSTRACT: (Purpose) To observe the effects of clearcutting on the abundance of small mammals. (Time and Duration) 1953-1962; 10 years. (Type of Research) Original research. (Methodology) A snap-trapping system of census was used in a northern hardwood forest type in clearcut and uncut forest areas. (Results and Conclusions) Populations of red-backed mice and white-footed mice were generally higher on the uncut area, while short-tailed shrew and woodland jumping mice occurred more frequently on the cut area. However, it can be concluded that commercial clearcut logging had a minor effect on small mammal populations. Red-backed mice and white-footed mice showed cyclic variations irrespective of habitat manipulations.

1446
Response of chipmunks and red squirrels to commercial clearcut logging.
AUTHOR: KRULL JN
AUTHOR AFFILIATION: Syracuse Univ, College of Forestry.
SOURCE TITLE: NY Fish and Game Journal.
SOURCE ID: 17(1):58-59, 1970.
YEAR PUBLISHED: 1970
CATEGORY: B1e
REGION: Northern Hardwoods Forest STATE: New York
KEYWORDS: clearcutting; impact; mammals, small; wildlife
ABSTRACT: (Purpose) To make observations on the effect of clearcutting on chipmunks and squirrels. (Time and Duration) 1952-1961; 10 years. (Type of Research) Original research. (Methodology) Chipmunks and red squirrels were censused in mid-June by sight and sound. (Results and Conclusions) Commercial clearcut logging had no appreciable effect on chipmunks or red squirrels. Hardwood and spruce seed-year variations were important causes of population variations.

1447
The ecological impact of transmission lines on the wildlife of San Francisco Bay.
AUTHOR: AREND PH
AUTHOR AFFILIATION: Wildlife Assoc.
SOURCE ID: Report prepared for the Pacific Gas & Electric Co, 1970, 24 p.
YEAR PUBLISHED: 1970
CATEGORY: B1e
REGION: California Mixed Evergreen Forest STATE: California
KEYWORDS: birds; ecology; impact; multiple use; right-of-way; wildlife
ABSTRACT: (Purpose) To investigate the ecological impact of electric power transmission lines and their towers on wildlife. (Time and Duration) 1970; 3 months. (Type of Research) Original research. (Methodology) Observational. (Results and Conclusions) Electric power lines mounted on steel towers cause very minimum avian loss and their adverse ecological effects on avian populations are negligible. Steel transmission lines have ecologically enhanced the wildlife environment by furnishing niches for sessile food base organisms at a rate of two ton per mile. Steel tower footings also provide niches for sessile organisms at a rate of 0.1 acre per mile of line, and habitat for many birds. Causeways for access are also habitat for sessile organisms and are used by people, where permitted, including bird watchers.

1448
A wildlife manager's view of herbicide use on the right-of-way.
AUTHOR: ROBERTS A H
AUTHOR AFFILIATION: PA Game Com.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 23:291-293, 1969.
YEAR PUBLISHED: 1969
CATEGORY: B1e
REGION: Applicable to entire United States
KEYWORDS: herbicides; right-of-way; wildlife
ABSTRACT: (Purpose) To discuss the use of herbicides on rights-of-way from a wildlife viewpoint. (Results and Conclusions) Herbicides constitute a small storehouse of tools which can be used or abused. Rightfully employed, they can aid enormously in maintaining desirable vegetative cover on rights-of-way and, at the same time, in improving the wildlife carrying capacity of such areas.

1449
Toxicology of picloram and safety evaluation of TORDON herbicides.
AUTHOR: LENG ML; MCCOLLISTER DD
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Down to Earth.
SOURCE ID: 25(2) :5-10, 1969.
YEAR PUBLISHED: 1969
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; fish; herbicides; impact; picloram; residue; safety; toxicology
ABSTRACT: (Purpose) To present the toxicologic, metabolic and residue data for the herbicide picloram as obtained from dietary feeding studies, reproduction and fertility studies, and radioactive tracer studies. (Time and Duration) Summarizes several studies over a 9 year period. (Type of Research) Original research and literature survey. (Methodology) Standard toxicologic, metabolic and residue studies were made including 90-day rat feeding studies, 2-year long-term feeding studies with rats and dogs, and a three-generation fertility, reproduction and lactation study. A carboxyl - 14 C-labeled picloram tracer study was also used. Other studies of blood and urine, milk, and meat, toxicity to birds, and toxicity to fish and other aquatic organisms, were conducted. (Results and Conclusions) Use of picloram presents no safety problem to humans, livestock, or wildlife. The acute oral toxicity is low in both small and large animals with LD50 values of 2000 to 8000 mg/kg in rabbits and rats, respectively. No adverse effect was observed in rats fed diets containing 1000 ppm for 90 days and only minimal effects were produced at 10,000 ppm (1% of total diet). The toxicity is also very low for birds, fishes, and other aquatic organisms. Treatment of rangeland or fields of small grain with effective dosages of picloram would not produce toxic residues in feeds for animals, nor in foods to be consumed by humans.

1450
TORDON Herbicides-evaluation of safety to fish and birds.
AUTHOR: KENAGA EE
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Down to Earth.
SOURCE ID: 25(1) :5-9, 1969.
YEAR PUBLISHED: 1969
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; fish; herbicides; impact; picloram; safety; toxicology
ABSTRACT: (Purpose) To bring together important information on the safety of picloram to fish and birds. (Time and Duration) Literature review of work over a 9-year period. (Type of Research) Literature review. (Methodology) Nine formulations were used in these studies, including Tordon 22K herbicide, Tordon 101 Mixture, Tordon 155 Mixture and Tordon 212 Mixture. Eighteen species of fish and birds were used in these tests. The tests on fish were done in unchanged non-flowing fresh water, usually in the laboratory. For birds a two-week dietary study was used and a three-generation study. (Results and Conclusions) Picloram acid and its salts exhibit low acute toxicity to fish, even when applied directly to water at rates up to 3 pounds of acid equivalent per acre. Use of the ester forms and the addition of 2,4-D tended to increase toxicity to fish. The hazard even here would be low due to physical environmental factors which prevent the maximum amount of applied herbicide reaching the fish population. All derivatives of picloram acid are very low in acute toxicity to birds and chronic toxicity problems were observed. Biological magnification apparently does not occur with the use of picloram.

1451
Toxicity and hazards to man, domestic animals, and wildlife from some commonly used auxin herbicides.
AUTHOR: WAY JM
AUTHOR AFFILIATION: Monks Wood Experimental Station, England.
SOURCE TITLE: Residue REviews
SOURCE ID: 26:37-62, 1969.
YEAR PUBLISHED: 1969
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; toxicity; wildlife; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To present a review of the literature on toxicity and other hazards that may arise from use of auxin herbicides. (Time and Duration) Review of literature from a 20-year period. (Type of REsearch) Literature review. (Methodology) Literature was reviewed on the toxicity and hazards to man, domestic animals, and wildlife for the auxin herbicides: MCPA, 2,4-D, MCPB and 2,4-DB; and also for 2,4,5-T, mecoprop, and 2,3,6-TBA. (Results and Conclusions) In man only one authenticated instance of death by poisoning has been noted in West European and North American literature. Authenticated case histories of sublethal effects are also very rare. However, complaints of dizziness, sickness, and other symptoms are made from time to time by workers engaged in field applications, particularly when the spray is inhaled

1451

excessively. The possibility of man acquiring toxic doses of these compounds in food, milk, or water appears to be very low. The danger of chronic toxicity has also shown to be very low and continuous high doses over many months rather than weeks are required to produce poisoning symptoms.

1452
Effects of human disturbance on nesting of bald eagles.
AUTHOR: MATHISEN JE
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Journal of Wildlife Management
SOURCE ID: 32:1-6, 1968.
YEAR PUBLISHED: 1968
CATEGORY: B1e
REGION: Laurentian Mixed Forest STATE: Minnesota; Wisconsin
KEYWORDS: birds; endangered; impact; species
ABSTRACT: (Purpose) To evaluate human disturbance as a potential cause of nesting failure among bald eagles. (Time and Duration) 1963-66; 5 years. (Type of Research) Original research. (Methodology) A total of 115 nests were observed at least twice during the nesting period, using both ground and aerial observations. Three wilderness classes were developed based on degrees of wildness where nests were found. (Results and Conclusions) There were no significant or appreciable differences in nest occupancy or nest success between high and low wilderness classes. Human activities at the present levels or isolation did not affect nesting success. Increasing summer activities may interfere with food gathering and cause general unrest among eagles as well as other species such as loons, osprey, and herons.

1453
Effect of altitude and forest manipulation on relative abundance of small mammals.
AUTHOR: GENTRY JB; MASON M; ODUM EP
AUTHOR AFFILIATION: Univ of GA.
SOURCE TITLE: Journal of Mammalogy.
SOURCE ID: 49(3):539-541, 1968.
YEAR PUBLISHED: 1968
CATEGORY: B1e
REGION: Southeastern Mixed Forest STATE: North Carolina
KEYWORDS: forest; habitat; impact; mammals, small; wildlife
ABSTRACT: (Purpose) To test the hypothesis that greater numbers of mammals occur with increasing altitude. (Time and Duration) 1967; 1 year. (Methodology) Standardized traplines were run along an altitudinal gradient in disturbed and undisturbed forests. (Results and Conclusions) Yields of small mammals increased with altitude in forested areas. The number of small mammal species were increased in coppiced forests due to invasion by three lower altitude species. Yields decreased with altitude in oldfield and nonforested habitats.

1454
Ecological effects of herbicides.
AUTHOR: MULLISON WR
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Down to Earth.
SOURCE ID: 28(2):30-36, 1967.
YEAR PUBLISHED: 1967
CATEGORY: B1e; B2a; B2b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: degradation; ecology; herbicides; impact; spray drift
ABSTRACT: (Purpose) To discuss three overly simplified but succinctly stated ecological laws: everything affects everything else; everything goes somewhere; and there is no such thing as a free lunch. (Time and Duration) (Type of Research) Literature review. (Methodology) Herbicides and herbicide application are discussed in relation to the ecology of an area. Topics explored are: volatility, spray drift, degradation of herbicides, effects of herbicides on water, fish and plankton. (Results and Conclusions) Organic herbicides have been extensively studied and used for a relatively short time. Nevertheless, during this period their ecological effects in modifying man's environment have been well recognized. Thus, herbicides are used for the selective killing of unwanted plants, such as weeds, according to man's desires and for his benefits. Experience to date indicates a vast preponderance of beneficial results from the proper use of herbidides. Fears that herbicides will render the soil permanently sterile are unfounded, as herbicides break down in the soil. As is true with others of man's inventions, it is the wisdom with which they are used that determines whether they have a beneficial or harmful ecological effect.

1455
2,4-D herbicide vegetation and pocket gopher relationships Black Mesa, Colorado.
AUTHOR: HALVORSON CH; HEGDAL PL; TIETJEN HP
AUTHOR AFFILIATION: US Bureau of Sport Fisheries and Wildlife
SOURCE TITLE: Ecology
SOURCE ID: 48(4):634-643, 1967.
YEAR PUBLISHED: 1967
CATEGORY: B1e
REGION: Ponderosa Pine-Douglas-fir Forest STATE: Colorado; New Mexico; Wyoming
KEYWORDS: habitat change; herbicides; mammals, small
ABSTRACT: (Purpose) To record vegetative cover and density changes after treatment with 2,4-D; to determine if and when a reduction in pocket gopher population occurs; and to study the toxicity of 2,4-D treated forbs to pocket gophers; and the effects of 2,4-D on other small mammal populations. (Time and Duration) 7-year study. (Type of Research) Original research (field study). (Methodology) 2,4-D herbicide was applied using 3 lb of the butyl ester of 2,4-D in a water carrier. The first spraying was made on rangelands at Black Mesa, CO, in 1958. In 1959 the research areas were resprayed. Vegetative composition and ground cover estimates were made using the step-point method. Unsprayed areas were used as controls. Pocket gopher population trends were collected simultaneously along four randomly selected 300-ft lines. Trapping was used to aid in the gopher census. Censuses were made for 7 years. Both forbs and pocket gophers remained at low levels on one area but returned to pretreatment levels on the other study area. The decline in pocket gopher numbers was attributed to an inability to survive where their preferred foods (forbs) were eliminated by herbicide treatment. The decline was not caused by movement of the animals from the sprayed areas, or by direct or indirect toxicity of 2,4-D. The common grasses offer, at best, only a marginal diet for northern pocket gophers.

1456
The nature and pattern of nonhunting mortality in fledged North American waterfowl.
AUTHOR: STOUT IJ
AUTHOR AFFILIATION: VA Polytechnic Institute
SOURCE ID: Blacksburg, VA, VA Polytechnic Institute, 1967, MS Thesis, 76-84 P.
YEAR PUBLISHED: 1967
CATEGORY: B1e
REGION: Applicable to entire United States
KEYWORDS: birds; mortality; waterfowl
ABSTRACT: (Purpose) To describe waterfowl mortality caused by power lines. (Type of Research) A discussion paper based on literature. (Results and Conclusions) Wire strike mortality was the most important collisional factor in survey data: 1,487 observations or 65% of the data. Most collisions occur in unfamiliar country and inclement weather is surely a contributing factor to losses. Puddle ducks are more vulnerable than other species.

1457
Utility line right-of-way management.
AUTHOR: ARNER DH
AUTHOR AFFILIATION: MS State Univ.
SOURCE TITLE: Transactions of the North American Wildlife Conference.
SOURCE ID: 31:259-268, 1966.
YEAR PUBLISHED: 1966
CATEGORY: B1e
REGION: Eastern Deciduous Forest STATE: Alabama; Maryland; Mississippi
KEYWORDS: cost; maintenance; management; prescribed burning; right-of-way; seeding; wildlife
ABSTRACT: (Purpose) To present the results of cooperative planning in dual ROW maintenance work in three southern states for increasing wildlife habitat while reducing overall costs of ROW maintenance. (Time and Duration) 16 years of research 1948-1964. Original research (Methodology) In the Maryland study, grass legume sod was established on ROW areas. In the Alabama and Mississippi studies, bulldozing, disking and fertilization were used. Perennial rye grass, crimson clover and fescue grass were tried on some areas. Other areas received chufa, bahiagrass and ball clover, or kobe lespedeza. Winter wheat and crimson clover seed mixes were also tried. Observations were made on seeded areas for several growing seasons to determine which species became established and persisted. (Results and Conclusions) Cooperative work between the Maryland Game Commission and a power company, over a seven year period, showed that the total cost for the power company was $6 per acre and for the game commission only $1.50 per acre per year. In both the upper and lower coastal plains of Alabama, seedings of bahiagrass combined with crimson clover, ball clover, or kobe lespedeza effectively retarded brush and provided highly nutritious summer and winter game food. The only maintenance given these plantings was one annual mowing. Prescribed burning proved to be the most economical and practical of all the maintenance techniques studied. Costs were less

than $7 per acre; based on a three-year rotation, the cost would be just a little over $2 per acre per year.

1458
Population changes and mortality of the mute swan in Britain.
AUTHOR: OGILVIE MA
SOURCE TITLE: The Wildfowl Trust.
SOURCE ID: 18:64-73. 1966.
YEAR PUBLISHED: 1966
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; ecological; impact; mortality; population; transmission line; waterfowl
ABSTRACT: (Purpose) To summarize population data for the Mute Swan in England. (Time and Duration) 1954-1966. (Type of Research) Original research. (Methodology) Band analysis and winter counts. (Results and Conclusions) Mute Swans are resident birds in England throughout the year. The annual winter count for the entire country varied between 15,300 and 23,900 over the 12-year period. The average annual mortality is approximately 40% with no detectable differences by age. Nearly 65% of all reported causes of death are probably due to accidents in flight and transmission lines are responsible for 44% of these deaths. Other causes of death include oiling, disease, cold weather, shooting and fighting.

1459
Herbicide treatment of browse on a big-game winter range in northern Idahoo
AUTHOR: MUEGGLER WF
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Journal of Wildlife Management
SOURCE ID: 30(1):141-151, 1966.
YEAR PUBLISHED: 1966
CATEGORY: B1e
REGION: Columbia Forest (Dry Summer) STATE: Idaho; Montana; Washington
KEYWORDS: browse; herbicides; mammals, game; shrubs
ABSTRACT: (Purpose) To investigate the possibilities of rejuvenating big game (elk and deer) winter range by using herbicides. (Time and Duration) 1960-1961; 2 years. (Type of Research) Original research. (Methodology) Three herbicide formulations of 2,4-D, 2,4,5-T and a mixture of both at three rates of helicopter application were tested on major shrub species. These were sprayed on 60 foot strips, 500 feet long, at rates of 3/4, 1-1/2, and 3 lb acid equivalent per acre. Effects on shrubs were observed. Influence of application date was studied by hand applications at six dates using a mixture of 2,4-D and 2,4,5-T. (Results and Conclusions) The mixture at 3 lb per acre was most effective in killing aerial crowns. Shrubs differed considerably in reaction to sprays, and care should be taken to avoid spraying sensitive redstem ceanothus. No seasonal guide to spraying could be developed. If cautious selective spraying is used, herbicides offer possibilities for improving big-game habitat. Long term effects have yet to be determined.

1460
Deathtraps in the flyways.
AUTHOR: VOSBURGH J
SOURCE TITLE: Birds in our lives.
SOURCE ID: US Dept Interior and US Fish and Wildlife Service, 1966, 364-371 p.
YEAR PUBLISHED: 1965
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: bird kills; birds; birds, song; impact; migration; mortality; right-of-way; scavenger
ABSTRACT: (Purpose) To review the problem of migrating bird mortality caused by man-made structures. (Time and Duration) To 1965. (Type of Research) Literature review. (Methodology) Personal interviews and literature review. (Results and Conclusions) This review article discusses bird mortality occurring at a variety of man-made structures: TV towers, ceilometers and tall buildings and monuments. Earliest reports of migration collisions were in the late 1800's. Although the greatest mortality seems to occur in overcast fall weather, records of mortality are available for all types of weather. Inconsistent reporting makes the magnitude of mortality impossible to estimate. Scavengers take advantage of the dead birds at most locations.

1461
Stop the pendulum in mid-swing!
AUTHOR: DILL NH
SOURCE TITLE: New Jersey Nature News.
SOURCE ID: 18:151-157, 1963.
YEAR PUBLISHED: 1963
CATEGORY: B1e
REGION: Applicable to entire United States
KEYWORDS: herbicides; impact; right-of-way
ABSTRACT: (Purpose) To encourage the public, and imparticular landowners, to demand the use of selective herbicide use on ROW vegetation. (Type of Research) Literature review and conjecture. (Results and Conslusions) One should agitate for use of selective spraying.

1462
Losses of mute swans in England in the winter of 1962-63.
AUTHOR: BOYD H; OGILVIE M
SOURCE TITLE: The Wildfowl Trust
SOURCE ID: 15:37-40. 1963.
YEAR PUBLISHED: 1963
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; ecological; impact; mortality; transmission line; waterfowl
ABSTRACT: (Purpose) To report winter mortality of Mute Swans in England. (Time and Duration) 1957-63. (Type of Research) Original research. (Methodology) The analysis of band returns from dead Mute Swans. (Results and Conclusions) Over 6500 swans were banded over a 7-year period in a population that averaged 9,300 to 13,600 birds. There were 506 recoveries for the period of January through March. Although the cause of death is not known for nearly half of the birds, nearly 19% of the deaths were due to collision with wires. Other mortality factors included deaths from cold, starvation, and disease.

1463
Heavy mortality of mute swans from electrocution.
AUTHOR: HARRISON J
SOURCE TITLE: The Wildfowl Trust
SOURCE ID: 14:164-165, 1962.
YEAR PUBLISHED: 1962
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; ecological; impact; mortality; transmission line; waterfowl
ABSTRACT: (Purpose) To report an instance of mute swan mortality from electrocution. (Time and Duration) April 1962. (Type of Research) Original research. (Methodology) Field observation. (Results and Conclusions) The carcasses of 21 Mute Swans were found beneath a 30 foot transmission line. The lines traversed a regular flight path of Mute Swans that used a nearby reservoir. An estimated 70 swans were using the reservoir, suggesting a possible 30 percent mortality caused by the transmission line.

1464
Sane use of herbicides.
AUTHOR: MASON EA
AUTHOR AFFILIATION: Arcadia Wildlife Sanctuary.
SOURCE TITLE: American Forests.
SOURCE ID: 30-31, 50, 1961 (March).
YEAR PUBLISHED: 1961
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: habitat manipulation; herbicides; pellets; spraying, broadcast; spraying, selective; wildlife
ABSTRACT: (Purpose) To point out the advantages of using selective removal of individual undesirable plants through the use of herbicides, rather than broadcast spraying, and to illustrate the benefits of selective removal in improving wildlife habitat. (Type of Research) Literature review (no bibliography). (Methodology) The author reviews various herbicides and application methods to show their impact on plant communities. Those that can be applied to an individual undesirable plant, or to a small area, without damaging desirable neighboring vegetation, are reviewed specifically. Methods of application are stressed which have least environmental impact. (Results and Conclusions) Herbicides present a small arsenal of tools which can be used or abused as can any tool. Correctly used, they can aid enormously in improving the appearance of areas, and the wildlife carrying capacity of an area. This can be accomplished by using herbicides to improve the food supply and the quality of cover-plant species. Herbicides, wisely used, can favor the growth of wildlife food-producing plants. Herbicides offer a new tool which used properly will improve areas for beauty and wildlife.

1465
Reported casualties to ringed ducks in the spring and summer.
AUTHOR: BOYD H
SOURCE TITLE: The Wildfowl Trust
SOURCE ID: 12:144-146, 1960.
YEAR PUBLISHED: 1960
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: bird kills; birds; ducks; ecological; impact; mortality; transmission lines; waterfowl

1465

ABSTRACT (Purpose) To summarize the cause of spring and summer mortality for 252 band recoveries of ducks in England over a 12-year period. (Time and Duration) 1947 to 1959 (Type of Research) Original research. (Methodology) Review of band (ring) recoveries for a 12-year period. (Results and Conclusions) Mallards and green-winged teal are the most common species reported. Accidental deaths include birds caught in fishing nets and muskrat traps, collisions with overhead wires, and from mowing machines (nesting females). There is a suggestion that males are more likely to be killed than females by collision with transmission lines.

1466
Techniques involved in the use of chemicals for establishing wildlife clearings.
AUTHOR: CHAPPELL WE; TRUMBO HA
AUTHOR AFFILIATION: VA Polytechnic Institute.
SOURCE ID: Blacksburg, VA, VA Polytechnic Institute, 1960, VA Coop Wildlife Research Unit Release 604, 454-459 p.
YEAR PUBLISHED: 1960
CATEGORY: B1e
REGION: Appalachian Oak Forest STATE: Virginia
KEYWORDS: ammonium sulfamate; clearing; fenuron; habitat manipulation; herbicides; monuron; wildlife
ABSTRACT: (Purpose) To determine the effectiveness of herbicidal treatments as a method of establishing wildlife clearings, and to compare cost of herbicidal methods to bulldozing and manual labor. (Time and Duration) Two-year study. (Type of Research) Original research (field study). (Methodology) At two locations in western Virginia monuron and fenuron were applied in June to some plots, and ammonium sulfamate and 2,4,5-T were used in frill treatment on other areas in August. Observations on apparent kill were made in the autumn and actual mortality was determined on year after treatment. (Results and Conclusions) Fenuron and monuron are the most effective herbicides for killing a greater proportion of the tree species; fenuron being more desirable because it gave quicker results. Both of these pellet-herbicides can be easily transported into inaccessible areas. A large number of annual and perennial plants invaded these areas during the first growing season after treatment. Due to the greater number of sprouts produced by the use of ammonium sulfamate, this method of treatment might be used to produce browse in areas where it is desired.

1467
Effect of habitat disturbance on a small mammal population.
AUTHOR: DARNELL RM; LOBUE J
AUTHOR AFFILIATION: Marquette Univ.
SOURCE TITLE: Journal of Mammalogy
SOURCE ID: 40(3):425-437, 1959.
YEAR PUBLISHED: 1959
CATEGORY: B1e
REGION: Maple-Basswood Forest + Oak Savanna STATE: Wisconsin
KEYWORDS: farming; habitat; impact; mammals, small; population
ABSTRACT: (Purpose) To determine the reactions of small mammal populations to destruction of the vegetative cover of a cropfield. (Time and Duration) 1956; 1 year. (Type of Research) Original research. (Methodology) A 20-acre alfalfa field that had undergone one cutting was studied from July to October using a grid system of trapping. Adjacent areas were also trapped. Areas were then cut to produce cover of various percents. (Results and Conclusions) Peromuscus maniculatus showed decreased utilization as vegetation increased in height, and a positive response to cutting; Microtus pennsylvanicus showed opposite responses.

1468
Small mammals in old field succession.
AUTHOR: HIRTH HF
AUTHOR AFFILIATION: Univ of CT.
SOURCE TITLE: Ecology.
SOURCE ID: 40(3):417-425, 1959.
YEAR PUBLISHED: 1959
CATEGORY: B1e
REGION: Appalachian Oak Forest STATE: Connecticut
KEYWORDS: habitat; impact; mammals, small; succession; wildlife
ABSTRACT: (Purpose) To examine small mammal populations in upland old field succession. (Time and Duration) 1957-1958; 1 year. (Methodology) Live trapping, 10 days each month, and snap trapping studies were made and population densities estimated. Three seral stages were studied: abandoned pasture (8-10 years), forest edge (24-28 years), and forest pasture (60-80 years). (Results and Conclusions) Small mammals increased during the grassland-herb-shrub stage up to the midseral stage of dense shrub and tree cover. Populations then decreased slightly in the woodland.

1469
The role of herbicides in wildlife production through creation and stabliziation of habitats.
AUTHOR: COULTER LL
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Down to Earth.
SOURCE ID: 13(4):4-6, 1958.
YEAR PUBLISHED: 1958
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: browse; food plots; habitat; habitat manipulation; herbicides; stability; waterfowl; wildlife
ABSTRACT: (Purpose) To explain and document the uses of herbicides in manipulating the habitat to aid in producing more game on less land and in stabilizing vegetation types suitable for wildlife. (Time and Duration) Literature review covering articles over a 20-year period. (Type of Research) Literature review. (Methodology) Articles are reviewed covering: 1) creating and maintaining openings in wooded areas; 2) browse production; 3) improvement of waterfowl habitat; and 4) chemical seedbed preparation for game food patches. (Results and Conclusions) Increased hunting pressure and reduction in available habitat has created a real problem in game production. An obvious answer is more efficient use of available lands. Recent experience with herbicides indicates that tools are now available which can be a real aid in producing more game on less land and in stabilizing vegetation types suitable for wildlife. Since these chemicals, as used, are harmless to wildlife, selective in action against plant species, and economical to use, they can play a decisive role in aiding man to regulate and conserve the nation's wildlife resources.

1470
Effects of silvicultural practices on wildlife food and cover in oak and aspen types in northern Michigan.
AUTHOR: GYSEL LW
AUTHOR AFFILIATION: MI State Univ.
SOURCE TITLE: Journal of Forestry.
SOURCE ID: 55(11):803-8809, 1957.
YEAR PUBLISHED: 1957
CATEGORY: B1e
REGION: Oak-Hickory Forest STATE: Michigan
KEYWORDS: browse; habitat; habitat change; management; regeneration; wildlife; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To compare various chemical and axe methods of eliminating overstory oaks to release pine; and to compare different harvest cutting practices for aspen. Also to measure the resulting plant cover and the amount of browse. (Time and Duration) Seven-year study, 1950-1956, (Type of Research) Original research. (Methodlogy) In the release studies the overstory oak was treated by axe girdling and cutting, chemical basal sprays, chemical in frills, and chemical applied as an aerial spray. All, or most, of the oaks were removed by these methods. Four to five years after release, the height growth and crown diameter of the released pine was obtained. The number of understory stems and leaf surface of herbs, shrubs, seedlings and sprouts was also determined. (Results and Conclusions) Sprouts resulting from axe girdling and cutting were taller and more numerous and the total amount of browse greater than in the plots treated with the chemicals. The mixture of pine, low deciduous cover and browse species will remain in some release areas for at least 10 to 15 years. Only a small amount of preferred browse and scattered low cover resulted from the bulldozing of an oak stand. From a similar operation in aspen a marked increase in the number of leaves and branches of aspen srouts occurred one year after bulldozing.

1471
Utilities and birds.
AUTHOR: DICKINSON LE
SOURCE TITLE: Audubon Magazine
SOURCE ID: 59:54-55, 86-87, 1957.
YEAR PUBLISHED: 1957
CATEGORY: B1e; B2e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: bird kills; birds; impact; structure design
ABSTRACT: (Purpose) To report on the general interaction between birds and electrical transmission systems. (Type of Research) Literature review and direct observations. (Methodology) Literature review. (Results and Conclusions) Often birds will not alight on charged conductor wires due to the electrostatic effect. Birds are electrocuted when their wings form a continuous path between two wires. The killing of gulls in NC was prevented by placing the conductors further apart. Eagle electrocutions in ID were still being reported, even though this problem had been solved in CA by placing wooden perches on top of the towers.

1472
Effects of certain common brush control techniques and materials on game food and cover on a power line right-of-way no. 4.
AUTHOR: BRAMBLE WC; BYRNES WR; WORLEY DP
AUTHOR AFFILIATION: PA State Univ.
SOURCE ID: University Park, PA, PA State Univ Agricultural Experiment Station, 1957, Progress Report 175, 4 p.
YEAR PUBLISHED: 1957
CATEGORY: B1e
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: brush; cover; food; herbicides; impact; right-of-way
ABSTRACT: (Purpose) To report the effects of various brush control techniques on the amount of game food and cover on an electric ROW in Pennsylvania. (Time and Duration) 4-year study. (Type of Research) Original research (field study). (Methodology) The brush control methods used included: no spray (control); broadcast foliage spray with 2,4-D and 2,4,5-T; oil-water, semi-basal summer spray with 2,4-D and 2,4,5-T; general summer basal spray of 2,4-D and 2,4,5-T; selective winter basal spray with 2,4,5-T; and broadcast foliage spray with ammonium sulfamate. (Results and Conclusions) Four years after spraying a power line right-of-way with herbicides, a comparison of the five techniques indicates that by use of basal sprays a stable ground cover can be maintained with minimum disturbance. Such cover has proven useful to several important game species. On the other hand, broadcast spraying resulted in drastic alterations of the low plant cover which has been slowly progressing towards a more stable condition. The broadcast spray areas are used by several important game species.

1473
Wildlife use of utility rights-of-way in Michigan.
AUTHOR: FOSTER CHW II
AUTHOR AFFILIATION: Yale Univ, School of Natural Resources.
SOURCE ID: Ann Arbor, MI, Univ of MI, 1956, Masters Thesis, 103 p.
YEAR PUBLISHED: 1956
CATEGORY: B1e
REGION: Beach-Maple Forest STATE: Michigan
KEYWORDS: birds; browse; hunting; mammals,small; right-of-way; utilization; wildlife; wildlife relationships
ABSTRACT: (Purpose) To investigate three woodland ROWs for the occurring wildlife relationships and utilization, and to evaluate their importance to ROW management. (Time and Duration) 1 year (1955-1956). (Type of Research) Original research. (Methodology) Two pipelines and one electric ROW were studied near Ann Arbor, MI. Vegetation density and inventory (using stem count) were made on each ROW. Browse utilization was recorded by stem counts. Small mammals were live-trapped, leaf nests counted, pellet surveys taken, track transects ran, and all observations recorded to document wildlife utilization on and adjacent to the ROW. (Results and Conclusions) Many species of small game and non-game wildlife utilized a ROW in some manner more often than the adjacent woodlot. A greater degree of use was found where the edge was more abrupt. Selective herbicide treatment was suggested in ROW construction as well as maintenance. Encouragement of natural food and cover patches such as blackberry, grape, and rose was suggested. Heavy hunter use was documented.

1474
Effects of certain common brush control techniques and materials on game food and cover on a power line right-of-way no. 3.
AUTHOR: BRAMBLE WC; BYRNES WR; WORLEY DP
AUTHOR AFFILIATION: PA State Univ.
SOURCE ID: State College, PA, PA State Univ Agricultural Experiment Station, 1956, 7 p.
YEAR PUBLISHED: 1956
CATEGORY: B1e
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: brush; cover; food; herbicides; impact; right-of-way
ABSTRACT: (Purpose) to report the effects of various brush control techniques on the amount of game food and cover on an electric ROW in Pennsylvania. (Time and Duration) 3-year study. (Type of Research) Original research (field study). (Methodology) The brush control methods used included: no spray (control); broadcast foliage spray with 2,4-D and 2,4,5-T; oil-water, semi-basal summer spray with 2,4-D and 2,4,5-T; general summer basal spray of 2,4-D and 2,4,5-T; selective winter basal spray with 2,4,5-T; and broadcast foliage spray of ammonium sulfamate. (Results and Conclusions) Improved game food conditions resulted from all treatments, owing particularly to creation of a new cover type amidst the unbroken mixed oak forest of the plateau. Highly valued shrubs such as blueberries and teaberries were present in large amounts only in the basal spray treatments. In the broadcast spray areas a grasslike or herbaceous community dominated, and while these are attractive to certain forms of wildlife, important shrubs were sparse or absent. Common game species of the region continued to use all treatment areas during the third year after spraying.

1475
Effect of certain common brush control techniques and materials on game food and cover on a power line right-of-way no. 2.
AUTHOR: BRAMBLE WC; BYRNES WR
AUTHOR AFFILIATION: PA State Univ.
SOURCE ID: State College, PA, PA State Univ Agricultural Experiment Station 1955, 7 p.
YEAR PUBLISHED: 1955
CATEGORY: B1e
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: brush; cover; food; herbicides; impact; right-of-way
ABSTRACT: (Purpose) To describe the effects of several common brush control treatment techniques and herbicides on game food and cover on a Pennsylvania electric ROW. (Time and Duration) Two-year study. (Type of Research) Original research (field study). (Methodology) The techniques used included: no spray; broadcast foliage spray of 2,4-D and 2,4,5-T; oil-water, semi-basal summer spray of 2,4-D and 2,4,5-T; general summer basal spray of 2,4-D and 2,4,5-T; selective winter basal spray of 2,4,5-T; and broadcast foliage spray of Ammonium sulfamate. (Results and Conclusions) Pellet counts showed that deer, rabbit and grouse were using the ROW after spraying in all treatment areas. There was evidence that the heaviest usage was in the unsprayed areas, which could be expected since more woody browse was present in those areas as winter food and the shrub layer offered good cover. However, the pellet counts in the sprayed areas indicated that they were being used by game. The summer basal treatment produced a 98.9 percent top kill and was superior in supression of resprouting (7 percent resprouting).

1476
Relationships of birds to power and communication lines.
AUTHOR: BENTON AH
AUTHOR AFFILIATION: NY State College for Teachers.
SOURCE TITLE: The Kingbird
SOURCE ID: 4:65-66, 1954.
YEAR PUBLISHED: 1954
CATEGORY: B1e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; utility poles; wire mortality
ABSTRACT: (Purpose) To describe the use of poles and wires by birds. (Type of Research) Discussion paper. (Results and Conclusions) Although a certain number of birds will be killed by wires, a vastly greater number will find utility lines useful.

1477
Ecology and land-use relationships of small mammals on a Michigan farm.
AUTHOR: LINDUSKA JP
AUTHOR AFFILIATION: MI Dept of Conservation.
SOURCE ID: MI Dept of Conservation, Game Div, 1950, 144 p.
YEAR PUBLISHED: 1950
CATEGORY: B1e
REGION: Beach-Maple Forest STATE: Michigan
KEYWORDS: ecology; habitat; land use; mammals, small; wildlife
ABSTRACT: (Purpose) To give the status of small mammals on a Michigan farmland area. (Time and Duration) 1940-1942, 1946, 4 years. (Methodology) Snap trapping and box trapping were used to census small mammals in farmland and woodland habitats. (Results and Conclusions) In farm habitats, prairie deermouse and the meadow vole were common, with bog lemming and short-tailed shrew also predominant. Sod fencerows with sparse shrubs were ideal habitat, but wooded fencerows supported few small mammals. In farm wood-lots, fox squirrels, red squirrels, flying squirrels, chipmunks, white-footed mice, and short-tailed shrew were important. Brushy areas and ungrazed woodlots also supported populations of red squirrels, white-footed mice, and chipmunks.

1478
The daily movements of cormorants on San Francisco Bay.
AUTHOR: BARTHOLOMEW GA JR
SOURCE TITLE: The Condor
SOURCE ID: 48(1):3-18, 1943.
YEAR PUBLISHED: 1943
CATEGORY: B1e
REGION: Applicable to entire United States STATE: California
KEYWORDS: behavior; birds; diurnal; marine; seasonal; transmission line; utilization
ABSTRACT: (Purpose) To describe the roosting and fishing acitivities of non-breeding Brandt and double-crested cormorants. (Time and Duration) September 1940 - July 1941. (Type of Research) Original research. (Methodology) Observations from dawn to dusk were made over a 11-

1478

month period on a 30 square mile area in the east-central part of San Francisco Bay, california. (Results and Conclusions) Double-crested cormorants were present on the San Francisco Bay area throughout the year, a maximum of 2300 birds in January, and a minimum of 470 in April. They were present in small groups in the central part of the Bay during the day and these roosted each night on a 2-mile stretch of power line running to Brooks Island. Brandt cormorants used the middle and western parts of the Bay and were not observed togetner with the double-crested cormorant.

1479
How valuable are clearings to birdlife?
AUTHOR: LAY DW
AUTHOR AFFILIATION: TX A&M Univ.
SOURCE TITLE: Wilson Bulletin
SOURCE ID: 50:254-256, 1938.
YEAR PUBLISHED: 1938
CATEGORY: B1e
REGION: Maple-Basswood Forest + Oak Savanna STATE: Texas
KEYWORDS: birds; checklist; clearing; edge effect; habitat; species
ABSTRACT: (Purpose) To determine the bird populations in several types of interior woodland and on margins of clearings within those forest stands. (Time and Duration) One year study, 1936. (Type of Research) Original reseach. (Methodology) In making the bird counts the observer walked slowly and recorded all birds seen during each 30-minute period. Stops were made whenever birds were heard or glimpsed. Usually only the birds actually seen were recorded, but occasionally, when the unmistakable song of a familar bird was heard in nearby cover, it was tallied. Interior counts were made more than 100 yards from the margins. Marginal counts were made along the edges of clearings. No bird more than 25 yards from the edge was included in the marginal counts. (Results and Conclusions) All of the very common species appeared in both margins and interiors. Some of these, however, were more than twice as numerous in margins as in interiors. Among these were the cardinal, mourning dove, blue jay, red-headed woodpecker and sparrow hawk. Species that were found only in margns included blue grosbeak, orchard oriole, mockingbird, blue-gray gnatcatcher, red-cockaded woodpecker, turkey vulture, red-winged blackbird, scissor-tailed flycatcher, migrant shrike, ruby-throated hummingbird and sycamore warbler. The margins of clearings were found to contain 41 percent more species and 95 percent more individual birds than the corresponding woodland interiors.

B2 - Environmental Component Alteration

1480
Influence of copper high tension lines on plants and soils.
AUTHOR: ERNST W; KRAAL H
AUTHOR AFFILIATION: Free Univ.
SOURCE TITLE: Environmental Pollution.
SOURCE ID: 11(2):131-135, 1976.
YEAR PUBLISHED: 1976
CATEGORY: B2
REGION: Applicable to entire United States
KEYWORDS: impact; right-of-way; soil; vegetation
ABSTRACT: (Purpose) To study the increase of copper under high tension lines in the Netherlands. (Time and Duration) 1973-74. (Type of Research) Original research. (Methodology) Soil and plant samples were taken from 0-63m vertically from the cables. Soils were analyzed for total and exchangeable copper and cation exchange capacity. Plant materials were analyzed for Cu by AAS. Copper resistance of Agrostis tenuis of sandy soil was tested by a rooting technique. (Results and Conclusions) An increase in total copper in fen and clay soils occurred near high tension lines as compared with samples from a greater distance and with all plots in sandy soil. Sandy soil showed very little difference under the lines and outside. Copper was higher in plants under high tension lines than at 60m distance, especially on sandy soil, via uptake by roots. No difference was found in species composition under and outside high-tension lines, and in copper tolerance of Agrostis tenuis. A risk of poisoning sheep may be involved but was not tested.

1481
Effects of power line corridor clearance and maintenance on stream habitat.
AUTHOR: DAY CG
AUTHOR AFFILIATION: WV Univ.
SOURCE ID: Morgantown, WV, WV Univ, 1976, Masters Thesis, 144 p.
YEAR PUBLISHED: 1976
CATEGORY: B2
REGION: Northern Hardwoods - Spruce Forest STATE: United States
KEYWORDS: clearing; fish; habitat; impact; maintenance; right-of-way; stream
ABSTRACT: (Purpose) To study changes in stream temperature due to power line exposure and changes in stream habitat from removal of riparian vegetation by herbicides. (Time and Duration) 1975-76. (Type of Research) Original research. (Methodology) A large, medium, and small stream were selected in each of three locations: NH, WV, and GA. Vegetation along streams was mapped, water temperatures recorded hourly for two days between 10am and 4pm at stations above, on, and below the ROW, global radiation and screen air temperatures were measured; view factor, shading, and energy flux were calculated; flow rate was measured; and several climatic factors were recorded. (Results and Conclusions) Stream habitat was diverse but it appeared that small to medium streams were particularly sensitive when riparian vegetation was removed. Mean temperatures on the nine streams ranged from -0.3 degrees C to almost 3 degrees C and stabilization did not occur until about 60-90m downstream. Repeated broadcast spraying which eliminated protective vegetation resulted in stream temperature rise, increased light, and accelerated erosion. Unprotected stream crossing by vehicles contributed to adverse impacts. Selective spraying or cutting would protect desirable riparian vegetation. On several streams with brook trout, the ROW temperatures reached marginal limits (over 20 degrees C) and undesirable minnows were observed.

1482
Impacts of construction activities in wetlands of the United States.
AUTHOR: DARNELL RM; JAMES BM; PEQUEGNAT WE
AUTHOR AFFILIATION: Tereco Corp.
SOURCE ID: Corvallis, OR, US Env Protection Agency, 1976, EPA68012452, 392 p.
YEAR PUBLISHED: 1976
CATEGORY: B2; C
CONTRACT NUMBER: EPA68012452
SPONSOR: US Env Protection Agency, Office of; Research and Development.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: aquatic; construction; environmental impact statement; impact; wetland
ABSTRACT: (Purpose) To review the various types of construction activities and their physical and biological impacts upon wetlands in the US. (Type of Research) Literature review and summary. (Methodology) Reviewed are general physical and biological properties of wetlands and their flora and fauna; various types of construction activities affecting wetlands and the specific effects. A synthesis, conclusions, and bibliography are presented. (Results and Conclusions) Major construction activities affecting wetlands are floodplain surfacing, drainage, mining, impoundments, dredging and channelization, and shoreline construction including bridges, highways, pipe and power lines. Each construction activity is characterized by physical, chemical, and biological alterations including habitat loss, addition of suspended solids, and water flow modification. Related impacts include temperature, pH and nutrient fluctuations, and pollutants such as heavy metals and pesticides. These specific effects are all reviewed for various construction activities.

1483
Guidelines for broadlevel evaluation and control selection for non-point source pollution associated with silvicultural activities.
AUTHOR: TEW RK
SOURCE TITLE: Chapter 1 in Non-Point Source Pollution Prediction Techniques.
SOURCE ID: US Forest Service and The Environmental Protection Agency, 1976, FS-EPA Interagency Agreement EPA-IAG-D6-0660.
YEAR PUBLISHED: 1976
CATEGORY: B2; C4; D
SPONSOR: US Forest Service.; Environmental Protection Agency.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: erosion; forest; impact; pollution; quality; runoff; silviculture; soil; vegetation; water
ABSTRACT: (Purpose) To establish a broad, viable natural resource framework for major disciplines to relate to in the planning process for nonpoint source pollution and its control. (Time and Duration) References from 1965 to 1976. (Type of Research) State-of-the-art review. (Methodology) Identifies site conditions for consideration in evaluating nonpoint source pollution. The data base includes soil survey reports and local maps on geology, climate, topography, and vegetation with accompanying descriptive material. Political land units are broken down into natural resource subdivisions for nonpoint source pollution planning. An environmental parameter checklist is used to document characteristics of a planning entity, show where information is missing, and relate to impact analyses. (Results and Conclusions) Natural resource base information relates to environmental impacts associated with silviculture primarily in the areas of plant productivity potential and surface erosion and runoff. Silvicultural activities alter a land unit through either removal or modification of vegetative cover or disturbance of the soil and litter layer which in turn change many physical and biological processes primarily associated with the hydrologic cycle. These process changes

then relate to nonpoint pollution. Mitigative and preventive controls, identified as access, timber harvest, and cultural practices related, are applied to every silvicultural activity for pollution abatement. Goal attainment is evaluated by sampling water quality parameters and organisms in the aquatic ecosystem.

1484
Certain ecological effects of high-voltage power lines.

AUTHOR: HYLTENCAVALLIUS N
AUTHOR AFFILIATION: Hydro-Quebec.
SOURCE ID: Varennes, Quebec, Hydro-Quebec Institue of Research, 1975, Report IREQ1160, 81 p.
YEAR PUBLISHED: 1975
CATEGORY: B2
REGION: Applicable to entire United States
KEYWORDS: ecology; electrostatic; impact; ozone; right-of-way
ABSTRACT: (Purpose) To describe certain ecological impacts of high voltage power lines and substations related to ozone production and electrostatic fields. (Type of Research) Literature review and some research. (Results and Conclusions) A summary of well-established knowledge concerning electrostatic fields indicates there is no direct effect; however, stress changes may be caused in workers at switchyards. Effect of high voltage lines on the public is negligible. Precautions could reduce effects on switchyard workers. Ozone production by power lines appears to be negligible.

B2a - Water

1485
Evaluation of pipeline impacts on wetlands (draft).

AUTHOR: MI PUBLIC SERVICE COMMISSION
AUTHOR AFFILIATION: MI Public Service Commission
SOURCE ID: Lansing, MI, MI Public Service Commission, 1978, 69 p.
YEAR PUBLISHED: 1978
CATEGORY: B2a
REGION: Laurentian Mixed Forest STATE: Michigan; Minnesota; Wisconsin
KEYWORDS: compaction; ecosystem; erosion; impact; soil; wetland
ABSTRACT: (Purpose) To evaluate the impact of pipeline construction on wetlands, particularly the rate and degree of wetland rehabilitation after pipeline construction. (Time and Duration) One-year study. (Type of Research) Original research (field study). (Methodology) All existing pipeline crossings in the Northern Niagaran Trend which pass through wetlands were systematically surveyed to evaluate the impact of construction on wetlands, particularly the rate and degree of wetland rehabilitation since pipeline construction. This rehabilitation was evaluated with respect to the vegetative community, ROW width and orientation, age of construction, and general maintainence activities. In addition, three conifer swamps were used for a study using strip transects to measure the change in growth rates of dominant species, density and wildlife use. (Results and Conclusions) Pipeline disturbance in wetlands affects soil, water, vegetation, and wildlife. Shrub swamps were less vulnerable to dieback, windthrow and sunscald than conifer swamps. Cedar, spruce and birch were more sensitive than fir, ash, maple or aspen to disturbance from dieback, windthrow and sunscald. Drainage problems were evident on 58 percent of the crossings and often contributed to retrogressive vegetation changes. Disruption of normal groundwater movement caused long-term ponding and progressive dieback of existing coniferous swamps and subsequent invasion of marsh or shrub swamp species. Vegetation impacts were less when pipelines were oriented in an east-west direction, and where widths were narrow.

1486
Evaluation of pipeline crossing impacts on stream environments (draft).

AUTHOR: MI PUBLIC SERVICE COMMISSION
AUTHOR AFFILIATION: MI Public Service Commission
SOURCE ID: Lansing, MI, MI Public Service Commission, 1978, 64 p.
YEAR PUBLISHED: 1978
CATEGORY: B2a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: environment; impact; sediment transport; sedimentation; stream
ABSTRACT: (Purpose) To compare the amount of sediment load and associated changes in streambed particle size composition from three different methods of stream crossing with pipelines. (Time and Duration) One-year study. (Type of Research) Original research (field study). (Methodology) Each of three streams was crossed using a different method. In the Open Cut method, digging was done directly in the stream; in the Flume method, the ditch was dug under the flume pipe; in the Plow Method, two bulldozer crosses of the stream were required (the first "breaks" a track through the streambed and the second pulls the pipeline through the broken ground). The sediment load and associated changes in streambed particle size composition were measured. (Results and Conclusions) Where all other factors offer no selectivity, streams should be crossed where the vegetative canopy is densest. Limit use of backfill to high-gradient streams subject to severe flooding, or to areas where soil is extremely unstable. Slope the streambank at the rate of one vertical part to two horizontal parts to prevent stabilization materials from tumbling into the stream. Return the stream to its pre-construction width and depth after construction. To prevent disruption of bank stabilization materials, vegetation, and stream disturbance, discourage vehicular use of the ROW by leaving stumps and brush in the ROW after construction, and by fencing steep hillsides with stump fences or wire fences and signs.

1487
Recovery of a deforested ecosystem.

AUTHOR: BORMANN FH; LIKENS GE; PIERCE RS
AUTHOR AFFILIATION: Cornell Univ. Yale Univ. US Forest Service.
SOURCE TITLE: Science.
SOURCE ID: 199(3):492-496, 1978.
YEAR PUBLISHED: 1978
CATEGORY: B2a; B2b; C4
REGION: Northern Hardwoods - Spruce Forest STATE: New Hampshire
KEYWORDS: biomass; clearcutting; ecosystem; forest; impact; nutrient removal; watershed
ABSTRACT: (Purpose) To evaluate the recovery of a deforested ecosystem after the vegetation was allowed to regrow, and to relate these findings to the effects of commercial clearcuttings. (Time and Duration) 1965 to 1976 - 11 years (Type of Research) Original field research (Methodology) This long-term experiment was conducted in a northern hardwood watershed-ecosystem at the Hubbard Brook Experimental Forest in New Hampshire. In 1965, all trees were felled and left in place; no roads or skid trails were made and no wood products were removed. Vegetative regrowth was suppressed with herbicides for the first three growing seasons, then allowed to regrow. Effects on hydrology, biogeochemistry and aboveground biomass production were evaluated for 10 years and compared with an adjacent undisturbed 60-year old forest. Eight commercially clear-cut forests were studied for 4 years after cutting to determine how results compared with the experimentally cut watershed. (Results and Conclusions) Deforestation had a major impact on both the amount and relative proportions of water, dissolved substances, and particulate matter lost from the ecosystem. Substances in drainage water increased due to accelerated decomposition, nitrification, and mineralization in the forest floor; and the absence of nutrient uptake by vegetation. Some ecosystem parameters returned to previous levels within 3 or 4 years after regrowth was permitted. Over the 10-year period after cutting, about 499 kg of nitrate N, 450 kg of Ca, and 166 kg of K per hectare were lost in stream water. During the same period, only 43 kg nitrate N, 131 kg Ca, and 21.7 kg K per hectare were lost from the adjacent forest. Commercial clear-cuts showed increased concentration of nutrients in stream water ranging up to 50% of those from the experimentally cut watershed. Both experimental and commercial clear-cuts showed greater losses of nutrients and organic matter than forested areas. More than 65 years may be required to replace biomass and nutrients lost in harvesting.

1488
Wisconsin pathologist tests effects of dioxin.

AUTHOR: COBERLY C
AUTHOR AFFILIATION: Univ of WI.
SOURCE TITLE: Sea Grant '70s.
SOURCE ID: 7(5(:6-7, 1977.
YEAR PUBLISHED: 1977
CATEGORY: B2a
SPONSOR: Univ of WI Sea Grant College Program.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: dioxin; herbicides; impact; mammals; persistence; poison; pollution, water; teratogen; toxicity
ABSTRACT: (Purpose) To report on effects of small daily doses of dioxin, 500 parts per trillion, on female rhesus monkeys, and to speculate on the possibility of significant levels of dioxin in the Great Lakes, particularly in Lake Ontario. (Time and Duration) One-year study. (Type of Research) Original research (laboratory). (Methodology) Female rhesus monkeys were fed small daily doses of dioxin for a period of nine months. After being kept on the diet for six months, the eight animals were bred. (Results and Conclusions) Of the five monkeys which conceived, four aborted in the second month of pregnancy. Within three months the animals began to lose hair and eyelashes, and developed serious skin problems. Five monkeys out of eight eventually died due to almost complete lack of both red and white blood cells, and the remaining animals showed similar symptoms. In view of these findings, the researcher believes that it is necessary to re-evaluate the use of compounds containing dioxin and especially the means of preventing their escape into the environment. Dioxins persist in the environment for long periods and eventually accumulate at the top of the food chain.

1488

1489
Implications of forest management practices on the aquatic environment.
AUTHOR: CORBETT ES; HOOPES R; LYNCH JA
AUTHOR AFFILIATION: PA State Univ. US Forest Service. PA Fish Comm.
SOURCE TITLE: Fisheries
SOURCE ID: 2(2):16-22, 1977
YEAR PUBLISHED: 1977
CATEGORY: B2a; C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: clearcutting; environment; fish; forest; management; nutrients; quality; riparian; stream; temperature; turbidity; water
ABSTRACT: (Purpose) To formulate the probable effects of timber harvesting on fisheries. (Time and Duration) References from 1950 to 1976. (Type of Research) Literature review. (Methodology) Probable effects are evaluated on the basis that each species of fish has a particular set of environmental conditions and habitat preferances that are optimal for its maintenance. Major stream parameters which were reviewed to ascertain probable effects of vegetation management were water temperature, stream turbidity and sedimentation, nutrient concentration, allochthonus organic detritus, and streamflow. Each parameter review is followed with a discussion of its implications on fisheries. (Results and Conclusions) Removal of forest cover, especially clearcutting and reduction of riparian vegetation, may affect aquatic environments and fisheries through increased streamflow, higher stream temperature, nutrient loading and eutrophication, turbidity, and reduced organic detritus. Streamflow increases and nutrient loading are usually short-term effects that return to pre-cutting levels following revegetation. Timber cutting alone has little effect on turbidity, but cutting combined with improper logging or road construction causes water quality deterioration. Removal of riparian vegetation reduces organic detritus, a food source for aquatic invertebrates, and alters invertebrate species composition and availability of terrestrial insects. Riparian cover is critically important in trout fisheries. Use of buffer strips along streams and partial clearcutting are effective in protecting streams.

1490
Long-term effects of repeated logging on an Appalachian stream.
AUTHOR: AUBERTIN GM; PATRIC JH
AUTHOR AFFILIATION: US Forest Service;; Southern IL Univ.
SOURCE TITLE: Journal of Forestry.
SOURCE ID: 75(8):492-494, 1977.
YEAR PUBLISHED: 1977
CATEGORY: B2a; B2b; C4
REGION: Mixed Mesophytic Forest STATE: West Virginia
KEYWORDS: forest; impact; logging; stream; streamflow; temperature; turbidity; water quality; watersheds
ABSTRACT: (Purpose) To report some effects on soil and water resources of timber cutting as practiced by eastern loggers since the turn of the century. (Time and Duration) 1901 to 1975; 75 years. (Type of Research) Review of early reports and current research data. (Methodology) The authors present information on logging history and stream effects from 1901 to 1975 for Watershed 2, predominated by oaks and maples, of the Fernow Experimental Forest in north-central West Virginia. The stream draining Watershed 2 has been gaged since 1951 and cutting effects on flow were computed by the unit watershed approach using an adjacent fully forested watershed as an untreated control. Watershed 2 was logged four times during the past 75 years; between 1901 and 1911, during World War II, 1958, and 1972. Diameter-limit harvesting of trees 17 or more inches in diameter was employed in 1958 with unplanned logging roads and in 1972 with carefully located roads and skid trails. Effects measured were streamflow, turbidity, temperature, pH, specific conductance, alkalinity, and 12 individual ion. (Results and Conclusions) Effects of old-growth logging on water can only be surmised; reports of 1933 note that erosion on the forest had not been excessive. Twenty-five years after logging streamflow was apparently sufficient in volume and quality to meet domestic and recreational needs. The diameter-limit cut of 1958 increased streamflow by 2.5 and 1.4 inches during the first and second years after cutting, respectively, increased turbidity due to erosion from a skid trail along the stream channel, and increased water temperature by 1.6 and 0.7 degrees F in the first and second years. No effect of cutting persisted for more than two years. The 1972 diameter-limit cut, with carefully located skid trails, caused a slight first-year increase in streamflow, 0.8 inch, but all effects on water quality were negligible. The watershed continues to produce water that requires minimum treatment to meet local domestic needs and the stream is still heavily fished for brook trout.

1491
Shrub plantings for erosion control in eastern Washington progress and research needs.
AUTHOR: KLOCK GO; MASON LL; TIEDEMANN AR
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Portland, OR, US Forest Service, Pacific Northwest Forest and Range Experiment Station, 1976. Research Note PNW279, 11 p.
YEAR PUBLISHED: 1976
CATEGORY: B2a; B2b
REPORT NUMBER: PNW279
REGION: Ponderosa Pine-Douglas-fir Forest STATE: Washington
KEYWORDS: erosion; erosion control; planting; shrubs; vegetation
ABSTRACT: (Purpose) To report on experience from planting native shrubs for erosion control on National Forests in eastern Washington. (Time and Duration) Four-year study. (Type of Research) Original research (field study). (Methodology) IN August 1975, survival measurements and vigor estimates were made on 14 species of shrubs planted on road cuts and fill slopes between 1971 and 1973 on National Forests in eastern Washington. One-year old, bare-root shrub seedlings were used. Seedlings were planted with a flat spade from an aluminum extension ladder laid upslope. Organic matter and plant nutrient content were extremely low on all planting sites. (results and Conclusions) The average survival of these 14 species ranged from 37 to 53 percent and was better at low than high elevations and greater on fill slopes than cut slopes. Of the species planted, blue elderberry, bush penstemon, wild rose, and serviceberry had the highest survivals. Vigor of blue elderberry and penstemon was good, but vigor of wild rose and serviceberry was only fair to poor. Bitterbrush, squaw carpet ceanothus and snowberry survived well on fill slopes, but not on cut slopes due to their being covered by ravelling soil material.

1492
Forests and rangelands as sources of chemical pollutants.
AUTHOR: MOORE DG; NORRIS LA
AUTHOR AFFILIATION: US Forest Service. Pacific Northwest Forest and Range Experiment Station.
SOURCE TITLE: Non-Point Sources of Water Pollution.
SOURCE ID: Corvallis, OR, OR State Univ, 1976, 17-35 p.
YEAR PUBLISHED: 1976
CATEGORY: B2a; B2b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: fertilization; forest; herbicides; pollution, water; range; runoff, storm; spray drift; 2,4-D
ABSTRACT: (Purpose) To discuss non-point sources of water pollution using examples of herbidie sprayings to forest and rangelands and water pollution from fertilization of forest and agricultural lands. (Time and Durantion) Examples cited from studies covering a 10-year period. (Type of Research) Literature review. (Methodology) Forest stream contamination by herbicdes in Oregon is reviewed covering the topics: direct application or drift of herbicides to streams and movement of chemicals from treated areas to streams. Effects of fertilization of forested watersheds are also discussed, although it is pointed out that most literature concerning the effects of fertilization on water quality deal with farm fertilization, not forest fertilization. (Results and Conclusions) The forest floor is a large reservoir of potential stream pollutants. Any amount of chemical that has not been degraded, volatilized, or absorbed is available for leaching or surface runoff. The mechanism by which chemicals are moved from spray deposits to a stream may be visualized as two competing reactions: leaching and surface runoff. Rainfall that is not lost through evaporation either enters the soil profile or runs over the surface. In either case, it carries surface deposited chemicals either in solution or as suspended matter. In general, where the water goes the chemical also goes, but not as fast. Numerous factors which influence the distribution of water between surface flow and infiltration are discussed.

1493
Herbicides and higher plant ecology.
AUTHOR: CHANCELLOR R; WAY J
AUTHOR AFFILIATION: Monks Wood Exp Station, England.
SOURCE TITLE: Pages 345-372 in Herbicides; physiology, biochemistry, ecology (volume 2).
SOURCE ID: New York, NY, Academic Press, 1976, 564 p.
YEAR PUBLISHED: 1976
CATEGORY: B2a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: animals, aquatic; herbicides; plants
ABSTRACT: (Purpose) To discuss herbicides and higher plant ecology with reference to grasslands, aquatic ecosystems and forest ecosystems. (Time and Duration) Literature review spanning 25 years. (Type of Research) Literature review. (Methodology) The authors discuss herbicides and higher plant ecology for arable land, unimproved and improved grassland, aquatic ecosystems, herbicides in forestry and woody plant control, and military uses. (Results and Conclusions) Over relatively short periods herbicides do not appear to change the number of weed species in a

field very much, but over longer periods they might. To be vulnerable to local extinction a weed would have to be very susceptible to widely-used herbicides and have very short-lived seeds. The most far reaching effects of the aquatic use of herbicides are associated with the death of macrophytic vegetation. Within limits the nature of the chemical itself is transitional and unimportant. The effects of removal of macrophytes on the disappearance, migration to other habitats and increased predation of aquatic invertebrates due to loss of cover have been recorded.

1494

Hydrologic response to silvicultural activities.

AUTHOR: LEAF CF; TROENDLE CA
SOURCE TITLE: Chapter 2 in Non-Point Source Pollution Prediction Techniques.
SOURCE ID: US Forest Service and The Environmental Protection Agency, 1976, FS-EPA Interagency Agreement EPA-IAG-D6-0660.
YEAR PUBLISHED: 1976
CATEGORY: B2a; C4; D
SPONSOR: US Forest Service.; Environmental Protection Agency.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: evapotranspiration; forest; hydrologic cycle; impact; infiltration; interception; precipitation; silviculture; soil moisture; water; yield
ABSTRACT: (Purpose) Determination of procedures to evaluate hydrologic impacts of silvicultural activities with national applicability. (Time and Duration) Literature from 1940 to 1976. (Type of Research) State-of-the-art review. (Methodology) Procedures to evaluate hydrologic response to silvicultural activities are presented in three parts: overview of the hydrologic cycle, hydrologic impacts, and hydrologic analysis. The hydrologic cycle is used to develop a base for discussing general processes involved in the precipitation-runoff regime. Hydrologic parameters are quantified as simple mathematical equations that link basic vegetation-soil-water processes and identify the resultant effects of silvicultural activities on these dynamic and interactive processes. Upon completion of the national evaluation, areas of hydrologic similarities will be grouped into homogeneous regions and the material presented by regions in a handbook. (Results and Conclusions) The hydrologic cycle can be reduced to key processes which man can affect. A major abstraction to precipitation is canopy interception. Canopy removal permits more precipitation to strike the ground, but good litter cover and soil structure allow water to infiltrate. Surface disturbance affects these processes and alters the pathway of water to the stream channel. Basic hydrologic processes such as precipitation, snowmelt, infiltration, and evapotranspiration are related by equation to forest cover density and soil conditions to predict soil-water regimes and water yield responses due to silvicultural activities. These activities are expressed in terms of changes in soil-water-vegetation characteristics and resultant hydrologic changes; specifically evapotranspiration changes, soil moisture status, and water yield volume and timing.

1495

Guidelines for quantification of nutrients resulting from silvicultural activities.

AUTHOR: CRUMRINE JP; CURRIER J
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Chapter 5 of Non-Point Source Pollution Prediction Techniques.
SOURCE ID: US Forest Service and The Environmental Protection Agency, 1976, FS-EPA Interagency Agreement EPA-IAG-D6-0660.
YEAR PUBLISHED: 1976
CATEGORY: B2a; B2b; C4
SPONSOR: US Forest Service.; Environmental Protection Agency.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: erosion; eutrophication; forest; impact; nitrogen; nutrients; phosphorus; quality; silviculture; stream; water
ABSTRACT: (Purpose) To develop guidelines on nutrient loading, insoluble and soluble components, and impacts on stream water chemistry from silvicultural activities. (Time and Duration) Literature from 1961 to 1975. (Type of Research) State-of-the-art review. (Methodology) Nutrient loading evaluation was presented as process evaluation models for forested areas. Organic nitrogen and total phosphorus were based on the sediment loading function derived from a modification of the Universal Soil Loss Equation. Concentration of total nitrogen and phosphorus in surface soil was obtained from existing maps or local Soil Conservation Service. Soluble inorganic nitrogen, NO3 and NH4, was based on the Crumrine-O'Hayre model which appeared best for application nationally. (Results and Conclusions) Silvicultural activities affect biogeochemical cycling of nutrients and cations by altering the total nutrient capital of the site through timber harvesting, fire, or fertilization and by altering the rate of organic matter decomposition, surface erosion, or ion exchange. Nitrogen and phosphorus are the nutrients of most concern with respect to water pollution and eutrophication. Nitrogen in the soil is primarily organically bound and is not readily transported. Ammonium and nitrate nitrogen are readily transported in solution but make up only a small proportion of total nitrogen. Phosphorus is present in the soil in organic or inorganic form. The primary mode of transport of organic nitrogen and total phosphorus is via surface erosion.

1496

Guidelines for quantification of temperature, dissolved oxygen, and organic matter changes resulting from silvicultural activities.

AUTHOR: CRUMRINE JP; CURRIER J
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Chapter 7 in Non-Point Source Pollution Prediction Techniques.
SOURCE ID: US Forest Service and The Environmental Protection Agency, 1976, FS-EPA Interagency Agreement EPA-IAG-D6-0660.
YEAR PUBLISHED: 1976
CATEGORY: B2a; C4; D
SPONSOR: US Forest Service.; Environmental Protection Agency.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: dissolved oxygen; forest; organic matter; quality; silviculture; stream; temperature; water
ABSTRACT: (Purpose) To evaluate impacts of silvicultural activities on stream temperature, dissolved oxygen and organic matter. (Time and Duration) Literature from 1963 to 1975 (Type of Research) State-of-the-art review (Methodology) Temperature and dissolved oxygen evaluation was limited to process simulation models for forested areas. Temperature change, in the theoretical model, is the product of stream exposed to sunlight from cutting times intensity of heating divided by stream discharge. In a modification, temperature change in percent is equal to the ratio length of stream exposed to the total length of stream above lower point of disturbance times 100. Temperature change is converted by a constant to degrees and the equation is used to determine allowable amount of stream exposed by harvesting. Dissolved oxygen can be directly linked to changes in stream temperature. (Results and Conclusions) Removal of shading vegetation by harvesting causes increased stream temperature due to increased heating from solar radiation. The magnitude of impact is a function of amount of canopy removed, length of time of full exposure, stream width and discharge, and initial temperature. High temperature can directly kill fish, decrease dissolved oxygen and increase fish susceptibility to disease, and indirectly alter community composition. Organic matter introduced into forest streams can at times cause decreased oxygen levels depending on amount of organic debris, formation of pools by blocking channels, and period of time debris exists in the stream.

1497

Preliminary proposal for stream channel erosion, deposition and transport evaluation and associated sediment discharge due to silvicultural activities.

AUTHOR: ROSGEN D
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Chapter 8 in Non-Point Source Pollution Prediction Techniques.
SOURCE ID: US Forest Service and The Environmental Protection Agency, 1976, FS-EPA Interagency Agreement EPA-IAG-D6-0660.
YEAR PUBLISHED: 1976
CATEGORY: B2a; C4; D
SPONSOR: US Forest Service.; Environmental Protection Agency.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: deposition; erosion; forest; quality; sediment; sediment transport; silviculture; stream; water
ABSTRACT: (Purpose) To describe an analytical process to quantify stream channel derived sediment and sediment production increases associated with silvicultural activities. (Time and Duration) Literature from 1953 to 1976 (Type of Research) State-of-the-art review. (Methodology) Techniques were designed to show changes in sediment production increases as a result of various altered management practices and management controls by local regressions using site specific information including water quality. The technique was adapted for streams of 3rd order or less. The basic analysis procedure utilizes the sediment rating curve approach. A flow chart framework method is applied to indicate the interrelationship between sediment derived from the surface erosion processes, mass wasting, roads and other direct contributions versus the changes in sediment from stream channels in response to stream-flow changes. (Results and Conclusions) One of the most significant water quality changes associated with silvicultural activities is that of accelerated inorganic sediment production. If down wasting rates are accelerated and/or the hydrologic regimen altered by silvicultural activities, total sediment production is increased at an exponential rate. In analyses of major processes involved, stormflow and snowmelt runoff are the major driving mechanisms. The analysis framework is conducted in steps to determine: 1) changes in streamflow for a given activity, 2) a sediment rating curve from suspended sediment data, 3) pre- and post-treatment sediment production from the channel, 4) introduced sediment from surface erosion and roads, 5) total suspended sediment, 6) bed load, and 7) modifiers of stability or rating curves.

1497

1498
Sediment prediction in wildland environments: A review
AUTHOR: FALLETTI DA
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Soil Erosion: Prediction and Control
SOURCE ID: Ankeny, IA, Soil Conservation Society of America, 1976, 183-192 p.
YEAR PUBLISHED: 1976
CATEGORY: B2a; B2b; C4
REPORT NUMBER: 21
REGION: Applicable to entire United States STATE: United States
KEYWORDS: erosion; forest; models; rangeland; sediment
ABSTRACT: (Purpose) To review the assessment of nonpoint water pollution as it relates to erosion and sediment prediction from forest and rangeland, referred to as wildland, environments. (Time and Duration) 38 references from 1954 to 1976. (Type of Research) Literature review (Methodology) The relative importance of various relationships in nonpoint sources of pollution were determined by independent evaluation of water quality parameters and land management activities. Individual parameter/activity relationships were ranked relative to their potential for water quality degradation using four categories: high, medium, low, and negligible. Existing models were evaluated for predicting nonpoint pollution from wildlands. Physical models related to surface runoff, erosion, and sedimentation discussed were streamflow, surface erosion, channel erosion, mass movement, and total sediment output. (Results and Conclusions) Most existing sediment models deal with surface erosion and were developed for agricultural lands. The review did not find any process-oriented models that predict sedimentation from unstable channels or mass-wasting sources. Total sediment output has been described mainly by regional regression models that may be difficult to relate to management alternatives. In many wildland environments channel erosion and/or mass wasting, rather than surface erosion, are the dominant sediment-producing processes. A comprehensive sediment-loading model is needed to provide a physical basis to evaluate the initial effects and trends in recovery time for massive site disturbances as well as the direct and secondary effects of vegetative manipulation in a wildland environment.

1499
Water management practices and their effects on nongame birds in range habitats.
AUTHOR: CAROTHERS SW; JOHNSON RR
AUTHOR AFFILIATION: Museum of Northern AZ.; Nat Park Service.
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975.
SOURCE ID: 1975, 210-222 p.
YEAR PUBLISHED: 1975
CATEGORY: B2a
REGION: Juniper-Pinyon Woodland + Sagebrush-Saltbush Mosaic STATE: Arizona
KEYWORDS: birds; ecosystem; environmental change; habitat; habitat change; habitat manipulation; impact; management; riparian; water
ABSTRACT: (Purpose) To discuss the impact of water management practices on bird habitat and consequential effects on number of species and population densities found in various habitat types. (Time and Duration) A discussion of findings of other researchers covering a 50 year period. (Type of Research) Literature survey. (Methodology) Literature review. (Results and Conclusions) Of the range habitats discussed, the grasslands have probably been most modified by man and his domestic herbivores. Species diversity and population densities discussed in this paper indicate low numbers of animals for the range habitats when compared with western coniferous forests or eastern deciduous hardwood forests. Urban situations in the southern desert shrub often support populations several times that of the original native habitat. Water management and salvage projects have endangered riparian ecosystems of the Southwest, where the highest population densities for non-colonial nesting birds in North America are recorded.

1500
Logging roads and protection of water quality.
SOURCE ID: Seattle, WA, Environmental Protection Agency, 1975, EPA910975007, 312 p.
YEAR PUBLISHED: 1975
CATEGORY: B2a; B2b; C2
SPONSOR: Environmental Protection Agency
REGION: Applicable to entire United States STATE: Alaska; Idaho; Oregon; Washington
KEYWORDS: erosion; forest; logging; pollution; quality; roads; sediment; silviculture; water
ABSTRACT: (Purpose) To provide a reference on the protection of water quality in planning, designing, constructing, reconstructing, using, and maintaining logging roads in EPA Region X. (Time and Duration) References from 1940 to 1974. (Type of Research) State-of-the-art review. (Methodology) This report deals specifically with logging roads which constitute an important aspect of silvicultural activities in Region X; Idaho, Oregon, Washington, and coastal Alaska. It is organized in two parts. Part one describes physical features of Region X including physiography and soils, geology, climate, and forest statistics; effect of logging roads on water quality; and surveillance and monitoring of non-point sources of pollution. Part two covers engineering criteria for planning, design, construction, and maintenance of logging haul roads directed toward sediment minimization. Specific criteria, procedures, and alternatives are presented for reducing degradation of water quality. (Results and Conclusions) Of all silvicultural activities, improperly constructed and inadequately maintained logging roads are conceded to be the principal man-caused source of sediment. Significant amounts of sediment reach streams by road surface erosion and mass soil movement. Many mass failures are associated with lack of drainage design. Minimizing surface erosion and sediment transport begins with the appropriate treatment or design of slope protection, and continues with the necessary attention to ditch size, lining, culvert intakes, culvert integrity, and culvert outlets. Under most conditions vegetative or other forms of permanent cover are essential to prevent excessive surface erosion from cut and fill slopes. Mulches, chemical soil stabilizers, or mechanical measures are necessary to prevent high initial soil loss during vegetation establishment

1501
Effects of timber harvesting and related management practices on water quality in forested watersheds.
AUTHOR: SOPPER WE
AUTHOR AFFILIATION: PA State Univ.
SOURCE TITLE: Journal of Environmental Quality
SOURCE ID: 4(1):24-29, 1975.
YEAR PUBLISHED: 1975
CATEGORY: B2a; B2b; C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: clearcutting; fertilization; forests; herbicides; impact; management; nutrient loss; quality; water; watersheds
ABSTRACT: (Purpose) To provide a panorama of the types of water quality investigations currently underway on forested watersheds throughout the US. (Time and Duration) 22 references from 1963 to 1975. (Type of Research) Review of selected studies. (Methodology) This review summarizes the adverse effects that three major forest land management activities — timber harvesting, fertilization, and use of herbicides — may have on water quality. Results are based on selected experimental watershed investigations conducted in MT, NC, NH, OR, PA, WA, and WV. Impacts considered are erosion and turbidity, water temperature, nutrient discharge, and water contamination from fertilizers and herbicides. (Results and Conclusions) Most erosion and water turbidity problems are traced to logging roads or other soil disturbances which can be minimized by applying technology developed for logging road location and construction in various forest regions. Forest cover removal may increase mean water temperature by 4 to 8 degrees and affect native fish populations and other aquatic life; impacts which can be avoided by leaving a narrow strip of vegetation along stream channels. Dramatic increases in nutrient losses were reported following drastic clearcutting and herbicide devegetation for 3 years at Hubbard Brook, NH. Nutrient losses from conventional clearcuts and strip cutting were considerably less in the same region. In contrast, nutrient losses following clearcutting in other regions of the US were small to negligible and did not reduce water quality below drinking water standards. The Hubbard Brook watershed study was considered atypical. Nitrogen concentrations in streams may increase due to fertilization, but it only persists for a short time and generally is below Public Health Drinking Water Limits. Herbicides if applied carefully to avoid drift or direct contact with streams at recommended rates do not impair water quality.

1502
Management of phreatophyte and riparian vegetation for maximum multiple use values.
AUTHOR: CAMPBELL CJ; HORTON JS
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Fort Collins, CO, US Forest Service, 1974, Research Paper RM117, 23 p.
YEAR PUBLISHED: 1974
CATEGORY: B2a
REGION: Applicable to entire United States STATE: Arizona; New Mexico; Texas

KEYWORDS: conservation; management; multiple use; riparian; vegetation; water
ABSTRACT: (Purpose) To summarize the knowledge about environmental relations of vegetation along water courses in the southwestern United States and impacts of vegetation management to reduce evapotranspiration on other resource values. (Type of Research) Literature review. (Methodology) The authors discuss measurement and evaluation of water losses from moist-site vegetation; ecological relationship including community changes and species characteristics; other resource uses of phreatophyte areas such as development of farms and grazing lands, wildlife, flood control, recreation, and preservation of natural conditions; and control of vegetation by mechanical and chemical means. An extensive literature review is included. (Results and Conclusions) Optimum management of moist-site areas, whether dominated by saltcedar, cottonwood or other riparian species, requires careful consideration of both environmental factors and the economic needs of the area. Seldom are areas best managed by devoting the land to a single use, as compromise management will usually return the greatest economic value. Only rarely in the Southwest are there phreatophyte areas that would be best managed by complete preservation. Examples are areas of cottonwood and other native species in southern portions of Arizona, which should definitely be set aside as natural areas.

1503
Ecological and environmental considerations in rights-of-way.
AUTHOR: WILLARD BD
AUTHOR AFFILIATION: Council on Env Quality.
SOURCE ID: 7-13, 1973 (August).
YEAR PUBLISHED: 1973
CATEGORY: B2a; B2b; B2c; B2d
REGION: Applicable to entire United States STATE: United States
KEYWORDS: ecological; ecology; ecosystem; environment; planning; principles; restoration; right-of-way; stability
ABSTRACT: (Purpose) To discuss ecological and environmental considerations in establishing ROWs so as to integrate the necessary human activities into the existing living systems with the least possible damage and loss, perhaps even with enhancement of those systems. (Type of Research) A review of ecological principles and terminology. (Methodology) The author reviews ecological terminology and principles, and points out what can be done in regard to right-of-way planning and development to better use ecological principles. (Results and Conclusions) Suggestions in ROW planning include: developing a sense of the first principle of ecology "everything affects everything else"; build ecological reconnaissance and information into planning at the earliest point; develop installation techniques that will alter the ecosystem as little as possible; locate the ROW in the transition zone between two ecosystems; choose grass or shrub communities over forests, as they will need less clearing or topping; select agricultural land wherever possible, as the growing of crops can continue with little change; choose disturbed ecosystems over mature, stable ones. Use helicopters for installations whenever possible.

1504
Fish and Wildlife habitat improvement in watershed projects.
AUTHOR: DILLON OW JR; MARRIAGE LD
AUTHOR AFFILIATION: Soil Conservation Service.
SOURCE TITLE: Wildlife & Water Management: Striking a Balance.
SOURCE ID: Ankeny, IA, Soil Conservation Society of America, 1973, 43-48 p.
YEAR PUBLISHED: 1973
CATEGORY: B2a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: fish; habitat; improvement; management; natural resources; recreation; reservoir; sedimentation; stream; watershed; wildlife
ABSTRACT: To show how watersheds can be developed and managed to offer significant and varied fish and wildlife opportunities. Recommendations and examples. (Results and Conclusions) Watershed programs offered under Watershed Protection and Flood Prevention Act of 1954 have aided materially in meeting increased demands of hunting and fishing. Considerations have included: controlling sediment by means of land treatment and structural measures; establishing and maintaining fish and fisheries in reservoirs; improving natural lakes by improving water levels; stream improvement for fish; providing passage for anadromous and migratory fish; manipulating water quality by alteration of outlet structures.

1505
Some environmental benefits of herbicides.
AUTHOR: BARRONS KC
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Down to Earth.
SOURCE ID: 29(1) :30-32, 1973.
YEAR PUBLISHED: 1973
CATEGORY: B2a; B2b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: benefits; environment; habitat; herbicides; impact; water; wildlife; yield
ABSTRACT: (Purpose) To point out some benefits, other than those traditionally considered, of using herbicides. (Type of Research) Literature review. (Methodology) Environmental benefits of herbicide use are discussed including: contribution to the crop yield revolution, soil fertility improvement, range and pasture management, water conservation, and wildlife habitat improvement. These are discussed to emphasize that the decision of whether or not to use herbicides should be based on many factors, rather than on economic factors alone. (Results and Conclusions) Trade-offs must be considered in deciding on the desirability of any method of vegetation control; they all have demonstrable environmental effects, whether they involve cutting, tillage, burning, or the use of herbicides. Benefits and detriments must both be entered in the ledger if an accurate balance sheet is to emerge and wise decisions made.

1506
The effect of strip-cutting on stream temperatures in the Hubbard Brook Experimental Forest, New Hampshire.
AUTHOR: BURTON TM; LIKENS GE
AUTHOR AFFILIATION: Cornell Univ.
SOURCE TITLE: BioScience.
SOURCE ID: 23(7):433-435, 1973.
YEAR PUBLISHED: 1973
CATEGORY: B2a
REPORT NUMBER: HBES51
SPONSOR: Nat Science Foundation.
REGION: Appalachian Oak Forest STATE: New Hampshire
KEYWORDS: buffer zone; canopy; clearing; community structure; impact; no-cut area; stream; temperature
ABSTRACT: (Purpose) To determine the effect of forest canopy removal on stream temperature. (Time and Duration) July 1971 - 2 hours; August 7, 1971 - ? hours; October 21-26, 1971 - 120 hours; July 18, 1972 - 1 hour. (Type of Research) Original and literature review. (Methodology) A small watershed was divided into horizontal strips 25m wide; every third strip was logged commercially in 1970. In lower reaches, a 10m strip of trees was left on each side of stream. Temperature was measured in this fast-flowing stream in each cut and uncut strip 5-10m above the lower edge on a sunny day and a cloudy day in summer. An attempt was made to measure single mass of water with aid of a dye. Maximum-minimum thermometers installed in stream in October. Study-section was 625m. Stream averaged 2.9 in width. (Results and Conclusions) On a sunny summer day, rapid heating of 4.5 degrees C occurred in cut strips with no buffer zone and subsequent cooling in uncut. Buffered cut strips (10m of trees) showed very little fluctuation. Temperature differential reduced on cloudy day toi

1507
What happens to phenoxy herbicides when applied to a watershed area.
AUTHOR: RITTY PM; WINSTON AW JR
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Industrial Vegetation Management.
SOURCE ID: 4(1) :12-14, 1972.
YEAR PUBLISHED: 1972
CATEGORY: B2a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: degradation; herbicides; phenoxies; watershed; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To discuss the products of decomposition of the phenoxy herbicides by soil microflora and the effect of these decomposition products on water supplies. (Time and Duration) One-year study. (Type of Research) Original research (laboratory and field). (Methodology) Laboratory apparatus used consisted of a supply of phenoxy solutions, an aerator (since biological oxidation by bacteria occurs generally under aerobic conditions), a settling chamber and proportioning pump to provide continuous feed at a set rate. The effluent were collected and chemically analyzed to determine components or degradation products. In other work, taste and odor studies were used. (Results and Conclusions) These phenoxy herbicides are decomposed into carbon dioxide, inorganic chloride ions and water. Free phenols are decreased, rather than increased, by bacterial degradation and are not the breakdown products of phenoxy herbicides. Aromatic oils have a much lower taste and odor threshold than the active ingredients in reputable phenoxy herbicide formulations. These oils, however, are decomposed even more rapidly than the phenoxy components. Therefore, reputable commercial formulations properly applied to watershed areas do not constitute a water pollution hazard ***UPDATE DATE: 78029
CREATE DATE: 78029A

1507

1508
Changes in streamflow following partial clearcutting on a forested watershed.
AUTHOR: LYNCH JA; PARTRIDGE DB; SOPPER WE
AUTHOR AFFILIATION: PA State Univ.
SOURCE TITLE: Pages 313-320 in Proceedings National Symposium on watersheds in Transition.
SOURCE ID: American Water Resources Assoc, 1972.
YEAR PUBLISHED: 1972
CATEGORY: B2a; C4
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: clearing; forest; impact; quality; stream; streamflow; temperature; turbidity; water; watershed
ABSTRACT: (Purpose) To determine the effects on water yield and water quality of clearcutting the lower slope riparian vegetation of an experimental watershed in central PA. (Time and Duration) 1967 to 1971; 4 years. (Type of Research) Original field research. (Methodology) The Leading Ridge Watershed Research Unit, consisting of 3 experimental watersheds, was established in an upland oak-hickory forest type of central PA in 1959. Following a 7-year calibration period, all timber was removed from the lower one-third of the 106-acre Watershed 2. Cutting was done in the winter and skid trails and logging roads were carefully located to reduce disturbance and erosion. All slash was removed from the stream channel and lopped and scattered. Roads and log loading areas were limed, fertilized and seeded with ryegrass after cutting was completed. The clearcut area was sprayed with a mixture of 2,4,5-T and 2,4-D for 3 years to control stump sprouts. Treatment effects on water quality and quantity were studied for 4 years. (Results and Conclusions) Clearcutting one-third of the watershed resulted in annual water yield increases of 1.25 to 2.89 area-inches in each of 4 years following cutting. Most water yield increases, 0.89 to 2.10 area-inches, occurred during the growing season due to reduced canopy interception and evapotranspiration. Monthly distribution of precipitation, rather than total yearly amount, influenced magnitude and timing of monthly, seasonal and annual water yield increases. During the 4-month logging period, only 8 of 23 turbidity samples exceeded 25 ppm. Maximum nonstorm and storm turbidity during logging was 175 and 550 ppm, respectively. The adjacent control watershed never exceeded 10 ppm turbidity. Most turbidity traced to disturbed areas decreased immediately after logging was completed. Clearcutting caused an increase of 6 degrees F in maximum water temperature, while minimum temperature was unchanged.

1509
Herbicides and water quality in American Forestry.
AUTHOR: PATRIC JH
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Proceedings Northeast Weed Science Society.
SOURCE ID: 25:365-375, 1971.
YEAR PUBLISHED: 1971
CATEGORY: B2a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: forest; herbicides; quality; water
ABSTRACT: (Purpose) To review the scientific literature and to evaluate the effect of hericides used in forests on water quality. (Time and Duration) One-year study. (Type of Research) Literature review. (Methodology) Fifty-four pertinent articles related to the use of herbicides on forest lands and their effect on water quality were reviewed. Effects on water quality, non-forestry studies and a discussion with recommendations. (Results and Conclusions) No report suggested that proper herbicide use has limited the usefulness of water in forest streams. Rules for reducing water pollution by herbicides are: 1) select the least toxic and persistent herbicide that will do the job; 2) follow the manufacturer's instructions; 3) avoid direct application into streams or on streamside vegetation; 4) store or dispose of herbicides where they are least likely to damage water supplies; 5) re-treat vegetation only as needed to maintain treatment objectives.

1510
Water temperature in small streams as influenced by environmental factors and logging.
AUTHOR: BROWN GW
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Forest Land Uses and Stream Environment, proceedings of a symposium.
SOURCE ID: Corvallis, OR, OR State Univ, 1971, 175-181 p.
YEAR PUBLISHED: 1971
CATEGORY: B2a; B2c; C4
SPONSOR: OR State Univ.
REGION: Pacific Forest STATE: United States
KEYWORDS: clearcutting; clearing; environment; streams; temperature; water
ABSTRACT: (Purpose) To describe the environmental factors which influence the temperature of small forest streams, how these factors are altered by logging, and the effects of logging on stream temperatures. (Time and Duration) 4 years; 1966-69. (Type of Research) Original field research. (Methodology) Three watersheds ranging in size from 150 to 750 acres received one of the following treatments: clearcut, patch cut, no cutting. Thermographs were placed at eighteen stream locations and data collected for one year before treatment and three years after treatment. (Results and Conclusions) Clearcut logging can produce large changes in stream temperatures in small forest streams. The principal source of heat is direct solar radiation. Shade removal may increase radiation loads by 6 to 7 times. Temperature control can best be achieved by providing shade between the boundary of the clearcut and the stream. Adequate shade may be provided by brush species if the stream is small. The changes in water temperature both at the site and downstream can be predicted using the simple equations offered by the author.

1511
The recovery of damaged streams.
AUTHOR: CAIRNS J JR; CROSSMAN JS; DICKSON KL
AUTHOR AFFILIATION: VA Polytechnic Institute
SOURCE TITLE: Association of Southeastern Biologists Bulletin.
SOURCE ID: 18(3):79-106, 1971.
YEAR PUBLISHED: 1971
CATEGORY: B2a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: degradation; improvement; pollution; stream
ABSTRACT: (Purpose) To discuss factors influencing the rate of recovery and restoration of damaged stream ecosystems. (Time and Duration) Two-year study. (Type of Research) Original research (field study). (Methodology) Four streams were studied, all located in Virginia. Shock acidification of a healthy stream was used to study its effects and then the gradual recovery of the aquatic community. Sulfuric acid was poured into the stream correlating this with an induced low flow. Macro-invertebrate samples were collected in both treated and untreated sections of the stream during the four weeks before treatment as well as immediately after acid addition. Periodic sampling was made thereafter. (Results and Conclusions) Biological recovery of damaged streams is a function of the physical, chemical and biological characteristics of the receiving stream, the severity and duration of the stress, and the availability of undamaged areas to serve as sources for recolonizing organisms. Short term acute stresses, produced by release of acidic or caustic materials, elicit a response pattern in the macroinvertebrate and fish communities typified by an immediate reduction in the number of specimens. When no residual toxicity is found and there are undamaged areas available to act as a source for recolonizing organisms, a rapid recovery occurs.

1512
Streamflow changes after forest clearing in New England.
AUTHOR: FEDERER CA; HORNBECK JW; PIERCE RS
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Water Resources Research.
SOURCE ID: 6(4):1124-1131, 1970.
YEAR PUBLISHED: 1970
CATEGORY: B2a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: clearing; flow; flow alteration; forest; stream
ABSTRACT: (Purpose) To summarize and discuss the changes in quantity and timing of water yield during the first three years after clearing a New England watershed. (Time and Duration) 3-year study. (Type of Research) Original research (field study). (Methodology) Two adjoining watersheds were used for this study. Watershed 2, 39 acres in area, was cleared; watershed 3, an untreated watershed, is 105 acres in area. Both watersheds have southerly aspects and average slopes of 20-30 percent. Watershed 2 was cleared between November 18 and December 31, 1965. All trees were felled and left in place; branches and stems were lopped to a maximum height of 3 ft above ground. Woody regeneration and stump sprouts were treated with herbicide in 1967 and 1968. (Results and Conclusions) Clearing a hardwood forest cover and preventing regrowth with herbicides increased annual water yield an average 12.2 area-inches for the first two water years after treatment. Most of the increase occurred during the critical low flow months (June through September), and the amount was governed in large part by rainfall in this period. There was a small advance of snowmelt runoff and a consistent increase in growing season high flow values. Thus, sizeable streamflow increases can result from forest clearing in the uplands of eastern United States.

1513
Erosion control on logging roads in the Appalachians.
AUTHOR: KOCHENDERFER JN
AUTHOR AFFILIATION: US Forest Service
SOURCE ID: Upper Darby, PA, US Forest Service, 1970, Research Paper NE158, 28 p.
YEAR PUBLISHED: 1970
CATEGORY: B2a; B2b; C4
REPORT NUMBER: NE158

REGION: Applicable to entire United States STATE: United States
KEYWORDS: erosion; erosion control; forest; logging; roads; seeding
ABSTRACT: (Purpose) To summarize what land managers know about preventing and controlling erosion on logging roads in the Appalachians. (Time and Duration) References from 1957 to 1968. (Type of Research) General review. (Methodology) The author presents a general review of erosion problems on logging roads in the Appalachinas. Eleven publications are listed in the bibliography but statements in the text are not directly referenced. The review includes information on what is known about road system planning, logging road location, drainage, maintenance, traffic regulation, care after logging, and seeding. (Results and Conclusions) It is concluded that the real sources of erosion damage in forest harvesting are the roads used to remove forest products. Aerial photos and topographic maps are recommended for use in planning to avoid damage to other resources. Road grades should seldom exceed 10% or be less than 3% to provide adequate drainage. Filter strips of undisturbed forest soils at least 100 feet wide should be provided between logging roads and streams. Roads must be adequately drained through proper use of culverts, dips, bridges, and outsloping to reduce erosion. Periodic road maintenance and regulation of traffic, especially during wet periods, is necessary to reduce erosion risk. When logging is completed, road surfaces should be smoothed to about 3% outslope, drainage structures cleaned, and areas of high erosion hazard seeded with a mixture of grass and legumes.

1514
Interaction of pesticides with aquatic microorganisms and plankton.
AUTHOR: ROAN CC; WARE GW
AUTHOR AFFILIATION: Univ of AZ.
SOURCE TITLE: Residue Reviews.
SOURCE ID: 33:15-45, 1970.
YEAR PUBLISHED: 1970
CATEGORY: B2a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: aquatic; herbicides; life; pesticide; toxicity; water
ABSTRACT: (Purpose) To review the literature concerning the interaction of pesticides (insecticides and herbicides primarily) with aquatic microorganisms and plankton. (Type of Research) Literature review. (Methodology) The authors review the literature related to the entry of pesticides into aquatic environments; toxicity of pesticides to aquatic microorganisms; concentration of pesticides; metabolism of pesticides. (Results and Conclusions) Pesticides do not always interact with aquatic microorganisms as predicted. Generally all pesticides are toxic to all microorganisms at some dosage. Toxicity includes changes in growth rate, metabolic rate and photosynthesis. The phenylureas are the most toxic herbicides to phytoplankton—while the cyclodienes are the most toxic insecticides. DDT can reduce photosynthesis in phytoplankton, and is also the most toxic material to many crustaceae. Aquatic microorganisms absorb and concentrate pesticides from water apparently inversely related to the water solubility of the compound.

1515
Some ecological benefits of woody plant control with herbicides.
AUTHOR: BARRONS KC
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Science.
SOURCE ID: 165:465-468, 1969.
YEAR PUBLISHED: 1969
CATEGORY: B2a; B2b; B4a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: ecology; grazing capacity; herbicides; runoff; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) This article was written to rebut the statements of some ecologists that the use of herbicide defoliants for controlling undesirable woody plants in pastures might result in soil erosion and soil laterization. (Time and Duration) The research reviewed in this article was published between 1961—1968. (Type of Research) Literature review. (Results and Conclusions) Numerous studies of the use of 2,4-D, 2,4,5-T and picloram on range and pastureland to improve productivity indicate that proper herbicide use removes many unwanted trees, brush and woody vines, and results in an increase in useful herbage. The resulting grass cover on treated range and pastureland had 75 percent less water runoff than from adjacent areas of brushland. The future importance of herbicides in controlling unpalatable, nonnutritious and poisonous plant growth is outlined and discussed.

1516
Loss of herbicides in runoff water.
AUTHOR: MERKLE MG; MORTON HL; TRICHELL DW
AUTHOR AFFILIATION: TX A & M Univ.
SOURCE TITLE: Weed Science.
SOURCE ID: 16(4):447-449, 1968.
YEAR PUBLISHED: 1968
CATEGORY: B2a; B2b
REGION: Applicable to entire United States STATE: Texas
KEYWORDS: chemicals; herbicides; picloram; runoff; water; 2,4,5-T
ABSTRACT: (Purpose) To determine the amount of herbicide in the runoff from small plots following simulated rainfall. (Time and Duration) 4 months. (Type of Research) Original. (Methodology) 10'x10' fallow and sod plots with slopes of 3% or 8% were treated with 1 gallon of solution of 2,4,5-T, dicamba, and picloram each at rates of 1 or 2 pounds per acre. In one experiment with picloram, only upper 50% of plot treated. All plots received a simulated rainfall of one-half inch in an hour, 24 hours after application and again four months later. Runoff water was collected and analyses made by gas chromatography and bioassay using 100 ml of run-off on bean seedlings and observing subsequent growth. 24 hours after application, losses of dicamba and picloram were greater (4 and 3 times) from sod plots than from fallow plots while 2,4,5-T losses were about equal. For picloram there was no sign of difference in percent loss from 8% or 3% slope, or in the rate of application. However, the percent of picloram lost decreased when runoff passed over untreated sod, which suggests that the distance between treated area and major water arteries is an important pollution consideration. Bioassays 24 hours after application resulted in death or altered growth of bean plants. Losses of all herbicides after four months averaged less than 1% of that after 24 hours. (There had been 8.5 inches of natural rainfall in the interim).

1517
Changing water temperatures in small mountain streams.
AUTHOR: BROWN GW; KRYGIER JT
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Journal of Soil and Water Conservation.
SOURCE ID: 22:242-244, 1967.
YEAR PUBLISHED: 1967
CATEGORY: B2a
REGION: Silver Fir-Douglas-fir Forest STATE: Oregon
KEYWORDS: clearcutting; clearing; ecosystem; fish; habitat; impact; stream; temperature; watershed
ABSTRACT: (Purose) To determine the effect of timber cutting on water temperature in small stream. (Time and Duration) Two years, 1964 to 1966. (Type of Research) Original. (Methodology) Temperatures of small streams were monitored at 20 thermograph stations for two years at outlets of two watersheds, one of which was subsequently clearcut. Temperatures taken following cutting. Second study site in two year old clearcutting where stream had been scoured and all vegetation removed for 1300 feet by a mud slide. Temperature measured at upper and lower ends of this site, using florescent dyes to determine travel time. (Results and Conclusions) Stream temperatures similar at outlets of two watersheds prior to clearcutting of one. Clearcutting regularly increased the daily change in temperature by 11 degrees F during first half of August, and the mean monthly maximum by 14 degrees F in September. In the second study, the water in its passage through the clearcutting increased 16 degrees F during midday. Reaction of these small mountain streams is extremely significant as they are salmon spawning grounds and source of municipal water supplies. Discussion of many interactions of temperature and water quality in this ecosystem, both directly and indirectly. Small streams heat more readily than large.

1518
Wetland road crossings: drainage problems and timber damage.
AUTHOR: STOECKELER JH
AUTHOR AFFILIATION: US Forest Service North Central Forest Experiment Station.
SOURCE ID: St Paul, MN, US Forest Service Research Note NC-27, 1967, 4 p.
YEAR PUBLISHED: 1967
CATEGORY: B2a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: damage; flood; mortality; ponding; right-of-way; wetland
ABSTRACT: (Purpose) To evaluate tree damage and drainage problems caused by the damming effect of roads. (Time and Duration) One-year study. (Type of Research) Original research (field study). (Methodology) A common sight in the Lake States is dead or dying timber in patches or strips along one side of a wetland forest road. Cause is failure to provide adequate cross drainage. A survey was made of 70 wetland crossings, located in Minnesota. A starting point was selected at random and the first 10 forest wetland crossings found in each of 7 counties were studied. Forest types involved were largely pure black spruce, tamarack, and mixtures of these two with northern white-cedar. The swamp hardwood type was also studied. (Results and Conclusions) Occurrence of damage was affected by the direction of the road in relation to the contour of the land. All 39 crossings that showed damage were within 45 degrees of being parallel to the contour (they ran across the drainage flow). The chief problems were absence of culverts or other cross drainage, culverts set too high, no collector ditch, no discharge ditch, inadequate collector or discharge ditches, and low culvert capacity. One of the crucial cross-drainage problems is the shallow placement of culverts, causing pools of water to form and kill timber.

1518

1519
Major environmental factors that affect the location, design, and construction of stabilized forest roads.
AUTHOR: GARDNER RB
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Loggers Handbook.
SOURCE ID: 27:12-13, 170-173, 1967.
YEAR PUBLISHED: 1967
CATEGORY: B2a; B2b; C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: construction; design; environment; forest; right-of-way; roads; stabilization
ABSTRACT: (Purpose) To review and discuss the environmental factors that influence location, design, and construction of stabilized forest roads. (Time and Duration) Thirteen references for 1935 to 1964. (Type of Research) Literature review. (Methodology) Introductory statements point out that in the first 60 years of the National Forest system about 200,000 miles of roads, worth about $2.5 billion, were constructed on National Forests and forecasts indicate that an additional 350, 000 miles costing $5 to $6 billion will be required. Further, roads were recognized as a major contributor to sediment resulting from on-the-ground development and use of forests and that sediment can be reduced by proper road design. A stabilized road was generally defined as one located and constructed to retain its basic geometric-as-constructed form sufficient to perform service without excessive maintenance or sediment movement. Environmental factors considered in road stability were soil texture, slope, aspect, precipitation, vegetation, and geology. (Results and Conclusions) Soil particle size, aggregate size, and detachability are the most important soil properties that influence erosion and road design. Other important properties are cohesion angle of internal fraction, porosity, permeability, and bearing strength. Slope steepness and length interact with other environmental factors in influencing the erosion process. Aspect affects functional characteristics of forest roads more than design and stability. Design of drainage and water control structures depends directly on amounts and intensities of precipitation. Vegetation is valuable for preventing surface erosion from cut and fill banks, but reliable quantitative data are lacking. Knowledge of land forms is important to identify areas with unfavorable dip and fault characteristics as well as those having potential slumping or slipping characteristics.

1520
Effects of weed burning on stream conditions.
AUTHOR: CUSHING CE JR; OLSON PA
AUTHOR AFFILIATION: Hanford Lab of General Electric Co.
SOURCE TITLE: Transactions of the American Fishery Society
SOURCE ID: 92(3):303-305, 1963.
YEAR PUBLISHED: 1963
CATEGORY: B2a
CONTRACT NUMBER: AT4511350
SPONSOR: Atomic Energy Commission
REGION: Ponderosa Shrub Forest STATE: Oregon; Washington
KEYWORDS: burning; fish, toxicity to; impact; stream; weeds
ABSTRACT: (Purpose) A cursory study of one burning in a small ditch was made to determine if by-products of the operation were deleterious to the native fish in the stream. (Time and Duration) One year study. (Type of Research) Original research (field study). (Methodology) A section of stream 245 yards long was selected for study, and the thistle mat covering the upper 180 yards was burned. The stream averaged 7 feet wide and 10 inches deep in the section burned and water velocity was negligible. The thistle mat had obscured the stream completely. Observation stations were located immediately below the area to be burned, at 173 yards below, and at 245 yards below. Ash production was estimated by weighing the ash deposited in upturned garbage-can lids placed at several locations under the thistles. (Results and Conclusions) The pH increased rapidly from 7.8 to 11.1 coincidentally with a temperature increase. The calcium and magnesium concentrations of the high-pH water were about twice those of the samples taken prior to burning. Potassium concentration increased threefold, but sodium increased only slightly. These increases were due to the estimated 20 kg of ash which were deposited in the stream. The fish showed marked distress at the time of increased temperatures and high pH; however, no mortalities resulted.

1521
Logging and erosion on rough terrain in the east.
AUTHOR: LULL HW; REINHART KG
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Pages 43-47 in Proceedings Federal Interagency Sedimentation Conference.
SOURCE ID: US Dept of Agriculture Miscellaneous Publication 970, 1963.
YEAR PUBLISHED: 1963
CATEGORY: B2a; B2b; C4
REGION: Eastern Deciduous Forest STATE: North Carolina; New Hampshire; West Virginia
KEYWORDS: erosion; forest, logging; quality; sedimentation; soil; water, watersheds
ABSTRACT: (Purpose) To review effects of logging on erosion in mountainous terrain of the eastern US. (Time and Duration) Eleven references from 1940 to 1960. (Type of Research) Literature review (Methodology) The review includes a brief synopsis of logging history in the southern Appalachian, Allegheny, White and Green Mountains and the occurrence of logging roads that are still traceable today. Erosion and stream sedimentation from cut over forest land, based on research conducted at the Coweeta Hydrologic Laboratory in NC, Fernow Experimental Forest in WV, and Hubbard Brook Experimental Forest in NH are discussed. Factors related to reduction in erosion after logging are identified. (Results and Conclusions) Stream turbidity from second-growth forested watersheds that haven't been logged for several decades is generally less than 2 ppm during nonstorm periods and under 11 ppm during most storm periods. Exploitive logging, however, increased maximum turbidity to 5,700 ppm at Coweeta and 56,000 ppm at the Fernow Forest, with the major source of sediment being improperly constructed skidroads and skidroads located too close to streams. Road location was identified as the most important factor in water-quality control during logging. The minimum distance of logging roads from a stream should be 25 feet plus 2 feet for each percent of slope between road and stream. Rapid reduction of erosion after logging was related to development of erosion pavements, invasion of vegetation, and leaf fall.

1522
Recommended logging practices for watershed protection in western Oregon.
AUTHOR: AMERICAN FORESTERS
AUTHOR AFFILIATION: Society of American Foresters.
SOURCE TITLE: Journal of Forestry.
SOURCE ID: Pages 460-465, 1959 (June).
YEAR PUBLISHED: 1959
CATEGORY: B2a
REGION: Cedar-Hemlock-Douglas-fir Forest STATE: Oregon
KEYWORDS: control; logging; roads; sediment; watershed
ABSTRACT: (Purpose) To present recommendations formulated by the Columbia River Section, Society of American Foresters for protection of watersheds during and after logging. (Type of Research) Based on experience and literature review (Methodology) A Watershed Management Committee of this Columbia River Section presents recommendations on laying out and planning the cutting area, road location and design, road construction, road maintenance, the logging operation and post operational clean-up and maintenance. These recommendations are for lands in western Oregon where rainfall is high (35 inches or more per year). They consider the impact of practices over the long period. (Results and Conclusions) Among recommendations of interest to ROW managers are: Use cull log crossings on streams until culverts can be placed. Uncompleted road grades which may be subject to considerable washing before final grading should be out-sloped or cross drained. Hold wet weather road building to a minimum. Avoid the inclusion of slash, logs or other organic debris in fills. Avoid channel changes or disturbances of stream channel. In building bridges, footings and abutments, limit machine work as much as possible to avoid disturbing the stream. Do not take gravel from stream beds. Culverts should be properly placed allowing for stable beds, adequate size, frequency and grade.

1523
Effects of vegetation removal on spring flow.
AUTHOR: BISWELL HH; SCHULTZ AM
AUTHOR AFFILIATION: Univ of CA.
SOURCE TITLE: California Fish and Game
SOURCE ID: 44(3):211-230, 1958.
YEAR PUBLISHED: 1958
CATEGORY: B2a
REGION: California Chaparral STATE: California
KEYWORDS: impact; water
ABSTRACT: (Purpose) To make quantitative measurements of increases in spring and creek flow and to observe situations where this occurs. (Time and Duration) 1945-1950; 2 years. (Type of Research) Original research. (Methodology) Spring flows were measured by collecting the amount of water after plant cover manipulation. (Results and Conclusions) Increases in flow resulted from brush and tree removal, conversion from trees and shrubs to shallow-rooted species, removal of plants whose roots were in free water, and a decrease in infiltration. The amount of stream flow increase varied considerably.

1524
How far from a stream should a logging road be located?
AUTHOR: SARTZ RS, TRIMBLE JR GR
AUTHOR AFFILIATION: US Forest Service
SOURCE TITLE: Journal of Forestry
SOURCE ID: 55:339-341, 1957
YEAR PUBLISHED: 1957
CATEGORY: B2a, B2b; C4
REGION: Northern Hardwoods - Spruce Forest STATE: New Hampshire
KEYWORDS: forest; logging roads; runoff; sediment transport; stream
ABSTRACT: (Purpose) To determine the width of filtration strip needed between logging roads and streams to filter road runoff and sediment. (Time and Duration) Fall 1956. (Type of Research) Original field research. (Methodology) Observations on sediment-discharge distance were made along a forest road of the Hubbard Brook Experimental Forest in NH. The soil was a well-drained sandy loam, with some impeded drainage due to hardpan, covered with hardwood leaf litter and 2 to 5 inches of humus. One section of the road, once used for logging sleds, was reopened as a watershed access road in 1955 and a new section was bulldozed in 1956. Both road sections were drained by open-top log culverts spaced at 50 foot intervals on 20% grades and 100 foot intervals on 10% grades. Distance of sediment movement in relation to degree of slope was measured at 36 culverts and data plotted as a curve to provide a guide to the width of strip needed. (Results and Conclusions) One of the most important factors that affects the distance sediment is carried is the way hollows, breaks in slope gradient, and slash and windthrown limbs and trees trap sediment. Based on sediment movement distance and slope gradients, rule-of-thumb recommendations on filtration strip widths were made for general watershed situations and for municipal watersheds where water quality is of paramount importance. For the general situation, the recommendation is a 25-foot strip on level land plus 2 feet additional width for each 1-percent increase in slope between road and stream, and for municipal watersheds a 50-foot strip is recommended on level land plus 4 feet additional width for each 1-percent increase in slope gradient. Data are limited in range to slopes between 10 and 46 percent and must be extrapolated beyond these limits.

1525
Chemical tests for trichloroacetic acid.
AUTHOR: HUMMER RW
SOURCE TITLE: Proceedings North Central Weed Control Conference.
SOURCE ID: 7:103, 1950.
YEAR PUBLISHED: 1950
CATEGORY: B2a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; tests
ABSTRACT: (Purpose) To outline a chemical test for the presence of trichloroacetic acid (TCA). (Time and Duration) One-year study. (Type of Research) Original research (laboratory). (Methodology) Chemical tests, qualitative or quantitative, must find their basis in the fundamental chemical reactions of the substance under consideration. The most interesting property of TCA is its relatively high solubility both in water and in organic solvents. Amyl alcohols offer the most promise for extracting TCA from aqueous media. Chemically TCA is a strong acid compared with mineral acids such as HCl and H_2SO_4. In the presence of alkaline agents or even in water solution, TCA can undergo a breakdown into trichloromethane and carbon dioxide. (Results and Conclusions) A review of chlorimetric tests for chloroform led us to a test which can be adapted to quantitative determination of TCA. An aliquot of the solution to be tested is treated with tenfold quantities of 30% sodium hydroxide solution and pyridine. The mixture is heated for 5 minutes. A magenta color develops in the pyridine layer in the presence of TCA. A calibration curve is prepared for the range of 10 to 100 micrograms to TCA using a photometer.

1526
Erosion silt as a factor in aquatic environments.
AUTHOR: ELLIS MM
AUTHOR AFFILIATION: US Bureau of Fisheries.
SOURCE TITLE: Ecology.
SOURCE ID: 17(1):29-42, 1936.
YEAR PUBLISHED: 1936
CATEGORY: B2a; C
REGION: Applicable to entire United States STATE: United States
KEYWORDS: aquatic; environment; erosion; silt
ABSTRACT: (Purpose) To ascertain quantitatively some of the specific effects of erosion silt on aquatic complexes. (Time and Duration) 1931 to 1934. (Type of Research) Original field research. (Methodology) Biophysical and biochemical studies were made at over 700 stations on streams of the Mississippi-Ohio-Missouri System and at Bureau of Fisheries Laboratories at Columbia, MO, and Fort Worth, TX. Water carrying erosion silt was analyzed to determine light penetration by turbidity measurement, limits of penetration of visible light, penetration of colored light of various wave lengths by spectographic photographs and measurements of colored light transmission, temperature adjustments, electrolytes, and bottom conditions such as silt blanketing and retention of organic matter. (Results and Conclusions) Erosion silt affects aquatic environments by screening out light, changing heat radiation, blanketing the stream bottom, and retaining organic material at the bottom. The millionth intensity depth for light penetration was reduced from 15,000 mm to 34,000 mm or more, to 1,000 mm or less. Erosion silt acts chiefly as an opaque screen to all wave lengths of visible light. Silt alters the rate of temperature change in river waters. Except for very quiet portions, silt is distributed throughout river waters even in deep holes. Silt did not materially alter the salt complex or amount of electrolytes. Silt layers of one-fourth to one inch thick caused high mortality to fresh-water mussels. Organic matter in erosion silt ranged from 8 to 12% of the dry weight of bottom mud.

1527
Persistence of 2,4-D and 2,4,5-T in chaparral soil and vegetation.
AUTHOR: MONTGOMERY ML; NORRIS LA; PLUMB TR
AUTHOR AFFILIATION: US Forest Service.; OR State Univ.
SOURCE TITLE: Bulletin of Environmental Contamination & Toxicology.
SOURCE ID: 17(1):1-8, 1977.
YEAR PUBLISHED: 1977
CATEGORY: B2b
REGION: Creosote Bush-Bur Sage STATE: California
KEYWORDS: herbicides; persistence; soil; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To report on the movement and persistence of 2,4-D and 2,4,5-T in soil and sprouting chamise vegetation for 1 year after application in a southern California chaparral site. (Time and Duration) One-year study. (Type of Research) Original research (field and laboratory). (Methodology) Study plants were two-year old regrowth of chamise which occurred after a wildfire near San Diego in September 1970. Experiment was a randomized block design with 5 replications, using 15m by 15m plots. The propylene glycol butyl ether esters of 2,4-D and 2,4,5-T were used at 3.4 kg ae each in 187 L of water per hectare. Terminal 15cm of sprouts from randomly selected chamise plants were collected 0, 14, 29, 65, 146 and 379 days after spraying. Soil samples were also collected at the same intervals. (Results and Conclusions) Maximum herbicide concentrations of 95.2 ppmw of 2,4-D and 92.4 ppmw of 2,4,5-T were in vegetation samples collected within 15 minutes after application. Mean levels declined rapidly, and 3.8 ppmw of 2,4-D and 2.5 ppmw of 2,4,5-T remained 12.5 months after applications in the chamise shoots that had originally been sprayed. The concentration of 2,4-D and 2,4,5-T in the upper 10cm of soil were 1.16 and 0.88 ppmw, respectively, 14 days after spraying. Within 69 days, an average of 0.22 ppmw of 2,4-D and 0.29 ppmw of 2,4,5-T remained, and 12.5 months after spraying only 0.04 to 0.05 ppmw of either chemical could be detected.

1528
Soil compaction after tree-length skidding in northern Mississippi.
AUTHOR: DICKERSON BP
AUTHOR AFFILIATION: US Forest Service Southern Forest Experiment Station.
SOURCE TITLE: Soil Science Society of America, Journal
SOURCE ID: 40:965-966, 1976.
YEAR PUBLISHED: 1976
CATEGORY: B2b
REGION: Southeastern Mixed Forest STATE: Alabama; Mississippi
KEYWORDS: compaction; impact; logging; soil
ABSTRACT: (Purpose) Tree-length harvesting with rubber-tired skidders causes soil compaction which impairs percolation and inhibits growth and regeneration of trees. This paper describes a 5-year study of changes in soil physical properties after tree-length harvesting. (Time and Duration) 5-year study. (Type of Research) Original research (field study). (Methodology) The study area was near Oxford, MS, in a mature pine-hardwood stand. Soils were of the Lexington and Ruston series; textures ranged from a loamy sand to a silty clay loam. During skidding they were relatively wet; moisture ranged from 12% by volume for sandy soils to 35% for the silt loams. In February 1967, 20 skid trails of varying lengths were created by skidding straight up slopes with a rubber-tired skidder. Three hardwood logs, each 35 feet long and 11 inches in top diameter were skidded seven times over each trail. (Results and Conclusions) After skidding with a rubber-tired skidder, bulk densities of wheel-rutted soils increased an average of 20% to 1.55 g/cm3; the increase was 10% for the soils between the ruts which were compacted by the movement of logs. Macropores were reduced 68% for wheel-rutted soils and 38% for log-disturbed soils; Percolation rates decreased initially but recovered gradually. Wheel-rutted soils require about 12 years to recover and log-disturbed soils about 8 years.

1528

1529
Effects on the soil microflora.
AUTHOR: GROSSBARD E
AUTHOR AFFILIATION: ARC Weed Research Organization, England
SOURCE TITLE: Pages 99-147 in Herbicides, physiology, biochemistry, ecology (volume 2).
SOURCE ID: New York, NY, Academic Press, 1976, 564 p.
YEAR PUBLISHED: 1976
CATEGORY: B2b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: microflora; phenoxies; toxicity
ABSTRACT: (Purpose) To discuss the effects of various herbicides on soil microflora, including soil microflora and soil fertility, direct and indirect effects of herbicides on the soil microflora. (Time and Duration) Literature review spanning 25 years. (Type of Research) Literature review. (Methodology) The author investigates such subjects as the contribution of soil microflora to soil fertility, and the possibility that substances that adversely affect the soil microflora might adversely affect fertility, especially with regard to long-term accumulation of residues. (Results and Conclusions) Herbicides exert effects on the soil microflora both in pure culture and in the soil. These may be inhibitory effects or stimulatory effects, but cannot be quantified precisely and are not readily reproduced. It is remarkable that these effects can be detected at all, especially in soil, in view of the relatively low amounts of herbicides applied, the ability of micro-organisms to adapt themselves to stress, the differences in environmental conditions and the overall fluctuations with time. Adverse influences of herbicides occur more frequently at rates of herbicide application well above those required for weed control.

1530
Effects on the soil fauna.
AUTHOR: EIJSACKERS H; VAN DER DRIFT J
AUTHOR AFFILIATION: Research Institute for Natural Management, Holland.
SOURCE TITLE: Pages 149-174 in Herbicides; physiology, biochemistry, ecology (volume 2).
SOURCE ID: New York, NY, Academic Press, 1976, 564 p.
YEAR PUBLISHED: 1976
CATEGORY: B2b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: fauna; herbicides; soil; toxicity
ABSTRACT: (Purpose) To discuss the effects of herbicides on the soil fauna using results of both laboratory and field research. (Time and Duration) Literature review spanning 35 years. (Type of Research) Literature review. (Methodology) The authors discuss soil fauna and its significance in soil, exposure and sensitivity of soil fauna to herbicides, laboratory research on the effect of herbicides on soil fauna, the effects of herbicides on soil fauna populations in the field, and also give a survey of effects on soil fauna groups by herbicides. (Results and Conclusions) In this discussion three phases of research are distinguished: laboratory investigation, field experiments, and observations in practice. Laboratory investigations can provide indications concerning potential toxic effects and their possible causes. The results obtained in this way show that a number of herbicides have toxic effects on soil fauna. Trial field sprayings are used to determine the influence of many natural variables on this toxicity. Climatic factors play an important role here, as well as the natural characteristics of the soil. In the third phase the data from laboratory and field experiments should be evaluated under field conditions, then it will become clear how the total complex influences the behavior of herbicides.

1531
Surface erosion.
AUTHOR: KNAPP KL
AUTHOR AFFILIATION: Watershed Systems Development Unit, Fort Collins, CO.
SOURCE TITLE: Chapter 3 in Non-Point Source Pollution Prediction Techniques.
SOURCE ID: US Forest Service and The Environmental Protection Agency, 1976, FS-EPA Interagency Agreement EPA-IAG-D6-0660.
YEAR PUBLISHED: 1976
CATEGORY: B2b; C4
SPONSOR: US Forest Service.; Environmental Protection Agency.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: construction; erosion, soil; forest; impact; sediment transport; silviculture
ABSTRACT: (Purpose) To identify and evaluate the silvicultural-activity-process-pollutant response with respect to surface erosion, transport, and delivery of organic and inorganic sediments. (Type of Research) State-of-the-art literature review (Methodology) This review was conducted to define upland sources of erosion and to select techniques which allow for adequate alternative quantification nationally. Methods are proposed to simulate erosion and sediment movement on wild and managed forested lands. These involve outputs in terms of soil loss, delivery ratio of eroded material, and particle size distribution of delivered material. Outputs were based on use of the Universal Soil Loss Equation modified for surface particle size distribution. (Results and Conclusions) Constructed surfaces such as roads, log decking areas, landings, and skid trails were identified as the major eroding surfaces in silvicultural settings. Rainfall detachment and detachment by overland flow are the principle eroding processes that must be considered. In the natural forest environment, the combination of canopy and ground cover reduces rainfall detachment to zero. Tree cutting reduces canopy density but in most cases does not alter ground cover; therefore, rainfall impact remains at zero. On construction sites, however, ground cover may be removed or seriously altered thereby increasing detachment both by rainfall and overland flow. In conclusion, only disturbed areas, where humus, litter and ground cover have been destroyed, need to be quantified for erosion.

1532
Mass wasting prediction techniques.
AUTHOR: ROSGEN D
SOURCE TITLE: Chapter 4 in Non-Point Source Pollution Prediction Techniques.
SOURCE ID: US Forest Service and The Environmental Protection Agency, 1976, FS-EPA Interagency Agreement EPA-IAG-D6-0660.
YEAR PUBLISHED: 1976
CATEGORY: B2b; C4; D
SPONSOR: US Forest Service.; Environmental Protection Agency.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: forest; geomorphology.; mass wasting; sediment; silviculture; soil mechanics
ABSTRACT: (Purpose) To present a procedure for identifying mass wasting derived sediment and subsequent sediment production increases associated with silvicultural activities. (Time and Duration) Literature from 1969 to 1976. (Type of Research) State-of-the-art review. (Methodology) Modeling for predicting the probability and magnitude of mass wasting contributions of slopes to stream courses is very limited. The author, therefore, recommends analysis techniques presented by Swanston in 1974 for western National Forests. This approach considers only the slopes directly above or adjacent to stream courses. It assumes that the evaluator has specialized experience in this field, that mass wasting includes debris slides and avalanches, slumps and mudflows, and dry creep and gravel. The analysis determines the risk of accelerating mass movement due to silvicultural activities and changes in risk resulting from modifications of management practices and specific controls. (Results and Conclusions) Understanding and experience in soil mechanics, geology, geomorphology and slope hydrology are necessary to make suitable mass wasting prediction using standard techniques. Aerial photos, topographic, soils and geologic maps, climatological information and vegetative conditions are a key to sound evaluation. The "factor of safety" technique, used in soil mechanics, has been used as a quantitative expression of the probability of mass movement occurring, but is only valid for quick release slides. The factor of safety is the ratio of shear forces promoting sliding on a critical surface to shear strength along the surface.

1533
Gully development and control: the status of our knowledge.
AUTHOR: HEEDE BH
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Fort Collins, CO, US Forest Service, 1976. Research Paper RM-169, 42 p.
YEAR PUBLISHED: 1976
CATEGORY: B2b; C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: check dams; erosion; erosion control; gully; watershed; waterway
ABSTRACT: (Purpose) To summarize the available body of knowledge and hypotheses on gully formation and control. (Time and Duration) References from 1925 to 1975. (Type of Research) State-of-the-art review. (Methodology) Historical background is presented and gully formation discussed in terms of mechanics, processes and morphology of discontinuous and continuous gullies, and models for predicting gully growth. Short- and long-term gully control objectives, including watershed restoration outside the channel, are considered. Types, design criteria, construction procedures, and cost relations of porous check dams are described and compared with other gully control structures and systems such as nonporous and earth check dams, and vegetation-lined waterways. Gully control is based mainly on work in the Colorado Rocky Mountains. (Results and Conclusions) Mechanics of gully erosion can be reduced to the processes of downcutting and headcutting. Downcutting of the gully bottom leads to gully deepening and widening, while headcutting extends the channel into ungullied headwater areas. Effective gully control must stabilize both the channel gradient and channel headcuts. The long-term objective is the establishment of an effective vegetation cover. Where engineering structures are necessary, single- or double-wire loose-rock check dams are effective, and the least expensive and simply built structures. Contrasted with check dams, waterway projects strive to establish a vegetation cover when land reshaping is

finished. Grassed waterways are cheaper to construct per linear meter of gully than check dams, but maintenance and erosion risk are greater.

1534
Soil erosion in the eastern forest.
AUTHOR: PATRIC JH
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Journal of Forestry
SOURCE ID: 74(10):671-677, 1976.
YEAR PUBLISHED: 1976
CATEGORY: B2b; C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: erosion; forest; infiltration; runoff; soil
ABSTRACT: (Purpose) To provide an overview of what is known about erosion in the eastern forest and how erosion rates are influenced by responsible forest management. (Time and Duration) References from 1862 to 1975. (Type of Research) Literature review. (Methodology) Forty-four research references are cited in this review of forest soil erosion. Emphasis is placed on fundamental concepts of infiltration and overland flow, geologic erosion, and measured erosion from forest land, followed by a discussion of erosion in relation to forest uses and management. Evidence is presented to refute findings of the President's Advisory Panel on Timber and the Environment that timber cutting causes severe damage to soil, watersheds, streams, water quality, wildlife habitat, and forest regeneration. (Results and Conclusions) The concept propounded 40 years ago was that rainfall in excess of infiltration capacity was the rule, even in forests, with runoff almost universally present to detach soil particles. It is postulated today that virtually all rainfall on forest land is absorbed into the soil, and reaches streams via subsurface flow. The geologic erosion norm for all land uses in eastern US is 1 foot per 10,000 years or .18 to .30 ton/acre/year. On eastern forest land, the average annual erosion loss ranges from .05 to .10 ton/acre/year, well below the geologic norm. Improper logging roads are identified as the major source of soil loss from managed forests in the East, but revegetation usually terminates this erosion within one to two years. Eroding channels are the other major source of particulate matter in forest streams. The author concludes that forest land can be managed so that there is little or no increase in soil erosion.

1535
Soil erosion and its control in the eastern forest.
AUTHOR: BRINK LK; PATRIC JH
AUTHOR AFFILIATION: US Forest Service.; Soil Conservation Service.
SOURCE TITLE: Soil Erosion: Prediction and Control.
SOURCE ID: Ankeny, IA, Soil Conservation Society of America, 1976, 362-368 p.
YEAR PUBLISHED: 1976
CATEGORY: B2b; C4
REPORT NUMBER: 21
REGION: Applicable to entire United States STATE: United States
KEYWORDS: disturbance; erosion; erosion control; forest; logging roads; sediment; soil
ABSTRACT: (Purpose) To review some of the research and practical experience dealing with the disposition of water in an uncut forest, how its disposition is changed by tree cutting, and the potential for soil erosion in both situations. (Time and Duration) 24 references from 1909 to 1976. (Type of Research) Literature review. (Methodology) The authors examine some of the early concepts of soil erosion in the forest beginning with Chittenden's statement in 1909 that soil erosion does not result from forest cutting in itself, but from cultivation implying disturbance in the broad sense. Misconceptions discussed include public failure to distinguish between timber harvest with prompt revegetation and deforestation or elimination of trees; and, the concept that tree cutting and timber harvest decrease the capability of forest land to absorb rain, with a corresponding increase in overland flow and soil erosion. This is followed by a review of current knowledge of erosion in undisturbed forests, erosion in well-managed forests, and estimating soil loss from forests. (Results and Conclusions) Total erosional loss in undisturbed eastern forests seldom exceeds 0.1 ton/acre/year. Tree cutting temporarily decreases evaporative losses and increases streamflow and solution losses from watersheds, but these effects disappear within one to two years. Soil erosion also increases slightly, but revegetation, litter fall, freezing and thawing, and biological activity in the soil soon result in return to pre-harvest levels. Poorly managed logging roads, however, have high soil loss potential and are the principal source of sediment from forest land. The universal soil loss equation, with modification of the C factor to account for surface organic layers, is accepted as a valid method for estimating sheet and rill erosion from forest land in the east and midwest. With further adaptation, the soil loss equation can also be applied to disturbed areas such as log landings.

1536
Logging road and skid trail construction.
AUTHOR: FISHER JE, TABER DW
AUTHOR AFFILIATION: State Univ of NY.
SOURCE ID: Syracuse, NY, State Univ of NY, Applied Forestry Research Institute, 1975, AFRI Miscellaneous Report 6, 46 p.
YEAR PUBLISHED: 1975
CATEGORY: B2b; C4
REPORT NUMBER: 6
REGION: Applicable to entire United States STATE: New York
KEYWORDS: construction; erosion; logging roads; skid trails; soil
ABSTRACT: (Purpose) To explain and discuss logging road and skid trail construction techniques which allow environmental impacts to be minimized. (Time and Duration) Workshop October 10-11, 1975. (Type of Research) Review papers and discussion. (Methodology) The proceedings include a summary of talks and informal discussions presented during the Logging Road and Skid Trail Construction Workshop held at Tupper Lake, NY. Topics covered were introduction to logging roads, temporary road and skid trail layout, logging road drainage and culverting, considerations and costs of forest road construction, physical limitations of soils, damage to residual trees from crawlers and skidders, NY State's classified streams regulations, policies and procedures, timber harvesting guidelines for NY, an amendment to NY State's soil and water conservation district law, revegetating critical erosion areas, and soil survey maps. (Results and Conclusions) The major forest pollutant is eroded soil, and roads are the major place in the forest where soil is exposed. From 3 to 7% of forest areas may be occupied by roads. Roads should be kept dry and stable with use of proper drainage structures. The major soil disturbances that occur in logging operations are compaction, shear and tear, erosion and sedimentation. Use of soil survey reports in road construction is stressed to identify physical properties and limitations and to make engineering interpretations to avoid future problems. Harvesting guidelines for NY recommend ways to protect streams and water during logging, to minimize effects upon soil from skidding and hauling, and to keep roadsides looking good during and after logging.

1537
Effect of soil constituents on herbicide activity in modified-soil field plots.
AUTHOR: WALDREP TW; WEBER JB; WEED SB
AUTHOR AFFILIATION: NC State Univ.
SOURCE TITLE: Weed Science.
SOURCE ID: 22(5):454-459, 1974.
YEAR PUBLISHED: 1974
CATEGORY: B2b
REGION: Southeastern Mixed Forest STATE: North Carolina
KEYWORDS: herbicides; impact; soil
ABSTRACT: (Purpose) To determine the direct effects of soil-applied organic matter and montmorillonite clay on the herbicidal activities of three different herbicides and on the chemical and physical properties of the soil in the field. (Time and Duration) 3-year study. (Type of Research) Original research. (Methodology) An organic muck and a montmorillonite clay were incorporated 7.6cm into the surface of a structureless sandy soil at rates ranging from 26,880 to 89,600 kg/ha. Prometryne and fluometuron were surface-applied and trifluralin were incorporated at two rates each in 1968 and 1970. (Results and Conclusions) Organic matter greatly reduced the biological activity of all three herbicides. Montmorillonite clay greatly reduced the activity of prometryne, slightly decreased the activity of fluometuron, and had no significant effect on trifluralin activity in all but the first year of the study. Both soil additives increased the cation exchange capacity of the soil. Muck decreased soil ph while montmorillonite increased it.

1538
A field survey of farmer experience with 765 kV transmission lines, November 18-20, 1974.
AUTHOR: BUSBY K; DRISCOLL D; WASHBON WE
AUTHOR AFFILIATION: NY Agricultural Resources Comm, NY Dept of Environmental Conservation, NY Dept of Agriculture and Markets.
SOURCE ID: Albany, NY, Agricultural Resources Commission, 1974, 8 p.
YEAR PUBLISHED: 1974
CATEGORY: B2b; B4
REGION: Applicable to entire United States STATE: Ohio
KEYWORDS: agriculture; animals, feral; farm; impact; man; transmission line
ABSTRACT: (Purpose) To sample the experiences of farmers who have lived and worked near 765 kV lines through at least one crop season. (Time and Duration) 1974 - 2 1/2 weeks. (Type of Research) Person-to-person question survey - not scientific. (Methodology) A survey was conducted by the New York Public Service Commission of 18 Ohio farmers who had high voltage power lines crossing their farms. The survey area included segments of the Kammer-Dumont 706 kV line and the Gavin-Marysville 720 kV line of the Ohio Power Company. The Kammer-Dumont line had been energized for three crop-growing seasons and the Gavin Marysville line for one season. The survey form was

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designed to avoid implanting negative ideas about the impact of power lines and to discern fact from prejudice. After completion of the survey form additional questions were asked in a deliberate attempt to bring out concerns. (Results and Conclusions) From the experience of 18 farmers it was concluded that: 1) safety and comfort of farm workers operating near high voltage lines is not a significant factor; 2) livestock seem to graze under power lines and towers without concern; 3) farmers prefer the 735 kV lines to 345 kV because there are fewer towers per mile and the wider based towers permit easier machinery operation; 4) persons living near the lines become accustomed to the corona noise in humid weather; and 5) there is no interference with TV reception. The major concern of farmers was related to soil compaction and broken tile drain systems from construction operations which in turn affected crop yields. Studies were recommended to determine high voltage effects on livestock fertility and reproduction, effect on perennial plants, and long term effect on workers.

1539
Effects of off-road motorcycle activity on Mojave Desert vegetation and soil.

AUTHOR: DAVIDSON E; FOX M
AUTHOR AFFILIATION: Thurston, WA, Regional Planning Council.; Univ of CA
SOURCE TITLE: Madrono
SOURCE ID: 22:381-390, 1974.
YEAR PUBLISHED: 1974
CATEGORY: B2b; B5b; C
REGION: Creosote Bush STATE: California
KEYWORDS: compaction; impact; off-road vehicles; soil; vegetation
ABSTRACT: (Purpose) To study effects of motorcycle disturbance on vegetation and soils of a representative portion of the Mojave Desert. (Time and Duration) 1973 to 1974; one year. (Type of Research) Original field research. (Methodology) Disturbance was studied on motorcycle pit areas and trails and equivalent undisturbed areas of a Creosote Bush Scrub community in Kern County, CA. Soils were sandy loam and fine sandy loam in the pit and trail areas, respectively. Soil core or clod samples were extracted at each site for determination of pore space and bulk density. Herbaceous plants and shrubs were sampled on spaced quadrats along 100 meter transects on disturbed and undisturbed areas. Degree of disturbance in relation to distance from the trail was determined on three subtransects representing center of trail, edge of trail, and off the trail. (Results and Conclusions) Motorcycle disturbance generally resulted in a decrease of live plants, increase in dead shrubs, decrease in average canopy per individual shrub, and decrease in plant diversity. Number of herbaceous species was reduced by one-half on disturbed areas. Evaluation of shrub death was difficult due to natural mortality and to disintegration of shrubs destroyed by motorcycles. Soil compaction by motorcycles caused a decrease in total porosity, mostly due to a reduction in macropore space, and an increase in bulk density. It is concluded that these changes in soil structure reduce water-holding capacity of the sandy loam soil and impede seed germination and root growth of desert plants.

1540
Terrain disturbance susceptibility, Norman Wells area, MacKenzie Valley.

AUTHOR: KURFURST PJ
AUTHOR AFFILIATION: Canadian Dept of Energy, Mines and Resources.
SOURCE ID: Environmental-Social Committee, Northern Pipelines, 1973, Report 7324, 35 p.
YEAR PUBLISHED: 1973
CATEGORY: B2b; B2f; C1; D
REPORT NUMBER: 7324
SPONSOR: Government of Canada.
REGION: Applicable to entire United States
KEYWORDS: access road; engineering; geology; mapping; permafrost; pipelines; soil
ABSTRACT: (Purpose) To investigate response of soil and rock materials to disturbances and to develop a terrain sensitivity mapping system that relates to pipeline construction and operation in the Northwest Territories, Canada. (Time and Duration) 1971 to 1973; 3 years. (Type of Research) Original field and laboratory research. (Methodology) Disturbed areas on oil well sites, seismic trails and access roads were studied for compaction, destruction and removal of vegetation, surface organic mats and top soil. Drill holes were used to map geologic materials and measure permafrost thaw. Chip and core samples were analyzed for engineering properties such as Atterberg limits, sieve analysis, specific gravity, bulk density and pH. Terrain disturbance susceptibility was classified in six units and plotted on 1:50,000 map sheets. (Results and Conclusions) The major factors affecting terrain performance to disturbance are ground-ice and/or water content; engineering properties of soils, especially grain size and index of plasticity; surface morphology including relief, degree, length and orientation of slopes; and type and extent of vegetation cover. Disturbances lead to increased thickness of the active layer and degradation of permafrost. Susceptibility to disturbance was nil on bedrock and sand and gravel deposits, moderate on till and organic sediments, and high on clay and clayey silts.

1541
The stability of natural slopes in the Mackenzie Valley.

AUTHOR: CODE JA
AUTHOR AFFILIATION: Canadian Dept of Energy, Mines and Resources.
SOURCE ID: Environmental-Social Committee, Northern Pipelines, 1973, Report 739, 18 P.
YEAR PUBLISHED: 1973
CATEGORY: B2b; C1; C2
REPORT NUMBER: 739
SPONSOR: Government of Canada.
REGION: Applicable to entire United States
KEYWORDS: erosion; geology; geomorphology; landslide; mapping; river banks; slope; soil; stability
ABSTRACT: (Purpose) To provide geologically based information to help minimize environmental disturbance due to construction on, or adjacent to, sloping terrain, particularly river banks in the Mackenzie Valley, Northwest Territory. (Time and Duration) 1971 to 1972; 2 years. (Type of Research) Field inventory, classification and mapping. (Methodology) Field inventory and mapping of river banks of the Mackenzie River and its main tributaries was done on high level air photos and 1:50,000 scale hydrographic charts by helicopter supplemented with ground verification. Information was reduced and compiled on 1:250,000 topographic sheets. River bank stability was classified by a system which relates types of failures to geologic and topographic factors. A qualitative assessment was made of geomorphic processes and failure mechanics associated with mass wasting. (Results and Conclusions) River bank stability was presented in 10 mapping areas. Map features were keyed to a legend showing geologic conditions, mode of erosion, and typical slopes. Slope failures are of two types: shallow active layer failure and multiple retrogressive slides. Factors to consider in river crossing sites are: retrogressive nature of larger slides, abrading action of river ice, adverse effects of forest fire on slope stability, and effects of ice-jamming in raising upstream water and ice levels.

1542
Effects of pipeline installation on soil properties and productivity.

AUTHOR: BUTTON RG; DEJONG E
AUTHOR AFFILIATION: Univ of Saskatchewan.
SOURCE TITLE: Canadian Journal of Soil Science
SOURCE ID: 53:37-47, 1973.
YEAR PUBLISHED: 1973
CATEGORY: B2b; B4a; C1
REPORT NUMBER: R81
REGION: Applicable to entire United States
KEYWORDS: disturbance; impact; pipeline; productivity; soil
ABSTRACT: (Purpose) To investigate effects of pipeline installation on soil productivity. (Time and Duration) 1968 and 1969; 2 years. (Type of Research) Original field and laboratory research. (Methodology) The study was conducted on three Chernozemic and two Solonetzic soils. Physical and chemical soil properties were measured on the undisturbed field, the trench, and the soil storage claybank adjacent to the trench. Chemical analysis of composite samples included NO3-N, extractable P and K, pH and electrical conductivity. Undisturbed core samples were analyzed for saturated permeability, pore space, oxygen diffusion, penetration, moisture content and bulk density. Wheat yield was measured on each site. Data was analyzed by paired t-test and multiple linear correlation. (Results and Conclusions) Mixing of soil horizons lowered NO3-N, P and K and increased electrical conductivity and pH at 0-15 cm depth of the trench and claybank. Subsequent tillage and salt leaching, however, minimized differences with the undisturbed field. Incorporation of topsoil increased NO3-N, P and K below 15-cm depth. In general, pipeline installation neither harmed nor improved physical properties of Chernozemic, whereas it improved Solonetzic soils. Wheat yields on claybanks were similar to undisturbed fields. Trenching did not affect yields on Chenozemic, but improved yields on older pipelines on Solonetzic soils.

1543
Compaction of agricultural soils.

AUTHOR: AMERICAN SOCIETY AGRICULTURAL ENGINEERS
SOURCE ID: St. Joseph, MI, American Society of Agricultural Engineers, 1971, 471 p.
YEAR PUBLISHED: 1971
CATEGORY: B2b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: agriculture; compaction; soil
ABSTRACT: (Purpose) To delineate the soil compaction problem, present current state of knowledge, and suggest needed research on soil compaction. (Type of Research) State of knowledge review. (Methodology) Mechanisms of compaction, its measurement, its effects on soil properties and plant growth, management factors related to

compaction, and economic assessment of compaction are presented in 9 chapters by 23 contributing authors. Each topic includes a literature review, interpretation of research findings, and identification of future research needs. (Results and Conclusions) The compaction process is a function of particle deformation and rearrangement and movement of soil particles, gas and liquid. The process depends on type of loading, mostly vehicular traffic and tillage, and on soil properties. Properties most affected by compaction are soil moisture, aeration, temperature, nutrition, and soil strength. Altered soil conditions in turn may affect plant establishment, rooting and yield. Compaction may be modified by freezing and thawing, wetting and drying, animal activity, root forces and cropping practices. Compaction is a national problem that is difficult to economically assess.

1544
Soil compaction due to tree length and full tree skidding with rubber-tired skidders.
AUTHOR: MACE AC JR
AUTHOR AFFILIATION: Univ of MN.
SOURCE TITLE: Minnesota Forestry Research Notes.
SOURCE ID: 214:1-4, 1970.
YEAR PUBLISHED: 1970
CATEGORY: B2b; C4
REGION: Spruce-fir Forest STATE: Minnesota
KEYWORDS: compaction; forest; logging; soils; tree skidding
ABSTRACT: (Purpose) To determine effects of full tree and tree length logging systems on soil compaction. (Time and Duration) Summer 1969. (Type of Research) Original field research. (Methodology) A 90- to 100-year old red pine stand growing on sandy soil was logged in 16-foot strips; one-half of the area by a tree length system and the other half by a full tree system using rubber-tired skidders. Each area was stratified into 4 blocks based on frequency of travel for tree skidding. Two replicate soil core samples were extracted at each of 3 soil depths, 0-2, 2-4, and 4-6 inches, at points representing undisturbed areas, between and within equipment tracks, and on the tree skidding trail. Bulk density of the 134.9 cubic centimeter soil cores was computed on a dry weight basis. (Results and Conclusions) Bulk densities were significantly increased by both logging systems except for the 0-2 inch zone under the tree length system. Lack of significant soil compaction in this zone was attributed to the presence of slash, inherent in the tree length system, that reduced both equipment and skidding impacts and organic matter disturbance. Frequency of travel was not a significant factor in soil compaction on the sandy soil, but it could be important on heavier silt loam or clay soils. Overall, the full tree system showed a two-fold increase in bulk density over the tree length system, and it occurred over a larger area. Long term compaction effects of these systems are unknown at this time.

1545
Movement of pesticides in soil.
AUTHOR: HARRIS CI
AUTHOR AFFILIATION: US Agricultural REsearch Service.
SOURCE TITLE: Journal of Agricultural and Food Chemistry
SOURCE ID: 17:80-82, 1968.
YEAR PUBLISHED: 1969
CATEGORY: B2b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; insecticides; leaching; soil
ABSTRACT: (Purpose) To study the movement of 11 insecticides in soil, using a standard evaluation system that had already been used with certain herbicides. (Time and Duration) One year. (Type of Research) Original research (laboratory). (Methodology) Columns of air-dray soil were placed in aluminum tubes. An insecticide in 10 ml of 95% ethanol was applied to each tube. Hagerstown silty clay loam and Lakeland sandy loam were the soils used in these tests. The soil columns were set up in plastic containers so that they could be subirrigated. Water was added to these containers to a depth of 2.5 cm. After 3 days the columns were sliced and the segments dried for lab testing. Gas chromatographic determinations were used to detect mobility of insecticides. (Results and Conclusions) Chlorinated hydrocarbon insecticides were immobile; phorate and disulfoton were only very slightly mobile while diazinon and especially thionazin exhibited greater mobilities. The mobilities of the studied insecticides were compared with those of 28 herbicides evaluated earlier in the same standard system. The herbicides DNBP, pyriclor, 7175, norea and cycluron were all more mobile than any of the 11 tested insecticides. The herbicides dicamba, tricamba, 2,3,6-TBA, amiben, methoxyfenac and fenac had the highest mobility factors.

1546
Nutrient loss accelerated by clear-cutting of a forest ecosystem.
AUTHOR: BORMANN; FISHER DW; LIKENS GE
AUTHOR AFFILIATION: Yale Univ. Dartmouth Univ. US Geological Survey.
SOURCE TITLE: Science.
SOURCE ID: 159:882-884, 1968.
YEAR PUBLISHED: 1968
CATEGORY: B2b
REGION: Northern Hardwoods Forest STATE: New Hampshire
KEYWORDS: clearing; ecosystem; forest; impacts; nitrogen; nutrient removal; potassium
ABSTRACT: (Purpose) To determine the input and output of chemicals after clearcutting on a small watersned area. Three-year study. 1964-1966. Original research. (Methodology) In 1965-66 a 15.6 na forest area was leveled by the US Forest Service. All trees, saplings, and shrubs were cut, dropped in place, and limbed so that no slash was more than 1.5m above the ground. No products were removed from the forest, and care was taken to minimize erosion of the surface. Samples of stream water were collected and analyzed weekly, as they had been for two years before the cutting; the loss of ions was calculated in terms of kilograms per ha. (Results and Conclusions) Clearcutting tends to deplete the nutrients of a forest ecosystem by: reducing transpiration and so increasing the amount of water passing through the system; simultaneously reducing root surfaces able to remove nutrients from the leaching waters; removal of nutrients in forest products; adding to the organic substrate available for immediate mineralization, and, in some instances, producing a microclimate more favorable to rapid mineralization. Loss of nutrients may be greatly accelerated in cutover forests where the soil microbiology leads to an increase of dissolved nitrate in leaching watersn

1547
Factors influencing the decomposition of TORDON herbicide in soils.
AUTHOR: GORING CAI; MEIKLE RW; YOUNGSON CR
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Down to Earth.
SOURCE ID: 23(2) :3-8, 10-11, 1967.
YEAR PUBLISHED: 1967
CATEGORY: B2b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: decomposition; herbicides; persistence; picloram; soil
ABSTRACT: (Purpose) To evaluate factors causing variations in persistence of picloram in the soil, and their relationship to the decomposition of picloram. (Time and Duration) One-year study. (Type of Research) Original research (laboratory). (Methodology) Nine soils, varying from clays and mucks to sandy loams, were used. Mechanical analyses were determined by the hydrometer method, ph with a glass electrode assembly, and organic matter by the wet combustion method. Carbon 14 picloram was used as the ammonium salt. Air, scrubbed free of carbon dioxide was passed over soil or nutrient medium containing labeled herbicide. The total amount of carbon dioxide was determined either by precipitation or by titration. Radioactive C was determined by counting the barium carbon precipitates. (Result and Conclusions) Decomposition was found to be incidental to breakdown of soil organic matter and there was no lag period over a wide range of herbicide concentration. Sterilization almost completely eliminated decomposition.

1548
Factors affecting the persistence of picloram in soil.
AUTHOR: BOVERY RW; DAVIS FS; MERKLE MG
AUTHOR AFFILIATION: TX A&M Univ. US Dept of Agriculture.
SOURCE TITLE: Agronomy Journal
SOURCE ID: 59:413-415, 1967.
YEAR PUBLISHED: 1967
CATEGORY: B2b
SPONSOR: Advanced Research Projects Agency, Dept; of Defense.
REGION: Oak + Bluestem Parkland STATE: Texas
KEYWORDS: degradation; herbicides; picloram; soil
ABSTRACT: (Purpose) To determine the effect of soil type, temperature, moisture, and light on the persistence and movement of picloram in the soil. (Time and Duration) One-year study. (Type of Research) Original research (laboratory study). (Methodology) The effect of soil type, temperature and moisture on the persistence of picloram was determined using vapor phase chromatographic analyses and plant bioassays. Movement studies were done using plastic pipes, 8cm in diameter and 64cm long, filled with soil. One mg of picloram (K salt) was applied uniformly to the soil surface with a small mist atomizer. Water equivalent to one inch of rain was dripped onto the soil over a period of 1 hour. Samples were taken at various depths. (Results and Conclusions) Detectable quantities of picloram were present in Houston clay, Axtell sandy loam, and commercial sand after incubation for 1 year, at 4, 20, and 38 C and at moisture levels of field capacity and 0.1 field capacity from rates as low as 0.25 ug per g (1/2 lb/A). Movement studies indicated that leaching was an important means of dissipating the

herbicide in light soils. Photodecomposition may also be important if the herbicide remains on the soil surface for long periods of time.

1549
Soil surface condition following tractor and high-lead logging in the Oregon Cascades.
AUTHOR: DYRNESS CT
AUTHOR AFFILIATION: US Forest Service, Pacific Northwest Forest and Range Experiment Station.
SOURCE TITLE: Journal of Forestry
SOURCE ID: 63(4):272-275, 1965.
YEAR PUBLISHED: 1965
CATEGORY: B2b; C4; D
REGION: Cedar-Hemlock-Douglas-fir Forest STATE: Oregon
KEYWORDS: compaction; disturbance; forest; logging; soil; soil surface; watershed
ABSTRACT: (Purpose) To assess and compare effects of high-lead and tractor logging on soils with similar undisturbed surface conditions. (Time and Duration) 1963 to 1964; one year. (Type of Research) Original field and laboratory research. (Methodology) Studies were conducted on two soil types of three high-lead and one tractor-logged cutting units in old growth Douglas-fir in the western Cascades. Soil surface disturbance after yarding was classified as undisturbed, slightly disturbed, deeply disturbed, and compacted. Percentage of total clearcut area in each class was determined by point sampling along a transect. Slash was classed as heavy, light, absent and cull log. Bulk density was measured to determine changes in soil physical properties in the four disturbance classes. (Results and Conclusions) Percentage of the area in slightly and deeply disturbed classes is about the same for both logging methods. Tractor logging caused a three-fold increase in compacted area and a corresponding decrease in undisturbed. Most compaction in tractor logging was on skidroads. Compaction in the high-lead units was caused by skidded logs. Bulk density was increased on deeply disturbed and compacted areas, but was similar to prelogging values on undisturbed and slightly disturbed areas. Tractor logging caused more disturbance than high-lead, but differences are minimized on slopes under 30 percent, skidroads on contour, and dry-season logging.

1550
Soil properties related to erosion of wild-land soils in central Washington.
AUTHOR: WOOLDRIDGE DD
AUTHOR AFFILIATION: US Forest Service, Pacific Northwest Forest & Range Experiment Stationn
SOURCE TITLE: Pages 141-152 in Forest-Soil Relationships in North America.
SOURCE ID: Corvallis, OR, OR State Univ Press, 1965.
YEAR PUBLISHED: 1965
CATEGORY: B2b; C4; D
REGION: Pacific Forest STATE: Washington
KEYWORDS: aggregation; erosion; forest; meadow; soil
ABSTRACT: (Purpose) To describe use of mean aggregate size as an index of erosion and discuss soil properties which are related to soil erosion hazard. (Type of Research) Original field and laboratory research. (Methodology) Aggregate size separation was made on undisturbed soil cores subjected to wet-sieving in a nest of four sieves for 30-minutes. Sums of percent oven-dry soil in each of six size classes and mean size in millimeters was termed mean aggregate size and was used as an index of soil erosion hazard. Variation in mean aggregate size was tested on three soil parent materials on transects through forest and open meadow. Associations between soil properties and erosion hazard were analyzed by multiple regression. (Results and Conclusions) Soil aggregation and mean aggregate size had maximum values under the forest canopy. Major changes in soil properties were associated with the transition from forest to semidenuded conditions. A major portion of variation in aggregate size was accounted for by organic matter content, bulk density and porosity; soil properties closely related to soil tilth and structure. Mean aggregate size as used in this study provided a good guide for assessment of erosion hazard of a particular soil.

1551
A universal soil-loss equation to guide conservation farm planning.
AUTHOR: SMITH DD; WISCHMEIER WH
AUTHOR AFFILIATION: US Dept of Agriculture.
SOURCE TITLE: Seventh International Congress Soil Science Transactions
SOURCE ID: 1:481-425, 1960.
YEAR PUBLISHED: 1960
CATEGORY: B2b; D
REGION: Applicable to entire United States STATE: United States
KEYWORDS: erosion; erosion, sheet; farm; soil; water
ABSTRACT: (Purpose) To present an improved soil-loss prediction procedure for more effective conservation farm planning especially applicable to specific fields. (Time and Duration) 1956 to 1960. (Type of Research) Based on long-term original research conducted by numerous investigators. (Methodology) More than 8,000 plot-years of basic erosion data were assembled from 37 locations in 21 states on punched cards for machine computation. Data was used to derive a soil-loss equation free of regionalized values and universally applicable where rainfall erosion was a problem. The equation was designed to predict longtime average soil losses for specific combinations of rainfall pattern, topography, soil, cropping, management and productivity level. (Results and Conclusions) The mathematical model for the derived Soil-Loss Equation is A = RKLSCP, where A is average soil loss, R is annual rainfall erosion index, K is soil erodibility, L and S are length and percent slope, C is the cropping factor, and P is erosion control practice. Existent climatic and physical conditions are used in the equation to estimate soil loss for a field. Other terms estimate how much loss can be reduced with various combinations of cropping and management practices. The best combinations can be considered in selecting a farm production plan to safeguard future production potential.

1552
Properties of soil in orchard as influenced by travel and cover crop management systems.
AUTHOR: BUNGER WC; MILLER DE; PROEBSTING EL JR
AUTHOR AFFILIATION: US Dept of Agriculture.
SOURCE TITLE: Agronomy Journal.
SOURCE ID: 55:168-191, 1963.
YEAR PUBLISHED: 1960
CATEGORY: B2b; C
REGION: Palouse Grassland STATE: Washington
KEYWORDS: compaction; cover; management; orchard; soil
ABSTRACT: (Purpose) To determine the influence of travel, in combination with cover crop practices, on soil compaction and other physical soil properties in a peach orchard. (Time and Duration) 1959 and 1961 - two years. (Type of Research) Original field and laboratory research. (Methodology) The study was conducted in a 12-year old peach orchard growing on a very fine sandy loam soil. Cover crop practices evaluated were continuous orchard grass, continuous alfalfa, winter rye disked in each spring, and a chemically maintained bare surface. Soil properties analyzed were bulk density distribution with depth, water stability of aggregates, organic matter percentage, and water infiltration rates. Soil samples were collected from traveled and nontraveled portions of the orchard. (Results and Conclusions) Physical properties of the soil were maintained in better condition with a cover crop than with a chemically maintained bare surface. There was less surface compaction, slightly increased soil aggregate stability, increased organic matter in the surface soil, and increased water infiltration in soil with continuous cover cropping compared with bare soil. Bulk density of the surface soil markedly increased by travel, with the effect decreasing with depth. Travel reduced water intake to approximately one-third that obtained in nontraveled areas. It is important to minimize those practices which contribute to compaction, especially travel when the soil is wet and most susceptible to packing.

B2c - Solar radiation

1553
Design EHV lines to reduce impact.
AUTHOR: BYRON RA
AUTHOR AFFILIATION: American Electric Power Service Corp.
SOURCE TITLE: Electrical World.
SOURCE ID: 1974 (January 15).
YEAR PUBLISHED: 1974
CATEGORY: B2c
REGION: Applicable to entire United States STATE: United States
KEYWORDS: construction; design; electromagnetic field effect; impact; right-of-way
ABSTRACT: (Purpose) To study EHV electromagnetic phenomena and to determine their impact on the environment. (Type of Research) A state of the art discussion. No literature cited. (Results and Conclusions) General discussion of some problems with electromagnetic phenomena and assessing the environmental impact.

1554
Industrialization, evolution and the development of heavy metal tolerance in plants.
AUTHOR: BRADSHAW AD; GREGORY RPG; MCNEILLY TS
AUTHOR AFFILIATION: Univ College of North Wales.
SOURCE TITLE: Symposium British Ecological Society
SOURCE ID: 5:327-343, 1965.
YEAR PUBLISHED: 1965
CATEGORY: B2c
REGION: Applicable to entire United States
KEYWORDS: ecosystem; environment; plants; resilience; toxicity

ABSTRACT: (Purpose) To describe changes in some plant species through evolution which has come about through the alteration of the environment by industrialization. (Time and Duration) Literature review covering a 15-year period. (Type of Research) Literature review. (Methodology) Of the environments, those that are produced by man's industiral activities are the most striking. Often they are new in the history of the world—thus they are new to the plant and animal life that surrounds them. The author reviews many papers to show how rapid colonization occurs and a new vegetation, different from the old, builds up, as in sand and gravel pits and old chalk works. Where the soil has been polluted by toxic substances from mining for heavy metals, sulphurous materials, etc., the materials left behind may be so poor that nothing can grow. (Results and Conclusions) For areas so poor nothing will colonize quickly, there are two choices: man can, if he chooses, perhaps at great expense, do something; or nature possibly can. When nature takes over, it is of evolutionary significance. It is difficult to find areas where nothing will eventually grow. If a niche is vacant, evolutionary processes will lead to colonization. In plants we do not seem yet to have any conclusive evidence of the evolution of populations tolerant to herbicides, although they have been used for many years. But in agricultural crops there are now many records of the genetic changes that can occur when a species is taken out of one habitat and grown in another.

B2d - Microclimate

1555
Use of fire in southern forests.
AUTHOR: CROW AB
SOURCE TITLE: Journal of Forestry.
SOURCE ID: 71(10):629-632, 1973.
YEAR PUBLISHED: 1973
CATEGORY: B2d
SPONSOR: LA State Univ, School of Forestry and; Wildlife Management.
REGION: Southeastern Mixed Forest STATE: Alabama; Georgia; Louisiana; Mississippi; South Carolina
KEYWORDS: fire; forest
ABSTRACT: (Purpose) To alert foresters and wildlife managers who use prescribed burning to the many factors to be considered before using fire. (Type of Research) Literature review. (Methodology) Review of pertinent literature concerning the use of prescribed burning in southern pine forests. (Results and Conclusions) Prescribed burning is used in fuel reduction, control of unwanted vegetation disease, site preparation, wildlife habitat improvement, and range improvement. Better weather prediction and practical guidelines for smoke management are needed. In the meantime, restraint and common sense should be used in burning programs.

1556
Microclimate modification due to power transmission rights of way.
AUTHOR: HEISLER G; HERRINGTON L
AUTHOR AFFILIATION: State Univ. of NY, College of Environmental Sciences and Forestryy
SOURCE TITLE: Pages 36-57 in Power Lines and the Environment.
SOURCE ID: Millbrook, NY, The Cary Arboretum of the New York Botanical Gardens, 1973, 170 p.
YEAR PUBLISHED: 1973
CATEGORY: B2d
REGION: Applicable to entire United States STATE: United States
KEYWORDS: corridor; humidity; microclimate; precipitation; solar radiation; transmission
ABSTRACT: (Purpose) To discuss microclimate modifications on electric transmission line corridors, including temperature, humidity, precipitation, solar radiation and wind near the ground, and to present the physical basis of microclimate control. (Time and Duration) Survey of 40 years of research. (Type of Research) Literature review. (Methodology) No literature relating directly to the microclimate modifications caused by electric transmission corridors were found. However, the literature in the fields of agriculture, forest regeneration, wildlife management and from basic meterological and physical principles has been surveyed as a basis of predicting microclimate changes on ROWs. (Results and Conclusions) The removal of tall vegetation such as trees or high brush will result in changes in the microclimate and hence changes in the vegetation on the surface and in water budgets and stream temperatures. These changes in microclimate will be due to changes in the location of the active surface and changes in albedo of the absorbing surfaces. In cases where the ROW is a "cut", microclimate gradients will be established across the ROW due to shadow patterns. One of the most important potential adverse impacts construction of electric ROWs may have is on stream temperatures. Sufficient data exists for an estimation of the increase in stream temperatures. The impacts of electric ROWs on general climate and indirectly on watershed hydrology are minimal; but these may cause changes in flora and fauna that may or may not be desirable.

1557
Prescribed burning in southern New England: introduction to long-range studies.
AUTHOR: GOODWIN RH; NIERING WA; TAYLOR S
SOURCE TITLE: Tall Timbers Fire Ecology Conference Proceedings.
SOURCE ID: 10:267-286, 1970
YEAR PUBLISHED: 1970
CATEGORY: B2d
SPONSOR: Nat Science Foundation
REGION: Appalachian Oak Forest STATE: Connecticut
KEYWORDS: regeneration
ABSTRACT: (Purpose) To assess the effects of controlled burning on floristic composition of representative vegetative types of Southern New England, as well as the effect on microclimate. (Time and Duration) 3 years. (Type of Research) Original. (Methodology) Three old fields and six forest areas in CT were selected for controlled burning. Permanent transects and a series of .5x2m quadrats were used to determine density and cover of vegetation. Microclimate Taylor maximum-minimum thermometer and a Palmer minimum-maximum soil thermometer were used 4cm below soil surface. Soil samples were collected and analyses made to include macro and micro elements. (Results and Conclusions) In old fields, burning caused an increase in Andropogon, while in forested areas root kill was restricted to such fire sensitive species as black birch in the 4 inch class, and stem kill was limited primarily to the 1 to 4 inch size class. Shrubs were reduced. No significant differences in temperatures were obtained at the 1 meter level.

B2e - Bird mortality

1558
Migrating birds respond to Project Seafarer's electromagnetic field.
AUTHOR: LARKIN RP; SUTHERLAND PJ
AUTHOR AFFILIATION: Rockefeller Univ.
SOURCE TITLE: Science
SOURCE ID: 195(4280):777-778, 1977.
YEAR PUBLISHED: 1977
CATEGORY: B2e
REGION: Northern Hardwoods Forest STATE: Wisconsin
KEYWORDS: birds; electromagnetic field effect
ABSTRACT: (Purpose) To describe the effects of an AC field on migrating birds. (Time and Duration) 1975; 1 year. (Methodology) The project Seafarer in Wisconsin includes antennae in the form of a cross about 8m above the ground which emit an electromagnetic signal and developed an intense AC magnetic field. A radar was used to follow individual migrating birds. (Results and Conclusions) No effects were observed on birds which flew straight and level. Assorted reactions indicated that birds turned or changed altitude more frequently when the antennae system was operating than when it was not.

1559
A study of the reproductive biology of herons, egrets, and ibis nesting on Pea Patch Island, Delaware.
AUTHOR: WIESE JH
AUTHOR AFFILIATION: Manomet Bird Observatory
SOURCE ID: Wilmington, DE, Delmarva Power & Light Co, 1977, 155 p.
YEAR PUBLISHED: 1977
CATEGORY: B2e
REGION: Southeastern Mixed Forest STATE: Maryland
KEYWORDS: birds; habitat; impact; mortality; right-of-way
ABSTRACT: (Purpose) To provide baseline data on factors affecting nesting success on Pea Patch Island before construction of a power line about one mile away. (Time and Duration) 1976; 7 months. (Type of Research) Original research. (Methodology) The heronry was dissected into seven physionomic sections. Vegetation was classified and the soil tested for toxicity. All nests were counted and reproductive success was studied. Flight route surveys were made. (Results and Conclusions) Baseline data was obtained against which to test the effects of the proposed powerline.

1560
Nonhunting mortality of fledged North American waterfowl.
AUTHOR: CORNWELL GW; STOUT IJ
AUTHOR AFFILIATION: VA Polytechnic Institute
SOURCE TITLE: Journal of Wildlife Management.
SOURCE ID: 40(4):681-693, 1976.
YEAR PUBLISHED: 1976
CATEGORY: B2e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; mortality; waterfowl
ABSTRACT: (Purpose) To review and compile qualitative evidence from available records on nonhunting mortality in waterfowl. (Time and Duration) 1963-65. (Type of Research) Literature search. (Methodology)

1560

Data were obtained from questionnaires, report files of US Fish and Wildlife Service, waterfowl band-recovery data, and literature. (Results and Conclusions) Wire strikes and collisions accounted for a majority of the casualities, and of the collisions those with utility wires were a minimal overall importance in waterfowl mortality, 0.1% of the total sample. Other sources of losses compiled were weather, predation, pollution, diseases and poisons, and miscellaneous factors.

1561
The effects of a tall tower on nocturnal bird migration — a portable ceilometer study.
AUTHOR: AVERY M; CASSEL JF; SPRINGER PF
AUTHOR AFFILIATION: ND State Univ.; US Dept of Interior.
SOURCE TITLE: The Auk.
SOURCE ID: 93(2):281-291, 1976.
YEAR PUBLISHED: 1976
CATEGORY: B2e
SPONSOR: Dept of Zoology, ND State Univ.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: bird kills; birds; impact
ABSTRACT: (Purpose) To report on direct visual observations of nocturnal migrants at a tall tower during four migration seasons and relate findings to proposed reasons why birds congregate at tall lighted towers. (Time and Duration) During spring and fall migration periods, 1972 and 1973; 2 years. (Type of Research) Original. (Methodology) Nighttime observations of migrants were made employing a portable ceilometer (a lamp powered by a 6-volt battery), a 20 x 60 spotting scope, and 7 x 35 binoculars. One watching location was near the base of the 366m tower, and the other location was 305m northeast of the tower. Watches were conducted on an average of four nights per week. Data were analyzed to determine if there were differences in the number of migrants and their direction of flight at the two locations. (Results and Conclusions) On overcast nights significantly more migrants were seen at the tower and flight directions tended to be more dispersed. On clear nights significantly more birds were seen away from the tower. Birds at the tower on overcast nights orient into the wind and remain close to the tower by fluttering or hovering. Birds did not circle the tower or orient toward the lights. On cloudy nights birds are arrested within the larger illuminated area and are reluctant to leave.

1562
Effects of highway rights-of-way on bird populations.
AUTHOR: FERRIS CR; HAVERLACK EG; MICHAEL ED
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 253-261 p.
YEAR PUBLISHED: 1976
CATEGORY: B2e
REGION: Mixed Mesophytic Forest
KEYWORDS: bird; impact; populations; right-of-way
ABSTRACT: (Purpose) The effects of highways on WV bird populations were studied. (Time and Duration) 1970-74. (Type of Research) Survey or census research. (Methodology) A census of birds was made along a high speed highway to provide data on habitat changes and bird use. A strip census method using four transects, plus a vehicle-drive census were used. (Results and Conclusions) Major questions associated with highways and bird use were not answered, according to the investigators; but long-term effects seem to be more beneficial than harmful. A total of 55 species were recorded during drive censuses. The most common species were starlings, crow, red-eyed vireo, indigo bunting, towhee, chickadee and tufted titmouse. Rankings varied from 1973 to 1974. Recommendations for habitat management included favoring invasion by natural vegetation which would be cut on a 10-year rotation, and leaving isolated trees, dead and living.

1563
Waterfowl mortality mouth of Saginaw River.
AUTHOR: PRAWDZIK T
AUTHOR AFFILIATION: MI Dept of Natural Resources.
SOURCE TITLE: Memorandum.
SOURCE ID: Gladwin, MI, MI Dept of Natural Resources, Gladwin District Office, Feb 11, 1976, 1 p.
YEAR PUBLISHED: 1976
CATEGORY: B2e
REGION: Laurentian Mixed Forest STATE: Michigan
KEYWORDS: birds; mortality; waterfowl
ABSTRACT: (Purpose) To report winter waterfowl mortality at a generating station. (Type of Research) Original report. (Results and Conclusions) Observation was made of 60-65 frozen waterfowl at a generating station where a warm water discharge channel was open on February 6. Suggestions to eliminate this were: prevent an open channel from forming, and place lines so they don't cross the open channel.

1564
Habitat management implications of migration.
AUTHOR: SPRUNT A
AUTHOR AFFILIATION: Nat Audubon Society.
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975.
SOURCE ID: 1975, 81-86 p.
YEAR PUBLISHED: 1975
CATEGORY: B2e; C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; habitat; management
ABSTRACT: (Purpose) To discuss the implications of bird migration on habitat management. (Type of Research) Literature review. (Methodology) Literature review. (Results and Conclusions) Most information is of a general nature, since very little direct research to determine need and use of migration habitat has been accomplished. Although birds utilize most available habitats during migration, certain areas and habitats are of particular importance. Managers should become more aware of the needs of migrant birds and attempt to maintain and increase diversity of habitat whenever possible.

1565
Death trap.
AUTHOR: SISSON J
SOURCE TITLE: National Wildlife
SOURCE ID: 13(2):18, 1975.
YEAR PUBLISHED: 1975
CATEGORY: B2e
REGION: Laurentian Mixed Forest STATE: Michigan
KEYWORDS: mortality; waterfowl
ABSTRACT: (Purpose) To report swan mortality on utility wires. (Type of Research) Original report. (Results and Conclusions) Thirty mute swans have been killed in 15 years at a bridge crossing in northern Michigan. Efforts to prevent the loss have not been successful and a flock of 70 birds is down to 2 dozen. Cutting of trees near the bridge appeared to cause the death trap conditions.

1566
Pole changes keep eagles flying.
AUTHOR: ANDERSON WW
AUTHOR AFFILIATION: ID Power Co.
SOURCE TITLE: Transmission and Distribution.
SOURCE ID: Pages 28-31, 1975 (November).
YEAR PUBLISHED: 1975
CATEGORY: B2e
REGION: Cedar-Hemlock-Douglas-fir Forest STATE: Idaho
KEYWORDS: bird, kills; birds; structure design
ABSTRACT: (Purpose) To describe changes in pole design to eliminate electrocution of eagles. (Time and Duration) Two-year study. (Type of Research) Original research (field study). (Methodology) Idaho Power Company began research in 1972 to determine just how serious eagle electrocution was. This involved periodic field trips to study the problem. Company poles were categorized as those that were a definite hazard to eagles; those which were a possible hazard; and those which were safe perches. Slow-motion films were used to learn of an eagle's ability to land on cross-arms supporting three or more wires under various wind conditions and angles of approach. Mock-up poles were designed to study new pole designs safe for eagles. (Results and Conclusions) A pole that is safe for eagles has a vertical separation of at least 43 inches between center and outer phases. Wherever a change in structure configuration to an approved type proved impractical, the electric company turned to conductor insulation covers, or installed perches of their own design 3 feet above the conductors. The eagles quickly adopted the perches as preferred landing sites, since the design allowed them to take off from any direction.

1567
Avian mortality from collisions with overhead wires in North Dakota.
AUTHOR: KRAPU GL
AUTHOR AFFILIATION: U.S. Fish and Wildlife Service
SOURCE TITLE: Prairie Naturalist.
SOURCE ID: 6(1):1-6, 1974.
YEAR PUBLISHED: 1974
CATEGORY: B2e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: bird kills; birds; impact; structure; transmission
ABSTRACT: (Purpose) To discuss the loss of birds from collisions with power and telephone wires in North Dakota. (Time and Duration) Observations over a four-year period. (Type of Research) Literature review and field observations. (Methodology) This is primarily a literature review of the 15 major papers dealing with avian mortality from collisions with overhead wires. In addition, the author cites numerous observations he has made in North Dakota dealing with bird collisions with towers,

power wires and telephone wires (Results and Conclusions) In the future, mortality caused by overhead wires of rural utilities will probably decline—the current trend toward burying rural telephone and power lines and declining farm populations are the principal contributing factors. Conversely, the planned construction of massive electrical generating plants in central and western North Dakota will result in a proliferation of transmission lines crossing the state from west to east. Intensive studies are needed to measure the impact of existing and proposed lines on migrant and breeding bird populations, since the east-west direction of these lines offers a significant obstacle to migrating birds.

1568
Nocturnal migrants killed at a central Florida TV tower: autumns 1969-1971.
AUTHOR: ANDERSON DH; TAYLOR WK
AUTHOR AFFILIATION: FL Technological Univ.
SOURCE TITLE: Wilson Bulletin.
SOURCE ID: 85(1):42-51, 1973.
YEAR PUBLISHED: 1973
CATEGORY: B2e
SPONSOR: Nat Science Foundation.; Frank M Chapman Award.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: bird kills; birds; impacts
ABSTRACT: (Purpose) To gather information about nocturnal migrants that were killed at a newly-erected 1,484 foot TV tower located in central Florida. (Time and Duration) Fall of 1969, 1970 and 1971; 3 years. (Type of Research) Original research. (Methodology) Killed birds were usually collected early in the morning; but during large kills, collections began at night and continued into the morning. All specimens found were either recorded or collected. Passerines were aged by plumages and skull ossification; nonpasserines were aged by plumages. Sex was determined by plumages and dissection. (Results and Conclusions) Sixteen families and 82 species were represented in in the 7,782 individuals collected. The largest kill was on September 28-29 1970; 1,592 individuals of 37 species were found. Thirty-one (38 percent) of the 82 species were warblers, and of the 7,782 individuals, 85 percent were parulids.

1569
Ruddy ducks colliding with wires.
AUTHOR: SIEGFRIED WR
SOURCE TITLE: The Wilson Bulletin
SOURCE ID: 84(4):486-487, 1972.
YEAR PUBLISHED: 1972
CATEGORY: B2e
SPONSOR: Delta Waterfowl Research Station.
REGION: Tall-grass Prairie STATE: Iowa; Minnesota; Montana; North Dakota; South Dakota
KEYWORDS: bird kills; breeding; ducks; impact; mortality; waterfowl; wetland
ABSTRACT: (Purpose) To report observations of birds colliding with wires. (Time and Duration) May-August 1971. (Type of Research) Original research. (Methodology) 10 surveys along 50km of overhead wires and a collection of 50 ruddy ducks. (Results and Conclusions) Eight ruddy ducks and eight individuals of four other species were found along the 500km survey. Most of the mortality appears to occur during and after dusk. There appears to be a 10% incidence of injury in ruddy ducks from collisions with wires.

1570
Bird mortality at four towers in eastern North Dakota—Fall 1972.
AUTHOR: AVERY M; CLEMENT T
AUTHOR AFFILIATION: ND State Univ.
SOURCE TITLE: Prairie Naturalist.
SOURCE ID: 4(3&4):87-95, 1972.
YEAR PUBLISHED: 1972
CATEGORY: B2e
SPONSOR: Jamestown, ND.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: bird kills; birds; structure; transmission
ABSTRACT: (Purpose) To determine how the nature of bird mortality differed with the geographic location and other features of radio transmission towers, to report on the kinds and numbers of birds killed and discuss some possible factors involved. (Time and Duration) One-year study. (Type of Research) Original research (field study). (Methodology) Three tower areas were searched for dead birds starting in August, and extending through mid-November. These investigations were made twice a week. The search area included both the immediate tower area and also the ground beneath the guy wires. The area around a fourth tower was searched daily. Counts were made of all dead birds, and these were identified as to species. (Results and Conclusions) Bird mortality numbered 561, representing 88 species. Species most frequently killed at three of the tower sites were dissimilar to those most commonly killed at the fourth tower site. Largest losses occurred on overcast nights following the passage of cold fronts through the regions. Scavengers and predators no doubt removed substantial numbers of the tower-killed birds at the sites where collections were only made twice weekly.

1571
Collisions with wires - a source of anatid mortality.
AUTHOR: CORNWELL G; HOCHBAUM HA
SOURCE TITLE: The Wilson Bulletin
SOURCE ID: 83(3):305-306, 1971.
YEAR PUBLISHED: 1971
CATEGORY: B2e
SPONSOR: Delta Waterfowl Research Station.
REGION: Tall-grass Prairie STATE: United States
KEYWORDS: bird kills; ducks; ecology; fences; impact; mortality; waterfowl
ABSTRACT: (Purpose) To report observations of ducks killed by collisions with barbed wire fences (Time and Duration) Limited. (Type of Research) Original research. (Results and Conclusions) Four observations of waterfowl mortality (pintail and blue-winged teal) caused by a collision with a barbed wire fence are reported. Removal of fences and overhead power lines from wetland areas are recommended.

1572
Studies on raptor mortality in western Utah.
AUTHOR: ELLIS DH; MURPHY JR; SMITH DG
AUTHOR AFFILIATION: Brigham Young Univ. Dept of Zoology and Entomology.
SOURCE TITLE: Great Basin Naturalist.
SOURCE ID: 29:165-167, 1969.
YEAR PUBLISHED: 1969
CATEGORY: B2e
SPONSOR: National Audubon Society Brigham Young; Univ.; Dept Zoology and Entomologyo
REGION: 3133 STATE: Utah
KEYWORDS: bird kills; impact; raptor
ABSTRACT: (Purpose) To determine causes and relative mortality rates of all species of raptors in western Utah. (Time and Duration) 2 years (Type of Research) Original research. (Methodology) A 12.1 mile stretch of gravel road paralleled by utility line (in Utah County) was surveyed approximately every 3 months from spring, 1967 to fall 1968. For comparison, surveys were conducted along the utility line outside the study area. Dead raptors were identified and cause of death determined when possible. (Results and Conclusions) Density of raptor kills was 3.14 birds per mile on the study road. Buteos and eagles suffered the greatest mortality. Heaviest mortality occurred in immature birds in the fall and winter, corresponding to the times of heaviest sport hunting. One suggested cause of mortality was hunters shooting the birds as they perched or roosted on the utility lines. Minor mortality causes may have been collisions with cars and possible 1080 poisoning.

1573
Shed few tears.
AUTHOR: MAYFIELD H
SOURCE TITLE: Audubon Magazine.
SOURCE ID: 69:61-65, 1967.
YEAR PUBLISHED: 1967
CATEGORY: B2e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: avifauna; bird kills; birds; density; ecology; impact; migration mortality; passerine; population; reproduction; status; survival; trend
ABSTRACT: To evaluate the importance of bird mortality at TV towers relative to the total population mortality. (time and Duration) 1967. (Type of Research) Literature review. (Methodology) This article discusses the importance of mortality in order to maintain healthy populations of birds (Results and Conclusions) the magnitude of mortality at televison towers is not significant and it is thought to be 0.0002% of the total mortality per year. However, the percentage may be larger for the red eyed vireo ovenbird, Tennessee warbler, magnolia warbler, palm warbler, yellow throat, catbird, and the thrushes.

1574
Bird casualties at a Leon County, Florida TV tower: an eleven-year study.
AUTHOR: NORRIS FA; STODDARD HL
AUTHOR AFFILIATION: Tall Timbers Research Station.
SOURCE ID: Tallahassee, FL, Tall Timbers Research Station, 1967, No. 8. 104 p.
YEAR PUBLISHED: 1967
CATEGORY: B2e
SPONSOR: Nat Science Foundation.; Nat Institute of Health.; Tall Timbers Research Station.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: bird kills; birds; impact
ABSTRACT: (Purpose) To provide a long-term study of bird mortality caused by a 673-foot TV tower, and later (after mid-April, 1960) by a

1574

1,010 foot tower that was built to replace the smaller tower (Time and Duration) October 1, 1955, through September, 1966: 11 years. (Type of Research) Original research. (Methodology) Twenty acres around the 673-foot tower were cleared and planted in centipede grass so that dead birds could be found more easily. An additional 14 acres were cleared when the 1,010-foot tower was built. The improved area was searched at daybreak every day with the exception of a few days in June. All dead birds were collected except for one very large kill. (Results and Conclusions) Major kills occur only at the peak of fall migration in October, when lethal weather(deep low clouds with mist murk and favoring winds) coincides with tremendous flights. A total of 29,451 individuals and 170 species were handled. Total number killed, time of kill, and other notes of interest are given for each species.

1575
Midway's deadly antennas.
AUTHOR: FISHER HI
AUTHOR AFFILIATION: Southern IL Univ.
SOURCE TITLE: Audubon Magazine.
SOURCE ID: 86:220-223, 1966.
YEAR PUBLISHED: 1966
CATEGORY: B2e
SPONSOR: Office of Naval Research.
REGION: Hawaiian Islands STATE: Hawaii
KEYWORDS: bird kills; birds; impact
ABSTRACT: (Purpose) To determine the number of Laysan albatrosses killed annually as a result of the antennas on Midway Island. (Time and Duration) 1964-65; 2 years. (Type of Research) Original research. (Methodology) The number of Laysan albatrosses and other birds killed by the antenna network on Midway Island were counted by personal observations. (Results and Conclusions) One-sixth of the world's 1,500,000 Laysan albatrosses may be lost due to the antenna network on Midway Island. The most deadly parts of the antennal setup are the slanting cables supporting the 300-foot towers of the SCATTER communications apparatus. No action has been taken on proposals that might alleviate this problem.

1576
A comparison of the species composition of two TV tower killed samples from the same night of migration.
AUTHOR: KEMPER CA; RAVELING DG; WARNER DW
SOURCE TITLE: The Wilson Bulletin.
SOURCE ID: 78(1) :26-30, 1966.
YEAR PUBLISHED: 1966
CATEGORY: B2e
SPONSOR: Nat Institute of Health.
REGION: Maple-Basswood Forest + Oak Savanna STATE: Iowa; Illinois; Minnesota; Wisconsin
KEYWORDS: bird kills; birds; birds, song; deciduous; impact; migration; mortality; nocturnal; passerine; prairie; transmission, communication
ABSTRACT: (Purpose) To compare the species composition of birds killed at two different TV towers on the same night. (Time and Duration) September 9-10, 1962. (Type of Research) Original research. (Methodology) All birds killed at two TV towers in Minnesota and Wisconsin were collected and identified for two nights in September. (Results and Conclusions) A comparison of 865 birds killed during migration at a Wisconsin site with 528 birds killed at a Minnesota site is made. The Wisconsin site kill resembles the species killed in a deciduous woodland area, while the kill in Minnesota is similar to species killed in prairie area. The important species in Wisconsin were red-eyed vireo, Tennessee, bay-breasted, and chestnut-sided warbler, and the important species in Minnesota were Swainson's thrush, yellow warbler, sora, and red eyed vireo.

1577
Weight characteristics of birds killed in nocturnal migration.
AUTHOR: GRABER JW; GRABER RR
SOURCE TITLE: The Wilson Bulletin.
SOURCE ID: 74(1):74-88, 1962.
YEAR PUBLISHED: 1966
CATEGORY: B2e
REGION: Oak-Hickory-Bluestem Parkland STATE: Illinois
KEYWORDS: avifauna; bird kills; birds; birds, song; impact; migration; mortality; nocturnal; passerine; transmission, communication
ABSTRACT: (Purpose) To present organ weights of nocturnal migrant birds killed at a television tower in central Illinois. (Time and Duration) 1958-1960. (Type of Research) Original research. (Methodology) Birds killed at a TV tower in central Illinois were collected, weighed and frozen the morning following the kill. The specimens were dissected within two months. Data were collected on fat condition, pectoral muscle mass, brain, heart, lung, spleen and liver weights. (Results and Conclusions) A slow-moving coldfront that results in complete overcast reduced visibility, usually with fog or precipitation, are the weather conditions that promote large kills of nocturnal migrants. Gross weights and organ weights of 469 specimens (21 species) are presented for nocturnal migrants killed in September. The Swainson's thrush, ovenbird, gray-cheeked thrush, red-eyed vireo, catbird and magnolia warbler were the most numerous species. The energetic cost of migration was estimated for adult male Swainson's thrushes to be 2.4 to 4.4 percent of gross weight per hour. Gross weight and weight of certain organs appeared to vary with sex and age. Males tend to be heavier than females, and immatures heavier than adults.

1578
Bird migration collision casualties at Saskatoon.
AUTHOR: GOLLOP MA
SOURCE TITLE: The Blue Jay.
SOURCE ID: 23(1):15-17, 1965.
YEAR PUBLISHED: 1965
CATEGORY: B2e
REGION: Applicable to entire United States STATE: Montana; North Dakota; Nebraska; South Dakota; Wyoming
KEYWORDS: avifauna, bird kills; birds; birds, song; impact; migration; mortality; nocturnal; passerine; transmission line
ABSTRACT: (Purpose) To report on birds colliding with radio and TV towers and powerlines during migration at Saskatoon, Saskatchewan. (Time and Duration) 1961-1964 (falls only). (Type of Research) Original research. (Methodology) One to four people systematically searched the area around radio and TV towers, and area near a power line with 29 wires 50 to 75 feet high. (Results and Conclusions) 543 individuals representing 43 species of birds were found dead over a 4-year period around nine radio and TV towers. The most common species of birds were: sora, flycatchers, Swainson's thrush, red-eyed vireo, yellow warbler, and ovenbird. Overcast skies and poor visibility were usually associated with the kills at the towers. The kills (15 birds of 12 species) at the power line were not associated with bad weather.

1579
An analysis of prairie warblers killed in Florida during nocturnal migration.
AUTHOR: MUMFORD RE; NOLAN V JR
SOURCE TITLE: The Condor.
SOURCE ID: 67:322-338, 1965.
YEAR PUBLISHED: 1965
CATEGORY: B2e
REGION: Beech-Sweetgum-Magnolia-Pine-Oak Forest STATE: Florida
KEYWORDS: birds; birds, song; impact; migration; mortality; season
ABSTRACT: (Purpose) To report on the results of an examination of 448 prairie warblers killed during spring and fall migration. (Time and Duration) 1957-1963. (Type of Research) Original research. (Methodology) Birds were collected the day after death and frozen. External measurements, sex, and body weight were determined for all specimens. Fat condition, gonadal weight, extent of skull ossification, stomach, and bursa of Fabricius were examined. (Results and Conclusions) Prairie warbler males migrate about two weeks earlier than females in the spring. First-year birds of both sexes may migrate later than adults. Fall migration begins with immature birds moving south in July. Adults begin migration by mid-August. Migration was complete by mid-October. There is a differential migration by age class and by sex. Spring birds were not fat and there was no molt. Autumn birds were quite fat, becoming more so as the season progressed. Immatures were fatter than adults and were more heavily wing-loaded.

1580
A tower for TV: 30,000 dead birds.
AUTHOR: KEMPER CA
SOURCE TITLE: Audubon Magazine
SOURCE ID: 66:86-90, 1964.
YEAR PUBLISHED: 1964
CATEGORY: B2e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: bird kills; birds; impact
ABSTRACT: (Purpose) To report on the bird kills at a TV tower in Eau Clair, Wisconsin. (Time and Duration) September 18-20, 1963; 3 days. (Type of Research) Original research (direct observation). (Methodology) A portion (10,195 individuals) of the dead birds were collected and identified. The total number of birds killed was estimated from this sample. (Results and Conclusions) Numerous bird kills had occurred at a 1,000-foot TV tower at Eau Claire, Wisconsin. On the nights of September 18-19 and 19-20, 1963, a very large kill occured (estimated 30,000 birds). The building of TV towers over 500 feet should be controlled to prevent destruction of migrating birds.

1581
Fall migration and weather, a radar study.
AUTHOR: BELLROSE FC; GRABER RR; HASSLER SS
SOURCE TITLE: The Wilson Bulletin.
SOURCE ID: 75(1) :56-77, 1963.
YEAR PUBLISHED: 1963
CATEGORY: B2e
SPONSOR: Nat Science Foundation.; IL Natural History Survey.
REGION: Oak-Hickory-Bluestem Parkland STATE: Iowa; Illinois; Indiana
KEYWORDS: bird kills; birds; climate; migration; nocturnal; passerine; precipitation; seasonal; weather
ABSTRACT: (Purpose) To evaluate the factors that influence migration in central Illinois. (Time and Duration) Fall 1960. (Type of Research) Original research. (Methodology) Migration patterns were determined through the use of radar. Meteorological information correlated with the data on migrant birds was obtained by US Weather Bureau daily surface maps. (Results and Conclusions) The Nocturnal bird migration during the fall, based on radar and lunar data, follows a typical pattern beginning shortly after sunset, reaching a peak at midnight, and declining sharply thereafter. The pattern based on data obtained by aural methods is contradictory. Although some migration occurs nightly throughout late summer and early fall, definite waves or rushes are usually observed at regular intervals. The rate or number of birds observed per hour shows a definite increase in late September and October. A shift in wind direction is usually associated with a wave of migrants, and the wind shift is almost always associated with a cold front. Changes in temperature and barometric pressure do not seem to be directly correlated with migration. The relationship between nocturnal migrants and weather is complex and no single pattern consistently occurs.

1582
Toxicity of "dybar" to bobwhite quail.
AUTHOR: BERGSTRAND J; KLIMSTRA WD
SOURCE TITLE: Journal of Wildlife Management:
SOURCE ID: 26(3):325-327, 1962.
YEAR PUBLISHED: 1962
CATEGORY: B2e
SPONSOR: Southern IL Univ, Cooperative Wildlife; Research Lab.
REGION: Applicable to entire United States STATE: Illinois
KEYWORDS: birds; herbicides; impact
ABSTRACT: (Purpose) To determine toxicity of herbicide Dybar to bobwhite quail. (Time and Duration) 17 days. (Type of Research) Original research. (Methodology) Pelleted fenuron was force-fed to 10 quail in predetermined amounts. Ten control birds were force-fed empty gelatinous capsules. Fenuron pellets were placed in front of a group of four birds to determine voluntary ingestion. (Results and Conclusions) No mortality occurred and behavior and alertness of the quail remained constant throughout the experiment. All birds increased in body weight.

1583
Regina TV tower bird mortalities 1961.
AUTHOR: NERO RW
SOURCE TITLE: The Blue Jay.
SOURCE ID: 19(4):160 165, 1961.
YEAR PUBLISHED: 1961
CATEGORY: B2e
REGION: Applicable to entire United States STATE: Montana; North Dakota; Nebraska; South Dakota; Wyoming
KEYWORDS: avifauna; bird kills; birds; birds, song; ecology; impact; migration; mortality; nocturnal; passerine
ABSTRACT: (Purpose) To report on birds colliding with a TV tower in Regina, Saskatchewan. (Time and Duration) September 1963. (Type of Research) Original research. (Methodology) A TV tower two miles east of Regina, Saskatchewan, was visited periodically during the month of September. Birds that died as a result of colliding with the tower were collected and identified. (Results and Conclusions) Two major instances of bird mortality involving 94 and 113 casualties are reported. Thirty species were identified with red eyed vireos being the most common. Wood warblers and vireos were the most common groups. One kill may have continued during the morning after sunrise when it was raining. There seemed to be little association with poor weather conditions and the second kill.

1584
Migrants at airport ceilometers.
AUTHOR: HICKEY MB
SOURCE TITLE: Passenger Pigeon.
SOURCE ID: 22(1):23-26, 1960.
YEAR PUBLISHED: 1960
CATEGORY: B2e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: avifauna; bird kills; birds; birds, song; ecology; impact; migration; mortality; nocturnal; passerine
ABSTRACT: (Purpose) To report on activities of migrant birds at the airport ceilometer in Madison, Wisconsin. (Time and Duration) May 1952 and October 1959. (Type of Research) Original research. (Methodology) Direct observation on two occasions. (Results and Conclusions) A description of migrating birds in the spring flying through the beam of light from an airport ceilometer is presented. There is also a record of a kill in the fall of 1959 caused by birds being attracted to the ceilometer that resulted in 117 dead birds found of 24 species.

1585
Bird migration casualties and weather conditions autumns 1958-1959-1960.
AUTHOR: LASKEY AR
SOURCE TITLE: The Migrant.
SOURCE ID: 31(4):61-68, 1960.
YEAR PUBLISHED: 1960
CATEGORY: B2e
REGION: Applicable to entire United States STATE: Alabama; Kentucky; Mississippi; Tennessee
KEYWORDS: avifauna; bird kills; birds; birds, song; impact; migration; mortality; nocturnal; passerine
ABSTRACT: (Purpose) To report on nocturnal migrant casualties at two TV towers in Nashville, Tennessee, during the autumn. (Time and Duration) 1958-60. (Type of Research) Original research. (Methodology) Two TV towers were visited throughout the falls of 1958-60 and the areas beneath them were systematically searched for dead birds. Number and species were recorded by location and date. (Results and Conclusions) The largest kills of nocturnal migrants were associated with the approach and passing of a coldfront with northerly winds, usually overcast skies and often some precipitation. The report includes a list of 3683 birds of 77 species that were collected over the three-year period. The most common species were: ovenbird, red-eyed vireo, Tennessee warbler, magnolia warbler, and catbird. An ultra-violet team at a nearby airport ceilometer did not cause any mortality of nocturnal migrants.

1586
Attraction of nocturnal migrants by lights on a television tower.
AUTHOR: COCHRAN WW
SOURCE TITLE: The Wilson Bulletin
SOURCE ID: 70(4):378-380, 1958.
YEAR PUBLISHED: 1958
CATEGORY: B2e
REGION: Oak-Hickory-Bluestem Parkland STATE: United States
KEYWORDS: bird kills; birds; birds, song; impact; migration; mortality; nocturnal; passerine; transmission, communication
ABSTRACT: (Purpose) To describe the behavior of nocturnal migrant birds in response to lights on a television tower. (Time and Duration) 1957. (Type of Research) Original research. (Methodology) Direct observations of migrant birds were made at a television tower from 8 pm, May 29 until 5:15 am, May 30 and from 3:30 am to 5:45 am on November 5. Call note counts were made in November with the red tower lights both on and off. (Results and Conclusions) Nocturnal migrant birds are attracted to and confused by the tower lights only on nights when the ceiling is low, and migrants are apparently forced to fly near or below the 1000 to 3000-foot level. They are not attracted on clear nights or on nights when cloud cover is high. Only a very small percentage of the birds which reach the tower are killed.

1587
Bird destruction at a TV tower.
AUTHOR: KEMPER CA
SOURCE TITLE: Audubon Magazine.
SOURCE ID: 60:270 271, 1958.
YEAR PUBLISHED: 1958
CATEGORY: B2e
REGION: Applicable to entire United States STATE: Wisconsin
KEYWORDS: avifauna; bird kills; birds; birds, song; ecology; impact; migration; nocturnal; passerine
ABSTRACT: To report on bird mortality occurring at TV towers in EauClaire, WI. August to September 1957. Original research. Two instances of mortality at a 1000 foot TV tower are described. An estimated 300 to 400 birds were killed in late August and 20,000 in mid September. The most common species to die were: ovenbird, bay breasted warbler, chestnut sided warbler, magnolia warbler and tennessee warbler. Twenty five species were identified as part of the kill.

1587

1588
An analysis of migrating birds killed at a television tower in east central Illinois, September 1955-May 1957.
AUTHOR: BREWER R; ELLIS JA
AUTHOR AFFILIATION: Univ of IL. Dept of Conservation.
SOURCE TITLE: The Auk
SOURCE ID: 75:400-414, 1958.
YEAR PUBLISHED: 1958
CATEGORY: B2e
SPONSOR: Nat Science Foundation
REGION: Applicable to entire United States STATE: United States
KEYWORDS: bird kills; birds; impact
ABSTRACT: (Purpose) Birds killed at a TV tower in Illinois were studied to provide data on the relative numbers of each sex and age group of a species, fat condition, migration of each group, geographical patterns of migration, and total volume of migration. (Time and Duration) September 1955-May 1957, 21 months. (Type of Research) Original research. (Methodology) Data was collected from seven bird kills at a 983 foot television tower located in Champaign County, Illinois. (Results and Conclusions) Bird kills occurred under conditions of 80-100 percent cloud cover, low cloud ceilings, and obscured visibility. Wood warblers were the most numerous. Bird species were most similar to samples from Tennessee and Georgia, and least similar to those from Kansas. A majority of the birds were adults, females, and moderately to excessively fat. Index values of total volume of migration were subject to many errors.

1589
Analysis of mass bird mortality in October, 1954.
AUTHOR: HAINES; JOHNSTON DW
AUTHOR AFFILIATION: Mercer Univ.
SOURCE TITLE: The Auk
SOURCE ID: 74:447-458, 1957.
YEAR PUBLISHED: 1957
CATEGORY: B2e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: bird kills; birds; impact
ABSTRACT: (Purpose) To analyze data from twenty-five instances of bird kills that occurred at airport ceilometers, radio and television towers, and tall buildings. These kills were reported from New York to the southern states and occurred between October 5 and 8, 1954. (Type of Research) Original research. (Methodology) Data for most of the kills were obtained by use of a questionnaire. Detailed examinations were made of 2552 birds that were killed at the Warner Robbins Air Force Base ceilometer. (Results and Conclusions) An advancing cold front is believed to have precipitated these mass mortalities by bringing together adverse weather conditions, nocturnal migrants, ceilometers and/or tall obstructions. A majority of the kills occurred at ceilometers. Over 100,000 birds were killed, and an estimated 50,000 individuals were killed at one location, the Warner Robbins Air Force Base ceilometer. Data on weight, sex, age, fat deposition, and subspecific determination were collected from birds killed at Warner Robbins.

1590
On the reluctance of gulls to fly under objects.
AUTHOR: GUNTER G
SOURCE TITLE: The Auk.
SOURCE ID: 73:131-132, 1956.
YEAR PUBLISHED: 1956
CATEGORY: B2e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: behavior; birds; fish; impact; transmission line
ABSTRACT: (Purpose) To report on the reluctance of laughing gulls to fly under an overhead object. (Time and Duration) 1952. (Type of Research) Original research. (Methodology) Observation of laughing gulls while feeding them fish from a moving boat. (Results and Conclusions) Laughing gulls would not fly under a drawbridge while being fed from a moving boat. The author also observes that although pelicans and herons will occasionally fly under telephone wires and electric lines, gulls seldom do.

1591
Reducing airport hazards to migrating birds will help prevent death in the night.
AUTHOR: TERRES JK
SOURCE TITLE: Audubon Magazine.
SOURCE ID: 58:18-20, 1956.
YEAR PUBLISHED: 1956
CATEGORY: B2e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: avifauna; bird kills; birds; birds, song; ecology; impact; migration; mortality; nocturnal; passerine
ABSTRACT: (Purpose) To review efforts leading to hazard reduction at airports to prevent death. (Time and Duration) Fall 1954. (Type of Research) Original research literature review. (Methodology) Direct observation of mortality at airports. (Results and Conclusions) A detailed account of an instance of massive bird mortality in the fall of 1954. This occurred from New York to Florida, the primary cause being an unusual weather pattern. Bird mortality at airport ceilometers can be reduced by using ultra-violet light.

1592
Studies of birds killed in nocturnal migration.
AUTHOR: MENGEL RM; TORDOFF HB
SOURCE TITLE: University of Kansas Publications of Museum of Natural History.
SOURCE ID: 10(1):1-44, 1956.
YEAR PUBLISHED: 1956
CATEGORY: B2e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: avifauna; bird kills; birds; birds, song; ecology; impact; migration; mortality; nocturnal; passerine
ABSTRACT: (Purpose) To discuss accidents in which large numbers of night-migrating birds are killed and to analyze a sample of migrant birds killed in autumn near Topeka, Kansas. (Time and Duration) September - October 1954. (Type of Research) Original research and literature review. (Methodology) A TV tower was visited throughout the fall and the area beneath the tower searched for dead birds. For all specimens, weight, sex, age, and fat condition were recorded, and certain species were measured. Some notes on molt were taken. (Results and Conclusions) A sample of 1090 birds representing 61 species were collected at a TV tower near Topeka, Kansas, in fall 1954. This represents 95% of the birds that died. The most common species, listed in order of abundance, were: Nashville warbler, yellow-throat, mourning warbler, Lincoln sparrow, red-eyed vireo, catbird, blue-headed vireo and dickcissel. All major kills occurred on cloudy and foggy nights associated with frontal weather. Estimates of the number of migrants suggest there is a tremendous volume of nocturnal migrants under some conditions. There is a differential migration of sex and age-groups for most species of birds.

1593
Sandhill cranes killed by flying into powerline.
AUTHOR: WALKINSHAW LH
SOURCE TITLE: Wilson Bulletin.
SOURCE ID: 68(1):325-326, 1956.
YEAR PUBLISHED: 1956
CATEGORY: B2e
REGION: Wheatgrass-Bluestem-Needlegrass STATE: Nebraska
KEYWORDS: birds, nongame; mortality
ABSTRACT: (Purpose) To describe an incident of sandhill crane mortality on a powerline. (Time and Duration) 1 day. (Type of Research) Observation. (Results and Conclusions) Five lesser sandhill cranes were found along a road where there was a two-wire powerline which paralleled the river where the birds roosted. Apparently, they had been killed by colliding with the wires.

1594
Mass bird mortality in Georgia, October, 1954.
AUTHOR: JOHNSTON DW
SOURCE TITLE: The Oriole
SOURCE ID: 20(2):19-26,1955.
YEAR PUBLISHED: 1955
CATEGORY: B2e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: bird kills; birds; impact
ABSTRACT: (Purpose) To describe the mass bird mortality that occurred in Georgia on the nights of October 6 and 7, 1954, and to explain what caused it. (Type of Research) Personal observations, reports from other persons, and literature review. (Methodology) Data on bird mortality and weather conditions within the state of Georgia were accumulated. Birds were personally examined to determine cause of death. (Results and Conclusions) An advancing cold front was pushing a large mass of migrating birds who were flying lower than usual due to low cloud ceiling. Some birds were killed by flying into tall obstacles—buildings, TV or radio towers—but a majority of the birds were killed around ceilometers, which project powerful vertical light beams into the sky. Birds were attracted to the light, became disoriented or blinded, and death resulted from flying into each other, the ground, or nearby obstructions.

1595
Bird mortality at airport ceilometers.
AUTHOR: HOWELL JC; LASKEY AR; TANNER JT
SOURCE TITLE: The Wilson Bulletin.
SOURCE ID: 66(3) :217-215, 1954.
YEAR PUBLISHED: 1954
CATEGORY: B2e

REGION: Applicable to entire United States STATE: Connecticut; Illinois; Kentucky; Tennessee; Wisconsin
KEYWORDS: avifauna; bird kills; birds; impact; migration; mortality; passerine; seasonal; weather
ABSTRACT: (Purpose) To report the general pattern of bird behavior mortality at airport ceilometers. (Time and Duration) 1948-1952. (Type of Research) Literature review. (Methodology) Review based on observations of bird mortality at airport ceilometers at six eastern United States locations. (Results and Conclusions) The reports of bird mortality at airport ceilometers have been summarized for a 4-year period (1948-1952). All instances occurred during the migratory period, ten in the fall and two in the spring. Overcast skies with a ceiling of 5000 feet or less and a large number of migrant birds were common to all mortality reports. Although passennes were the most common victims, a number of dead non-passerine species have been reported. Mortality appears to result from impact. either with the ground, another bird in mid-air, or with nearby structures.

1596
Electrocution of parakeets at Agra, India.
AUTHOR: DILGER WC
SOURCE TITLE: Condor
SOURCE ID: 56:102-103, 1954.
YEAR PUBLISHED: 1954
CATEGORY: B2e
REGION: Applicable to entire United States
KEYWORDS: bird kills; birds; impact; mortality; transmission, electric
ABSTRACT: (Purpose) To report mortality of parakeets at Agra, India due to electrocution. (Time and Duration) 1945. (Type of Research) Original research. (Methodology) Direct observation of birds using electric wires. (Results and Conclusions) Rose-ringed parakeets have a method of using their bills to assist with climbing about amidst perches. This behavior resulted in mortality at electric poles. Other species of birds using the poles for perching were not affected.

1597
Weather and spring migration.
AUTHOR: WILLIAMS GG
SOURCE TITLE: The Auk.
SOURCE ID: 67:52-65, 1950.
YEAR PUBLISHED: 1950
CATEGORY: B2e
REGION: Applicable to entire United States STATE: United States
KEYWORDS: avifauna; birds; migration; mortality; passerine; seasonal; weather
ABSTRACT: (Purpose) To review the role of weather in bird migrations. (Time and Duration) Review of literature published between 1927 and 1948. Literature review. (Results and Conclusions) The effects of spring weather patterns on migration are discussed. Most spring migratory flights are probably not on a direct north-south line and there are few spring sesons that the pattern of migration is not affected by bad weather. This includes a need for reverse migration and instances of migrants occurring in unusual locations. Several examples of unusual sightings in the spring are presented.

B3 - Fish and Wildlife Management/ROWs

1598
Wildlife considerations in rights-of-way management.
AUTHOR: SMITH DL
AUTHOR AFFILIATION: Federal Highway Admin.
SOURCE TITLE: Rural and Urban Roads
SOURCE ID: Pages 26-28, 1978 (February).
YEAR PUBLISHED: 1978
CATEGORY: B3; C2
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; highway; mammals, small; management; right-of-way; roadside; wildlife
ABSTRACT: (Purpose) To provide a general narrative on wildlife considerations in highway maintenance. (Type of Research) Narrative. (Results and Conclusions) Highway rights-of-way offer a diverse habitat type that can be maintained to benefit birds and small mammals. Larger animals which could be a motorist hazard should not be managed for, but special structures implemented where such animals must cross a highway during migrations. Examples are given showing how certain small mammals and birds have actually benefitted from a highway. Suggestions for wildlife management along highways include avoiding mowing during nesting seasons, reducing mowing as much as possible, planting of wildlife trees and shrubs, and development of borrow pits. Close cooperation is urged between the maintenance engineer and wildlife biologist.

1599
Endangered bird species: habitat manipulation methods.
AUTHOR: ZIMMERMAN DR
SOURCE TITLE: Science.
SOURCE ID: 192(4242):876-878, 1976.
YEAR PUBLISHED: 1976
CATEGORY: B3
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; endangered; habitat; management; species
ABSTRACT: (Purpose) To explain the types of manipulative management currently being used in an attempt to increase endangered bird species populations. (Type of Research) Literature review. (Methodology) Literature review. (Results and Conclusions) In manipulative management, biologists intercede directly in the afflicted birds' life cycles, either by moving or manipulating the birds themselves, or by manipulating their immediate breeding or feeding habitat. Management techniques explained were egg transfer, double-clutching, cross-fostering, providing feeding stations, predator control, and captive breeding. The successes and failures of the programs were discussed.

1600
Wildlife Management Program for the Volney-Edic 765 kV Transmission Line of Niagara Mohawk Power Corporation.
AUTHOR: BRAMBLE WC
SOURCE ID: Syracuse, N.Y., Niagara Mohawk Power Corp., 1976, 11p.
YEAR PUBLISHED: 1976
CATEGORY: B3
REGION: Northern Hardwoods Forest STATE: New York
KEYWORDS: management; wildlife
ABSTRACT: (Purpose) To design A wildlife management plan for the Volney-Edic 765 kV transmission line. (Type of Research) Management plan. (Methodology) From literature and experience. (Results and Conclusions) A wildlife management plan was designed to improve wildlife habitat conditions. This is done through modification of commonly accepted ROW management techniques with specific objectives of improving cover type interspersion, encouraging development of ROW edges, and increasing plant cover diversiy and wildlife food and cover. These include modification of four standard clearing methods and eight brush disposal techniques. Brush piling is recommended to improve lop and drop brush disposal. Modifications are applied to common vegetation types and sensitive areas on the ROW. A 10-year maintenance program is outlined.

1601
Power lines right-of-ways, and wildlife management - a working paper.
AUTHOR: ME DEPT. OF INLAND FISHERIES AND GAME
SOURCE ID: Me Dept of Inland Fisheries and Game, 1975; 5 p.
YEAR PUBLISHED: 1975
CATEGORY: B3
REGION: Northern Hardwoods - Spruce Forest STATE: Maine
KEYWORDS: right-of-way; wildlife
ABSTRACT: (Purpose) To describe special management for critical wildlife habitat. (Type of Research) Descriptive paper. (Results and Conclusions) ROWs can be managed to become beneficial for wildlife. Deer wintering areas can be enhanced by ROWs parallel to them to furnish low browse. Travel lanes should be left when a ROW crosses a deer yard, and ROW width should not exceed the height of edge trees. Gullies on ROW should be left in dense cover; trees may be topped. On multiple-lines an island of cover should be left between ROWs. Lines should not be put through duck marshes, or underground. Endangered species nesting areas should be avoided or screened by a natural buffer strip. Potential exists for the enhancement of wildlife habitat on some rights-of-way. Selective cutting and spraying on rights-of-way should be aimed at eliminating trees and allowing the growth of grasses, forbs, herbs and shrubs. Broadcast sprays or other nonselective methods such as bulidozing should not be used as a means of vegetation control.

1602
Big game use and habitat changes in a recently logged mixed conifer forest in northeastern Oregon.
AUTHOR: EDGERTON PJ
AUTHOR AFFILIATION: US Forest Service, Pacific Northwest Forest and Range Experiment Station
SOURCE TITLE: Western Association of State Game & Fish Commissioners.
SOURCE ID: 52:239-246,1972.
YEAR PUBLISHED: 1972
CATEGORY: B3; C4
SPONSOR: US Forest Service.
REGION: Grand Fir-Douglas-fir Forest STATE: Oregon
KEYWORDS: clearing; forest; habitat; impact; logging; mammals, big game; wildlife

1602

ABSTRACT: (Purpose) To determine the relative use of logged conifer forests by elk and mule deer. (Time and Duration) Four years (1966-1969). (Type of Research) Original field research. (Methodology) Pellet counts of both deer and elk were made on four basic habitat types: 1) clearcut with slash left and ground seeded to grass; 2) clearcut with 1/2 slash remaining but no seeding; 3) unlogged strips on perimeter of clearcut areas; 4) partial cut strips. Plant cover measurements and utilization were also determined for the second, third, and fifth growing seasons after logging. (Results and Conclusions) Elk and deer used the clearcuts more than the partial cut or unlogged areas, obviously attracted to the better variety and quality of food. The unlogged area was second in use, being excellent cover, but poor in forage. The partial cut area was least preferred because it lacked volume and forage found in the clearcuts, and the cover offered in the unlogged area. Elk showed a greater difference in preference among the four areas than did deer.

1603

Wildlife response to rights-of-way management; phase I: rights-of-way in western Washington, a final report.

AUTHOR: LASSOIE JP; SMITH M; TABER RD
AUTHOR AFFILIATION: Univ of WA. WA State Game Dept.
SOURCE ID: Seattle, WA, Univ of WA, 1970, 13 p.
YEAR PUBLISHED: 1970
CATEGORY: B3
REGION: Pacific Forest STATE: Washington
KEYWORDS: management; right-of-way; wildlife
ABSTRACT: (Purpose) To examine the extent to which the primary objectives of right-of-way management and the quality of wildlife habitat could be reconciled. (Time and Duration) 1970; 1 year. (Type of Research) Preliminary data collection. (Methodology) Utility records were examined and personnel questioned to get information on possible study areas. (Results and Conclusions) Basic information was collected on ROW sites to be used for a field study. In general, commonly accepted herbicide sprays and cutting techniques are used.

1604

Shrubs for Wildlife habitat improvement in southern Michigan.

AUTHOR: ZORB G
SOURCE ID: Lansing, MI MI Dept of Conservation, 1966, Research and Development Report 81, 14 p.
YEAR PUBLISHED: 1966
CATEGORY: B3
SPONSOR: MI Dept of Conservation.
REGION: Beech-Maple Forest STATE: Michigan
KEYWORDS: habitat; habitat manipulation; planting; shrubs; wildlife
ABSTRACT: (Purpose) to decide which common shrub plantings for wildlife in southern MI were of value, as well as site selection, planting methods, and maintenance used. (Time and Duration) Not given, but probably less than one year. (Type of Research) Questionnaire and data compilation. (Methodology) A two-page shrub appraisal form was sent to 28 game biologists in southern Michigan asking for ratings for wildlife food and cover quality, their choice of the top five shrubs to use, and comments relating to individual species and research needs. Scores were tallied for 21 different shrubs and rated as to "use" or "not to use." Results were compared with evaluations of New York's shrub planting program. (Results and Conclusions) For large scale plantings, autumn olive, multiflora rose, Siberian crab, and highbush cranberry are highly recommended. Other plants recommended for smaller plantings were: dogwoods, buffaloberry, Washington haw, wild grape, and nannyberry. General planting recommendations for each species are also given.

1605

Evaluating the use of aerial nesting platforms by Canada geese.

AUTHOR: CRAIGHEAD JJ; STOCKSTAD DW
SOURCE TITLE: Journal of Wildlife Management.
SOURCE ID: 25(4):363-372, 1961.
YEAR PUBLISHED: 1961
CATEGORY: B3
SPONSOR: MT Cooperative Wildlife Research Unit.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; breeding; changes, effect of; habitat change; nest; nesting; population; predation; reproduction; structure design; trend; waterfowl
ABSTRACT: (Purpose) To evaluate the use of aerial platforms as nest sites for Canada geese as a management practice. (Time and Duration) 1953-1960. (Type of Research) Original research. (Methodology) During a 5-year period, 73 aerial platforms (average) were available each year to Canada geese along Flathead Lake, in Nine Pipe Reservoir, and along Flathead River, Montana. Nests located on natural and artificial sites were studied each year. (Results and Conclusions) Artificial nesting platforms can be used effectively in the management of Canada geese. The wooden platforms should be 30 x 26 x 6 inches. They should be placed 20 to 50 feet above the ground, preferably at isolated sites so as to minimize desertion. The platforms must be repaired and replenished with soil and duff each season prior to the establishment of nesting territories. Although the nesting platforms do not appear to cause an increase in general population level, they can bring about a change in nesting habitat that is beneficial to the population. The platforms would be most effective if placed on large islands, on lake and river shorelines, wherever suitable nesting sites are limited, or where natural sites are subjected to flooding or heavy predation.

1606

The role of herbicides in wildlife management.

AUTHOR: CAIN SA; LEONARD JW
SOURCE TITLE: Recent Advances in Botany.
SOURCE ID: Toronto, Ontario, Univ of Toronto Press, 1959, Vol 11, 1422-1425 p.
YEAR PUBLISHED: 1959
CATEGORY: B3
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; management; wildlife
ABSTRACT: (Purpose) A review of the current (1959) herbicides uses in wildlife management. (Type of Research) Literature review. (Results and Conclusions) Herbicides (depending on cost) may be a valuable tool in wildlife management because they are effective and can be applied easily and extensively. Outlined are major benefits of herbicides, such as creating and maintaining openings for wildlife, eliminating unwanted aquatic vegetation, and encouraging sprouting of food and cover plant species. Further research is urged, especially in aquatic usage. Questions are raised on the value of maintaining suitable wildlife habitat on highway ROWs as that may also increase mortality.

1607

Game management.

AUTHOR: LEOPOLD A
AUTHOR AFFILIATION: Univ of WI.
SOURCE ID: New York, NY, Charles Scribner's Sons, 1933, 481 p.
YEAR PUBLISHED: 1933
CATEGORY: B3; C4; E
REGION: Applicable to entire United States STATE: United States
KEYWORDS: game; impact; management; wildlife
ABSTRACT: (Purpose) To describe game conservation by management. (Type of Research) Textbook. (Results and Conclusions) Covering all aspects of wildlife management, this book contains chapters on population dynamics, ranges, censusing, hunting, refuges, predator control, food-water-cover manipulation, disease and mortality, policy, aesthetics, and economics all related to game species. Chapter 14, "Accidents," briefly references electrocution of birds by transmission lines.

B3a - Feasibility assessments

1608

Right-of-way management for an endangered species: the red-cockaded woodpecker.

AUTHOR: JACKSON JA
AUTHOR AFFILIATION: MS State Univ.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 247-252 p.
YEAR PUBLISHED: 1976
CATEGORY: B3a
REGION: Southeastern Mixed Forest STATE: Alabama; Florida; Georgia; Louisiana; Mississippi; South Carolina
KEYWORDS: birds; habitat; management; right-of-way
ABSTRACT: (Purpose) The possibility is of utilizing interstate highway rights-of-way in the southeastern US as corridors to link isolated populations of the red-cockaded woodpecker, an endangered species is discussed. (Type of Research) Discussion paper. (Results and Conclusions) Implication is made that findings may relate to utility ROW management which would consist of maintaining, or introducing, pines along ROW edges to be grown on an 80-year rotation, with sparse ground cover favored. This would reduce "island effects" of local habitats and may possibly apply to other endangered species.

1609

Woodpecker foraging in Appalachian clearcuts.

AUTHOR: CONNER RN; CRAWFORD HS
AUTHOR AFFILIATION: VA Polytechnic Institute.; US Forest Service.
SOURCE TITLE: Journal of Forestry.
SOURCE ID: 72(9):564-566, 1974.
YEAR PUBLISHED: 1974
CATEGORY: B3a
REGION: Oak-Hickory Forest STATE: Virginia
KEYWORDS: birds; clearing; foraging; habitat; habitat change; management

ABSTRACT: (Purpose) To evaluate the effect of clearcutting on activities of four species commonly found in Appalachian mixed oak stands: the downy, hairy, and pileated woodpeckers, and the common flicker. (Time and Duration) One year study, 1972-1973. (Type of Research) Original research. (Methodology) 20-acre plot was selected in each of four areas on the Jefferson National Forest. Plots were on mid to lower slopes between the crest of the ridge and the adjoining valley; site index for oak was 70 or below. Vegetation consisted mainly of oaks and hickories. Each plot was observed for 20 hours per season in fall 1972, winter 1973, and spring 1973. The length of time each bird spent pursuing each activity was recorded. Observations were recorded independently for each woodpecker present and summed for all species. (Results and Conclusions) In mixed oak stands, downy and hairy woodpeckers fed on insects located under the bark of the abundant logging debris left one year after clearcutting. Flickers fed on ants and fruits found on the ground in an area clearcut five years previously. A 12-year-old clearcut area was used only occasionally by all these birds. A mature, uneven sized stand was used substantially by downy, hairy and pileated woodpeckers, but not by the common flicker.

1610
Wildlife - an essential consideration determining future highway roadside maintenance policy.
AUTHOR: JOSELYN B
AUTHOR AFFILIATION: IL Natural History Survey.
SOURCE TITLE: Highway Research Record
SOURCE ID: Washington, D C, Highway Research Board, 1969, No 280, 14 p.
YEAR PUBLISHED: 1969
CATEGORY: B3a; B3b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds, game; birds, song; maintenance; mowing; nest; right-of-way; roadside; safety; wildlife
ABSTRACT: (Purpose) To trace the history of roadside development and discuss newly emerging concepts of roadside vegetation management and their implications for ground-nesting birds and small mammals of the Midwest. (Time and Duration) Literature review covering papers published over a 30-year period. (Type of Research) Literature review and questionnaires. (Methodology) Three decades of literature related to roadside ROW management practices were reviewed, including the recent federal government standards for the Interstate system. Literature was also reviewed related to highway kills of deer and pheasant. From these data recommendations were made on areas of future research needs. (Results and Conclusions) The primary concern of highway administrators has been for the safe, efficient movement of traffic. Conservation considerations have been mostly confined to topics having direct bearing on the highway user, erosion control and functional plantings. Development of habitat for wildlife on highway ROWs has been rare. Conservationists have argued for these practices to benefit game birds and mammals. More research is needed before definite wildlife management practices can be incorporated on roadside ROWs. Conservationists are not justified in arguing for highway roadside cover without regard to safety implicatons; however, highway administrators must not arbitrarily preclude wildlife considerations from roadside management programs without evidence that a hazard is created.

1611
Browse plants yield best in forest openings.
AUTHOR: ALCANIZ R; HALLS LK
AUTHOR AFFILIATION: US Forest Service, Southern Forest Experiment Station.
SOURCE TITLE: Journal of Wildlife Management
SOURCE ID: 32(1):185-156, 1968.
YEAR PUBLISHED: 1968
CATEGORY: B3a
REGION: Beech-Sweetgum-Magnolia-Pine-Oak Forest STATE: Texas
KEYWORDS: browse; checklist; food; forest; habitat change; species
ABSTRACT: (Purpose) To report on a study in which productivity of browse plants grown in an opening was compared to yields beneath a moderately stocked stand of pines. (Time and Duration) Four-year study, 1963-1966. (Type of Research) Original field research. (Methodology) In early 1963, one year old seedlings of 21 browse species considered to be good wildlife foods were planted beneath a recently thinned saw-timber-size stand. Nine plants of each species were equally spaced within each of four contiguous 1/4-acre blocks. The same planting schedule and arrangement were carried through in a nearby abandoned field. Here the land was disced in preparation for planting. Weight of fruit and length of twig growth per plant were determined periodically. This paper gives results for those species that bore fruit in 1966. (Results and Conclusions) At age five years, open-grown plants of seven browse species were compared with those growing beneath a pine understory. These species included American beautyberry, yaupon, Japanese honeysuckle, Alabama supple-jack, strawberry bush, flowering dogwood and yellow jessamine. Open-grown plants averaged 32 times more fruit and nearly seven times more twig growth than plants beneath the saw-timber-size pine stand.

1612
Rights-of-way for wildlife.
AUTHOR: LATHAM RM
AUTHOR AFFILIATION: PA Game Com.
SOURCE TITLE: Pennsylvania Game News.
SOURCE ID: 27(4):19-23, 1956.
YEAR PUBLISHED: 1956
CATEGORY: B3a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: brush control; habitat; maintenance; vegetation; wildlife
ABSTRACT: (Purpose) To discuss the use of rights-of-way for managing wildlife. (Type of Research) Literature review. (Results and Conclusions) A vegetation cover very acceptable to the wildlife manager can be established on rights-of-way without conflicting with the needs or requirements of utility companies. The author belives that this desirable end result can be achieved without additional costs to these companies. In fact, there is good evidence that selective spraying of sprouts and seedlings will prove to be the most economical method of ROW establishment and maintenance.

1613
Ammate in the diet of deer.
AUTHOR: HAUGEN AO
AUTHOR AFFILIATION: AL Cooperative Wildlife Research Unit.
SOURCE TITLE: Journal of Wildlife Management.
SOURCE ID: 17(1):33-36, 1953.
YEAR PUBLISHED: 1953
CATEGORY: B3a
REGION: Beech-Sweetgum-Magnolia-Pine-Oak Forest STATE: Alabama
KEYWORDS: ammonium sulfamate; deer; herbicides; impact; toxicity; wildlife
ABSTRACT: (Purpose) To determine whether deer mortality was due to a recent application of Ammate (ammonium sulfamate) to undesirable trees on the Talladega National Forest. (Time and Duration) Two-year study (1950-1951). (Type of Research) Original research (field). (Methodology) Facilities consisted of two pens and three doe deer, one adult and two yearlings. In each test at least one deer was used as a check animal. Feeding experiments were carried on for two summers. Species of plants treated with ammonium sulfamate included some of the most commonly treated in timber stand improvement operations. Two-week intervals were allowed between tests; during these "rest periods" deer were fed corn, feed and alfalfa hay. These foods were also available for deer during the test period. (Results and Conclusions) Deer that were provided ammonium sulfamate in crystalline form or were fed herbicide-treated foliage of sweet gum, water oak, post oak, persimmon and black cherry, were found to suffer no ill effects from the diet. Results indicated that the use of ammonium sulfamate in weeding out trees does not endanger deer.

1614
Hedge plantings for erosion control and wildlife management.
AUTHOR: EDMINSTER FC
AUTHOR AFFILIATION: Soil Conservation Service.
SOURCE TITLE: Transactions of the North American Wildlife Conference.
SOURCE ID: 4:534-541, 1939.
YEAR PUBLISHED: 1939
CATEGORY: B3a; B4a
REGION: Applicable to entire United States STATE: United States
KEYWORDS: checklist; erosion; management; shrubs; soil; species; stability; wildlife
ABSTRACT: (Purpose) To stress the benefits of contour hedges when planted on the farm, and show that managed hedges are beneficial for wildlife management and erosion control. (Time and Duration) One year. (Type of Research) Literature review. (Methodology) The author summarizes his experience and those of others in the United States and Europe in establishing and maintaining hedges. Particular emphasis is put on the selection of proper species and methods of maintaining hedges. (Results and Conclusions) Planting and care of hedges is a valuable tool for soil conservation and wildlife management. A managed hedge is quite different from a wild hedgerow. Hedges are of greatest value when planted on the contour and may be located along fences, on other contour field boundaries or at the top of filter strips above diversion terraces. A number of species of woody plants may be used for hedges. Two or more species should be used in each hedge, planted in a double row with staggered 2-foot by 2-foot spacing. From 200 to 600 feet apart is a desirable spacing of hedges on a slope. Some maintenance is required.

B3a - Feasibility assessments

1614

B3b - Management techniques in use

1615
Cooperative wildlife habitat development along transmission line corridors.
AUTHOR: FOWLER DK; MARCUM LC; PUGH RR
AUTHOR AFFILIATION: TN Valley Authority. TN Wildlife Res. Agency.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management. January 6-8, 1976.
SOURCE ID: Mississippi State MS. MS State Univ. 1976. 295-301 p.
YEAR PUBLISHED: 1976
CATEGORY: B3b
REGION: Mixed Mesophytic Forest STATE: Alabama; Kentucky; Mississippi; North Carolina; Tennessee; Virginia
KEYWORDS: habitat; management; right-of-way; wildlife
ABSTRACT: (Purpose) A description is given of recent developments within the TVA system in seven states which should benefit wildlife along ROWs. (Type of Research) Discussion paper. (Results and Conclusions) On new ROWs a grass-legume mixture is developed by cultivation, seeding, and fertilizing. Ky 31 fescue is commonly sown for erosion control and is soon replaced by native plants. Opinion is given that wildlife species change, and habitat is lost for some and increased for others. Failure to get good brush control and anxiety about herbicides caused a change from herbicides to mechanical methods. About 90 percent of the program is on a four-year rebrushing cycle with large rotary-type machines. On 10 percent, where terrain and damage prevent mechanical rebrushing, herbicides are still used. As research is lacking on effects of mechanical methods on wildlife on ROWs, evidence from forest clear-cutting is referred to for habitat changes of value to wildlife. Cooperative agreements have been made with landowners for agricultural use, and cost-sharing agreements have been made with public agencies for ROW wildlife habitat improvement. A procedure is being worked out for long-term cooperative agreements with major land owners and the TWRA.

1616
Wildlife management on utility company rights-of-way: results of a national survey.
AUTHOR: LANCIA RA; MCCONNEL CA
AUTHOR AFFILIATION: Univ of MA.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State. MS, MS State Univ. 1976, 307-314 p.
YEAR PUBLISHED: 1976
CATEGORY: B3b
REGION: Applicable to entire United States STATE: United States
KEYWORDS: management; right-of-way; wildlife
ABSTRACT: (Purpose) A questionnaire survey of 312 utilities throughout the US was made to learn of their ROW management practices for wildlife. (Time and Duration) 1975. (Type of Research) Survey research. (Methodology) Questionnaires were sent to 165 electric power suppliers, 130 gas pipeline companies, and 17 gas-electric companies, distributed throughout the contiguous US. The survey was primarily concerned with ROW management on transmission lines. Chi-square tests and analyses of variance were made where applicable. (Results and Conclusions) Responses were obtained from 47 percent in 44 states. Twenty-four percent had implemented a wildlife management plan, and vegetation maintenance to create a more favorable habitat was the most frequently cited plan. High cost of management was the chief problem; uncooperative landowners was next, and this was important as 89 percent of the ROWs were under an easement. Beneficiaries were primarily hunters and the general public, with bird watchers ranking third. Small game mammals and upland game ranked highest as objectives of wildlife management. Trail bikers and snowmobilers were considered a problem, along with hunters, while woodpeckers were the most important problem species. Foresters and environmental technicians were the most common specialties among employees. Over 80 percent of the companies did not know of any state policy on ROW wildlife management.

B3c - Cost of management techniques

1617
Practical aspects of managing roadside cover for nesting pheasants.
AUTHOR: JOSELYN GB; TATE GI
AUTHOR AFFILIATION: IL Natural History Survey.; IL Dept of Conservation.
SOURCE TITLE: Journal of Wildlife Management
SOURCE ID: 36(1):1-11, 1972.
YEAR PUBLISHED: 1972
CATEGORY: B3c; C2
SPONSOR: IL Natural History Survey.; IL Dept Conservation.; Federal Aid Project.
REGION: Tall-grass Prairie STATE: Iowa; Illinois; Indiana; Kentucky; Ohio
KEYWORDS: birds; habitat; managment; right-of-way
ABSTRACT: (Purpose) To determine the feasibility of managing roadsides for nesting ring-necked pheasants and to answer questions regarding (1) acceptance of the program by farmers, (2) problems of establishing seedings, (3) costs, and (4) possible effects on pheasant populations. (Time and Duration) 1967-70; 4 years (Type of Research) Original research. (Methodology) Roadsides within a 20 square mile area of east-central Illinois were seeded to bromegrass (Bromus spp) and alfalfa (Medicago sativa) during August and September, 1968, to evaluate cost and acceptance of seeding as a practical tool for providing pheasant nesting cover over a large area. (Results and Conclusions) Of the 65 farm operators residing in the management unit, 61 participated in the program. Part of the agreement was that farmers delay roadside mowing until July 31. During 1970 less than 10 percent of the roadsides had been mowed by July 31. Amortized over a 10-year life expectancy of the seedings, the cost per acre per year would be about $7. Data from a prior study showed that number of pheasants hatched on roadsides was substantially increased by the seeding.

B4 - Effects on Agricultural Crops

1618
Wild fruit of the right-of-way.
AUTHOR: BRAMBLE WC; BYRNES WR
AUTHOR AFFILIATION: Purdue Univ.
SOURCE TITLE: Industrial Vegetation Management
SOURCE ID: 8(1):2-4, 1976.
YEAR PUBLISHED: 1976
CATEGORY: B4
REGION: Appalachian Oak Forest STATE: New Jersey; Pennsylvania
KEYWORDS: food; right-of-way; shrubs; wildlife
ABSTRACT: (Purpose) Observations were made on fruiting of shrubs during a study of plant cover development on a herbicide-sprayed ROW from 1953-1973 in central Pennsylvania. (Time and Duration) 1953-1973. (Type of Research) Original research. (Methodology) Observations were made on six treatment areas in each of four randomized blocks. (Results and Conclusions) Eleven species of shrubs and small trees were observed fruiting vigorously on the ROW. These included blueberries, deerberry, huckleberry, witch-hazel, bear oak, elderberry, wintergreen, Juneberry, and sassafras. Open conditions produced by 2,4-D and 2,4,5-T sprays favored vigorous fruiting as compared with sparse fruiting in the adjacent forest. Deer, grouse, turkey, and songbirds, used these fruit as a food supply.

1619
The long-term socio-economic impact of an electrical power transmission corridor on the rural environment: perception and reality.
AUTHOR: BOYER J; MITCHELL B; PRIDDLE GB
AUTHOR AFFILIATION: Univ of Waterloo.
SOURCE TITLE: Submission to the Royal Commission on Electric Power Planning.
SOURCE ID: Waterloo, Ontario, Univ of Waterloo, 1976, 43 p.
YEAR PUBLISHED: 1976
CATEGORY: B4
SPONSOR: Royal Commission on Electric Power; Planning
REGION: Applicable to entire United States
KEYWORDS: environment; impact; land use; right-of-way; socioeconomic; transmission
ABSTRACT: (Purpose) To examine the long-term effects upon land use, land value, land transfers and environmental quality arising from a hydro corridor. (Time and Duration) March 1976 (Type of Research) Field study and attitude survey. (Methodology) The long-term impact of a power corridor on selected land use, economic, and social aspects was studied on an existing 230 kV hydro corridor built in the early 1950's northeast of Waterloo and on an adjacent parallel control corridor. Both corridors were examined to determine differences in physiography, geology, soils, capability for agriculture, and actual land use. Economic differences between the two corridors were evaluated by determining number and type of land transfers and number and value of land sales. Sixteen residents in each corridor were interviewed to determine their attitudes toward the hydro corridor. (Results and Conclusions) No differences were found between the existing hydro corridor and control strip relative to physical and economic attributes. Chi-square analysis indicates that there was no significant difference in the types of land transfers and in sale price per acre in the study area. Results of the attitude survey of residents shows that they have adapted to the presence of the power line; the line was rarely mentioned in a negative manner. In contrast, residents in the control area were more negative in thinking that the power line disrupted agricultural activity, reduced land value, and was an unattractive feature of the landscape. Opposition against hydro corridors

can be expected to continue at the planning and construction stages, but in the long run, they do not appear to have many negative impacts.

1620
Effects of pipeline construction on creosote bush scrub vegetation of the Mojave Desert.
AUTHOR: ESLINGER DH; JOHNSON HB; VASEK FC
AUTHOR AFFILIATION: Univ. of CA.
SOURCE TITLE: Madrono.
SOURCE ID: 23:1-13, 1975.
YEAR PUBLISHED: 1975
CATEGORY: B4
REGION: American Desert (Mojave-Colorado-Sonoran) STATE: California
KEYWORDS: construction; impact; right-of-way; vegetation
ABSTRACT: (Purpose) To assess the impact of a pipeline construction on creosote bush scrub vegetation. (Time and Duration) 1972; 1 yr. (Type of Research) Original research. (Methodology) Vegetation was studied on belt transects. The pipeline was constructed 12 years before the study. (Results and Conclusions) Construction had completely destroyed the vegetation. Significant revegetation by long-lived species had taken place on four areas but not on four other areas. Best revegetation occurred in areas of moderate to high productivity. Desert vegetation such as creosote bush is fragile and will take many centuries to regain its former condition, as an old shrub community.

1621
Growing Christmas trees on a power line right-of-way.
AUTHOR: JOSLYN J J; MACCONNELL P W
AUTHOR AFFILIATION: Univ of MA.
SOURCE TITLE: Proceedings Northeastern Weed Control Conference.
SOURCE ID: 22:329-333, 1968.
YEAR PUBLISHED: 1968
CATEGORY: B4
SPONSOR: Holyoke Water Power Co.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: multiple use; planting; right-of-way; trees
ABSTRACT: (Purpose) To investigate Christmas tree production as a means of meeting Company objectives on wooded sections of rows. (Time and Duration) 1965. (Type of Research) Original research. (Methodology) Sixty-eight acres were planted with 1000 trees per acre. Nine species were used. Survival was taken at the end of the growing season. (Results and Conclusions) The question of suitability of rows for Christmas tree production is not one of technology, but of demand for the trees. At the time this article was written, there was not enough demand for christmas trees.

B4a - Soils - productivity, yield

1622
The effects of hydro transmission towers on farm operations in western and eastern Ontario; a synthesis of the Ridgetown and kemptville studies.
AUTHOR: ONTARIO HYDRO
AUTHOR AFFILIATION: Ontario Hydro.
SOURCE ID: Toronto, Ontario, Ontario Hydro, 1977, 108 p.
YEAR PUBLISHED: 1977
CATEGORY: B4a; B4d; B4e
REGION: Applicable to entire United States
KEYWORDS: agriculture; cost; crop yield; impact; land use; right-of-way; towers; transmission
ABSTRACT: (purpose) To determine the effects of Ontario Hydro towers on farm operations in Western and Eastern Ontario. (Time and Duration) 1974 to 1975; two years. (Type of Research) Original field research. (Methodology) Two studies were conducted by Ridgetown and Kemptville Agricultural Colleges; one projected effects of towers on the resources of farmers and the other determined effects on farm field operations. In the first, 50 towers of various types and arrangements were surveyed in a field condition simulation to evaluate safe operating distance, time and motion efficiency, crop damage, non-productive area, tower location, and weed control costs. The second involved actual farm operations, utilizing 38 samples, to determine land removed from production, crop damage and yield reduction, loss of inputs, loss of machinery efficiency, and effect on farm income. Crops studied were soybeans, small grains, corn and hay. (Results and Conclusions) Tower location in fencerows was the best and resulted in less wasted time, lost productive area, equipment contact, and reduction in income. In fields, towers oriented parallel to work direction were best and those in the headland worst. About 70% of costs to farmers was due to creation of non-productive area and the remainder to time loss, crop damage and material loss. Cost to farmers for all factors due to a 26 by 26 foot tower was a $12.64 per year in wheat to $28.28 in corn silage in Western Ontario and $2.10 per year in hay to $13.16 in corn in Eastern Ontario. Overall, costs to farmers was related to tower size, location and design, equipment size, crop grown, and expertise of equipment operator.

1623
Agricultural impacts of EHV transmission lines — four cases in Ontario.
AUTHOR: ONTARIO HYDRO
AUTHOR AFFILIATION: Ontario Hydro
SOURCE ID: Toronto, Ontario, Ontario Hydro, 1974.
YEAR PUBLISHED: 1974
CATEGORY: B4a; B4d; B4e
REGION: Applicable to entire United States
KEYWORDS: compaction; electrical effect; farming; impact; land use, productivity; right-of-way; transmission
ABSTRACT: (Purpose) To propose studies to further quantify the effect of transmission lines on farm communities and to implement an effective means of transmitting the information to the affected farm community. (Time and Duration) Documents of 1963 and 1974 (Type of Research) Documents of farm impacts and research recommendations. (Methodology) This document includes two cases or claims involving impacts of 230 kV and 500 kV transmission lines on tobacco farming in Ontario, a proposal for routing of a 500 kV line to minimize impacts on farming by the Durham County Federation of Agriculture to the Solandt Commission, and recommendations by Ontario Hydro for studies of EHV line impacts on farming communities. It was recommended that field research be conducted by the Research Branch of Ministry of Agriculture and Food with financing and coordination by Ontario Hydro (Results and Conclusions) A claim investigated concerned electrostatically-induced shocks received from green tobacco in a kiln adjacent to a 230 kV transmission line. The discharge energy was found marginally capable of igniting propane gas used in the kiln for tobacco curing. A brief submitted to the Solandt Commission by a group of farmers sought to provide an understanding of the uniqueness of tobacco farming and how a new transmission route would impact their operations. Alternate routes were proposed to reduce agricultural impacts. Recommended studies of transmission lines include tower and construction-related impacts on farm field operations; radio and television interference; induced currents on vehicles, fences, and buildings; ozone concentrations; irrigation hazards; impacts on parallel utilities; audible noise levels; effect of helicopter patrols on farm animals; and limitations on aerial crop spraying.

1624
Effects of trunk-injected oxydemetonmethyl on Douglas-fir cone and seed insects, seedling production, and mice.
AUTHOR: GILES RH JR; JOHNSON RD; SCHENK JA
AUTHOR AFFILIATION: Univ of ID Forest, Wildlife and Range Experiment Station.
SOURCE ID: Moscow, ID, University of Idaho Forest, Wildlife and Range Experiment Station, 1967, Station Paper No. 2, 19 p.
YEAR PUBLISHED: 1967
CATEGORY: B4a
REGION: Grand Fir-Douglas-fir Forest STATE: Idaho; Oregon; Washington
KEYWORDS: herbicides; impact; insecticides; mammals; toxicity; trees
ABSTRACT: (Purpose) To determine the effect of trunk-injections of oxydemetonmethyl in preventing seed loss through seed insects, and the effects of this insecticide on seedling production and on mice. (Time and Duration) Two-year study. (Type of Research) Original research (field study). (Methodology) In 1964, two replicates of six Douglas-fir were selected as test trees, with two in each replicate serving as controls. Oxydemetonmethyl was injected during June with a Mauget Tree-Injector Unit, using 24 grams for each tree. Cone and branch-tip samples were collected one week after treatment, and at two-week intervals thereafter. Branches were tested for signs of phytotoxicity. Cones and seeds were studied for larvae and pupae. Cones and seeds from injected trees were fed to live-trapped deer mice. (Results and Conclusions) Highly significant differences in mortality of Barbara colfaxiana were obtained between treated and untreated cones. Sample counts of dead and living midge larvae within the galls indicated that mortality of this species was high. The insecticide did not produce discernible phytotoxic symptoms, and apparently had no effect on seedling growth or development. Test colonies of white mice and deer mice fed treated cones showed no difference in behavior, fecundity and survival of young from those colonies fed untreated material.

1625
Rating northeastern soils for their suitability for wildlife habitat.
AUTHOR: ALLAN PF; DUGAN RF; GARLAND LE
AUTHOR AFFILIATION: Soil Conservation Service.
SOURCE TITLE: Twenty-eighth North American Wildlife Conference.
SOURCE ID: 28:247-261, 1963.
YEAR PUBLISHED: 1963
CATEGORY: B4a; C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: classification; habitat; soils; wildlife

B4a - Soils - productivity, yield

1625

ABSTRACT: (Purpose) To discuss the suitability rating of specific soils for management of several important northeastern wildlife habitat elements. (Type of Research) Somewhat of a general literature review, with a discussion of concepts still in developmental form. (Results and Conclusions) The authors hold that behavior of soils can be predicted from knowledge of their properties. The growth habits and characteristics of plants that comprise wildlife habitat are affected by such behavior. The authors get into a long discussion of the factors and making of the rating.

1626

Use of shrubs in developing farm wildlife habitat.

AUTHOR: EDMINSTER FC
AUTHOR AFFILIATION: Soil Conservation Service.
SOURCE TITLE: Transactions, Fifteenth North American Wildlife Conference.
SOURCE ID: 15:519-550.
YEAR PUBLISHED: 1950
CATEGORY: B4a; C4
REGION: Applicable to entire United States STATE: Massachusetts; New Hampshire; New York; Pennsylvania; Vermont
KEYWORDS: carrying capacity; conservation; growth form; habitat; mammals; soil; vegetation
ABSTRACT: (Purpose) To discuss the use of various shrubs that can be planted around farm wood lots to provide habitat for wildlife (Type of Research) Literature review. (Results and Conclusions) Shrubs planted in conservation practice on farms can be an integral part of a sound land-use plan and soil conservation program. Shrub plantings fit well into hedges, borders, windbreaks, odd areas for wildlife cover and on streambanks. So located, their cover often becomes a key to productive wildlife habitat pattern and enhances the carrying capacity of the whole farm for important wildlife species. Shrubs suitable for use in the northeast are discussed in some detail.

B4e - Decreasing operational efficiency

1627

A preliminary study of power line damages.

AUTHOR: DOANE AGRICULTURAL SERVICE
AUTHOR AFFILIATION: Doane Agricultural Service.
SOURCE ID: St Louis, MO, Doane Agricultural Service, 1969, 9 p.
YEAR PUBLISHED: 1969
CATEGORY: B4e
REGION: Eastern Deciduous Forest STATE: Illinois; Indiana; Ohio
KEYWORDS: farming; impact; right-of-way; towers
ABSTRACT: (Purpose) To make a survey of actual damages and problems in farming around utility poles and towers. (Time and Duration) 1969; 1 year. (Type of Research) Original survey research. (Methodology) Farmer interviews and personal observations were used. (Results and Conclusions) Land taken out of production on a 2-pole structure averaged 0.0084 acres while around steel towers it averaged 0.041 acres. All structures presented a minor weed problem ranging from 29% with heavy weed infestation, 50% with medium weeds, 20% with light weeds, and 1% with no weeds. Aerial spraying was accomplished at all locations where used. An extra hour per structure per year was the most common estimate of added labor time in farming. Damage to machinery was reported by 35% of farmers. Re-entry by utilities averaged once every 20.1 years, although 40% reported that companies had made one or more entries for various purposes. All farmers said that crop settlements were very generous; with compensation for easement usually about $300 to $600 per structure. Time studies on farming around poles ranged from 7 minutes per structure for cultivating soybeans to 50 seconds for harrowing.

B5 - ROW Multiple Use/Effects

1628

Multiple use potential along power transmission rights of way.

AUTHOR: RANDALL W
AUTHOR AFFILIATION: Univ of MA.
SOURCE TITLE: Pages 90-113 in Power Lines and the Environment.
SOURCE ID: Millbrook, NY, The Cary Arboretum of the New York Botanical Gardens, 1973, 170 p.
YEAR PUBLISHED: 1973
CATEGORY: B5
REGION: Applicable to entire United States STATE: United States
KEYWORDS: agriculture; multiple use; recreation; right-of-way; road; trails; wildlife
ABSTRACT: (Purpose) To explore the vast potential for multiple use on the electric transmission ROWs now existing or in the planning stage throughout the United States. (Type of Research) Literature survey and observations. (Methodology) The author explores the many types of multiple use that can be carried on beneath electric transmission lines including pipelines for water, gas, oil, and sewers; telephone and television cables; electric distribution lines; railroads; and rapid-transit systems. Agricultural uses are also feasible, including the growing of Christmas trees as well as agricultural crops. Recreation uses, including hunting and hiking and the installation of basketball courts, barbeque pits, bicycle paths, campsites, and golf courses are a possibility. (Results and Conclusions) As available land becomes scarcer, and as environmental concerns are expressed more fully in the regulatory arena, multiple uses of ROW areas will become much more common. As the utilities move to accommodate these demands more fully, they are reconsidering, from newly evolving perspectives, restraints they may once have considered to be compelling. Serious problems may arise when it must be decided which uses to accommodate on each right-of-way area, as one group's interests may conflict with another's.

B5b - Off-road vehicles

1629

Ecological effects of snowmobiles.

AUTHOR: MERRIAM HG; NEUMANN PW
AUTHOR AFFILIATION: Carleton Univ.
SOURCE TITLE: Canadian Field-Naturalist.
SOURCE ID: 86:207-212, 1972.
YEAR PUBLISHED: 1972
CATEGORY: B5b; C
REGION: Applicable to entire United States
KEYWORDS: animals; browse; ecology; impact; off-road vehicles; snow; snowmobile
ABSTRACT: (Purpose) To evaluate the ecological effects of snowmobiles in parks and greenbelt areas. (Time and Duration) Winter 1970. (Type of Research) Original field research. (Methodology) Studies on snowmobile impacts were conducted at four park and greenbelt sites in the vicinity of Ottawa, Canada. Changes in snow structure were determined by measurements of snow and air temperature, specific gravity, compaction, water holding capacity, and melting rates. Snowshoe hare and red fox activity was studied weekly from January to March by recording track intersections on line transects located within and adjacent to snowmobile trails and contrasted with control areas outside of trail influence. Damage to saplings, expressed as severe or minor, was measured along transects on and parallel to snowmobile trails. Browsing of shrubs was observed in similar vegetation types beside and parallel to trails and in control areas. (Results and Conclusions) Temperature gradients showed that undisturbed snow provided excellent thermal insulation but that heat conduction increased after passage of snowmobiles. Specific gravity of natural snow was 2 to 3 times lower than snow compacted by snowmobiles to a depth of 40 centimeters. After compaction, water holding capacity of snow increased slightly and rate of snow melt doubled. Seventy eight percent of saplings less than 2.5 centimeters diameter at the snow surface were damaged due to a single passage of one snowmobile; 27 percent of the saplings had damage severe enough to cause a high probability of death. Animal activity data indicate that snowshoe hares avoid snowmobile trails while red fox activity was twice as great in the trail zone. There was no relationship between herbivore browsing and snowmobile trails.

C - Related Literature

1630

Ecological impacts of off-road recreation vehicles.

AUTHOR: BRANDER RB
AUTHOR AFFILIATION: US Forest Service, Northcentral Forest Experiment Station.
SOURCE TITLE: Outdoor recreation research: applying the results.
SOURCE ID: Marquette, MI, US Forest Service, 1973, 29-35 p.
YEAR PUBLISHED: 1973
CATEGORY: C
REGION: Applicable to entire United States STATE: United States
KEYWORDS: ecology; ecosystem; impact; mammals, small; off-road vehicles; snow; snowmobile
ABSTRACT: (Purpose) To review the body of environmental knowledge on the snowmobile and show how this information could be used by resource managers. (Type of Research) Literature review. (Methodology) This is a review of current scientific literature dealing with impact of snowmobiles on the environment. The review considers dramatic negative effects known as proximal or point impacts and ultimate or total system impacts. Discussion includes characteristics of snow and their relationship to small mammal populations. (Results and Conclusions) Literature on snowmobile impact is limited, with first reports beginning in 1971. Available literature answers some questions about effects on parts of systems but none on total systems. Literature on snow indicates that it is a good insulator and provides important winter habitat for small mammals such as mice, shrews, and voles. Mechanical compaction reduces snow depth, increases thermal conductivity and density. The author infers that

these conditions have a negative effect on small mammals and concludes that similar effects occur with snowmobiles. The author further concludes that reduction in small mammals could affect food chains which end in raptors.

1631
Herbicides and the soil fauna.
AUTHOR: CANGIOLI G; RAPOPORT EH
AUTHOR AFFILIATION: Universidad Nacional del Sur, Argentina.
SOURCE TITLE: Pedobiologia.
SOURCE ID: 2:235-238, 1963.
YEAR PUBLISHED: 1963
CATEGORY: C
REGION: Applicable to entire United States
KEYWORDS: fauna; herbicides; soil; turf; MCPA; 2,4-D
ABSTRACT: (Purpose) To determine the influence on soil micro- and mesofauna of MCPA and 2,4-D herbicides applied to turf. (Time and Duration) 1960 to 1961; 6 months. (Type of Research) Original field research. (Methodology) Eight 7-square-meter plots were selected in garden turf covered with gramineae. Five plots were untreated controls. One plot was treated with sodium salt of MCPA at 4 liters/ha and 37 days later with 2,4-D ester (Esso #10) at 20 liters/ha. A second plot received 2 liters/ha 2,4-D (Esso #10), and a third plot 2 liters/ha 2,4-D (Shell #40). Soil samples of 10X10X6 cm were taken from all plots 6 days and 4 months after treatment. Samples were extracted for 15 days in a Berlese-Tullgren battery. Microarthropods were identified and population data subjected to analysis of variance. (Results and Conclusions) Results of analysis of variance for subsamples and determination of significance between two means, treated and control plots, show that there was no difference in soil fauna between herbicide treated and untreated plots. The author concludes that 2,4-D and MCPA weedkillers do not affect in appreciable manner the total density of soil microarthropods. Collembola, Acari and Homoptera groups constituted about 90% of the total soil fauna identified.

1632
The significance of farmland for waterfowl nesting and techniques for reducing losses due to agricultural practices.
AUTHOR: MILONSKI M
AUTHOR AFFILIATION: Univ of MO.
SOURCE TITLE: Proceedings North American Wildlife Conference
SOURCE ID: 23:215-228, 1958.
YEAR PUBLISHED: 1958
CATEGORY: C
REGION: Tall-grass Prairie STATE: Minnesota; North Dakota
KEYWORDS: birds; farming; impact; mowing; waterfowl
ABSTRACT: (Purpose) To provide information on farmland nesting of waterfowl. (Time and Duration) 1956-57; 2 years. (Type of Research) Original research. (Methodology) Nests were located by farmers as they worked the fields. (Results and Conclusions) 608 nests of 7 species of ducks were examined, of which pintail was most abundant. The preferred pintail nesting site was in stubble and 57 to 41 percent were destroyed by farming. Haylands were important for 5 waterfowl species with few hens killed by mowing. Twenty percent of renesting was on roadsides. Leaving small areas unmowed and mowing over nests were successful. Predation on mallard nests in tall cover was twice that of pintails in lower cover. Collecting and hatching eggs from doomed nests can be practical while success of moved nests was only 27 percent.

1633
The growth and wildlife use of planted shrubs and trees at the W. K. Kellogg multiple use forest.
AUTHOR: GYSEL LW; LEMMIEN W
AUTHOR AFFILIATION: MI State Univ.
SOURCE TITLE: Michigan Quarterly Bulletin.
SOURCE ID: 38(1): 139-145.
YEAR PUBLISHED: 1954
CATEGORY: C
REGION: Beach-Maple Forest STATE: Michigan
KEYWORDS: forest; habitat; shrubs; trees; wildlife
ABSTRACT: (Purpose) To describe survival, growth, fruit production and wildlife use of some planted trees and shrubs. (Time and Duration) 18 years. (Type of Research) Original research. (Methodology) Plantings were made on abandoned farmland in plowed furrows of rows and clumps and studied for 16-18 years. Indigobush amorpha, Siberian peashrub, silky dogwood, Tartarian honeysuckle, multiflora rose, Russian olive, and European mountain ash were planted. (Results and Conclusions) Survival of all plantings was fair to good. Only indigobush amorpha increased markedly in number of stems and area. While all species produced abundant fruit, production was greatest for Tartarian honeysuckle. The densest cover was produced by Tartarian honeysuckle and multiflora rose. All species were used by at least one of the wildlife species. Multiflora rose was most intensively used. In general, the planted species increased food and cover in the area.

C1 - Pipelines

1634
Emphasizing the benefits of the environmental rehabilitation of natural gas pipeline rights-of-way.
AUTHOR: DOWNEY
AUTHOR AFFILIATION: TDA Consultants.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management. January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ. 1976, 231-240 p.
YEAR PUBLISHED: 1976
CATEGORY: C1
REGION: Applicable to entire United States STATE: United States
KEYWORDS: environment; management; right-of-way
ABSTRACT: (Purpose) A discussion of the general design, construction, and maintenance of a gas pipeline ROW as related to environmental rehabilitation. (Results and Conclusions) Coordination with landowners and agencies is a necessary process. Location is a prime consideration which involves sight lines, terrain, soil and vegetation. Design of a pipeline should reestablish removed plant material, wave edges, feather edges, avoid straight lines, and angle road crossings. Principles in construction should include effect of small plant stands, soil profile renewal, and regrading. Maintenance programs should control erosion, reduce plant mortality, and consider human encroachment. A different approach should be used in an urban setting to consolidate uses, to select a beneficial location, and a design to provide for open space, recreation, and transportation. Interested citizens and users can be involved in tree planting and maintenance.

1635
Final report on a study of selected coastal zone ecosystems in the Gulf of Mexico in relation to gas pipelining activities.
AUTHOR: CORNABY BW; ENGSTROM DG; WILLINGHAM CA
AUTHOR AFFILIATION: Battelle Columbus Lab.
SOURCE ID: Columbus, OH, Battelle Columbus Laboratories, 1975.
YEAR PUBLISHED: 1975
CATEGORY: C1
REGION: Applicable to entire United States STATE: Alabama; Florida; Louisiana; Mississippi; Texas
KEYWORDS: ecosystem; impact; marsh; pipeline; right-of-way
ABSTRACT: (Purpose) To identify habitat combinations and factors which influence their changes, to evaluate effects of gas pipelining, to assess duration and magnitude of impacts. (Time and Duration) 1972-74; 2 years. (Type of Research) Original research. (Methodology) Six representative sampling areas were selected of major ecosystem types. Samples were taken on disturbed and control transects in terrestrial and aquatic habitats. Physical and chemical measurements were taken of soil and water, and biotic communities were sampled. Vegetation was sampled for species and biomass. Censuses were taken of birds present and of arthropods as indicators of the total system. Plankton, epibenthic, and benthic samples were taken and both intertidal and marsh areas were studied. Statistical tests were applied to data. (Results and Conclusions) Pipeline laying results in partially filled ditches, 6x10 ft maximum, and canals, 8x50 ft, which may be backfilled. Levees may also be produced. While many alterations are of considerable significance, and some populations increase while others decrease, such population losses may be of little significance. In fact, pipelining does not totally remove any important components of the ecosystem, although many are usually affected. Herbivores and carnivores were present and pipelines may offer some essential habitat needs for important species. Minimizing of pipeline construction changes in the habitat will be a most important factor in reducing future habitat impacts.

1636
Erosion control during pipeline construction.
AUTHOR: ROBINSON LR JR
AUTHOR AFFILIATION: Jordan and Associates, Camp Hill, PA.
SOURCE TITLE: Pages 175-182 in Proceedings National Symposium on Urban Rainfall and Runoff and sediment Control.
SOURCE ID: Lexington, KY, Univ of KY, 1974, UKYBU106.
YEAR PUBLISHED: 1974
CATEGORY: C1
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: construction; erosion; erosion control; law; pipeline; regulations; right-of-way; sediment
ABSTRACT: (Purpose) To review erosion and sedimentation control regulations in Pennsylvania and present observations of field experience during pipeline construction. (Type of Research) Review of regulations and field observations. Not scientific research. (Methodology) Presents plans and regulations for erosion and sedimentation control pertaining to earthmoving activities implemented by the Pennsylvania Environmental Quality Board in 1972. Design factors and design criteria required in control plans are presented. Field experience during pipeline construction

1636

is discussed and effectiveness of erosion control structures was monitored and pictorially recorded. Includes observations on sediment transport, straw silt traps, stream crossings, and cleanup after construction. (Results and Conclusions) The purpose of Pennsylvania regulations on earthmoving activities is to control sedimentation to prevent water pollution. Control measures must be set forth in a plan. From photographs and turbidity measurements, no undue erosion or sediment transport was evident where erosion control structures were in place. Silt was effectively trapped by straw bales placed across streams, draws, and road crossings. Small streams were best protected by pipe crossings of the right of way. Roadside ditches trapped sediment. Rough terrain and vegetation filtered sediment.

C2 - Highways

1637
Highway erosion control systems: an evaluation based on the universal soil loss equation.
AUTHOR: FARMER EE; FLETCHER JE
AUTHOR AFFILIATION: US Forest Service.; UT State Univ.
SOURCE TITLE: Pages 12-21 in Soil Erosion: prediction and Control.
SOURCE ID: Ankeny, IA, Soil Conservation Society of America, 1976.
YEAR PUBLISHED: 1976
CATEGORY: C2
SPONSOR: American Association of State Highways; and Transportation Officials.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: construction; erosion; erosion control; highway; sedimentation; soil loss
ABSTRACT: (Purpose) To adapt the Universal Soil Loss Equation for use in highway construction and to illustrate procedures for its application to a hypothetical highway cross-section. (Type of Research) Original; equation modification and testing. (Methodology) The Universal Soil Loss Equation was modified for highway construction use by eliminating the C and P factors, which relate specifically to agricultural lands, and substituting an erosion control factor, VM. The VM factor is applied as a single unit in the equation and accounts for effects of all erosion control measures including planting vegetation, physical changes, and application of chemicals. Coefficients for various erosion control practices were accordingly assigned to adjust expected soil loss. (Results and Conclusions) The modified USLE permits a semiquantitative evaluation of erosion control systems in highway construction. Expected soil loss for selected rainfall, soil erodibility, slope length and gradient factors was adjusted by application of coefficients for erosion control measures. Dramatic reductions in predicted soil loss were shown by use of straw mulch and grass establishment, sodding and gravel mulch, ditching, and installation of sediment traps along highway shoulders and median. Final selection of an erosion control system could be based on performance evaluation, expected soil loss, cost, and needs of the transportation system.

1638
Highway-wildlife relationships; volume 1: a state-of-the-art report.
AUTHOR: LEEDY DL
AUTHOR AFFILIATION: Urban Wildlife Research Center.
SOURCE ID: Springfield, Va. Nat Technical Information Service, 1975, Report FHWARD764, 183 p.
YEAR PUBLISHED: 1975
CATEGORY: C2
REPORT NUMBER: FHWARD764
CONTRACT NUMBER: PO530189
SPONSOR: US Dept of Transportation, Fed Highway; Admin, Offices of Research and; Development.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: brush control; erosion, soil; fish; highway; wildlife
ABSTRACT: (Purpose) To assess what is known about the effects of highways, their construction, maintenance and operation on fish and wildlife and their habitats. (Type of Research) Literature review. (Results and Conclusion) The twenty million or more acres in highway right-of-way have been largely neglected as wildlife habitat. Opportunities exist for creating valuable fish and wildlife impoundments during construction, yet the minimal effort needed to locate and design such impoundments has generally not been made. Better measures for mitigating habitat losses, predicting effects of highways on fish and wildlife, and enhancing highway environments for fish, wildlife, and people are sorely needed.

1639
Impact of highways on the hydrogeologic environment.
AUTHOR: PARIZEK RR
AUTHOR AFFILIATION: PA State Univ.
SOURCE TITLE: Environmental geomorphology.
SOURCE ID: Binghamton, NY, State Univ of NY, 1971, 151-199 p.
YEAR PUBLISHED: 1971
CATEGORY: C2
REGION: Applicable to entire United States STATE: Pennsylvania
KEYWORDS: construction; environment; hdyrology; highway; impact; quality; right-of-way; water
ABSTRACT: (Purpose) To review some of the adverse influences that highways have had or may have on the surface-water and ground-water regimen. (Type of Research) Field observations and review of scientific literature. (Methodology) Information presented is based on observations and problems at specific highway locations in Pennsylvania and adjacent states supplemented with pertinent scientific literature. It stresses unfavorable influences related directly to the highways or to satellite land-use activities. Emphasis is placed on physical and quality changes in the hydrogeologic regimen including surface-water and ground-water reservoirs. (Results and Conclusions) Deep cuts and extensive fills in highway construction can produce unfavorable changes such as beheading of aquifers, creating new ground-water drains, altering drainage divides, reducing streambed infiltration, siltation of channels, reducing slope stability, and adjustments in runoff and recharge. Surface and ground water quality may be affected by turbidity increases from sediment, pollution from oils, chemicals, litter during highway use, contamination from chemicals such as salts and pesticides in highway maintenance, and acid drainage from exposed pyrite-bearing strata. Specific research needs to evaluate environmental impacts are stressed. Increased knowledge will allow prediction of changes in advance of construction.

1640
Practical aspects of a selective brush management program on Wisconsin roadsides.
AUTHOR: BESADNY CD; KABAT C; RUSCH AJ
AUTHOR AFFILIATION: WI Dept of Natural Resources.
SOURCE TITLE: Transactions, Thirty-Third North American Wildlife Conference
SOURCE ID: 33:236-249.
YEAR PUBLISHED: 1968
CATEGORY: C2
REGION: Maple-Basswood Forest + Oak Savanna STATE: Wisconsin
KEYWORDS: brush; habitat; herbicides; maintenance; mammals; management; right-of-way; vegetation
ABSTRACT: (Purposes) To decribe a program for maintaining brushy cover along roadside rights-of-way. (Type of Research) Original research. (Methodology) Approximately 12 miles of roadside right-of-way were selected for the pilot project. Treatments consisted of combinations of selected cutting with hand and power tools, and selective spraying with 2-4-D or 2-4-5-T in a backppack sprayer to remove or kill undesirable vegetation. (Results and Conclusions) The most practical methods of brush management in rights-of-way were selective cutting and spraying, and selective spraying, at costs of $20.70 and $14.20 respectively, per mile of roadside. Specific procedures for managing brushy roadsides included: (1) Roadside selection, (2) Marking and (3) Treatments and maintenance. To be most effective, the program should be incorporated into regular maintenance program of local highway departments.

1641
The influence of management on the flora of roadside verges.
AUTHOR: WAY JM
AUTHOR AFFILIATION: Monks Wood Experiment Station.
SOURCE TITLE: Symposium Monks Wood Experiment Station: The Biotic Effects of Public Pressures on the Environmenttt
SOURCE ID: Pages 151-155, 1967.
YEAR PUBLISHED: 1967
CATEGORY: C2
REGION: Applicable to entire United States
KEYWORDS: flora; impact; management; roadsides
ABSTRACT: (Purpose) To discuss vegetation management of roadside verges. (Type of Research) Discussion paper. (Results and Conclusions) Verges are not considered a serious source of farm weeds. Mechanical vegetation control may be more destructive than chemicals, although the latter can have severe effects on dicots. Conservation investigations are needed to answer some important questions regarding plants and animals found on verges and how management affects them.

1642
The influence of highway construction on a stream.
AUTHOR: BALL RC; KING DL
AUTHOR AFFILIATION: MI State Univ.
SOURCE ID: East Lansing, MI, MI State Univ Agricultural Experiment Station Research Report 19, 1964, 4 p.
YEAR PUBLISHED: 1964
CATEGORY: C2
REPORT NUMBER: RR19
CONTRACT NUMBER: WP0001106
SPONSOR: Supply and Pollution Control
REGION: Beach-Maple Forest STATE: Michigan

KEYWORDS: construction; fish; highway; impact; invertebrates; right-of-way; sediment; stream
ABSTRACT: (Purpose) To present some of the harmful effects of inorganic sediments originating from a highway construction site near a warm-water Michigan stream. (Time and Duration) Summer 1961; 4 months. (Type of Research) Portion of extensive ecological field study-original. (Methodology) A study was conducted on the Red Cedar River in south-central lower Michigan during construction of highway I-96 adjacent to the stream. Accrual rate of inorganic sediments in mg/m2/day was measured for three sampling periods. Effect of inorganic matter influx into the stream was determined on aufwuchs (basic producers), invertebrates (herbivores, carnivores, and tubified worms), fish, and stream energetics before and during siltation. (Results and Conclusions) Inorganic sediments in the river increased turbidity and reduced light penetration, scoured organisms from the stream bed, and due to settling, suffocated many organisms. Sediments increased two-fold from the June to early September sampling, due, to intense rain and erosion from construction sites, resulting in a 68% decrease in organic aufwuch production. Substantial reductions occurred in herbivorous and carnivorous insects and tubified worms due to scouring and smothering.

1643
Detrimental effects of highway construction on a Montana stream.
AUTHOR: BAILEY JE; WHITNEY AN
AUTHOR AFFILIATION: MT Dept Fish and Game.
SOURCE TITLE: American Fisheries Society Transactions
SOURCE ID: 88(1):72-73, 1959.
YEAR PUBLISHED: 1959
CATEGORY: C2
REGION: Douglas-fir Forest STATE: Montana
KEYWORDS: construction; fish; highways; right-of-way; stream
ABSTRACT: (Purpose) To study the effects of highway construction on game fish. (Time and Duration) 1955-1957; 2 years. (Type of Research) Original research. (Methodology) A fish census was taken by shocking stream sections before and after highway construction. (Results and Conclusions) A bulldozer was used to remove brush, scour the streambed, and straighten the channel for 350 feet. A severe reduction, from 91 large-sized fish (6 inches and over) in 1955 to 6 in 1957, occurred. Small-sized fish (under 6 inches) were reduced from 144 to 14.

C3 - Railroads

1644
Railroad air space line routing.
AUTHOR: FOLEY ET
AUTHOR AFFILIATION: Colbbs and Hill Inc.
SOURCE TITLE: Electrical World.
SOURCE ID: 45-47, 1972 (June 1).
YEAR PUBLISHED: 1972
CATEGORY: C3
REGION: Applicable to entire United States STATE: United States
KEYWORDS: planning; railroad; right-of-way; transmission
ABSTRACT: (Purpose) Discussion concerning existing rail corridors that are readily adapted for use as electric transmission corridors. (Type of Research) General discussion. (Results and Conclusions) Discussion of the benefits and problems encountered when placing a transmission line in an existing rail corridor.

C4 - Vegetation Openings

1645
Cost-effectiveness analysis: a method to evaluate silvicultural activities for non-point pollution abatement.
AUTHOR: US FOREST SERVICE
SOURCE ID: US Forest Service, 1977, 51 p.
YEAR PUBLISHED: 1977
CATEGORY: C4
CONTRACT NUMBER: EPAIAGD60660
SPONSOR: US Dept of Agriculture.; US Env Protection Agency.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: construction; erosion, soil; forest; management; mass wasting; road; sedimentation; silviculture
ABSTRACT: (Purpose) To provide a usable tool for state and local water quality planners and forest land managers who are faced with the problem on non-point source pollution. (Type of Research) Original research. (Methodology) Concept and methodologies presented in this paper are based upon consideration of commonly used silvicultural systems which were assembled at workshops by informed professionals from government agencies, academia, private industry and international research stations. Field data was obtained through personal visits to numerous National Forests, and to state and privately owned land (Results and Conclusions) In general it is concluded that access practices, including road location, construction and maintenance, constitute the greatest primary source of erosion although these activities are dictated largely by the choice of harvesting system. Cost-effectiveness analysis is a useful tool for choosing among various erosion controls if it is used properly

1646
Rate of recovery of forest communities following disturbances.
AUTHOR: HUTNIK RJ
AUTHOR AFFILIATION: PA State Univ.
SOURCE TITLE: Proceedings. Monitoring Forest Environment Through Successive Sampling.
SOURCE ID: Pages 203-214, 1977.
YEAR PUBLISHED: 1977
CATEGORY: C4
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: browse; burning; clearcutting; vegetation; wildlife
ABSTRACT: (Purpose) To determine the effect of clearcutting, fire, and high deer populations on species composition, structure, and functioning of a mixed oak forest ecosystem. (Time and Duration) 1966-1973; 8 years. (Type of Research) Original research. (Methodology) Four plots were clearcut in 1966 and 2 were burned in 1967 along with 2 uncut plots. Two uncut and unburned plots served as controls. Each plot was 80.4x80.4m in size. Vegetation was sampled after 1, 2, 3, 5, and 7 growing seasons to get biomass by species. (Results and Conclusions) Species richness increased substantially due to cutting, and reached a maximum within 3 years. Deer browsing severely restricted abundance of blackberry, loosestrife, and trees; sedges and hay-scented fern were increased. Blueberries were increased by cutting. After 7 years fenced plots had the appearance of a multilayered forest while unfenced plots resembled an open meadow. While biomass accumulation will take many years to reach precutting levels, net annual primary production for fenced plots almost equalled the pre-cutting level by 1973. Fireweed was especially important in maintaining stability following disturbances.

1647
Effect of logging on songbird populations in a northern hardwood forest.
AUTHOR: BEHREND DF; SAISORN B; WEBB WL
AUTHOR AFFILIATION: State Univ. of NY, College of Env Science and Forestry.
SOURCE TITLE: Wildlife Monographs
SOURCE ID: 55:1-35, 1977.
YEAR PUBLISHED: 1977
CATEGORY: C4
REGION: Northern Hardwoods Forest STATE: New York; Pennsylvania
KEYWORDS: birds; cutting; forest; impact; population
ABSTRACT: (Purpose) To determine the effect of logging on breeding bird populations in a northern hardwood forest. (Time and Duration) 1951-1962; 10 years. (Methodology) Forest areas were cut 25%, 50%, 75%, and 100%, and six permanent counting strips were established in the interior of each area and in an uncut control area. Bird counts were made in June by sight and sound with early and late morning replications. A population index was used which was arrived at by determining the highest number of individuals of a species tallied at any station on any date and adding the six station numbers thus obtained. A paired t-test was used to analyze data. (Results and Conclusions) None of the bird species were eliminated by logging; a few were recorded only in logged stands. Number of species and diversity indices were higher in logged areas. Eleven species were not affected by logging, eight species were increased in abundance by logging, and seven species were decreased.

1648
Vegetation and environmental features of forest and range ecosystems.
AUTHOR: BJUGSTAD AJ; DUNCAN DA; GARRISON GA
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: US Forest Service, Agriculture Handbook 475, 1977, 68 p.
YEAR PUBLISHED: 1977
CATEGORY: C4
REGION: Applicable to entire United States
KEYWORDS: ecosystem; environment; forest; land use; soil; wildlife
ABSTRACT: (Purpose) To describe ecosystems used by the US Forest Service. (Type of Research) Manual derived from literature. (Results and Conclusions) The report includes 34 soil-vegetation ecosystems covering the 48 contiguous states. For each ecosystem, the physiography, climate, vegetation, fauna, soils, and land use are briefly described. A colored map is attached.

1648

1649
Importance, preservation and management of riparian habitat: a symposium.
AUTHOR: JOHNSON RR; JONES DA
AUTHOR AFFILIATION: Nat Park Service. US Forest Service.
SOURCE ID: Fort Collins, CO, US Forest Service, 1977. General Technical Report RM43. 217 p.
YEAR PUBLISHED: 1977
CATEGORY: C4
REGION: Applicable to entire United States STATE: Arizona; New Mexico
KEYWORDS: fish; habitat; riparian; streams; water; wildlife
ABSTRACT: To bring together material that represents the current state of knowledge and to point out directions for research and management of riparian ecosystems in the southwest. (Type of Research) A symposium. (Results and Conclusions) The 27 papers stress the importance of riparian habitats and their preservation, while recognizing that economic uses must be made of such areas in connection with dams, grazing, etc. Nothing specific is said of rights of way, although it can be implied that adverse ecological effects within riparian habitats should be avoided. Wildlife populations and important vegetation types and methods for their inventories are described. Research needs are given.

1650
Importance of riparian ecosystems: biotic considerations.
AUTHOR: HUBBARD JP
AUTHOR AFFILIATION: NM Dept of Game and Fish.
SOURCE TITLE: Pages 14-18 in Importance, preservation and management of riparian habitat.
SOURCE ID: Fort Collins, CO, US Forest Service, 1977. General Technical Report RM43, 217 p.
YEAR PUBLISHED: 1977
CATEGORY: C4
REGION: Applicable to entire United States STATE: Arizona; New Mexico
KEYWORDS: birds; fish; habitat; mammals, small; riparian; water
ABSTRACT: (Purpose) To probe the question of the importance of riparian ecosystems in sustaining the rich biota of the southwest. (Type of Research) Discussion paper. (Results and Conclusions) Fishes are the most important group in the riparian ecosystem, and of the 75 species, six are federally endangered and one is threatened. Vegetation clearing and pollution are major threats to fish survival. Of the 100 plant species of New Mexico's floodplains, almost 40% are obligates. All stream systems are rich in breeding birds and contain 16-17% of the entire breeding avifauna of temperate US. Eight species of small mammals show a strong riparian dependence. Preservation of riparian ecosystems by management is of utmost importance.

1651
Changes in small mammal populations after clearcutting of northern Ontario Black Spruce Forest.
AUTHOR: MARTELL AM; RADVANYI A
AUTHOR AFFILIATION: Canadian Wildlife Service.
SOURCE TITLE: Canadian Field-Naturalist.
SOURCE ID: 91:41-46, 1977.
YEAR PUBLISHED: 1977
CATEGORY: C4
REGION: Spruce-fir Forest
KEYWORDS: clearing; forest; mammals, small; populations
ABSTRACT: (Purpose) To study changes in small mammal populations following clearcutting. (Time and Duration) 1972-75; 4 years. (Type of Research) Original research. (Methodology) Live-trapping and dead-trapping census methods were used. (Results and Conclusions) The most noticeable change in small mammal populations after clearcutting was in composition. Clearcuts were unfavorable to red-backed voles, rock voles, and bog lemming; but favorable to deer mice, meadow voles, heather voles and least chipmunks. Little change was caused in density.

1652
Stress effects on bird-species diversity within mature forest ecosystemss
AUTHOR: ADAMS DL; BARRETT GW
AUTHOR AFFILIATION: Miami Univ.
SOURCE TITLE: American Midland Naturalist.
SOURCE ID: 96(1):179-194, 1976.
YEAR PUBLISHED: 1976
CATEGORY: C4
REGION: Beach-Maple Forest STATE: Indiana; Ohio
KEYWORDS: birds; ecosystem; forest; impact
ABSTRACT: (Purpose) To evaluate the effects of selective cutting of a forest on tree and bird-species diversity patterns. (Time and Duration) 1973. (Type of Research) Original research. (Methodology) Two study sites were used for comparison: a small virgin forest tract and a selectively cut woodland, both beech maple forest types. A 15-acre sample plot was selected in each woods for bird sampling. A modified point-quarter method was used to sample trees. Breeding bird censuses were done by territorial mapping. (Results and Conclusions) The selectively cut woods exhibited greater absolute density, greater species diversity and greater species richness than the virgin woods. There were 38 territorial avian species and 151 breeding pairs in the virgin woods in contrast to 32 species and 110 pairs in the cut woods. Evidence was obtained that birds tend to respond to overall structure of major tree components in forest communities.

1653
Some Silvicultural Concepts and Options for Achieving Wildlife Habitat Goals.
AUTHOR: HALL F C
AUTHOR AFFILIATION: US Forest Service.
YEAR PUBLISHED: 1976
CATEGORY: C4
REGION: Pacific Forest STATE: Oregon; Washington
KEYWORDS: forest; habitat; management; silviculture; wildlife
ABSTRACT: (Purpose) To discuss the scheduling and other factors of silvicultural treatment to attain optimum habitat for elk and pileated woodpeckers. (Methodology) The article is divided into three parts: (1) silvicultural means for attaining elk habitat (2) silvicultural means for attaining pileated woodpecker habitat, and (3) an example of how both habitats may be attained in the same general land area. (Results and Conclusions) Optimum elk habitat is composed of 20% hiding cover, 10% thermal cover, 10% either hiding or thermal cover, and 60% forage area. Pileated woodpeckers require trees at least 20 inches at dbh, and they prefer to nest in a two - storied stand. A system for providing habitat for both animals is discussed.

1654
Woodcock use of clearcut aspen areas in Wisconsin.
AUTHOR: GREGG LE; HALE JB
AUTHOR AFFILIATION: WI Dept of Natural Resources.
SOURCE TITLE: Wildlife Society Bulletin.
SOURCE ID: 4(3):111-115, 1976.
YEAR PUBLISHED: 1976
CATEGORY: C4
SPONSOR: US Fish and Wildlife Service;; WI Dept of Natural Resources.
REGION: Maple-Basswood Forest + Oak Savanna STATE: Wisconsin
KEYWORDS: birds, game; bulldozing; clearcutting; clearing, mechanical; habitat manipulation
ABSTRACT: (Purpose) To determine the woodcock use of clearcut aspen areas in northern WI. (Time and Duration) 1968-1974. (Type of Research) Original field research. (Methodology) Nearly 6,000 woodcock were trapped and banded during the study period. Study areas on clearcut areas were used to trap woodcock with capture effort and success recorded. Woodcock abundance and sign were recorded along with site characteristics. Follow-up treatment of the study areas was made by a bulldozer scalping trails. (Results and Conclusions) Woodcock have been known to utilize cleared areas for feeding, roosting, and singing grounds; they responded immediately to the study area clearcuts. Cutting techniques seemed to be of less importance than the amount of soil disturbance as a result of the technique used. Soil disturbance created an easy food supply (earthworms) and woodcock use declined as the area revegetated. By annual bulldozing of trails after logging, woodcock use was maintained for five years in one study area.

1655
Some thermal and biological effects of forest cutting in West Virginia.
AUTHOR: LEE R; SAMUEL DE
AUTHOR AFFILIATION: WV Univ.
SOURCE TITLE: Journal of Environmental Quality
SOURCE ID: 5(4):362-366, 1976.
YEAR PUBLISHED: 1976
CATEGORY: C4
REGION: Eastern Deciduous Forest STATE: Kentucky; North Carolina; Tennessee; Virginia; West Virginia
KEYWORDS: forest; impact; streams; water
ABSTRACT: (Purpose) To evaluate thermal changes and their biological effects in forest streams following cutting. (Time and Duration) 1972-73; 2 years. (Type of Research) Original research. (Methodology) Stream temperatures were monitored continuously for 18 months using conventional instruments. Two benthic samples were taken each month in weir ponds. Emerging insects were captured in 1973 using floating traps. Four watersheds were used in the study each with varying degrees of cutting. (Results and Conclusions) During summer months complete cutting caused over 4C mean temperature increases and maximum increase of over 9C. Changes diminished to about one-half, 3 years after cutting. The control pond produced by far the highest total numbers and biomass of benthic fauna and numbers of aquatic insects. Forest cutting effect on stream temperatures was not significant when a strip of trees was left to provide shade.

1656
Machine to harvest slash, brush, and thinnings for fuel and fiber - a concept.
AUTHOR: KOCH P; MCKENZIE DW
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Journal of Forestry
SOURCE ID: 74(12):809-812. 1976.
YEAR PUBLISHED: 1976
CATEGORY: C4
REGION: Southeastern Mixed Forest STATE: Alabama; Georgia; North Carolina; South Carolina; Virginia
KEYWORDS: brush; hogging; slash
ABSTRACT: (Purpose) To propose an alternative method for harvesting increased fuel and fiber. (Type of Research) Discussion paper. (Results and Conclusions) A new mobile hog machine which will be developed for hogging logging slash and conveying chips and chunks to mulch beds is described.

1657
Burying forest residue—an alternative treatment.
AUTHOR: MCLEAN HR; WARD FR
AUTHOR AFFILIATION: US Forest Service, Pacific Northwest Forest and Range Experiment Stationn
SOURCE ID: Portland, OR, US Forest Service, 1976, Research Note PNW270, 7 p.
YEAR PUBLISHED: 1976
CATEGORY: C4
REPORT NUMBER: PNW270
REGION: Silver Fir-Douglas-fir Forest STATE: Oregon
KEYWORDS: damage; disease; forest; residues; slash disposal; soil
ABSTRACT: (Purpose) To determine cost, time, and effect of burying forest residue. (Time and Duration) 1970-1974; 3 1/2 years. (Type of Research) Original field research. (Methodology) Slash burying studies were conducted in white fir stands on sandy loam soil with 0 to 10 percent slopes. Residue volumes and weights were estimated by sampling along a line transect. Pits were excavated to a 5 foot depth, slash covered by 2 feet of soil, and area broadcast seeded with grass. Rate of fire spread and resistance to control were determined before and after treatment. Trees sustaining root or bole damage were evaluated. Damaged trees and exhumed residue were examined after three years for incidence of disease. (Results and Conclusions) There were about 51 tons/acre of residue, averaging 5 inches diameter and rated high fire hazard, before burying. Burying reduced residue by 80-90% and lowered fire hazard to acceptable levels. Bulldozing of residue scarified the ground resulting in bare soil on the whole area. Total cost of disposal was $83/acre at 1975 prices. About 70% of standing trees damaged by tractors were in good condition 3 1/2 years later. No endemic root diseases occurred; decay by saprophytes was occurring in pits. Vegetation regrowth was sparse on bare soil but erosion was no problem in the stable soils and gentle slopes.

1658
Population dynamics of rodents during post-fire succession in chaparral.
AUTHOR: QUINN RD
AUTHOR AFFILIATION: CA State Polytechnic.
SOURCE TITLE: Ecological Society Bulletin.
SOURCE ID: 57(1):10, 1976.
YEAR PUBLISHED: 1976
CATEGORY: C4
REGION: California Chaparral STATE: California
KEYWORDS: fire; mammals, small
ABSTRACT: (Purpose) To describe population changes in small rodents after a chaparral fire. (Time and Duration) 5 years. (Type of Research) Original research. (Methodology) A live trapping census method was used. (Results and Conclusions) All rodent populations were reduced or eliminated by fire, and low population densities persisted for two years. Rapid post-fire succession was followed by rapid changes in rodents. An abundant large granivore, a rare small granivore, an abundant small granivore, and a large herbivore were always present.

1659
Changes in grass cover of a desert rodent fauna following habitat perturbation.
AUTHOR: WHITFORD WG
AUTHOR AFFILIATION: NM State Univ.
SOURCE TITLE: Ecological Society Bulletin.
SOURCE ID: 57(1):29, 1976.
YEAR PUBLISHED: 1976
CATEGORY: C4
REGION: Grama-Galleta Steppe + Juniper-Pinyon Woodland Mosaic STATE: New Mexico
KEYWORDS: cover; disturbance; fauna; habitat; mammals, small
ABSTRACT: (Purpose) To describe changes in cover and rodent populations after herbicide application in a desert habitat. (Type of Research) Original research. (Methodology) A trapping study method was used. (Results and Conclusions) Treatment of a desert shrub community with dicamba resulted in a reduction in creosotebush and an increase in grass. The dominant species, Dipodomys merriami, was replaced by Dipodomys ordii as a result of habitat selection.

1660
Comparisons of vegetation cover and composition on pipeline and transmission line rights-of-way of various ages.
AUTHOR: BELEL JR; MERINO JM; ODENING WR
AUTHOR AFFILIATION: Woodward-Clyde Conservatory.
SOURCE TITLE: Ecological Society Bulletin.
SOURCE ID: 57(1):7, 1976.
YEAR PUBLISHED: 1976
CATEGORY: C4
REGION: California Chaparral STATE: California
KEYWORDS: clearing; cover; right-of-way; vegetation
ABSTRACT: (Purpose) To describe vegetation changes on rights-of-way following clearing. (Type of Research) Original research. (Results and Conclusions) Vegetation recovery within cleared rights-of-way was slow in both chaparral and creosote bush vegetation. Complete recovery was not observed on ROWs over 15 years old; although significant successional advancement was observed at some sites.

1661
Breeding bird populations of power line rights-of-way on the Oak Ridge Reservation.
AUTHOR: KROODSMA RL
AUTHOR AFFILIATION: Oak Ridge Nat Lab.
SOURCE TITLE: Ecological Society Bulletin.
SOURCE ID: 57(1):56, 1976.
YEAR PUBLISHED: 1976
CATEGORY: C4
REGION: Appalachian Oak Forest STATE: Tennessee
KEYWORDS: birds; population; right-of-way
ABSTRACT: (Purpose) To census breeding birds on rights-of-way and adjacent forest. (Type of Research) Original research. (Results and Conclusions) Five bird species not found within the forest accounted for over 95% of the ROW population. Birds on the ROW were six times more abundant in areas of naturally regenerated vegetation than areas of planted grasses. Both ROW birds and forest birds were roughly twice as frequent on south-facing edges than on shaded north-facing edges.

1662
Elk use as related to characteristics of clearcuts in western Montana.
AUTHOR: LYON LJ
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Elk-Logging-Roads Symposium Proceedings.
SOURCE ID: Moscow, ID, University of ID, 1976. 69-72 p.
YEAR PUBLISHED: 1976
CATEGORY: C4
REGION: Applicable to entire United States STATE: Montana
KEYWORDS: clearcutting; elk; mammals, game; wildlife
ABSTRACT: (Purpose) To examine elk use of clearcuts of various sizes and in different locations. (Time and Duration) 1973; 1 year. (Methodology) Pellet group counts were made along transects in 0.02 acre plots at 100 foot intervals in clearcuts and surrounding uncut forests. (Results and Conclusions) Nothing was clearly demonstrated according to the authors. But it is possible to suggest openings of 10-40 acres with good slash cleanup will be most acceptable to elk. Use will remain low until vegetation reaches 2-3 feet in height.

1663
Cost of stream protection during timber harvest.
AUTHOR: DYKSTRA DP; FROEHLICH HA
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Journal of Forestry.
SOURCE ID: 74(10):684-687, 1976.
YEAR PUBLISHED: 1976
CATEGORY: C4
REGION: Cedar-Hemlock-Douglas-fir Forest STATE: Oregon
KEYWORDS: appraisal; cost; protection; stream; timber harvest; watershed
ABSTRACT: (Purpose) To develop procedures for appraising costs of protection alternatives for steep headwater streams in Pacific Northwest and to apply the methodology to harvesting operations. (Type of Research) Original research. (Methodology) Cost appraisal methods were applied to three alternative timber harvesting methods for stream protection. The alternatives were: 1) conventional felling, bucking, and cable yarding followed by channel cleanup; 2) special uphill, cable-assisted felling followed by conventional bucking, cable yarding, and

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channel cleanup; and 3) conventional felling, bucking, and cable yarding with an uncut buffer strip of trees between logged area and stream channel. Felling and channel cleanup costs were procured from previous appraisals and interviews of logging managers, supplemented with time studies of channel hand-cleaning operations. (Results and Conclusions) Cost appraisal applied to stream protection alternatives on ten areas showed that none of the alternatives was clearly preferable for a majority of the study areas. The least-cost alternative on four areas was the 55-foot buffer strip, on three areas conventional felling, and the remaining three areas cable-assisted directional felling. The appraisal method recognizes that cost of stream clearing is a function of the volume of debris to be removed, but does not predict debris loading. Also, the method does not compare stream impacts, but does provide estimated cost for different logging treatments.

1664
A design guide for wildlife protection and conservation for transportation facilities.
SOURCE ID: Washington, DC, American Association of State Highway and Transportation Officials, 1976, 51 p.
YEAR PUBLISHED: 1976
CATEGORY: C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: highways; wildlife
ABSTRACT: (Purpose) To provide a guide for consideration of impacts of highways on wildlife. (Type of Research) Guide. (Results and Conclusions) Habitat of threatened or endangered species should be avoided in locating highways. Where they cannot be avoided, the use of any tool or resource available for enhancement of the remaining habitat ought to be considered.

1665
Avian populations in herbicide treated brush fields.
AUTHOR: BEAVER DL
AUTHOR AFFILIATION: Univ of CA.
SOURCE TITLE: The Auk.
SOURCE ID: 93:543-553, 1976.
YEAR PUBLISHED: 1976
CATEGORY: C4
REGION: California Chaparral STATE: California
KEYWORDS: birds; brush; habitat; herbicide; population
ABSTRACT: (Purpose) To compare the avian population in two areas of a brush field before and after herbicide treatment. (Time and Duration) 1969-70; 2 years. (Type of Research) Original research. (Methodology) A spot map technique was used to locate nests and breeding pairs. (Results and Conclusions) Brush field birds appear to select habitat on the basis of vegetation form, such as foliage profile, and not on food supply. Avian population numbers and species did not change with herbicide treatment because essential elements of the habitat were not altered. Avian species did change on the entire brushfield.

1666
Impact of roads on big game distribution in portions of the Blue Mountains of Washington.
AUTHOR: OVERLY R; PERRY C
AUTHOR AFFILIATION: WA Dept of Game.
SOURCE TITLE: Pages 62-68 in Elk-Logging-Roads Symposium Proceedings.
SOURCE ID: Moscow, ID, Univ of ID Forest, Wildlife and Range Experiment Station, 1976, 142 p.
YEAR PUBLISHED: 1976
CATEGORY: C4
SPONSOR: WA State Dept of Game.
REGION: Grand Fir-Douglas-fir Forest STATE: Washington
KEYWORDS: deer; distribution; elk; game, big; impact; mammals, big game; road
ABSTRACT: (Purpose) To study the impact of roads on big game distribution within adjacent habitats and establish guidelines for road construction in big game habitats in the Blue Mountains of Washington. (Time and Duration) 3 years; 1972-1974 (?). (Type of Research) Original field research. (Methodology) Roads in the Blue Mountains of Washington were classified into three groups based on condition, size, traffic use, maintenance required. Vegetation was classified as grassland-meadow, open forest, dense forest, or riparian. Pellet group transects were read on plots located at 33, 220, 440, and 880 meters from the roads. Control transects were read in random plots in back country areas away from roads. Aspect of slope was also recorded when doing the transects. (Results and Conclusions) All roads reduced elk use in grassland-meadows, predominately on west and south slopes. All roads reduced elk use in open forests but in varying distances depending on road classification. Most reduction here occurred on all slopes except east slopes. No explanation was evident on why roads on east slopes caused only minimal disruption of game use. Basically, research showed roads reduce big game habitat up to half-mile away. Impact was greatest for main roads through open vegetation types and then reduced with reduced road types and increasing vegetation density.

1667
Silvicultural options and habitat values in deciduous forests.
AUTHOR: EVANS KE; ZEEDYK WD
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975.
SOURCE ID: 1975,115-127 p.
YEAR PUBLISHED: 1975
CATEGORY: C4; E5
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; forest; habitat; regeneration; successional stages
ABSTRACT: (Purpose) To review and summarize silvicultural information and bird habitat-population data, and synthesize the knowledge into a format useful to the forest manager. (Type of Research) Literature review. (Methodology) Literature review. (Results and Conclusions) The stated impacts of silvicultural options on bird populations are often speculative because they have not been tested. Additional research is needed to answer many questions. In nongame bird management, we must recognize that birds will be present in virtually all habitats, but species composition, population density and/or diversity will be influenced by timber management practices. Species with narrow specific habitat requirements present the greatest challenge to management.

1668
Range management practices and bird habitat values.
AUTHOR: BUTTERY RF; SHIELDS RW
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975.
YEAR PUBLISHED: 1975
CATEGORY: C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; habitat; management
ABSTRACT: (Purpose) To present available information on the known and probable effects of fourteen range management practices upon nongame bird habitat. (Type of Research) Literature review. (Methodology) Literature review. (Results and Conclusions) The known and probable effects upon nongame bird habitat of the following range management practices were given: (1) grazing systems; yearlong, continuous, deferred, deferred rotation and rest rotation, common use, alternate use; (2) range improvements; structural improvements, water development, herbicidal treatment, rangeland seeding, type conversion, fire management, and rodent control. More research is needed to fully determine the effect of range management on nongame bird habitat.

1669
Avifauna and succession in Douglas-fir forests of the Pacific northwest.
AUTHOR: MESLOW EC; WIGHT HM
AUTHOR AFFILIATION: OR Cooperative Wildlife Research Unit.
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975.
SOURCE ID: 1975, 266-271 p.
YEAR PUBLISHED: 1975
CATEGORY: C4
REGION: Cedar-Hemlock-Douglas-fir Forest STATE: Oregon; Washington
KEYWORDS: birds; forest; succession
ABSTRACT: (Purpose) To explain natural succession and timber management in the Douglas-fir forest of the Pacific Northwest, and to discuss the effects of succession and timber management on the region's avifauna. (Type of Research) Literature review. (Methodology) Literature review. (Results and Conclusions) Timber management in the Douglas-fir region of the Pacific Northwest attempts to speed regeneration and to establish an even-aged monoculture of Douglas-fir. This management conflicts with bird life in four areas: (1) shortening of the grass-forb and shrub stage, (2) effect of an even-aged Douglas-fir monoculture, (3) elimination of snags, and (4) elimination of old-growth forest.

1670
Silvicultural options and habitat values in coniferous forests.
AUTHOR: BUMSTEAD RS; CROUCH GL; THOMAS JW
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975.
SOURCE ID: 1975, 272-287 p.
YEAR PUBLISHED: 1975
CATEGORY: C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; forest; habitat; regeneration

ABSTRACT: (Purpose) To review the association of birds to the different seral stages of a coniferous forest, and how forest management affects these associations. The role of birds on insect populations and the effect of fire on bird habitat are discussed. (Type of Research) Literature review. (Methodology) Literature review. (Results and Conclusions) Different bird species are associated with one or more stages of succession in a coniferous forest. The dependence of a bird species on a particular stage and how forest management practices affect that stage determine if a management practice will be beneficial, detrimental, or have no effect on a particular bird population. Birds help to prevent insect epidemics, but probably do little to suppress epidemics. Fire is beneficial to some bird populations and detrimental to others.

1671
Environmental impact statement: vegetation control by mechanical, chemical, and fire treatment in the states of Arizona and New Mexico.
AUTHOR: HURST WD
AUTHOR AFFILIATION: US Forest Service, Southwestern Region.
SOURCE ID: Albuquerque, NM. US Forest Service, 1975, 164 p.
YEAR PUBLISHED: 1975
CATEGORY: C4
REPORT NUMBER: USDAFSR3FESADM7
SPONSOR: US Forest Service, Southwestern Region.
REGION: Applicable to entire United States STATE: Arizona; New Mexico
KEYWORDS: brush control; burning; chemicals; clearing, mechanical; control; environmental impact statement; vegetation
ABSTRACT: (Purpose) To assess the impact of various vegetation control practices (mechanical, chemical, and fire treatment) upon national forest land in NM and AZ. (Time and Duration) Statement of Forest Service policy and past research, literature review, proposed plans. (Methodology) Statement of proposed vegetation changes, methodologies, and expected impacts from several vegetation control proposals for national forest lands in AZ and NM. Each project and location is described in detail. Guidelines are given for minimizing impacts during implementation of the plans. Letters and comments from reviewers and public are shown with corresponding replies.

1672
Avian behavior and habitat management.
AUTHOR: VERNER J
AUTHOR AFFILIATION: IL State Univ.
SOURCE TITLE: The Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975.
SOURCE ID: 1975, 39-58 p.
YEAR PUBLISHED: 1975
CATEGORY: C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; habitat; management; selection
ABSTRACT: (Purpose) To assess the implication of avian behavior in habitat management. (Type of Research) Literature review. (Methodology) Literature review. (Results and Conclusions) A thorough understanding of the role of behavior in avian habitat utilization, habitat selection, and dispersion patterns is an important part of formulating management programs compatible with maintenance of bird populations. Four major subjects: mating systems, dispersion, territoriality, and habitat selection, are summarized. Management recommendations and research needs are given.

1673
Plant succession and interactions with fauna.
AUTHOR: HAMILTON RB; NOBLE RE
AUTHOR AFFILIATION: LA State Univ.
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975.
SOURCE ID: 1975, 96-114 p.
YEAR PUBLISHED: 1975
CATEGORY: C4
SPONSOR: LA Agricultural Experiment Station.
REGION: Eastern Deciduous Forest STATE: Connecticut; Massachusetts; Maryland; Maine; New Hampshire; New York; Pennsylvania; Rhode Island; Vermont
KEYWORDS: birds; forest; habitat; succession
ABSTRACT: (Purpose) To give a general literature review of plant succession, the relationship of bird populations to succession, forest management, and nongame bird management in the deciduous forest. (Type of Research) Literature review. (Methodology) Literature review. (Results and Conclusions) Bird species are associated with one or more stages of plant succession. Many of the presebt forest management practices reduce or eliminate certain plant stages and can be considered somewhat harmful to avian variety and density. Although management information provided will be primarily speculative, in general the best way to maximize bird species diversity is to maximize habitat diversity.

1674
Herbicides for wildlife habitat manipulation.
AUTHOR: LANDES K R
AUTHOR AFFILIATION: US Forest Service
SOURCE TITLE: 1975 Proceedings John S Wright Forestry Conference
YEAR PUBLISHED: 1975
CATEGORY: C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: habitat; herbicides: management: wildlife
ABSTRACT: (Purpose) To explain why herbicides have been and are being used in wildlife habitat manipulation: review some herbicide uses: and consider alternative methods of habitat manipulation. (Type of Research) Literature review. (Results and Conclusions) Use of Herbicides is one method of manipulating cover diversity. Most treatments attempt to develop or maintain early successional plant associations for game food and cover. Cutting, mowing, bulldozing, plowing, discing, burning, and grazing were briefly considered as alternatives to herbicide uses. It seems apparent that herbicide use is a valuable tool, and there are few, if any, alternatives to accomplish certain objectives.

1675
Vegetation structure and breeding bird diversity.
AUTHOR: BALDA RP
AUTHOR AFFILIATION: Northern AZ Univ.
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975.
SOURCE ID: 1975, 59-80 p.
YEAR PUBLISHED: 1975
CATEGORY: C4; E1
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; habitat
ABSTRACT: (Purpose) To review techniques that attempt to show what effect vegetation structure has on nongame bird species diversity, and to point out the advantages and disadvantages of those techniques. (Type of Research) Literature review. (Methodology) Literature review. (Results and Conclusions) A number of approaches have been used by avian ecologists to answer questions about habitat selection by specific species of birds. In some respects all are useful, but no one technique will provide all the answers land managers need. Numberous structural components of vegetation are valuable in predicting bird species diversity, but many other factors that might be important have not been fully assessed. Land managers should try to maintain as many naturally occurring habitats as possible.

1676
Watershed management practices and habitat values in coniferous forests.
AUTHOR: MORRIS MJ; MYERS CA
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Symposium on Management of Forest and Range Habitats for Nongame Birds, May 6-9, 1975.
SOURCE ID: 1975, 288-294 p.
YEAR PUBLISHED: 1975
CATEGORY: C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; forest; habitat: management; watersheds
ABSTRACT: (Purpose) To explain the objectives of watershed management practices in coniferous forest, and how these practices modify vegetation and change nongame bird habitats. (Type of Research) Literature review. (Methodology) Literature review. (Results and Conclusions) Clearcutting and thinning of coniferous forest are used to increase water yields, and planting and protection of trees reduce sediment loads and peak flows. All these practices modify vegetation and increase habitat diversity, which may or may not be beneficial to birds. More research is needed to determined the effect of watershed management practices on bird populations.

1677
Deer, brush control, and livestock on the Texas rolling plains.
AUTHOR: DARR GW; KLEBENOW DA
SOURCE TITLE: Journal of Range Management.
SOURCE ID: 28(2):115-118, 1975.
YEAR PUBLISHED: 1975
CATEGORY: C4
REGION: Prairie Brushland STATE: Texas
KEYWORDS: brush; deer; habitat; herbicides; wildlife
ABSTRACT: (Purpose) To obtain quantitative data on habitat use by white-tailed deer during all seasons, how existing brush control influences deer use, and to evaluate the impact of livestock on deer. (Time and Duration) 1969-71. (Type of Research) Original research. (Methodology) Spotlight counts were made on 3-4 transects, each about 20 miles in length. Each transect was sampled twice each one hour after sunset. Transects were stratified into six habitats. (Results and Conclusions) Deer density was greatest in unchained bottomland habitat. Other habitats supported

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moderate densities of deer. Chaining bottomland habitats was detrimental to deer, particularly on large areas. Herbicides, of which 2,4,5-T was the most commonly used, appeared to have little detrimental effect on deer and in some situations may have been beneficial as they caused only partial brush kill; however, the effects were variable. Sheep had a negative effect on deer, except in bottomland habitats, probably owing to forage depletion.

1678
The effect of small-tract clearcutting on populations of birds and small mammals.
AUTHOR: AMBROSE RE
AUTHOR AFFILIATION: Univ. of TN.
SOURCE ID: Knoxville, TN, Univ. of TN, 1975, MS Thesis, 287 p.
YEAR PUBLISHED: 1975
CATEGORY: C4
REGION: Appalachian Oak Forest STATE: Tennessee
KEYWORDS: birds; clearing; impact; mammals, small; population
ABSTRACT: (Purpose) To determine the density of birds and small mammals on clearcuts and control areas. (Time and Duration) 1971-1974; 4 years. (Methodology) Two paired areas were studied, each consisting of a small clearcut and control. Two annual censues of birds and small mammals were made. The live trapping and recapture method was used for small mammals; the spot-mapping method for birds. (Results and Conclusions) Overall breeding bird populations for two years were 3.0 and 3.6 times higher in a small clearcut than in an adjacent forest. Edge effects were greater on bird distribution than on mammals. Peromyscus leucopus, the most abundant rodent, was, for the two years, 2.2 and 2.9 times more abundant in the clearcut than in the forest. Tamias straitus and Blarina brevicauda were also more numberous in the clearcut.

1679
Effects of highways on wildlife.
AUTHOR: MICHAEL ED
AUTHOR AFFILIATION: WV Univ.
SOURCE ID: Morgantown, WV, WV Univ, 1975, 89 p.
YEAR PUBLISHED: 1975
CATEGORY: C4
REGION: Mixed Mesophytic Forest STATE: West Virginia
KEYWORDS: birds, game; birds, nongame; impact; mammals, game; mammals, small; right-of-way; wildlife
ABSTRACT: (Purpose) To measure the impact of a highway on wildlife. (Time and Duration) 1971-75; 5 years. (Type of Research) Original research. (Methodology) Wildlife was monitored by sightings and signs, and small mammals by trapping. (Results and Conclusions) Highway effects extended to 1/10 mile from the highway. None of the larger birds or mammals were either adversely affected or benefited. The ecotone developed was favorable to small mammals and birds, and these increased, as well as predators.

1680
Forest habitat management for non-game birds in central Applachia.
AUTHOR: DEGRAFF RM; GILL JD; THOMAS JW
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Upper Darby PA US FOrest Service, Northeastern Forest Experiment Station, 1974, Research Note NE192.
YEAR PUBLISHED: 1974
CATEGORY: C4
REPORT NUMBER: NE192
REGION: Appalachian Oak Forest STATE: Connecticut; Massachusetts; New Hampshire; New Jersey; New York; Pennsylvania; Rhode Island; Vermont
KEYWORDS: birds; forest; habitat; management
ABSTRACT: (Purpose) To suggest methods for bird-habitat improvement in central Applachia. (Type of Research) Discussion of management practices. (Results and Conclusions) Edge habitats are inhabited by many species, with life forms of vegetation present more important than species. Management should be encouraged. The amount of edges should be increased, such as between forest and meadow or brush. A meadow with brushy patches or edges provides food and cover variety. To achieve interspersion, narrow strips, 75-100 feet wide, are preferable to wider blocks.

1681
The effects of roads on populations of small mammals.
AUTHOR: CARMODY GR; FENTON MB; OXLEY DJ
AUTHOR AFFILIATION: Carleton Univ.
SOURCE TITLE: Journal of Applied Ecology.
SOURCE ID: 11(1):51-59, 1974.
YEAR PUBLISHED: 1974
CATEGORY: C4
REGION: Laurentian Mixed Forest STATE: Maine; Michigan; New Hampshire; New York; Vermont; Wisconsin
KEYWORDS: impact; mammals, small; population; right-of-way; road; wildlife
ABSTRACT: (Purpose) To document the effects of roadways on movements of small and medium-sized mammals in eastern Canada. (Time and Duration) 1971-1972. (Type of Research) Original research. (Methodology) Roadways used ranged from two-lane country gravel to four-lane paved highways. Trapping periods were 12-17 days. Observation points were established at the edge of the road at each site to record data. Two driving routes were used to document mortality along roadways. (Results and Conclusions) Of the 589 small mammals trapped, most common were Peromyscus leucopus and Tamias Striatus. Small forest margins exceeded 20m. Wider roads were crossed by medium-sized mammals. Road mortality increased with increasing road improvement and was highest when traffic density was high and young were present. Numerous mammals were recorded crossing two-lane gravel county roads.

1682
Forestry operations in the Canadian subarctic: an ecological argument against clear-cutting.
AUTHOR: GILL D
AUTHOR AFFILIATION: Univ of Alberta
SOURCE TITLE: Environmental Conservation
SOURCE ID: 1(2):87-92, 1974.
YEAR PUBLISHED: 1974
CATEGORY: C4
REGION: Applicable to entire United States STATE: Alaska
KEYWORDS: clearing; ecology; forest; succession
ABSTRACT: (Purpose) To show that succession following clear cutting plus fuel cutting by Eskimos in locations long occupied by them does not follow the usual trend. (Time and Duration) 1966-67 & 1971; 2 years. (Type of Research) Original research. (Methodology) Sites were examined and vegetation noted. (Results and Conclusions) Sites exposed by constant cutting result in a secondary succession of low-arctic tundra heath, mosses, and lichens. This leads to questions concerning use of clear cutting in the subarctic to harvest white spruce.

1683
The export of nutrients and recovery of stable conditions following deforestation at Hubbard Brook.
AUTHOR: BORMANN FH; LIKENS GE; SICCAMA TG
AUTHOR AFFILIATION: Yale Univ. Cornell Univ. US Forest Service
SOURCE TITLE: Ecological Monographs
SOURCE ID: 44:255-277, 1974.
YEAR PUBLISHED: 1974
CATEGORY: C4
SPONSOR: Nat Science Foundation.
REGION: Northern Hardwoods - Spruce Forest STATE: New Hampshire
KEYWORDS: deforestation; disturbance; ecosystem; erosion; forest; nutrient removal; sediment; stability; watershed
ABSTRACT: (Purpose) To determine effects of deforestation on export of particulate matter, erodibility of the ecosystem, and importance of dissolved substances and particulate matter in exported materials. (Time and Duration) 1965 to 1970; 5 years. (Type of Research) Original field research - watershed basis. (Methodology) Studies were conducted on gauged deforested and untreated reference watersheds of 13.2 and 15.6 hectares, respectively. On treated area, cut trees were limbed and dropped, no forest products removed, and vegetation regrowth chemically repressed for 3 years. Particulate matter was measured in the weir pond and in water passing over the weir. Particulates were separated into organic and inorganic portions. Loss of chemical elements was computed from composition of collected organic and inorganic material. Relation between streamflow rate and particulate matter was simulated by regression. (Results and Conclusions) Deforestation and chemical control of regrowth resulted in export of particulate matter of 38 metric tons/km2/year, compared with only 2.5 tons for the control ecosystem, with the greatest increase occurring in the third year due to increased erodibility. The proportion of inorganic particulates increased on the deforested area over five years. Deforestation caused a major increase in net loss of mineral elements N, K, P, Al, Ca, Fe, Mg, Cl, Si and Na. Runoff from the deforested area increased by 41% in the first year and declined to a 19% increase by the four year. Particulate export declined after four years due to vegetation regrowth.

1684
Wildlife problems associated with reservoirs used for electrical power generation (with special emphasis on Wells Hydroelectric Project Wildlife Study).
AUTHOR: OLIVER WH
AUTHOR AFFILIATION: WA Dept of Game.
SOURCE TITLE: Western Association Game and Fish Commissioners Proceedings
SOURCE ID: 54:146-155, 1974.
YEAR PUBLISHED: 1974
CATEGORY: C4
REGION: Silver Fir-Douglas-fir Forest STATE: Washington

KEYWORDS: mitigation; water; wildlife
ABSTRACT: (Purpose) To describe the impact on wildlife and mitigation problems at a hydroelectric project. (Type of Research) Discussion paper. (Results and Conclusions) Terrestrial wildlife has been neglected in planning, which has led to a large loss. Mitigation of losses is inferior owing to lack of information on wildlife impacts. Destruction of riparian areas cannot be replaced by moving up the hill to a new shoreline. Fisheries mitigation is well known and similar attention to replacement of wildlife is needed.

1685
The impact of oil development on wildlife populations in northern Alaska.
AUTHOR: HINMAN R
AUTHOR AFFILIATION: Ak Dept of Fish and Game.
SOURCE TITLE: Western Association Game & Fish Commissioners Proceedings
SOURCE ID: 54:156-174, 1974.
YEAR PUBLISHED: 1974
CATEGORY: C4
REGION: Arctic Tundra STATE: Alaska
KEYWORDS: impact; pipeline; populations; tundra; wildlife
ABSTRACT: (Purpose) To comment on the impact of oil exploration and development on terrestrial wildlife species. (Type of Research) Discussion paper. (Results and Conclusions) River valleys are concentration areas for wildlife and exploration and development. Animal-man interactions have been one of the chief impacts. Harassment of animals is an important problem. Effects of impedance of animal movements will be difficult to quantify.

1686
Eastern bluebirds nesting in clearcuts.
AUTHOR: CONNER RN
AUTHOR AFFILIATION: VA Polytechnic Institute and State Univ.
SOURCE TITLE: Journal of wildlife Management.
SOURCE ID: 38(4):934-935, 1974.
YEAR PUBLISHED: 1974
CATEGORY: C4
REGION: Appalachian Oak Forest STATE: Virginia
KEYWORDS: birds; birds, nongame; clearcutting
ABSTRACT: (Purpose) To describe the nesting of bluebirds in clearcuts. (Time and Duration) 1973; 1 year. (Type of Research) Original research. (Methodology) A systematic search for nesting birds was conducted in an oak-hickory forest on 10 clearcut areas. (Results and Conclusions) Clearcuts containing snags are an important source of bluebird nesting habitat. Seven of the ten clearcuts searched contained an active bluebird nest, and all nests were in standing dead snags.

1687
Use of fire: comments from the north central states.
AUTHOR: AHLGREN CE
SOURCE TITLE: Journal of Forestry.
SOURCE ID: 71(10):635-636, 1973.
YEAR PUBLISHED: 1973
CATEGORY: C4
SPONSOR: Quetico-Superior Wilderness Research; Center.
REGION: Spruce-fir Forest STATE: Michigan; Minnesota; Wisconsin
KEYWORDS: fire; succession
ABSTRACT: (Purpose) To review ecological aspects of burning in silvicultural practices in the north central states. (Time and Duration) Review pertinent literature from 1935 to 1970. (Type of Research) Literature review. (Methodology) Commented on past work in use of fire in the Midwest. (Results and Conclusions) In the north central states prescribed burning is used primarily in restoring lands to fire-adapted Jack pine, black spruce, and aspen in a once-per-tree-generation fire rotation.

1688
Bird density and diversity as related to vegetation in forest recreational areas.
AUTHOR: CRAWFORD HS; HARLOW RF; HOOPER RB
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Journal of Forestry
SOURCE ID: 71(12):766-769, 1973.
YEAR PUBLISHED: 1973
CATEGORY: C4
SPONSOR: US Forest Service Southeastern Forest; Experiment Stationo
REGION: Eastern Deciduous Forest STATE: Georgia; North Carolina; South Carolina; Tennessee; Virginia
KEYWORDS: birds; forest; habitat; management
ABSTRACT: (Purpose) To define vegetational features to which bird populations were responding in forest recreational areas. A specific objective was to test the relation between populations of breeding birds and density of understory. (Time and Duration) May-July, 1969. 3 months (Type of Research) Original research. (Methodology) Study plots were established on 21 forestlike and nine parklike recreational areas in the Southern Appalachians. Breeding bird populations were estimated by plotting territorial males. Understory foliage cover less than 12 feet high and canopy cover were sampled along randomly located transects 100 feet long. Relationships between habitat variables and bird populations were examined by regression analysis. (Results and Conclusions) There was a positive linear relationship between percentage of understory cover and the density of breeding birds. Species diversity had a weak association with understory cover; however, the mixture of coniferous and deciduous foliage above 12 feet appeared to be important to species diversity. Clumping of understory shrubs is important to birds in open, parklike recreational areas. Management recommendations were made.

1689
A wildlife brief for the clearcut logging of douglas-fir.
AUTHOR: HOOVEN EF
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Journal of Forestry
SOURCE ID: 71(4):210-214, 1973.
YEAR PUBLISHED: 1973
CATEGORY: C4
REGION: Pacific Forest STATE: California; Oregon; Washington
KEYWORDS: clearing; mammals, game; mammals, small; wildlife
ABSTRACT: (Purpose) To describe effects of staggered clearcuts of Douglas-fir upon wildlife. (Type of Research) A discussion paper based on literature. (Results and Conclusions) Big-game mammals benefit by timber removal and slash burning which provide openings with edges and increase plant diversity and nutritional value of food plants. Deer mice and creeping-mice increase after clearcutting as herbs and grasses increase. Shrews remain stable while chipmunks slowly increase in numbers. As brushy cover develops, snowshoe hare increase and mountain beaver are favored on moist slopes. Pocket gophers become common on clearcuttings. Little is known as to how clearcutting of Douglas-fir affects birds; however, many species of birds utilize the forest openings created and are attracted to burns.

1690
Effect of herbicide-induced changes in vegetation on nesting ducks.
AUTHOR: BOAG DA; DWERNYCHUK LW
AUTHOR AFFILIATION: Univ. of Alberta
SOURCE TITLE: Canadian Field-Naturalist
SOURCE ID: 87:155-165, 1973.
YEAR PUBLISHED: 1973
CATEGORY: C4
REGION: Grama-Needlegrass-Wheatgrass
KEYWORDS: herbicides; impact; waterfowl; 2,4-D
ABSTRACT: (Purpose) To examine the effects of herbicides on vegetation and ducks. (Time and Duration) 1965-67; 3 years. (Type of Research) Original research. (Methodology) A systematic search was conducted to locate nests both before and after broadcast spraying with 2,4-D (Results and Conclusions) The herbicide reduced broad-leaved plants and favored grasses. Duck nests were aggregated in unsprayed areas, among preferred broad-leaved plants, but they avoided grasses.

1691
Ecological modifications caused by the removal of tree and shrub canopies in the Mackenzie Delta.
AUTHOR: GILL D
AUTHOR AFFILIATION: Univ. of Alberta
SOURCE TITLE: Arctic
SOURCE ID: 26(2):95-111, 1973.
YEAR PUBLISHED: 1973
CATEGORY: C4
REGION: Yukon Forest
KEYWORDS: ecology; shrubs; trees; tundra
ABSTRACT: (Purpose) To study the effect of tree and shrub removal on vegetation development in the Mackenzie Delta. (Time and Duration) 1966-67 and 1971; 2 years. (Type of Research) Original research (Methodology) Vegetation was analyzed on sample plots. (Results and Conclusions) Removal of white spruce and willow-alder canopies from exposed sites caused environmental degradation and a secondary succession of low-artic tundra heath; moss and lichen species occurred. Hardy tundra plants invaded previously forested locations. Turf hummocks developed within only 20 years after clearcutting.

1691

1692
Assessing potential impacts of logging and road construction on the soil and water resources in a semi-primitive area.
AUTHOR: AASHEIM RJ
SOURCE ID: Bozeman, MT, MT State Univ. 1973, MS Thesis, 135 p.
YEAR PUBLISHED: 1973
CATEGORY: C4
SPONSOR: Nat Science Foundation.
REGION: Douglas-fir Forest STATE: Montana
KEYWORDS: assessment; construction; erosion; soil; impact; logging; road; siltation; soil; water
ABSTRACT: (Purpose) To map the soils of the study area and relate them to any environmental problems associated with logging operations in the area. Also to assess the impact of logging on the semi-primitive environment. (Time and Duration) 1973-1974; 2 years. (Type of Research) Original field research. (Methodology) Soils in the Gallatin Canyon drainage in southern Montana were surveyed, typed, and mapped using conventional methods. Also determined were soil limitations for logging roads, erodibility factors, sediment source areas, sediment yield, and suspended sediment in the drainage. A review of logging practices was undertaken. A literature review was also included. (Results and Conclusions) All conclusions were based on the assumption that no more than 15% of the drainage would be disturbed by logging at any one time. Sediment entering the creek would increase from 12.75 tons to 18.8 tons per day (47%) following logging. Most of the increase would be due to logging road construction. Water yield increases were expected to be less than one inch after logging for the entire drainage. Stream temperatures would increase less than 4 degrees F if buffer strips were maintained. Slash burning effects were predicted to be small if less than 15% of the burn was classified as severe. Only slight changes were predicted for nutrient reserves in the drainage and increased fertility in the stream. Conclusions were that much greater impacts would occur if more than 15% of the drainage was disturbed by logging.

1693
Revegetation following forest cutting: mechanisms for return to steady-state nutrient cycling.
AUTHOR: BORMANN FH; MARKS PL
AUTHOR AFFILIATION: Cornell Univ.; Yale Univ.
SOURCE TITLE: Science
SOURCE ID: 176:914-915, 1972.
YEAR PUBLISHED: 1972
CATEGORY: C4
REGION: Applicable to entire United States
KEYWORDS: clearing; forest; nutrient cycle; regeneration; revegetation
ABSTRACT: (Purpose) To discuss the recovery process of an ecosystem following a disturbance. (Type of Research) Original research; part of a larger study (Methodology) 15.6 hectare watershed was logged. The amount of biomass, rate of biomass accumulation, rate of canopy closure as indicated by leaf area index, and rate of accumulation of nutrients (nitrogen, calcium, magnesium, potassium, and sodium) in plant tissues were measured. (Results and Conclusions) The data indicate that following severe disturbance such as clearcutting, the growth and development of dense stands of successional species such as pin cherry may be extremely rapid. Such growth acts to minimize nutrient loss from the ecosystem.

1694
Puckerbrush forestry.
AUTHOR: GAUVIN A
SOURCE TITLE: American Forests.
SOURCE ID: 78(3):36-39, 58, 1972
YEAR PUBLISHED: 1972
CATEGORY: C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: management; right-of-way; shrubs; utilization
ABSTRACT: (Purpose) To discuss the possibility of harvesting woody shrubs that generally come in after logging or clearing. (Results and Conclusions) Predicts that wood-fiber farming of presently costly and unproductive ROWs could become a reality by the late 1970s. Basically, the ROWs would be seeded with woody shrub seeds. In 10-15 years, the ROW would be harvested by using a chipper, and the wood chips sold to a mill.

1695
A roadside conservation and beautification program for southeastern Wisconsin watersheds.
AUTHOR: WI NAT RES COUN OF ST AGENCIES
SOURCE ID: Madison, WI, WI Natural Resources Council of State Agencies, 1972, 26 p.
YEAR PUBLISHED: 1972
CATEGORY: C4
REGION: Maple-Basswood Forest + Oak Savanna STATE: Wisconsin
KEYWORDS: management; right-of-way; roadsides; shrubs; watershed
ABSTRACT: (Purpose) To describe a roadside beautification and conservation program. (Type of Research) Descriptive paper. (Results and Conclusions) A mandatory program is proposed for selective shrub and prairie vegetation management along highways. It consists of removing problem trees and noxious weeds from roadsides, while leaving desirable plants to grow in their place, or by planting desirable vegetation. Erosion control treatments should be applied where needed. Mapping roads and selecting sites with care is essential.

1696
First-year effects of sagebrush control on two sparrows.
AUTHOR: BEST LB
AUTHOR AFFILIATION: MT State Univ.
SOURCE TITLE: Journal of Wildlife Management.
SOURCE ID: 36:534-544, 1972.
YEAR PUBLISHED: 1972
CATEGORY: C4
REGION: Grama-Needlegrass-Wheatgrass STATE: Montana
KEYWORDS: birds, nongame; herbicides
ABSTRACT: (Purpose) To examine the effects of sagebrush control on two species of sparrows. (Time and Duration) 1966-1969; 4 years. (Type of Research) Original research. (Methodology) Five 40-acre plots in sagebrush-grassland were used. Two were control plots, and three were aerially sprayed with 2,4-D in 1968. Birds were censused in June and July in nesting season. No significant change in vesper sparrow populations. Brewer's sparrows nested in shrubs; vesper sparrows on the ground. Consumption of plant foods (seeds) increased on sprayed areas; animal foods decreased. Nest cover was the determining factor.

1697
Effects of noise on wildlife and other animals.
AUTHOR: MEMPHIS STATE UNIV
SOURCE ID: Washington, DC, US Government Printing Office, 1971, NT1D3005, 74 p.
YEAR PUBLISHED: 1971
CATEGORY: C4
REPORT NUMBER: NT1D3005
CONTRACT NUMBER: 68040024
SPONSOR: US Envi Protection Agency.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; fish; mammals; noise
ABSTRACT: (Purpose) To study the effects of noise on wildlife. (Type of Research) Literature review. (Methodology) The literature review was divided into four categories: effects of noise on laboratary animals, effects of noise on farm animals, demonstrated effects of noise on wildlife and suspected effects of noise on wildlife. (Results and Conclusions) The best documented, most clearly proven effect of high intensity noise exposure on hearing organisms is that of damage to the auditory structure with a resulting loss of hearing. Few, if any, of the reported or suggested effects of noise on animals would benefit the animal or increase its chances for survival. However, some of the effects might possibly lead to its death or decrease its chances of survival.

1698
Clear-cut logging and sediment production in Oregon coast range.
AUTHOR: BROWN GW; KRYGIER JT
AUTHOR AFFILIATION: OR State Univ, School of Forestry.
SOURCE TITLE: Water Resources Research.
SOURCE ID: 7(5):1189-1198, 1971.
YEAR PUBLISHED: 1971
CATEGORY: C4
SPONSOR: Fed Water Quaity Admin.; OR State Univ.
REGION: Pacific Forest STATE: Oregon
KEYWORDS: burning, controlled; clearing; impact; road; sediment
ABSTRACT: (Purpose) The purpose of this paper is to describe the effect of road building, clear-cut logging, and slash burning on suspended sediment production from three forested watersheds. (Time and Duration) 11 years; 1958 - 1969. (Type of Research) Original research. (Methodology) The sediment yield characteristics of the watersheds were monitored for 7 years before treatment logging roads were constructed in 1965. Logging was done in 1966 on the different watersheds with a varying degree of the area being clear-cut. Some of the watersheds had the slash burns in October 1966. The watersheds were monitored for sediment till the end of the 1968-1969 storm seasons. (Results and Conclusions) The authors have shown that clearcut logging may produce little or no change in sediment concentrations in small streams. The greatest changes were associated with the road building operation that preceded logging and the controlled slash burning afterward.

1699
A probable instance of songbird collision mortality.
AUTHOR: WEIER RW
AUTHOR AFFILIATION: Nat Wildlife Refuge.
YEAR PUBLISHED: 1971
CATEGORY: C4
REGION: Wheatgrass-Needlegrass STATE: North Dakota
KEYWORDS: birds; collision; mortality
ABSTRACT: (Purpose) To describe mortality of songbirds at a building site. (Time and Duration) 1971. (Type of Research) Original research. (Methodology) Dead birds were collected and examined. (Results and Conclusions) Sixty-eight dead birds were found on a church lot. None were found at similar sites in the town. Death was found to have been caused by collision.

1700
Making forest clearings for game with pelleted herbicides fenuron and tordon.
AUTHOR: COOK J
AUTHOR AFFILIATION: MI Dept of Natural Resources
SOURCE ID: Lansing, MI, MI Dept of Natural Resources, 1971, P-R Project Report W-117-R-4, Job 117-6.4, 48 pp.
YEAR PUBLISHED: 1971
CATEGORY: C4
REGION: Northern Hardwoods Forest STATE: Michigan
KEYWORDS: birds, game; clearing; habitat; herbicides; mammals, game; vegetation; wildlife
ABSTRACT: (Purpose) To test tordon and fenuron for creating small forest openings for wildlife. (Time and Duration) 1967. (Type of Research) Original research. (Methodology) Tests were carried out in three man-made clearings on six 1/10 acre plots in each clearing. Six herbicide rates of application were applied by hand. (Results and Conclusions) The herbicides showed promise of creating desirable weed-grass-shrub vegetation on small areas for wildlife habitat. Total stem numbers were reduced and invading stems proved less vigorous on treated areas.

1701
Browse and cover for wildlife.
AUTHOR: ROBINETTE WL
AUTHOR AFFILIATION: US Bureau of Sport Fisheries and Wildlife.
SOURCE TITLE: Pages 69-76 in Wildland Shrubs - Their Biology and Utilization, International Symposium.
SOURCE ID: Ogden, UT, USDA Forest Service, 1972, General Technical Report INT-1, 494 p.
YEAR PUBLISHED: 1971
CATEGORY: C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; browse; cover; mammals; shrubs
ABSTRACT: (Purpose) To show how shrubs contribute to the welfare of wildlife. (Type of Research) Literature review (Results and Conclusions) Shrubs are used as food by 117 wildlife species in the US. Wildlife feed selectively on shrubs. Large game mammals need browse and shrub diversity to get a balanced diet. Shrubs supply a part of the diet of small mammals both game and nongame. Most nongame birds utilize shrubs for fruits or seeds and at least 12 important shrub genera produce fruits that are heavily used by songbirds. Various species of grouse are heavy users of leaves, buds, flowers, and fruits of many shrubs. Many mammals use shrub cover to hide or escape from predators, and predators use shrubs for concealment. Shrubs fulfil the need for cover for many birds for shade, protection, roosting, perching and nesting.

1702
Immediate effects of hardwood removal and prescribed burning on bird populations.
AUTHOR: MICHAEL ED; THORNBURGH PI
AUTHOR AFFILIATION: Austin State Univ. AZ State Univ.
SOURCE TITLE: Southwestern Naturalist
SOURCE ID: 15(3):359-370, 1971.
YEAR PUBLISHED: 1971
CATEGORY: C4
REGION: Oak + Bluestem Parkland STATE: Texas
KEYWORDS: birds, burning; impact; populations; 2,4-D
ABSTRACT: (Purpose) To determine density, nesting population, and seasonal fluctuation of birds following hardwood removal and prescribed burning. (Time and Duration) 1966-68; 3 years. (Type of Research) Original research. (Methodology) Sample plot censuses of birds were carried out in a pine stand in which all hardwoods had been killed, a pine-hardwood stand with 25% hardwoods, and a control with 36% hardwoods. The pine and pine-hardwoods were prescribed burned. 2,4-D amine injection was used to remove hardwoods from the pine unit. (Results and Conclusions) Birds preferred the burned pine unit which had developed the densest understory and had the greatest density and diversity of birds. Slash and dead trees from hardwood removal provided good habitat for birds.

1703
Plant and mammal changes on a clearcut in west-central Oregon.
AUTHOR: GASHWILER JS
AUTHOR AFFILIATION: US Bureau of Sport Fisheries
SOURCE TITLE: Ecology
SOURCE ID: 51(6):1018,1026, 1970.
YEAR PUBLISHED: 1970
CATEGORY: C4
REGION: Pacific Forest STATE: Oregon
KEYWORDS: burning, controlled; clearing; flora; impact; wildlife
ABSTRACT: (Purpose) To study the effect of clearcutting Douglas-fir type on the changes of plant composition and coverage and small mammal populations. (Time and Duration) 12 years; 1954 to 1965. (Type of Research) Original research. (Methodology) Circular milacre plots and plants to a height of 6 feet were used. Vegetation was measured at or near peak development in July and August. Data was taken annually 1954 to 1961. The mammal populations were measured by using live traps. All captured mammals were tagged and released. Populations were calculated by the Lincoln Index Method. (Results and Conclusions) Clearcutting increased the ground cover over the central (22.1% vs 17.0%). Plants covered only 2% of the area one growing season after burning. At the end of the study, the mammal populations were higher in the clearcut area than in the control.

1704
Effects of clear-cutting on stream temperature.
AUTHOR: BROWN GW; KRYGIER JT
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Water Resources Research.
SOURCE ID: 6:1133-1140, 1970.
YEAR PUBLISHED: 1970
CATEGORY: C4
SPONSOR: OR State Univ.; Fed Water Pollution Control Admin.
REGION: Pacific Forest STATE: Oregon
KEYWORDS: clearing; impact; stream; temperature
ABSTRACT: (Purpose) The purpose of this paper is to describe the long-term effects of two clearcuttings on the temperature of two small streams in Oregon's coast Range. (Time and Duration) 1964 - 1969; six years. (Type of Research) Original research. (Methodology) One watershed was completely clearcut and a second watershed was patch-cut, cutting only 25% of the area and leaving strips of vegetation along the stream. A third watershed served as a control. Eighteen thermographs were installed in the three watersheds, 1964 and 1965 served as control periods and 1966-1969 as treatment periods. (Results and Conclusions) The patch-cuts on Deer Creek did not produce any significant changes in temperature in the main stream. Strips of timber were left beside the streams, the amount of shade on the stream surface was unchanged. Little shade remained on the total clearcut, and large changes in annual and daily patterns of temperature were observed.

1705
Controlled burning and air pollution: an ecological review.
AUTHOR: KOMAREK EV
AUTHOR AFFILIATION: Tall Timbers Research Station.
SOURCE TITLE: Proceedings Annual Tall Timbers Fire Ecology Conference
SOURCE ID: 10:141-173, 1970.
YEAR PUBLISHED: 1970
CATEGORY: C4
REGION: Applicable to entire United States
KEYWORDS: burning; ecology; fire; pollution
ABSTRACT: (Purpose) To consider basic laws and ecological principles that govern man, earth, and the universe and thus try to place pollution from controlled burning in proper perspective. (Type of Research) A discussion paper. (Results and Conclusions) Basic universal laws which affect the atmosphere are discussed in general. The natural fire carbon cycle of lightning fires is considered a vital part of the earth's ecosystem and is greatly different from the man-made pollution carbon cycle. Air pollution is a problem of cities and industries, not of rural burning, and contributions by controlled burning of forest and pastures are minor. Major problems of controlled burning are local visibility and local air pollution, and are not of global importance. There is no ecological alternative to control burning for its importance to wildlife, forest, and farm management.

1706
High density of birds breeding in a modified deciduous forest.
AUTHOR: JOHNSTON DW
AUTHOR AFFILIATION: Univ of FL.
SOURCE TITLE: Wilson Bulletin.
SOURCE ID: 82:79-82, 1970.
YEAR PUBLISHED: 1970
CATEGORY: C4
REGION: Appalachian Oak Forest STATE: Virginia

1706

KEYWORDS: birds, nongame; habitat
ABSTRACT: (Purpose) To census birds in a modified oak-chestnut forest. (Time and Duration) 10 days. (Type of Research) Original research. (Methodology) Forest had been changed to open park-like condition owing to partial clearing and planting. (Results and Conclusions) The high density of breeding birds (80 pairs) was attributed to increased shrub layer and edges and partial clearing of forest. This increased feeding areas for many species through introduced open spaces both horizontally and vertically.

1707
Improving deer habitat in upper Michigan by cutting mixed-conifer swamps.
AUTHOR: KREFTING LW; PHILIPS RL
AUTHOR AFFILIATION: US Bureau of Sport Fisheries and Wildlife.
SOURCE TITLE: Journal of Forestry.
SOURCE ID: 68(11):701-704, 1970.
YEAR PUBLISHED: 1970
CATEGORY: C4
REGION: Spruce-fir Forest STATE: Michigan
KEYWORDS: browse; clearcutting; deer; mammals, game
ABSTRACT: (Purpose) To evaluate deer habitat in a study of cutting methods. (Time and Duration) 1952-1966. (Type of Research) Original research. (Methodology) Mixed-conifer swamps were given a diameter-limit, selection, shelter wood, block & strip cutting. Deer habitat values were measured. (Results and Conclusions) Strip cutting, 75' wide and 400' long, met requirements of deer best. Deer use was significantly higher in strip cut areas than in uncut areas and more pounds of browse were available in the strips. Clearcut strips provided excellent cover adjacent to an abundant browse supply. Snow melted earlier in clearcut strips than in forest.

1708
Succession and species distribution in relation to erosion in southern Illinois.
AUTHOR: BAZZAZ FA
AUTHOR AFFILIATION: Univ of IL, Dept of Botany.
SOURCE TITLE: IL State Academy of Science Transactions.
SOURCE ID: 64:430-435, 1969.
YEAR PUBLISHED: 1969
CATEGORY: C4
REGION: Oak-Hickory Forest STATE: Illinois; Kentucky; Missouri
KEYWORDS: erosion; indicator species; succession; vegetation
ABSTRACT: (Purpose) This study was conducted to determine if correlation among degree of erosion, plant cover and succession, and the distributions of various plant species could be made. (Time and Duration) Prior to 1967. (Type of Research) Original research. (Methodology) Two fields that were abandoned for 30 years or more were used for the study areas. Plots were laid out as follows: 10x10 meter plots for trees, 4x4m for shrubs, and 2x1m for herbs. Twenty-five plots of each size were laid out. Basal area, density and percent cover were measured. A large shallow gully was mapped. This was done to test the possibility of the vegetation being correlated to degree of erosion. (Results and Conclusions) Erosion is a very important factor affecting succession in southern Illinois. It is also evident that the degree of erosion controls the distribution of some plant species. Erosion could be reduced successfully by planting pines in these fields.

1709
Increases in maximum stream temperatures after slash burning in a small experimental watershed.
AUTHOR: LEVNO A; ROTHACHER J
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: US Forest Service Research Note
SOURCE ID: US Forest Service Pacific Northwest Forest and Range Experiment Station, 1969, PNW110, 7 p.
YEAR PUBLISHED: 1969
CATEGORY: C4
REPORT NUMBER: PNW110
REGION: Pacific Forest STATE: Oregon
KEYWORDS: burning, controlled; clearing; impact; stream; temperature; water; watershed
ABSTRACT: (Purpose) To summarize changes that occurred in maximum stream temperatures during the first year after slash was burned (Time and Duration) 1966; one year. (Type of Research) Original research. (Methodology) Logging slash was broadcast burned in October 1966. Water temperatures were recorded hourly on punched tape at a gauging station at the mouth of the experimental watershed. (Results and Conclusions) Water temperature regime may be changed when timber harvest removes the shade provided by streamside vegetation. Burning, which removes all protective stream cover, also increases solar radiation on the stream, causing a marked rise in water temperature. The principal effect of land management practices may be largely in upstream areas, which are often important fish habitats.

1710
Fire and mammals.
AUTHOR: HANDLEY CO JR
AUTHOR AFFILIATION: Smithsonian Institution.
SOURCE TITLE: Proceedings Annual Tall Timbers Fire Ecology Conference.
SOURCE ID: 9:151-159, 1969.
YEAR PUBLISHED: 1969
CATEGORY: C4
REGION: Applicable to entire United States
KEYWORDS: fire; mammals
ABSTRACT: (Purpose) To describe the importance of fire to mammals in general. (Type of Research) A discussion paper. (Results and Conclusions) The importance of fire in the evolution of mammals and as a significant force in the lives of today's mammals is described. Development and maintenance of grasslands through burning is discussed.

1711
Research on logging slash disposal by fire.
AUTHOR: WADE DD
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Proceedings Annual Tall Timbers Fire Ecology Conference
SOURCE ID: 9:229-234, 1969.
YEAR PUBLISHED: 1969
CATEGORY: C4
REGION: Southeastern Mixed Forest
KEYWORDS: fire; slash
ABSTRACT: (Purpose) To discuss the problem of slash accumulation as an obstacle to pine regeneration and the use of fire to reduce slash. (Type of Research) Discussion paper. (Results and Conclusions) Findings are limited to harvested loblolly pine stands for which a rule of thumb has been developed that 1/4 ton of slash is deposited for every cord harvested. Use of fire to reduce wildfire hazard is a low cost technique but calls for more research to establish adequate burning guidelines. Controlled burning for wildlife habitat improvement in small clearcut openings warrants an intense fire generated by "keyhole" burning. This may increase legumes, promote sprouting, and increase seed availability. Survival of small hardwoods would be immaterial.

1712
The role of predation in vegetational diversity.
AUTHOR: HARPER JL
AUTHOR AFFILIATION: Univ College, North Wales.
SOURCE TITLE: Brookhaven Symposia in Biology.
SOURCE ID: 22:48-61, 1969.
YEAR PUBLISHED: 1969
CATEGORY: C4
REGION: Applicable to entire United States
KEYWORDS: diversity; vegetation; wildlife
ABSTRACT: (Purpose) To describe experiments with herbivores in affecting vegetation composition. (Type of Research) Discussion paper. (Results and Conclusions) The rise and fall of rabbit populations is correlated with decline and increase in diversity of flora. At high populations, there was a marked decline in the wealth of species. When populations were reduced, there was a spectacular increase in perennials and a general increase in floral richness. Other experiments in agriculture also document the effects of herbivores such as cattle and sheep.

1713
Foods and feeding habits of white-tailed deer.
AUTHOR: LAY DW
AUTHOR AFFILIATION: TX Parks and Wildlife Dept.
SOURCE TITLE: Pages 8-13 in Symposium on White-tailed Deer in the Southern Forest Habitat.
SOURCE ID: Nacogdoches, TX, USDA Forest Service, 1969, 130 p.
YEAR PUBLISHED: 1969
CATEGORY: C4
REGION: Applicable to entire United States STATE: Texas
KEYWORDS: deer; food; mammals, game
ABSTRACT: (Purpose) To describe the principle foods of white-tailed deer and their feeding habits. (Type of Research) Discussion paper. (Results and Conclusions) The best insurance for proper deer nutrition is maximum habitat variety. Principle foods are browse, fruits, succulent herbage, mushrooms and farm crops. Preference varies by season.

1714
Critical factors in habitat appraisal.
AUTHOR: ZEEDYK WD
AUTHOR AFFILIATION: US Forest Service
SOURCE TITLE: Pages 37-41 in Symposium on White-tailed Deer in the Southern Forest Habitat.
SOURCE ID: Nacogdoches, TX, USDA Forest Service, 1969, 130 p.
YEAR PUBLISHED: 1969

CATEGORY: C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: deer; habitat; mammals, game
ABSTRACT: (Purpose) To discuss the critical factors in appraising white-tailed deer habitat. (Type of Research) Discussion paper. (Results and Conclusions) The most frequently identified criteria in appraising habitat are. 1) inherent soil fertility; 2) abundance and variety of forage; 3) interspersion of food and cover; 4) nature and extent of escape cover; and 5) resistance of habitat to severe weather stress.

1715
Effects of timber harvest and regeneration on deerfood and cover.
AUTHOR: CARTER VE; DOW EA
AUTHOR AFFILIATION: US Bureau of Sport Fisheries and Wildlife.
SOURCE TITLE: Pages 62-65 in Symposium on White-tailed Deer in the Southern Forest Habitat.
SOURCE ID: Nacogdoches, TX, US Forest Service, 1969. 130 p.
YEAR PUBLISHED: 1969
CATEGORY: C4
REGION: Applicable to entire United States STATE: Arkansas; Georgia; Mississippi
KEYWORDS: cover; deer; food; mammals, game
ABSTRACT: (Purpose) Even-aged forest management in the Piedmont shows how this method can be modified to benefit deer and other wildlife. (Type of Research) Discussion paper (Results and Conclusions) Periodic partial cuttings along with prescribed burning has given excellent habitat management on refuges. Harvesting 50 to 100 acre units each year in an 80-year rotation has kept about 5% of the area in openings free of timber growth and insures continuous browse and seasonal habitat conditions.

1716
How size and distribution of cutting units affect food and cover of deer.
AUTHOR: MCGINNES BS
AUTHOR AFFILIATION: US Bureau of Sport Fisheries and Wildlife.
SOURCE TITLE: Pages 66-70 in Symposium on White-tailed Deer in the Southern Forest Habitat.
SOURCE ID: Nacogdoches, TX, USDA Forest Service, 1969, 130 p.
YEAR PUBLISHED: 1969
CATEGORY: C4
REGION: Applicable to entire United States
KEYWORDS: cover; deer; food; mammals, game
ABSTRACT: (Purpose) To discuss size and distribution of cutting units in even-aged forest management. (Type of Research) Discussion paper. (Results and Conclusions) In even-aged management, cuts must be large enough to feed deer and not utilize all of the browse or leave an excess. Smaller cuts of 25 to 50 acres are desirable. Long narrow cuts give greater edge and benefit the most deer. Optimum widths should not exceed 600 to 800 feet and may be up to 1/4 mile wide. An uncut strip on each side will provide cover and mast.

1717
Response of deer to alternate-strip clearcutting of lodgepole pine and spruce-fir timber in Colorado.
AUTHOR: WALLMO OC
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Fort Collins, CO, US Forest Service, 1969, Research Note RM141, 4 p.
YEAR PUBLISHED: 1969
CATEGORY: C4
REGION: Ponderosa Pine-Douglas-fir Forest STATE: Colorado
KEYWORDS: clearing; deer; mammals, game
ABSTRACT: (Purpose) To report responses of mule deer to clearcutting. (Time and Duration) 1954-66; 13 years. (Type of Research) Original research. (Methodology) Timber was harvested in clearcut strips 1, 2, 3, and 6 chains wide, alternating with uncut strips of the same width. Their length was approximately 600 feet. Slash was not cleaned up. Pellet group counts were made on belt transects. (Results and Conclusions) Mule deer use of clearcut strips doubled 10 years after logging as compared with uncut strips. Mean pellet-group densities on cut strips were 3 times those on uncut strips and virgin forest areas.

1718
Natural filtering of suspended soil by a stream at low flow.
AUTHOR: MINER NH
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: US Forest Service Research Note.
SOURCE ID: US Forest Service Northwest Forest and Range Experiment Station, 1968, PNW-88, 4 p.
YEAR PUBLISHED: 1968
CATEGORY: C4
REPORT NUMBER: PNW88
SPONSOR: US Forest Service, Pacific Northwest; of Portland Bureau of Water Works.
REGION: Pacific Forest STATE: Oregon
KEYWORDS: erosion, channel; filtration; flow; sediment; soil; stream
ABSTRACT: (Purpose) To measure soil movement downstream from road construction. (Time and Duration) August 1964. (Type of Research) Original research (Methodology) Sediment-laden water was followed visually until it reached the first sampling point 150 feet downstream from the road crossing. A dye was added to identify the same water mass farther downstream. Samples were collected at 3 more points downstream, and amounts of sand, silt and clay were measured. (Results and Conclusions) Particle-size analysis showed a tenfold reduction in total suspended-solids concentration during flow through 1,050 feet of stream. During low-flow conditions the natural filtering action of the stream tends to reduce particle concentrations within a relatively short distance and careful operations may be carried out without seriously impairing the water supply.

1719
Manipulation of roadside cover for nesting pheasants - a preliminary report.
AUTHOR: ETTER SL; JOSELYN GB; WARNOCK JE
AUTHOR AFFILIATION: IL Natural History Survey.
SOURCE TITLE: Journal of Wildlife Management
SOURCE ID: 32(2):217-233, 1968.
YEAR PUBLISHED: 1968
CATEGORY: C4
REGION: Applicable to entire United States
KEYWORDS: birds; mowing; right-of-way; seeding
ABSTRACT: (Purpose) To study possibilities of managing roadsides for ring-necked pheasant nesting cover. (Time and Duration) 1962-65; 4 years. (Type of Research) Original research. (Methodology) The study was conducted on and near a 23,200 acre area in east-central Illinois. Beginning in 1962, 38 seeded plots using grasses and legumes were established. Forty-two unmanaged control plots were used in 1963 with 32 plots added in 1964. Searches were made for nests with a crew of 4-5 and nests were revisited periodically for data. (Results and Conclusions) Nests on unmowed plots seeded to a grass-legume mixture averaged 3.0 per acre; on controlled mowing plots nests averaged 2.0 per acre; on uncontrolled mowing plots nests averaged 1.5 per acre. The hatch per acre on seeded roadsides exceeded all other cover types during 3 of the 4 years. Seeded plots tended to become monotypic with brome grass dominant on many plots. A reliable and economic means of seeding needs to be developed.

1720
Brush vs. cleared range as deer habitat in southern Texas.
AUTHOR: DAVIS RB; WINKLER CK
AUTHOR AFFILIATION: TX A & I Univ.
SOURCE TITLE: Journal of Wildlife Management
SOURCE ID: 32:321-329, 1968.
YEAR PUBLISHED: 1968
CATEGORY: C4
REGION: Applicable to entire United States STATE: Texas
KEYWORDS: brush; deer; habitat; mammals, game; wildlife
ABSTRACT: (Purpose) To measure the effect of brush control by rootplowing on deer. (Time and Duration) 1960-64; 5 years. (Type of Research) Original research. (Methodology) Tagged brush species were observed at 2-week intervals for foliage, flowers, or fruit. Observations were made on feeding deer and the deer were collected for rumen samples. Food available was measured on 100-foot transects. Each site consisted of a plot that had been rootplowed and an adjacent brush plot. Behavior of a deer herd was studied. (Results and Conclusions) While brush species are a staple in deer diets, a reliable supply of forbs is needed grasses seem to be utilized primarily in the winter. Drouth plus overstocking made native brush essential to deer. Rootplowed areas seeded to grass cannot be ranked as high as native brush range for deer. Small areas of brush-controlled range within dense brush stands may be advisable for good deer habitat

1721
Criteria for designing and locating logging roads to control sediment.
AUTHOR: PACKER PE
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Forest Science.
SOURCE ID: 13(1):2-18, 1967.
YEAR PUBLISHED: 1967
CATEGORY: C4
REGION: Columbia Forest (Dry Summer) STATE: Idaho; Montana; Wyoming
KEYWORDS: access; erosion; road; sediment; watershed
ABSTRACT: (Purpose) This study mathematically evaluated the separate effects of a number of watershed and road characteristics erosion of

1721

forest road surfaces and movement of sediment from roads. (Time and Duration) 2 years; 1958-1959 (Type of Research) Original research. (Methodology) 720 study sites were used. A number of measurements were taken at each study site; also, each site had to meet six requirements in order to be selected as as study site. (Results and Conclusions) This investigation shows that spacing of logging road cross drains and widths of protective strips below logging roads are affected significantly by several watershed and road characteristics that are readily available to forest managers.

1722
Forests, wildlife, and habitat management — a critical examination of practice and need.
AUTHOR: LARSON JS
AUTHOR AFFILIATION: US Forest Service
SOURCE ID: Asheville, NC. US Forest Service Southeastern Forest Experiment Station, 1967, Research Paper SE30, 28p.
YEAR PUBLISHED: 1967
CATEGORY: C4
REPORT NUMBER: SE30
REGION: Laurentian Mixed Forest STATE: United States
KEYWORDS: clearing; foraging; forest; habitat; management; wildlife
ABSTRACT: (Purpose) To determine the nature and extent of forage clearing for game management in eastern US forests, and to evaluate the present body of knowledge of the practice. (Type of Research) Literature review. (Methodology) Review of literature, field trips, personal interviews, and correspondence were used. (Results and Conclusions) Organized clearing for forage began about 1935 and has involved 22 eastern states with over 30,000 acres cleared. National Forests account for 1/3 to 1/2 of the total acreage. Mowing, renewal and fertilizing have been used to maintain forage. Clearing range from 1/10 to 60 acres with food supply was their most common role and edge effect second. Creation of vegetation diversity has been a major reason for clearings. A comparison of forage clearings with less expensive natural clearings has not been although nearly $4 million has been invested.

1723
Bird mortality at KOMU-TV tower, Columbia, Missouri, Fall 1965 and 1966.
AUTHOR: ELDER WH; HANSEN J
AUTHOR AFFILIATION: Univ MO.
SOURCE TITLE: The Bluebird
SOURCE ID: 34(1): 1967.
YEAR PUBLISHED: 1967
CATEGORY: C4
REGION: Oak-Hickory Forest STATE: Iowa; Illinois; Kansas; Missouri
KEYWORDS: birds; collision; mortality
ABSTRACT: (Purpose) To present data on passerine bird kills caused by a television tower and its guywires. (Time and Duration) 1965-66; 2 years. (Type of Research) Original research. (Methodology) Dead birds were collected, and sexed and aged. (Results and Conclusions) In 1965, 205 birds, 28 birds, and 618 birds of 15-32 species were collected (from beneath the tower.) A second heavy kill was observed in 1966. Previous kills had occurred in 1954 (62 species among 1,887 individuals), and in 1960 (41 species among 658 dead birds). Yellow-throats, catbirds, red-eyed vireos, Tennessee warblers, ovenbirds and Swainson's thrushes ranked high in mortality. For most species, adults and young were migrating together.

1724
Evaluation of the wildlife results from fuel breaks, browseways, and type conversions.
AUTHOR: DASMANN W; HUBBARD R; MACGREGOR WG
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Tall Timbers Fire Ecology Conference Proceedings
SOURCE ID: 7:179-194, 1967.
YEAR PUBLISHED: 1967
CATEGORY: C4
REGION: California Chaparral STATE: California
KEYWORDS: deer; habitat; wildlife
ABSTRACT: (Purpose) To make an evaluation of the results of deer habitat improvement projects. (Type of Research) Information survey. (Methodology) Survey. (Results and Conclusions) Browseways are built through dense brush, about tractor blade width, by crushing brush with a bulldozer blade or hand-chopping. They receive medium to high deer use for long periods. Browse rejuvenation areas have been crushed, burned, sprayed, mowed, rolled, chopped, etc., and usually have a high deer population, more than untreated areas. Browse plantations may be made by direct seeding, or transplants to restore browse species; however, many have been failures. Brush type conversions to an herbaceous type appear to be beneficial to wildlife. Fuelbreaks are usually about 300 feet wide to convert brush to grass. These provide type interspersion and edges of value to wildlife. Wildfire rehabilitation is usually by aerial seeding with grass. Weed tree control was of low benefit to wildlife. Of paramount importance is creation of wildlife openings in timber stands, wildlife corridors, and islands of cover.

1725
Uptake and movement of herbicides in plants.
AUTHOR: HULL HM
AUTHOR AFFILIATION: US Dept of Agriculture
SOURCE TITLE: Pages 49-55 in symposium proceedings: herbicides and vegetation management in forests, ranges and noncrop lands.
YEAR PUBLISHED: 1967
CATEGORY: C4
REGION: Applicable to entire United States
KEYWORDS: herbicides
ABSTRACT: (Purpose) To discuss uptake and movement of herbicides in plants. (Type of Research) Literature review (Results and Conclusions) Waiting until foliage is mature is important. Active root growth and ample soil moisture have been found to be important in a number of cases, as well as chemical formulation and use of surface active agents. Using several chemicals improved efficiency of control, and increased herbicidal activity can be obtained by adjusting droplet size.

1726
Response of vegetation communities to manipulation.
AUTHOR: NEWTON M
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Pages 83-87 in symposium proceedings: herbicides and vegetation management in forests, ranges, and noncrop lands.
SOURCE ID: Corvallis, OR, OR State Univ, 1967, 355 p.
YEAR PUBLISHED: 1967
CATEGORY: C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; impact; vegetation
ABSTRACT: (Purpose) To outline some basic concepts concerning ecological response to herbicides. (Type of Research) Discussion. (Results and Conclusions) Describes the concept of plant succession and influence of climate. Recovery of desert communities is slow owing to deficient moisture. Savannah types respond more quickly than deserts to manipulation; introduction of grass delays return of shrubs and trees. In temperate regions, removal of trees results in an increase in herbs and shrubs, and some shrubs respond to form cover that may resist invasion by trees. Removal of tropical rain forest gives rise to an herb-shrub-tree community and removal of trees may give rise to a shrub community. In all vegetation types, repeated applications give dominance of resistant species.

1727
Effects of vegetation management on wildlife.
AUTHOR: LAWRENCE WH
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Pages 88-93 in symposium proceedings: herbicides and vegetation management in forests, ranges and noncrop lands.
SOURCE ID: Corvallis, OR, OR State Univ, 1967, 355 p.
YEAR PUBLISHED: 1967
CATEGORY: C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; impact; management; wildlife
ABSTRACT: (Purpose) To review some specific uses of herbicides and their impact of forest wildlife. (Type of Research) Literature review. (Results and Conclusions) Herbicides have been used to maintain sharp-tailed grouse and deer habitat. Hardwood control to favor pine has taken place in the South. 2,4-D has been used to alter gopher habitat to control the population.

1728
Ecological considerations in brush control.
AUTHOR: GRATKOWSKI HJ
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Pages 124-140 in symposium proceedings: herbicides and vegetation management in forests, ranges and noncrop lands.
SOURCE ID: Corvallis, OR, OR State Univ, 1967, 355 p.
YEAR PUBLISHED: 1967
CATEGORY: C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: brush; ecology
ABSTRACT: (Purpose) To take a look at interactions between plants, and between plants and their environment. (Type of Research) Literature review. (Results and Conclusions) Many interactions occur in an ecosystem when environmental factors are changed or species eliminated. Microclimates are also changed. Shrubs have been seeded to reduce browse on conifers.

1729
Residues of herbicides and impact on uses by livestock.
AUTHOR: WARREN LE
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Pages 227-242 in symposium proceedings: herbicides and vegetation management in forests ranges and noncrop lands.
SOURCE ID: Corvallis, OR, OR State Univ, 1967, 355 p.
YEAR PUBLISHED: 1967
CATEGORY: C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: herbicides; impact; livestock
ABSTRACT: (Purpose) To discuss the possible problems of forage contamination by herbicides. (Type of Research) Literature review. (Results and Conclusions) Herbicides are degraded at different rates in soils depending upon the chemical and soil conditions. It is slower in plants, in some cases. Phenoxy herbicides are not usually attractive to livestock. Withholding of grazing allows for nil residues in milk if extended to seven days after 2,4-D spraying. 2,4-D has been found in tissues and blood after 72 hours. There is very little actual hazard to livestock if herbicides are properly used.

1730
Impact of range improvement practices on wildlife habitat.
AUTHOR: BROWN ER
AUTHOR AFFILIATION: WA Dept of Game.
SOURCE TITLE: Pages 243-247 in symposium proceedings: herbicides and vegetation management in forests, ranges and noncrop lands.
SOURCE ID: Corvallis, OR, OR State Univ, 1967, 355 p.
YEAR PUBLISHED: 1967
CATEGORY: C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: habitat; mammals, game; range; wildlife
ABSTRACT: (Purpose) To describe the impact of range improvement on wildlife habitat. (Type of Research) Literature review. (Results and Conclusions) A number of cases where wildlife benefited from ecological changes caused by herbicides are cited. The major area of conflict is in control of sagebrush, which is a habitat for sage grouse, antelope, mule deer, and elk. While eradication of sagebrush is potentially harmful to game, most control programs leave enough to keep wildlife populations in food and cover.

1731
The future of vegetation management.
AUTHOR: DAY BE
AUTHOR AFFILIATION: Univ of CA.
SOURCE TITLE: Pages 298-303 in symposium proceedings: herbicides and vegetation management in forests, ranges and noncrop lands.
SOURCE ID: Corvallis, OR, OR State Univ, 1967, 355 p.
YEAR PUBLISHED: 1967
CATEGORY: C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: management; vegetation
ABSTRACT: (Purpose) To discuss the future of vegetation management. (Type of Research) Discussion. (Results and Conclusions) Vegetation management consists of fostering beneficial plants and suppressing less desirable vegetation. The future of chemical vegetation management depends upon research. Herbicides are only one tool among many and the future of herbicide technology lies in the soil where treatment may make conditions unfavorable to undesirable species.

1732
Slash cleanup in a Ponderosa pine forest affects use by deer and cattle.
AUTHOR: REYNOLDS HG
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Fort Collins, CO, US Forest Service, 1966, Research Note RM64, 3 p.
YEAR PUBLISHED: 1966
CATEGORY: C4
REGION: Grama-Galleta Steppe + Juniper-Pinyon Woodland Mosaic STATE: Arizona
KEYWORDS: forest; mammals, game; slash disposal
ABSTRACT: (Purpose) To provide information on effects of slash disposal upon understory conditions and animal use. (Time and Duration) 1964; 1 year. (Type of Research) Original research. (Methodology) Paired sample plots were used to measure vegetation and pellet groups. The area was logged in 1958. (Results and Conclusions) Slash cleanup has no measurable effect upon total or class production of understory vegetation. Forage production was low on ponderosa pine sites. Cattle droppings were more numerous on areas cleared of slash; deer pellet groups were greater where slash was undisturbed.

1733
Selective maintenance of edge areas on national forest lands in Indiana and Ohio.
AUTHOR: HAMILTON R; LANDES K R
AUTHOR AFFILIATION: US Forest Service
SOURCE TITLE: Proceedings 27th Midwest Fish and Wildlife Conference.
SOURCE ID: 289-296, 1965 (December).
YEAR PUBLISHED: 1965
CATEGORY: C4
REGION: Eastern Deciduous Forest STATE: Indiana; Ohio
KEYWORDS: forest; habitat; maintenance; spraying; wildlife
ABSTRACT: (Purpose) To describe the use of a selective technique for establishing and maintaining edge areas on National Forest lands in Indiana and Ohio. (Results and Conclusions) The authors recommend that selective basal spraying be used. This will allow removal of unwanted plants, while keeping desirable herbs, shrubs and small-growing trees that can be used by wildlife. Several utility companies having rights-of-way on National Forest lands have entered into cooperating agreements with the Forest Service, and agreed to selectively maintain all their rights-of-way.

1734
Hawthorns-multiple use shrubs.
AUTHOR: SHARP WM
AUTHOR AFFILIATION: US Bureau of Sport Fisheries and Wildlife.
SOURCE TITLE: The Cornell Plantations
SOURCE ID: 21(2):19-22, 1965.
YEAR PUBLISHED: 1965
CATEGORY: C4
REGION: Applicable to entire United States STATE: New York; Ohio; Pennsylvania
KEYWORDS: multiple use; shrubs; wildlife
ABSTRACT: (Purpose) To describe multiple use possibilities of hawthorns. (Type of Research) Descriptive paper based on literature and experience. (Results and Conclusions) Hawthrons are useful to wildlife, grow on a wide range of soils with minimum cultural care, compete well, and have aesthetic value. The species invades idle lands, where it often occurs in thickets in open grassy areas providing excellent coverts for woodcock, grouse, and wild turkey.

1735
Determining the range of tolerable erosion.
AUTHOR: SMITH RM; STAMEY WL
AUTHOR AFFILIATION: US Agricultural Research Service.
SOURCE TITLE: Soil Science
SOURCE ID: 100(4):414-424, 1965.
YEAR PUBLISHED: 1965
CATEGORY: C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: agriculture; erosion; soil; vegetation
ABSTRACT: (Purpose) Review and analysis of viewpoints and data that may help establish ranges of tolerable erosion. (Type of Research) Literature review. (Methodology) This paper includes a review of literature and available data to assess soil erosion and soil renewal rates with time. This includes inventory of soil resources, expression of essential soil property requirements, data on erosion, and data on renewal of soil properties with time. The essential soil property given the most attention is depth of favorable soil material. (Results and Conclusions) It is suggested that accelerated soil erosion rates much greater than normal or geologic erosion should not be tolerated. Normal erosion on slopes with close-growing vegetation probably was 0.1 to 0.6 tons per acre annually on land suitable for agriculture. Erosion on large watersheds was between 0.1 and 1.0 tons per acre per year. Soil renewal by rock weathering was about 0.2 tons per year in central US. Surface deposition results in soil renewal of several tons per acre annually near the source and less at remote locations. Erosion tolerance used in conservation planning ranged from 0.5 to 6.0 tons per acre per year. These tolerances are excessive for soils without depth reserves or with deficiencies.

1736
Streamflow increases after removing woodland-riparian vegetation from a southern California watershed.
AUTHOR: ROWE PB
AUTHOR AFFILIATION: Univ of AZ.
SOURCE TITLE: Journal of Forestry
SOURCE ID: 61:365-371, 1963.
YEAR PUBLISHED: 1963
CATEGORY: C4
REGION: Sierran Forest STATE: California
KEYWORDS: floods; flow; quality; riparian; sedimentation; stream; vegetation; water; watersheds
ABSTRACT: (Purpose) To determine the amount of streamflow increase from removal of bottom woodland-riparian vegetation, when increases occur, and how treatment affects floods, sedimentation and water quality. (Time and Duration) 1958 and 1959; two years. (Type of Research)

1736

Original field research (Methodology) Woodland-riparian vegetation was removed along stream channels on an 875-acre watershed near San Dimas; an adjoining 740-acre untreated area served as a control. Each watershed was equipped with rain gauges and stream gauging station. Vegetation was cleared along 1.3 miles of canyon bottom in 1958-59 and stumps sprayed with 2,4-D and 2,4,5-T. Effects on streamflow were computed by comparing flows from treated and control watersheds during periods of comparable rainfall and moisture conditions. (Results and Conclusions) Riparian trees and shrubs removed were replaced by resident grasses which reduced streamflow increases during winter periods of wet soils and excess rainfall. The greatest gain in water yield due to treatment occurred during the summer. Streamflow increase during the first drying season was 17.4 acre-feet or equivalent to 1.2 acre-feet per acre treated. The greatest monthly increase, 3.5 acre-feet, occurred in June of the first year. Clearing riparian vegetation had no appreciable effect on peak discharge, erosion, or water quality. No trace of hormone herbicides were detected in the water.

1737
Effects of logging upon fish resources of the west coast.
AUTHOR: CHAPMAN DR
AUTHOR AFFILIATION: OR State Univ.
SOURCE TITLE: Journal of Forestry
SOURCE ID: 60:533-537, 1962.
YEAR PUBLISHED: 1962
CATEGORY: C4
REGION: Pacific Forest STATE: Alaska; Idaho; Oregon; Washington
KEYWORDS: clearing; fish; flow; impact; pollution; temperature; water
ABSTRACT: (Purpose) A discussion of the effect of logging on streams and fish in the varied land and stream habitats along the Pacific Coast. (Type of Research) Literature review and discussion of current studies. (Results and Conclusions) The effects of logging noted to date in many streams of the Pacific Coast have been detrimental and often disastrous. Particular effort should be devoted to determinations of the exact sources of and damaging effects, so that protective steps can be planned in future harvest operations.

1738
Effect of logging on understory vegetation and deer use in a Ponderosa Pine forest of Arizona.
AUTHOR: REYNOLDS HG
AUTHOR AFFILIATION: US Forest Service
SOURCE ID: Fort Collins, CO. US Forest Service, Rocky Mountain Forest and Range Experiment Station, 1962, Research Note No 80, 7 p.
YEAR PUBLISHED: 1962
CATEGORY: C4
REPORT NUMBER: RM80
REGION: Ponderosa Pine-Douglas-fir Forest STATE: Arizona; New Mexico
KEYWORDS: clearing; forest; habitat; impact; logging; thinning; wildlife
ABSTRACT: (Purpose) To determine the effects of timber harvesting on understory vegetation and deer use. (Time and Duration) 1958-61. (Type of Research) Original research. (Methodology) Vegetation and deer use were sampled in logged and unlogged ponderosa pine forests on stratified samples. Understory vegetation was estimated in pounds per acre on 96-square-feet plots. Deer pellet groups were counted on 100-square-feet plots. (Results and Conclusions) Production of understory vegetation on selectively logged lands exceeded that on unlogged lands for 11-15 years for sedges, perennial grasses, forbs and aspen. North and south slopes yielded about equal amounts of vegetation. Peak production was reached about six years after logging and continued higher for 11 years. Ridgetops and dense pole stands produced the least vegetation. Between 3-11 years after logging, deer use was the highest; use was lower in pole stands, on ridges, and on sites dominated by grasses and sedges. Thinning of pole stands, on north aspects, and where there is an understory are promising management possibilities.

1739
Use of natural openings in a Ponderosa pine forest of Arizona by deer, elk, and cattle.
AUTHOR: REYNOLDS HG
AUTHOR AFFILIATION: US Forest Service
SOURCE ID: Fort Collins, CO. US Forest Service Rocky Mountain Forest and Range Experiment Station, 1962, Research Note No 78, 4 p.
YEAR PUBLISHED: 1962
CATEGORY: C4
REPORT NUMBER: RM78
REGION: Ponderosa Pine-Douglas-fir Forest STATE: Arizona; New Mexico
KEYWORDS: clearing; edges; forest; habitat; pellets; wildlife
ABSTRACT: (Purpose) To determine how natural forest openings are used by deer, elk, and cattle. (Type of Research) Original research. (Methodology) Seven natural openings from 1-40 acres were studied in a logged-over ponderosa pine forest in Arizona. Transect lines were divided into contiguous 2x50 foot plots. Pellet groups were counted on plots and herbaceous vegetation and forest overstory noted. (Results and Conclusions) Deer used openings, borders, and forest about equally. Cattle made more use of borders than elk; both used the open forest less than borders. Both cattle and elk prefer forest openings.

1740
Pheasant nesting cover strips.
AUTHOR: MUSSER EG
AUTHOR AFFILIATION: PA Game Comm.
SOURCE TITLE: Pennsylvania Game News
SOURCE ID: Pages 21-23. 1962 (May).
YEAR PUBLISHED: 1962
CATEGORY: C4
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: birds; cover; mowing
ABSTRACT: (Purpose) To check a report that pheasants nest primarily on edges of hay fields and most could be saved by delaying mowing. (Time and Duration) 1950; 1 year. (Type of Research) Original research. (Methodology) Eighteen cover strips in hay fields were purchased in which nesting was checked during June and August. (Results and Conclusions) Most pheasant nests were found in 50-75 foot edges of field borders. The cost of delaying mowing in the 37 acres studied was $1,024.28. A total of 583 hatched eggs were found in 50 nests on the 18 cover strips. The PA Game Commission felt this justified such purchases and proceeded to purchase nesting cover strips in most counties in southeastern Pennsylvania over the ensuing years.

1741
Permanent plant cover for road cuts and similar conditions by secondary succession.
AUTHOR: TABOR P
AUTHOR AFFILIATION: Soil Conservation Service
SOURCE TITLE: Agricultural Journal
SOURCE ID: 54:179, 1962.
YEAR PUBLISHED: 1962
CATEGORY: C4
REGION: Southeastern Mixed Forest STATE: Alabama; Georgia; South Carolina
KEYWORDS: planting; restoration; seeding; succession
ABSTRACT: (Purpose) To describe a method to speed up secondary succession to replace planted grasses and legumes. (Type of Research) Descriptive paper. (Results and Conclusions) On road cuts and flood control dams, an artificial plant cover established by fertilizer, mulch, and moisture leads to more rapid than normal takeover by native grasses, herbs, shrubs, and vines.

1742
Use of silvicultural techniques for improving deer habitat in the Lake States.
AUTHOR: KREFTING LW
AUTHOR AFFILIATION: Univ of MN.
SOURCE TITLE: Journal of Forestry.
SOURCE ID: 60(1):40-42, 1962.
YEAR PUBLISHED: 1962
CATEGORY: C4
REGION: Spruce-fir Forest STATE: Minnesota
KEYWORDS: deer; habitat; improvement; mammals, game
ABSTRACT: (Purpose) To discuss use of forestry techniques for improving deer habitat. (Type of Research) Discussion paper. (Results and Conclusions) Prescribed burning improves deer habitat but cannot be used where timber value is high and being utilized. Discing has given variable results in deer habitat improvement, which, in general, have not been encouraging. Planting natural browse holds little or no promise, but planting for winter cover and travel lanes with balsam fir and spruce is possible. Use of 2,4-D to produce available browse of mountain maple has been encouraging. Aerial use of 2,4-D has reduced undesirable hazel and increased desirable browse. Use of phytocides for making new openings and preserving old ones is promising.

1743
Bulldozing to produce browse for deer.
AUTHOR: GYSEL LW
AUTHOR AFFILIATION: MI State Univ.
SOURCE TITLE: Michigan Quarterly Bulletin.
SOURCE ID: 43(4):722-731, 1961.
YEAR PUBLISHED: 1961
CATEGORY: C4
REGION: Northern Hardwoods Forest STATE: Michigan
KEYWORDS: bulldozing; food; wildlife
ABSTRACT: (Purpose) To determine the effects of bulldozing on deer browse species in different plant communities in Michigan. (Time and Duration) 1956-60. (Type of Research) Original research. (Methodology) Plots were bulldozed with a D-2 in 1956. Milacre plots were used to measure percent cover of all species up to six feet and number of stems

by diameter classes. Weight of browse produced was determined in 1957 and 1960 and amount of browsing was noted. Chemical analyses were made of plant parts within reach of deer in one plot. (Results and Conclusions) Bulldozing proved to be most effective in producing large amounts of browse in sapling-pole, sugar maple stands and sumac communities. A check area produced 99 pounds of browse per acre, while sugar maple produced 1260 pounds and oak 866 pounds per acre. A willow stand developed very little palatable browse.

1744

The interrelations of logging, birds, and timber regeneration in the Douglas-fir region of northwestern California.

AUTHOR: HAGAR DC
AUTHOR AFFILIATION: Univ of Ca, Davis, Dept of Zoology
SOURCE TITLE: Ecology
SOURCE ID: 41(1):116-125, 1960.
YEAR PUBLISHED: 1960
CATEGORY: C4
REGION: Pacific Forest STATE: California
KEYWORDS: birds; clearing; food; impact; population; regeneration; trees
ABSTRACT: (Purpose) The purpose of this investigation was to determine changes in species composition, numbers, food habits, and activities of bird populations after the forest is logged. And also during the first couple years after logging when regeneration of timber is important. (Time and Duration) 3 years; 1955 to 1957. (Type of Research) Original research. (Methodology) Censuses to obtain relative abundance of bird populations was made 8 or 10 times a month in each of the vegatative types. Food habits of important seed-eating birds were studied by field observation and examination of stomach contents. Food habits of the juncos were studied in detail. In stomach examinations, the contents were spread out under a dissecting microscope and percent volume of each kind of food was estimated. (Results and Conclusions) Logging alters the composition of the bird population and may cause a temporary decline in over-all numbers. Within a year after cutting, former numbers are regained, though species composition is different. The junco became predominant on cutovers where an abundance of weed seeds, berries and insects helped the population flourish. These birds turned largely to Douglas-fir seed when it was available.

1745

Browsing and stand regeneration in clear- and selectively-cut hardwoods.

AUTHOR: CAMPBELL RA; RIPLEY TH
AUTHOR AFFILIATION: US Forest Service
SOURCE TITLE: Transactions North American Wildlife Conference.
SOURCE ID: 25:407-415, 1960.
YEAR PUBLISHED: 1960
CATEGORY: C4
REGION: Appalachian Oak Forest STATE: North Carolina
KEYWORDS: browse; cutting; deer; mammals, game
ABSTRACT: (Purpose) To observe browse production-utilization after clearcutting and selective cutting of mountain hardwoods. (Time and Duration) 1949-1959; 10 years. (Type of Research) Original research. (Methodology) Three areas were clearcut, modified clearcut, and improvement cut, with no replications. Regeneration was sampled on 1/100 milacre plots. Degree of browsing was noted. (Results and Conclusions) More browse was produced in the clearcut area than in the selective cut. Clearcutting produced more browse than could be used by deer and trees grew out of their reach. Selective cutting browse was severely overused by deer.

1746

Small mammals and old field succession on the Piedmont of New Jersey.

AUTHOR: PEARSON PG
AUTHOR AFFILIATION: Rutgers Univ.
SOURCE TITLE: Ecology.
SOURCE ID: 40(2):249-255, 1959.
YEAR PUBLISHED: 1959
CATEGORY: C4
SPONSOR: Rutgers Univ Research Council.
REGION: Appalachian Oak Forest STATE: New Jersey
KEYWORDS: distribution; mammals, small; succession; vegetation
ABSTRACT: (Purpose) To study the small mammal fauna in relation to secondary succession on the Piedmont of New Jersey. (Time and Duration) 1 year; July, 1956 to June 1957. (Type of Research) Original research. (Methodology) Five fields, ages 7, 11, 16, 46, and 66 years, plus an oak forest, were used for the study. Twenty-five live traps were placed in each field. Animals captured were marked and released after size, pelage, and other characteristics had been recorded. Also the location of the trap-site was noted in relation to the vegetation cover. (Results and Conclusions) Relative abundance of the total small mammal fauna increased from the 7 and 11 to the 16-year stage as the field aspect developed, decreased by the 46-year stage and then increased as the forest matured. The species distribution was a reflection of the change from a well-developed grassland stage at 16 years to a developing forest aspect afterwards.

1747

The effects of fire on a population of small rodents.

AUTHOR: COOK SF
AUTHOR AFFILIATION: Univ of CA
SOURCE TITLE: Ecology.
SOURCE ID: 40(1):102-108, 1959.
YEAR PUBLISHED: 1959
CATEGORY: C4
REGION: California Chaparral STATE: California
KEYWORDS: fire; impact; mammals, small; population
ABSTRACT: (Purpose) To measure the recovery of small rodent populations after a fire. (Time and Duration) 1953-1956; 4 years. (Type of Research) Original research. (Methodology) A mature grassland, with scattered brush of eucalyptus and planted pine, was completely burned by wildfire from a power line blown down by wind. A snaptrapping census was begun three weeks after the fire. (Results and Conclusions) All species of mice were essentially eliminated by the 1958 fire, and cover regrowth was needed before mice recovered. The change from brush dominanted by Peromyscus spp. to grass was accompanied by a general shift in species composition to Reithrodontomys and Microtus.

1748

The distribution and movement of small mammals in central Oklahoma.

AUTHOR: HAYS HA
AUTHOR AFFILIATION: Univ of OK.
SOURCE TITLE: Journal of Mammalogy.
SOURCE ID: 39(2):235-244, 1958.
YEAR PUBLISHED: 1958
CATEGORY: C4
REGION: Oak + Bluestem Parkland STATE: Oklahoma
KEYWORDS: habitat; mammals, small
ABSTRACT: (Purpose) To secure information on small mammals in central Oklahoma. (Time and Duration) 1952-1953; 1 year. (Type of Research) Original research. (Methodology) Live-trapping and snap trapping census methods were used in open grassland and in a wooded ravine. (Results and Conclusions) The number of small mammals was three times as great in open grassland as in the wooded ravine. Peromyscus maniculatus was the most abundant species in open grassland. Cotton rat (Sigmodon hispidus) and pocket rat were also abundant and restricted to grassland. Peromyscus leucopus was the most abundant species in the ravine, with the eastern wood rat (Neotoma floridana) second.

1749

Wind-caused mortality in Minnesota swamp black spruce in relation to cutting methods and stand conditions.

AUTHOR: HEINSELMAN ML
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Society of American Foresters, Proceedings
SOURCE ID: Pages 74-77, 1957.
YEAR PUBLISHED: 1957
CATEGORY: C4
REGION: Laurentian Mixed Forest STATE: Maine; Michigan; Minnesota; New York; Wisconsin
KEYWORDS: clearcutting; trees; windfall
ABSTRACT: (Purpose) To compare black spruce mortality from windfall under various silvicultural systems. (Time and Duration) 1948-53; 5 yrs. (Methodology) Large scale cuttings were made in swamp black spruce to test 6 methods: shelterwood, clear-cutting in strips, clear-cutting in patches, light thinning, tree selection, and group selection. Each treatment was repeated in 3 separate compartments. Strips were cut 1 chain wide, patches were 1/4 to 1/2 acre in area. (Results and Conclusions) Wind loss from strips or patches was light and was not substantially more than uncut or lightly partially cut stands when the area cut was about 20% of the total. However, wind loss increased with intensity of partial cuttings. Losses were related to site and stand age. Storm winds were serious where large open areas exposed heavy partial cutting. Shelterwood cutting losses were highest but were not significant at the 5% level.

1750

Rightofways and wildlife habitat: a progress report.

AUTHOR: EGLER FE
AUTHOR AFFILIATION: Aton Forest
SOURCE TITLE: Transactions North American Wildlife Conference.
SOURCE ID: 22:133-144, 1957.
YEAR PUBLISHED: 1957
CATEGORY: C4
REGION: Applicable to entire United States

1750

KEYWORDS: management; right-of-way
ABSTRACT: (Purpose) To discuss important right of way problems of a general nature. (Type of Research) Discussion paper. (Results and Conclusions) A long and involved discussion of ROW management which did not include wildlife habitat except very indirectly by allusion.

1751
The effect of hardwood removal on wildlife.
AUTHOR: GOODRUM PD; REID VH
AUTHOR AFFILIATION: US Fish and Wildlife Service.
SOURCE TITLE: Proceedings Society of American Foresters
SOURCE ID: Pages 141-147, 1957.
YEAR PUBLISHED: 1957
CATEGORY: C4
REGION: Applicable to entire United States STATE: Alabama; Louisiana; Mississippi; Texas
KEYWORDS: impact; mast; trees; wildlife
ABSTRACT: (Purpose) To describe the value of oaks in southern pine forests in producing mast for wildlife food. (Type of Research) Discussion from literature. (Results and Conclusions) Acorns are valuable wildlife food in southern pine forests to deer, squirrels, turkey, and quail. Oaks also add brushy cover, and should be preserved in the forest.

1752
Investigations of the use of 2,4,5-T esters as a basal spray in the control of bear oak.
AUTHOR: BRAMBLE WC; BYRNES WR; WORLEY DP
AUTHOR AFFILIATION: PA State Univ.
SOURCE TITLE: Weeds.
SOURCE ID: 5:121-132, 1957.
YEAR PUBLISHED: 1957
CATEGORY: C4
REGION: Appalachian Oak Forest STATE: Pennsylvania
KEYWORDS: herbicides; spraying, basal; 2,4,5-T
ABSTRACT: (Purpose) To determine the best time of the year, concentration, volume of spray, and point of application to kill bear oak. (Time and Duration) 1952-55; 3 years. (Type of Research) Original research. (Methodology) Applications were made with paint brush and knapsack sprayers to groups of 10 to 20 plants. 2,4,5-T esters in oil were used for the tests. (Results and Conclusions) Optimum topkill was obtained by carefully encircling the basal portion of the stem with spray. Early winter was the best time for treatment and late fall the poorest. Concentrations of above 2 percent by volume were needed to get consistent kills, and high volumes gave the fastest kill. Three years were needed to evaluate the results of the spray.

1753
Responses of small mammal populations to logging of Douglas-fir.
AUTHOR: TEVIS L JR
SOURCE TITLE: Journal of Mammalogy.
SOURCE ID: 37(2):189-196, 1956.
YEAR PUBLISHED: 1956
CATEGORY: C4
REGION: Redwood Forest STATE: California
KEYWORDS: clearing; logging; mammals, small; population; wildlife
ABSTRACT: (Purpose) To determine numbers and species of small mammals (mice) that occurred in cutover areas of various ages of Douglas-fir forests. (Time and Duration) Parts of three years (1952-1954). (Type of Research) Original field research. (Methodology) 100 snap traps were set for three days and nights on each of 34 sites covering cutovers ranging in age from three months to 20 years. Traps were also set in adjacent forests in each case. Trapping was done May through November. Bait used was walnut meat. Reproduction data was obtained from biopsies of 625 specimens. (Results and Conclusions) 1033 specimens of 16 small mammal species were captured. Comparative data was obtained for only white-footed mouse, Townsend chipmunk, and trowbridge shrew. White-footed mice quickly invaded new cutovers and became more abundant than in the adjacent forest, apparently due to plentiful cover and food. When the cutover began decreasing in vegetation variety (after 10 years), the populations decreased. Douglas-fir seeds are principle food of the mice and explain why reseeding cuts in this area often fail. Similar habitat utilization of cutovers by the remaining species are discussed. White-footed mice, Townsend chipmunks and chickarees were responsible for destruction of large amounts of Douglas-fir seed.

1754
Breeding bird populations in relation to plant succession in the Piedmont of Georgia.
AUTHOR: JOHNSTON DW; ODUM EP
AUTHOR AFFILIATION: Univ of GA.
SOURCE TITLE: Ecology.
SOURCE ID: 37:50-62, 1956.
YEAR PUBLISHED: 1956
CATEGORY: C4
REGION: Beech-Sweetgum-Magnolia-Pine-Oak Forest STATE: Georgia
KEYWORDS: birds, nongame; succession
ABSTRACT: (Purpose) To describe breeding bird populations of seral stages. (Time and Duration) 1950-1951; 2 years. (Type of Research) Original research. (Methodology) Censusing on 13 areas was by territory mapping. (Results and Conclusions) Breeding bird densities increased about three times (136 pairs) in 20-year-old shrublands, as compared with recently abandoned fields (15-40 pairs). Densities decreased in young pine forests, and increased (239 pairs) in old pine and young hardwood stands. Birds are an important influence in determining the nature and extent of a shrub stage.

1755
The effect of rodents on reforestation.
AUTHOR: SPENCER DA
AUTHOR AFFILIATION: US Fish and Wildlife Service.
SOURCE TITLE: Proceedings of the Society of American Foresters.
SOURCE ID: Pages 125-128, 1955.
YEAR PUBLISHED: 1955
CATEGORY: C4
REGION: California Chaparral STATE: California
KEYWORDS: fire; impact; mammals, small; slash
ABSTRACT: (Purpose) To describe the effect of rodents on reforestation. (Type of Research) Discussion paper. (Results and Conclusions) A 50% reduction in the number of rodents occurred immediately after burning; species composition did not change. Thus, fire-denuded areas do continue to support some small mammals. Natural population fluctuations occur from year to year. Small 30-acre clearcut areas are difficult to free of rodents even by poison bait owing to reinvasion and increased breeding rates.

1756
Brush control in southeastern New York: fifteen years of stable tree-less communities.
AUTHOR: EGLER FE; POUND CE
AUTHOR AFFILIATION: Boy Scouts of America.; American Museum of Natural History.
SOURCE TITLE: Ecology
SOURCE ID: 34(1): 63-73, 1953.
YEAR PUBLISHED: 1953
CATEGORY: C4
SPONSOR: American Museum of Natural History.; Boy Scouts of America.
REGION: Northern Hardwoods Forest STATE: New York
KEYWORDS: brush control; cover; transect; vegetation
ABSTRACT: (Purpose) The purpose of this paper is to report upon the vegetation of a tract of land 0.8 hectare in area. (Time and Duration) 1936-1951; 15 year study. (Type of Research) Original research. (Methodology) A transect, 650 meters long and 12 meters wide, was studied for floristic composition and structure of the plant communities. Both permanent and temporary plots were established. (Results and Conclusions) On the line described, the accidental absence of suitable conditions for germination and development of tree seeds and the absence of root-suckering trees allowed the formation of a dense low vegetation that has since prevented the mass invasion of trees. Such trees as have invaded now have a coverage of less than 1 percent.

1757
Our disregarded rights-of-way — ten million unused wildlife acres.
AUTHOR: EGLER FE
AUTHOR AFFILIATION: American Museum of Natural History, NY.
SOURCE TITLE: Transactions North American Wildlife Conference.
SOURCE ID: 18:147-158, 1953.
YEAR PUBLISHED: 1953
CATEGORY: C4
REGION: Applicable to entire United States
KEYWORDS: edges; right-of-way; spray, broadcast; spraying, selective; wildlife
ABSTRACT: (Purpose) To discuss wildlife habitat management on ROWs. (Type of Research) Discussion paper. (Results and Conclusions) Selective basal spraying with 2,4-D and 2,4,5-T is preferable to blanket foliage spraying. It fills the land with edge effects and produces a mixture of shrubs and ferns with grass, which will resist tree invasion.

1758
Borders and openings of beech-maple woodlands in southern Michigan.
AUTHOR: GYSEL LW
AUTHOR AFFILIATION: MI State Univ
SOURCE TITLE: Journal of Forestry
SOURCE ID: 49:13-19, 1951.
YEAR PUBLISHED: 1951
CATEGORY: C4
REGION: Beach-Maple Forest STATE: Indiana; Michigan; Ohio
KEYWORDS: borders; edge; plant succession
ABSTRACT: (Purpose) To describe in detail various aspects of border and opening communities. (Time and Duration) 2 years. (Type of Research) Original research. (Methodology) Six borders formed by ungrazed woodlands with a pasture or grass field were studied. Milacre plots were used for lesser vegetation and 2-milacre plots for trees; 23 of each size were placed about 1 chain apart. Cover was estimated in four density classes in milacre plots; number of tree species was tallied in the 2-milacre plots by three size classes. A similar analysis was made in woodland interiors. (Results and Conclusions) The structure and composition of borders was extremely variable. Fifty-nine plant species were listed in borders with lower strata covering an average of 40% of the border sample area. All borders were completely covered by tree crowns. A narrow Rubus-Solidago community developed between trees and fields. Elder, Rubus, or grape communities developed in large forest openings after a herb-shrub community as initial cover. The total number of plant species and amount of cover were slightly greater in borders and openings than the interiors. Openings closed in 4-20 years depending on their size.

1759
Breeding birds of the forest edge in Illinois.
AUTHOR: JOHNSTON VR
AUTHOR AFFILIATION: Univ of IL.
SOURCE TITLE: The Condor
SOURCE ID: 49(2):45-53, 1947.
YEAR PUBLISHED: 1947
CATEGORY: C4
REGION: Oak-Hickory-Bluestem Parkland STATE: Iowa; Illinois; Kansas; Missouri
KEYWORDS: birds; edge; forest
ABSTRACT: (Purpose) To describe the avifauna of the forest edge to determine if it constituted a distinct unit and to analyze avian responses to edge habitat. (Time and Duration) 1943; 1 year. (Methodology) Bird count surveys were made in the morning on edges and in the interior of woods which had been marked off in squares, 50m per side. The woods was a mesophytic hardwood forest. Edges varied from shrubby to grass-weeds. Comparison was made with a beech-maple forest interior. (Results and Conclusions) Fourteen bird species occurred primarily along the forest edges and 10 species in the forest interior. Four species were found in both habitats. The forest edge was found to be a distinct community inhabited by a characteristic set of species. The field sparrow was classed as a typical forest edge bird. The male ruby-throated hummingbird belonged to the forest edge while the female to the interior. The crested flycatcher, wood pewee, indigo bunting, and house wren were found in both habitats.

1760
Effect of land use practices on breeding bird populations in Ohio.
AUTHOR: DAMBACH CA; GOOD EE
AUTHOR AFFILIATION: OH State Univ.
SOURCE TITLE: Journal of Wildlife Management
SOURCE ID: 7(3): 291-297, 1943.
YEAR PUBLISHED: 1943
CATEGORY: C4
REGION: Mixed Mesophytic Forest STATE: United States
KEYWORDS: birds; impact; land use; population
ABSTRACT: (Purpose) To study the effects of land use practices recommended by the Soil Conservation Service upon breeding bird population. (Time and Duration) 1937-1942; 5 years. (Type of Research) Original. (Methodology) Breeding bird populations were determined by counting singing males. The number of breeding birds were determined for the following farm land uses: (1) cropland; corn, small grain, and meadow in strips and not stripped. (2) pasture; (3) woodland, grazed or protected. The change in the number of acres in each land use after implementation of SCS farm plans was determined. From this information the effect on bird populations was determined. (Results and Conclusions) Data from two farming areas in Ohio showed conclusively that application of SCS recommended land use practices increased breeding bird populations. The most important factors were: (1) fewer acres clean-tilled and in small grains and an increase in the acreage with permanent vegetation; (2) more acres in meadow; (3) breaking large crop fields into narrow alternating strips of different crops; (4) increased acreage of managed pastures; (5) material increase in acreage of protected woodlands.

1761
Wildlife increased by erosion control practices.
AUTHOR: BOND RM; HAWBECKER AC
AUTHOR AFFILIATION: Soil Conservation Service.
SOURCE TITLE: Soil Conservation
SOURCE ID: 7:255-256, 1942.
YEAR PUBLISHED: 1942
CATEGORY: C4
REGION: California Chaparral STATE: California
KEYWORDS: erosion; wildlife
ABSTRACT: (Purpose) To describe a successful planting for erosion control and wildlife. (Type of Research) Observational. (Results and Conclusions) Trees and shrubs were planted on an eroding field and later a water supply was added. Quail and many other birds prospered on the area.

1762
A small mammal community in the upper Sonoran Desert.
AUTHOR: SPENCER DA
AUTHOR AFFILIATION: US Fish and Wildlife Service.
SOURCE TITLE: Ecology.
SOURCE ID: 22(4):421-425, 1941.
YEAR PUBLISHED: 1941
CATEGORY: C4
REGION: American Desert (Mojave-Colorado-Sonoran) STATE: Arizona
KEYWORDS: desert; habitat; mammals, small
ABSTRACT: (Purpose) To obtain information on normal movement and drift of small rodents. (Time and Duration) 1935-1936; 1 year. (Methodology) Resident small mammals were removed from 5-acre quadrats by trapping. Drift into the area was taken at 2 week intervals. Cactus dominated the quadrat along with desert hackberry shrub, mesquites, annual grasses and forbs. (Results and Conclusions) White-throated wood rats were most common and were associated with cactus. Merriam's kangaroo rats, which fed on seeds, were second in abundance. Two species of ground squirrels were third followed by three pocket mice species. Fifteen other small mammals were recorded along with such predators as skunks, desert fox, Texas badger, and coyote.

1763
A trap-removal census study of small mammals.
AUTHOR: CAHALANE VH
AUTHOR AFFILIATION: US Fish and Wildlife Service.
SOURCE TITLE: Journal of Wildlife Management.
SOURCE ID: 5(1):42-67, 1941.
YEAR PUBLISHED: 1941
CATEGORY: C4
REGION: Upper Gila Mountains Forest STATE: Arizona; New Mexico
KEYWORDS: census; habitat; mammals, small
ABSTRACT: (Purpose) To determine small mammal populations in various habitats and to evoke a census method. (Time and Duration) 1932-1933; 2 years. (Type of Research) Original research. (Methodology) A trapping-removal study. (Results and Conclusions) Four species (chipmunk, pocket gopher, mouse, and rabbit) were trapped in the yellow pine community, four in the oak community and eight in mesquitegrass. Many species used several habitats.

1764
The farm fence in wildlife management and erosion control.
AUTHOR: EDMINSTER FC
AUTHOR AFFILIATION: Soil Conservation Service.
SOURCE TITLE: Transactions, Third North American Wildlife Conference
SOURCE ID: 3:582-591.
YEAR PUBLISHED: 1938
CATEGORY: C4
REGION: Applicable to entire United States STATE: United States
KEYWORDS: erosion, soil; habitat; restoration; vegetation; wildlife
ABSTRACT: (Purpose) To discuss the use of fence ROW vegetation for wildlife management and erosion control (Type of Research) Original research, but the results are not based on one study (Results and Conclusions) Farm lands generally lack adequate permanent wildlife shelter, and fencerow vegetation offers very good opportunity for improvement. Systems of overgrown fencerows will raise the wildlife carrying capacity. Artificial planting of fencerows insures good species composition. Overgrown fences benefit crops, aid in soil and water convervation.

1764

D - Environmental Assessment Methodologies

1765
The relationship of terrestrial vertebrates to plant communities and their successional stages. (Draft))
AUTHOR: MASER C; MILLER R; THOMAS JW
AUTHOR AFFILIATION: US Forest Serivce Bureau of Land Management.
SOURCE TITLE: Forest-wildlife relationships in the Blue Mountains of Washington and Oregon.
SOURCE ID: Portland, OR, US Forest Service, Pacific Northwest Forest and Range experiment Station.
YEAR PUBLISHED: 1977
CATEGORY: D
SPONSOR: Wildlife Management Institute.; OR Dept of Fish and Wildlife.; US Forest Service.; Bureau of Land Management.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: habitat; management; matrix; succession; wildlife
ABSTRACT: (Purpose) To develop a more effective tool for land-use planning in meeting environmental changes. (Methodology) A project was undertaken by land managers from several government agencies to develop a more effective tool for land-use planning in meeting environmental changes. Wildlife-habitat association models were developed, and 379 wildlife species in the Blue Mountains were reduced to 16 "life forms." Animals were related to plants by behavior and by the stage of vegetation development; the direction of change was estimated. The information system derived is best suited for use in broad-scale land-use planning; it does not replace the trained, experienced biologist.

1766
Rapid survey guide for forest wildlife habitat improvement.
AUTHOR: HASSINGER JD; PUGLISI MJ
AUTHOR AFFILIATION: PA Dept of Natural Resources.
SOURCE TITLE: Journal of Forestry.
SOURCE ID: Pages 585-586, 1977 (September).
YEAR PUBLISHED: 1977
CATEGORY: D
REGION: Applicable to entire United States
KEYWORDS: evaluation; forest; habitat; wildlife
ABSTRACT: (Purpose) To describe a rapid survey method of integrating wildlife habitat improvement into forest management. (Type of Research) Descriptive paper. (Results and Conclusions) A guide has been developed which includes: 1) a listing of vegetation types, and 2) an acreage dot grid. Aerial photos are used to describe habitat components and their acreage within circles on the grid: 50 acres for herbaceous openings, 100 acres for evergreen cover, and 250 acres for woodland habitats.

1767
Keynote address - environmental considerations in rights-of-way management.
AUTHOR: SMITH PF
AUTHOR AFFILIATION: US Env. Protection Agency, Office of Federal Activities.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-way Management. January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 7-11 p.
YEAR PUBLISHED: 1976
CATEGORY: D
REGION: Applicable to entire United States STATE: United States
KEYWORDS: environment; management; right-of-way
ABSTRACT: (Purpose) Implications of the NEPA to ROW selection and management are discussed. (Results and Conclusions) NEPA regulations apply only to federal agencies and have created the environmental impact statement which must be prepared on major actions having significant effect on human environment. Emphasis is placed on the critical importance of ROW location, design, and construction on later environmental effects of ROW management. Several important documents which affect ROW issues have been developed, namely, "Natural Forest Landscape Management:(Chapter 2) Utilities" by the USDA; and documents by the USDI and the Federal Power Commission.

1768
The regulatory process as a means of resolving the environmental impacts of utility facilities.
AUTHOR: BURGGRAF FB
AUTHOR AFFILIATION: NY Public Service Com.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management. January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 15-21 p.
YEAR PUBLISHED: 1976
CATEGORY: D
REGION: Applicable to entire United States STATE: United States
KEYWORDS: environment; impact; right-of-way; route selection methodology
ABSTRACT: (Purpose) A general account is given of the workings of the regulatory process required by Article VII of the NY State Public Service Law of 1970. (Results and Conclusions) This law calls for review and approval of construction certificates by the NY Public Service Commission (PSC) with an in-house staff of experts to carry out technical phases of the program. The Commission can override local government which otherwise could block orderly development of transmission facilities. Public hearings are held, however, with the PSC staff acting as adversaries to the utility. Application requires that five categories be examined; biological, cultural, land use, aesthetics, and noise. The law also calls for utilities to furnish more precise maps and plans after a corridor has been approved, and the PSC staff inspects construction as it proceeds. State court has upheld the PSC in several test cases. While computer use in routing is considered useful, it is not in itself adequate; the human factor must be considered.

1769
Considerations in evaluating utility line proposals.
AUTHOR: SMITH ET
AUTHOR AFFILIATION: US Dept of Interior.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Right-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State UNiv, 1976, 23-33 p.
YEAR PUBLISHED: 1976
CATEGORY: D
REGION: Applicable to entire United States STATE: United States
KEYWORDS: environment; management; right-of-way; route selection methodology
ABSTRACT: (Purpose) A utility corridor study is discussed as a part of the National Resource and land Investigations (RALI) Program of the USDI. (Results and Conclusions) Planning involves a two-phase evaluation process: route certification and the ROW development and management plan approval. This evaluation includes a pre-proposal review, a technical review, an environmental review, and an environmental statement (EIS) preparation, and may take more than a year to complete. Public meetings for review of expected impacts are usually held after a formal proposal has been submitted. If an EIS is required, this must be prepared in detail and circulated to interested groups and agencies. Then, should major revisions be required, the entire review process may be repeated. Moreover, when approval is finally granted, mitigating measures are often attached which establish conditions under which the ROW has been authorized.

1770
Environmental selection of transmission line routes with maps and computers.
AUTHOR: HOWLETT B
AUTHOR AFFILIATION: Bhi Env Consultants.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management. January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 35-41 p.
YEAR PUBLISHED: 1976
CATEGORY: D
REGION: Applicable to entire United States STATE: United States
KEYWORDS: environment; impact; right-of-way; route selection methodology
ABSTRACT: (Purpose) A discussion of how a transmission line siting process has been developed as a technical method for selecting low environmental impact routes. (Results and Conclusions) The process involves five steps: selection of study area and features to be inventoried, inventory of data, selection of alternate routes, evaluation of impacts of each route, and selection of a preferred route. Use of a computer was recommended for evaluation rather than for selection of routes. Shaded overlays on USGS quadrangle sheets were used for route selection using density shading for weighting data. A computer program has been developed to evaluate data by subparts (links) to select lowest cost/least impact routes. A minimum impact route is thus selected for re-examination on USGS sheets, aerial photos, or in the field.

1771
Power: a high voltage transmission corridor location system.
AUTHOR: GILES RH; JONES AB; SMART CW
AUTHOR AFFILIATION: VA Polytechnic Institute.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 43-47 p.
YEAR PUBLISHED: 1976
CATEGORY: D
REGION: Applicable to entire United States STATE: United States
KEYWORDS: environment; impact; right-of-way; route selection methodology
ABSTRACT: (Purpose) To describe a computer-based system called "Power", developed for corridor selection in power line routing. (Results and Conclusions) The system involves the use of 27-acre cells, 12 resource areas which may be weighted, and 42 critical characteristics for

selecting a preferred corridor in a large polygonal area of about 80 USGS quadrangle sheets.

1772
Land use aspects of EHV transmission lines.
AUTHOR: PANGBURN GC; WALQUIST BT
AUTHOR AFFILIATION: Westinghouse Electric Corp, Env Systems Dept.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 49-56 p.
YEAR PUBLISHED: 1976
CATEGORY: D
REGION: Applicable to entire United States STATE: United States
KEYWORDS: land use; right-of-way; route selection methodology
ABSTRACT: (Purpose) A general description of EHV transmission lines in relation to land use. (Results and Conclusions) Spatial impacts include both direct affects on the ROW and those outside the ROW, such as residential land use. Temporal impacts of line construction are usually greater than permanent impacts. Route selection involves three basic methods: quantitative, qualitative, and graphic. Aerial photos and topo maps are the common interpretive sources to secure basic data and analysis of land use for incompatible land uses as a first phase. A second phase deals with compatible uses. Impact may be reduced by utilization of parallel routes and upgrading of low voltage routes. Localized conflicts usually must also be considered and multiple-use helps mitigate use impacts of local interest.

1773
The transmission line aesthetic impact evaluation process and its implementation in a comprehensive scheme.
AUTHOR: ROSEMARIN CS; WILSON DL
AUTHOR AFFILIATION: Oak Ridge Nat Lab.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 57-68 p.
YEAR PUBLISHED: 1976
CATEGORY: D
REGION: Applicable to entire United States STATE: United States
KEYWORDS: aesthetics; impact; right-of-way; route selection methodology
ABSTRACT: (Purpose) A description of how hypothetical transmission lines were routed in east Tennessee to devise a computerized method (TLAIE) for evaluation of aesthetic impacts of selected transmission corridors and routes. (Results and Conclusions) 40-acre cells were weighted to produce plotted displays of cell weight, aesthetic variables, and total score to indicate areas of worst impact. Political feasibility and ecological impacts were also analyzed by the system; and multiple-use capabilities and modifications were added.

1774
Computer interpretation of soil data for rights-of-way management.
AUTHOR: BEEMAN LE; ROWLAND EB; SMART CW
AUTHOR AFFILIATION: TN Valley Authority.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 69-75 p.
YEAR PUBLISHED: 1976
CATEGORY: D
REGION: Applicable to entire United States STATE: United States
KEYWORDS: computer; management; right-of-way; soils
ABSTRACT: (Purpose) A description of how county soil surveys with their soil maps and detailed information are used as basic ecological data for planning vegetation management on ROWs. (Results and Conclusions) While analyses can be made manually with maps and overlays, computer technology can greatly contribute to efficiency of interpretations where a number of maps are needed. Digitizing data calls for subdivision of the analysis area into cells each with a predominant soil type. This is relatively expensive but, once digitized, a computer can be used to efficiently generate a wide range of interpretive maps. This process serves to focus attention on sites of special management concerns and must be used in conjunction with careful field work.

1775
An ecological methodology used in the selection of a 500 kV transmission line route in the southwestern United States.
AUTHOR: ASTOR PH; MALEFYT JJD; MALEFYT SD
AUTHOR AFFILIATION: Envirosphere Co.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 77-87 p.
YEAR PUBLISHED: 1976
CATEGORY: D
REGION: Applicable to entire United States STATE: United States
KEYWORDS: ecology; right-of-way; route selection methodology
ABSTRACT: (Purpose) A description of methodology developed in Arizona to route a 500 kV line. (Results and Conclusions) The method was based on (1) biotic communities and (2) geographic range of human interest animals. Community alteration values based on "years to recovery" for each community were combined with six community characteristics to assign community impact levels. The characteristics were: area, revegetation potential, plant diversity, vertebrate support, habitat for protected species, and stability. Habitat evaluation for wildlife of human interest was then combined with biotic community impact. The distribution of the two sets of ecological impact along the corridor were used in conjunction with geology/hydrology, human environment, and aesthetics in selecting a preferred route.

1776
Environmental planning of overhead transmission lines: a New England example.
AUTHOR: JUDD P; RIETSEMA AV
AUTHOR AFFILIATION: Northeast Utilities Service Co.
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: Mississippi State, MS, MS State Univ, 1976, 89-105 p.
YEAR PUBLISHED: 1976
CATEGORY: D
REGION: Applicable to entire United States STATE: United States
KEYWORDS: environment; planning; right-of-way; selection
ABSTRACT: (Purpose) Description of an environmental planning procedure for transmission lines in Connecticut which was made necessary by failure of open planning and resultant creation of a Power Facility Evaluation Council. (Results and Conclusions) Application for a transmission line must describe its effect on the environment and ecology, including the nature of the probable impacts. To meet this, a working outline and flow chart have been developed for environmental analysis which include effects on "natural systems" in addition to land use and visual effects. The procedure emphasizes field work, and includes diagrams, photos and maps to clearly depict the situation on a proposed transmission line. Economics and engineering are still the main basis for routing and structure design; environmental decisions are judged on whether the benefits are worth the additional cost.

1777
Land suitability pattern for electrical transmission lines on national forests and grasslands in northern Idaho, Montana,North Dakota, and western South Dakota.
AUTHOR: HAGAN TP; MUTCH FK; REINSEL EN
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Missoula, MT,US Forest Service/Northern Region, 1976, 75 p.
YEAR PUBLISHED: 1976
CATEGORY: D
REPORT NUMBER: R17621
REGION: Columbia Forest (Dry Summer) STATE: Idaho; Montana; North Dakota; South Dakota
KEYWORDS: forest; planning; right-of-way
ABSTRACT: (Purpose) To describe overhead electric transmission line planning through development of a land suitability pattern. (Type of Research) Discussion. (Results and Conclusions) Units or areas of land are mapped and rated for transmission lines. To do this, a physical inventory is combined with environmental elements and assessed to identify patterns of suitable areas and provide a ready data base for processing application. Descriptions are given of major construction activities which must be considered. The land system inventory integrates physiography, geology, climate, and soils with landforms and vegetation to produce mapping levels following a system proposed by Bailey which is based on climate and physiography. The suitability map should be used only for long range planning owing to its small scale. The map must be combined with other environmental, social, economic, and engineering elements for planning. Narrative and tables are presented which indicate general suitability of mapping units for transmission lines.

1778
Measurement techniques in environmental impact assessment.
AUTHOR: FLOWERDEW RTN; SKUTSCH MM
AUTHOR AFFILIATION: Univ Dar es Salaam.; Univ of Manchester.
SOURCE TITLE: Environmental Conservation
SOURCE ID: 3(3):209-217, 1976.
YEAR PUBLISHED: 1976
CATEGORY: D
REGION: Applicable to entire United States
KEYWORDS: environment; impact
ABSTRACT: (Purpose) To review a few well-known techniques used in environmental assessment and bring out the inherent difficulties and potential of each. (Type of Research) Discussion paper. (Results and Conclusions) Techniques are grouped into 3 classes: impact identification, impact evaluation, and impact comparison. For impact identification, linear

1778

graphs and matrix systems are discussed as representative techniques. In making impact evaluation, the often-used numerical scales should only be regarded as relative rankings which can be helpful to the decision maker. Impact comparisons involve a further step, the combining of impacts to obtain an overall score for each alternative. An overlay map technique using color intensities to depict levels has some weaknesses. A double matrix system also has problems. The Battelle method which categorizes the parameters of the environment is discussed. None of these techniques remove the need for ultimate value judgments.

1779

Environmental evaluations using birds and their habitats.

AUTHOR: GRABER JW; GRABER RR
AUTHOR AFFILIATION: IL Natural History Survey.
SOURCE ID: Urbana, IL, IL Natural History Survey, 1976, Biological Notes 97, 39 p.
YEAR PUBLISHED: 1976
CATEGORY: D
REGION: Applicable to entire United States
KEYWORDS: birds; environment; evaluation; habitat
ABSTRACT: (Purpose) To describe a method of environmental evaluation based on breeding bird populations and their gross habitats. (Type of Research) Descriptive paper. (Results and Conclusions) Habitat evaluation is based on: 1) replacement, 2) total area of habitat in the region, 3) change in habitat, 4) amount of habitat in the impact area, and 5) fauna and/or floral complexity. A Habitat Evaluation Index and Faunal or Floral Index is computed. If data is not available, a field estimate of the number of breeding bird species in each gross habitat is made.

1780

Evaluating stream trout habitat on large-scale aerial color photographs.

AUTHOR: ALDRICH RC; GREENTREE WJ
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Berkeley, CA, US Forest Service, 1976, Research Paper PSW-123, 21 p.
YEAR PUBLISHED: 1976
CATEGORY: D
REGION: California Chaparral STATE: California
KEYWORDS: evaluation; fish; habitat
ABSTRACT: (Purpose) To describe a method of using aerial color photography for evaluating trout stream habitat. (Type of Research) Method description. (Results and Conclusions) Most characteristics of trout streams are visible on photos and can be described. Measurements can be made for estimates of average size of the stream bottom aggregates, depth of water, streambank heights, and heights of streambank vegetation. Degree of shade can be evaluated with shadow lengths. Habitats supporting trout stream insects can be evaluated using photos as a base for field checks.

1781

The evaluation of ecological resources in the countryside for conservation purposes.

AUTHOR: GOLDSMITH FB
AUTHOR AFFILIATION: Univ College, London.
SOURCE TITLE: Biological Conservation
SOURCE ID: 8:89-96, 1975.
YEAR PUBLISHED: 1975
CATEGORY: D
REGION: Applicable to entire United States
KEYWORDS: ecology; evaluation; habitat
ABSTRACT: (Purpose) To present an account of one method of ecological evaluation. (Type of Research) Discussion paper. (Results and Conclusions) At present there is no agreement as to what procedure should be adopted. A case study is described which includes 3 land systems, 6 major habitats, and 4 parameters for each habitat. A formula is given for calculating an index of ecological values which simply multiplies the parameters together for each habitat type and sums the total for each kilometer square.

1782

Resource and land investigations (RALI) program: considerations in evaluating utility line proposals.

AUTHOR: HOLBERGER R; LUBORE S; MORROW L
AUTHOR AFFILIATION: Mitre Corp.
SOURCE ID: McLean, VA, Mitre Corp, 1975, MTR6948 (NTIS PB248261), 347 p.
YEAR PUBLISHED: 1975
CATEGORY: D
REGION: Applicable to entire United States STATE: United States
KEYWORDS: evaluation; impact; rights-of-way
ABSTRACT: (Purpose) To review material required to evaluate proposed utility lines and assess their environmental impact. (Type of Research) Literature review. (Results and Conclusions) Ecologic systems and ecosystems are described and stability sensitivity discussed. Vulnerable species and endangered species are considered highly important in assessment. Possible impacts and mitigation are reviewed.

1783

Impact of transmission lines.

AUTHOR: HEKLER K; MEIER P
AUTHOR AFFILIATION: Berkshire Regional Planning Com.; Curran Associates, Inc.
SOURCE TITLE: Evaluation of Power Facilities: A Reviewer's Handbook.
SOURCE ID: Pittsfield, MA, Berkshire County Regional Planning Com, 1974, 97-110 pp.
YEAR PUBLISHED: 1974
CATEGORY: D
REGION: Northern Hardwoods Forest STATE: United States
KEYWORDS: impact; right-of-way
ABSTRACT: (Purpose) To describe the physical, biological and visual impacts of transmission facilities. (Type of Research) Discussion. (Results and Conclusions). Soil erosion is considered the major impact of line construction. The best safeguards are rigorous construction specifications, an example of which is given. Brush burning is described as a cause of air pollution. And interference with TV and radio is a reason given to avoid residential areas. Clearcutting is said to create a meadow. Windthrow, erosion and death of border trees are also results of clearcutting. Selective cutting is much more expensive but has less impact. Impact on wildlife can be improved by planting cedar, etc, and possible electrocution of bald eagles is considered an important problem. Erosion is included as a possible serious impact on aquatic wildlife. Illustrations are given of methods to reduce impact on landscape quality. Other impacts considered briefly are public safety, aviation, property ownership, water supply systems, range and forest management, and underground transmission lines.

1784

Environmental impacts associated with electric transmission lines.

AUTHOR: KITCHINGS JT; SHUGART HH; STORY JD
AUTHOR AFFILIATION: Oak Ridge Nat Lab.
SOURCE ID: Springfield, VA, Nat Technical Information Service, 1974, ORNL-TM-4498, 100 p.
YEAR PUBLISHED: 1974
CATEGORY: D
REPORT NUMBER: ORNLTM4498
REGION: Applicable to entire United States STATE: United States
KEYWORDS: environment; impact; right-of-way
ABSTRACT: (Purpose) To discuss environmental impacts of electric transmission lines. (Type of Research) Discussion from literature. (Results and Conclusions) A general description is given of considerations involved in route selection, mainly habitat modification and aesthetics. Possible construction and maintenance impacts are described which may be caused by erosion and exposure of streams following clearcutting; by habitat alteration in clearcut or selective cut strips; and by use of herbicides. Some other associated impacts considered were insecticides and ozone production. A matrix is presented which allows comparison of the unaltered system with the system as influenced by a transmission line. This can by used to quantify alternate routes and/or management techniques. Judgement values must be assigned to factual data in the matrix.

1785

Resource and land investigations (RALI) program: methodologies for environmental analysis. Volume 1: environmental assessment.

AUTHOR: BENNINGTON G; LUBORE S; PFEFFER J
AUTHOR AFFILIATION: Mitre Corp.
SOURCE ID: McLean, VA, Mitre Corp, 1974, MTR6740 (NTISPB244600), 159 p.
YEAR PUBLISHED: 1974
CATEGORY: D
REGION: Applicable to entire United States
KEYWORDS: assessment; environment; methods
ABSTRACT: (Purpose) To address methodologies for performing environmental assessments. (Type of Research) Review paper. (Results and Conclusions) A comprehensive review of methodologies for performing environmental assessments.

1786
General environmental guidelines for evaluating and reporting the effects of nuclear power plant site preparation, plant and transmission facilities construction.
AUTHOR: EMERSON DB; HOPKINS HT; SQUIRE GR
AUTHOR AFFILIATION: Hittman Associates, Inc.
SOURCE ID: Washington, DC, Atomic Industrial Forum, 1974, 48p.
YEAR PUBLISHED: 1974
CATEGORY: D
REGION: Applicable to entire United States
KEYWORDS: construction; environment; evaluation; right-of-way
ABSTRACT: (Purpose) To provide a guide for complying with AEC regulations. (Type of Research) Manual. (Results and Conclusions) Activities associated with transmission lines which are to be included in an impact statement are described. The impacts of these activities, including mitigating measures, are delineated.

1787
Environmental impact analysis for overhead transmission lines.
AUTHOR: SCHAAL HR
AUTHOR AFFILIATION: Eckbo, Dean, Austin and Williams.
YEAR PUBLISHED: 1973
CATEGORY: D
REGION: Applicable to entire United States STATE: United States
KEYWORDS: environment; environmental impact; impact; right-of-way; statement
ABSTRACT: (Purpose) To describe a method for evaluating the impact of transmission line location and construction. (Type of Research) Original research. (Methodology) Describes a method and format for environmental impact analysis for overhead transmission lines as developed by EDAW in the course of preparing an environmental impact statement for Pacific Gas and Electric Company. (Results and Conclusions) The approach described in this paper is solid and provides strong organization. Discussion of some specific environmental factors is included.

1788
Environmental factors in siting of transmission facilities.
AUTHOR: BARTHOLD LO; PUNTEL WR; RINGLEE RJ
AUTHOR AFFILIATION: Power Technologies Inc.
SOURCE TITLE: American Power Conference, April 19, 1972.
SOURCE ID: 15 p.
YEAR PUBLISHED: 1972
CATEGORY: D
REGION: Applicable to entire United States STATE: United States
KEYWORDS: environment, environmental assessment; planning; right-of-way
ABSTRACT: (Purpose) To discuss the need for incorporating environmental concerns into planning mechanisms. (Results and Conclusions) It is very important that there is development of functionally equivalent alternatives when dealing with any environmentally sensitive solution. This is important in terms of winning public confidence and support of the implementation stage.

1789
Design of an environmental evaluation system.
AUTHOR: WHITMAN IL
AUTHOR AFFILIATION: Battelle Columbus Lab.
SOURCE ID: Nat Technical Information Service, 1971, PB201743, 61 p.
YEAR PUBLISHED: 1971
CATEGORY: D; F
REPORT NUMBER: PB201753
CONTRACT NUMBER: 1406D7005
REGION: Applicable to entire United States STATE: United States
KEYWORDS: design; environment; environmental impact statement; water resources
ABSTRACT: (Purpose) To develop procedure for the evaluation of environmental impacts of water resources development projects. (Done for the Bureau of Reclamation.) (Methodology) A five-man research team developed this environmental evaluation system. These were ten different activities that the research team performed in designing this system, such as an extensive literature review, field inspection of existing projects, and so on. (Results and Conclusions) In-depth discussion on evaluating water resources development projects and the different parameters that need to be considered. This system, however, requires more information than is normally collected.

1790
Overhead transmission lines.
AUTHOR: MULCAHY JV
AUTHOR AFFILIATION: US Dept Interior.
SOURCE TITLE: Right-of-Way
SOURCE ID: Pages 7-16, 1959 (April).
YEAR PUBLISHED: 1959
CATEGORY: D
REGION: Applicable to entire United States
KEYWORDS: acquisition; appraisal; easement
ABSTRACT: (Purpose) To discuss various problems connected with acquisition of overhead transmission right-of-way. (Type of Research) A discussion paper. (Results and Conclusions) The nature of ROW easements and their appraisals are described. Timber appraisal comments advise against use of future growth or income per acre estimates.

1791
Avian mortality from wire collisions.
AUTHOR: ALLARD GE; MCKENNA MG
AUTHOR AFFILIATION: University of North Dakota
SOURCE TITLE: North Dakota Outdoors.
SOURCE ID: Pages 16-18, 1977
YEAR PUBLISHED: 1977
CATEGORY: B2e; D
REGION: Wheatgrass - needlegrass STATE: North Dakota
KEYWORDS: bird kills; structure design
ABSTRACT: (Purpose) To sample a section of highway bordered by a transmission line for dead birds and try to determine cause of mortality and possible solutions to the problem. (Time and Duration) Summer 1976. (Type of Research) Original field research. (Methodology) Eleven sampling days during summer of 1976 consisted of driving a North Dakota highway paralleled by a transmission line and running between two lakes. All dead birds were counted and identified. Results were presented. (Results and Conclusions) A total of 244 dead birds were found on the highway only. All the birds were waterfowl or marsh birds. Highest numbers were coots (83) and cormorants (52). The total number of mortalities was considered low due the fact that no search was conducted for dead birds off the highway. It was implied most mortality was due to collisions with the wires. Suggestions were made calling for adequate environmental studies before construction of lines.

1792
Silvicultural chemicals and protection of water quality.
AUTHOR: NEWTON M
AUTHOR AFFILIATION: OR State Univ.
SOURCE ID: Seattle, WA, US Env Protection Agency, 1977, EPA910977036 224 p.
YEAR PUBLISHED: 1977
CATEGORY: A1b; B1; D
REPORT NUMBER: EPA910977036
SPONSOR: Env. Protection Agency.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: animals; application methods; aquatic; fish, toxicity to; herbicides; pesticides; toxicity; water
ABSTRACT: (Purpose) The purpose of this report is to complete a three part documentation of the state-of-the art technology to minimize or prevent non-point sources of pollution from silvicultural activities. The two preceding documents deal with (1) the logging roads and protection of water quality and (2) forest harvest, residue treatments, water quality, etc. (Time and Duration) Approximately 250 references. (Type of Research) Literature review and syntnesis. (Results and Conclusions) Chapters 2, 3, and 5 describe the scope of chemical usage in forestry; chapter 4 summarizes the toxicological properties of the major forest chemicals. Specific water quality criteria are established with respect to the toxic properties of specified chemicals. Chapter 6 provides guidelines which forest managers can use nationwide to meet the specified water quality standards. A glossary and an appendix are provided to assist in interpretation of technical material.

1793
Liability and resource conservation aspects of rights-of-way use.
AUTHOR: SHELTON LR
AUTHOR AFFILIATION: Mississippi State University
SOURCE TITLE: Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management, January 6-8, 1976.
SOURCE ID: MS State University, 1976, 315-320 p.
YEAR PUBLISHED: 1976
CATEGORY: A5G; D
REGION: Southern Floodplain Forest STATE: US
KEYWORDS: management, right-of-way
ABSTRACT: (Purpose) A discussion paper concerning the effect of liability upon wildlife conservation of utility ROWs in the southeast. (Type of Research) Discussion paper. (Results and Conclusions) The duty of care owed the ROW user partly depends on his classification, whether trespasser, licensee or invitee. Liability may be reduced by several actions such as informing recreationists of all known hazardous conditions and inserting a "hold harmless" clause in a lease. Reduction of the possibility of liability suits will greatly aid in wise use of the wildlife resource.

1794

Harmonize overhead lines with landscape.
AUTHOR: WILLARD BE
AUTHOR AFFILIATION: Council on Environmental Quality.
SOURCE TITLE: Electrical World
SOURCE ID: 40-41, 1973 (July 1).
YEAR PUBLISHED: 1973
CATEGORY: D
KEYWORDS: planning; right-of-way
ABSTRACT: (Purpose) To discuss some basic ecological principles and how utilities can learn to apply these principles to their operations. (Results and Conclusions) Some important points were made in the paper concerning ways to minimize impact on the ecosystem, such as trying to locate a line in the transition zone between two ecosystems, where less disturbance is likely, or choosing developing ecosystems over mature, stable ones.

1795

Environmental factors and susceptibility to herbicides.
AUTHOR: HAMMERTON JL
AUTHOR AFFILIATION: University College of Wales
SOURCE TITLE: Weeds
CATEGORY: D
KEYWORDS: environment; herbicides; temperature; toxicity
ABSTRACT: (Purpose) To review the literature on environmentally induced variations in susceptibility, with particular reference to the control of dicotyledonous weeds by growth regulator herbicides in cereal crops. (Time and Duration) Literature review covering research over a 15-year period. (Type of Research) Literature review. (Methodology) The effects of rainfall, humidity, temperature, light, soil conditions, crop effects, and such other factors as stage of growth at time of spraying and wind, are investigated to determine how each affects the control obtained after spraying a growth regulator herbicide on weeds in a cereal crop. Both direct and indirect effects of the environment, and the possible role of the crop in modifying the environment of the weeds, are considered. (Results and Conclusions) High humidities and high temperature in general increase susceptibility, and temperature also may have important morphogenetic effects. Low light intensity before, and high intensity after, spraying appear to increase susceptibility. Light also may affect leaf morphogenesis. Soil conditions also may affect susceptibility, particularly soil residues of certain herbicides, and crop competition may contribute to weed mortality. The relationship of stage and growth at spraying to susceptibility is also discussed.

1796

Evolution of backline and danger tree determination.
AUTHOR: ROBINSON JP
AUTHOR AFFILIATION: Bonneville Power Admin.
SOURCE ID: Portland, OR., Bonneville Power Admin., 16 p.
CATEGORY: A1d; D
REGION: Pacific Forest STATE: Montana; Washington
KEYWORDS: clearance; danger trees
ABSTRACT: (Purpose) To describe the conductor clearance method of backline location and danger tree designation. (Type of Research) Descriptive account. (Results and Conclusions) A tree monitoring system has been computerized to determine the backline and danger trees. This results in a staggered backline and leaving danger trees within the backline area. Less timber is bought and fewer trees are cut. Also an irregular backline is produced.

1797

Evaluation of vegetation in environmental planning.
AUTHOR: MCBRIDE JR
AUTHOR AFFILIATION: University of California, Berkeley.
SOURCE ID: Berkeley, CA., Univ. of CA., 34 p.
CATEGORY: D
KEYWORDS: environmental assessment
ABSTRACT: (Purpose) To describe an approach for evaluation of vegetation in environmental planning. (Type of Research) Descriptive report. (Methodology) Experience and literature. (Results and Conclusions) A vegetation survey should be made to provide complete descriptions which will cover the 19 parameters that have been identified for use in evaluation. Vegetation parameters are grouped under five classes; amenity, human safety, ecological, economic, and scientific. Amenity includes visual quality, recreation potential, noise abatement, air pollution reduction, climate amelioration, and historic value. Human safety includes fire potential and windthrow environmental conditions, erosion control, wildlife habitat, role in regional ecosystem, successional potential, and fragility. Economic includes commodity resources and tax revenues. Scientific includes rare and endangered species, unique vegetation, and genetic composition.

E - Habitat Evaluation Techniques

1798

A handbook for habitat evaluation procedures.
AUTHOR: BASKETT TS; FLOOD BS; SPARROWE RD
AUTHOR AFFILIATION: MO Cooperative Wildlife Research Unit
SOURCE ID: Washington, DC, US Dept of Interior, Fish and Wildlife Service, 68 p.
YEAR PUBLISHED: 1976
CATEGORY: E
CONTRACT NUMBER: USDI141600082014
SPONSOR: US Fish and Wildlife Service; Univ. of MO.
REGION: Oak + Bluestem Parkland STATE: Arkansas; Illinois; Kentucky; Missouri; Tennessee
KEYWORDS: animals, aquatic; birds, game; fish; habitat; mammals; mammals, big game; mammals, small game
ABSTRACT: (Purpose) The development and implementation of a habitat evaluation system for measuring effects of water development projects on fish, wildlife and related resources. (Type of Research) Original research. (Methodology) Six groups of animals are categorized in as many as six habitat types. They are composed principally of animals whose habitat requirements are well known, easily found in literature, and occur in the project area. The six groups of animals are forest game, upland game, tree squirrels, terrestrial furbearers, aquatic furbearers, and waterfowl. (Results and Conslusions) Development of a handbook for evaluation habitat for six different animal groups. For each animal group, food, cover, water reproductive requirements are given as well as others. Samples of evaluation sheets and instructions for using this system are given.

1799

The nature of vegetation: its management and mismanagement.
AUTHOR: EGLER FE
AUTHOR AFFILIATION: Aton Forest
SOURCE ID: Bridgewater, CT, CT Conservation Assoc, 1976, 572 p.
YEAR PUBLISHED: 1976
CATEGORY: E
REGION: Applicable to entire United States STATE: United States
KEYWORDS: ecology; ecosystem; management; plant succession; vegetation; wildlife
ABSTRACT: (Purpose) To provide a text, for interested parties, on the conception of vegetation management. (Time and Duration) Thirty-eight years of teaching, research, and field experience. (Methodology) The author discusses basic principles of vegetation management as they relate to composition, morphology, physiology, ecology, geology, history, and classification. (Results and Conclusions) The author attempts to synthesize and integrate all of the diverse disciplines which must be drawn upon to manage vegetation. A wide variety of topics are discussed generally in a clear, if somewhat non-classical fashion. References are not given in this volume.

1800

A technique for estimating potential wildlife populations through habitat evaluations.
AUTHOR: WILLIS R
AUTHOR AFFILIATION: KY Dept of Fish and Wildlife Resources.
SOURCE ID: Kentucky Dept of Fish and Wildlife Resources, 1975, Pittman-Robertson Game Management Technical Series No. 23, 12 p.
YEAR PUBLISHED: 1975
CATEGORY: E
REGION: Mixed Mesophytic Forest STATE: Kentucky
KEYWORDS: cover; evaluation; food; habitat; hunting; population; wildlife
ABSTRACT: (Purpose) To describe a method of evaluating carrying capacity for deer, gray squirrel and other game animals based on habitat suitability and using a point system to estimate potential wildlife populations. (Time and Duration) Literature survey covers 30 years of references. (Type of Research) Literature survey and personal observations. (Methodology) A point system was developed to enable the researcher to assign different values to the various habitat components and then combine their values into a single measurement. The acre-per-animal figures used were arrived at by reviewing pertinent literature on the species concerned. The figures used are average values derived from past research conducted in areas climatically, topographically and botanically similar to the study area. (Results and Conclusions) The technique for estimating potential wildlife populations is outlined. Habitat is considered excellent for a species when the sum of the numerical values of all its elements is high. Less suitable habitat receives a lower score, reflecting a drop in carrying capacity. Four classes of habitat are used, excellent, good, fair and poor. When all sample units have been rated, the totals are summed and expanded to produce an estimate of the potential resident game populations that the area can support. With modifications to reflect conditions occurring in other regions, this system could apply in most states.

1801
A method of regional landscape evaluation for wildlife.
AUTHOR: HAWES RA; HUDSON RJ
AUTHOR AFFILIATION: Cornell Univ, Dept of Natural Resources; Univ of Alberta.
SOURCE TITLE: Journal of Soil and Water Conservation.
SOURCE ID: 209-211, Sept-Oct 1976.
YEAR PUBLISHED: 1976
CATEGORY: E
SPONSOR: Cooperative Forestry Research Program.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds, game; carrying capacity; classification; ecology; mammals, big game
ABSTRACT: (Purpose) To develop a method of evaluating land for wildlife that facilitates analysis of wildlife resources at a reconnaissance level for land use planning and decision-making. (Time and Duration) 1973 (estimated). (Type of Research) Original research. (Methodology) Classified study area into preliminary land systems - recurring patterns of landforms with associated vegetation and soil. Delineated land systems by air photo interpretation. The land systems and boundaries were field checked at 130 sites where data was collected on bedrock geology, surficial deposits, soil development, texture and drainage, vegetation composition and topography. The land systems provided the baseline information for wildlife suitability interpretations. (Results and Conclusions) The method of land evaluation facilities determining habitat suitabilities for a variety of wildlife species. The suitability ratings assess the degree of effort required for land systems to provide species habitat requirements. The method is versatile. It can be used on different species and is adaptable to other regions. The technique is relatively rapid and inexpensive.

1802
Habitat selection of breeding birds in an east Tennessee deciduous forest.
AUTHOR: ANDERSON SH; SHUGART HH JR
SOURCE TITLE: Ecology.
SOURCE ID: 55(4):828-837, 1974.
YEAR PUBLISHED: 1974
CATEGORY: E
SPONSOR: Oak Ridge Nat Lab, Env Sciences Div.
REGION: Mixed Mesophytic Forest STATE: Tennessee
KEYWORDS: birds; forest; habitat
ABSTRACT: (Purpose) To determine whether 28 species of breeding birds have certain distinct habitat preferences. (Time and Duration) May 30 to July 20, 1972. (Type of Research) Original research. (Methodology) Bird populations were sampled on 24, 0.08 ha plots in a deciduous forest in Tn. Univariate analysis was used to test for differences in abundance for each bird species with respect to 28 habitat variables. (Results and Conslusions) Results indicated some bird species were distributed according to specific habitat variables, while others were not strongly related to any single variable but were related weekly to a large number of variables.

1803
Avian species diversity in desert scrub.
AUTHOR: TOMOFF CS
AUTHOR AFFILIATION: Univ of WA
SOURCE TITLE: Ecology
SOURCE ID: 55(2):396-403, 1974
YEAR PUBLISHED: 1974
CATEGORY: E
SPONSOR: Nat Science Foundation The Society of; Sigma XiX
REGION: American Desert (Mojave-Colorado-Sonoran) STATE: Arizona; California; New Mexico; Texas
KEYWORDS: birds; community structure; habitat
ABSTRACT: (Purpose) To determine what effect habitat diversity has on breeding bird density and diversity in the Sonoran Desert in southern Arizona. (Time and Duration) March 10 - August 31, 1970; 6 months. (Type of Research) Original research. (Methodology) Three study sites were selected to represent a gradient of structural complexity of the vegetation in creosotebush habitats. Breeding bird populations were studied and pertinent information recorded. Each bird species was placed in an ecologic foraging category. For each study site, breeding bird species diversity (BSD), J index, foraging diversity (FD), physiognomic coverage diversity (PCD), equally important physiognomic dimensions (Ep) were calculated. (Results and Conclusions) As habitat complexity increased, nest sites and food niches became more diverse; and breeding bird density increased. Birds are highly specific in their selection of plants for nest placement; densities of most species are strongly related to densities of nest plants. In desert scrub communities the physiognomic coverage diversity, based on a system of plant life forms, was more accurate than MacArthur's foliage-height diversity in predicting breeding bird species diversity.

1804
Evaluation of pheasant nesting habitat in eastern South Dakota.
AUTHOR: TRAUTMAN CG
AUTHOR AFFILIATION: SD Dept of Game, Fish, and Parks.
SOURCE TITLE: Transactions of the North American Wildlife Conference.
SOURCE ID: 25:202-213, 1960.
YEAR PUBLISHED: 1960
CATEGORY: E
SPONSOR: SD Dept of Game, Fish, and Parks.
REGION: Bluestem Prairie STATE: South Dakota
KEYWORDS: birds; habitat
ABSTRACT: (Purpose) To determine the extent of pheasant nesting and brood production in the various cover types common to the eastern portion of South Dakota's high-pheasant density range. (Time and Duration) June 10-August 23, 1958 and 1959 (except for flax, small grain and tame hay which were searched at harvest time). (Type of Research) Original research. (Methodology) In 1958, a township size area was cover mapped using aerial photos as base maps. Five acre corner plots were used in each quarter section with sixteen five acre corner plots. The sample was selected by drawing two letters at random from a 4x4 latin square. In 1959, strip plots of 50x1000 feet with 5 strip plots pet quarter section were selected at random. Plots were intensively sampled for pheasant nests. (Results and Conclusions) Density was 0.84 nests per acre in 1958, 0.91 nests per acre in 1959. Best cover was alfalfa in sloughs and areas around fencerows and roadsides. Hatching success was 20% of all nests in 1958 and 24% of all nests in 1959. 80% of all hens hatched a clutch in 1959. On lands devoted to maximum game production alfalfa and clover should not be mowed; grasslands should not be grazed or should be grazed only lightly, and small grain crops are preferred over row crops for providing nesting cover. Roadways should be unmowed as long as possible during nesting time.

1805
Shrubs and vines for northeastern wildlife.
AUTHOR: GILL JD; HEALY WM
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Upper Darby, PA, Northeastern Forest Experiment Station, 1974, US Forest Service General Technical Report NE9, 180 p.
YEAR PUBLISHED: 1974
CATEGORY: E
REPORT NUMBER: NE9
SPONSOR: US Forest Service Northeastern Forest Exp. Station
REGION: Applicable to entire United States STATE: Kentucky; New York; Pennsylvania; West Virginia
KEYWORDS: birds; fauna; forest; habitat; mammals; management; vegetation
ABSTRACT: (Purpose) To provide practical information about managing shrubs and woody vines of the Northeast that are important food and cover for wild birds and mammals. (Type of Research) Literature review. (Results and Conclusions) Forty different shrubs and vines were discussed by different authors. The range, habitat, life history, use by wildlife, propagation, and management were discussed for each species.

1806
How to Improve Forest Game Habitat.
AUTHOR: BYRD NA; HOLBROOK HL
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Forest Management Bulletin.
SOURCE ID: Atlanta, GA, US Forest Service, State and Private Forestry, SE area, 1974, 6 p.
YEAR PUBLISHED: 1974
CATEGORY: E
REGION: Southeastern Mixed Forest STATE: Alabama; Georgia; Mississippi; North Carolina; South Carolina
KEYWORDS: birds, game; forest; habitat; mammals, big game; mammals, small game; management; prescribed burning; silviculture
ABSTRACT: (Purpose) To provide the practicing forester a ready field reference by stand classes on how to improve or maintain the habit of five popular forest game species. (Type of Research) Literature review. (Methodology) Briefly defines the needs of the gray squirrel, bobwhite quail, white tailed deer, ruffed grouse, and wild turkey. Also lists some of the important food species for each animal. (Results and Conclusions) Gives the timber prescription for wildlife habitat management by stages of stand development.

1807
Forage preferences of tame deer in a northwest Pennsylvania clear-cutting.
AUTHOR: HEALY WM
AUTHOR AFFILIATION: US Forest Service.
SOURCE TITLE: Journal of Wildlife Management
SOURCE ID: 35(4):717-712, 1971.

1807

YEAR PUBLISHED: 1971
CATEGORY: E
SPONSOR: PA Cooperative Wildlife Research Unit.
REGION: Northern Hardwoods Forest STATE: New York; Pennsylvania
KEYWORDS: browse; deer; food
ABSTRACT: (Purpose) To determine deer food preferences in a recently clear-cut area (Time and Duration) 1965; one year. (Type of Research) Original research. (Methodology) Three tame deer—a buck, a doe, and a castrated male—were used. The deer were trained to harness and leash so that they could be closely observed. The deer were observed periodically throughout 1965. Feeding time was recorded by plant species and part (leaf, twig, or fruit). Between observation periods, the deer were kept in pens and fed. (Results and Conclusions) Brambles were the most important food plant year-round. Timber species were also important year-round. Seedlings of black cherry, the most valuable timber species, were lightly used. Deer were always selective when feeding. Preference varied for individual plants of most species. Deer browsing will not prevent regeneration of the timber stand. Cuts should not be smaller than 17 acres.

1808

The influence of mammals and birds in retarding artificial and natural reseeding of coniferous forests in the United States.

AUTHOR: ALDOUS SE; SMITH CF
SOURCE TITLE: Journal of Forestry.
SOURCE ID: 45(5):361-369, 1947.
YEAR PUBLISHED: 1947
CATEGORY: E
SPONSOR: US Fish and Wildlife Service.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: birds; food; forest; mammals, small; regeneration; wildlife
ABSTRACT: (Purpose) To point out the degree and type of pressure exerted by birds and mammals on forest seeds and to describe methods of reducing these losses. (Time and Duration) Mainly from late 1930 to 1947. (Type of Research) Literature review. (Methodology) Review of pertinent literature involving mammal and bird depredation on forest seeds. (Results and Conclusions) Reduction control of animals and repellents tested were unsuccessful. Cultural practices and mechanical protection with wire screens produced best results, but were economically questionable.

1809

Bird population changes after timber harvesting of a mixed conifer forest in Arizona.

AUTHOR: FRANZREB KE
SOURCE ID: Fort Collins, CO, US Forest Service, 1977, Research paper RM-184, 26 p.
CATEGORY: E
KEYWORDS: birds; clearing; forest; impact; populations
ABSTRACT: (Purpose) This study was to determine changes in avian species' composition and densities in a mixed conifer forest after timber harvesting. (Time and Duration) 1973-1974; 2 years. (Type of Research) Original field research. (Methodology) Censusing of birds in one plot subject to timber harvesting (selective overstory removal) and in one control plot was conducted from 1973-1974 in the white mountains of Arizona. Tree species preferences and tree height selection were also examined to determine changes in habitat utilization. (Results and Conclusions) Timber harvesting was detrimental to some species, but beneficial to others. The number of species in the harvested and control areas was similar, but species composition and densities differed considerably. Several species including Coues' Flycatcher, Purple Martin, and Western Bluebird were found only on the harvested site. This site was also preferred by Red-Tailed Hawk, Kestrel, Yellow-Bellied Sapsucker, House Wren and Gray-Headed Junco. In contrast, the control area was preferred by the Western Flycatcher, Brown Creeper, Red-Faced Warbler, Hermit Thrush and a few others. Tall trees were preferred in both habitats. In both areas, Douglas-Fir, White-Fir and Engleman Spruce were preferred. Leaving more trees of the most desirable species can allow a habitat to support more birds of some species than it would if otherwise harvested. Slash piles were very important, especially for Gray-Headed Juncos and, to a lesser extent, House Wrens. To prevent reduction of these species, some slash piles should be allowed to remain after a harvest. Snags were also an important habitat component for many species in the cut-over area.

1810

A Program for Wildlife Management on Transmission Rights-of-Way of the Niagara Mohawk Power Corporation.

AUTHOR: BRAMBLE WC
SOURCE ID: Syracuse, NY, 1976, 14 p.
YEAR PUBLISHED: 1976
CATEGORY: B3; E
REGION: Northern Hardwoods Forest STATE: New York
KEYWORDS: management; wildlife
ABSTRACT: (Purpose) To develop a general program for wildlife management on transmission line right-of-way. (Type of Research) Management plan. (Methodology) From literature and experience. (Results and Conclusions) A general wildlife management plan was prepared to enhance wildlife habitat on transmission line ROWs. Conditions to be developed include diversity of vegetation, a patch-like pattern of plant cover, increased wildlife food, and edges. A basic model ROW is described as varied to fit local conditions, and includes a clear-cut center to be kept in low vegetation with a selective-cut edge on each side. Brush piles will be left for wildlife cover. The ROW center will be maintained by broadcast sprays with selective sprays used on the edges. Restoration will provide for seeding of tower sites with some level areas left for natural revegetation and dusting places. Application of management techniques to common vegetation types is described along with treatment of road and stream crossings. Special management for game and non-game species of the area including songbirds is included.

1811

The harm our roads do to nature and wildlife.

AUTHOR: FENTON MB; OXLEY DJ
AUTHOR AFFILIATION: Vanier College; Carleton Univ.
SOURCE TITLE: Canadian Geographic Journal
SOURCE ID: 92(3):40-45, 1976.
YEAR PUBLISHED: 1976
CATEGORY: B1e; C2; E
REGION: Applicable to entire United States
KEYWORDS: highways; mortality; wildlife
ABSTRACT: (Purpose) To discuss the impact of roads on natural environment. (Type of Research) Discussion paper. (Results and Conclusions) There is a woeful lack of information about effects of roads on the environment. The opinion is given that many wild animals are killed, habitats are disrupted, and chemicals affect wildlife.

1812

The future of Alaska's caribou.

AUTHOR: KEIM CJ; VAN HYNING JM
AUTHOR AFFILIATION: Univ of AK.
SOURCE TITLE: NRA Conservation Yearbook.
SOURCE ID: 4-11, 1975.
YEAR PUBLISHED: 1975
CATEGORY: B1e; B2f; E
REGION: Brooks Range STATE: Alaska
KEYWORDS: habitat; wildlife
ABSTRACT: (Methodology) A description is given of the present condition of the 13 herds of caribou in Alaska. Two of these herds have decreased drastically in recent years. Requirements for a healthy herd and how they can be met in the future are: 1) Large areas, good land use, and comprehensive planning to preserve integrity. Though large blocks of wilderness will be set aside they will not be continuous. 2) Unimpeded movement. (Results and Conclusions) Bands in motion seek relief from insects, go to traditional calving grounds, summer range, breeding areas, and winter range. Even slight alterations are deleterious. Transportation corridors would lessen interference of roads and pipelines. 3) Good winter range, is often a key to survival. Increased human activity increases danger of fire, harassment, and air pollution, which is harmful to lichens used as food. Need to control. 4) No competition with other grazing animals. (Results and Conclusions) Concludes that it is unlikely caribou can be preserved in their present abundance, but possibly smaller herds will persist under good management.

1813

Effect of logging on forage values for deer in Colorado.

AUTHOR: NAGY J; REGELIN WL; WALLMO OC
AUTHOR AFFILIATION: US Forest Service. CO State Univ.
SOURCE TITLE: Journal of Forestry
SOURCE ID: 72(5):282-285, 1974.
YEAR PUBLISHED: 1974
CATEGORY: B1e; E
REGION: Ponderosa Shrub Forest STATE: Colorado
KEYWORDS: clearing; forage value; grazing; habitat; impact; wildlife
ABSTRACT: (Purpose) To determine the influence of logging on the moisture content, crude protein content, and in vitro digestibility of forages eaten by tame deer. (Time and Duration) One-year study (1970). (Type of Research) Original research. (Methodology) Grazing of tame deer was observed during three summer periods—June 26-July 4, August 3-11, and September 14-18. Intake was quantified by counting the number of bites of each species eaten by each deer. Simulated bites were hand-plucked to obtain an average weight per bite. All plant species which comprised more than 1 percent of the total bites were collected for nutritional analysis. Plants were collected on July 5, August 12, and September 15, so that nutrition parameters could be measured throughout the season. (Results and Conclusions)

Crude protein content, moisture content, and in vitro digestibility within a collection date did not differ statistically between clear-cut and in-cut strips. Crude protein and moisture content declined significantly between dates, but in vitro digestibility did not change as the plants matured. Because deer spend more time grazing in clear-cut strips, they obtained over twice as much of their crude protein and digestible dry matter there.

F - Research Procedures

1814

Forests and water: effects of forest management on floods, sedimentation, and water supply.
AUTHOR: ANDERSON HW; HOOVER MD; REINHART KG
AUTHOR AFFILIATION: US Forest Service.
SOURCE ID: Berkeley, CA, US Forest Service, 1976, General Technical Report PSW18, 115 p.
YEAR PUBLISHED: 1976
CATEGORY: A1; A4; B2; F
REPORT NUMBER: PSW18
SPONSOR: US Forest Service.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: clearing; erosion; forest; impact; management; sediment; vegetation; water
ABSTRACT: (Purpose) The purpose of this paper is to capture the accumulated experience and perspective of the literature of four hydrologists representing more than 100 years of experience as active reserach scientists. (Time and Duration) Literature cited is extensive, an estimated 600 citations ranging over more than 40 years. (Type of Research) Literature review and synthesis. (Methodology) The authors draw on more than 100 years of collective experience as research hydrologists, and from a comprehensive review of the literature. They summarize what is known about the effects of current forestry practices on watershed resources. They first review the basic hydrologic processes, then discuss the effects of forest harvesting, regeneration type conversion, fire, grazing, fertilizers and pesticides on water supply, floods, erosion, and water quality. They also present special problems of the fire prone chaparel areas, phreatophytes, wetland forests, and strip mined lands.

1815

Powerline right-of-way.
AUTHOR: LONGCORE JR
AUTHOR AFFILIATION: Patuxent Wildlife Research Center.
SOURCE TITLE: American Birds.
SOURCE ID: 25(6):997-998, 1971.
YEAR PUBLISHED: 1971
CATEGORY: A5b; B1a; F
REGION: Eastern Deciduous Forest STATE: Alabama; Kentucky; Maryland; Pennsylvania; South Carolina
KEYWORDS: birds; density; population; right-of-way; vegetation
ABSTRACT: (Purpose) To determine the species of birds using a right-of-way in Maryland, the density of breeding males on the right-of-way, and what effect maintenance practices had on these populations. (Time and Duration) 1967-1971, 4 years. (Type of Research) Original research. (Methodology) A territorial male census was used to determine density. A nest search was conducted, and a list of birds that visited the right-of-way was recorded. Censuses were conducted before and after maintenance periods to determine the effect of the maintenance techniques on the bird populations. (Results and Conclusions) There was little change in breeding bird species and density after the right-of-way was maintained by cutting and chipping the pines and selectively basal spraying the other tall growing species. One species, the Prairie Warbler, was apparently adversely affected. The removal of Virginia pine, which was used very commonly for a singing perch, might have contributed to the decline in singing males. The densities of territorial males and number of nests found are given.

1816

Tree growth control research project.
AUTHOR: EDISON ELECTRIC INSTITUTE
SOURCE ID: New York, NY, Edison Electric Institute, 1971, EEI Publication No. 71-900, 127 p.
YEAR PUBLISHED: 1971.
CATEGORY: A5b; F
REPORT NUMBER: EE171900
CONTRACT NUMBER: EEIRP24
SPONSOR: Edison Electric Institute.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: growth inhibitor; maintenance; sprouting; trees; trimming
ABSTRACT: (Purpose) To determine the best chemical for reducing growth of sprouts after trees on distribution line areas had been trimmed, and thus to lengthen the time between successive trimming operations. (Time and Duration) Four-year study (1964-1976). (Type of Research) Original research field. (Methodology) Fifteen privately-owned electric utility companies conducted specific experiments, some on mixed species of trees, as encountered in a normal line clearance operation, and others on certain specialized subjects. Specialized experiements involved studies of concentration, effects of treatment as different seasons, and different formulations. Thirteen semi-solid inhibitor-fortified tree dressings and eight liquid inhibitor-fortified dressings were evaluated. Data involved observations on 17,000 cuts distributed among 1,180 trees. (Results and Conclusions) Etnyl 1-naphthaleneacetate if effective in preventing sprout emergence, but is only partially effective in retarding elongation. Length of the tallest sprouts was reduced by 50% or more by the inhibitor is effective in most instances. Time of year applied does not appear to influence it effectiveness on most species. Liquid forulations compare favorably with solid forms. The full potential of the inhibitor is only realized when good pruning practices are followed.

1817

Do herbicides affect game?
AUTHOR: BRAMBLE WC
AUTHOR AFFILIATION: Purdue Univ.
SOURCE TITLE: Pennsylvania Game News.
SOURCE ID: 26-29, 1968 (July).
YEAR PUBLISHED: 1968
CATEGORY: A5b; B1e
SPONSOR: Purdue Univ.
REGION: Oak-Hickory Forest STATE: Kentucky; Tennessee
KEYWORDS: animals, game; community structure; habitat manipulation; herbicides; impact; wildlife; 2,4-D; 2,4,5-T
ABSTRACT: (Purpose) To compare the effects of several common commercial brush control spray techniques and learn their effects on game food and cover. (Time and Duration) 1953 to 1966; 13 years. (Type of Research) Original field plot research. (Methodology) Half mile sections of ROW were sprayed with one of four 2,4-D, 2,4,5-T mixtures; carriers were oil or water; rates ranged from 4 to 12 pounds per acre. Methods beyond this are not explicitly stated, but generalized statements of results suggest that the composition and probably the density of vegetation were tallied periodically. Estimates of browsing and a combination of direct observation, pellet counts, and tracks were used to estimate game usage. (Results and Conclusions) This is a general reporting paper rather than a data paper. This paper reports in popular terms a study which Bramble and Byrnes have reported in substantially greater detail elsewhere. The results in general are: 13 years after application the ROW is clear of heavy woody plants and is receiving heavy and continued usage by game animals; plant species composition is different, with substantial increases in preferred game forage species; browse species are high in protein and other elements; small game animals like rabbit have also increased in the test areas.

1818

Nocturnal migration in Illinois - different points of view.
AUTHOR: GRABER RR
SOURCE TITLE: The Wilson Bulletin
SOURCE ID: 80(1):36-71, 1968.
YEAR PUBLISHED: 1968
CATEGORY: B2E; F
REGION: Oak-Hickory-Bluestem Parkland
KEYWORDS: avifauna; bird kills; birds; birds, song; distribution; ecology; migration; mortality; nocturnal; passerine
ABSTRACT: (Purpose) To evaluate different methods of studying nocturnal migration and to discuss patterns of migration for central Illinois. (Time and Duration) 1957-1963. (Type of Research) Original research and literature review. (Methodology) Direct observations of migration were made by radar and aural methods. Composition of the migrant swarms in the area under study was identified by comparison of species data from bird kills at television towers and from daily field censuses conducted in forest and shrubby forest edge habitat during fall. (Results and Conclusions) Observations of night migration may vary considerably depending on the study technique used. Although there are gross differences in volume measurements of migration, the different techniques (audio system, radar, tower kills) all reflect the same night-to-night periodicity or timing of migration. Mass flights of birds in September occur after a wind shift to northerly with the passage of a cold front. He notes that species densities that migrate in the spring and fall are different and based on this, he proposed that most routes must be elliptical. Migration routes of the Bobolink, Palm Warbler and Nashville Warbler are discussed. A comparison between tower kills in Illinois and Florida suggests a funnel effect at lower latitudes.

1819
Movement of herbicides in soil.
AUTHOR: HARRIS CI
AUTHOR AFFILIATION: US Department of Agriculture
SOURCE TITLE: Weeds.
SOURCE ID: 15:214-216, 1967.
CATEGORY: A5b; F
KEYWORDS: herbicides; soil
ABSTRACT: (Purpose) To discuss the mobility of 28 herbicides in soils, and to describe a soil column system to evaluate the relative mobilities of herbicides in soil. (Time and Duration) One-year study. (Type of Research) Original research (laboratory). (Methodology) Twenty-eight technical herbicides were used in this study. Application rates were in the range that might be used in practical weed control. Soil columns were made from 1-inch segments of 3-inch aluminum with a wall thickness of 0.25 inches. Air-dry soil was packed uniformly to a depth of 1.75 inches. Herbicides in a 10 ml of 95% Ethanol were applied to the columns. Water was added to the containers and the units placed in a hood. After 3 days the columns were sliced and 10 oat seeds planted. (Results and Conclusions) A data presentation system which expresses the results for each herbicide in a given soil as a single number is proposed. Comparisons of mobilities of new herbicides with those known for other older, better understood herbicides should make it possible to predict the behavior of new herbicides in the field. The aromatic acid herbicides were most mobile, and the insoluble toluidines least mobile. Results for 28 herbicides are given.

1820
A review of toxicological information on Tordon herbicide.
AUTHOR: LYNN GE
AUTHOR AFFILIATION: Dow Chemical Co.
SOURCE TITLE: Down to Earth.
SOURCE ID: 20(4):6-8, 1965.
YEAR PUBLISHED: 1965
CATEGORY: A1b; A5b; B1; F
SPONSOR: Dow Chemical Co.
REGION: Applicable to entire United States STATE: United States
KEYWORDS: fish, toxicity to; herbicides; mammals; picloram; toxic hazard; toxicity
ABSTRACT: (Purpose) To summarize the early reports of picloram toxicity characteristics to several organisms. (Time and Duration) Not specified, but probably early 1960's. (Type of Research) Summary of toxicity data, no literature citations. (Methodology) Standard acute and chronic toxicity testing protocols. (Results and Conclusions) LD50 values for picloram, Tordon 22K, Tordon 10K pellets and Tordon 101 in mice, rats, guinea pigs, rabbits, and chickens are presented. Narrative presentation of findings on vapor toxicity, applications to the eye, and skin exposure is made. Sub-acute feeding studies with rats, sheep and calves are reviewed. Repeated skin exposure tests are included, as are toxicity tests with fish, snails, and daphnia. A one year chronic feeding study was included. Specific data is offered in several instances. In general terms, picloram is moderate to low in toxicity to the organisms tested.

1821
Some primary and secondary effects of herbicides on wildlife.
AUTHOR: GEORGE JL
AUTHOR AFFILIATION: US Fish and Wildlife Service
SOURCE TITLE: Pages 40-73 in Herbicides and their use in Forestry: proceedings, Forestry Symposium.
SOURCE ID: Pennsylvania State University
YEAR PUBLISHED: 1962
CATEGORY: B1g; F
KEYWORDS: herbicides; wildlife
ABSTRACT: (Purpose) To discuss available toxicological data on the effects of commonly used herbicides on mammals, birds, reptiles, amphibians, fish and invertebrates. (Time and Duration) Summarizes 10 years of research. (Type of Research) Literature review. (Methodology) A very complete search of the literature was made to pull together all information on the toxicity of a large number of herbicides to mammals, reptiles, birds, amphibians, fish and invertebrates. Secondary effects of herbicides on wildlife are discussed, including indirect toxicological effects due to subiethal dosages, changes in palatability of poisonous plants, changes in chemical composition of plants, and injury, contamination, or death of food-chain organisms. (Results and Conclusions) Available toxicological information on the effects of commonly used herbicides on mammals, birds, reptiles, amphibians, fish, and invertebrates is summarized. Some herbicides are very toxic to animals, but normally the direct toxicological hazard to warm-blooded vertebrates is not great. Indirect effects of herbicides through habitat modification may be much more important.

1822
Vegetation science concepts I: Initial floristic composition, a factor in old-field vegetation development.
AUTHOR: EGLER FE
AUTHOR AFFILIATION: American Museum of Natural History.
SOURCE TITLE: Vegetatio
SOURCE ID: 4:412-417, 1954.
YEAR PUBLISHED: 1954
CATEGORY: A5b; A5e; F
REGION: Appalachian Oak Forest STATE: Connecticut; New York; Pennsylvania
KEYWORDS: communities; community structure; initial floristic composition; succession
ABSTRACT: (Purpose) The first in a series of papers discussing certain concepts applicable to the science of vegetation. (Time and Duration) Based on observations covering a 20-year period. (Type of Research) Literature review and field observations. (Methodology) The author discusses vegetation development from the traditional plant succession standpoint. Other discussions cover: old-field vegetation development; old-field vegetation development in textbooks; relay floristics; initial floristic composition; and the relative importance of the two factors. (Results and Conclusions) Two principles are considered as being involved in vegetation development on abandoned agricultural lands. The first, called "Relay Floristics", involves a succession of incoming and out-going plants, each group invading the land, ousting its predecessor, and in turn preparing the site so as to be ousted itself. The second principle is called "Initial Floristic Composition", and refers to that element which invades or has invaded at the time of abandonment. Following abandonment, there is a progressive development, with the forbs and grasses assuming predominance first, and the trees last. An evaluation of the relative importance of these two principles is necessary in vegetation management.

1823
Relationship between trout populations and cover on a small stream.
AUTHOR: BOUSSU MF
AUTHOR AFFILIATION: Department of Game, Fish and Parks
SOURCE TITLE: Journal of Wildlife Management
SOURCE ID: 18(2):229-239, 1954.
CATEGORY: B1C; F
REGION: Douglas Fir Forest STATE: MT
KEYWORDS: aquatic; cover; fish; impact; plants; population; stream; vegetation
ABSTRACT: (Purpose) To determine the relation between trout populations and: 1) The various kinds of natural cover in a small stream; 2) The effect of partial or complete removal of natural cover; 3) The application of artificial cover to areas devoid of it. (Time and Duration) June 1951-March 1953. (Research) Original. (Methodology) Experimental and control sections selected along a small stream on basis of presence or absence of cover features. Fish were collected by shocking, then classified, counted and weighed both before and after alteration which consisted of applying artificial brush cover or removing natural cover. Pre-alteration inventories made four times and three post-alterations at least one month following alteration. (Results and Conclusions) Marked increase in numbers and pounds of fish in sections where artificial cover applied. Following removal of natural brush cover, there was a weight decrease of 58.4% in the experimental sections compared to an increase of 36% in the control section of legals.

1824
Outline for ecological life history studies in trees, shrubs, and stem succulents.
AUTHOR: PELTON JF
AUTHOR AFFILIATION: Univ of MN.
SOURCE TITLE: Ecology.
SOURCE ID: 32(2):334-343, 1951.
YEAR PUBLISHED: 1951
CATEGORY: F
REGION: Applicable to entire United States STATE: United States
KEYWORDS: Ecology; research; shrubs; trees
ABSTRACT: (Purpose) One of a series of outlines and bibliographies on ecological life history studies of both plants and animals which are currently appearing in Ecology. (Time and Duration) Two-year study. (Type of Research) Literature review. (Methodology) The author lists general references, and representative studies as starting points in research on phanerophyte life forms. (Results and Conclusions) It is apparent from the above outline that solving most ecological problems concerning even a single species requires much more time and effort than is ordinarily available to one person. Consequently, most autecological data accumulate over extended periods from numerous studies of a local or limited nature and short duration. There is need, however, for survey studies which integrate th known ecological data concerning a given species, clarify the importnat problems, and attempt to fill in some of the gaps in our knowledge of the species.

Appendix List of Categories

A. CONSTRUCTION AND MAINTENANCE METHODS ON TRANSMISSION LINE ROW'S

A1 ROW clearing and Construction
A1a Mechanical vs. manual felling
A1b Chemical application
A1c Danger tree identification
A1d Vegetation removal
A1e Sensitive ecosystems considerations
A1f Vegetation height limitations
A1g Clearing specifications
A1h Access roads
A1i Stream and wetland crossing procedures
A1j Water bars for soil stabilization
A1k Overstory topping and pruning

A2 Tower Spotting and Design
A2a Footing designs and impacts
A2b Conductor configurations and ROW width, clearing specifications
A2c Height requirement, span lengths, conductor sag limitations, site access requirements
A2d On and off-site fabrications
A2e Tower site lay-down requirements
A2f Equipment limitations
A2g Aerial erections

A3 Conductor Stringing Objectives and Methods
A3a Bull-wheels and tension stringers
A3b Aerial stringing

A4 ROW Restoration Objectives and Methods
A4a Topsoil recovery
A4b Soil stability
A4c Revegetation techniques
A4d Site grading

A5 ROW Maintenance Objectives, Methods and Impact
A5a Objectives as related to ecosystems
A5b Chemicals
A5c Manual
A5d Mechanical
A5e Natural maintenance
A5f Combinations of above
A5g Public relations programs

B. ECOLOGICAL EFFECTS OF ROW CONSTRUCTION, TOWER SITING, RESTORATION, AND MAINTENANCE

B1 Effects on Terrestrial and Aquatic Communities and Population Changes Resulting from Site Alterations
B1a Composition (numbers of species)
B1b Structure (species age distribution)
B1c Diversity (numbers of individuals per species)
B1d Productivity
B1e Habitat destruction
B1f Behavioral
B1g Wildlife use of ROWs and effects on wildlife

B2 Environmental Component Alteration
B2a Water
B2b Soil
B2c Radiation
B2d Microclimate
B2e Bird mortality
B2f Permafrost disturbance
B2g Windthrow of trees

B3 Fish and Wildlife Management Techniques
B3a Feasibility assessment of implementing existing techniques on ROWs
B3b Techniques presently implemented on ROWs
B3c Costs of fish and wildlife management techniques

B4 Effects on Agricultural Crops
B4a Soil productivity and yield changes
B4b Increasing cultivable lands
B4c Drainage alterations and yield changes
B4d Displacement operational efficiency
B4e Decreasing operational efficiency

B5 Effects of Row Multi-Use
B5a Trails
B5b Off-road recreation vehicles
B5c Sportsmen
B5d Grazing

C. LITERATURE RELATED TO OVERHEAD TRANSMISSION RIGHTS-OF-WAY

C1 Pipeline construction and maintenance
C2 Highway construction and maintenance
C3 Railroad construction and maintenance
C4 Studies pertaining to linear or small openings in vegetation communities

D. ENVIRONMENTAL ASSESSMENT METHODOLOGIES

E. HABITAT EVALUATION TECHNIQUES

F. RESEARCH PROCEDURES

A

AASHEIM RJ. 1692
ABBOTT RE 1242
ADAMS DL 1652
ADAMS RE 1171
ADKISSON CS. 1313
AHLGREN CE 1687
AKAMINE EK 1258
ALCANIZ R. 1611
ALDOUS SE 1808
ALDRICH RC 1780
ALEXANDER M. 1238
ALLAN PF 1625
ALLARD GE 1791
ALLEN P. 1161
ALTOM JD 1046
AMBROSE RE 1678
AMERICAN FORESTERS 1522
AMERICAN SOCIETY AGRICULTURAL ENGINEERS. 1543
ANDERSON DH. 1568
ANDERSON HW. 1814
ANDERSON JH 1004
ANDERSON R 1411
ANDERSON SH 1307 1373 1802
ANDERSON WL. 1401
ANDERSON WW 1566
ANON. 1051 1107 1118
AREND PH 1447
ARNER DH .1029 1167 1247 1383 1457
ASBAUGH FA 1226
ASPLUNDH EK 1157
ASPLUNDH ENVIRONMENTAL SERVICES 1288
ASTOR PH 1775
AUBERTIN GM 1490
AVERG E 1177
AVERY M 1561 1570

B

BAILEY JE 1643
BALDA RP 1291 1675
BALL RC 1642
BANKOSKE JW 1279
BARIBEAU J. 1069
BARICK FD. 1361
BARKER J 1227
BARNES J. 1414
BARNHART JA 1034
BARRETT GW. 1652
BARRONS KC 1505 1515
BARTHOLD LO. 1788
BARTHOLOMEW GA JR 1478
BASKETT TS. 1798
BAUMAN TT. 1386
BAUR JR 1215
BAYNES AS 1261
BAZZAZ FA 1340 1708
BEATTY RH 1091
BEAVER DL 1665
BECKWITH ST. 1359
BEEMAN LE 1774
BEHREND DF 1647
BELEL JR. 1660
BELLROSE FC. 1581
BENNETT JM 1248
BENNINGTON G 1785
BENTON AH 1128 1476
BERGSTRAND J 1582
BERTHY HP 1031
BESADNY CD 1640
BEST JA 1320
BEST LB. 1696
BETSILL CW 1410
BINGEMAN CW 1184
BISWELL HH. 1523
BJUGSTAD AJ. 1648
BLACK H 1156 1399
BOAG DA 1690
BOEKER EL 1419
BOELTER DH 1113
BOLLEN WB 1061 1096
BOND RM. 1761
BORMANN FH. . .1487 1546 1683 1693
BORRECCO JE 1432
BOUSSU MF 1823
BOVEY RW. 1030 1215 1229 1232 1370 1548
BOYD H 1462 1465
BOYD WI 1392
BOYER J. 1619
BRACKEBUSCH AP 1101
BRADSHAW AD. 1554
BRADY HA. 1062 1185
BRAMBLE WC. . .1250 1254 1304 1312 1318 1337 1384 1433 1472 1474 1475 1600 1618 1752 1810 1817
BRANDER RB. 1630
BRANDT SE 1034
BRENDER EV 1085
BRENMAN H. 1126
BREWER R 1588
BRINK LK. 1535
BROWN ER. 1730
BROWN GR. 1043
BROWN GW. 1099 1510 1517 1698 1704
BRUM GD. 1016
BUCKNER CH. 1324
BUELL HF 1331
BUELL MF 1331
BUFFINGTON JD. 1041
BUMSTEAD RS 1670
BUNGER WC. 1552
BURGESS RL 1413
BURGGRAF FB. 1768
BURNS JW 1105 1106
BURTON TM. 1506
BUSBY K 1538
BUTLER PA 1084
BUTTERY RF 1668
BUTTON RG 1542
BYRD BC 1032 1045 1233
BYRD MA. 1395
BYRD NA 1808
BYRNES WR 1246 1254 1304 1312 1337 1384 1433 1472 1474 1475 1618 1752
BYRON RA. 1553

C

CABLE DR 1355
CADBURY CJ 1436
CAHALANE VH. 1763
CAIN SA. 1606
CAIRNS J JR. 1511
CAMPBELL CJ. 1502
CAMPBELL J. 1240
CAMPBELL RA 1745
CAMPBELL RS 1239
CANGIOLI G. 1631
CARMODY GR 1681
CAROTHERS SW 1499
CARTER MC 1302
CARTER VE 1715
CARVELL KL . . .1023 1031 1076 1180 1305 1317
CARY ARBORETUM 1283
CASSEL JF 1438 1440 1561
CAVANAGH JB 1408 1412
CECH FC. 1076
CERRETANI D 1428
CHAMBERLAIN EB JR 1350
CHANCELLOR R 1493
CHAPMAN DR. 1737
CHAPPELL WE . .1042 1063 1183 1366 1466
CHEPIL WS 1142
CHRISTENSEN DR. 1316
CLEMENT T 1570
CLIBURN LE. 1260 1383
CLONINGER RA 1417
CLOSE GE. 1113
COARTNEY JS 1183 1366
COBERLY C 1488
COBLE HD .1216 1217 1218 1219 1220
COCHRAN WW 1586
CODE JA. 1541
CODY JB. 1035
COLLINS D. 1270
CONNER RN. 1313 1609 1686

COOK DB 1396
COOK J. 1700
COOK SF 1747
CORBETT ES. 1489
CORBIN FT. 1201
CORNABY BW. 1635
CORNWELL GW. 1560 1571
COULTER LL 1469
COVINGTON DA. 1126
COWELL BC 1089
CRAIGHEAD JJ. 1605
CRAMER OP 1100
CRAN HJ JR 1066 1209
CRAWFORD HS. 1609 1688
CRAWFORD JE 1310
CROSBY D 1375
CROSSMAN JS. 1511
CROUCH GL 1670
CROW AB 1555
CRUMRINE JP. 1495 1496
CUMBIE PM. 1417
CUNNINGHAM EL. 1289
CURRIER J. 1495 1496
CURTIS JD 1153
CURTIS RL. 1309
CUSHING CE JR 1520

D

DAHL E 1372
DALTON RL 1074
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