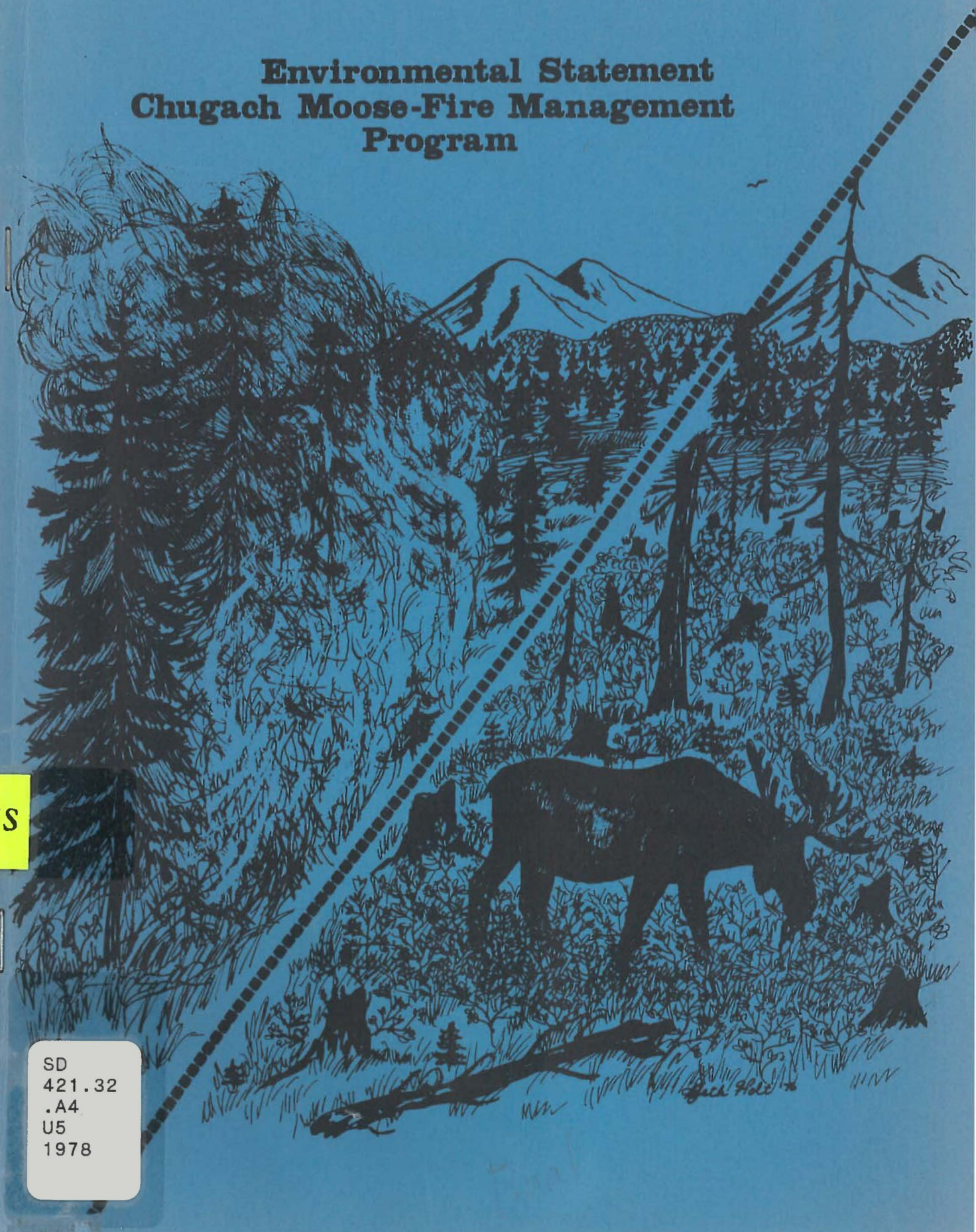
Environmental Statement
Chugach Moose-Fire Management Program



Environmental Statement Chugach Moose-Fire Management Program

USDA FOREST SERVICE ENVIRONMENTAL STATEMENT

FOR THE CHUGACH MOOSE - FIRE MANAGEMENT PROGRAM

CHUGACH NATIONAL FOREST

Prepared in accordance with
Section 102 (2) (c) of Public Law 91-190

USDA-FS-R10-FES (ADM) 77-07

SUMMARY SHEET

I Draft ( ) Final (x)

II Name of USDA Agency: Forest Service

III Administrative (x) Legislative ( )

IV Brief Description of the Action

Over a 10 year period beginning in 1977, a total of about 22,000 acres of land at 139 sites will be treated by prescribed burning. The purpose is to improve vegetation for use as forage by Alaskan moose on the National Forest portion of the Kenai Peninsula in southcentral Alaska. Prescribed fire will be used in a planned, controlled, natural way to increase moose populations as past wildfires have done by accident.

V Summary of Environmental Impact and Adverse Environmental Effects

The proposal will largely simulate the natural effects of fire without all the adverse impacts usually associated with wildfire. About 9% of the forested land in the proposal area will be impacted. However, moose populations, a mobile resource, will be affected favorably over a much larger percentage of the area. The proposal will favorably affect or have no lasting effect on: vegetation, soils, water, early successional stage wildlife, fish, recreation, wildfire hazards and visual resources in the long run. At the same time some adverse impacts may occur as a result of: changes in vegetation, decreased older forest wildlife populations, insects, reduced recreation values received by those who dislike the effects of fire, presence of dead burned snags and vegetation reducing visual resource values, temporary reduction in air quality, minor losses of wood products, and possible increased moose-vehicle collisions.

VI List of Alternatives Considered

The alternatives to the proposal discussed and considered were:

A. No action
B. Mechanical treatments
C. Chemical treatments
D. Commercial sale of wood products
E. Differently designed proposed action

VII List of Concerned Public From Which Comments Were Received

A. Local Government
Kenai Borough Planning and Zoning Commission
Cook Inlet Air Resource Management District

B. State Government
Department of Fish and Game
University of Alaska, Department of Natural Resources, Fairbanks
Cooperative Wildlife Research Unit
Division of Lands
Department of Public Safety - State Troopers
Department of Environmental Conservation
Department of Highways
Division of Policy Development and Planning
Division of Parks, SHPO

C. Federal Government
Department of the Interior
Fish and Wildlife Service, Kenai National Moose Range
Fish and Wildlife Service, Alaska Area Office
Bureau of Land Management
National Park Service
Federal Aviation Administration
Environmental Protection Agency, Region 10

Department of Agriculture
U. S. Forest Service
Alaska Planning Team
Institute of Northern Forestry
Alaska Region 10
Washington Office, Fire Management
Chugach National Forest

Department of Commerce
NOA National Marine Fisheries Service

Department of Defense
172D Infantry Bde. (Alaska) Natural Resources

D. Public Meetings, Organizations, and Individuals
Public meetings, presentations, news and radio releases, etc., were conducted to solicit comments

before the Program and Final Environmental Impact Statements were initiated. Organizations contacted were:

Alaska Center for the Environment
Alaska Conservation Society, Cook Inlet Chapter
Elmendorf AFB, Rod & Gun Club
Anchorage Sportsmens Club
Society of American Foresters
Sierra Club, Knik Chapter
Sierra Club, Alaska Representative
Wildlife Society
Chugach Electric Company
Cook Inlet Native Corporation
Nordic Ski Club
Mountaineering Club of Alaska
Alaska Professional Hunters Assn.
Cook Inlet Historical Society
Izaac Walton League
Audubon Club

VIII Date Draft Environmental Statement Was Made Available to CEQ and the Public March 18, 1977

Date Final Environmental Statement Was Made Available to EPA and the Public 21 MAR 1978

Forest Supervisor
Chugach National Forest
Pouch 6606
Anchorage, Alaska 99502

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I DESCRIPTION

The Proposal

Over a ten year period beginning in 1977 a total of 21,699 acres of National Forest Land at 139 sites in historical winter range will be treated by prescribed burning to effect improvement of vegetation for use by Alaskan moose (Alces gigas). About 2% of the total land mass in National Forest on the Kenai would be treated. About 9% of the valley area (forested land) would be burned in total over a 10 year period. This is a programmatic EIS covering 22,000 acres. The U. S. Forest Service defines prescribed burning as:

> The skillful application of fire to fuels in a definite area under exacting conditions such as weather, fuel moisture, and soil moisture, to accomplish certain planned objectives. Fire is used scientifically to realize maximun net benefits at minimum damage and acceptable cost.
>
> Proper land-use coordination requires that prescribed burning plans be correlated with the requirements and objectives of both fire control and all affected resource management functions. Probable benefits must be carefully weighed against potential damages in planning the fire prescription. In some cases only a light burn is desired, but in others the fire must be intense and severe to accomplish the specific objective. (FSM 5153.11 Oct. 71)

Prescribed burning is not wildfire. Wildfire is accidental fire begun by man or natural causes. Wildfires usually are suppressed immediately and have no management objective. Wildfires may also have positive, or neutral effects. Because they can destroy developments, timber etc. wildfires can have negative impacts.

Prescribed burning is the use of fire in a carefully controlled way within weather, humidity and other conditions pre-determined before the fire is ignited. Prescribed burning is confined to a pre-determined area by means of pre-planned boundaries, either natural, such as snow banks or creeks, or by man made boundaries such as roads, trails and pre-constructed firebreaks. Prescribed burns are staffed with fire-fighting crews, equipment, and materials to assure that the fire is confined within its prescribed boundaries. If a fire should escape its boundaries, it can be extinguished through the use of pre-positioned men, equipment, supplies, handlines and other means.

Table 1 summarizes the Program schedule. Appendices 1-10 show the detailed schedules.

Table 1 - Summary of annual prescribed burn acres & cost.

Year	No. Sites	Acres	Cost $
1977	7	475	10,451
1978	20	958	21,200
1979	23	2719	25,690
1980	13	2394	25,880
1981	4	2570	26,360
1982	12	2508	26,190
1983	20	2432	30,290
1984	20	2376	29,270
1985	12	2193	26,730
1986	8	3074	23,020
Totals	139	21,699	245,081

The treatments will occur entirely in the valleys and valley floors of watersheds on the Chugach National Forest portion of the Kenai Peninsula. As shown alphabetically in Table 2 and Figures 1 - 16. The priorities in Table 2 indicate general value to moose, and suitability and availability for prescribed burning. Figures 2 - 16 show the sites at a 1" = 1 mile scale. The numerals indicate site number (i.e. 3), acreage (i.e. 38a) and the general difficulty of the site (i.e. II).

The prescribed burning will take place primarily in late spring or early summer but some may be done in mid-summer and early autumn. The goal will be to kill all standing vegetation (large and small trees, shrubs) in the sites to convert them to an early unshaded successional stage. Willows and birch will be left as seed trees as often as possible.

Total estimated cost over the next 10 years in 1977 dollars is approximately $250,000 (not including administration overhead costs). The Chugach National Forest Fire Management Officer provided most of the burn cost estimate factors and experience. Cost estimates were calculated based upon each unit's size, the burn's resistance to control and rate of spread, amount of hand-line (hand labor constructed fire breaks), number of men and salaries, vehicles and equipment, aircraft costs, and per diem and subsistence. Some of these factors are shown in Appendix 11.

Figure 1 - Kenai Peninsula portion of the Chugach National Forest showing proposed prescribed burn sites

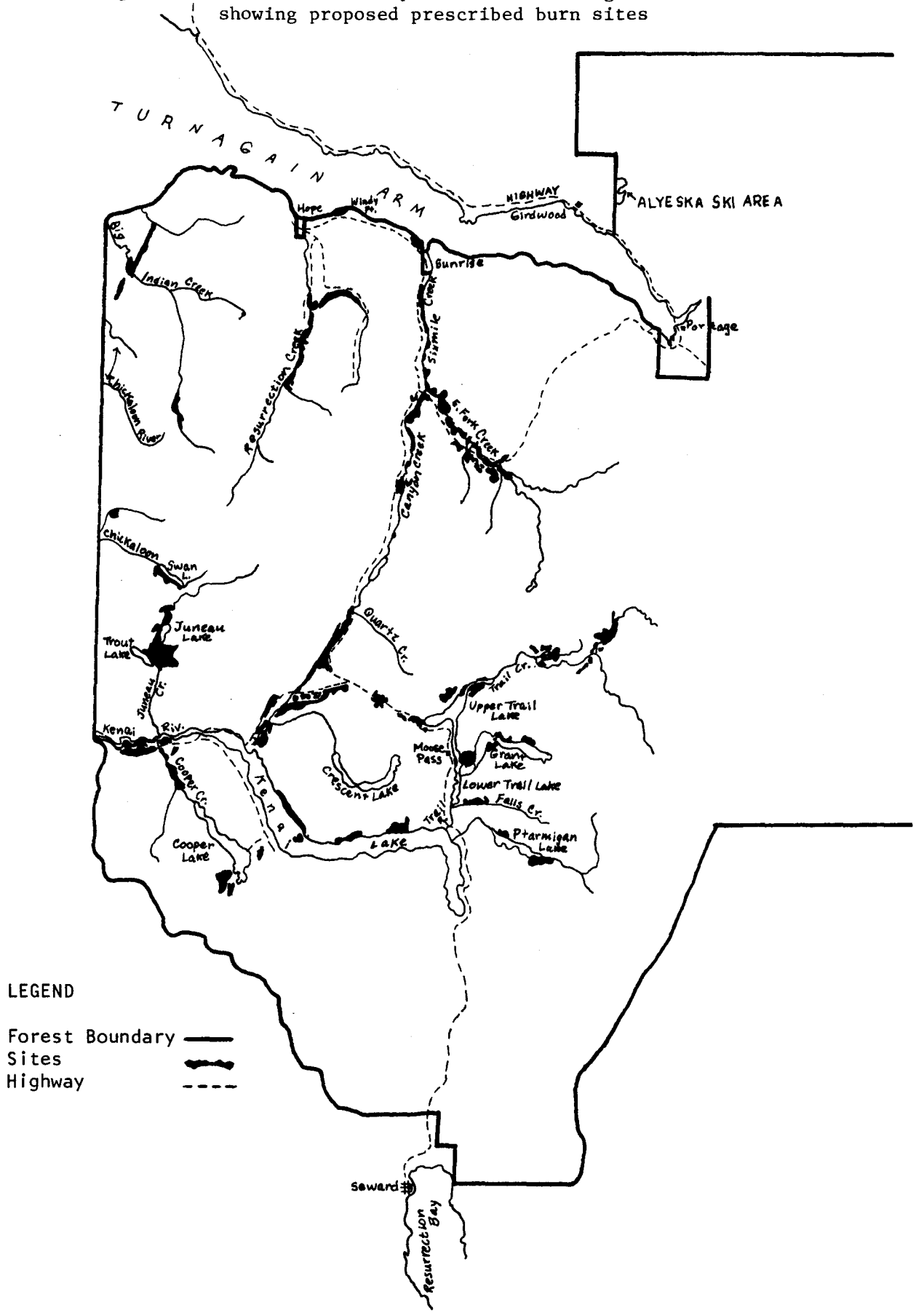


Table 2 - Prescribed burn site acres by Area.

Area	Acres	Highest Priorities
Canyon Cr.	918	
Chickaloon R.	2136	5
Cooper - Kenai L.	2135	4
Cooper Cr.	410	
E. Fork Cr.	2364	8
Grant L.	659	
Indian Cr.	430	
Juneau Cr.	2800	1
Kenai R.	273	3
Ptarmigan L.	247	
Quartz Cr.	2982	2
Resurrection Cr.	3067	6
Six Mile Cr.	874	
Trail R.	471	7
Trail Cr.	1743	

A Prescribed Burn Plan will be prepared for each site to assure that all requirements are met (See Appendix 12). Experienced fire management and wildlife management personnel will prepare the Plans in consultation with other land management professionals in the Forest Staff (landscape architect, soils scientist, hydrologist, forester etc.).

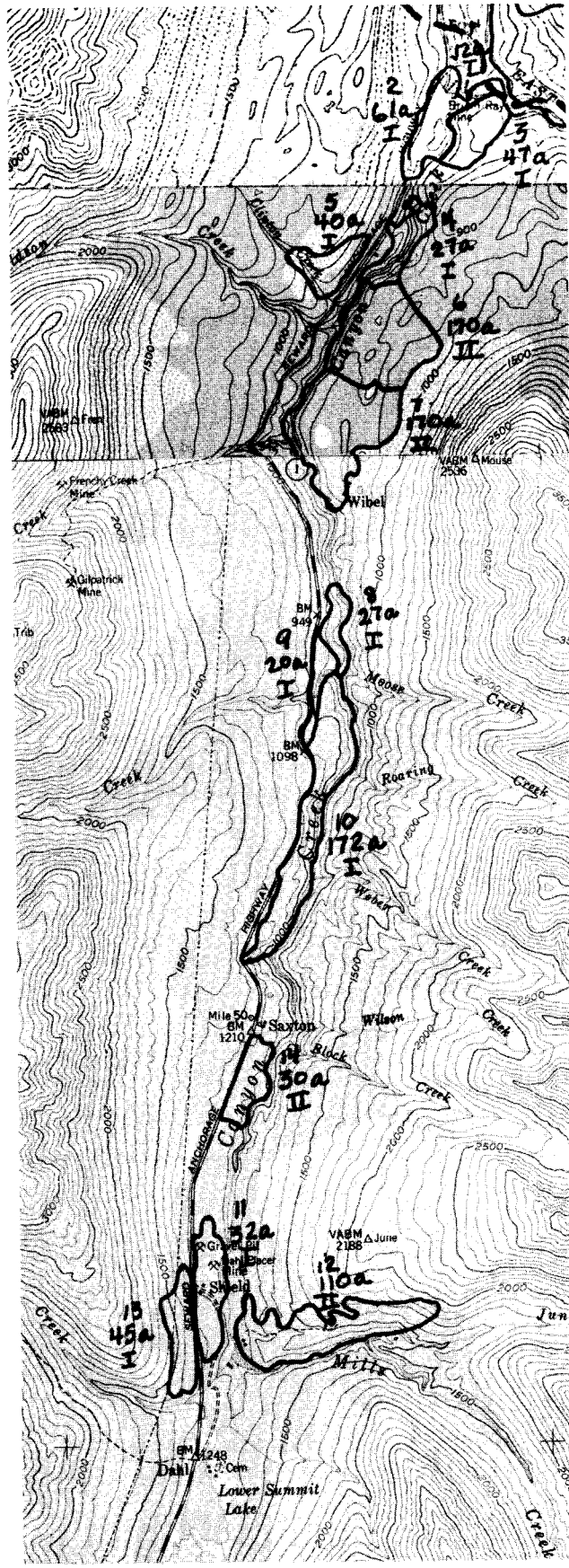


Figure 2 - Canyon Creek Sites

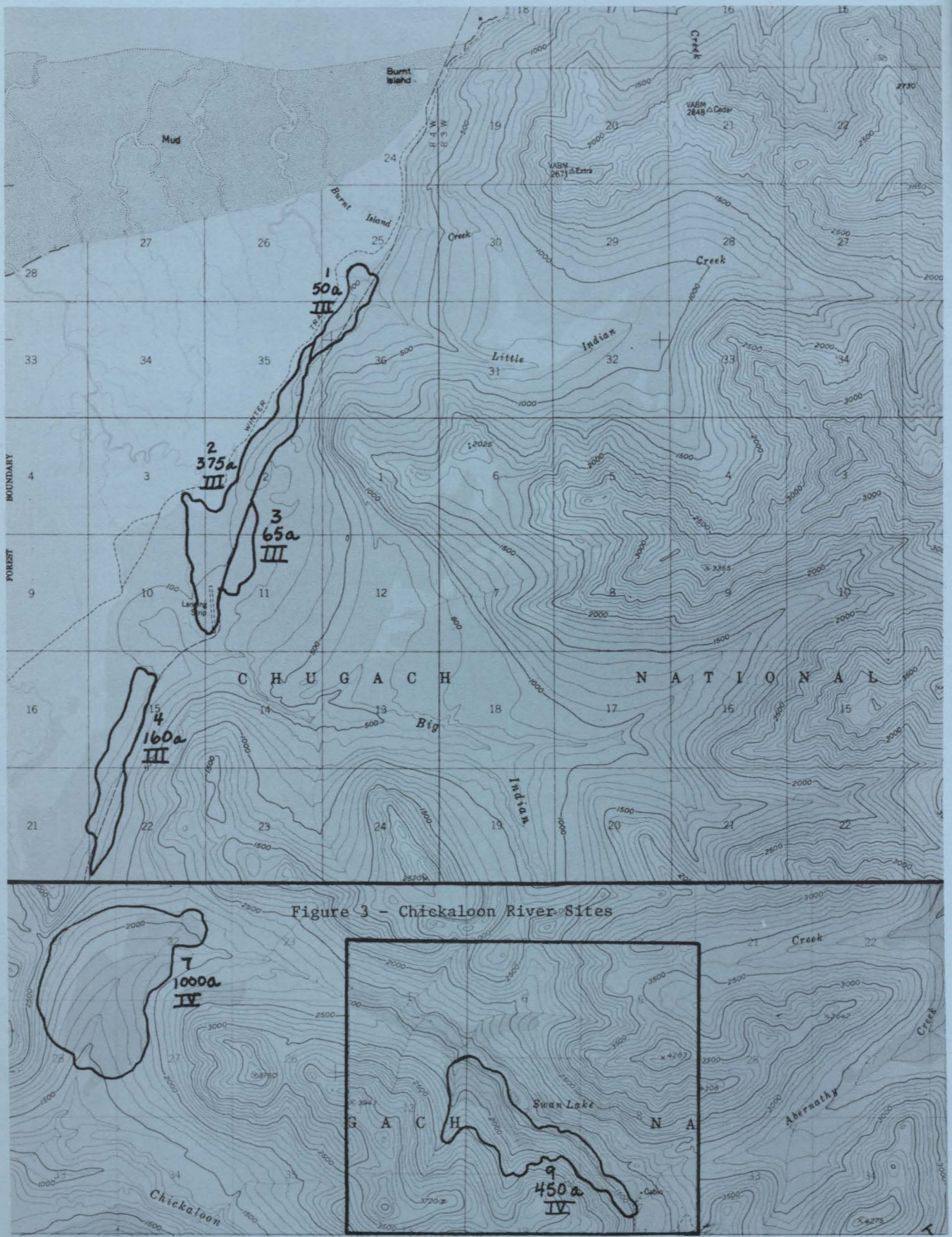


Figure 3 - Chickaloon River Sites

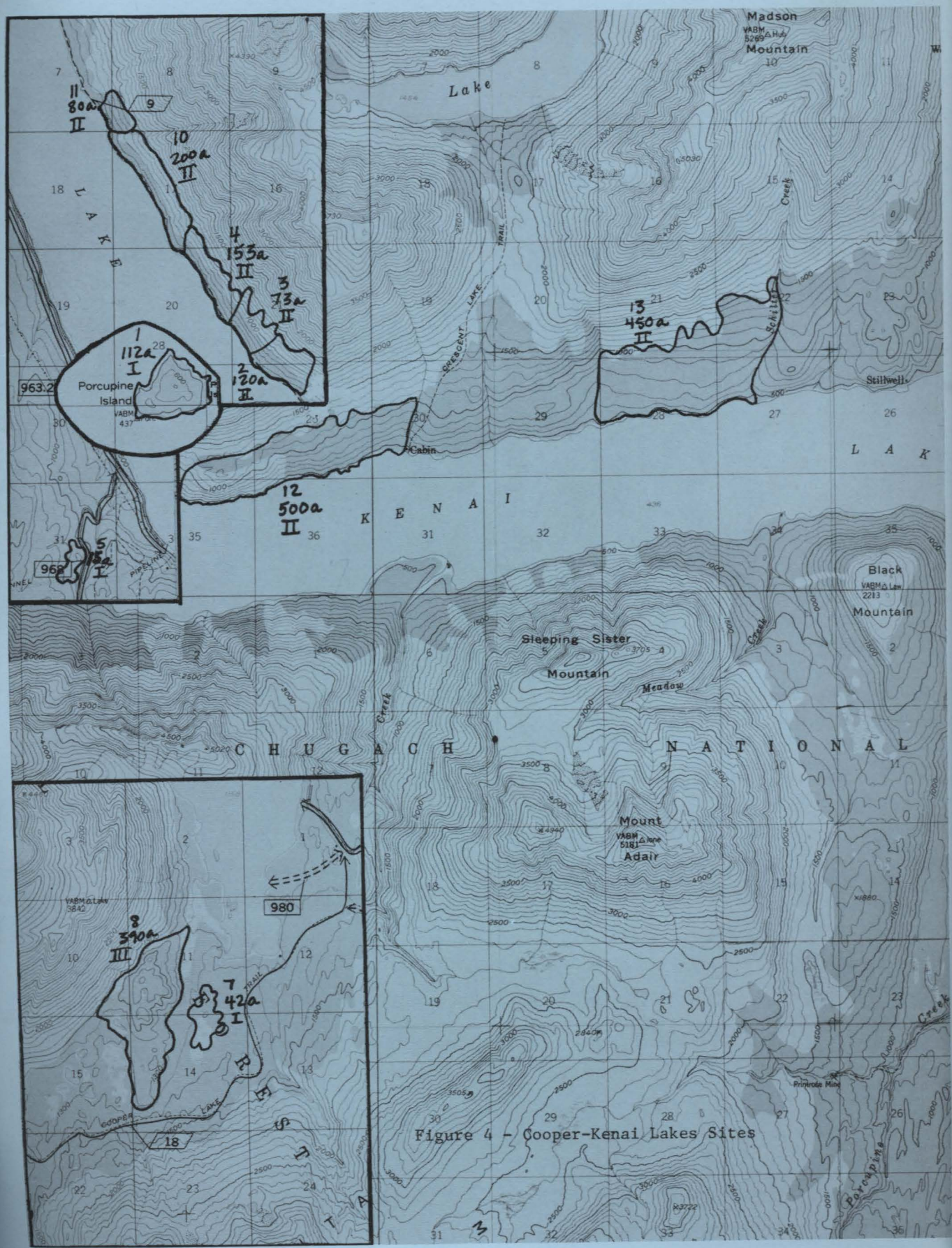


Figure 4 - Cooper-Kenai Lakes Sites

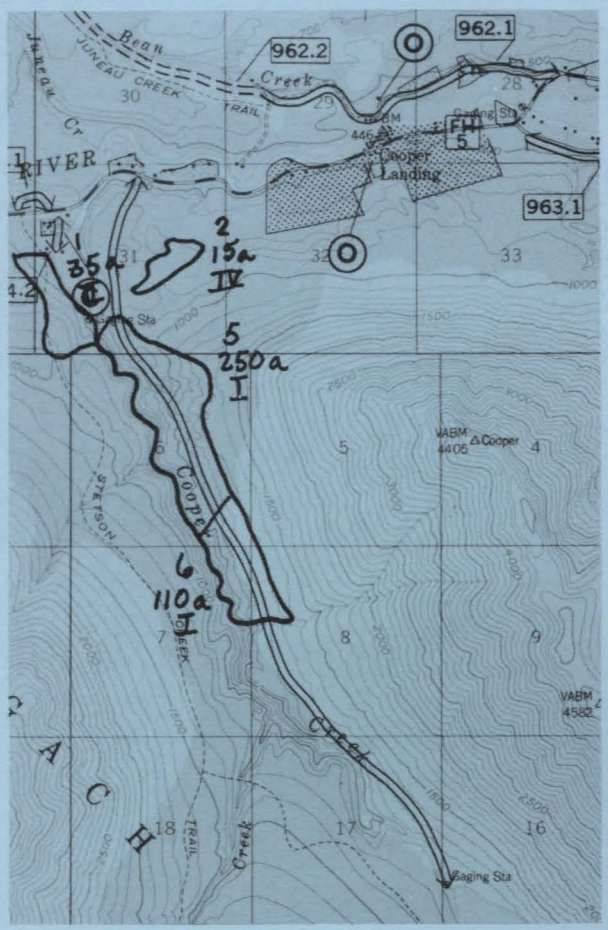


Figure 5 - Cooper Creek Sites

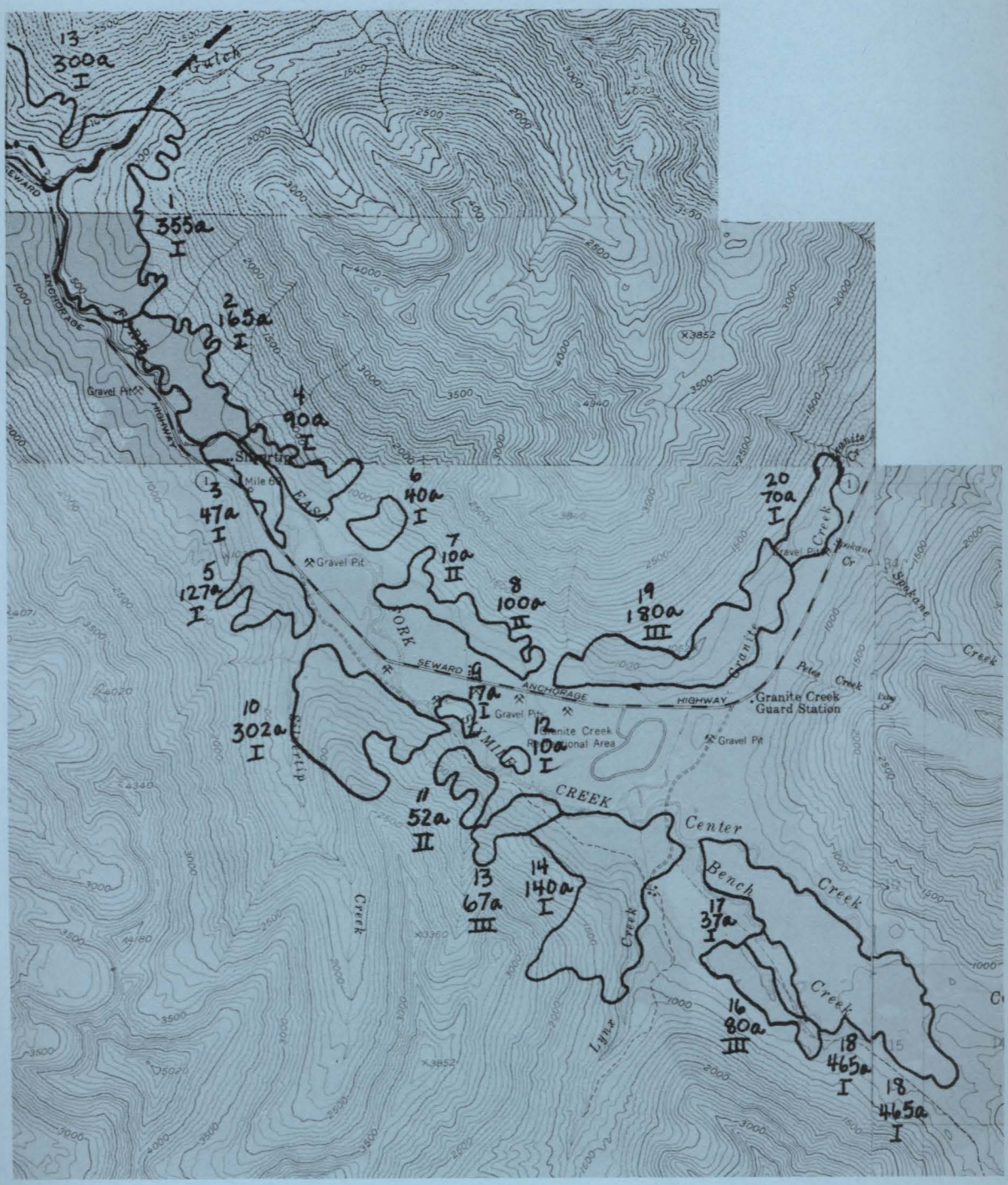


Figure 6 - East Fork Creek Sites

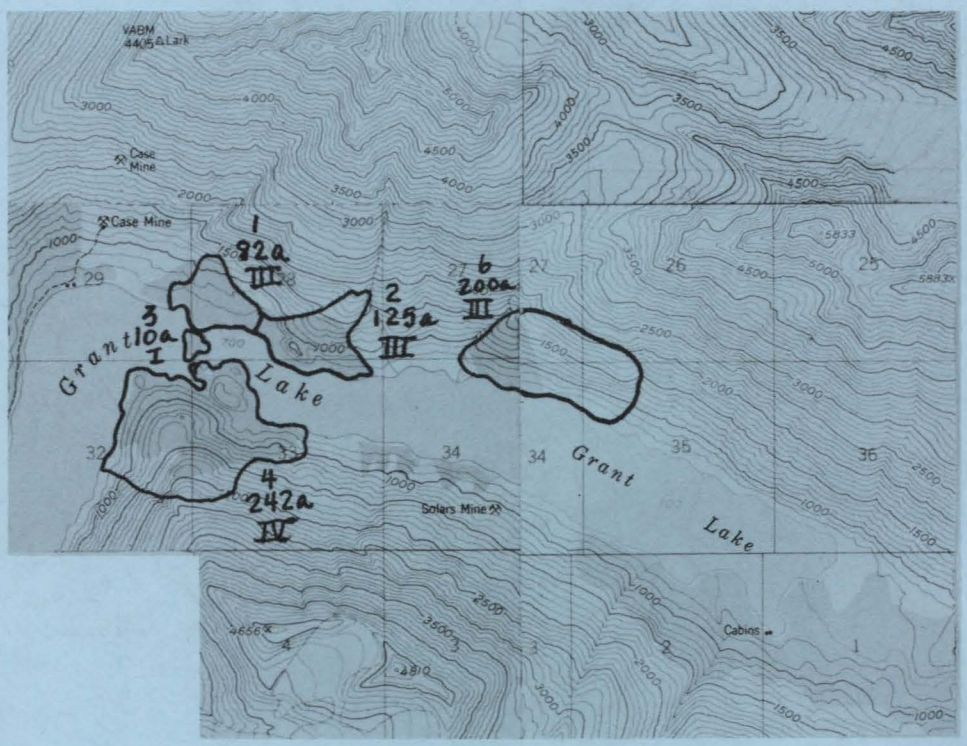


Figure 7 - Grant Lake Sites

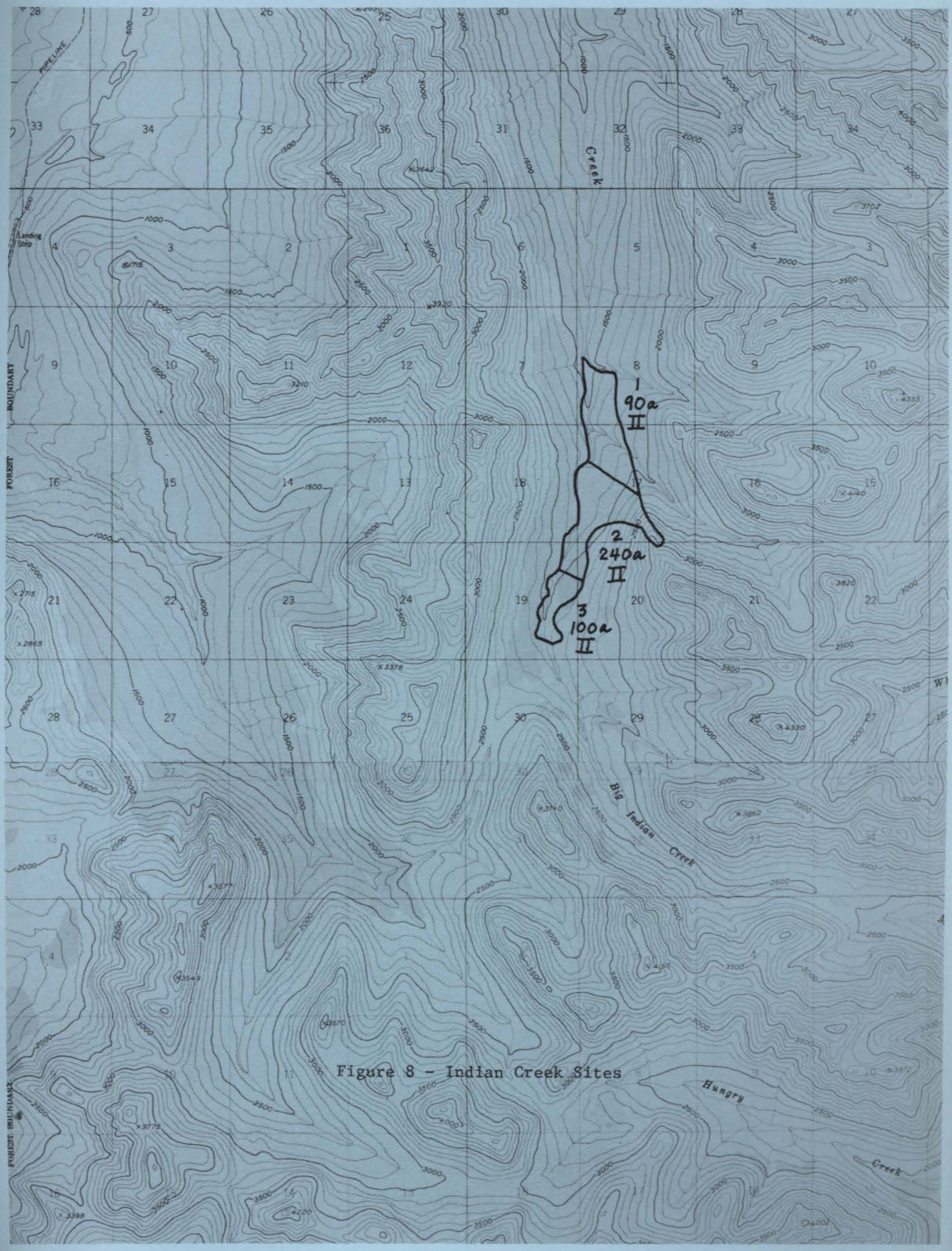


Figure 8 - Indian Creek Sites

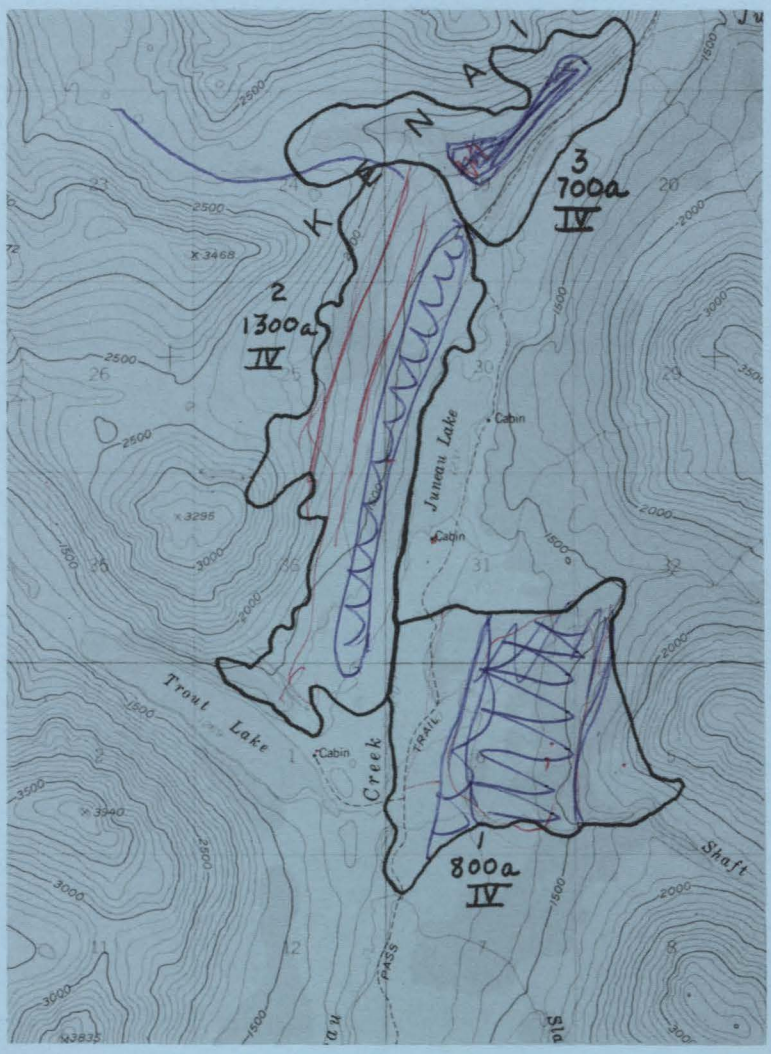


Figure 9 - Juneau Creek Sites

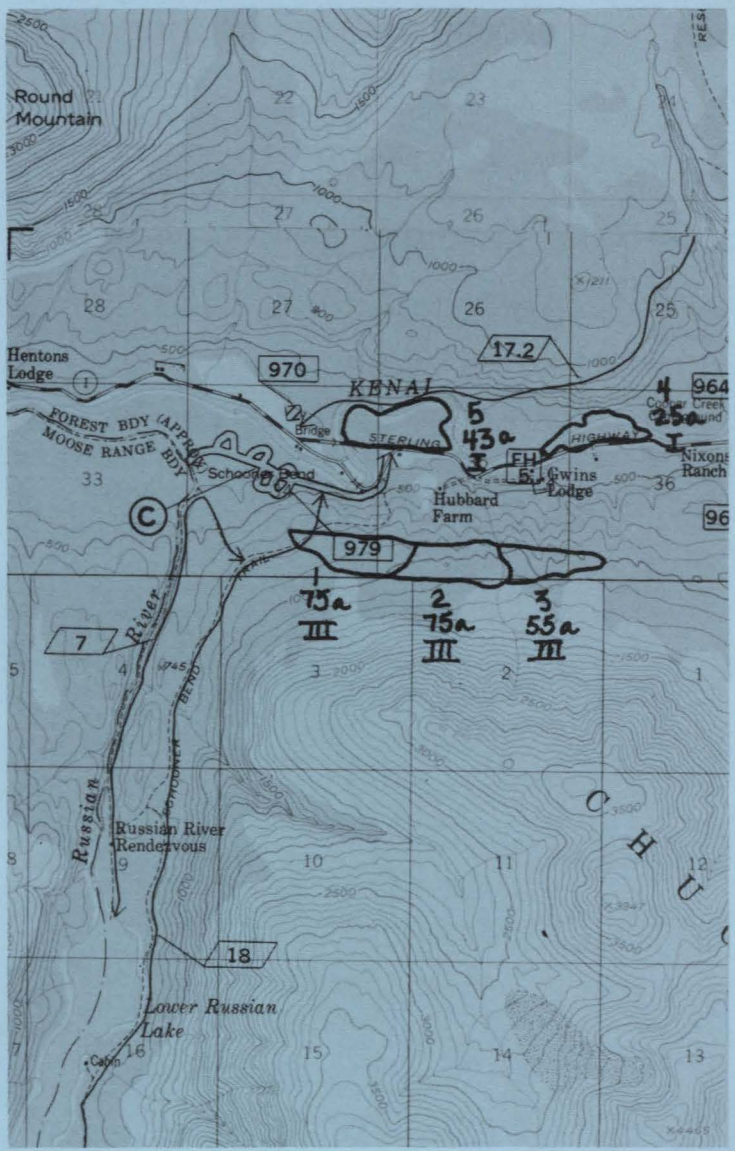


Figure 10 - Kenai River Sites

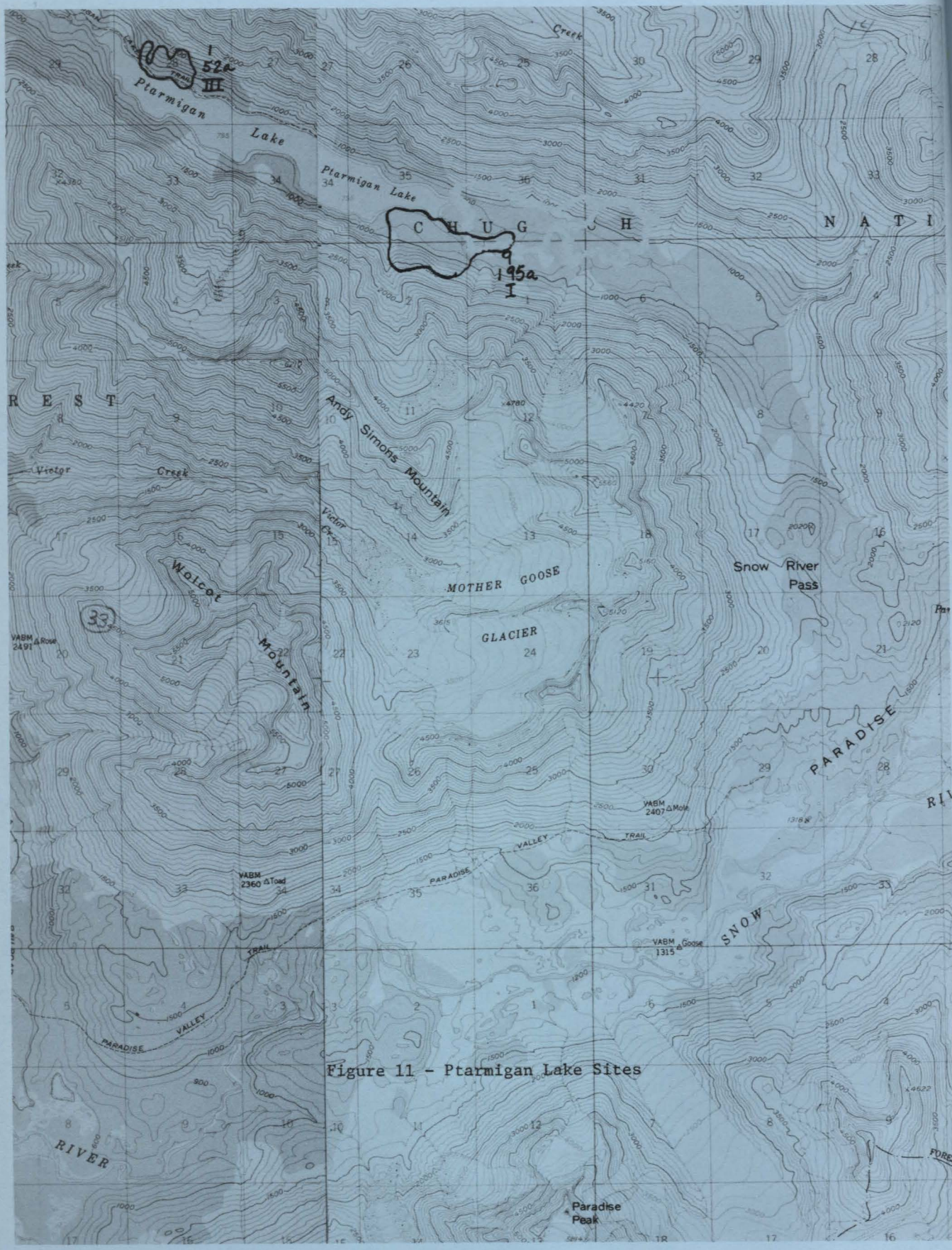


Figure 11 - Ptarmigan Lake Sites

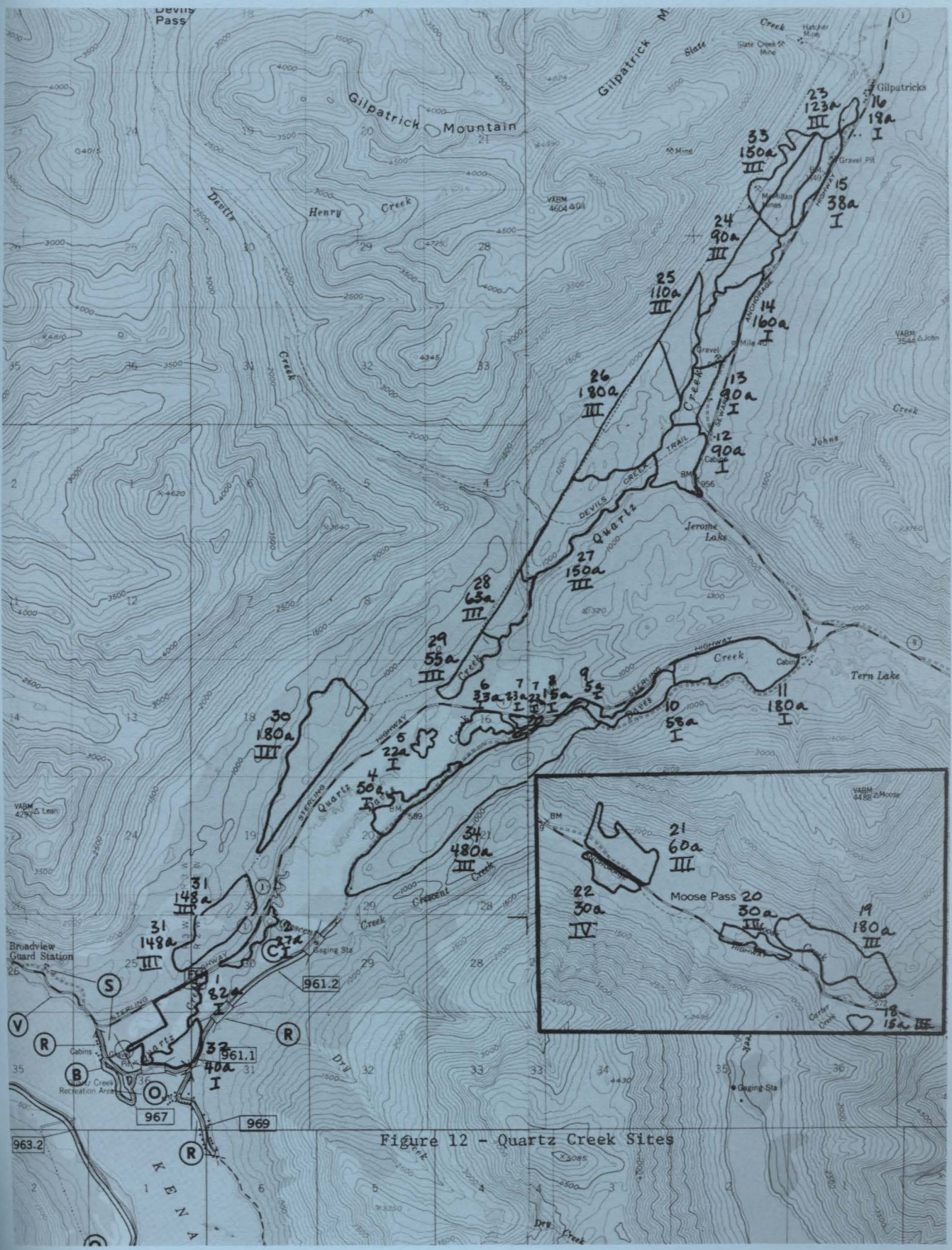


Figure 12 - Quartz Creek Sites

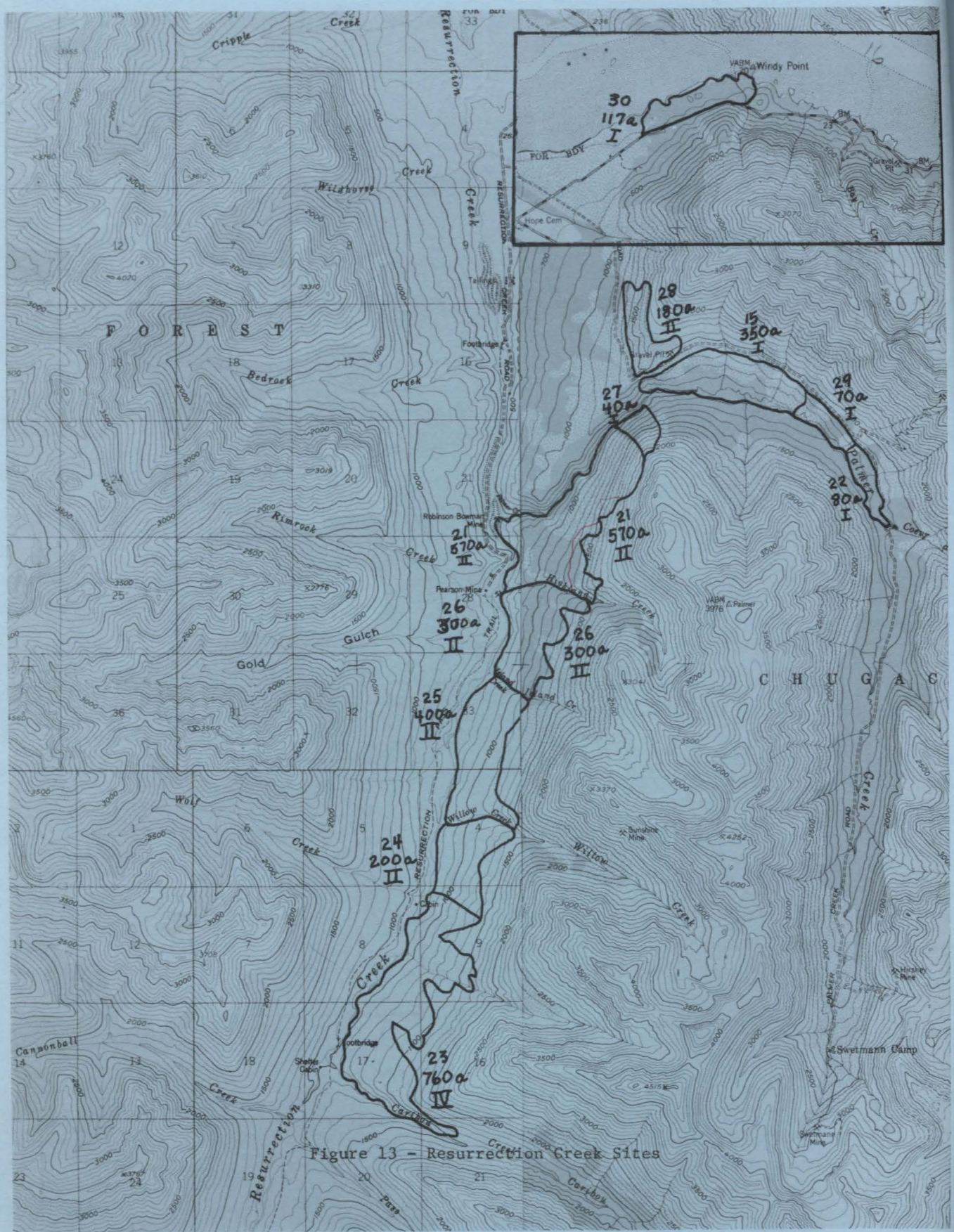


Figure 13 - Resurrection Creek Sites

Figure 14 - Six Mile Creek Sites

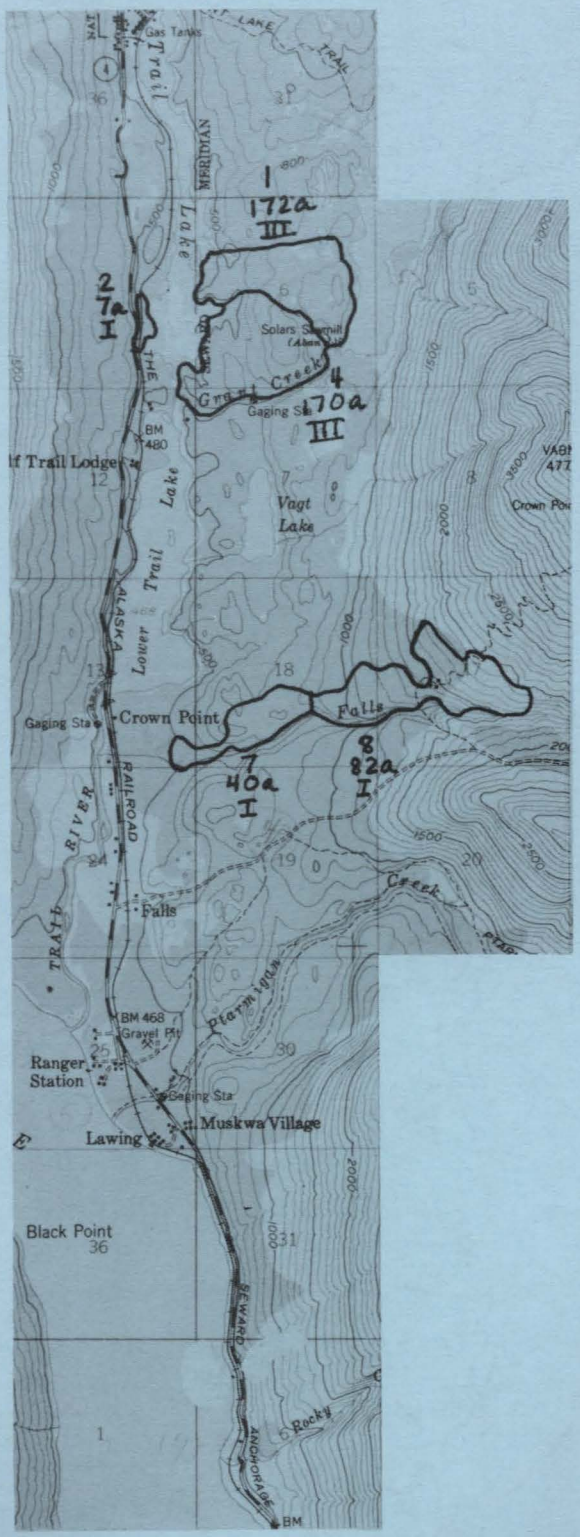


Figure 15 - Trail River Sites

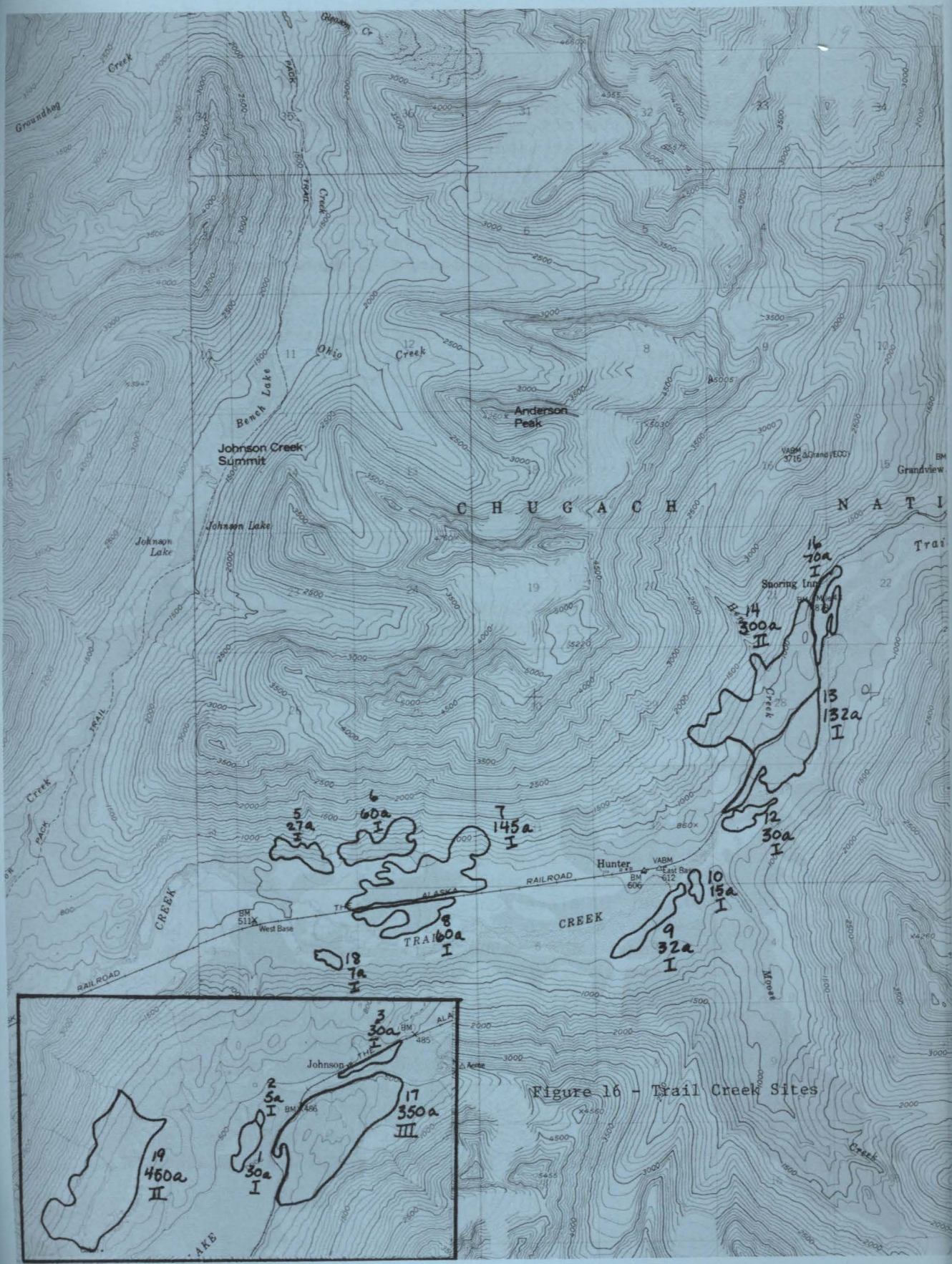


Figure 16 - Trail Creek Sites

Public Information and Education

Some prescribed burn sites will be near or partially within sight of transportation systems (roads, trails etc,) or interpretive facilities (visitor's centers, signed roadside pulloffs etc.) Interpretive signs and other means such as brochures or displays in visitor centers will be used to inform and educate the public of this beneficial use of fire for increasing moose populations. At selected sites signs will be erected both before and promptly after the burns to explain the justification and purpose to the public. An annual progress report will be released thru the news media.

Some of this function can be financed thru present budgets and some will require additional funding requests.

Present Environment

Location

The proposed action will take place on the National Forest portion of the Kenai Peninsula in southcentral Alaska. Much of the following Present Environment description has been extracted from the Kenai portion of the Chugach Land Use Plan.

This area, containing approximately 1,200,000 acres, includes all of the National Forest lands which drain into Turnagain Arm, the Kenai River or Resurrection Bay. (See Figure 1)

The National Forest portion of the Kenai Peninsula is characterized by rugged mountain terrain interlaced by narrow valleys which, for the most part, run north and south. The eastern and southwestern boundaries are heavily glaciated and most of the lakes and streams in these parts of the unit carry heavy silt loads; whereas the lakes and streams on the western half are clear.

Vegetation varies considerably with elevation. Timber stands, both coniferous and deciduous, are found in the valley bottoms and extend up to 1500 feet in elevation. The steeper slopes of the mountains are generally covered by thick stands of alder in the 1000 to 2500 foot range. Above 2500 feet grassy alpine meadows dominate the landscape along with barren rock outcroppings. Air quality is excellent and pollutant content is insignificant. Possible pollutant sources are the industries located on the west side of the peninsula and in Anchorage. Climate is generally mild. The annual precipitation averages about 25 inches and much of this occurs in the form of snow in the winter and heavy rains in the spring and fall. The first general snowfalls begin in mid-October and the snow cover usually lasts until about the first of May in the valleys. Summer temperatures are moderate and average around

56 degrees, although they may occasionally reach into the eighties; winter temperatures may reach minus 20 degrees, similar or slightly warmer than Anchorage. The area lies within the Continental Climatic Zone, such as is found in interior Alaska.

Visual Resources

This portion of the Forest is scenic with its variety of topographic features, vegetation, lakes and streams. It is accessible by paved road from Anchorage, has a trail system, and is enjoyed by a great many people. In addition, a variety of wildlife can often be seen from the highway.

Social and Economic

This area is influenced by the largest population concentrations in the State. The Anchorage area, which lies 50 miles northwest of the Forest boundary, has a population of about 190,000. It is the business and commercial center of the State and is growing rapidly. It is also the transportation hub for the entire north country, being served by numerous airlines, as well as by highway, railroad and by sea.

Seward, at the southern end of the unit, has a population of 2,000. It is connected to Anchorage by the Alaska Railroad as well as by highway. Other small towns in the area are Moose Pass, Hope and Cooper Landing. The major communities in the western part of the Kenai Peninsula are Kenai, Soldotna and Homer. These communities are also connected by highway to Anchorage, thru the National Forest. The total population in this vicinity is about 11,000.

Some major considerations in planning management of this area are:

1. The resident population of this part of Alaska will continue to expand.

2. Recreation will continue to be a major use of this unit.

Recreation

Recreation is a major resource on the Kenai Peninsula. Approximately 480,000 visitor-days of recreation use were recorded in this unit in 1976. About forty percent of this use was attributed to travel along the highways and roads within the Forest. Major activities are fishing, hunting, cross-country skiing, hiking, camping, and snowmobiling.

Exclusive of saltwater use, the 1972 recreation report indicated that, compared with the Forest as a whole, the Kenai Peninsula received ninety-six percent of the use on roads, ninety-eight

percent on trails, ninety-three percent on lakes and streams, ninety-three percent on undeveloped land areas, and ninety-four percent at developed sites.

Since 1960 the Forest Service has constructed or improved 480 camp and picnic units in 20 separate locations, 11 cabins, 10 trailhead parking lots, two boating sites, a visitor's center and seven visitor information signs. In addition the Forest administers special use permits for 150 summer homes, four resorts, four organization camps, two winter sports sites and seven roadside picnic sites.

In 1977, a bill was re-introduced in the U. S. Senate to establish this unit and some adjacent lands in the Harding icefields as a National Recreation Area. The intent of this proposal is compatible with the bill.

Wildlife and Fish

The Kenai contains a wide variety of fish and wildlife resources and has a high public use of both the consumptive and non-consumptive aspects of the resource. Big game includes moose, dall sheep, mountain goat, caribou, brown and black bear, wolves and wolverine.

The moose population has been declining due to natural loss of winter range thru natural forest succession and suppression of wildfires. The sheep, goat, and black bear populations receive moderate to heavy hunting pressure where access is available. Certain portions of the unit are closed to hunters to provide for wildlife viewing. Wolves and a small number of brown bear are found in the unit. The Kenai Peninsula is the only place within the National Forest system to have a resident caribou and dall sheep population. The caribou herd is growing . Wolverine, coyote, fox, lynx, marten, mink, otter, red squirrel, spruce grouse, ptarmigan, snowshoe hare, bald eagle, owls, hawks, songbirds, and small mammals all add to the variety of the wildlife resource.

Trapping of furbearers supplies a small income for a limited number of trappers. Harvest levels tend to fluctuate directly with market prices.

The fishery resource consists of many lakes and streams containing king, red, coho, pink and chum salmon; rainbow and lake trout, Dolly Varden char, grayling and smelt. The Russian River red salmon fishery and the Resurrection Bay coho salmon fishery are popular sport fishing attractions.

The Chickaloon Flats Game Management Area has been established jointly with the U. S. Fish and Wildlife Service, Alaska Dept. of Fish and Game, and Alaska Division of Lands to manage the area for the protection and utilization of the wildlife resource. Road and trail access to and thru some of the key wildlife habitat provides public use and enjoyment of both the wildlife and fishery resources.

Fire

Fire management on the Kenai Peninsula is significant to resource managers, but only recently has been recognized as a potent tool for land management. Land managers have the ability to control both wildlife and prescribed fires.

The new Forest Service National Fire Plan has provided for increases in initial wildfire attack capacity. Increased land use on Native and State selections in and adjacent to the National Forest will increase the risk of wildfire spreading to Forest lands. The B.L.M. will continue to assist the Forest Service and the Kenai National Moose Range in wildfire suppression.

On the Kenai, natural succession of vegetation toward a spruce climax forest are increasing the chances of large wildfires in the absence of fuel management. Emphasis on the use of prescribed natural fire (allowing wildfires to burn within a limited area) or prescribed burning as a management tool is increasing. The first prescribed burning for wildlife habitat purposes on National Forest lands in Alaska were conducted here in 1976, as part of a study (described later).

The Kenai has a history of large wildfires. Evidence of past wildfires can be seen in the forest communities today. Virtually no upland situation below timberline seems to have escaped fire at some time in the past. Climatic conditions and the nature of the forest on the Kenai Peninsula favor extensive spread of fires if suppression efforts and fuel management programs are not initiated. High fire dangers are experienced throughout the summer months.

The trend of fire occurrence shows that for the period 1970 through 1974 there were 91 fires, compared to 24 fires for the period of 1965 through 1969; an increase of 280%. The 91 fires burned 153 acres and suppression costs were $387,000.

Timber

The forests of the Kenai Peninsula include Sitka spruce, white spruce, black spruce, mountain hemlock, paper birch, quaking aspen and black cottonwood. White spruce and cottonwood dominate the

valley bottoms over most of the area. Mixed stands of Sitka spruce and hemlock are predominant where a marine climate is experienced near Seward and adjacent to Turnagain Arm.

Commercial forest land covers about 100,000 acres. Only about 9,000 acres of this is potentially available for harvest without special restrictions. Approximately two-thirds of the commercial forest land is overmature, decadent and uneven-aged. The remainder of the commercial forest land supports young, even-aged stands which have followed fires during the past seventy-five years. These young stands, in varying stages of plant succession, are dominated by paper birch. Normal plant succession is toward a spruce-hemlock forest climax.

Generally tree size and volume per acre are lower than on the remainder of the Forest. White spruce stands average 10-15,000 board feet/acre while the better Sitka spruce and black cottonwood stands average 20-25,000 board feet/acre.

Timber harvest has mainly been limited to small timber operators who log the better stands of spruce near the highway system. Past sales have typically averaged less than 1 million board feet per year. The nearest major mill at Seward is presently closed and future markets are in doubt.

Soils

The major portion of this unit consists of high rugged mountains separated by narrow glaciated alluvial valleys. These valleys have typical glaciated U-shapes, contain glacial and alluvial deposits and often several lakes.

The Twenty Mile, Placer, Snow and Resurrection Rivers drain large ice fields and are subject to high water and frequent deposits of alluvial materials. This results in braided streams and frequent channel changes.

The northwest corner of the unit contains a portion of the Chickaloon Flats. This is a broad expanse of tidal marshes, through which flow meandering channels intermingled with deposits of silt and organic matter. Similar type areas are found at the head of Turnagain Arm. In general, limited soils work has been done and only broad groupings can be discussed. These include:

1. High mountains Shallow very fragmental mineral and shallow, dark reddish-brown organic are the two major soil types. They are generally less than 20 inches deep and are interspersed with rock outcrops.

2. Steep side slopes Many of these areas are subject to rock and snow slides. In general, soils are less than 20 inches deep and are very gravelly. There are many outcrops of bedrock and rock cliffs.

3. Low slopes Here both glacial and colluvial deposits occur. Many have been partially sorted by water. Soils typically are very gravelly and are less than 30 inches in depth. Areas of highly thixotropic silty soils have been reported (Juneau Creek watershed). Organic soils up to 10 feet in depth are found in swampy areas and depressions.

4. Narrow and broad river and stream flood plains These are variable depending upon source of deposited material, age since deposition, stream size, gradient and other factors. Soils adjacent to streams and subject to frequent flooding have a few inches of soil over coarse to fine materials. This is a very unstable location for soil development and areas are being constantly rejuvenated by frequent deposition and removal of material. Higher areas, which are more stable, show more soil development. Textures vary from clay to sand with depths generally less than 30 inches. Areas of mucky organic soils occur.

5. Saltwater flats These consist of heavy deposits of sedge peat and silt and are several feet in depth. They are subject to frequent saltwater inundation.

Transportation

The Kenai area contains the largest concentration of roads and trails on the Forest. Within the Forest boundary there are 107 miles of paved highways which form part of the link between Anchorage and the major population centers of the Kenai Peninsula. There are also an additional 81 miles of gravel roads, including campground loops, within the National Forest portion of this unit.

There is a total of 145 miles of existing trails of which 105 miles are considered to be in adequate condition. These trails vary in length from short nature trails to thirty-eight miles for the Resurrection Pass Trail.

In addition to the commercial airports at Seward, Kenai, Soldotna and Homer there are small airstrips located at Lawing, Quartz Creek, Hope and along the pipeline route near Chickaloon Flats. Floatplane air taxi service is available at Cooper Landing, Moose Pass and Seward to provide access to the many lakes of the unit.

The Alaska Railroad operates a line through Placer Valley, Trail Creek, Moose Pass, Snow River and on to Seward. Once the alpine is reached, cross country hiking for great distances is possible.

Roadless and Wilderness Resources

The roadless character of the area and sites treated will not be altered by the proposal. No roads will be built. No ground vehicles will be used off of existing highways, roads, and trails.

No significant earth moving will occur. Handline construction will disturb small areas of soil in a linear fashion.

Access will be improved a little by the clearing of handlines to contain the burns. These, however, will be short-lived as the lines will grow in with shrubs and trees very rapidly.

After extensive literature review and stury, Lutz (1960) concluded that "it is likely that forest fires have occurred on the Kenai ever since there were forests." The earliest written account of fire there found by Lutz was in 1851. Therefore, it appears that the wilderness character of the roadless areas on the Kenai was shaped to some extent by fire. Past and present management requires that all wildfires be suppressed on the Kenai including the roadless areas. At present the only option immediately available to re-introduce fire into the roadless areas with wilderness character is through prescribed burning such as is proposed in this Program. This Program will not adversely affect or change the wilderness character of the roadless areas where some of the burns are proposed. Prescribed burning may actually enhance wilderness character through simulation of natural conditions.

Minerals

The Kenai Peninsula has a history of gold mining dating from the 1800's. Mining was primarily for placer deposits in the valley bottoms. Although a number of hard rock lode mines were developed, none of them produced significant amounts of gold. Virtually all gold mining on the Kenai Peninsula shut down by 1941. Many claims have been maintained on the books with proof of labor filed. Over 150 active claims exist on the unit and a number of new claims are staked each year.

Land Occupancy

Land occupancies within this unit are many and varied. Besides those uses of a recreational nature, there have been many special use permits issued for homesites, transmission lines, power stations, radio and television towers, pack stations, dams and weirs, air strips, borrow pits, sanitary land fills, cemeteries and various other community service facilities.

There are also scattered parcels of patented tracts, most of which are located along the highways or the railroad tracks.

Land ownership

Under the provisions of the Statehood Act, a total of 4,147 acres of National Forest Lands within this unit have been selected to date by the State. These tracts surround the communities of Cooper Landing, Moose Pass and Hope. None of the prescribed burn sites are located within the selections.

There are also groups of patented homesites and homesteads at Lakeview, Primrose Landing, Tern Lake, Upper Trail Lake and Snow River in addition to small, scattered tracts in the vicinity of Kenai Lake.

It is uncertain at this time what the total affect of the Alaska Native Claims Settlement Act will have on this unit. Some historical or archeological sites selection have been made under the act.

Archeological and Historic Sites

Most of the scattered sites are the result of past settlements and activities of native, Russian, and early American settlement. They are of interest to archeologists, historians, and to the general public as well. Most of the sites discovered so far have to do with mining activities that took place around the turn of the century.

Appendix 13 lists the known sites on the National Register of Historic Places (two each) and Alaska Heritage Resource Survey (12 each). These were obtained by consultation with the State Historic Preservation Officer and his office files in Anchorage, Alaska, with the assistance of Douglas Reger, in May 1977. A copy of the SHPO letter is shown as Appendix 14.

No sites listed are in any of the proposed burn units.

A professional archaeologist with the Alaska Region, U.S. Forest Service (Gerry Clark), has been consulted by phone, in writing, and has surveyed sites in the field for any historical/archaeological significance/relics, remains, etc. An archaeologist is presently assigned to the Chugach National Forest (John Mattson) and will be consulted and involved in all burn site planning in the office and field before any burns are approved or conducted. Ground surveys of all sites will be conducted by the archaeologist as he sees fit for each site during the planning phase.

Proposal Background

Purpose

All indications are that the primary factor limiting moose populations on the Kenai is food quantity, quality, and availability.

The purpose of the proposal is to improve the existing forested moose habitat to increase the carrying capacity (population) for moose. The tall growth form of the present forest cover on the sites will be reduced to a low growth form (early successional stage). The lower growth form of the food species (willow, birch, aspen etc.) will thus be available for use by moose (below 7 feet). In addition, the younger lower growth forms of sprouts and seedlings will have much higher nutritive quality and quantity of the small succulent stems per acre.

Social, Economic, and Environmental Objectives

The social objective of the proposal is to produce more moose on the same land for public use. The public use may be consumptive (i.e. hunting), or non-consumptive (i.e. viewing, photography etc.). The Alaska Fish and Game Department will manage the herd itself for appropriate objectives of use.

There are no direct economic objectives for the proposal.

The calculated cost of the Program in 1977 dollars is estimated to be about $250,000 ($11.50/acre).

Economic benefits that are very difficult to measure are: enhanced recreation benefits, increased hunter and tourist expenditures, the value of having more moose living in the area, and others.

The environmental objective of the proposal is to enhance the productivity of the forest from its present low level to a higher level of moose producing and carrying capacity. (See also Favorable Impacts - Wildlife - Moose).

One calculation that is relatively easy to make for benefit is the meat value of a moose. About 2200 additional bull moose 1-6 years in age would be available for harvest over 25 years. The value of meat alone is about $1,000,000 in 1977 supermarket packaged beef values. This calculation is made for illustration and should not be construed as favoring consumptive uses and values, over non-consumptive uses and values. In fact, many more cows and calves would be available for non-consumptive uses than bulls for consumptive uses as a result of the Program (Fig. 21). Cows and calves may also be available for consumptive use.

Demand or Urgency of Need

To some people producing more moose or any wildlife form is not urgent. However, people in general have a need for natural aesthetic experiences as much as they need food, water and shelter. More moose will satisfy wildlife experience needs as well as subsistence needs for many people. Wildlife populations, and moose in particuliar have or are reaching their maximum ability to provide for peoples' needs in Alaska. The moose productivity of much of Alaska's land has remained the same or declined while human populations and use of moose have increased dramatically in recent years. Because of their large size, behavior, and palatability they are much in demand by consumptive as well as non-consumptive users.

Moose range deterioration has been formally recognized on the Kenai portion of the Forest since at least 1940 (Edwards, 1940). No significant remedies have been planned or executed to date. We believe that remedial action is long overdue in 1976.

Origin of the Proposal

Historical One of the earliest reports on moose range problems on the Kenai was by Edwards (1940). He reported range deterioration due primarily to moose numbers exceeding the range's carrying capacity. He also observed that:

It is significant that over most of this country the growth of browse species is largely confined to the limits of an old burned-off area. Estimates as to the date of the fire made from observations of plant growth would place it at about fifty years ago. It was reported that the bulk of the country now frequented by moose has been previously burned over. Fire removes the dense stand of spruce and permits the development of the deciduous species. A dense stand of spruce reproduction is now encroaching upon the mixed stand of aspen, willow and birch and rapidly replacing these more valuable species.

Lucas (1932) observed that "Native tradition indicates that the western Kenai country was quite extensively burned over and that moose appeared shortly thereafter."

Dufresne (1946) regarded 1883 as the year of the fire following which moose (said to have been practically unknown up to that time) appeared.

Lutz (1940) provides a detailed literature review which historically links moose and wildfires.

Lutz (1940) concluded that "it is likely that forest fires have occurred on the Kenai Peninsula ever since there have been forests."

Effective wildfire suppression by man in the area did not occur until the 1950's and 1960's. It is not merely a coincidence that good moose ranges have been disappearing and no new ones have been created, during this period of effective wildfire suppression. Good moose populations are linked to early successional stages of vegetation (Spencer and Chatelain, 1953, Leopold and Darling, 1953, Viereck 1973, and Le Resche et al. 1974). In southcentral Alaska the only force creating early successional stages over large areas has been wildfire.

Present Forest Service Land Management Direction Generally the direction at all levels is to produce maximum sustained yields of resources consistent with the needs of other resources affected.

The Forest and Rangeland Renewable Resources Planning Act required that the Forest Service (and other agencies) develop long range resource goals and direction. Specifically the Forest Service's recommended program developed under this act focuses on three areas one of which is that: "Efforts on behalf of wildlife and fish, land and water stewardship, and human and community development would be accelerated."

The Sikes Act of 1974 directed the Forest Service to develop cooperative wildlife habitat improvement plans with the state game and fish departments. It will provide funds to finance such projects. The Chugach Moose-Fire Management Program is such a plan.

The Chugach National Forest Land Use Plan specifically directs that the Forest seek ways to use prescribed fire for land improvement projects such as silviculture, wildfire hazard reduction and wildlife habitat. (Sect. 170.3 p. C - 16.3) Other guidance provided by the Chugach Land Use Plan and Alaska Region Program Emphasis that pertains to the proposal follows:

Ch. 111.2.

Man caused deterioration of noise and air quality will be kept within ambient established Federal and State standards. Emphasis will be directed toward maintaining noise and air quality at present or lower levels.

. . . air quality will not be degraded more than temporarily by the proposal.

Ch. 117.3, Item 2.
Place emphasis on habitat improvement where demand is shown.

. . . the proposal will improve a large amount of habitat in a high demand area.

Ch. 117.3, Item 5.
Management of key habitat sites along highways on the Kenai and CRD will be directed toward wildlife photography and viewing.

. . . the proposal will provide more moose for such use on the Kenai.

Ch. 170.1, Item 7.
The need for the use of fire in maintaining existing range or creating new moose range areas will increase on the Kenai Peninsula.

. . . this proposal will increase or improve such range.

Ch. 170.1, Item 8.
More studies and research will be needed to determine the effects of fire on soil fertility, stability and tree regeneration.

. . . development of this proposal has added to our knowledge of these factors.

Ch. 170.3, Items 2. and 3.
Identify areas of wildfire potential and plan fuel management accordingly.

Seek ways to use prescribed fire for land improvement projects such as silviculture, hazard reduction and wildlife habitat.

. . . this long range proposal will contribute to these goals.

Ch. 211, Item 28.
Design habitat improvement and use projects to avoid adverse impacts upon aesthetic and other resource values.

. . . this proposal has been designed to avoid such impacts as much as feasible.

Ch. 211, Item 51.
Consider effects on fishery habitat of all operations adjacent to bodies of water.

. . . this factor was considered, and the impact will be negligible if not beneficial.

Ch. 324, Item 8.
Evaluate proposals for habitat improvements which may create an impact on tree regeneration.

. . . the proposal does not significantly impact commercial timber regeneration or the commercial timber base.

Ch. 354, Item 8.
Maintain a natural appearance which protects or enhances aesthetic and recreation values.

. . . the frequent natural boundaries of the sites will protect or enhance such values thru added vegetative and forest opening variety.

Ch. 354, Item 12.
Evaluate traffic before habitat improvement measures are attempted close to high speed roads.

. . . traffic has been evaluated and some increased collisions may occur. Mitigation measures will reduce this problem. (See Adverse Impacts - Transportation)

Ch. 354, Item 13.
Avoid adverse aesthetic impacts in habitat improvement projects.

. . . few aesthetic values will be impacted adversely due to the natural boundaries and treatments prescribed. Some adverse impacts will be unavoidable.

Ch. 354, Item 18.
Incorporate landscape management considerations into the design, location, alignment, and appearance of all roads, trails and other improvements.

. . . two Forest Landscape Architects have been consulted and their concerns and suggestions incorporated where feasible.

Kenai Unit, Area A-9, Item 2/c-59.
Traffic considerations will be carefully evaluated before habitat improvement measures are attempted close to high speed roads.

. . . traffic considerations were carefully evaluated. Some adverse impacts are expected but mitigation measures will reduce or eliminate them.

Kenai Unit, Area A-11, Item 1/c-64.
Allow no developments that will adversely affect Mineral licks or the animals using them.

. . . the sites are not near the licks in Quartz Creek. Such prescribed fire treatment would not adversely affect the sites if nearby.

The following are quoted from the U.S.F.S. Alaska Region Program Emphasis FY-77.

In coordination with other program activities, implement prescribed burning as a land management tool in natural and activity fuels.

Begin identification of areas which should be planned for fire prescriptions.

. . . this study will facilitate accomplishing these emphasis goals.

State and Local Jurisdictional Controls The Program will be coordinated within the jurisdictional areas of the Kenai Peninsula Borough, the Cook Inlet Air Resources Management District and the Alaska Department of Fish and Game. The Program will comply with the Air District's open burning regulations for 1.) prior notification of the District of burning to be done, and 2.) no burning on days forecast by the weather services to be poor for smoke dispersal. Smoke dispersal will be a lesser consideration for burns in more remote areas.

The Alaska Department of Fish and Game will be instrumental in assuring appropriate law enforcement and harvest regulations to allow the moose herd to grow as a result of the Program.

Cooperation and coordination will be accomplished with all jurisdictions.

Moose-Fire Ecology Moose Habitat Requirements-Cover such as brush, forests or terrain is important to moose primarily for escape or concealment from man or predators. Cover is more than adequate on the Kenai. The same cover generally provides for the seclusion needs of moose. Water supplies too are more than ample here.

We believe that the factor limiting moose on the Kenai is lack of food... quantity, quality, and availability. Table 3 shows some of the results of the Quartz-Kenai Prescribed burn Study begun in 1975 for two important browse species.

The species of greatest importance are Kenai paper birch (Betula papyrifera kenaica), willow (Salix alaxensis, Salix scouleriana, Salix bebbiana) and quaking aspen (Populus tremuloides).

Table 3 - Browse plant densities and heights from two sites on the west shore of Kenai Lake.

	Mature Spruce Forest (late successional stage)		1959 wildfire (early successional stage)	
	plants/acre	ave. height ft.	plants/acre	ave. height ft.
willow	0	0	312.	2.4
birch	55	30	5062	3.1
both	55	30	5374	2.8

This sample shows 100 times as many browse plants on the burned area as on the unburned area. Furthermore, all of the browse is available (below 7 ft.) in the burn and none is available in the mature forest. Fire does not always produce such dramatic results but this example is illustrative.

Burning increases protein and phosphorus content and digestability of shrub tissues thru elimination or reduction of shading and competition (Dewitt and Derby 1955, Schaefer 1965, Hanson and Smith 1970, Lay 1957, Halls and Epps 1969). Potash content is also known to increase (Komarek, 1976). The willow and birch browse plants on the Kenai are generally decadent from perennial over use and old age. The quantity and quality of browse from such plants is lowered as a result (Spencer and Chatelain 1953).

Role of Fire in Nature - That fire plays such an important part in the ecology of moose in southcentral Alaska should come as no surprise. All over the U. S. prescribed fire is being used to duplicate the effects once obtained thru natural wildfire for managing specific plants or animals. Examples are the use of prescribed or prescribed natural fire in Sequoia, Kings Canyon, Everglades, Shenandoah, Grand Teton and Yosemite National Parks and in the Nez Perce, Clearwater, St. Joe, Gallatin and most other National Forests. Benefits are derived for plants, animals, people and industries. Volumes of periodicals contain thousands of such examples.

Simply outlined, fire accomplishes the following in moose habitat:

1. Reduces older vegetational stages or climaxes to early successional stages thru:
    a. forest canopy removal by killing
    b. seedbed/soil preparation/scarification
    c. inducing new crops of young productive browse plants or sprouts.

2. Recycles nutrients from the older or decadent vegetation's stems and trunks into the soil and back into young plants or sprouts very quickly thru reduction to ashes.

3. Allows the growing branches or sprouts of shrubs and trees to be available to moose.

Nearly 90 percent of the winter forage in the region grows out of reach within a few years if not browsed adequately or treated by fire or other techniques. (Spencer and Chatelain 1953).

Moose are very mobile in locating and utilizing forage sources. They moved into the 1959 Kenai Lake wildfire area from miles around to use the profuse birch and willow browse growing there. Burns on the Chugach National Forest could influence moose movements on the Kenai National Moose Range and vice versa. That these movements would involve large numbers of moose is doubtful.

Wildfires' Effects on the Kenai National Moose Range Probably the best documented account of the relationship of moose populations and fire on the Kenai Peninsula was written by Spencer and Hakala (1969). Figure 17 is taken from Spencer and Hakala's paper and illustrates the response of the moose population on the Kenai National Moose Range to periods of wildfire occurrence as well as specific fires.

Specific findings of Spencer and Hakala's study which were instrumental in developing and designing this proposal are:

1. Vegetation following burning is largely determined by the vegetation there before the burn.

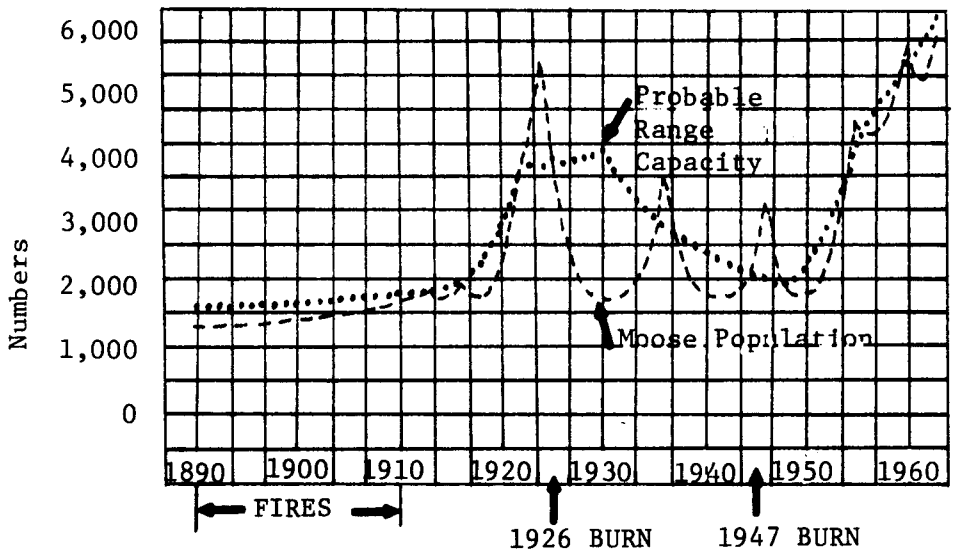
2. Heavy browse growth after fires is reached in about 7 years and reaches maximum in about 15 years.

3. Moose populations begin increasing due to fire effects about 5 years after fire.

4. After burns the favorable forage conditions last from 5-20 years and perhaps longer under favorable conditions.

5. Forest fires in the boreal forest have generally been beneficial to moose.

Figure 17 - Estimated population and probable range capacity 1890-1960 (for moose on the Kenai National Moose Range from Spencer and Hakala, 1964)



Development of the Proposal

Review by Agencies and Resource Specialists

In October 1975, an outline and brief description of the methodology to be used in developing the plan was sent to many agencies for review and input. The proposal was discussed with many individual professional resource specialists. Comments and suggestions received were incorporated where reasonable. See Section VII, Consultation with Others.

Range Treatment Technique Studies

Studies of range improvement techniques begun in the mid 1960's by the Forest Service examined roller-dozer crushing, and herbicide treatment to kill older vegetation and release browse growth. Recent analysis of accumulated data and literature showed that neither technique appears to be feasible for range treatment in the Kenai Mountains (Culbertson, 1975, Culbertson, 1976, Lyons and Mueggler 1968). (See also Section VI Alternatives to the Proposed Action). Consequently prescribed burning has become the only opportunity worth developing.

The Quartz-Kenai prescribed Burn Study was begun by the Chugach National Forest in 1975, to study the effects of past fires and refine techniques for use of prescribed burning. A total of 10 acres have been burned at three sites. Some results obtained thus far are:

1. Browse increased by a factor of 100 times after the 1959 Kenai Lake Fire.

2. Prescribed burning on low or wet sites with abundant grass and forb growths should be done after snow leaves in the spring but before summer green up.

3. Prescribed burning had very little effect on soils. Temperature measurements made during the prescribed burns showed that while temperatures reached 400° to 600° F. at the surface organic horizon (leaf litter) they were less than 100° F. at the litter-soil interface.

4. Weather and climate will be major factors affecting the success of prescribed burning.

Definition of Priorities and Restrictions

Priorities The following factors were mapped and assessed to determine where the highest priority areas were for prescribed burning: moose winter ranges, access, timber land classification, vicinity ownership and snowfall patterns. Because climate, vegetation, and burn results are all interrelated, the generalized ecological zones shown in Figure 18 were drawn to assist in evaluating potential sites. A brief description follows:

ecological zone/name	climate	vegetation	landform
1 interior	continental	white spruce-hardwood	mountains and old broad low alt. valleys.
2 glacier	glacier-icefield influenced continental	spruce cottonwood	glaciers, icefields in mountains, younger glacial valleys.
3 coastal	marine	sitka spruce hemlock	coastal mts. and valleys

The potential for fire use for moose habitat improvement in each of these zones is very different as follows:

ecological zone	fire use potential
interior	high
glacier	low or none
marine	low or none

The priorities as used in this proposal by area are shown in Table 2.

Snowfall depth patterns showed a snow "shadow" in the Juneau-Cooper-Quartz-Moose Pass Kenai Lake area (interior zone) and much greater depths in the Turnagain-Snow River-Seward area (glacier and marine zones).

Restrictions All the following were mapped on a set of one-inch topographic maps. Most of these were purposely avoided to prevent conflicts:

buildings	mines
businesses	lakes
towns	streams
recreation sites	recreation withdrawals
highways	private land
trails	gravel withdrawals (RR)
powerlines	timber resources
pipelines	caribou ranges
tele-communication site	some outstanding visual features

Developments or other potential conflicts not detected in this level of site planning will be detected when the on the ground site prescribed burn plans are written.

Range Capability Analysis

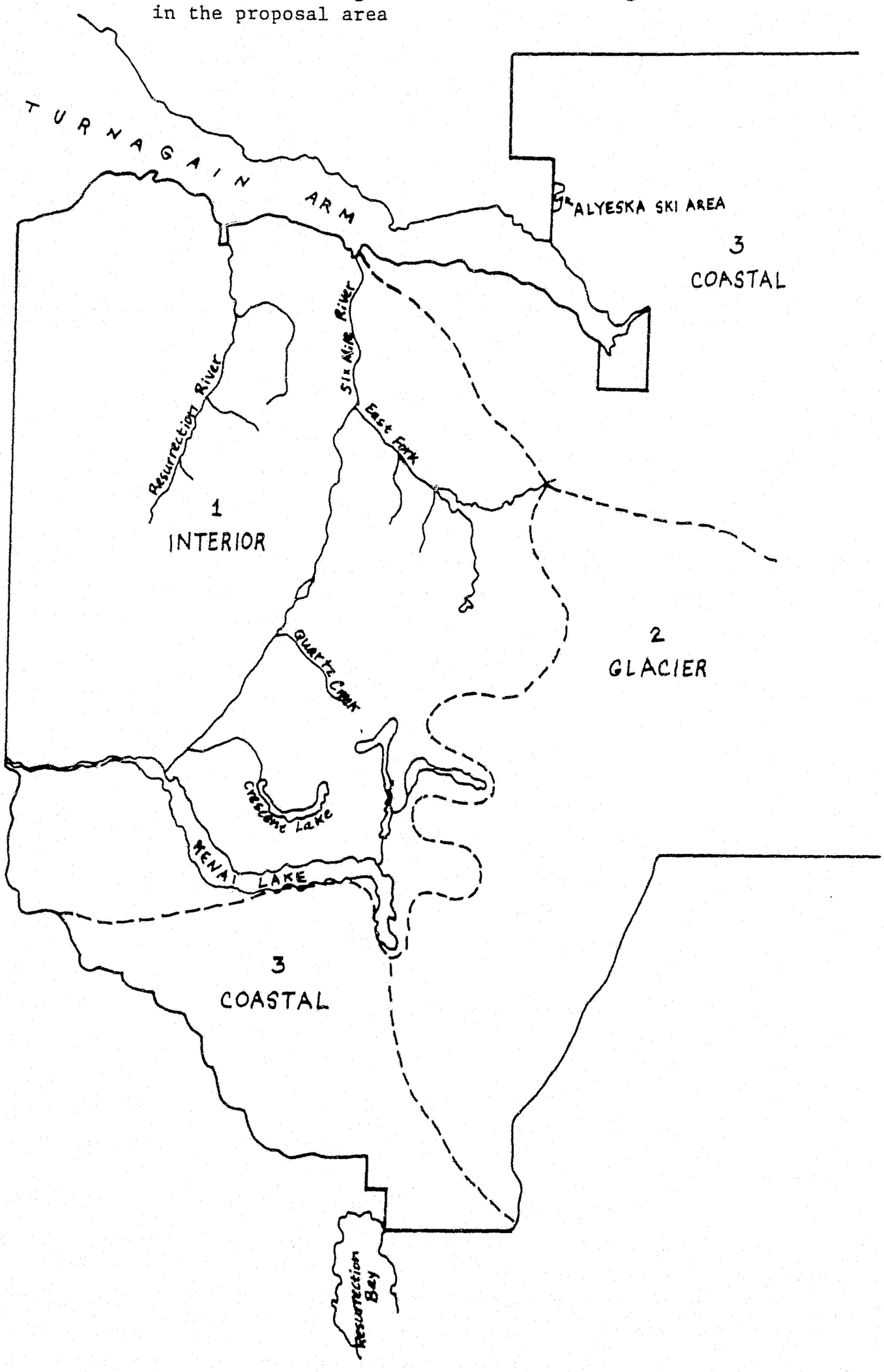
This step analyzed condition, availability, and suitability of ranges for treatment by prescribed burning.

Moose Production and Population Measures These indicate the productivity of the ranges as reflected by measures of the moose population itself and its use by hunters. Three Alaska Fish and Game Department data sources were used here for the 1965-74 period: moose harvests, hunter numbers, and air surveys (Tables 4, 5 and 6). The limitations of these data are recognized such as error, poaching effects, weather, terrain, and observer and observability differences between areas. They were used only as indications of general patterns.

Table 4 - Average number of hunters and moose harvests for subunits of Game Management Unit 7 for the 1965 - 74 period.

Subunit	Hunters	Hunters/mi ^{2}	Rank
01	36	0.08	3
02	62	0.13	2
03	106	0.15	1
04	42	0.13	2

Figure 18 - Generalized ecological zones (climate-vegetation-landform) in the proposal area



Subunit	Moose Harvest	Harvest/mi^2	Rank
01	15	.03	3
02	22	.05	2
03	70	.10	1
04	16	.05	2

*

Generally Table 4 shows that hunter numbers and moose harvest have been greatest in the western third of the proposal area, less in the middle third, and least in the eastern third.

* 01 = 20 mi R., 02 = 6 mi - Quartz-Johnson-Trail Cr., 03 = Cooper-Kenai L.-Resurrection R., 04 = Seward-Snow-Trail R.

Table 5 -Total moose hunters, harvest, and success for Game Management Unit 7.

Year	Hunters	Harvest	Success %
1965		No data	
1966	445	113	25.4
1967	414	124	30.0
1968	481	164	34.0
1969	561	179	32.2
1970	520	180	34.7
1971	563	119	30.0
1972	780	176	22.6
1973	779	157	20.6
1974	492	64	13.0
1975	462	66	14.3

Table 6 - Air observations of moose numbers in composition count areas of Game Management Unit 7 for the 1961 - 74 period

Area	Ave. No. Moose	Moose/mi^2
1	52	0.68
2	18	1.05
3	31	0.44
4	46	1.00
5	111	1.66
6	104	2.21
7	12	2.00
8	17	0.52
9	82	1.28
10	280	3.11
11	24	2.00
12	214	5.94
13	113	5.38
14	68	2.96
15	104	1.00
16	41	1.58
17	33	2.54
18	46	1.00
20N & - S	135	3.21
21	96	4.00

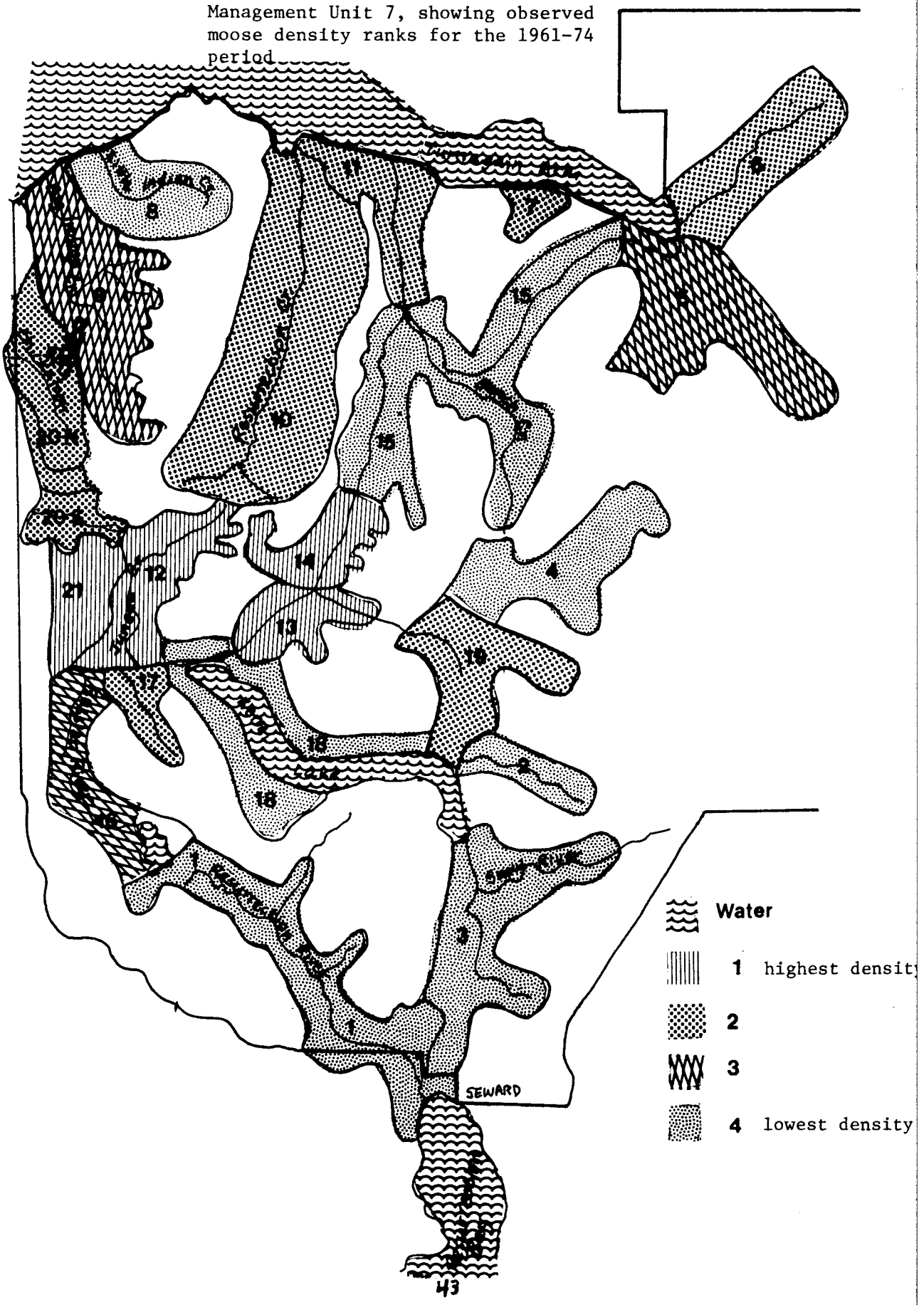
Figure 19 illustrates the data of Table 6. Generally higher observed moose densities for the 1964 -74 period were in the central and western portions of the proposal area (the interior ecological zone).

Range Condition Twelve Forest Service and Alaska Fish and Game Department Cole browse transects were established and read in Unit 7 during the 1962-72 period in the following areas: Six Mile Creek, Juneau Creek, Portage Valley, Ptarmigan Creek, Quartz Creek, Snow River and Twenty Mile River.

Generally the readings confirmed what bilolgists knew already . . . . . the Kenai ranges have deteriorated to decadence and low productivity. The average form class was 2 to 3 or moderately to severely hedged, the age class was mature to decadent, and leader (new stems) use usually approached or exceeded 50%.

Observation of browse plants in general in the proposal area shows severe hedging of nearly every available browse plant. Close examination frequently reveals that seemingly live heavily hedged browse plants or sprouts are really dead. The only extensive

Figure 19 - Moose composition count areas, Game Management Unit 7, showing observed moose density ranks for the 1961-74 period



highly productive moose winter range below tree line known is about 3000 acres in the 1959 burn area west of Kenai Lake. Low growth willow forms and dwarf birch (Betula glandulosa) do provide some moose winter ranges at or near tree line but offer no known potential for management.

The present moose range problems on the Kenai were predicted by Spencer and Hakala (1964), Spencer and Chatelain (1953), and Leopold and Darling (1953).

Color Air Photo Interpretation Potential sites were outlined on 4"/mile color positive air photo series taken in 1974, while close coordination with the restriction maps was maintained. This close coordination prevented layout of burn sites where other uses were already present or would be damaged. The air photos were searched stereoscopically for adequate boundaries to hold prescribed burning. A difficulty of treatment code was assigned, the acreage was measured, and a serial number was assigned each site. Black spruce Bogs were avoided as they are unsuitable sites (Viereck, 1973).

Field Checks Most sites were checked on the ground, or from a helicopter to assure that appropriate browse species, were present for successful post-burn results. Fuel and firebreaks were verified and analyzed by the Forest Fire Management Officer. Accuracy of airphoto observations was also checked. Aerial oblique color slides of most sites were taken and catalogued for future reference. Many potential units were eliminated due to conflicts with other uses or low suitability. Others were added as a result of field work.

Annual Range Improvement Goals Development

The total 21,699 acres inventoried was roughly divided into two initial years annual acreage goals of 500 and 1000 acres for 1977 and 1978. Then the remaining 20,000 acres was divided over the next eight years for the 10 year Program. (Table 1).

Next the sites were mapped and labeled according to the proposed year of treatment using the following guides:

1. Largest units delayed (until more local experience is gained).

2. Remote clusters of sites scheduled together to be done concurrently.

3. Low risk sites to be done first, higher risk delayed

4. Lower drainages to be done before upper drainages.

5. Adjacent sites were scheduled to be treated several years apart.

Evaluation of Results

Photo points and available browse density plots will be emplaced and marked with steel and a map for each burn unit. The photo points and plot readings will be re-done at 5 year intervals beginning just before the burn and continuing for 20 years.

Interrelationship with Other Projects

There are two other programs in the proposal area that potentially affect relatively large acreages.

Forest Wildfire Suppression

This program is very effective at limiting wildfires to small sizes. It has had obvious beneficial effects. However, one adverse effect since its inception decades ago has been to allow the forests to age and mature to the point where the present proposal has become necessary for rehabilitation of moose forage habitat.

Timber Management

This program affects more acres at present than any other except wildfire suppression. Annual harvest has averaged less than one million board feet or about 100 acres affected annually. This proposal has no significant effect on the commercial timber base. (See Section II Environmental Impacts, Adverse, Timber).

Less than 10% of the total forest land in the proposal area would be affected in combination over the next 10 years. All of these will be regenerating to new conifers, hardwoods, and other vegetation within a few years of harvest or burning (See Section II Environmental Impacts, Favorable, Vegetation). The accumlative effect of the two programs is not significant.

II ENVIRONMENTAL IMPACTS

Although the proposal is generally considered of local importance, the road system through the area is used significantly by visitors from outside Alaska and could be considered to have State or National significance. The area involved is inside the proposed Seward National Recreation Area (1977 Senate Bill) which would focus national interest on this area if passed by Congress.

Viereck (1973) has written an excellent paper describing the impacts of wildfires on vegetation, wildlife, soils and water, and recreation in the Alaska Taiga Zone of most of interior Alaska.

The proposal area is a part of this zone. Two differences between wildfires and prescribed burning are in the effects on vegetation and soils. Wildfires would be larger, more lethal to more vegetation and soil damage, if any, would be more notable than for prescribed burning.

Some differences also are apparent between the Taiga of interior Alaska and that of the Kenai. The Kenai's winters are not usually so severe nor are such extremely low or high temperatures encountered as in the interior. Also, permafrost is not known on the Kenai as it is in the interior.

Little could be gained by describing in different words what Viereck, an experienced plant ecologist, has already written and summarized so well. Therefore he will be cited frequently in the following passages on environmental impacts.

Favorable Impacts

Natural Environment

Vegetation Whether prescribed burning will favorably or adversely impact vegetation largely is a matter of personal point of view, philosophy, and goals. Burning will adversely impact the present stands by largely destroying them above ground, along with whatever present social or aesthetic values they now possess. However, the resulting generation of vegetation will be favorably impacted. Is it a favorable impact that one generation (of whatever organism) dies so that another might have space in which to live and grow? If the goal is to eliminate overstory vegetation to favor younger growth (as in the proposal) then the impact of burning on the vegetation (and moose in this case) is favorable, Viereck describes the ecological effects of fires on vegetation:

> 1. Dry sites. On dry sites such as southfacing slopes or coarse river alluvium, the usual forest vegetation is white spruce, paper birch, aspen, balsam poplar, or some combination of these species. Depending upon the severity of the fire, the usual succession is reinvasion by light seeded species such as Epilobium and willow shrubs, especially Salix scouleriana and S. bebbiana, and an almost immediate replacement by tree species. Both aspen and birch will regenerate from the original trees by sprouting or root suckers. The herbaceous or shrub stages last only until they are overtopped by the tree species. If a seed source is available, white spruce will also invade within a year or two of the fire, as is evidenced by many even-aged spruce stands. However, in most extensive fires seed is not available; also, white spruce may produce abundant seeds only once in 12y. Aspen and birch stands dominate

most of the south-facing uplands in the interior of Alaska. Aspen occurs on the driest, warmest sites. These are generally south-southwest facing slopes (Lutz and Caporaso, 1958; Gregory and Haack, 1965). Balsam poplar and black cottonwood also occur on these sites, but they are primarily found adjacent to rivers (Hutchison, 1967: Viereck, 1970). The paper birch type occurs on cool, moist east- and west-facing slopes (Gregory and Haack, 1965).

Eventually these stands are replaced by black or white spruce, but the process is usually a slow one. Spruce seed is often limited, distribution is not great over large areas, and seedbed conditions are not optimal for spruce regeneration. Also, Gregory (1966) shows that it is difficult for seedlings to become established because of the smothering effect of the birch litter. On south-facing slopes, aspen is gradually replaced by white spruce- few aspen stands are over 100 yr old, and these usually have an understory of white spruce. Paper birch is replaced by either black spruce or white spruce. Mixed stands of birch and spruce of up to 150 yr. of age are common in the uplands.

Because of the frequency of fire in the uplands, what happens to the older spruce stands is not entirely known. Older white spruce stands exist only on the islands of floodplains where they are protected from fire by the river. Here, 350-year-old white spruce stands have been found. These river-bottom spruce stands may persist as a result of flooding that periodically eliminates the moss layer, preventing the development of permafrost (Viereck, 1970). Normally on the floodplain, the successional sequence is from white spruce to black spruce and bog as permafrost develops in the spruce stands (Drury, 1956; Viereck, 1970). It has been suggested that, even on the upland, old white spruce stands may be replaced by black spruce and bog. Wilde and Krause (1960) have stated "The poor regeneration of white spruce on these moss-covered soils cast doubt on the climax nature of this species in the subarctic environment. A wide opening in the canopy is likely to cause invasion by Sphagnum spp. and black spruce, an association which would preclude the regeneration of white spruce." This is in contrast to more southerly areas of the boreal forest, where it is considered that white spruce would be the prevailing vegetation if it were not for repeated forest fires (Raup and Denny, 1950, Rowe, 1971).

Occasionally, where black spruce stands have developed on coarse alluvium or outwash, or on thin rocky soils, a severe fire may result in the replacement of black spruce stands by aspen that are established as seedlings or by root suckers. Often in these stands, black spruce may reseed at the same

time as aspen, but because of the rapid growth of aspen and the slow growth of black spruce, these stands develop into dense aspen stands with a low understory of black spruce. Thus, black spruce may occur on these temporarily dry sites, but with the development of the black spruce and moss and an impervious frozen layer, these sites will revert to more mesic conditions.

Most of the proposed sites are of the Dry Site type described by Viereck.

2. Wet sites. The forest succession on wet sites, poorly drained sites, and permafrost sites follows a somewhat different sequence. These sites, occupied primarily by black spruce stands, muskegs, and bogs are the most widespread in Alaska and are the most frequently burned.
Because of the semiserotinous cones on the black spruce, tremendous quantities of spruce seed drop to the ground during the first and second summer after a fire. These quickly germinate and the pattern is that of rapid replacement of the black spruce type by another very dense black spruce stand.

The "wet sites" occur in the proposal only as inclusions with larger expanses of "dry sites". Therefore detailed discussion is not necessary.

Viereck continues:

Present Mosaic of Vegetation

The successional sequence described in the above section and the relative frequency of fires in the last 200 yr have resulted in a mosaic of vegetation in the interior of Alaska that is closely related to past fire history. Old fire boundaries are apparent when one scans the hillsides or studies aerial photographs. Nearly all the stands are less then 150 yr old, and most represent earlier stages of fire succession. Thus, paper birch and aspen cover large areas of the drier sites in the upland, whereas dense young stands of black spruce are common in poorly drained upland sites and in the lowlands. At present, these are no accurate figures as to the relative percentage of area covered by each of the major types within the taiga. According to Hutchison (1967), of the 43 million hectares of forest land within the taiga. 79% is of noncommercial forests, primarily black spruce and open white spruce stands near tree line. Of the area classified as commercial, which totals 10.5 million hectares, white spruce accounts for 57%: paper Birch, 23%: aspen, 11%: and balsam poplar and cottonwood, 9%.

Although the distribution and abundance of these types are related in some degree to chance following fire, much is owed to the autecology of the individual species, especially to their regenerative capabilities and their site requirements.

C. Autecological Relationships

The revegetation of a burn in the Alaskan taiga is related to two basic sets of variables. First, the site will set limitations on the plant community and thus the potential number of species available to colonize an area. Second, the success of the species to colonize an area is dependent upon its reproductive characteristics.

Reproduction of the tree species and associated shrubs and herbs is complex owing to the many controlling factors so we will consider seed and vegetative reproduction separately.

1. Seed reproduction. Obviously, seed supply is of basic importance. Where environmental conditions do not limit germination and seedling growth, it is the factor controlling this type of reproduction. The source can be either seed dispersed onto the burned seed bed or seed stored in the seed bed that is not burned nor rendered nonviable by the temperature created by the fire.

In the taiga of Alaska, information exists only for seed dispersed into the burn. Zasada (1971) summarizes the information for tree species. The most important aspects of his paper and the limited information available on other woody species are summarized below.

(a) Most wildfires occur during the months of June and July. This includes the time (mid-June) of ripening and dispersal of aspen and balsam poplar seed, but definitely before ripening of white spruce seed, and well before the occurrence of significant amounts of paper birch seed. Thus, immediately after a fire, a seed source for aspen and balsam poplar may exist on both living and dead trees within the burn and on trees in adjacent, unburned stands. White spruce and paper birch seed must come from living trees within the burn or stands adjacent to the burn. It is not likely that seeds in cones or catkins would mature after death of the parent tree by fire. Fires also occur prior to black spruce seed maturation. However, because of the semiserotinous cones of black spruce, there is always some seed available after the burn except in a few cases, where the burn is hot enough to destroy the cone and its seed. In central Alaska, in one heavily burned black

spruce stand with a density of 909 dead trees per hectare, based on the seed remaining in 16 trees, it was estimated that the residual seed numbered 8,200,000 per hectare. Germination of this seed for each tree ranged from 8.3 to 7.5% with an average of 41% for 6400 seed, which mean that there were approximately 3,400,000 viable seeds per hectare left on the trees following a heavy burn.

(b) The periodicity and quantity of seed crops vary significantly between hardwood and coniferous species. Birch, which depends heavily on seed as a means of reproduction (Gregory and Haack, 1965), produces vast quantities of viable seed at least once every 4 yr (Zasada and Gregory, 1972). Although no information is available for aspen and balsam poplar, the quantity and periodicity of seed crops appear similar to birch. The interval between good white spruce seed crops appears to be 10-12 yr. and the quantity of seed produced in these good seed years is 10-20% of that produced by birch (Zasada and Viereck, 1970). Periodicity of seed crops in black spruce is less important than in other species because some seed is always available in the semiserotinous cones: however, intervals between good crops are probably roughly the same as for white spruce. At present, no data exist on seed production in black spruce in Alaska.

Another factor to be considered in relation to fire and periodicity of seed crop in white spruce is that of a correlation between bad fire years and increased seed crop the following year. Zasada and Gregory (1969) show that one factor of importance in initiation of flower buds in white spruce is a warm, dry period in June and the first half of July. These same conditions also create high fire danger potential. For the brief period of record (1957-1971) of seed production, 1958 and 1970 were the best seed years, whereas 1957 and 1969 were the most destructive fire years. A similar correlation has been noted for Pinus sylvestris by Uggla (1958), who stated "There exists a tendency toward a coincidence of hot summers, good seed years, and years with many forest fires."

. . . . . .

(c) Tree seed dispersal in the taiga is accomplished primarily by wind; unknown and perhaps significant quantities are dispersed over snow and by water, mammals, and birds. Aspen and balsam poplar are dispersed the greatest distance, followed by paper birch, white spruce, and black spruce. The relationship of the number of seeds reaching a given location in a disturbed area and the quantity of seed produced is important and has been considered in detail for birch by Bjorkbom (1971).

Thus, the size and shape of the fire may be important factors in determining the invading tree species. Small burned areas could be colonized by white spruce dispersed from trees around the edge of the fire, whereas invasion of white spruce into large burned areas is an extremely slow process unless pockets of unburned white spruce remain within the burned areas. In a study in the Caribou-Poker Creeks Research Watershed near Fairbanks, Quirk and Sykes (1971) suggest that stringers of mature white spruce are less susceptible to fire than the surrounding successional stands and thus may remain as a seed source when the surrounding stands stands are burned. Effective dispersal distance for white spruce has been determined to be approximately two tree heights (45-60 m). Extensive fire areas are easily recolonized by black spruce from residual seed, and by aspen, balsam poplar, and birch from long-distance transport of seed and from vegetative reproduction. Although Rowe (1971) considers white spruce in Alaska to be a fire-adapted tree, it seems to have no reproductive behavior that is adapted to invasion of large burned areas.

Excluding the largest, the proposal sites average about 100 acres. This larger size should favor hardwoods (long range seeders) over spruce (short range seeders).

The above discussion considers only tree seed. No information is available concerning seed production, survival, dispersal, and mobility for shrub and herbaceous species.

Salix is one of the most important groups of shrubs to invade burned areas. Some Salix species, such as Salix alaxensis and S. scouleriana, produce ripe seed as early as the end of May, wheras others, such as Salix glauca, disperse ripe seed from late July until the end of August. Salix seed, as with aspen and balsam poplar, are viable only for a few weeks (USDA Forest Service, 1948). Therefore, the time of burn may be important in determining which species of willow will colonize the burn the first year.

In the proposal the favored willow species will be thus determined by the date of the burn, and timing of a species seed release. Such dates cannot be determined exactly before hand in planning for a given prescribed burn site.

The second possible source of seed for regeneration following fire is organic matter and soil; longevity of seed stored there and whether or not it is rendered nonviable by the temperatures generated by the fire will determine the availability of this seed. There seem to be two general categories of seed.

Tree, tall shrub (alder, willow), and certain small shrub (e.g., Vaccinium spp.) seeds occupy one category. The longevity of these seeds is generally short under natural conditions, lasting from a few weeks (willow) to probably no more than several years (white spruce). In addition, the physical characteristics of these seeds, e.g., thin, soft seed coats and little or no endosperm, seem to provide very little protection to the embryo from high temperatures.

In contrast, the second general category of seeds has relatively thick, hard seed coats and more endosperm surrounding the embryo than short-lived seeds. The longevity of long-lived seeds is not known, but the thick seed coat suggests an impervious nature and perhaps longer period of viability under natural conditions. Although no data are available for Alaska for the effect of fire on seed germination, seeds from elsewhere with similar characteristics are known to be fire-resistant and, in some species, their germination is stimulated by fire (Cushwa et al., 1968) Among others, genera included are Viburnum, Rosa, Cornus, Geocaulon, Corydalis, and Shepherdia. In one burn studied in Alaska, Corydalis sempervirens seed germinated within a few weeks after a burn, apparently from residual seed in the burned organic layers.

The environmental factors that regulate temperature and moisture and affect seed germination and seedling establishment are the next important aspect of seed reproduction. Mineral soil appears to be the most suitable seed bed for germination of all species of Alaska taiga trees and most of the shrubs. Organic seed beds can provide excellent conditions if they remain wet throughout the critical period; however, this probably rarely occurs on most burned sites in Alaska. When seed beds are dry, temperatures as high as 70°C have been recorded at the surface of the unburned moss-organic matter on south slopes. The maximum thickness of organic seed beds that can be tolerated is determined in part by the ability of the radicle to penetrate to a more stable moisture supply such as exists in the mineral soil; general observations show that thicknesses greater than 5-8 cm will prevent rapid establishment of white spruce and most likely all tree species.

Lutz (1956) observed considerable variation in seed bed conditions in burned areas. He reports that an average of 35% of burned areas contains exposed mineral soil. However, the variation is extreme (0-100%) and would appear to indicate that each burn must be considered as a separate case. With regard to seed-bed conditions, it is probably more realistic to consider the organic matter thickness in the unburned stands. In mature hardwood stands, organic-matter thickness averages 7-10 cm. In white spruce stands, moss-organic matter

is generally 20-30 cm thick; in black spruce, up to 50 cm or more thick. This, in conjunction with those factors that affect drying of these layers, helps to explain the variation in the amount of mineral soil exposed and observed by Lutz. They also complicate the patterns of revegetation within each burn.

Considering the general abundance of moisture in the growing season on the Kenai, and the fact that exposed mineral soils favor most of the trees and shrub species, hot fires will generally be favored in the burn prescriptions to assure mineral soil exposure and overstory kill.

2. Vegetative reproduction. Vegetative reproduction is important for the following reasons:

(a) The great variability in destruction of the organic layers sets limitations on reproduction by seed.

(b) Reproductive material with an established root system and available supply of stored food is immediately available and not dependent on dispersal into the burned area.

(c) There is a low success ratio of sexual reproduction by some species coupled with an ability to reproduce vegetatively. Aspen stands are mostly the result of vegetative reproduction (Gregory and Haack, 1965). Balsam poplar and black cottonwood are known to reproduce vegetatively; however, the importance in stand formation is not known. Birch also reproduces by stump shoots but although stands with several stems originating from old stumps are not uncommon, most trees appear to be of seed origin. Vegetative reproduction following fire is of little importance to the spruces. Most of the shrub and herbaceous species sprout or sucker vigorously following fire. On a 1971 fire at Wickersham Dome in interior Alaska, revegetation is being studied in detail by the Institute of Northern Forestry. Populus tremuloides, Betula papyrifera, Salix scoulerianа, and Alnus crispa were observed to produce shoots to 40 cm long the same summer as the fire, and there were numerous smaller sprouts of Ledum groenlandicum, Rosa acicularis, and Vaccinium uliginosum.

The occurrence of the propagating plant parts within the organic matter-soil system is important in vegetative reproduction. This, as with organic matter, varies between sites and with species. In the aspen stands, most of the propagating roots occur within 5-15 cm of the soil surface. In white and black spruce forest, the roots and rhizomes of many of the shrub and herbaceous species occur within 2-5 cm of the interface between mineral soil and organic matter.

Thus, the intensity and depth of burn may encourage sprouting and suckering under some conditions and prohibit them under others.

Soils - Viereck continues:

III. EFFECTS ON SOIL

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Soil Nutrients

Lutz (1956) summarizes the data on the effects of fire on soil nutrients in Alaska. Although, as stated in Ahlgren and Ahlgren (1960), there is considerable variation in the effects of fire on soil properties as related to various aspects of the site conditions and original soil properties, some generalities may be made which seem to hold true for Alaska and other northern countries. Both Lutz in Alaska and Scotter (1971a) in northern Canada find an increase in nitrogen, exchangeable calcium, and to a lesser degree, potassium and phosphorus in the surface soil layers following fire. Coupled with this is a decrease in acidity. Lotspeich et al. (1970) find no significant trends in soil nutrients 1 year after a fire in black spruce stands in eastern Alaska but note a slight decrease in total cation exchange and an increase in potassium.

Lutz (1956) explains the increase in available nutrients as resulting from their release from the burned portions of the organic layer as well as from increased nitrification by soil organisms and increased abundance of plants with nitrogen-fixing organisms following fire. Van Cleve (1971), on the other hand, estimates that with a uniform burn consuming the nitrogen in the 0-5 cm layer of the forest floor, 778 kg/ha and 2026 kg/ha of nitrogen would be lost from a 70- and 170-yr-old spruce forest, respectively. This loss would represent a potential supply of N rather than an actual supply of available N at the time of the fire.

However, Heilman (1966, 1968) shows that much of the soil nitrogen, potassium, and calcium is tied up in lower organic layers, which in permafrost soils remain frozen the year around and is thus unavailable to plants. In the five stages of succession from a birch-alder stand to a sphagnum-black spruce stands, he finds that the foliar levels of nitrogen decrease with age of the successional stand and that P and K actually are deficient as the nutrients become unavailable in the frozen or cold organic layers. He concludes that the

removal of low-density and low-nitrogen-containing layers of moss by fire and the deeper thawing of the underlying soil result in a concentration of available nutrients in the warmest portion of the soil profile. They also help to explain the large improvement in productivity and available nitrogen following the burning of the sphagnum-black spruce type in Alaska.

Whatever the actual cause, there does seem to be a release of nutrients and a fertilizing effect of fire on the organic soils in Alaska. Lutz (1956) notes that seedlings which become established immediately after fire may grow faster than seedlings of the same age in nursery beds. No data exist for the amount of time that this effect persists under Alaskan conditions. However, in Sweden Uggla (1967) finds that the growth of seedlings on an area of raw humus that had been burned was better than growth on an unburned area for only the first 9 yr following the fire. After 21 yr, tree growth on the unburned area was 65% greater than on the burned area. In Alaska, Heilman (1966) shows that in the later stages of succession of the black spruce type the nutrients once again become limiting to tree growth.

Rallston and Hatchell (1971) made an extensive literature review on soil effects of prescribed burning (versus wildfire). They cited 41 pieces of literature, concluding:

> It should be recognized by now that drastic changes in soil physical properties and removal of forest floor materials sufficient to cause significant increase in erosion rates can only be expected from severe fires or on sites where particular combinations of soil, topography, and rainfall confer high risk of damage. If recommended conditions for prescribed burning are observed, the danger of causing soil damage is negligible. Probably the most cogent summary of our topic is given by Davis (12) who notes:
>
> > There is a tendency to overemphasize the unfavorable effects of fire on mineral soil by stressing extreme situations in frequency and intensity of burning. There should be no minimizing of the destructive and undesirable results of wildfires, and this applies both to occasional severe fires and to the cumulative deteriorating effect of frequent moderate fires. But it must also be recognized, and this is a point of large practical importance, that many fires have little total soil effect one way or another and some are beneficial. This fact permits a fairly wide range of choice in management without risking significant soil damage.

There seems little reason to question this viewpoint at this time.

No surface vehicles will be used off of roads on the ground for burn site or handline preparation. Handline will usually be limited to narrow mineral soil exposures of 1-4 feet and occasionally to 1/2 mile length but usually much less. We do not believe that these will have significant impacts. The proposal's impacts on soils will be neutral to favorable in general due to the fertilizing effects.

Water Again Viereck (1973) makes a good description of the impacts:

> Little information is available on the effects of fire on hydrologic relations in Alaska. Lotspeich et sl. (1970) studied changes in stream nutrients and fauna in and adjacent to a 100,000-hectare fire in eastern Alaska. They find an increase in the chemical oxygen demand and potassium concentration in streams of the burned area, compared waith those in the unburned area, but they find no change in the benthic fauna of the streams that could be attributed to the effects of the fire.
>
> Increased erosion and water runoff as a result of fire seem to be at a minumum in northern areas in contrast to temperate regions, where fire nearly always results in increased runoff and flashy stream flow (Ahlgren and Ahlgren, 1960). Both Lutz (1956) and Scotter (1971a) point out that the low intensity of summer rainfall, the long periods when the soil is frozen, the high water-holding capacity of the organic layers, and the rapid revegetation of the partially burned organic soils result in very little surface erosion of the burned sites.

The areas burned will accumulate more snow (and consequently water) so that in spring break-up greater amounts of water will be released into watersheds and streams. This impact will not significantly affect those systems due to the small acreages involved compared to the total watershed acreages.

The proposal's impacts on water will be neutral to favorable in general as a result of some possible nutrient release into presently quite sterile water systems.

Wildlife - Moose - The discussion of the rationale for the proposal in the DESCRIPTION adequately showed that the impacts will be extremely favorable on moose. Figures 20 and 21 shows the range acreage improvement and condition changes and calculated response of the proposal area's moose population to the prescribed burning.

The benefits to moose populations were calculated by comparing two situations for the proposal area. The "present" situation was that of the present with low calf:cow ratios of about 20:100 and high mortality of calves of about 20% per year. The second was the "improved" situation created by prescribed burning with calf:cow ratios improving to 40:100 and calf mortality falling to 10%. More than a dozen assumptions had to be made before the population response models could be calculated. The benefit of the proposal was then obtained by subtracting the "present" from the "improved" situation. However, simplified benefits for a given 25 year life on each prescribed burn treatment are as follows:

Total additional calves produced (born) - 5500

Total additional calves surviving to yearling - 4800

Living moose at year 25 for all treatments combined (recognizing the staggered burn schedule) - 2200

Bull harvest that could be taken in bulls only seasons, yearlings thru 6 yr olds -2200 (harvest occurs annually for each of 25 years)

The increased capacities used were calculated based on the results of fire effects on the Kenai National Moose Range herd reported by Spencer and Hakala (1964). There the calf:cow ratio increased from 20 to 50 per hundred cows and November and January composition counts increased dramatically during the decade following the 1947 Burn. The same is expected with the proposal. The figures were calculated on the assumption that delays in the Program, lack of adequate finances, weather or other circumstance would not greatly upset the schedule. The capacity is calculated based on the average expected vegetative response. Some sites may not respond as well as expected and others may far exceed expectations. For example, Quartz Creek and Resurrection Creek among others are expected to provide much higher moose population response per acre treated than Ptarmigan Lake or Trail Creek.

Viereck (1973) summarized the impacts on most other major species or wildlife groups:

C. Sheep and Goats (Ovis, Oreamnos)

Leopold and Darling (1953b) conclude that sheep and goats primarily associated with climax vegetation of the alpine type rather than with tundra-taiga types and that fire, because of its infrequent occurence in this type, has little influence on the habitats of sheep or goats in Alaska. Hjeljord's (1971) investigation of the feeding ecology and habitat preference of the mountain goat in southeastern Alaska and Gross' (1963) study of sheep range on Victoria Mountain and Mount Schwatha in Alberta does not mention the influence of fire on the habitats of these species.

Figure 20 - Moose Range improved by annual increments and subsequent habitat condition changes

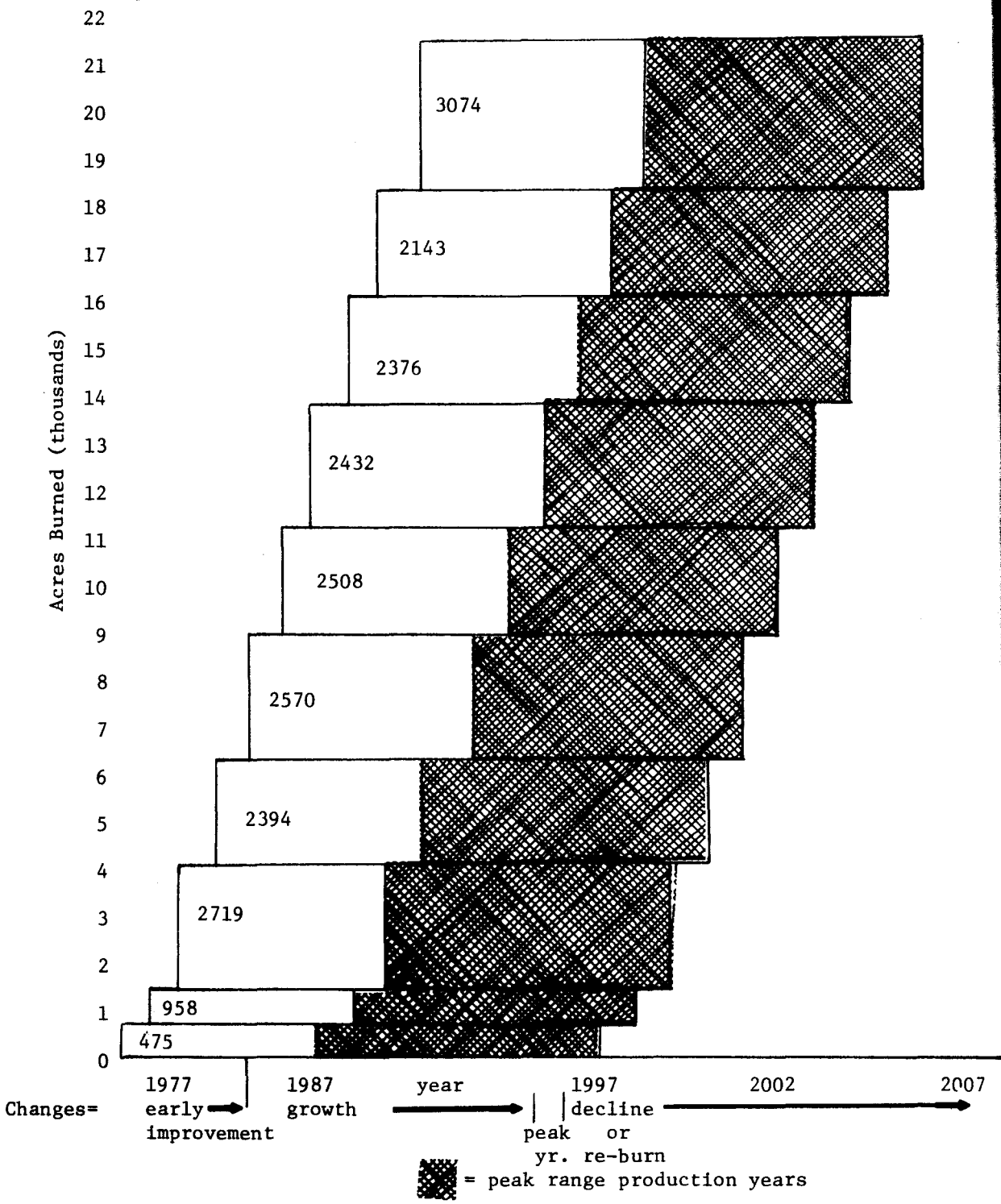
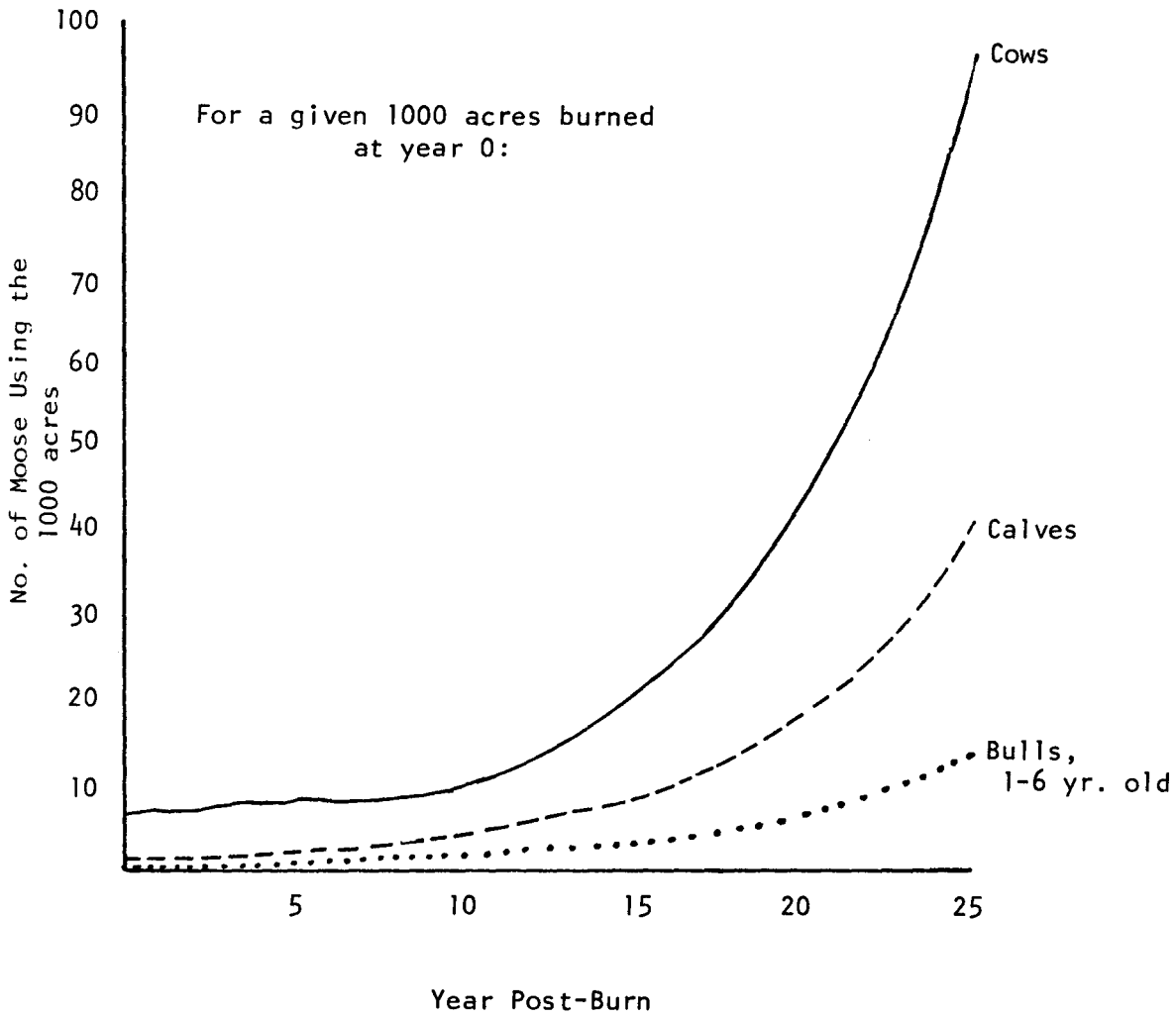


Figure 21 - Calculated Number of Cows, Calves and Bulls After Prescribed Burning



On plant succession and wildlife management, Cowan (1951) comments that some sheep ranges and populations in the Canadian Rockies are being reduced by the advance of the forest in areas where fire control is effective. Geist (1971) feels that sheep habitats are being displaced gradually by other plant communities in response to climatic changes and that the stable climax grass communities that comprise major sheep habitats do not vanish within a few decades as do the burned habitats of moose. He notes exceptions where fire results in some grasslands occupied by sheep.

Edwards (1954) states that fire improved sheep ranges by converting the undesirable coniferous forest into productive grasslands on which sheep in the Canadian Rockies depend for forage. Sheep population in these areas tripled between 1916 and 1936, primarily through improved range conditions resulting from fire.

In the proposal area there are several sheep or goat winter spring ranges that could be effected. No prescribed burns are proposed in these areas. The prescribed burns proposed are down in the bottom and lower sides of the valleys and in all likelihood will not affect sheep or goat range.

D. Small Mammals

Hakala et al. (1971) cite an unpublished report by Ellison on file at the Kenai National Moose Range of a study of small mammals on the 1969 Swanson River burn. They verify this report and state "Immediately after the fire, dead voles (mice) were found in the smoldering ashes. But a year after the fire, numbers of voles seemed to be nearly equal inside and outside the burn, although numbers of shrews may have been fewer in parts of the burn. The insectivorous diet of shrews might make them more susceptible to habitat disturbance by fire." Ellison feels that location of traps in the burn possibly influenced results; however, there were many islands of unburned habitat throughout the burn.

The heavier lush growth of forbs and shrubs in the burn area we believe will be a favorable impact on mice and shrews as heavier more nutritious growth makes more and a better variety of foods and provides cover from avian and other predators. Deer mice (Peromyscus sp.) or other insectivorous seed eating small mammals may invade the sites within a short time after the burns (Fala 1975, Tester 1965, and Tevis 1956).

Small mammals can usually escape immediate fire effects by use of burrows.

Viereck continues:

E. Fur Bearers

Hakala (1952), in describing beaver (Castor canadensis) habitat on Goldstream Creek and Chatanika River, mentions that where spruce has been burned, poplars and birches are abundant. Murray (1961) studying beaver ecology in the upper Tanana River, comments that when fire makes actual contact with a beaver colony "damage may be immediate and absolute." The immediate effect of fire is destruction of their food supply; but on a long-term basis, fire renews the aspen-cottonwood forest. He also observes that when pure spruce stands burn, new growth of aspen and cottonwood increase the abundance and availability of beaver food.

Patric and Webb (1953) feel that the high beaver populations of many areas in the northern forest are a direct result of extensive clearcutting and widespread forest fires. They do state, however, that "modern fire control and intensive forest management practices are generally reducing the area of suitable beaver habitat, because the beaver is adapted to the early stages of forest succession, especially postfire types, which include aspen and willow."

Koontz (1968), in studying small game and fur bearers of the proposed Rampart Dam impoundment area on the Yukon River in Alaska, concludes that the effects of fire on wildlife populations are not clearly understood but that many people believe that uncontrolled fire and certainly repeated fires are not beneficial to some species of wildlife. He thinks that fires repeated at "long intervals" may be beneficial to most species of wildlife by creating edge and causing reversion of vegetation into several successive stages.

Murray (1961) states that fires in the past were set by Indians in interior Alaska to drive muskrats from their dens, but that this practice has been successfully discouraged.

F. Black Bear (Ursus americanus)

Hatler (1972), in his study of food habits of black bear in Alaska, states that many older burns produced excellent crops of blueberries, which comprises 49% of the fall diet of black bear in his study.

The proposal we believe will favor black bears by providing excellent berry crops, edge, and other usable vegetation not found in more mature forest types.

G. Snowshoe Hare (Lepus americanus)

Grange (1965) feels that the chance for great abundance of hares in northern coniferous forest is limited to very early successional forest stages not long after fire. He states that 9% of the total forested area was burned in Alaska during an 11-yr period (1940-1950) and that, because of slower succession, fire effects may persist for decades. Generally, Grange feels that the relation of fire to habitat succession and fluctuations in snowshoe hare population should be studied more thoroughly before the influence of fire is dismissed.

During a peak of the hare population (estimate of 150 hares/square km) near Fairbanks, Alaska, in the fall-winter of 1971-1972, hares consumed willow sprouts that resulted from a fire during late June of 1971. They also consumed charred black spruce and aspen bark.

Birds - The greater varity of habitats and more deciduous flora created by the burn openings will probably provide for a greater diversity of birds (Conner and Adkinson 1975). Worldwide, deciduous forest generally supports a wider variety of birds than coniferous forests. Generally the mature forest species such as cavity nesters will not be favored but the species using early successional stage or low shrubby areas will be. Since the proposal will only affect about 9% of the area's forest, the impact to mature forest bird forms will not be significant.

Increased insect populations in the burn areas should favor more small birds and their predators than the shaded relatively sterile coniferous or overgrown forest types presently on the sites.

Fish - The waters of the proposal area are generally cool, low in nutrient content, have high gradients and are only moderately productive. The proposals impacts will be neutral in general and favorable at best on fish and fish habitat. As pointed out earlier some increased oxygen demand occurs in waters of watersheds with very large wildfires. However, oxygen levels are not limiting in the area's streams. The sites are relatively small, and they will be done over a 10 year period instead of simultaneously (as with a wildfire). Siltation will be negligible as stated earlier and will not affect fish.

Recreation - All forms of recreation will be enhanced by the presence of more moose that people can use and enjoy for whatever purpose. Hikers, campers, backpackers, fishermen, hunters, picnickers, nature-watchers, cabin users, horseback riders, snow mobilers, skiers, motorists, photographers and berrypickers will usually enjoy seeing more moose. As pointed out by Hakala et al. (1971) the recreational use of a burned area for hunting will be greater for years after a fire than before because of increased moose and snowshoe hare populations. Many more moose will be available per year over the 25 year life of the burns for consumptive as well as non-consumptive recreational use.

Fires also create good conditions for edible mushrooms, blueberries, and a variety of wildflowers, with obvious favorable recreation values.

Visual Resources - Much of the valuable visual resources in the Kenai now are largely the result of past wildfires: birch stands, aspen groves, contrasting colors, and golden leaves in autumn. The proposal will largely simulate wildfire effects on the visual resources.

The prescribed burns will treat areas to natural boundaries such as snowline, treeline, creeks, ponds ridges, meadows, rock chutes, and areas adjacent to lakeshores as well as roads and utility corridors. Inside the burns themselves fire will burn in various natural shapes and fashions: it will creep here and there, burn hot in one place and cool in another; leave some patches un-touched and others totally consumed. Live untouched stands or trees will remain in some areas. This fire behavior will occur because of the natural variations in topography, fuels, temperatures, humidity etc. This natural pattern and resulting successional stages of plants will highly contrast with unburned stands. The increased variety will add interest and therefore enhance the visual resource.

Short-term impacts (up to 40-60 years), because of numerous snags, may exert considerable impact in some areas. Long-term impacts may be beneficial because of the maintenance of variety in the landscape. It may be impractical to cut snags in many areas.

The burns in the more sensitive visual areas (i.e. E. Fork Cr., Canyon Cr., Quartz Cr. , Resurrection Trail etc. have been scheduled to allow 2-5 years between burning of adjacent sites. This will allow more vegetation recovery in adjacent sites and reduce impacts. However, this will not mitigate to a large degree the impact of numerous snags resulting from the burns.

Is maintaining visual variety thru burning a favorable or adverse impact? Largely as a result of anti-wildfire advertizing by private and government over the last 40 years the common public attitude against fire (any fire, for any use) has been negative. However, recent trends in public land management show a demand for

management (of all resources) in as naturalistic a manner as possible (wooden signs, earth-tone paints, natural shaped clearcut logging etc.). Using fire (a natural force) will comply with the present trend of naturalistic management.

Meskimen (1971) outlined four simple concepts for use of prescribed burning in forest landscapes create variety by arranging vegetation types so their edges form naturalistic patterns. In short he directed that land managers use "nature faking". He continues:

> Plus scenery usually has the quality of variety -- contrasting landforms or life forms arranged in patterns that impress us as pretty or at least interesting. Conversely, minus landscapes lack variety: perhaps not enough different landforms or life forms to show contrast; or forms too disordered to make patterns; or patterns displeasing in shape or size.
>
> Between the extremes of landscapes so empty that no contrast exists or so cluttered that no patterns emerge, there is an almost infinite spectrum of desirable variety. This broad range of variety offers unlimited opportunity to intensively manage our mutiple resources. And we'll be scenically compatible as long as we imitate shapes and sizes from the characteristic landscape. That's nature faking.

Komarek (1973) points out that:

> The natural landscapes when first viewed by European visitors to this country, I suggest, were managed landscapes. The word "manage" implies control and it is clearly evident that biotic community development and open space were to a large extent controlled by lightning-set fires and fires set by the hand of men on purpose. And these landscapes can be approximated because it makes no difference if vegetation is burned by a fire set by a lightning strike, or an aborigine twirling a fire stick or by a college educated ecologist with a drip torch, the ecological effects can be simulated.

Wildfire The proposal will reduce wildfire hazards in the area to some extent by consumption of fuels and making breaks in otherwise continuous forests fuel types (somewhat like a fuels management program does.) This Program will not alter the Forest Service policy of suppression and control of wildfires.

Social and Economic Environment

Recreation and Low Income Populations - The proposal will improve the quality of life for residents in the Anchorage-Kenai area thru greater populations of moose for recreational and subsistence use. Greater expenditures by recreationists (especially hunters) on the Kenai portion of the National Forest will add income to what is

otherwise a low-income population with seasonal incomes. The significance and magnitude of the added moose related expenditures in the local economy is not known at this time.

Economic - The cost of the Proposal is estimated to be $245,081 in 1977 dollars. Recreation, aesthetics, meat, viewing and other values will be the benefits of the proposal. For harvestable surplus moose meat values alone the benefit is about $1,000,000 or a benefit:cost ratio of about 4:1. Other values probably contribute as much or more value so the benefit:cost ratio is probably closer to 10:1.

Adverse Impacts

Natural Environment

Vegetation - As discussed thoroughly under Favorable Impacts, Vegetation, the above-ground vegetation will be mostly destroyed by the prescribed burns. For the management objective of producing good moose foraging habitat the effect is favorable and will not be further discussed here.

Soils - There will be no significant adverse impacts of the proposal on soils (See Favorable Impacts, Soils)

Water - There will be no significant adverse impacts of the proposal on water temperature, chemistry or sediment loads. (See Favorable Impacts, Water)

Wildlife - Caribou - A small herd of about 400 caribou is found year round in the alpine portion of the proposal area. All the proposed burns are below treeline in spruce hardwood forest so will not adversely affect their year-round ranges. There is only a remote chance that a prescribed burn would escape and affect the Kenai caribou herd range.

Generally there is agreement in the literature that wildfire eliminates much of the lichen forage in spruce forest for considerable periods (Viereck 1973). However, Lensink (1954) and Skoog (1968) have shown that caribou in Alaska are not dependent upon lichen growth in spruce forest and can utilize other available foods such as sedges to make up for any losses of lichens due to fire.

Small Mammals - Herbivorous mice such as voles (Microtus sp. or Cleithrionomys sp.) will probably be reduced in numbers for perhaps 2 years following burning (Fala, 1975)

Red squirrels, which are primarily a more mature forest species will probably be adversely effected on the burn sites.

Furbearers - The proposal will adversely affect fisher and marten habitat and numbers on the perscribed burn sites as reviewed by Viereck (1973):

> Lensink (1953) and Lensink et al. (1955) found that Cleithrionomys and Microtus comprise 74% and 68% of the diet of marten (Martes americana actuosa) during summer and winter and conclude that marten is found in areas dominated by climax spruce forest. The burning of climax spruce forest eliminates fur bearers, such as marten.
>
> Edwards (1954), working in Wells Gray Park, B.C., concludes that fire removed marten for decades and found that decline in caribou restricted the use of forested lowlands by wolverine and grizzly bear.
>
> During a 3-yr study (1948-1951) in Ontario, DeVos (1951) found that fisher (Martes pennanti pennanti) and marten (Martes americana americana) were practically absent from extensive recently logged or burned areas and that stands of birch and aspen of fire origin were poor habitats. He states that late stages of succession produce more favorable habitats for fisher and marten.
>
> Predators of mice such as weasels, mink and fox may also be adversely affected on the sites due to possible reduced herbivorous mouse populations there.

Birds - Mature forest species (i.e. woodpeckers, chickadees) will be adversely affected by the proposal at least for the period until the site again develops more mature forest.

The burns will possibly reduce the capacity of the sites to support spruce grouse (another mature forest species) as reviewed by Viereck (1973):

> Hakala et al. (1971) cite an unpublished report by Ellison concerning the effect of the 1969 Swanson River fire on spruce grouse. Ellison found only 18 Broods on one 10.4-sq-km (4-sq-mile) plot in the burned fraction 1 yr after the fire, compared with 41 on the same area in 1969 before the fire. They conclude that the fire reduced the carrying capacity for grouse broods by 56%.

The immediate affect of a prescribed burn in spring will be the destruction of nests on site. Adults will probably attempt to re-nest nearby but will probably have reduced success. The preferred burn period will be midsummer to obtain better vegetation kill. Thus, nests will be less impacted and young birds will be mobile enough to avoid the flames.

Fish - There will be no significant adverse impacts of the proposal on fish or their habitat. (See Favorable Impacts, Fish).

Insects - The following review is taken from Viereck (1973):

> EFFECTS ON INSECTS
>
> A number of insect species have been observed to be prevalent in fire-damaged trees, especially spruce. Buprestids and cerambycids are commonly seen in large numbers within a fire area, possibly attracted to the smoke and heat (Evans, 1971) or by some olfactory response to volatile materials. Scolytids attack the damaged trees and the fallen logs that have adequate phloem for brood production.
>
> The wood borers rapidly degrade the logs, making salvage for lumber impractical. They play a major role in breaking down damaged material. Bark beetles are of more importance on the fringe of the fire, in "islands" of slightly scorched trees within the fire perimeter, or in the residual stand. Dendroctonus sp., Ips spp., and Trypodendron spp. have all been found in damaged trees adjacent to burns. The first two genera have the potential to increase their population in the burned material and spread to the live trees outside the burn. Trypodendron bores directly into the wood, causing a "shot hole" appearance. The holes and staining that follow degrade the wood. If the climatic conditions are favorable, the populations of Trypodendron in adjacent unburned stands may cause as much or more damage than the original fire.
>
> Another aspect of fire-insect relationship is that the changes in the composition or age of the forest stands after fire are accompanied by changes in the insect fauna. Where spruce may not have presented an entomological problem, destructive defoliators, such as the large aspen tortrix (Choristoneura conflictana), may become widespread in the hardwoods (Beckwith, 1968). Often The conversion of a large area to seedlings produces a potential insect problem that does not exist prior to the fire. . . . . .

Any adverse impacts from insects will generally not have any impact on the commercial forest lands because they are mostly in the coastal ecological zones and most of the proposal is in the interior ecological zone. (See Figure 18). Baker (1974) relates bark beetle outbreaks to the presence of many old white spruce and their debris in Alaska forests. Thus burning could also tend to reduce insect hazards. We are not aware of any insect problems following fires in the area in the past so this potential adverse impact will probably not occur in any significant magnitude.

Recreation and Visual Resources - Recently burned and blackened areas are considered unattractive by many people. The dead snags still standing, brown needles or scorched trees, and a blackened forest floor are the immediate after effects of any burn. Charred trees will stand for years before deteriorating.

The burns in the more sensitive visual areas have been scheduled to allow 2-5 years between burning of adjacent sites. This will allow some vegetation recovery in adjacent sites and help to reduce impact. However, this will not reduce the impact of snags on those adjacent sites.

Advertising has emphasized the early stage of the post fire scene .... ashes, blackened trees etc. In the first growing season within a few weeks a fresh new growth of forbs, tree and shrub sprouts, wildflowers, and grasses begin emerging from and covering the ashes. There is frequently an almost parklike appearance to the burn except for the dead spires still standing. Within a few years the areas are being revegetated with new shrubs and young trees. Fireweed is a common component of post-fire vegetation. The added colors, contrasts, and diversity in the forest vegetation enhance recreation experiences and will at least partly offset any long term negative impacts of dead tree tops showing. Generally the adverse impacts to recreation and visual resources have already been avoided thru the coordination with and avoidance of high use sites in the development of the proposal. (See Section I DES-CRIPTION, Development of the Proposal). The burns in the more sensitive visual areas have been scheduled to allow 2-5 years between burning of adjacent sites. This will allow for more vegetation recovery in adjacent sites and reduce impacts. Burning creates negative and positive impacts that may or may not offset one another.

Table 7 summarizes the proposal sites adjacent to transportation systems (highways, roads, trails, major lakes).

Table 7 Proposed prescribed burn sites adjacent to travel or transportation systems.

Area	Miles of System Affected			
	Paved Highway	Gravel Road	Improved Trail	Major Lake or River
Canyon Cr.	4	-	-	-
Chickaloon R.	-	-	-	3
Cooper Kenai L.	-	0.5	-	8
E. Fork Cr.	-	-	3	-
Grant Lake	-	-	-	3.5
Juneau Cr.	-	-	6.5	1.5
Kenai R.	1	-	-	-
Ptarmigan L.	-	-	-	1
Quartz Cr.	7	4	1.5	0.3
Resurrection Cr.	-	6	-	-
Six Mile Cr.	-	7	-	-
Trail R.	-	-	-	1.3
Trail Cr.	-	-	-	0.7
Affected Totals -	12	17.5	11	19.3
Proposal Area Totals -	107	81	105	125
Affected Total ÷ Proposal Area Totals -	11%	22%	10%	15%

The areas with the most potential for adversely impacting recreation and visual resource due to present public use, accessibility, visibility of sites, and topography are: Cooper-Kenai Lakes, E. Fork Creek, Juneau Creek, and Quartz Creek.

Four recreation cabins will be affected by prescribed burns in their vicinity at Swan Lake, Juneau Lake, and Trout Lake. The discussion that follows is based upon the view that the burns will adversely impact these cabins' visual attractions.

Juneau Creek site 2 (See Figure 9) will be on gentle slopes behind the Trout Lake Cabin. It will probably be largely screened from view by vegetation in the foreground between it and the cabin. Site 2 will also be in view about 500 yards across Juneau Lake from the Juneau Lake and Romig cabins. Its impact has been or will be lessened by the mitigation measures outlined below. One major mitigation measure already taken was to avoid planning a burn in the excellent potential moose range north, south, and east of the Juneau Lake Cabin. The loss of this range to natural succession is a major wildlife habitat tradeoff impact of having put the cabin here in the past. The land provided for developed recreation cabins, campgrounds and other such sites all over the Kenai has been mostly at the expense of key moose winter range. These have been acceptable tradeoffs in the multiple-use context. Therefore, it seems now that any tradeoffs in recreational values of these four cabins may be a matter of tradeoffs by one resource or use for the benefit of another in the National Forest multiple-use environment.

Specific mitigation measures that have already taken place thru planning and coordination or will be taken during or after the burns are:

1. Layout of burn sites away from transportation systems, campgrounds, cabins, summer homes, and other high public use areas.

2. Leaving buffer zones of brush or timber between high public use areas and burn sites, where possible, and when negative impacts would otherwise occur.

3. Felling of unsightly snags close to high public use routes and sites or selected areas within burns after the burns are finished.

4. Avoidance of burn site layout on points of special visual attention near common transportation routes such as islands, wildlife rearing areas, lake shores etc.

5. Controlling ignition thru the Prescribed Burn Plan to be written for each site so that vegetation and visual values to transportation systems is affected the least amount possible.

6. Because of the great variety of characteristics, patterns, kills etc. That will result from each individual prescribed burn, some mitigation needs will not be apparent until after the burn is completed.

7. Burns immediately adjacent to trails and paved highways will be minimized in number on an annual basis where possible using the following as guidelines:

> 4/yr. on paved highways, 2/yr. on maintained system trails. This will reduce annual impacts to visual resources.

8. State troopers will be requested to participate in burns involving traffic control. An individual will be designated to provide information on the burn to motorists during any traffic stoppages.

Wildfire - Fire is a very powerful force that will utilize natural fuels, in this case, inside prescribed boundaries. More fuels that it could utilize will always be in the vicinity and these could accidently become ignited, resulting in a wildfire. Hopefully in all cases the actions required by the Prescribed Burn Plan will prevent a wildfire, and in nearly all cases it will. Note that the Prescribed Burn Plan (Appendix 12) also allows and plans for this eventuality in the "Suppression Plan If Fire Escapes" section.

The Chugach National Forest's normal wildfire suppression system will be implemented in the event that a prescribed burn results in a wildfire.

Air - Smoke management will be an important factor in planning each burn. Smoke in the air at low altitudes for any significant period can adversely affect recreation, transportation and residents. Potential smoke management problems will be derived from weather forecasts before burns are begun. This will assure no burning in poor dispersal weather, and as rapid as possible smoke dispersion when the decision is made to burn. For example, we know that burning under a neutral or unstable lapse rate will reduce low-level pollution, that burning following a cold frontal passage is conducive to good smoke dispersal and that burning when the mixing layer is greater then 2,000 feet is desirable (Ward and Lamb 1970). Smoke dispersal will be a less critical consideration in remote unpopulated areas.

An extensive literature review and analysis of the impacts of prescribed (or controlled) burning on air has been done by Komarek (1970). His conclusions follow:

> An ecological review on air pollution as a whole, and in particular the relationship of controlled burning to such possible pollution warrants the following conclusions:
>
> 1. In spite of the tremendous amounts of pollutant materials released into the atmosphere, mankind as yet has not materially affected air quality on a global basis. This is largely due to the excellent self-cleansing properties of the atmosphere as well as the extremely large volume of the air envelope of the earth.

2. The air pollution problem, presently, is primarily one of urban areas and the consequent concentration of pollutants from combustible engines, industrial processes, and the burning of fossil fuels (coal, oil, gasoline, etc.). Over 95 percent of the pollution problem is a city problem; not of rural areas or of forest and field.

3. Smoke particles from lightning fires have always been a part of our atmosphere long before man. These particles play an important part in our atmosphere as condensation nuclei for rainfall and are a vital part of our atmosphere.

4. There is no evidence that materials resulting from controlled burning in forestry, agriculture or wildlife management are hazardous to human health.

5. The problems of such controlled burning are primarily one of visibility. However, such burning is not a daily activity and any one acre is only burned one time within any one year, or even longer intervals. That visibility can be an important problem is certain but this can be handled by proper management, particularly with due regard for meteorological conditions. It is weather that primarily creates such conditions.

6. I find that controlled burning as a source of air pollution is rarely if anything but a purely local matter. The past history of fire exclusion abundantly demonstrates that wildfires would sweep large areas and, in fact, would produce much larger problems of air pollution. These wildfires occur under the worst possible conditions and only come under control when weather patterns or fuel conditions change.

7. And in final conclusion I wish to state that there is no ecological alternative to controlled burning for its many important uses in wildlife, forest and farm management. These past ten Fire Ecology Conferences, where over 200 speakers have presented their studies and their conclusions, cannot be over-looked. The work of these leading ecologists, foresters, wildlife managers, and other land managers must be recognized by the specialists in air pollution or drastic effects on nature's ecosystems will result.

Timber - Table 8 shows the overlap of proposal burn sites with commercial forest lands. Note that a very small percent of the timber base is involved (0.5, 11, and 3% of standard, special, and marginal components). The 11 million board feet of the marginal component are all inoperable, The stand codes of the remainder of the stands shows them all to be immature or pole timber. Consequently none of the stands are mature and available for harvest, except perhaps some trees in the 45 acres of standard component on the Hope Road near the mouth of Six Mile Creek. Note that it has been deferred in the burn schedule until 1980 to allow for possible house log cutting or other utilization of the wood values.

Table 8 - Prescribed burn sites overlap with inventoried commercial forest lands timber resource.

Burn Area	Site	Overlap Acres	Est. Over-lap Vol. mm BF	Compartment No.	Stand No.	Mgt Restr.	SCC	Acres	Total Vol. mm BF
Standard Component:									
Six Mile Cr.	1	45	0.9	22	5 10-550	077	10	45	0.9
Special Component: Total 45 acre 0.9 mmBF (0.5% of Kenai standard component acres)									
Quartz Cr.	21	49	0.2	12	3 11-650	634	11	49	0.2
E. Fork Cr.	16	40	0.2	33	35 11-650	683	11	207	1.0
E. Fork Cr.	14	50	0.2	33	34 10-650	683	11	74	0.3
E. Fork Cr.	12	10	0.2	33	28 11-650	683	11	44	0.3
E. Fork Cr.	1	54	0.3	22	2 11-650	681	11	54	0.3
Six Mile Cr.	13	177	0.9	33	7 11-650	610	11	177	0.9
Resurrection Cr.	21	100	2.2	21	3 11-650	610	10	189	2.8
Resurrection Cr.	26	50							
Resurrection Cr.	15	96	0.5	7	3 11-650	683	11	96	0.5
Resurrection Cr.	29	25	0.1	7	1 11-650	683	11	25	0.1
Chickaloon R.	1	20	0.3	4	11 10-650	610	10	33	0.5
Chickaloon R.	1	15	0.1	4	4 11-650	610	11	61	0.3
Chickaloon R.	2	40	0.6	4	2 10-650	683	10	112	1.7
Total		726 ac.	5.7mm BF	(11% of Kenai Special component acres)					

Marginal Component: (All inoperable)
Total 1136 ac. 11 mm BF (3% of Kenai marginal component acres)

Transportation - The influence of the proposal on recreation associated with transportation systems has already been discussed as well as the fact that smoke dispersion could partially hamper some aircraft corridors for short periods.

Another possibility that could be an adverse impact of the proposal is increased vehicle-moose collisions. This will probably result from either increased numbers of moose crossing the highways or increased traffic or both. One possible solution to this problem would be to make the prescribed burns up to the edge of highways and roads. Thus, moose range could be improved and the additional moose would also be much more visible to an approaching vehicle . . . . . collisions would thus be reduced. Overall then the two actions 1) more moose produced and 2) greater visibility of moose approaching the right of way would tend to offset one another. Screening burn effects from public view will be done where feasible when the visual impacts are negative, Generally roadside vegetation will be preserved except to prevent or reduce vehicle-moose collisions.

Mitigating measures which will be taken (or requested from the Alaska Dept. of Highways) are:

1. Posting of signs warning motorists of moose and major crossing areas or crossings with significant collision hazards.

2. Reduction of speed limits on specified portions of the paved highways to reduce the collision potential.

3. Clearing of areas adjacent to the right of way by felling and burning to assure better visibility of moose at crossing areas or areas with significant collision hazards.

4. Other measures as suggested thru public and agency involvement.

Roadless and Wilderness Character - The roadless character of the area and sites treated will not be altered by the proposal. No roads will be built. No ground vehicles will be used off of existing highways, roads, and trails.

No significant earth moving will occur. Handline construction will disturb small areas of soil in a linear fashion.

Access will be improved a little by the clearing of handlines to contain the burns. These, however will be short-lived as the lines will grow in with shrubs and trees very rapidly.

This area is not a classified wilderness nor is it expected to be in the forseeable future.

After extensive literature review and study Lutz (1960) concluded that "it is likely that forest fires have occurred on the Kenai ever since there were forests." The earliest written account of fire there found by Lutz was in 1851. Therefore, it appears that the wilderness character of the roadless areas on the Kenai was shaped to some extent by fire.

Recent, past, and present management requires that all wildfires be suppressed on the Kenai including the roadless areas. Existing wildfire suppression is, in fact, then considered to be adverse to the "Roadless and Wilderness" character of the area. The major natural influence of fire has been removed by man.

At present the only option immediately available to re-introduce fire into the roadless areas with wilderness character is thru prescribed burning such as is proposed in this Program. This Program will not adversely affect or change the wilderness character of the roadless areas where some of the burns are proposed.

Prescribed burning may actually enhance wilderness character thru simulation of natural wilderness conditions.

Historical and Archeological - Appendix 13 lists the known sites on the National Register of Historic Places (two each) and Alaska Heritage Resource Survey (12 each). These were obtained by consultation with the State Historic Preservation Officer and his office files in Anchorage, Alaska, with the assistance of Douglas Reger in May 1977. A copy of the SHPO letter is shown as Appendix 14.

No sites listed are in any of the proposed burn units.

A professional archaeologist with the Alaska Region, U.S. Forest Service (Gerry Clark) has been consulted by phone, in writing, and has surveyed sites in the field for any historical/archaeological significance/relics, remains, etc. An archaeologist is presently assigned to the Chugach National Forest (John Mattson) and will be consulted and involved in all burn site planning in the office and field before any burns are approved or conducted. Ground surveys of all sites will be conducted by the archaeologist as he sees fit for each site during the planning phase.

Mining Claims - A few of the proposed burns will remove vegetation on non-patented (not private) mining claims. There is no legal requirement that the vegetation be left for mining use. In fact the Multiple-Use Mining Act of 1955, retains the Forest Service right to manage vegetation on un-patented claims. This should have no adverse impact on mining operations.

Utilities - No adverse impacts to utilities (powerlines, pipelines) are anticipated. Specific measures to be done to assure no interference with utility services are:

1. Clearance of fuels away from utility poles or facilities.

2. Posting of fire fighting crew members, tank trucks or other control equipment near or accessible to utility structures as required by the burn situation.

3. Other utility structure protective measures as required.

Social and Economic Environment

There will be no significant adverse impacts on the social and economic environment.

III SUMMARY OF PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

The proposal will adversely affect the following:

existing vegetation
some herbivorous small mammals
red squirrel habitat
spruce grouse habitat
mature forest bird species habitat
some vegetation adjacent to the burns as a result of insect damage
some recreation and visual resources
wildfire hazard (resulting from the prescribed burns themselves)
air quality locally and temporarily
a limited amount of commercial timber
moose vehicle collision rate

Mitigation measures have been accomplished or outlined for many of the above to reduce the adverse impacts. These measures have been outlined in Section I: Development of the Proposal; and Section II: Adverse Impacts.

All of the above adverse impacts cannot be avoided because they are the natural consequences of converting over-grown or older forest types to early successional stages by use of prescribed burning.

IV RELATIONSHIP BETWEEN THE LOCAL SHORT TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG TERM PRODUCTIVITY

The short-term effects of the proposed action on the long term productivity of resources has largely been discussed already. Briefly the effect on the long term productivity of various amenities and resources can be described as follows:

Resource	Long Term Effect
timber	none to insignificant conflict
soil	none to insignificant damage
water	insignificant to increased amount
moose	greatly increased numbers
mature forest birds	decreased numbers on site
early successional birds	increased numbers on site
fish	none
recreation	enhanced experiences
visual resources	minor improvement
wildfire hazard (general)	decreased
quality air	none to insignificant decrease in quality
access	none to insignificant improvement
roadless character	none
wilderness character	none to more natural
minerals	none
open space and solitude	none
diversity	increased vegetative and animal

V IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The only irreversible and irretrievable commitment will be the oil, gasoline, and other fossil related products used in the chainsaws, trucks, aircraft and other equipment during the life of the Program.

VI ALTERNATIVES TO THE PROPOSED ACTION

No Action

This alternative is the existing management on the proposal area. The impact of this alternative is what we have today . . . . deteriorated, moose ranges and aging, forest land. Very low numbers of moose are being produced. The potential of the land for producing moose, a highly desired game animal, food source, and wildlife attraction, would continue to be lost to forest succession. The present benefits in water, recreation, fish, wood etc. continue to be produced under this alternative.

Mechanical Treatments

This alternative has been studied by the Forest Service for years. Studies done on the Mile 43 project were recently completed. This project used bulldozer drawn rollers to crush down and break up more older forest stands to remove the canopy and allow for sprouting and new seedling growth of browse for moose. Some of mechanical treatment's advantages are its manageability to make different shapes and sizes, and work near developed sites without fear of damaging them. Two of the major disadvantages are that it is

very expensive and it cannot be used on rugged, remote or non-road accessed terrain. Large quantities of machinery fuel would be consumed during the Program. Other disadvantages are that it does not kill young spruce and they tend to re-establish more quickly after crushing than after burning. Minerals are not recycled as thoroughly or quickly as with fire. Birch does not attain nearly as dense stands as for fire as shown in limited studies (Culbertson 1976). Estimated treatment costs are about $150/acre in 1977 dollars (Culbertson, 1976).

The hydroax is another machine that is capable of removing older forests by mowing with a large set of high speed blades. Its advantages and disadvantages are the same as for bulldozers and rollers. Its costs are about $8,000/month rent on the machine and $90/day for an operator. On the Kenai proposal area's ranges (larger tall trees and shrubs) at best, it would cost $100 per acre.

Chemical Treatments

Herbicide treatments to remove older shrubs and induce better forage has been studied by the Forest Service in the proposal area and elsewhere. With 2,4D and 2,4,5T sprays short-term (5 year) gains in willow browse were realized with no long-term benefit, while birch and aspen showed neither short nor long-term improvements (Culbertson, 1975). These same results were also found by Lyon and Mueggler (1968). Since this alternative would not accomplish the required results; acreage cost rates are meaningless.

Commercial Sale of Wood Products

Logging or chipping the forest stands and then burning are a possible alternative. At present however, chipping is not considered as primary manufacture and Forest Service restrictions prohibit export of wood products from Alaska that do not meet the primary manufacture requirements. Most of the proposal sites do not have large enough trees on them for felling and canting to meet primary manufacture requirements.

This operation's disadvantages are essentially the same as for any mechanical treatment. Road access and more gentle terrain would be required. Burning after removal of the wood products would accomplish mineral recycling and added browse stimulation. In the multiple-use context this is a better alternative than merely burning, at least for the gentle terrain. Burning would still be needed to treat remote or rugged sites. Costs would be those for administering the sales and planning and executing the burning. Currently the market for low quality-quantity forest wood products as are grown in the proposal area is poor.

A Differently Designed Proposed Action

The proposed action could be scheduled over a longer period, 20 years for example. This would delay accomplishment and results, but it would spread any adverse effects out over a longer period and consequently reduce their intensity.

All the proposal sites near or visible from trails, roads, lakes, or recreation developments could be eliminated. This would remove most visual and recreation impact. However, it must be recognized that the best existing and potential moose ranges are near or in the same travel-recreation-visual corridors as are used by man. The range improvement results potential would be so reduced as to make the proposal ineffectual. Access for the public to use the moose resource (for hunting, viewing etc.) would also be much more difficult and expensive.

General

All of the above are alternatives for killing the dominant non-browse productive overstory vegetation. However, to accomplish the required results the minerals must be recycled. To do this in a timely manner fire must be used. In this aspect then, the only alternatives are "No Action", or any of the above combined with fire treatment. In actuality, econonomic considerations eliminate most alternatives except a "No Action" and a largely fire oriented alternative, such as is proposed.

VII CONSULTATION WITH APPROPRIATE FEDERAL AGENCIES AND REVIEW BY STATE AND LOCAL AGENCIES DEVELOPING AND ENFORCING ENVIRONMENTAL STANDARDS AS WELL AS CONCERNED PUBLICS.

Professional Agencies and Individuals

Individuals and members of the following have been consulted, asked for, or provided input and advice on the proposal:

U. S. Dept. of Commerce
  National Oceanic and Atmospheric Administration
    National Marine Fisheries Service

U. S. Environmental Protection Agency

U. S. Dept. of the Interior
  Bureau of Land Management
  Fish and Wildlife Service
    Kenai National Moose Range

U. S. Forest Service
  Alaska Planning Team
  Insitiute of Northern Forestry
  Alaska Region 10 Office
  Washington Office
Alaska Interagency Moose Committee

State of Alaska
  Dept. of Fish and Game
  Dept. of Highways
  Dept. of Natural Resources
  Dept. of Environmental Conservation

Kenai Borough Planning And Zoning Commission
Cook Inlet Air Resource Management District
U. S. Army, 172 D Infantry Bde. (Alaska), Natural Resources
University of Alaska, Dept. of Natural Resources

Many land management specialists on the Chugach National Forest have been consulted, given advice and guidance, and contributed materially to the proposal:

Clay Beal - Forester, Forest Supervisor
T. Edward Morris - Fire Management Officer
(prescribed burn plans, fire mgt. technical advice and guidance, knowledge of prescribed burn costs and estimates)
Fred Harnisch - Forester, Timber Program Mgr.
Norm Howse - Fisheries Biologist, Wildlife & Fish Program Mgr.
Gerald Coghlin - Engineer, Forest Engineer
Gerry Clark - Archaeologist, R-10 U. S. Forest Service, Juneau
Wallace Watts - Forester
Quentin Mack - Forester, Timber Planner
Charles Harnish - Hydrologist
Thomas J. Sheehy - Soil Scientist
Edgar Brannon - Landscape Architect
James Tallerico - Landscape Architect
Sigurd T. Olson - Wildlife Biologist, Alaska Planning Team
Frank Morrell - Forester, I & E Program Manager
James L. Culbertson - Wildlife Biolgist, Chugach
Moose-Fire Mgt. Program development and Environmental Statement

Narrative of Public Involvement Results

Complete transcripts of meetings and public response letters are on file. For concerns lists, the number of times mentioned is once unless shown in parentheses.

The bulk of the directly communicated (other than by radio and news media) involvement consisted of answering questions posed by the members of the public concerned enough to attend meetings or make contact. This input we interpreted as "neutral" (62%).

Several organizations representing interested groups were absent from all meetings (after direct invitation). These were: Sierra Club, Nordic Ski Club, Mountaineering Club of Alaska, Alaska Professional Hunters Association, and the Izaac Walton League. No letters or other input were received from these organizations.

Interpretation of input "for" or "against" the proposal was based on the direct statement, general thrust, and/or attitude of the respondents' input or questions.

Understandably, all wildlife organizations were in favor of the proposal (i.e., Elmendorf Rod and Gun Club).

Government Agencies Meeting

The following agencies with potential concerns on the proposal were invited to this meeting held at the Chugach National Forest Supervisor's Office at 9:00 a.m., January 14, 1977:

Alaska Dept. of Fish and Game (did not attend)
Kenai National Moose Range
Bureau of Land Management (Anchorage Office)
National Park Service
U. S. Fish and Wildlife Service
Alaska Division of Lands
Cook Inlet Air Resources Management District
Alaska State Troopers
Federal Aviation Administration
Alaska Dept. of Environmental Conservation
Alaska Dept. of Highways

A briefing on the purposes, background, and environmental considerations, as well as maps and slides, were presented. The session was opened for questions, answers, concerns, and input.

Most discussion involved questions and answers, and is briefed below as concerns:

impact of more moose, more hunters
other costs of more moose, more hunters in EIS
spruce grouse habitat loss or gain
* small bird nest destruction (2)
* inability to reach 10 year goals
* too much emphasis on hunter harvest
moose aesthetic values (5)
reduce spruce to get more moose
air space restriction
smoke problems (2)
old forests will burn in future as wildfire
alternatives to fire for moose
timber sales slash burning

erosion of soil into salmon streams
* natural fire starting in proposed burn site
impact on Resurrection Trail users
control of alpine fires
caribou habitat
adequate fuel for aerial ignition of sites
long term maintenance of burn sites
Christmas trees
public meetings
* moose-car collisions
* stress habitat improvement, not meat values

* = negative comments on proposal

Private Organizations Meeting

The following organizations were invited to the meeting held at 7:30 p.m. on January 20, 1977, at the Chugach National Forest Supervisor's Office:

Attended	Did Not Attend
Alaska Conservation Society	Sierra Club
Elmendorf Rod & Gun Club	Nordic Ski Club
Society of American Foresters	Mountaineering Club of Alaska
Anchorage Sportsmens Club	Alaska Professional Hunters Assn.
Alaska Center for the Environment	Cook Inlet Historical Society
Wildlife Society (attended 1/14/77)	Izaac Walton League
Audubon Club (attended 1/14/77)	

Their concerns were expressed almost entirely as questions, and are briefed as follows:

burns near trails
cost per acre
timber use
increased calf crops
Kenai National Moose Range Programs (2)
units in Wilderness Areas
* poor weather conditions on Kenai for burns
nutrient cycling
present and future moose populations (4)
* overbrowsing vegetation
caribou habitat
fire control measures in event fire escapes boundaries
burning of large areas, size of burns
moose use of burned areas
* danger to large numbers of moose drawn to burn sites

* hunting season changes by ADF&G
past moose harvests
ADF&G fisheries involvement
burn proximity to roads and trails in 1977
EIS requirement
disadvantages of burning
more people visiting burn areas
* moose-car collisions

* = negative comments on proposal

Key Individual or Group Contacts

The Forest Supervisor and Wildlife Biologist described the proposal and answered questions by phone or in small meetings with the following:

Who	Date	Concerns
Cook Inlet Native Regional Corporation Lands Section	3/09/77	very much in favor of program; size of project and where
Alaska Department of Fish and Game, Juneau Office, Research, I & E, Habitat	2/02/77	post burn plant species; alder invasion; in favor of proposal
Chairman, Alaska Department of Fish and Game	1/28/77	in favor of proposal
Chugach Electric	1/28/77	wanted notification of burns; protection of powerlines; caribou habitat
Sierra Club, Knik Chapter	1/25/77	none
Elmendorf Rod and Gun Club	3/02/77	all 72 members in favor of proposal
Alaska Department of Fish and Game, Anchorage Office, Noontime Seminar	4/05/77	area to be improved; salmon streams protection
* Kenai Peninsula Planning Commission	6/28/76	moose-car collisions; smoke, fire hazards

* = negative comments on proposal by 2 of 8 members on Commission

Public Meetings

Three public meetings were held. These were preceded by announcements in local newspapers, radio releases, and posted notices in public places such as post offices (see below). Most meeting time was devoted to providing information and answers.

Meeting	Attendance	Time and Date
Cooper Landing, Alaska	18	7:30 p.m., 3/29/77
Seward, Alaska	9	7:30 p.m., 3/30/77
Anchorage, Alaska	15	7:30 p.m., 3/31/77

Concerns expressed were:

old forests will burn in wildfires if not managed
burns are better for moose than old forests (5)
forest litter needs burned off
* some burns proposed could impinge on goat/sheep range
* waste of wood products (3)
smoke
furbearer habitat
* wildfires resulting from proposed burns
burning better than logging
preference for moose over small birds and mammals
* burns unsightly (2)
wolf increases due to more moose
moose range carrying capacity and numbers (3)
burn timing
* young animals endangered by fires (3)
moose-car collisions (2)
too much fire control on Kenai
proposal funds may be cut off or limited (2)
caribou habitat
fire use on Kenai National Moose Range
leave areas for moose cover
need to monitor forage production
too small acreage to be burned
historical cabin in danger from fire
control of fires near structures
notification of local people of burn needed
plant species valuable to moose
more hunters leading to more vandalism
public input use in making decision
need more moose
man-caused fires

* = negative responses

Summary of Input Results

A. Meetings

1. Open Public Meetings

	Seward	Cooper Landing	Anchorage	Totals
For	1	5	6	12
Against	1	1	3	5
Neutral	7	13	6	26
Total Attendance	9	19	15	43

2. Interested Agency Meeting

Total attendance 13 (neutral input)

3. Interested Conservation Groups Meeting

Total attendance 5 (neutral input)

B. Reviews of EIS

1. Government and Agency

Favorable	5
Unfavorable	3
Neutral	7
Total	15

C. Letters

1. Private Organization Letters

Favorable	1
Unfavorable	1
Total	2

2. Personal Letters

For	2
Against	3
Total	5

D. Key Individual/Group Contacts

For	2
Against	0
Neutral	5
Total	7

E. Summary (of all individual input received)

For	22*	= 24%
Against	12	= 13%
Neutral	56	= 62%
Total	90	

* does not include Elmendorf Rod and Gun Club vote of 72 members in favor 3/2/77

Adjustments to Proposal Resulting from Public Input

The ideas, criticism, and support that was received had been predicted. No new significant concerns surfaced.

As a result of the input, the following measures will be taken in addition to those already outlined:

1. Special consideration will be given to private landowners' concerns adjacent to burns.

2. Special efforts are being taken to assure use of the tree and wood resources in the sites before and after burning. Efforts include advertising free firewood and houselogs, and administering their utilization by the public.

3. Adjustments will be made on unit boundaries to prevent any potential damage to wild sheep and goat ranges from burning.

4. Special surveys and consultation with State and Federal archaeology/history authorities has been and will be continually conducted to assure protection of historical/ archaeological resources.

Specific Responses to Public Criticism

The following responses will be brief where the answers are already in the text of the EIS, and no response will be made except as "Refer to EIS." Input-Appendix number refers to the copy of the letter making the substantive criticism (shown as an appendix to this EIS).

Input Appendix No.	Response
15 Jean Smith	1. The USFS has determined through public contact that some species (i.e., moose) can be given priority for management on limited acreage over other animals in less demand (i.e., rodents, birds, etc.). Significant damage to other wildlife habitat will not occur in our judgement.

2. Visual damage potential is being handled by mitigating measures outlined in EIS and consultation with landscape architects.

3. Wildfires will not replace planned, controlled burns because they frequently are not in forest types that will result in good moose forage areas.

4. We do not intend to cancel the proposal due to public support for moose production for viewing, photographing, or hunting.

15B
Cook Inlet
Historical Society

4B. Refer to responses 1 and 4.

16
Jerry Allison

5. Refer to EIS. See response 1 above.

6. We are permitting the public to take trees and firewood for their use instead of burning them.

7. Developments that must be protected from wildfires are shown in the EIS.

17
Maurice Amundson

8. Measures will be taken before any burn to assure that it does not result in wildfire on any adjacent lands. There is, however, always an element of risk in prescribed burning.

9. Visual resources protection - see response 2.

10. Management of the smoke created will be a prime consideration in planning and managing the burns. Special efforts will be made to prevent prolonged exposure of people/dwelling areas to smoke.

18
Kenai Borough

11. No minutes were forwarded to us to answer in this EIS. The EIS establishes the scientific and public support for this program concept.

18B
Alice Yarborough

11B. Moose priority - see response 1.

19 Nelson Eshleman	12. Contour strip cropping would require mechanical vehicles. On the steep, wet, rugged terrain of the Kenai mountains, vehicle use would not only be extremely difficult, but also detrimental to soils, water, access, and wilderness character through the requirement for roads. 13. Moose have not historically and do not require the use of high capital intensive domestic crops for forage to survive and flourish. Refer to EIS contents. 14. Wood use - see response 6. 15. Costs of prescribed burning are much less than cropping that would require high capital costs in purchase of machinery and its maintenance. Cost of machinery far exceeds burning costs. 16. Fertilizers are very expensive. Their use in domestic grain (cash crop) production makes farm profits very slim. Therefore, their use for a (noncash, amenity) crop such as moose could hardly be cost effective.

The following letters were both supportive and critical or needed response:

20 Alaska Dept. of Fish and Game	17. In very few, if any, burns do we expect to have wildfire result wherein the use of fire retardants would be necessary. We may use retardants in those few instances as a last resort to prevent major wildfire outbreak. 18. We would use tracked or wheeled vehicles in streams for fire suppression only as a last resort, and primarily for protection of private property or to prevent loss of life. We feel this is very unlikely at this time.
21 Alaska Dept. of Fish and Game	19. The boundaries of burn units will be adjusted in consultation with ADF&G to assure that no wild sheep or goat ranges are adversely affected.
22 U.S. Dept. of the Interior, Env. Officer	20. Vegetative-moose response to the Kenai National Moose Range Fires has been documented well by Spencer and Hakala (1964). It is not necessary to repeat its results here.

21. We are budgeted, staffed, and intend to conduct monitoring of soils/watershed effects of the burns for 1978 and thereafter. Based on existing soils and water knowledge and literature, we do not expect such problems.

22. We have consulted the appropriate State historical and archaeological authorities and have hired an archaeologist to continue the efforts.

31
Office of the Governor

23. Protection of historic/archaeological sites - refer to response 22 and EIS for compliance.

24. Erosion and water quality - refer to response 21.

25. Coordination with State forestry personnel has been made and will continue with Lawrence A. Dutton and Paul Maki.

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Appendix 1 - 1977 Prescribed Burn Sites Schedule

Area	Sites	Acres	Cost $
E. Fork Cr.	3	47	702
E. Fork Cr.	8	110	1380
Quartz Cr.	4	50	709
Quartz Cr.	10	58	1930
Quartz cr.	13	90	2010
Trail R.	7	40	1880
Trail R.	8	80	1840
Totals	7	475	10451

Appendix 2 - 1978 Prescribed Burn Sites Schedule

Area	Sites	Acres	Cost $
Quartz	15	38	560
Quartz	6	33	700
Quartz	21	60	1020
Canyon Cr.	5	40	1540
Canyon Cr.	11	32	600
E. Fork Cr.	2	165	1100
E. Fork Cr.	16 & 17	117	1420
E. Fork Cr.	12	10	340
E. Fork Cr.	9	17	340
Cooper Cr.	1	35	2210
Cooper Cr.	2	15	2230
Cooper Cr.	6	110	1960
Kenai R.	5	43	540
Resurrection Cr.	30	117	2420
Cooper-Kenai L.	5	15	900
Six Mile Cr.	2	27	800
Six Mile Cr.	4	32	700
Six MIle Cr.	6	25	800
Six Mile Cr.	9	7	460
Six Mile Cr.	11	20	560
Totals	20	958	21,200

Appendix 3 - 1979 Prescribed Burn Sites Schedule

Area	Sites	Acres	Cost $
Quartz Cr.	24	90	1680
Quartz Cr.	5	22	500
Quartz Cr.	19	180	3260
Cooper - Kenai	1	112	260
Cooper - Kenai	2	120	1210
Cooper - Kenai	3	73	410
Cooper - Kenai	4	153	510
Cooper - Kenai	10 & 11	280	1360
Resurrection Cr.	15	350	2260
Resurrection Cr.	22	80	760
Resurrection Cr.	27	40	510
Resurrection Cr.	28	180	2010
Resurrection Cr.	29	70	1060
Trail R.	2	7	300
Canyon Cr.	14	30	660
Canyon Cr.	12	110	680
Kenai R.	1	75	1040
Kenai R.	2	75	1040
Kenai R.	3	55	1140
Cooper Cr.	6	250	1960
Six mile Cr.	8	37	500
Six mile Cr.	13	300	1780
Six Mile Cr.	5	30	800
Totals	23	2719	25,690

Appendix 4 - 1980 Prescribed Burn Sites Schedule

Area	Sites	Acres	Cost $
Juneau Cr.	1	800	7020
Juneau Cr.	3	700	5120
Quartz Cr.	23	123	1540
Quartz Cr.	9	5	200
Quartz Cr.	26	180	2500
Quartz Cr.	29	55	1200
Canyon Cr.	4	27	1860
Canyon Cr.	8	27	1000
Canyon Cr.	9	20	900
E. Fork Cr.	4	70	1000
E. Fork Cr.	20	70	520
Six Mile Cr.	1	117	1880
Six Mile Cr.	10	180	1120
Totals	13	2,394	25,880

Appendix 5 - 1981 Prescribed Burn Sites Schedule

Area	Site	Acres	Cost $
Juneau Cr.	2	1300	9020
Resurrection Cr.	21	570	6520
Resurrection Cr.	25	400	5100
Resurrection Cr.	26	300	5720
Totals	4	2,570	26,360

Appendix 6 - 1982 Prescribed Burn Sites Schedule

Area	Sites	Acres	Cost $
Cooper-Kenai L.	12	500	3740
Cooper-Kenai L.	13	450	3740
Trail Cr.	1 & 2	35	720
Trail Cr.	3	30	210
Trail Cr.	17	350	3920
E. Fork Cr.	1	355	1740
Canyon Cr.	6 & 7	340	5660
Quartz Cr.	14	160	1340
Quartz Cr.	30	180	2420
Quartz Cr.	8	15	400
Quartz Cr.	28	63	1640
Quartz Cr.	20	30	660
Totals	12	2,508	26,190

Appendix 7 - 1983 Prescribed Burn Sites Schedule

Area	Sites	Acres	Cost $
Chickaloon R.	1	50	2260
Chickaloon R.	2	375	3860
Chickaloon R.	3	65	2460
Chickaloon R.	4	160	2460
Chickaloon R.	5	36	2060
Grant L.	1	82	720
Grant L.	2	125	700
Grant L.	3	10	420
Grant L.	4	242	2320
Grant L.	6	200	1020
Trail Cr.	5	27	810
Trail Cr.	6	60	610
Trail Cr.	7	145	860
Trail Cr.	8	60	610
Trail Cr.	9	32	210
Trail Cr.	10	15	210
Trail Cr.	18	7	700
Canyon Cr.	3	47	1660
Canyon Cr.	6 & 7	340	5660
E. Fork Cr.	10 & 11	354	680
Totals	20	2,432	30,290

Appendix 8 - 1984 Prescribed Burn Sites Schedule

Area	Sites	Acres	Cost $
	16	70	610
Quartz	7	23	500
Quartz	25	110	2380
Quartz	22	30	1880
Canyon Cr.	10	172	2820
E. Fork Cr.	6	40	580
E. Fork Cr.	1	355	1740
E. Fork Cr.	13 & 14	207	780
E. Fork Cr.	19	190	1540
Kenai R.	4	25	440
Six Mile Cr.	3	27	600
Six Mile Cr.	12	50	3680
Six Mile Cr.	7	15	360
Totals	20	2,376	29,270

Appendix 9 - 1985 Prescribed Burn Sites Schedule

Area	Sites	Acres	Cost $
Resurrection Cr.	23	760	6200
Resurrection Cr.	24	200	5500
Trail R.	1	172	1130
Trail Cr.	19	450	5600
Quartz Cr.	16	18	340
Quartz Cr.	33	150	1540
Quartz Cr.	12	90	1340
Quartz Cr.	18	15	460
Quartz Cr.	27	150	1880
Canyon Cr.	2	61	1440
E. Fork Cr.	5	127	1300
Totals	12	2,193	26,730

Appendix 10 - 1986 Prescribed Burn Sites Schedule

Area	Sites	Acres	Cost $
Chickaloon R.	7	1000	4260
Chickaloon R.	9	450	2960
E. Fork Cr.	18	465	1600
Cooper-Kenai L.	7	42	700
Cooper-Kenai L.	8	390	2500
Ptarmigan L.	1	52	1460
Ptarmigan L.	9	195	2360
Quartz Cr.	34	480	7180
Totals	8	3.074	23,020

Appendix II

Prescribed Burn Site Sizes
Fire Behavior, Handline and Total Cost Estimates

L = low, M = Medium, H = high

Area	Site	Acres	Resistence to Control	Rate of Spread	Handline Complete	Handline Improve	Total Cost $
Canyon Cr.	1	12	M	M	5	-	460
	2	61	M	M	10	-	1440
	3	47	H	H	10	35	1660
	4	27	H	H	15	50	1860
	5	40	M	H	-	50	1540
	6 & 7	340	M	M	80	_	5660
	8	27	M	H	10	15	1000
	9	20	M	M	_	30	900
	10	172	M	H	70	20	2820
	11	32	L	M	10	_	900
	12	110	L	M	_	_	680
	14	30	L	M	20	20	660
Chickaloon R.	1	50	H	H	_	90	2260
	2	375	H	H	_	240	3860
	3	65	H	H	_	70	2460
	4	100	H	H	10	100	2460
	5	36	H	H	_	60	2060
	7	1000	M	M	60	_	4260
	9	450	M	H	30	40	2960
Cooper-Kenai L.	1	112	L	M	_	_	260
	2	120	L	H	_	20	1200
	3	73	L	H	_	20	410
	4	153	L	H	_	30	510
	5	15	H	M	_	25	900
	7	42	L	M	_	25	700
	8	390	M	M	_	180	2500
	10 & 11	280	L	H	_	20	1360
	12	500	H	M	80	-	3740
	13	450	H	M	80	-	3740
Cooper Cr.	1	15	H	M	20	50	4300
	2	15	H	M	20	50	2230
	5	250	H	H	50	120	4300
	6	110	H	H	_	_	1960
E. Fork Cr.	1	355	M	M	30	_	1740
	2	165	M	M	10	30	1100
	3	47	L	M	10	15	1000
	4	90	M	M	10	_	1000
	5	127	M	M	30	_	1300
	6	40	M	H	_	_	580
	7 & 8	110	M	M	25	75	2660
	9	17	L	M	_	_	340
	10 & 11	354	L	M	_	_	680
	12	10	L	M	_	_	430

Area	Site	Acres	Resistence to Control	Rate of Spread	Headline Complete	Headline Improve	Total Cost $
Quartz Cr.	26	180	H	H	—	170	2500
	27	150	M	M	—	60	1880
	28	63	M	M	10	50	1640
	29	55	M	M	—	70	1200
	30	180	M	H	20	180	2480
	31	148	M	M	30	120	3060
	32	40	M	M	—	20	1340
	33	150	M	H	20	—	1540
	34	480	H	H	160	160	7180
Resurrection Creek	15	350	L	M	60	—	2260
	21	570	M	H	100	80	6520
	22	80	L	M	—	25	760
	23	760	M	H	80	70	6200
	24	200	M	H	40	60	5500
	25	400	M	H	—	100	5100
	26	300	M	H	50	70	5020
	27	40	L	H	—	—	510
	28	180	M	H	30	—	2010
	29	70	L	M	20	40	1060
	30	117	H	M	40	—	2420
Six Mi. Cr.							
	1	117	H	M	15	—	1880
	2	27	M	M	20	—	880
	3	27	M	M	—	20	600
	4	32	M	M	15	—	700
	5	37	L	M	15	—	800
	6	25	L	M	15	—	560
	7	15	L	M	15	—	360
	8	37	L	M	5	—	500
	9	7	L	M	5	—	460
	10	180	M	M	—	—	1120
	11	20	L	M	15	—	560
	12	50	H	M	100	—	3680
	13	300	M	H	20	—	1780
Trail R.	1	172	M	L	20	40	1130
	2	7	L	L	10	—	300
	4	170	M	L	20	40	1130
	7 & 8	122	H	H	20	100	2160
Trail Cr.	1 & 2	35	L	M	15	—	720
	3	30	L	L	—	—	210
	5	27	L	M	60	20	810
	6	60	L	M	20	60	610
	7	145	L	M	20	—	860
	8	60	L	M	20	—	610
	9	32	L	L	—	—	210
	10	15	L	L	—	—	210
	12	70	L	L	—	—	610
	13	132	L	L	5	—	510

Area	Site	Acres	Resistence to Control	Rate of Spread	Handline Complete	Handline Improve	Total Cost $
E. Fork Cr.							
	13 & 14	207	M	M	—	—	780
	16 & 17	117	M	M	40	—	1420
	18	465	L	H	—	80	1600
	19	190	M	H	20	—	1540
	20	70	L	L	—	—	540
Grant L.							
	1	82	M	M	—	20	720
	2	125	M	M	—	20	700
	3	10	L	L	—	—	540
	4	242	L	H	40	20	2320
	6	200	M	M	—	10	1020
Indian Cr.							
	1	90	M	M	—	70	2650
	2	240	M	M	—	30	2450
	3	100	M	M	—	20	3250
Juneau Cr.							
	1	800	L	L	—	40	7020
	2	1300	L	M	—	200	9020
	3	700	M	M	20	—	5120
Kenai R.							
	1	75	L	M	10	40	1040
	2	75	L	M	20	—	1040
	3	55	L	M	20	40	1140
	4	25	L	M	—	—	440
	5	43	L	M	—	—	540
Ptarmigan L.							
	1	52	M	M	—	20	1460
	9	195	M	H	20	—	2360
Quartz Cr.							
	1	87	M	M	20	—	1100
	2	27	M	M	—	—	340
	4	50	L	M	5	—	600
	5	22	L	L	20	—	500
	6	33	L	L	20	20	700
	7	23	L	L	—	20	500
	8	20	L	H	20	40	400
	9	5	L	M	—	—	200
	10	58	M	M	15	60	1740
	11	180	M	M	80	40	400
	12	90	M	H	—	10	1340
	13	90	M	M	30	60	2060
	14	100	M	H	—	10	1340
	15	38	M	M	10	—	560
	16	18	M	M	—	—	340
	18	15	L	M	10	—	460
	19	180	H	M	70	40	3260
	20	30	M	M	10	20	660
	21	60	M	H	30	—	1020
	22	30	M	M	40	—	1880
	23	120	M	H	20	—	1540
	24	90	M	M	—	70	1680
	25	110	M	M	40	100	2380

Area	Site	Resistence to Control	Rate of Spread	Handline Complete	Handline Improve	Total Cost $
Trail Cr.						1660
14	300	L	L	30	—	610
16	70	L	L	20	—	3920
17	350	M	M	—	—	700
18	7	L	L	—	—	5600
19	450	H	M	120	80	

APPENDIX 12

ALASKA REGION

PRESCRIBED BURN PLAN

FOREST _____ DATE PREPARED _____

PREPARED BY _____ APPROVED BY _____

DATE OF APPROVAL _____

SALE OR PROJECT NAME _____

LOCATION _____ T. _____ R. _____ S. _____

TYPE OF BURN: COMPLEX _____ INTERMEDIATE _____ NON-COMPLEX _____

TYPE OF FIRE _____

_____

_____

PURPOSE OR OBJECTIVE OF BURN _____

_____

_____

_____

_____

_____

DATE CUTTING OR TREATMENT COMPLETED _____

PRESCRIBED BURN SCHEDULE FOR: SPRING _____ SUMMER _____ FALL _____ WINTER ____

ESTIMATED COST: PREPERATION _____ BURNING _____ EQUIPMENT _____

REMANNING _____ TOTAL _____

AREA ANALYSIS

A. ANALYSIS

1. SIZE (ACRES) _____ PERIMETER (CHAINS) _____

2. TOPOGRAPHIC FEATURES

SLOPE _____ ASPECT _____ ELEV. TOP _____ BOT._____

POSITION ON SLOPE - UPPER 3rd _____ MIDDLE 3rd _____

FLAT _____ SADDLE _____

CONTROL LINE _____

WATER SOURCES _____

SOIL CONDITIONS _____

3. FUEL DESCRIPTION

VEGETATIVE TYPE _____ CONDITION _____

FUEL TYPE _____ TONS PER ACRE _____

ARRANGEMENT _____

4. FUEL CONDITION ADJACENT TO BURN AREA _____

PRESCRIBED WEATHER AND FUEL CONDITIONS

Item	In Block		Outside Block	
	Maximum	Mimimum	Maximum	Mimimum
1. FUEL MOISTURE RANGE				
2. RELATIVE HUMIDITY				
3. WIND SPEED AND DIRECTION				
4. IGNITION TIME				

PREBURN WEATHER

1. PRECIPITATION MEASUREMENTS _____

2. FUEL MOISTURE STICKS DAILY MEASUREMENTS TWO WEEKS IN ADVANCE OF BURN _____

3. HYGROTHERMOGRAPH CHARTS TWO WEEKS IN ADVANCE OF BURN _____

WEATHER FORCAST DAY OF BURN

FORCAST CENTER _____ FORECASTER _____

2. SUMMARY OF FORECAST _____

WEATHER DURING BURN

1. WET BULB _____ DRY BULB _____ RELATIVE HUMIDITY _____ WIND SPEED _____

WIND DIRECTION _____ FFM _____ TIME FIRED _____ TIME FINISHED _____

FIRE OUT _____

SAFETY PRECAUTIONS

L. SAFETY PLAN _____

2. HAZARDS

FIRING CREW MEMBERS COULD GET AHEAD OF ONE ANOTHER.

DIP TORCHES WHEN USED ON POOR FOOTING IMPOSES A THREAT FOR BURNS ON OPERATOR.

DENSE SMOKE, AND THUS, THE DANGER OF EXCESS INHALATION.

IN GENERAL MOST HAZARDS ASSOCIATED WITH WILDFIRES WILL BE PRESENT DURING THE BURN.

3. SAFETY PRECAUTIONS.

ESSENTIALLY ALL OF THE ABOVE HAZARDS CAN BE COPED WITH AS FOLLOWS:

ASSURE THAT EVERYONE IS BRIEFED REGARDING THE HAZARDS.

CREWMEN MUST WORK DELIBERATELY AND AT SAFE SPEEDS.

MAINTAIN GOOD COMMUNICATIONS AND BE SURE EVERYONE KNOWS THEIR JOB.

WEAR THE SAME PROTECTIVE GEAR THAT IS USED ON WILDFIRES, LOW FLAMMABILITY CLOTHING, GOOD BOOTS, GLOVES AND GOGGLES IN HEAVY SMOKE.

IN GENERAL GOOD COORDINATION BETWEEN CREWS AND EQUIPMENT AS WELL AS INDIVIDUAL EFFORTS AND SAFETY CONSCIOUSNESS WILL BE NECESSARY TO MAINTAIN A SAFE WORKING

PUBLIC INFORMATION

CONTACT THE FOLLOWING:

LOCAL PEOPLE _____ RECREATIONISTS _____ STATE TROOPERS _____
NEWS MEDIA _____ COOPERATING FIRE AGENCIES _____ OTHER _____

UNIT FIRING PLAN

A. FIRING PRESCRIPTION

1. METHOD _____

2. IGNITION POINTS _____

3. SEQUENCE OF FIRING _____

4. TIME OF IGNITION _____

5. EXPECTED FIRE BEHAVIOR _____

HOLDING AND MOPUP PLAN

1. PLANNED FIRE LINE BREAKDOWN:

   SECTOR _____ _____

   SECTOR _____ _____

   SECTOR _____ _____

2. TANKER AND HOSE-LAY LOCATIONS _____

3. WATER STORAGE OR SOURCES _____

4. PORTABLE PUMP LOCATIONS _____

5. HOLDING FORCE INSTRUCTIONS _____

6. MOPUP FORCE INSTRUCTIONS _____

7. FOLLOW-UP PATROL AFTER MOPUP _____

ORGANIZATION AND EQUIPMENT

A. ORGANIZATION

1. PRESCRIBED BURN FIRE BOSS _____ FIRE BEHAVIOR OFFICER _____

2. FIRING BOSS _____ CREW _____, _____,

_____, _____,

3. HOLDING BOSS _____, CREW: _____,_____,

_____, _____, _____, _____

_____, _____, _____, _____

4. MOPUP BOSS _____, CREW: _____, _____,

_____, _____, _____, _____,

_____, _____, _____, _____.

B. EQUIPMENT

1. TRANSPORTATION _____

_____

_____

2. COMMUNICATIONS _____

_____

3. TORCHES AND FUEL _____

_____

4. HAND TOOLS _____

_____

5. TANKERS AND PUMPS _____

_____

6. SPECIAL EQUIPMENT _____

_____

_____

SMOKE MANAGEMENT FORECAST

A. SMOKE MANAGEMENT

1. STABILITY AND EXPECTED CHANGES (INVERSIONS, TIME OF FORMATION, AND SISS.)

2. ESTIMATED HEIGHT OF SMOKE COLUMN

3. ESTIMATED DIRECTION OF SMOKE COLUMN (WIND DIRECTION AND SPEED AT SMOKE COLUMN HEIGHT.)

4. SPECIAL OR UNIQUE CHARACTERISTICS OF SMOKE BEHAVIOR ON THE FIRE.

SUPPRESSION PLAN IF FIRE ESCAPES

FIRE BOSS _____

AVAILABLE MANPOWER ON PRESCRIBED BURN _____

FIRST REINFORCEMENTS

WHERE: _____ HOW MANY: _____

ETA: _____ HOW TO CONTACT: _____

_____

AVAILABLE EQUIPMENT

TYPE: _____ WHERE: _____

ETA: _____ HOW TO CONTACT: _____

_____

CONTROL PLAN _____

_____

_____

_____

_____

_____

_____

Appendix 13

Historic/Archaeologic Sites in the Proposal Area

National Historic Register Sites on Kenai

Seward Number 25 Alaska Nellie's Homestead
Seward Number 18 Hope Historic District

Alaska Heritage Resource Survey Sites
on Edge of or Near Sites

Burn Area	Seward No.	Name	Type	Date	Other
East Fork	105	White's Roadhouse	cabins	1910	-
Canyon Creek	106	Hope Cutoff Prehistoric Site	site	-	-
"	36	Canyon Creek	logs (dam?)	-	-
"	152	Lauritsen Cabin	cabin	1900	-
"	153*	Michelson Cabin	cabin	1900	-
"	22	Dahl town	3 cabins	1900	-
"	35	Michaelson Cemetary	cemetary	1900	-
Quartz Creek	15	Gilpatrick	cabins, town	1896	-
Juneau Creek	41	Slaughter Gulch	Russian artifacts	-	-
Trail Creek	118	Johnson	cabins	1910	RR station
"	37	Johnson Springs	cabin and springs	-	near Tinker claim
"	93	Hunter	buildings	1912	RR station

* on edge of site

Appendix 14

Lee -

STATE OF ALASKA

JAY S. HAMMOND, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF PARKS

323 E. 4TH AVENUE
ANCHORAGE 99501

August 9, 1977

Re: 1130-1-1

Clay G. Beal, Forest Supervisor
Chugach National Forest
Pouch 6606
2221 East Northern Lights Blvd.
Suite 230
Anchorage, Alaska 99502

Dear Mr. Beal:

In response to your request (I.D. No. 77023510) concerning the Chugach Moose-Fire Management Program's consideration of archaeological and historical resources we wish to emphasize the following:

1. The accessibility of the Kenai Peninsula increases the need for interpretation and identification of Heritage resources to enhance the recreation values of the area for the public. At the same time, accessibility increases the danger of careless destruction to heritage resources. The responsibility to both identify and protect heritage resources lies with state and federal agencies.

2. Your statement to include an archaeology-history specialist in all present and future project and operation planning to protect heritage resources in accordance with Federal and State laws is strongly endorsed.

3. Burn sites should be of sufficient distance from any identified heritage resource to eliminate any adverse effects. In addition, we highly recommend a site survey of each proposed burn location prior to any action.

Sincerely,

TERRY A. McWILLIAMS
Director

William S. Hanable

By: William S. Hanable
State Historic Preservation Officer

KK:lea

Appendix 15

Jean Smith REALTOR

(907) 277-6013

BOX 1928
746 F STREET
ANCHORAGE, ALASKA 99501

April 21, 1977

RECEIVED
APR 21 1977
CHUGACH N.F.

Clay Beal
Forest Supervisor
Chugach National Forest
2221 E. Northern Lights #230
Anchorage, Alaska 99504

Dear Mr. Beal:

Having attended the public hearing March 31 at which Lee Culbertson presented the Forest Service' plan to burn 22,000 acres over the next 10 years, I remain unconvinced that this is a worthwhile project and wish to go on record that I am opposed to the plan.

The reasoning presented by Mr. Culbertson in support of the plan is specious from several standpoints. By what rationale does the Forest Service, or Game Management agency determine that moose have higher priority in the scheme of life than birds, rodents, and other living creatures? Why must we burn 22,000 acres in the hope that the number of moose could double within 20 to 40 years? A more economical and simpler method to accomplish this would be to ban the cow moose hunts for a given period of years (or entirely), or to shorten the hunting season. While this may not be politically popular with the hunting enthusiasts in the area, I believe the majority of voters are non-hunters.

The proposed burning plan certainly does not take into consideration the visual pollution created. Mr. Culbertson embraced the plan under the theory that "tourists love to see moose". True, but even more than seeing moose, I believe they enjoy seeing trees and I do not think we local residents or the tourists should be exposed to the ugly sight of hundreds of acres of burned areas for the next 20+ years. The trade-off between that and possibly a few more moose is certainly unacceptable to me.

Mr. Culbertson stated an estimated cost of $12.00 per acre to accomplish the proposed plan. This results in a cost of $264,000. for the 10-year 22,000 acre plan. I am reasonably sure the $12. per acre figure is based on 1977 costs and can be expected, through rising inflation, to double that figure, making the whole plan extremely costly to the taxpayers. The end does not justify the means.

The proposed plan also apparently does not take into consideration fires in the area which will normally occur during the 10-year period caused by lightning, plane crashes, arson or accident. The March 31 Anchorage Times carried a front-page story stating

REALTOR®

State Forester Ted Smith was placing a burning ban in effect one month earlier than normal this year because he felt the forest fire danger will be extreme. Having specifically asked Mr. Culbertson if the Forest Service burning plan would be reduced (if implemented) by whatever burning occured through other means, he stated this would not happen -- that the Forest Service would pursue their program regardless. Such inflexability is appalling.

In this current era of environmental awareness and fear of ecological degradation, resulting in rerouting of the Oil Pipeline to protect a nesting ptarmigan (or whatever), the cancellation of dam projects in the lower 48 because of some un-heard of insect, etc., I am astounded that the Forest Service would even consider this burning project and to tell us, as Mr. Culbertson did, that the environmental impact statement filed in Washington was found totally acceptable, certainly strains one's sense of credibility.

I hope you will cancel entirely the proposed burning plan and devote your efforts to the many other very worthwhile management programs carried on by the Forest Service.

Sincerely,

Jean Smith

Jean Smith

Appendix 15B

CB

Cook Inlet Historical Society

April 27, 1977

RECEIVED
MAY 2 1977
CHUGACH N.F.

Clay G. Beal
Forest Supervisor
Chugach National Forest
2221 E. Northern Lights Blvd., Suite 230
Anchorage, Alaska
99504

Dear Mr. Beal:

Thank you for your copy of Environmental Statement Chugach Moose-Fire Management Program.

The book is well done and the presentation is clear. Although I could perceive your point, I could not help but wonder what happens to birds, nests, etc., and the smaller animals when the forest burns.

Moose is of course useful to man as food, but should we use our forests to raise our cattle? Is this the function of forests?

I am sure that we throw off the balance of Nature when we set artificial fires which are supposed to prepare grazing ground for the moose.

I fear I am one of those who would prefer to leave the "forests" alone; just protect them from man who has succeeded so well in destroying so much, at times even intentionally.

Most people who hunt moose do not need it for food; they can afford and have freezers full of beef.

Sincerely,

Antoinette Shalkop

Antoinette Shalkop
Vice President, Cook Inlet Historical Society

Port Ashton, Ak
99654
Aug 1, 1977

Dear Sirs,

Re: The article on controlled burning of spruce forests to improve moose habitat on the Kenai Peninsula, in "Alaska" magazine, August 1977.

A forest dominated by spruce, or other conifers, may not be desirable to some species, such as moose, but there are many animals for which it is preferred habitat, including owls, some hawks, eagles, woodpeckers, jays, chickadees, grosbeaks, crossbills, spruce chickens, squirrels, porcupines, weasels, mink and marten. Your fires not only wastefully kill off the spruce and other plants, but also destroys the homes of many small animals. Perhaps these animals ✓

are also considered undesirable, as they are not thought of as food for man, with few exceptions.

Another small animal that does well in a conifer dominated environment is the black-tail deer. If deer were planted on the Kenai Peninsula, maybe there wouldn't be so many hunters coming to Prince William Sound from Seward and Anchorage, and our deer population would have a chance to build back.

If those spruce trees really must be labelled "undesirable," why not let some of them be removed by loggers?

Please explain this statement: "Wildfires can no longer be allowed to produce moose range

because of developements that must be protected on the Kenai."

How extensive are the developements? Are there not occassional wildfires that do not endanger those developements? How successful have you been in controlling wildfires?

Perhaps if you were to send me statistics and more information, you could convince me that you are doing the right thing.

Do the majority of Kenai Peninsula residents favor your burning program?

Sincerely,

Jerry Allison

Appendix 17

RECEIVED
MAY 17 1917
CHUGACH N.F.

U.S. Forest Service Supervisor
Chugach National Forest

May 14, 1917
Coopers Landing
Alaska
(99572)

Dear Sir:

I am writing this letter as a 25 year concerned resident of Coopers Landing in regard to your planned Controled burn in this area for making Moose Browse or feed.

The map shows that you have area on Cooper Creek and other areas that are from a ¼ to ½ mile from, my year around home here for 23 years, in the, or very close to the best and thickest spruce stand in the area which is a good set up for a wild fire to take off and burn out all the residents of Coopers Landing.

I saw two fires in this area that left a lot of doubt in my mind if Anyone in the Service can be

considered capable of controlling a fire because the handling of the two that we did have here, were very. miss managed and left a lot of pretty looking country a sight for sore eyes, with dirty ugly old snags that does nothing for a pretty area like we have here.

I have failed to see any increase in the moose population of the area, they have been decreasing at a very rapid pace since the above mentioned fires

One thing we don't need is moose on the road and around our homes, I enjoyed it at one time, but over the years there has been 3 killed right on my garden spot by hunters, was just lucky didn't get shot myself with people shooting wildly in the area. my garden is only 200 hundred feet from the house which is setting in the trees.

III

In my opinion I think this is the most ridiculous program that you have come up with yet. If you continue to plan a burn within 10 miles of my home, the next letter will be from an attorney and I'll continue to carry my case to Washington D.C. to see if we have to be subjected to possible loss of our homes and inhale the dirty old smoke from a fire that is not in the best interest of residents of Cooper Landing. The smoke of one of those fires can hang right here in the Valley for weeks if the conditions are just right.

In this day and age I don't think that you have any more right to release a lot of smoke and pollution into the air than any one else. I'm sure if an individual were to try something like that they would be perhaps jailed for it, but you

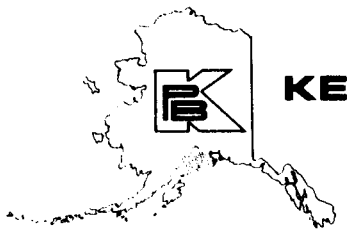
figure you can take tax payers money to pay your salaries and all the other expenses involved, to pollute the air of the country.

I promise if this is carried out as proposed I will put my full effort into stopping it, if advised of it or in after the fact case which ever it is. While I'm still living and in a condition to do it. I plan to make this my home for the remaining years of my life.

I would like to be advised of your action on this.

Sincerely yours

Maurice Amundson



KENAI PENINSULA BOROUGH

BOX 850 • SOLDOTNA, ALASKA 99669
PHONE 262-4441

DON GILMAN
MAYOR

May 13, 1977

RECEIVED
MAY 16 ...
CHUGACH N.F.

Mr. Clay Beal
Forest Supervisor
Chugach National Forest
222 E. Northern Lights Blvd.
Anchorage, Alaska 99504

Dear Mr. Beal:

The purpose of this letter is to inform you of the Kenai Peninsula Borough Planning Commission action upon review of the ENVIRONMENTAL STATEMENT CHUGACH MOOSE-FIRE MANAGEMENT PROGRAM.

At the April 25, 1977 meeting, the Planning Commission voted to go on record as opposing the burn program in concept, especially opposing the burn program in the populated areas of Canyon Creek, Cooper Creek, Cooper-Kenai Lake, East Fork Creek, Kenai River, Quartz Creek, Six Mile Creek and Trail River. A copy of the appropriate minutes will be forwarded to you as soon as they are approved.

Sincerely,

IKE D. WAITS
Acting Planning Director

IDW:rh

P. O. Box 2140
Anchorage, Alaska 99510
March 29, 1977

Forest Supervisor
Chugach National Forest
2221 E. Northern Lights
Anchorage, Alaska 99504

Dear Sir:

Since I will be unable to attend your public hearing in Anchorage regarding your proposed 10-year burning program for Forest Service land on the Kenai, I am writing to express my opinion on this matter, and hope that you will include this letter in your collection of public input concerning the burns.

I wish to express a strong objection to the program. I believe it over-emphasizes the fostering of population growth in one single species at the expense of well over a hundred other species of wildlife that live within the area. While studies are plentiful on the beneficial effects of fire for moose populations, very few studies have been done on its effect on other species -- and what studies exist are ambiguous as to results. A major program such as you propose should not be embarked upon without further preliminary study. The 22,000 acre program suggests that hunting is considered a prime use of a National Forest, rather than just one of numerous legitimate uses.

I also feel the assumption that controlled burning will simply replace the "uncontrolled" burns that modern fire-fighting technology now prevents is a questionable claim. Relatively large "out-of-control" burns do still occur down on the Kenai, for example, the one near the oil pipeline road within the Moose Range. Intensifying forest management to the extent of staging large burns raises humanitarian questions that should be addressed.

I hope that my opinion may be included in your record of public testimony.

Sincerely,

Alice Yarborough

Alice Yarborough

Appendix 19

19 April 1976

Subject: Control Burning of Government Lands for Browsing

Burning of any type, is not always a good thing, to begin with, it creates errosion of the soil and in many cases destruction of --- vegetative forest products, it eliminates the absorption of water --- changing water shed conditions, causing flooding and errosion.

I would be more in favor of contour strips, with the planting of domestic grasses and or oats, with the application of nutrient feeding fertilizers annually --- not necessarily reseeding each season --- for generally there will be enough seed remaining to replenish, through the treading of the animals.

These strips could be (50) feet in width, following a natural terrain contour in-land, far enough off of the Highway that, they would not be a Highway hazard and at the same time not be easy Prey areas for the Hunter --- But could improve the feeding with higher nutrient feed during the worst part of the winter month when feed browse is at a premium, for all ages of the animals.

These strips would not destroy the primitive-ness of any area, but, could aid as a fire-break for future fire control --- provide additional feeding habitat and or environment with minimum controls.

The cost would be far less in the long run than control burning --- the animals themselves would do a lot of the improving, after the strips are established --- by treading and browsing over periods of each season.

Further-more, these animals will alternate their diet --- by changing browsing from domestic feed to natural feed and returning periodically. This, I know, for I have monitered their actions or habits for many years during the winter months and in general this is their browsing habits --- when available in our Homestead Farming areas.

I don't feel burning is the answer to the problem of providing a feeding habitat --- there is just to much reaction from other problems such as, Soil errosion, Wind errosion, water shed and many others --- not to mention the extended wait for revegetation --- the destruction of natural growth production from past years, that could in time be utilized as marketing resources.

(con't)

Subject: Control Burning of Government Lands for Browsing

The cost of Control Burning is prohibitive, the amount of man-power and machinery needed to stand-by for this type of operation cannot justify the investment return --- Where as, Contour stripping could be done, with much less resistance, or calculated risk, planting Contour strps is less costly, more conservation-wise in all phases of the operation. These contour strips would be a green belt of nutritional vegetative cover over the terrain, least apt to cause errosion or other conservation problems.

The minus of the many elements needed in the soil, creates malnutrition and disease in plant, animal and man --- by balancing or adding these essential nutrients, we will produce a better quality of plant, animal and man.

I would like to make it known --- that, you can analyze our soils, here in Alaska, and you will find the lacking of the many elements that are needed for the proper feeding and growth of Plant, Animal and Man --- In fact, you can send soil samples out to the big Laboratories for a nine element analysis, and they will write back and ask where the sample came from, that all they could find was high Nitrogen and a small amount of potash --- I would say this is poor nutrition.

Many Farmers from the Upper Kenai Peninsula feel, that, with this type of a feeding habitat, it would greatly relieve the domestic crop destruction caused by the moose in past years --- even though the Wild Life Management in the State of Alaska --- denies that Moose will eat, high nutritional fed domestic grain and grasses and survive --- We find, they do very well and to the extent of migrating into herds --- numbering from (6) to (25) head or sometimes even more --- depending upon the amount and size of domestic feed available --- they also feed in the manner mentioned earlier --- They even stay in the area after they have eliminated the bulk of the feed. We have photographic proof, as does many tourists who travel by.

We feel, that the Upper Kenai Peninsula has had and seen enough of all types of burning, and that there are better ways to improve the Habitat of wild-life.

Thank you.

Sincerely yours,

Nelson C. Eshleman

Nelson C. Eshleman
Farmer and Conservationist
Star Route #2, Box 286
Sterling, Alaska 99672

Appendix 20

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

OFFICE OF THE COMMISSIONER / *SUPPORT BUILDING – JUNEAU 99801*

JAY S. HAMMOND, GOVERNOR

June 9, 1977

RECEIVED
JUN 14
CHUGACH N.F.

Mr. Clay G. Beal
Forest Supervisor
Chugach National Forest
2221 E. Northern Lights Blvd.
Suite 230
Anchorage, Alaska 99504

Dear Mr. Beal:

Please excuse the tardiness of this reply to the Chugach National Forest Moose Management Plan draft environmental impact statement. I sincerely hope that our comments will still be considered at this late date.

The Chugach National Forest Moose Management Plan was found to be very well done in general. It was felt that the historical and present situations were treated comprehensively and that in most cases sufficient consideration was given to the spectrum of public and resource concerns.

There are some concerns, however, which the Department feels were not fully discussed in the Moose Management Plan. I would like to bring these concerns to your attention.

At the beginning of the proposal the Forest Service mentioned on page one (1), paragraph five (5) "If a fire should escape its boundaries, it can be extinguished through the use of prepositioned men, equipment, supplies, hand lines and other means". We are concerned with the possible use of toxic chemical fire retardants as "other means" to extinguish fires especially in the water systems of Quartz Creek, Cooper-Kenai Lake, Resurrection Creek, Trail River, and East Fork Creek where salmon in their varying age classes are known to occur either near and/or downstream from the proposed control burn areas. Unless the fire retardant is certified non-toxic to the fish and the organisms in their food chain, we are totally opposed to its use.

We are also concerned with the type of suppressant equipment that may be used. We recommend that within the aforementioned fish streams there be no use of tracked or wheeled vehicles for fire suppression purposes unless the use of such equipment would prevent the loss of human life or significant private property damage.

Even though excessive siltation may not materialize under the proposed controls it should still be of concern. Other than this and the other mentioned considerations, we see no problems with the program and wish it success.

Sincerely,

James W. Brooks

James W. Brooks
Commissioner

Appendix 21

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

JAY S. HAMMOND, GOVERNOR

Alaska Dept. of Fish & Game
Cooper Landing, Alaska 99572

May 12, 1977

RECEIVED
MAY 16 1977
CHUGACH N.F.

Mr. Lee Culbertson
Chugach National Forest
2221 E. Northern Lights Blvd.
Anchorage, AK 99504

Dear Lee:

Thanks for sending the maps of those of your proposed burn areas which I requested. I am returning them with pertinent Dall sheep winter range (green), mountain goat winter range (yellow), and mixed goat and sheep winter range (orange) marked in.

As you can see, several of your proposed burns will involve goat range and mixed goat and sheep range directly, and, if allowed to burn up into the alpine tundra, will involve sheep winter range. Since nobody yet knows the effects of burning on sheep and goat winter ranges, I would advise caution where they could be damaged. Both species are very limited as to suitable habitat in late winter. Loss of critical winter habitat could be potentially serious. Fortunately, your proposed burns involve very small portions of winter habitat of both species, and <u>if</u> kept within your boundaries should do little harm.

However, if the fires get out of control, particularly if they burn upslope very much, several wintering areas could be badly hurt. I believe the following are the most critical:

Quartz Creek sites 19 and 21
Grant Lake sites 2 and 6 } (most potential danger to goats)
Trail Creek sites 5 and 6
Cooper-Kenai Lake sites 2,3,4,12, and 13(potential danger to sheep)

In the event you discover during earlier burns that you cannot prevent fires from burning upslope into the alpine (and subalpine where goats are concerned), I would recommend that you delete at least the most critical portions of these proposed burns and substitute other areas with less possible danger to sheep and goat winter habitats.

It is certainly possible that controlled burning could be beneficial to sheep and, especially, goat winter range. However, such burns should not be carried out until adequate experimentation and study demonstrate their effects.

Sincerely,

Lyman Nichols
Game Biologist

cc: ADF&G Habitat Protection

Appendix 22

United States Department of the Interior

OFFICE OF THE SECRETARY

P. O. Box 120
Anchorage, Alaska 99510

May 18, 1977

ER 77/360

RECEIVED
MAY 20 1977
CHUGACH N.F.

Mr. Clay G. Beal
Forest Supervisor
U. S. Forest Service
Chugach National Forest
2221 E. Northern Lights Blvd.
Anchorage, Alaska 99504

Dear Mr. Beal:

We have reviewed the draft environmental impact statement for the Chugach Moose-Fire Management Program, and offer the following comments for your consideration:

Page 34, Wildlife Effects on the Kenai National Moose Range: The statement cites some recent data concerning wildlife recovery on the 1969 Kenai burn. It does not include data or reference to vegetative studies that may be in process. Studies of wildlife and vegetative recovery on the Kenai burn would provide significant data on wildlife effects. A coordination of reference dates for Spencer and Hakala is needed between the first paragraph and that for Figure 17.

Page 38: We suggest that a map be inserted showing the subunits of Game Management Unit 7. We believe the tables would be more meaningful with a map.

Page 45, Favorable Impacts-Vegetation: We feel that the proposed plan of prescribed burning on the Chugach National Forest, if carried out as planned, will generally be beneficial in making better quality habitat available to moose.

Page 59 D, Small Mammals: While some losses of small vertebrates will undoubtedly occur, we feel these will generally be of short duration and of relative insignificance compared with the longer term benefits to moose and other species.

Page 64, Adverse Impacts-Water: Water-quality monitoring of surface-water resources should be considered, especially for areas containing

adjacent burn sites and where burning is to occur on both the lower and upper reach of drainages.

Page 74, Historical and Archeological: We suggest that the "National Register of Historic Places" and the Alaska State Historic Preservation Officer be consulted to determine if sites on, or eligible for, the National Register will be affected by the proposal. The results of these consultations should be included in the final statement.

As far as can be determined from the statement, there has been no cultural resource survey of the project's zone of potential impact. We suggest that the Alaska State Historic Preservation Officer also be consulted on need for a survey and to provide guidance in conduct of the investigation.

Thank you for the opoortunity to review and comment on the draft statement.

Sincerely yours,

Paul D. Gates
Regional Environmental
Officer-Alaska

A. Carriere
931 Karluk
Anch. Ak. 99501

Forest Supervisor
Chugach National Forest
2221 E. Northern Lights
Anch. Ak. 99504

Dear Sir:

In regard to your proposed Fire Mgmt / Wildlife habitat improvement program on the Kenai. I wish to voice my overall support of your program. There are two areas I wish to comment on, both of witch may lend credability to your program.

First I wish to comment on additional public involvement; not additional involvement at this time, but a general review by the public at say 3 and 6 years into the program. After 3 years Go back to the people; this is what we have done so far - should we continue? I feel that at 3 years all of the adverse impacts would have surfaced. Granted that the positive impacts would have only started to appear, but I feel a trend would have been established.

THIS SECOND COMMENT SHOULD REALY BE ADDRESSED TO THE ALASKA DEPT OF FISH + GAME, BUT FEEL IT WORTHWILE TO COMMENT HERE ALSO. I KNOW THE MOST LIMITING FACTOR TO MOOSE ON THE KENAI IS WINTER HABITAT. BUT FEEL THE SECOND LIMITING FACTOR MAY BE HARVEST, LEGAL AND OTHERWISE. & FEEL AN OVERALL PROGRAM OF MANAGEMENT OF THE HABITAT AND MANAGEMENT OF THE ACTUAL ANIMALS WOULD HAVE TO BE MORE EFFECTIVE THAN EITHER ONE ALONE. I WOULD URGE YOU TO EXPRESS THIS VIEW TO THE DEPT. OF FISH + GAME IN TERMS OF HARVEST AND ENFORCEMENT.

AGAIN, YOU HAVE MY SUPPORT FOR YOUR PROGRAM.

THANK YOU
Allan D. Cannin

Appendix 24

CALVIN M. FAIR, D.D.S.
P.O. BOX 369
SOLDATNA, ALASKA 99669

Lee ✓ CB

April-11-77

Mr. Clay Beal, Forest Supervisor
Chugach National Forest
2221 E. Northern Lights Blvd.
Suite 230
Anchorage, Alaska 99504

Dear Mr. Beal:

I have reviewed your fire management program for the Chugach Forest. I realize there will be some adverse impacts, but the worst in my mind will be the possibility of concentrating moose populations close to highways in some areas.

I have long felt that fire is perhaps the best overall management tool available to provide and improve moose browse habitat. I certainly would favor it over the mechanical crushers now being used by the FWS.

You certainly have my support with this program.

Sincerely,
Calvin M. Fair

Appendix 24B

State Director, Bureau of Land Management
Anchorage, Alaska

May 6, 1977

Area Director, Fish and Wildlife Service, Anchorage, Alaska

Review of draft environmental statement for proposed Fire Management Program for Chugach Moose - Fire Management Program, Chugach National Forest, Kenai Peninsula, Alaska (ER-77/360)

We have reviewed the subject statement as requested in a memorandum dated April 14, 1977, from Bruce Blanchard, Director, Office of Environmental Project Review.

We feel that the proposed plan of prescribed burning on the Chugach National Forest, if carried out as planned, will generally be beneficial in making more habitat of better quality available to moose. While some losses of small vertebrates will undoubtedly occur, we feel these will generally be of short duration and of relative insignificance compared with the longer term benefits to moose and other species.

Original Signed By
Gary [illegible]

cc: ADF&G, Juneau
ADF&G, USFS, Anchorage
AOES, AORF, WAES
Br. Env. Coord. NEC

02-001B

STATE of ALASKA

MEMORANDUM

RECEIVED
APR 18 1977
CHUGACH N.F.

TO: Supervisor
Chugach National Forest
Anchorage

DATE : April 13, 1977

FROM: Howard R. Kelser
Environmental Field Officer
Department of Environmental Conservation

SUBJECT: Recent Hearing and Proposed Burning of Forest Service Lands

Hello:

Just a note to comment on your recent hearing and on the burning proposal of Forest Service lands.

I thought that your Forest Service personnel did a fine job in explaining the project. When I first read about the program in the news media, I was led to believe that 22,000 acres of land would be burned over the spring ('77). If this had been true, I was a little concerned for the bird life if the burn would have taken place during the nesting period. However, through explanation of the project by your personnel, this fear has now been eliminated.

I support your proposed burning program.

H.R.K.

HRK:ht

Appendix 26

lee - CB

STATE OF ALASKA

JAY S. HAMMOND, GOVERNOR

DEPARTMENT OF FISH AND GAME

OFFICE OF THE COMMISSIONER / *SUBPORT BUILDING – JUNEAU 99801*

May 17, 1977

Forest Supervisor
Chugach National Forest
Suite 230
2221 E. Northern Lights Boulevard
Anchorage, AK 99504

Dear Sir:

The Division of Game, Alaska Department of Fish and Game, has reviewed the draft Environmental Statement of the Chugach Moose-Fire Management Program. We find it a very well-developed and well-written plan, and can only offer a few suggestions for improvement.

In considering problems of cabins vs burns, the fact that we own a cabin in Chickaloon River Site 1 was apparently overlooked. This does not imply, however, that this burn should be curtailed for aesthetic reasons.

The reference to fisher (Pages 65 and 74) should be deleted, as this species is not indigenous to Alaska.

Adequate notice to the public is undoubtedly planned, although not specifically outlined in this Statement. We encourage the Forest Service to achieve maximum publicity on the program, both to counter the "Smokey Bear" syndrome, and to decrease public concern (aircraft reporting the control burns, etc.) at the time of application.

In general, this is one of the better Environmental Statements we have had the pleasure of reviewing, and we congratulate the Forest Service for the excellent job of planning for a progressive program. The program has our unqualified support.

Sincerely,

Robert A. Rausch
Director
Division of Game

RECEIVED
MAY 20 1977
CHUGACH N.F.

Appendix 27

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION X

1200 SIXTH AVENUE

SEATTLE, WASHINGTON 98101

REPLY TO ATTN OF: 10FA - M/S 623

MAY 12 1977

RECEIVED
MAY 16 ..
CHUGACH N.F.

Mr. Clay G. Beal
Forest Supervisor
Chugach National Forest
2221 E. Northern Lights Boulevard
Suite 230
Anchorage, Alaska 99504

Dear Mr. Beal:

We have reviewed the draft environmental statement on the Chugach Moose-Fire Management Program and can foresee no significant adverse environmental impacts if the program is implemented.

The Environmental Protection Agency has rated this draft environmental statement LO-1, LO (Lack of Objections), 1 (Adequate Information). The rating will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air Act.

Thank you for the opportunity to review this statement.

Sincerely,

Alexandra B. Smith

Alexandra B. Smith
Director
Office of Federal Affairs

Environmental Impact of the Action

LO--Lack of Objections

EPA has no objections to the proposed action as described in the draft impact statement or suggests only minor changes in the proposed action.

ER--Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to reassess these aspects.

EU--Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

Adequacy of the Impact Statement

Category 1--Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2--Insufficient Information

EPA believes that the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3--Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the draft statement.

If a draft impact statement is assigned a Category 3, ordinarily no rating will be made of the project or action, since a basis does not generally exist on which to make such a determination.

CB

LEC

Alaska Chapter,
THE WILDLIFE SOCIETY
333 Raspberry Road
Anchorage, Alaska 99502
April 29, 1977

Mr. Clay G. Beal
Forest Supervisor
Chugach National Forest
2221 E. Northern Lights Blvd.
Suite 230
Anchorage, Alaska 99504

Dear Mr. Beal:

The Alaska Chapter of the Wildlife Society has reviewed your Environmental Impact Statement regarding moose habitat improvement within the Chugach National Forest on the Kenai Peninsula. In addition, I have also discussed the program with several of your employees involved with the project.

We wish to compliment you on a well planned project and hope you can conduct the habitat improvement work as planned. We fully support your effort.

We are aware that there will be initial detrimental impacts, particularly on some birds and small mammals, but the long range effects of creating "edge habitats" should be beneficial to most forms of wildlife.

Sincerely yours,

Will Troyer (by DT)

Will Troyer
President, Alaska Chapter
The Wildlife Society

cc: Robert Rausch

Appendix 29

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

INF--Fairbanks

REPLY TO: 8400 March 29, 1977

SUBJECT: Environmental Statement for Moose-Fire Management Program

TO: Lee Culbertson
Chugach National Forest
2221 East Northern Lights Blvd., Suite 230
Anchorage, AK 99504

Les and I have gone over the draft of your impact statement and found it to be a really excellent and thorough piece of work. It shows a lot of thought and just plain hard work.

The only suggestion we would have centers on evaluation of results of burning. The only mention of this we could find was one short paragraph on page 44. In view of the time, effort, and expense expended on these burns, it would seem that a carefully thought out program of evaluation should be instituted. If we could be of any help along these lines, we would be most happy to oblige.

Our new fire scientist, Dr. Rod Norum from Missoula, will be on board by about the middle of April. We will send him a copy of the statement and ask him to comment on it.

Ted

C. T. DYRNESS
Program Leader

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P. O. Box 1668, Juneau, Alaska 99802

eb

May 19, 1977

LEE

RECEIVED
MAY 26 1977
CHUGACH N.F.

Mr. Clay G. Beal
Forest Supervisor
Chugach National Forest
2221 E. Northern Lights Boulevard
Suite 230
Anchorage, Alaska 99504

Re: USDA-FS-R10 DES (ADM 77-07 Chugach Moose - Fire Management Program)

Dear Mr. Beal:

The Environmental Statement for the Chugach Moose - Fire Management Program, which accompanied your letter of March 23, 1977, has been received by the National Marine Fisheries Service.

The statement has been reviewed and we have no comments to offer.

Sincerely yours,

for Harry L. Rietze
Director, Alaska Region

Appendix 31

CB

Lee -

STATE OF ALASKA

OFFICE OF THE GOVERNOR

JAY S. HAMMOND, GOVERNOR

STATE POLICY DEVELOPMENT AND PLANNING

POUCH AD – JUNEAU 99811
PHONE 465-3612

May 11, 1977

RECEIVED
MAY 16 1977
CHUGACH N.F.

Mr. Clay G. Beal
Forest Supervisor
Chugach National Forest
2221 E. Northern Lights Blvd.
Suite 230
Anchorage, Alaska 99504

Subject: Chugach Moose-Fire Management Program DEIS
State I.D. No. 77032510

Dear Mr. Beal:

The State Clearinghouse has completed its review of the subject proposal.

Comments from State agencies indicate the proposed action is viewed with a too narrow perspective. Impact on resources which should be addressed include the effect of the proposal on historic and archaeological sites, water quality and diversity of vegatation types as well as such recreational uses as hiking, canoeing, photography, fishing and roadside sightseeing. Additionally, investigation should be undertaken to determine the feasibility of logging the selected areas, prior to burning.

I suggest you contact the following State personnel to discuss these various issues:

Protection of historic and cultural properties and recreational values - the Alaska Division of Parks has a comprehensive file of historical and archaeological resources, including a number within the areas proposed to be burned. The person to contact is Mr. Russ Cahill, Director, Division of Parks, 619 Warehouse Drive, Anchorage, Alaska, Phone: 274-4676;

Erosion control and water quality maintenance coordination should be maintained with Mr. Kyle Cherry, Regional Environmental Supervisor, Department of Environmental Conservation, 338 Denali Street, Anchorage, Alaska, Phone: 274-5527.

In addition, coordination should be maintained with State forestry personnel. Contact can be made through Lawrence A. Dutton, Manager, Southcentral Land District, Division of Lands and Water Management, 323 E. 4th Avenue, Anchorage, Alaska, Phone: 279-5577.

I futher suggest that you convene a meeting of the above

named individuals to review their concerns and to coordinate State efforts with those planned by the Forest Service.

This letter satisfies the review requirements of Office of Management and Budget Circualr A-95.

Sincerely,

John Halterman
State-Federal Coordinator

cc: Russ Cahill
Kyle Cherry
Lawrence Dutton

STATE OF ALASKA

JAY S. HAMMOND, GOVERNOR

DEPARTMENT OF HIGHWAYS

CENTRAL DISTRICT / 5700 E. TUDOR ROAD – P.O. BOX 5700
ANCHORAGE 99502

April 1, 1977

Re: Environmental Statement
Chugach Moose-Fire
Management Program
52-2441

Forest Supervisor
Chugach National Forest
2221 E. Northern Lights Blvd.
Suite 230
Anchorage, Alaska 99504

Dear Sir:

The Department of Highways, Central Division has no objection to the Chugach Moose-Fire Management Program.

Enclosed you will find a copy of our proposed Six Year Program for construction on the Kenai Peninsula. Please note the proximity of some of the proposed burn areas to proposed highway construction.

If highway construction is in progress during a proposed burning period, close coordination between the Forest Service representatives and Mr. Guy Greene, Construction Engineer for the Central Division will be necessary to avoid any conflict.

If any questions or problems arise, my staff will be available for assistance.

Sincerely,

Rowe D. Redick

Rowe D. Redick
Central Division Engineer

Attachment:
Six Year Transportation
Construction Program