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GENERAL

INVESTIGATION MEMORANDUM

Susitna Hydroelectric Project

Terrestrial Program

Fiscal Year 1984

---FINAL DRAFT---

Harza-Ebasco Susitna Joint Venture

November 1983

TABLE OF CONTENTS

		PAGE
1.0	INTRODUCTION	1-1
	1.1 BACKGROUND	1-1
	1.2 GENERAL OBJECTIVES	1-1
2.0	STUDY OBJECTIVES	2-1
3.0	IDENTIFICATION OF ISSUES	3-1
4.0	PREVIOUS STUDIES AND DATA AVAILABILITY	4-1
	4.1 PREVIOUS STUDIES	4-1
	4.2 DATA AVAILABILITY	4-1
5.0	DELINEATION OF STUDY AREA	5-1
6.0	STUDY METHODOLOGY	6-1
	6.1 PREVIOUS DATA AND REPORTS	6-1
	6.2 GENERAL INVETIGATION MEMORANDUM AND PLAN OF STUDY	6-1
	6.3 STAFF MEETINGS AND PROGRESS REPORTS	6-1
	6.4 SITE RECONNAISSANCE VISITS	6-2
	6.5 SUBCONTRACTOR MANAGEMENT	6-2
	6.6 QUALITY ASSURANCE	6-2
	6.7 COORDINATION	6-3
	6.7.1 General	6-3
	6.7.2 Progress Review and Planning Meetings	6-3
	6.7.3 Workshops	6-4
	6.8 REVIEW OF ADF&G PLANS OF STUDY/ANNUAL REPORTS	6-4
	6.9 TRANSMISSION LINE INVESTIGATION	6-5
	6.10 REGULATORY AGENCY AND PERMIT SUPPORT	6-5
	6.11 FERC REQUESTS FOR SUPPLEMENTAL INFORMATION	6-5
	6.12 FERC SITE TOURS	6-6
	6.13 ENGINEERING DESIGN CHANGES/LICENSES APPLICATION UPDATE	6-6
	6.14 AGENCY COMMENTS ON THE LICENSE APPLICATION	6-7
	6.15 REVIEW DRAFT EIS	6-7

TABLE OF CONTENTS (Continued)

6.16 FINALIZE FY'85 WORKSCOPES FOR SUBCONTRACTORS AND ADF&G 6-7

6.17 IMPACT ASSESSMENT AND MITIGATION PLANNING 6-8

6.17.1 Settlement Process 6-8

6.17.2 Tracking and Documentation System. 6-9

6.17.3 Mitigation Plan Status Report. 6-10

6.17.4 FY 1984 Settlement Process Work Efforts. 6-11

6.17.4.1 Upstream Moose. 6-11

6.17.4.2 Downstream Moose. 6-19

6.17.4.3 Caribou 6-23

6.17.4.4 Dall Sheep. 6-25

6.17.4.5 Black and Brown Bears.. 6-27

6.17.4.6 Wolf and Wolverine. 6-31

6.17.4.7 Belukha Whale 6-32

6.17.4.8 Other Species 6-32

7.0 STUDY COORDINATION AND MANAGEMENT 7-1

7.1 HARZA-EBASCO. 7-1

7.2 INTERACTION WITH OTHER STUDY TEAMS. 7-1

7.3 SUBCONTRACTORS. 7-2

7.4 COORDINATION AND MANAGEMENT OF SUBCONTRACTORS 7-3

8.0 SCHEDULE AND DELIVERABLES 8-1

8.1 SCHEDULE. 8-1

8.2 DELIVERABLES. 8-1

9.0 BUDGET. 9-1

10.0 ATTACHMENTS. 10-1

APPENDIX A - AGENCY RAISED ISSUES. 10-2

APPENDIX B - MAJOR SUSITNA PROJECT TERRESTRIAL STUDIES . . 10-13

1.0 INTRODUCTION

1.1 BACKGROUND

Harza-Ebasco Joint Venture (H-E) has been authorized by the Alaska Power Authority to manage the Environmental Program associated with the Susitna Hydroelectric Project. This General Investigation Memorandum sets forth the objectives, methodology, organization and personnel, schedule, deliverables and budget for accomplishing the wildlife and botanical resources studies needed to support the Federal Energy Regulatory Commission (FERC) licensing of the Project. The activities and budget described in this memorandum are for Fiscal Year (FY) 1984 (July 1983 through June 1984).

The understanding for developing the activities described in this memorandum for the Terrestrial Program was gained through: review of previous study reports on the Susitna Project; review of the FERC License Application, particularly Exhibit E; and meetings with the Power Authority, terrestrial studies subcontractors, and agencies.

1.1 GENERAL OBJECTIVES

Task 4 of the H-E Contract for the Susitna Project contains the Environmental Program for the Licensing and Design of the Project. The program is designed to meet the following general objectives:

1. to evaluate the environmental effects of the proposed Project in order to recommend modifications and other measures necessary to assure compatibility of the Project with the environment;

2. to ensure that the technical aspects of the environmental study program enable compliance with statutory and regulatory requirements governing project development;

3. to develop coordinated, effective data collection and analysis programs which facilitate evaluation of project effects and mitigation of adverse effects of the proposed Project; and

4. to assist and support engineering activities to ensure proper and efficient implementation of design features to comply with environmental constraints and objectives.

The specific study objectives for the Terrestrial Program are presented in Section 2.0 of this memorandum.

2.0 STUDY OBJECTIVES

Specific study objectives for the Terrestrial Programs have been defined primarily from the Task 4 scope of work presented in the Susitna Project Contract. In addition, review of previous study reports on this Project and the FERC License Application, plus meetings with the Power Authority, agencies, and the terrestrial studies subcontractors have identified the specific study objectives.

The specific study objectives for the Terrestrial Program are identified below. A list of Terrestrial Program activities designed to satisfy these objectives during FY 1984 are presented in Table 2-1.

1. In coordination with the H-E Licensing and Permitting Group, identify Federal Energy Regulatory Commission (FERC), agency, and public concerns about wildlife and botanical resources associated with the Susitna Project in need of resolution for timely licensing and permitting to the Project.

2. In coordination with Project engineers, review and evaluate the impacts of design modifications on wildlife and botanical resources and identify concerns in need of resolution for successful licensing and permitting of the Project.

3. Consolidate, as appropriate, identified concerns into specific issues to be addressed during the licensing process or later;

4. Develop in consultation with appropriate regulatory agencies and subcontractors, programs to resolve these issues.

5. Working with the Power Authority staff, manage or conduct these programs in a manner that will ensure that program results are effectively utilized to resolve issues and enhance the environmental compatibility of the Project in a cost-effective manner.

6. Assist and support engineering activities to ensure that project design is compatible with necessary environmental constraints and objectives.

TABLE 2-1

TERRESTRIAL PROGRAM ACTIVITIES FOR FY 1984

1. Review data collected to date and previous reports.

2. Prepare General Investigation Memorandum.

3. Prepare Detailed Plan of Study.

4. Participate in weekly staff meetings.

5. Prepare monthly Terrestrial Program progress reports.

6. Conduct site reconnaissance visits to familiarize Terrestrial Study Team staff with Project area.

7. Manage subcontractor field program and impact assessment/mitigation planning efforts, including budget and schedule control, research design, and quality assurance.

8. Produce H-E Quality Assurance Manual and institute subcontractor quality assurance programs [a/],[b/].

9. Review and comment on ADF&G's big game plans of study and annual reports[a/].

10. Coordinate the activities of the entire Terrestrial Study Team, including the subcontractors and ADF&G.

11. Prepare a final report for the spring 1983 Terrestrial Modeling Workshop[a/].

12. Conduct a spring 1984 Terrestrial Program Workshop and prepare a report[a/].

13. Provide input to the Task 41 Transmission Line Report regarding wildlife and botanical resources impacts of alternate corridors.

TABLE 2-1 (Continued)

14. Prepare information for non-FERC permit applications[a/].

15. Prepare responses to remaining FERC supplemental information requests.

16. Prepare for and particpate in FERC site tours and presentation[a/].

17. Evaluate the impacts of design changes and the implications of changed assumptions and associated forecast revisions on terrestrial ecosystems.

18. Prepare update of License Application based on design refinements.

19. Prepare responses to formal agency comments on License Application[a/].

20. Review Draft EIS[a/].

21. Prepare final work scopes for the Terrestrial Program in FY 1985[a/], [b/], [c/].

22. Identify concerns related to the Projects's Impact Assessment and Mitigation Plan in need of resolution for successful licensing and permitting of the Project; consolidate identified concerns into specific issues; develop appropriate programs to resolve these issues; and manage or conduct these programs in a manner that will ensure that program results are effectively utilized to resolve issues, comply with the FERC licensing process, and enhance environmental compatibility of the project[a/], [b/], [c/].

23. Establish and maintain a tracking and documentation system for Impact Assessment and Mitigation Planning[a/].

TABLE 2-1 (Continued)

24. Refine the Terrestrial Mitigation Plan and prepare a status report including long range plan of studies and other milestones[a/].

25. Identify candidate lands for moose habitat enhancement[a/].

26. Review literature, unpublished data, and studies in progress to evaluate habitat enhancement techniques.

27. Conduct a browse inventory pilot study to determine the most efficient methods to conduct the extensive browse inventory in summer 1984[b/].

28. Conduct a limited moose food habits study to help design the extensive browse inventory (if funding is available)[b/].

29. Complete a spring plant phenology study to determine the distribution, relative abundance, and time of occurrence of early spring moose and bear forage in the impoundment area[b/].

30. Conduct a survey of beaver colonies between Devils Canyon and Talkeetna and downstream of Talkeetna and collect information on beaver overwinter survival to support beaver impact assessment modeling efforts[c/].

31. Initiate the extensive browse inventory to be conducted during summer 1984 (if funding is available)[b/].

32. Prepare a preliminary draft forage vegetation map to provide a basis for stratification for the extensive browse inventory (if funding is available)[d/].

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a/ LGL will provide input or lead this effort.
b/ U of A Palmer will provide input or lead this effort.
c/ U of A Fairbanks will provide input or lead this effort.
d/ Vegecation mapping subcontractor will lead this effort.

3.0 IDENTIFICATION OF ISSUES

A key step in preparing the General Investigation Memorandum for the Terrestrial Program is the identification of specific issues which must be addressed during the licensing process. These issues present FERC, other agencies, and public concerns relative to wildlife and botanical resource impact information needs resulting from the Susitna Project. They have been identified through workshops, individual agency meetings, and formal agency correspondence. A preliminary list of these terrestrial issues is provided in Section 10.0, Appendix A. The issues list also provides at least one source of the origin- ating concern and a preliminary summary of the status of resolution or planned work efforts for each issue.

The complete process of issue identification and resolution is described in Section 6.17.1. The tracking and documentation system for this process is defined in Section 6.17.2. A mitigation plan status report, which includes a long-range plan for resolution of remaining issues, is described in Section 6.17.3 and the major FY 1984 issue resolution work efforts are described in Section 6.17.4. The specific issues each work effort is designed to address are also identified in Section 6.17.4.

4.0 PREVIOUS STUDIES AND DATA AVAILABILITY

4.1 PREVIOUS STUDIES

Terrestrial studies relating to hydroelectric development on the Susitna River have been conducted since the mid-1970s.

A listing of major reports documenting previous studies on vegetation and wildlife in the project area that were supported by Susitna Project funds is presented in Section 10.0, Appendix B.

4.2 DATA AVAILABILITY

Although the references listed in Section 10.0, Appendix B represent the majority of existing information on vegetation and wildlife in the Susitna River Basin, additional data sources do exist. Many of these re- sulted from preliminary studies on wildlife impacts of Susitna River hydroelectic development. Another source of additional data are the many ADF&G research reports on big game mammals and their predators in Game Management Unit 13 that have been produced in recent years. Finally, additional data on big game are available through harvest reporting and standard field surveys and inventories. These latter data are published by ADF&G as Annual Reports of Survey-Inventory Activities.

5.0 DELINEATION OF STUDY AREA

The main terrestrial study area for the Susitna Project consists of that portion of the Susitna River watershed between its confluences with the Tyone River and Indian River. The terrestrial study area also includes that portion of the Nenana River drainage between Deadman Mountain and the Denali Highway which will be traversed by the project access road.

Downstream of the project area the primary study area is the river floodplain and immediately adjacent areas. For some studies, however, such as downstream moose and black bears, the study area extends far enough away from the river to include the home ranges of those animals that utilize floodplain habitats. For purposes of downstream terrestrial studies, the downstream area is generally divided into the area between Devil Canyon and Tal- keetna and the area between Talkeetna and Cook Inlet.

The transmission line intertie route betwen Healy and Willow is also part of the terrestrial study area. Broad areas between Willow and Anchorage and Healy and Fairbanks are also included for the purpose of alternative transmission line route selection.

Study area boundary maps for each major field study are provided in the Plan of Study.

6.0 STUDY METHODOLOGY

6.1 PREVIOUS DATA AND REPORTS

The initial task of the Terrestrial Study Team is to review previously collected data and reports, including the FERC License Application and ADF&G and subcontractor reports dealing with wildlife/botanical resources.

6.2 GENERAL INVESTIGATION MEMORANDUM AND PLAN OF STUDY

After preparation of a General Investigation Memorandum, which describes the objectives, methodology, organization and personnel, schedule, deliverables, and budget for conducting the FY 1984 Terrestrial Program, a Plan of Study will be prepared which presents the detailed methodology and schedule for the FY 1984 Terrestrial Program.

6.3 STAFF MEETINGS AND PROGRESS REPORTS

Continuing activities of the H-E Terrestrial Staff are participation in weekly staff meetings and preparation of monthly progress reports. These are primarily the responsibility of the Group Leader. Staff meetings provide a standardized means for information transfer between and among the Environmental and Licensing Operations Manager and the Environmental Group Leaders and Licensing Task Leader. Monthly progress reports contain input from subcontractor progress reports and represent input to the Monthly Project Progress Report. As such, they follow the format prescribed for the Project Progress Report.

6.4 SITE RECONNAISSANCE VISITS

Another initial and continuing activity of the H-E Terrestrial Staff is to conduct site reconnaissance visits to familiarize staff both with the environmental attributes of the project area and the project layout. Reconnaissance visits will include both aerial and ground surveys.

6.5 SUBCONTRACTOR MANAGEMENT

Four subcontracts to H-E will be consummated during FY 1984 for Terrestrial study efforts. Subcontractors include LGL Alaska Research Associates (LGL), the University of Alaska Palmer Agricultural Experiment Station (U of A Palmer), the University of Alaska Cooperative Wildlife Research Unit (U of A Coop.), and the University of Alaska Museum (U of A Museum). These subcontractors and their areas of responsibility are shown in Section 7.3.

The task of subcontractor management includes: assisting the subcontractor in scope preparation; (1) review, negotiation, and approval of subcontractor scope, budget, and schedule; (2) assisting in preparing and finalizing a contract; (3) monitoring of subcontractor progress while ensuring that budgets and schedules are being met; (4) coordinating subcontractor logistic requirements with H-E logistics personnel; (5) coordinating subcontractor activities with other Terrestrial Program activities; and (6) performing quality assurance audits or reviews of subcontractor activities and deliverables.

6.6 QUALITY ASSURANCE

All subcontractors will be required to apply a Quality Assurance (QA) Program to their studies. This will include quality assurance procedures for data collection, checking, and storage, analytical procedures, report preparation and review. H-E will develop a QA Manual to encompass any studies in which it directly participates

and to include an overview of QA procedures for all Task 4 subcontractors.

6.7 COORDINATION

6.7.1 General

Terrestrial Program coordination is generally described in Section 7.0; specific coordination activities are described in this section.

Coordination is primarily the responsibility of the H-E Terrestrial Group Leader but is also shared by the LGL Project Manager. LGL coordination responsibility covers activities associated with terrestrial model refinements as well as other activities related to impact/assessment mitigation plan refinement as directed by H-E. The primary mechanism for communication and coordination will be through frequent and open communication among H-E, subcontractors, and ADF&G staff.

6.7.2 Progress Review and Planning Meetings

A systematic means of ensuring that good coordination occurs will be implemented through regular progress review and planning meetings. These meetings will be attended by the H-E Group Leader, LGL Project Manager, ADF&G Research Coordinator, ADF&G Habitat Division reviewer, and a USFWS project reviewer. In addition, it is expected that Power Authority Staff will attend as time permits and additional staff members from H-E, LGL, ADF&G, USFWS, U of A Palmer Experiment Station, U of A Museum and U of A Cooperative Wildlife Research Unit, will attend as necessary. Members of the Aquatic, Hydrology and Social Science Study Teams will also be requested to attend when appropriate to ensure that activities are coordinated with these groups and to obtain their technical expertise when the need arises.

Progress review and planning meetings will be conducted monthly or more or less frequently as the need arises. These meetings will provide a forum for each major entity of the Terrestrial Study Team to report on their activities for the previous month, including preliminary results of field studies, and to discuss their planned activities and problem areas. The meetings will provide the opportunity for Terrestrial Study Team members to modify their activities so that they provide more useful input to other activities in a timely manner. General planning activities will also take place at these meetings relative to deciding priorities and defining work efforts necessary to support impact assessment and mitigation plan refinement. Minutes covering each of these meetings will be prepared and distributed to all Terrestrial Team members.

6.7.3 Workshops

Another form of information transfer and coordination is through workshops. A large workshop centered on terrestrial modeling efforts was held in spring 1983. A draft report presented the status of terrestrial models, as refined at the workshop and associated technical meetings, and identifed information needs for further model refinement. This report will be finalized in December 1983 following receipt of comments from Terrestrial Study Team members.

A 1984 Workshop is currently planned for spring 1984. This workshop will inform all interested parties of Terrestrial Program, terrestrial model, and issue resolution status, and will provide for critical review and input on further model refinements and issue resolution.

6.8 REVIEW OF ADF&G PLANS OF STUDY/ANNUAL REPORTS

Plans of Study and annual reports prepared by ADF&G will be reviewed and comments submitted to the Power Authority.

6.9 TRANSMISSION LINE INVESTIGATION

The goal of the Transmission Line Investigation is to have preferred routes for each project transmission line segment and substation locations agreed upon by the public, agencies, and serviced utilities during 1983. Wildlife and botanical resources are a prime concern in transmission line routing and so the Terrestrial Study Team will provide support as required. This includes participaton in field reconnaissance, agency interviews, public meetings, data collection, and report preparation.

6.10 REGULATORY AGENCY AND PERMIT SUPPORT

Susitna Project licensing will require that many regulatory requirements be satisfied in addition to FERC requirements. Federal, state, and/or regulatory requirements in at least three areas will need major support from the Terrestrial Study Team. These areas include wetlands, eagles, and endangered species. Sections 401 and 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act, the Executive Order on Protection of Wetlands, the Bald Eagle Protection Act, and the Endangered Species Act are the major federal regulations pertaining to activities affecting these resources. The Terrestrial Study Team will work closely with the H-E Licensing and Permitting Group to provide the necessary support required to ensure project compliance with pertinent non-FERC regulations.

6.11 FERC REQUESTS FOR SUPPLEMENTAL INFORMATION

On April 12, 1983 FERC provided the Power Authority a list of supplemental information requests relative to the license application. This list included 32 questions pertaining to botanical and wildlife resources (Chapter 3). Additional questions on Socioeconomics (Chapter 5), Recreation (Chapter 7), Land Use (Chapter 9), and Alternatives (Chapter 10) related heavily to wildlife or botanical

resources. On November 3, 1983 FERC made additional requests for supplemental information relative to terrestrial resources. Members of the Terrestrial Study Team are working both directly and through subcontractors to prepare this information.

6.12 FERC SITE TOURS

The Terrestrial Study Team helped prepare itineraries for and participated in the extensive August 1983 FERC site tours. An evening presentation was also prepared.

6.13 ENGINEERING DESIGN CHANGES/LICENSE APPLICATION UPDATE

A review of the engineering and project operation concepts will be performed so as to optimize the overall project concept. A major aspect of this process is to consider the environmental implications of any proposed engineering design modifications. Ultimately this process will lead to the preparation of various environmental reports on project design modifications which may be used as the basis for updating the FERC License Application. The process described below will be used for the development of the required environmental reports.

After initial discussion concerning the nature of potential design modifications between engineering and environmental personnel, a "Discussion Memorandum" will be prepared by the appropriate environmental scientist. The objectives of this memorandum will be to promote communication and understanding of the problem between engineering and environmental personnel.

When the engineering evaluation process is complete, a report will be prepared to accompany the engineering study report. The depth and detail of the environmental report will depend on the nature of the design modification and the affected project impacts.

When a decision is made to officially modify Project design, the FERC License Application will need to be updated. Preparation of the terrestrial portions of this update will be performed by the Terrestrial Study Team in a format prescribed by the Project Licensing Group. The License Application update will build upon previous environmental reports prepared on engineering design modifications.

6.14 AGENCY COMMENTS ON THE LICENSE APPLICATION

Formal agency comments on the License Application will be received during FY 1984. The Terrestrial Study Team, in conjunction with subcontractors, will prepare formal responses to the appropriate comments.

6.15 REVIEW DRAFT EIS

The FERC Draft EIS on the Susitna Project will be available in February 1984. The Terrestrial Study Team will review this document on behalf of the Power Authority and prepare written comments for transmittal to FERC.

6.16 FINALIZE FY 1985 WORK SCOPES FOR SUBCONTRACTORS AND ADF&G

This task represents the finalization of FY 1985 work scopes and contracts or contract amendments with the terrestrial subcontractors. It also includes finalization of ADF&G's FY 1985 RSA. These activities will be conducted through an iterative process consisting of Terrestrial Study Team meetings to decide on priorities, proposal preparation, proposal review, and proposal revision.

6.17 IMPACT ASSESSMENT AND MITIGATION PLAN REFINEMENT

6.17.1 Settlement Process

Refinement of the Terrestrial Impact Assessment and Mitigation Plan is an ongoing process that is necessary to support licensing of the Susitna Project. This process has been organized into four overlapping phases.

The first phase involves identification of FERC, other agency, and public issues about wildlife and botanical resources associated with the Susitna Project in need of resolution for licensing of the project. These issues have been identified through workshops, individual agency meetings, formal agency comments on the draft FERC License Application, and public meetings, such as the FERC scoping meeting. One of the major vehicles for identifying agency and subcontractor concerns was the February 28 - March 2, 1983 Mitigation Planning Workshop. A table listing the issues identified to date along with the source of the originating concern is provided as Appendix A.

The second phase of this process is the discussion of each issue with the appropriate agency in order to arrive at a final list of the issues to be addressed during the licensing process. Phase three involves the development, with appropriate agency and subcontractor personnel, of appropriate programs to resolve these issues. This phase will be conducted through a series of technical meetings. The programs can range from a simple written response, defining why the issue does not justify further study, to extensive field programs. A Detailed Plan of Study will be prepared for each extensive field or office study. The programs tentatively identified to date for resolving the issues are provided along with the issues in the Appendix A tables. The final phase of the process is the management or conduct of these programs in a manner that will ensure

that program results are effectively utilized to resolve the issues and enhance the environmental compatibility of the Project. The ultimate goal of this process is the development of an equitable settlement of issues.

6.17.2 Tracking and Documentation System

It is important that a "bookkeeping" system be developed and applied to the Terrestrial Program issue settlement process so that the current status of impact assessment and mitigation planning for each impact mechanism can be documented and tracked through the process. This is necessary even though there is a broader tracking system for the entire settlement process (being maintained by the Licensing and Permitting group) because many agency-raised issues are general (i.e., impacts not adequately quantitifed--Issue T-20) and tracking and documentation of the resolution of these issues requires an examination of each impact mechanism.

The tracking and documentation system to be implemented for the Terrestrial Program consists of a table maintained on a word processing system that includes columns listing: (1) each species or other appropriate biological unit; (2) each impact mechanism potentially affecting each species/biological unit; (3) the status of impact assessment for each impact mechanism (i.e., a brief description of how it was assessed, how adequate/inadequate and quantitative/qualitative the assessment was, and a reference to the document(s) and page(s) where the assessment is located): and (4) a brief description of how, and to what extent, the impacts resulting from each impact mechanism will be mitigated together with a reference to the detailed mitigation plan description.

A first draft of the species/biological unit and impact mechanism portions of the table will be completed by the end of October 1983. This will be distributed among Terrestrial Study Team Members for

review; however, work will continue on the remaining portions of the table and a first draft of the entire tracking and documentation system will be available by the end of November 1983. The table will be updated monthly and will be used at t . Terrestrial Program progress review and planning meetings as the basis for reporting progress and planning future activities. The table will provide a means for grasping the total scope of unresolved issues so that prioritization of work efforts can be clearly made.

6.17.3 Mitigation Plan Status Report

The ultimate goal of the impact assessment/mitigation plan refinement process is to develop a Terrestrial Mitigation Plan that is consistent with the Power Authority's Fish and Wildlife Mitigation Policy for the Susitna Project and that satisfies FERC, other agencies, and the public. Therefore, it is important to at least define the framework for the plan at an early stage so that resolution of the remaining issues can be focused at defining the specifics of the plan. The initial framework will be the plan provided in the license application. This framework will be reviewed informally with agencies, subcontractors, and the Power Authority in order to refine the plan and therefore, to refine field programs as much as possible. After receipt of agency comments, a more formal strategy will be pursued to define the mitigation plan framework. Because of certain data requirements that require long lead times, the mitigation plan may not be finalized for several years. However, a report documenting the current status of the plan will be prepared by the Terrestrial Study Team at the end of FY 1984.

This document will briefly describe the status of the plan as of that date, the refinements made during the previous year, the reports and other products dealing with impact assessment/mitigation plan refinement produced during the year, the remaining terrestrial issues, and the long range plan for resolving these issues and finalizing the mitigation plan.

6.17.4 FY 1984 Settlement Process Work Efforts

A number of field studies and other tasks designed to resolve some of the remaining terrestrial issues are currently underway or planned for FY 1984. Budget limitations have necessitated delaying or reducing the scope of some work efforts. Therefore, the FY 1984 program represents only those work efforts considered to be of highest priority. In the subsections provided below, the FY 1984 work efforts are described within the framework of the overall impact assessment and mitigation planning program for each species or species group. In addition, the specific issues (Appendix A) that are addressed by each work effort are identified.

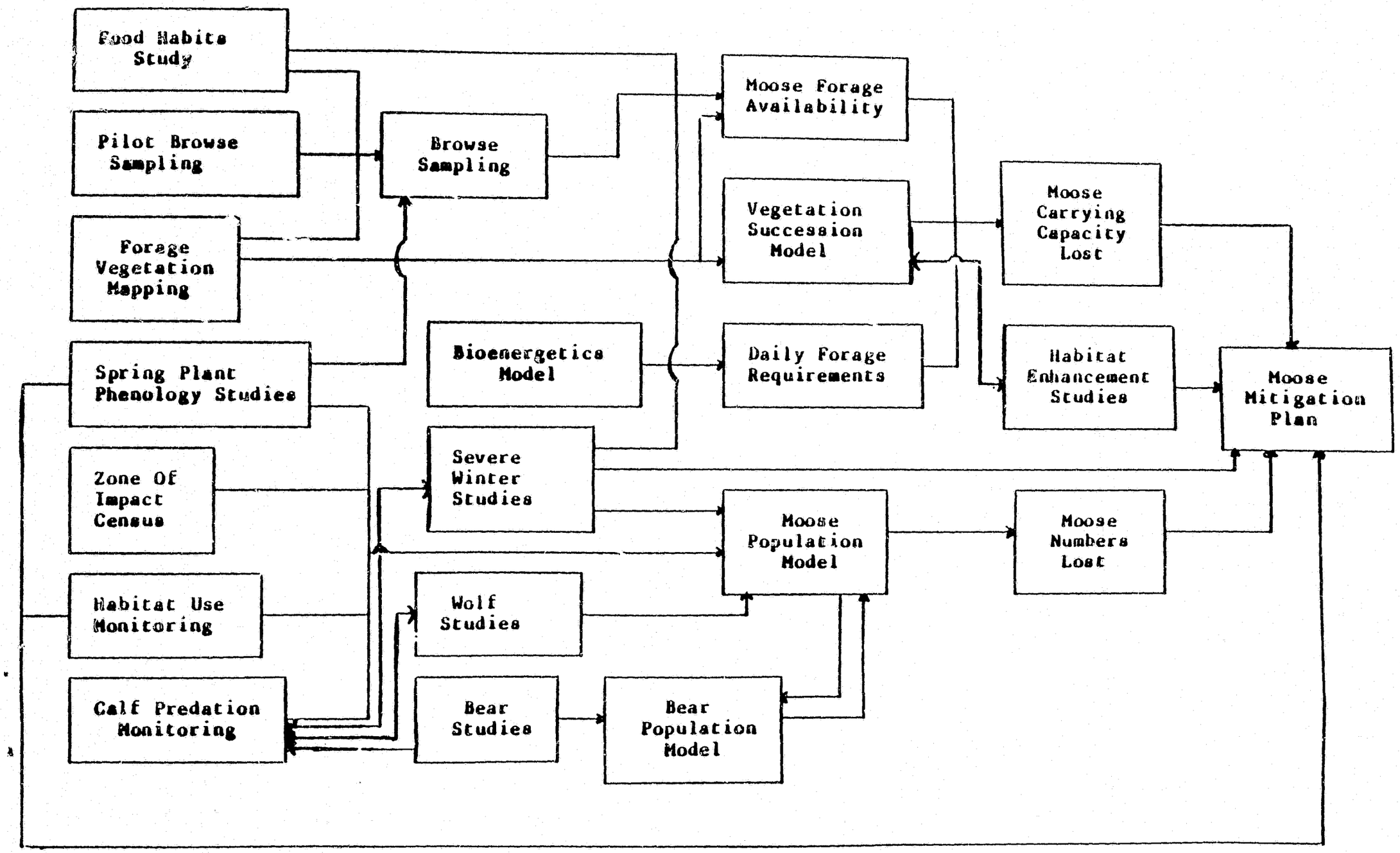
6.17.4.1 Upstream Moose. Two approaches to refining the impact assessment for moose upstream of Devil Canyon are being followed. The first is based on the existing population and attempts to predict how the population will respond to the project over time. The second is a habitat-based approach which attempts to estimate the potential of habitat that will be altered or lost to support moose. The population approach has the advantage of predicting actual changes in moose numbers. It allows estimation of impacts that are not habitat-based, such as accidents and human-induced mortality. The habitat-based approach is useful for estimating changes in potential carrying capacity when existing populations are not fully utilizing their habitat and for direct comparison of specific acreages and the benefits of habitat enhancement techniques. Each approach will provide information necessary for evaluating the other and the integrated results of both are expected to provide the basis for mitigation planning. The linkages among the various work efforts designed to support these two approaches are shown in Figure 6-1.

Work efforts to be conducted during FY 1984 along with the responsible organizations include:

1. Zone of Impact Census - ADF&G
2. Impact Area Habitat Use Monitoring - ADF&G
3. Calf Predation Monitoring - ADF&G
4. Severe Winter Studies (if severe winter occurs) - ADF&G
5. Spring Plant Phenology Study-U of A Palmer
6. Forage Vegetation Mapping - Unknown subcontractor
7. Pilot Browse Sampling - U of A Palmer
8. Moose Food Habits Study - U of A Palmer
9. Browse Sampling - U of A Palmer
10. Wolf Studies - ADF&G
11. Bear Studies - ADF&G
12. Bioenergetics Model Testing - ADF&G/USFWS
13. Bear Population Model Refinement - ADF&G/LGL
14. Moose Population Model Refinement - ADF&G/LGL
15. Habitat Enhancement Studies (monitoring winter use of downstream disturbed sites) - ADF&G
16. Habitat Enhancement Studies (literature review of habitat enhancement techniques)-H-E
17. Mitigation plan refinement (identification of candidate lands for habitat enhancement) - H-E/LGL/Agencies

Brief scope descriptions of each of these work efforts along with the organizations with primary responsibility, deliverable due dates, and the specific issues each work effort is designed to address are provided below.

Figure 6-1. **LINKAGES AMONG COMPONENTS OF UPSTREAM/MOOSE IMPACT ASSESSMENT & MITIGATION PLAN REFINEMENT EFFORTS**



1. Work Effort: Zone of Impact Census

Primary Responsibility: ADF&G

Issues Addressed: T-17, T-20, T-39

Deliverable Due Dates: Draft Annual Report due 4/1/84

Scope: The zone of impact (defined as all areas within one home range length of any area which will be altered by construction and operation of the project) will be censused in November 1983 using techniques described by Gasaway et al. 1981 to provide estimates of the number and sex and age composition of moose that will be exposed to direct project impacts. The census area also will include all of composition Count Areas 7 and 14 to provide a comparison with the 1980 census and to check the accuracy of predictions of the moose submodel.

2. Work Effort: Impact Area Habitat Use Monitoring

Primary Responsibility: ADF&G

Issues Addressed: T-17, T-20, T-33, T-39

Deliverable Due Dates: Draft Annual Report due 4/1/84

Scope: The radio-collared moose known to inhabit the zone of impact will be relocated 2 to 4 times a month between September and February depending on moose movements and 6 to 8 times a month between March and June. Monitoring at other times of the year and monitoring of other radio-collared moose will be limited to the level necessary to maintain contact and identify significant changes in movement patterns. If new vegetation maps are digitized, relocation data will be re-analyzed to determine habitat selectivity.

3. Work Effort: Calf Predation Monitoring

Primary Responsibility: ADF&G

Issues Addressed: T-17, T-20, T-39, T-44

Deliverable Due Dates: Draft Annual Report due 4/1/84

Scope: Forty newborn moose calves will be captured and fitted with mortality made radio collars in late May 1984. Signals will be monitored twice a day through June. (Monitoring will continue into FY'85 at a rate of once a day through July and

twice a month August through November.) When the radio signal indicates a calf is dead, the site will be visited on the ground as soon as possible and the causes of mortality will be assessed (Ballard et al. 1979). Mortality rates by cause will be calculated and used to correct the moose submodel. A sample of black bears will be intensely monitored to determine rates of predation (see Food Resource Identification under Bear Studies).

4. Work Effort: Severe Winter Studies

Primary Responsibility: ADF&G

Issues Addressed: T-17, T-20, T-39, T-41

Deliverable Due Dates: Draft Annual Report due 6/1/84 if severe winter occurs and funding is available

Scope: Spatial and temporal variation in snow accumulation patterns makes it difficult to define a "severe winter". Moose may respond differently to early accumulation of snow than they do to the same accumulation late in the winter. Therefore, a "severe winter" will be defined largely by the movements of moose. The winter of 1982-83 will be used as a standard. Severe winter procedures will be initiated when radio-collared moose, whose movements were documented during 1982-83, move into areas subject to habitat loss or alteration in larger numbers than in 1982-83. If this condition occurs, the following activities will be conducted.

Radio-collared moose relocation flights will be intensified. The sample of 30 regular inhabitants of the primary zone of impact will be located twice a week. Other radio-collared moose will be relocated weekly to determine if their use of the zone of impact increases and to aid in identification of critical winter range that will not be impacted.

Two aerial surveys will be conducted to map moose distribution in January and February.

In March, a census will be conducted to estimate the number of moose in and within 5 miles of the impoundments.

Location and numbers of dead moose will be recorded. A sample of dead moose will be visited on the ground and the sex, age and cause of death will be assessed.

Two wolf packs will be relocated daily for a period of 30 days. Wolves will be backtracked and kills recorded to determine rates of predation. As many kills as possible will be visited and sex, age, and condition of each animal will be assessed.

5. Work Effort: Spring Plant Phenology Study

Primary Responsibility: U of A - Palmer

Issues Addressed: T-20, T-38

Deliverable Due Dates: Draft Annual Report due 3/31/84

Scope: Data on moose and bear movements indicate that the impoundment area is relatively heavily used in early spring. The plant plenology study conducted in the 1983 field season addressed the questions of what, when, and where plant foods became available for use as early spring forage. Observations of animal browsing were also made.

6. Work Effort: Forage Vegetation Mapping

Primary Responsibility: Unknown Subcontractor

Issues Addressed: T-20, T-30, T-31, T-32, T-33

Deliverable Due Dates: Preliminary Draft Map due 6/15/84 if funding is available

Scope: This effort is designed to provide more detailed vegetation mapping to be used for quantification of habitat-based impacts in general, and specifically to provide a basis for stratification for moose carrying capacity estimation. The FY 1984 effort is designed to provide a product just sufficient to allow its use to improve the statistical efficiency of the browse inventory.

7. Work Effort: Pilot Browse Sampling

Primary Responsibility: U of A - Palmer
Issues Addressed: T-20, T-36
Deliverable Due Dates: Draft Report due 1/31/84
Scope: This study is designed to refine methods for the extensive browse sampling program scheduled for summer 1984. It involves evaluation of sample size, plot size, and sampling techniques.

8. Work Effort: Moose Food Habits Study

Primary Responsibility: U of A - Palmer
Issues Addressed: T-20, T-37
Deliverable Due Dates: Draft Report due 4/30/84
Scope: This study is designed to assist in finalizing plans for the extensive browse sampling program by confirming or modifying the list of important forage species in the project area during each season.

9. Work Effort: Browse Sampling

Primary Responsibility: U of A - Palmer
Issues Addressed: T-20, T-36
Deliverable Due Dates: Draft Report due 6/30/84
Scope: This effort represents the planning and mobilization for the extensive browse inventory to be conducted during July-August 1984 in the middle Susitna Basin.

10. Work Effort: Wolf Studies (See Wolf studies)

11. Work Effort: Bear Studies (See Bear studies)

12. Work Effort: Bioenergetics Model Testing

Primary Responsibility: ADF&G/USFWS
Issues Addressed: T-20, T-34
Deliverable Due Dates: Draft Annual Report due 4/1/84
Scope: Field validation of the bioenergetics model at the Kenai Moose Research Center will be conducted in FY 1984 and FY 1985.

This phase will be conducted by ADF&G with partial support from USF&WS. ADF&G personnel partially funded by APA will participate in the design, direction, and data analysis direction of this phase. All operating and most personnel costs will be borne by ADF&G and USF&WS. This effort will involve refining the model's capability of predicting energy and nitrogen requirements and generating forage intake values.

13. Work Effort: Bear Population Model Refinement (see Bear Studies)

14. Work Effort: Moose Population Model Refinement

Primary Responsibility: ADF&G/LGL

Issues Addressed: T-20, T-34

Deliverable Due Dates: Final 1983 Terrestrial Model Report due 12/15/83, Draft 1984 Workshop Report (including terrestrial model status) due 6/30/84.

Scope: Refinements to the moose population model will be made to the extent that budget and new data allow the moose carrying capacity model to be refined as described in Work Effort 12 above.

15. Work Effort: Habitat Enhancement Studies (monitoring winter use of downstream disturbed sites) (See Downstream Moose studies)

16. Work Effort: Habitat Enhancement Studies (literature review of habitat enhancement techniques)

Primary Responsibility: H-E

Issues Addressed: T-35

Deliverable Due Dates: Draft Report due 3/15/84

Scope: All relevant information on habitat enhancement techniques for moose and bear will be reviewed and summarized. Sources will include published literature, unpublished data on

file, and information from current projects. All techniques will be evaluated with regard to their applicability and effectiveness for the Susitna Basin.

17. Work Effort: Mitigation Plan Refinement (identification of candidate lands for habitat enhancement)

Primary Responsibility: H-E/LGL/ADF&G

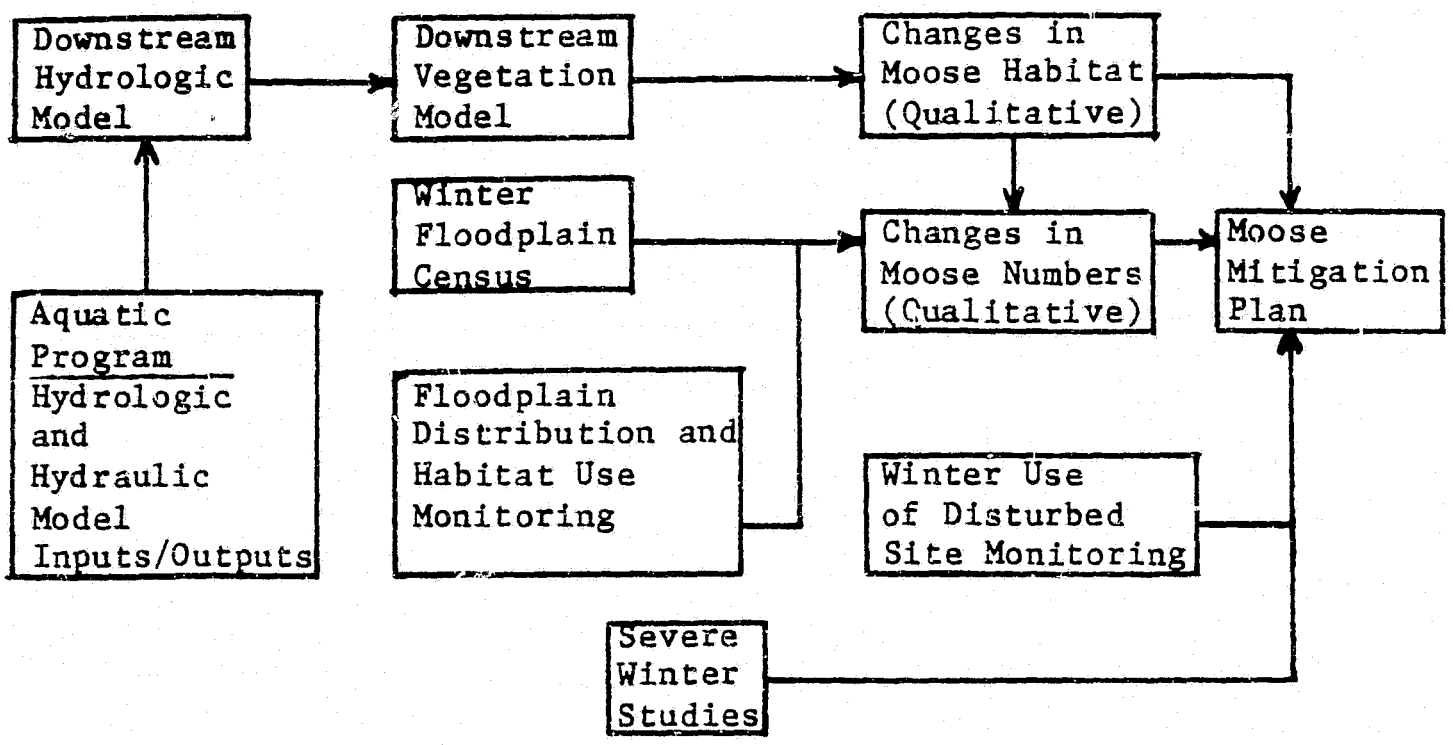
Issues Addressed: T-35

Deliverable Due Dates: Draft Report due 1/15/84, Draft Mitigation Plan Status Report due on 6/15/84

Scope: Approximately 100,000 acres of land suitable for moose and bear habitat enhancement will be identified and mapped. The large area allows for maximum flexibility in siting the approximate 20,000 acres of land that will eventually be selected for actual enhancement. Selection criteria and an implementation procedure for selection criteria will be developed in conjunction with ADF&G moose and bear investigators and Area Biologists. A major data source for this effort will be the ADF&G Habitat Division data developed for the Susitna Area Plan. The report will address acquisition problems and management options.

6.17.4.2 Downstream Moose. The impacts of the project on moose downstream of Devil Canyon are being assessed by modeling the physical processes (e.g., flooding, ice scouring) affecting downstream moose habitat, modeling the changes in downstream moose habitat resulting from the modification of the hydrologic regime, and determining the magnitude, distribution, habitat selection, and timing of moose use of these floodplain habitats. Potential habitat enhancement measures are being studied by closely monitoring moose winter use of disturbed sites known to be heavily used by moose in winter. Close coordination with the aquatic program is being conducted to assure consistency of inputs and outputs where practical. Figure 6-2 portrays the linkages among the various work efforts involved in this approach.

Figure 6-2. Linkages Among Components of Downstream Moose Impact Assessment and Mitigation Plan Refinement Efforts



All work efforts will be conducted at some level during FY 1984. A very weak link exists in the modeling efforts. This weakness is the lack of information on which to base the representation of the effects of physical processes on vegetation. This lack of information and the probable long-term nature of any studies that could be conducted to obtain the information, significantly limits the ability of the vegetation model to make quantitative predictions with a reasonable degree of accuracy. For this reason, the modeling efforts will be reevaluated to assess their value and role in the overall effort.

Brief scope descriptions of each work effort along with the organizations with primary responsibility, deliverable due dates, and the specific issues each work effort is designed to address are provided below.

1. Work Effort: Downstream Hydrologic and Vegetation Model Refinement

Primary Responsibility: LGL/H-E/ADF&G

Issues Addressed: T-1, T-20

Deliverable Due Dates: Final 1983 Terrestrial Model Report due 12/15/83,, Draft 1984 Workshop Report (including terrestrial model status) due 6/30/84

Scope: Refinements to the downstream hydrologic and vegetation models will be made in coordination with the Aquatic and Hydrology Study Teams to the extent that budget and new data allow only following a reassessment of their value to the downstream assessment effort. In addition to or instead of model refinement, a refined assessment of downstream vegetation impacts will be conducted based on a review of published and unpublished information and discussions with ice experts.

2. Work Effort: Floodplain Distribution and Habitat Use Monitoring

Primary Responsibility: ADF&G

Issues Addressed: T-20, T-35, T-40

Deliverable Due Dates: Draft Annual Report due 4/1/84

Scope: Existing radio-collared moose will be relocated approximately twice a month from November to May and weekly between mid-May and mid-June. Monitoring during summer and monitoring of moose away from areas that are likely to be impacted by the project or serve as mitigation lands will be at a minimum level to maintain contact.

3. Work Effort: Winter Floodplain Censuses

Primary Responsibility: ADF&G

Issues Addressed: T-20, T-35, T-40

Deliverable Due Dates: Draft Annual Report due 4/1/84

Scope: Aerial censuses for moose in Susitna River floodplain habitats and disturbance subclimax vegetative sites from Cook Inlet to Devil Canyon will be conducted six times, through winter as long as snow cover conditions permit.

4. Work Effort: Winter Use of Disturbed Site Monitoring

Primary Responsibility: ADF&G

Issues Addressed: T-20, T-35, T-40

Deliverable Due Dates: Draft Annual Report due 4/1/84

Scope: Samples of 12 moose will be radio-collared from each of 3 (Montana west, Montana middle and Kashwitna Lake north) and 6 moose on one (Talkeetna west) of the previously studied "disturbed" sites (Modafferi 1983). To distribute sampling intensity over the winter period, 4 moose will be captured and radio-collared at each of the former 3 sites during each of 3 sampling periods (mid-November, mid-January, and mid-March). Three moose will be captured and radio-collared during each of the later sampling periods at the Talkeetna west site.

There is evidence that some moose use such areas only during periods of deep snow accumulation. Consequently, tagging will be regulated by the changes in numbers of moose using the sites. If aerial censuses and observations made on radio tracking flights indicate that additional moose are no longer moving to the area, tagging will be suspended.

A sample of blood and an incisor tooth will be collected from each individual moose for determination of physiological condition and age.

Radio-collared moose will be relocated every two weeks, weather permitting, except during the mid-May to mid-June calving period when they will be relocated each week.

5. Work Effort: Severe Winter Studies

Primary Responsibility: ADF&G

Issues Addressed: T-20, T-40, T-41

Deliverable Due Dates: Draft Annual Report due 6/1/83 if severe winter occurs and funding is available.

Scope: Spatial and temporal variation in snow accumulation patterns makes it difficult to define a "severe winter." Moose may respond differently to early accumulation of snow than they do to the same accumulation late in the winter. Therefore, a "severe winter" will be defined largely by the movements of moose. The winter of 1982-83 will be used as a standard. Severe winter procedures will be initiated when river censuses indicate larger numbers of moose in the downstream floodplain than were observed in 1982-83.

Four additional river censuses will be conducted. In conjunction with one river census, distribution of moose to either side of the river will be mapped to determine the availability, location and habitat type of critical winter range outside of the floodplain.

6. Work Effort: Mitigation Plan Refinement (see Upstream Moose Studies)

6.17.4.3 Caribou. The primary impacts of project development on caribou are likely to result from the potential movement barriers created by the access roads and the impoundments. The extent to which these features may affect movements is very difficult to predict due to the variability exhibited by caribou in their reaction to other barriers reported in the literature and their unpredictable range use patterns relative to other large North American herbivores.

The best approach to evaluate project impacts appears to be through building up a large data base on pre-project movements and range use so that effective mitigation measures can be recommended and that the effects of the barriers after project development can be fully evaluated. Thus, the FY 1984 program includes monitoring the size, productivity, and movement patterns of caribou in the project area. The scope of work for these studies, the organizations with primary responsibility, deliverable due dates, and the specific issues each work effort is designed to address are provided below.

1. Work Effort: Main Nelchina Herd Monitoring

   Primary Rsponsibility: ADF&G

   Issues Addressed: T-20

   Deliverable Due Dates: Draft Annual Report due 4/1/84

   Scope: A pool of about 25 radio-collared caribou will be maintained in the main Nelchina herd. These caribou will be relocated throughout the year often enough to document movement routes (particularly in the vicinity of the proposed impoundments) and seasonal range use; 4 surveys in winter, 4 surveys during spring migration, 2 surveys during calving, 2 surveys during summer, 2 during autumn dispersal and 1 during the rut.

   Estimates of population growth and herd productivity of the main Nelchina herd will be made through annual censuses and composition sampling.

2. Work Effort: Upper Susitna-Nenana Subherd Monitoring

   Primary Responsibility: ADF&G

   Issues Addressed: T-20

   Deliverable Due Dates: Draft Annual Report due 4/1/84

   Scope: A sample of about 8 radio-collared caribou will be maintained in the upper Susitna-Nenana subherd. They will be relocated about 10 times per year to determine seasonal range use and movement patterns.

The dispersed nature of the upper Susitna-Nenana subherd make traditional census techniques impractical. A minimum population estimate will be made based on direct counts, during the rut. Observations of radio-collared caribou, tracks in snow and an analysis of seasonal habitat use will be used to ensure that major portions of the herd are not missed.

6.17.4.4 Dall Sheep. The major potential direct impact of project development on Dall Sheep will be inundation of a portion of the Jay Creek mineral lick and human disturbance at or near the lick. Therefore, additional studies are concentrating on quantifying sheep use of Jay Creek and other nearby licks, assessing and comparing the mineral content of these licks, and monitoring seasonal habitat use of sheep range in the project area. FY 1984 studies will simply involve completing those efforts inititated in late FY 1983. These efforts are briefly described below.

1. Work Effort: Dall Sheep Lick Use Patterns
   Primary Responsibility: ADF&G
   Issues Addressed: T-20, T-42
   Deliverable Due Dates: Draft Annual Report Due 4/1/84
   Scope: The following procedures are for the summer of 1983. Most work will be accomplished during FY 1983, however observations will extend into early FY 1984.

Twenty-one sheep in the Watana Hills were color-marked by specially adapted firearms shot from a helicopter in early April 1983. Ten sheep marked in the northern Watana Hills were marked red; 11 sheep in the southern Watana Hills were marked blue.

An observtion blind was erected in early or mid-May to quantify use of various areas of the Jay Creek lick bluff and identify individual sheep (color-marked and others) using the main Jay Creek lick and the secondary lick area on the opposite ridge. Observtions were made by 1 or 2 observers with the aid of binoculars and spotting scopes. Most observations were made

during the most likely lick activity period (0440-2000 hours). The sex, age, dye-markings, individual identity (if known), length of lick use, zone of lick use, date, time, weather conditions and other pertinent information will be recorded. Observations will continue until late July or when a seasonal drop in use is evident. Similar observations were made at the East Fork lick from late May to mid-June and at other Watana Hills' licks.

2. Work Effort: Mineral Lick Elemental Analysis

Primary Responsibility: ADF&G

Issues Addressed: T-20, T-42

Deliverable Due Dates: Draft Annual Report due 4/1/84

Scope: Samples will be taken from various areas in the Jay Creek lick, nearby secondary licks (upstream and on opposite ridge), East Fork lick and any other licks found in the Watana hills and nearby areas outside the licks for comparison. The samples will be taken with plastic utensils and placed in plastic containers to avoid contamination from metal. Sampling will occur after lick observations have ascertained preferred licking zones. The samples will be analyzed for water soluable and total elemental levels of Na, K, Ca, Mg, and 29 other elements by the inductively coupled argon plasma (ICAP) method. Analyses of the Jay Creek lick will be completed by fall 1983.

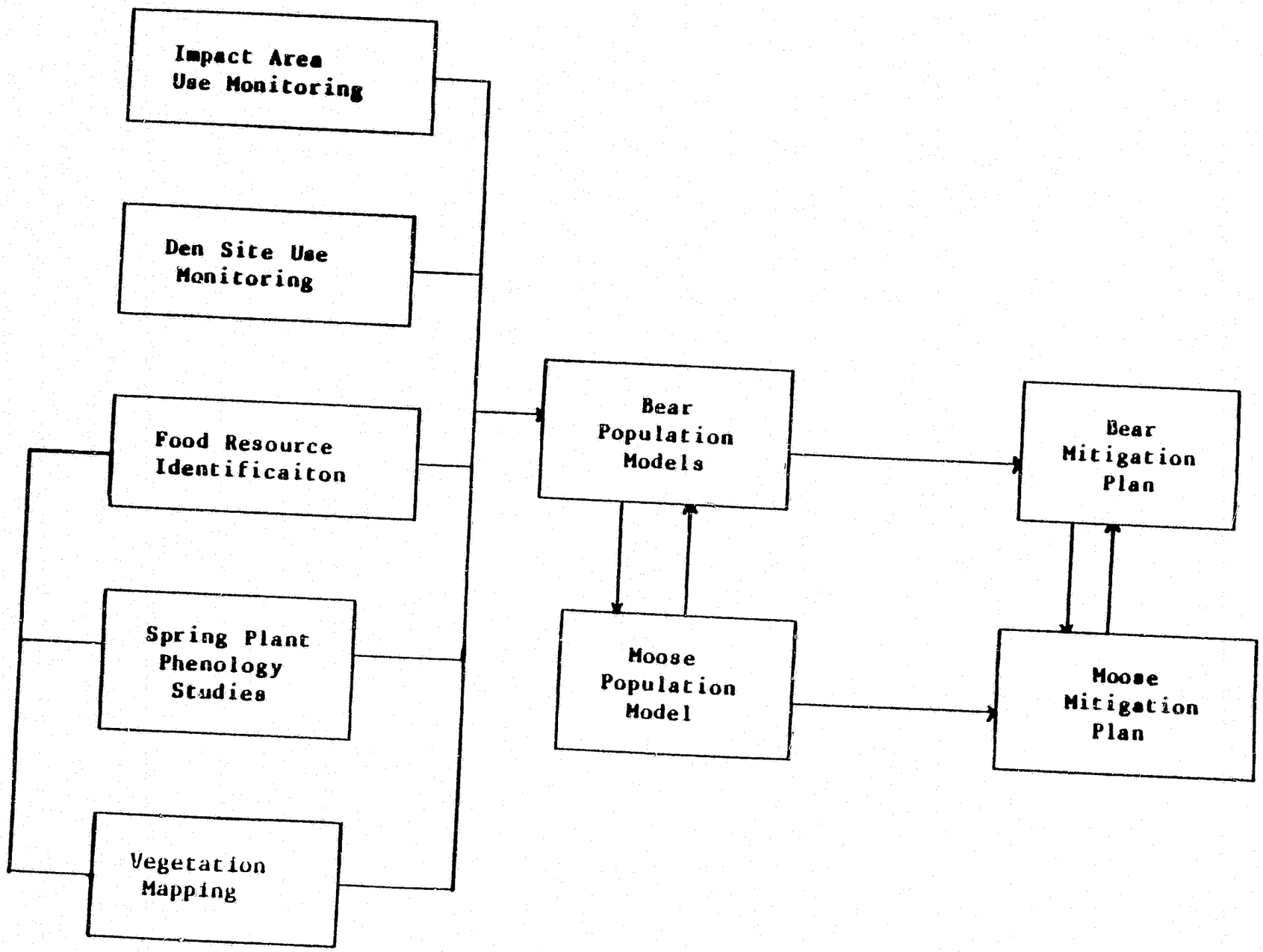
One hundred foot elevation contours of various areas of the Jay Creek lick will be documented using a Wallace and Tiernan model FA181 altimeter, and visibly marked for use during sheep observations. Project engineers and soils geologists will be consulted to predict the physical effects of the impoundment on the Jay Creek lick.

6.17.4.5 Black and Brown Bears. Direct project impacts on bears will result primarily from loss of denning and foraging habitat. Bear habitat use, especially for foraging, exhibits considerable seasonal and annual variability. Therefore, a large data base on preproject distribution, habitat use, numbers, and food habits is preferred for impact assessment. Also, because of the suspected importance of brown bear predation on moose calves in limiting moose populations, additional data on this phenomenon is desired as input to moose modeling efforts. Studies designed to collect these data are currently underway. They are identified along with the linkages among them in Figure 6-3.

All studies are currently planned to be conducted in FY 1984. The responsible organizations for each work effort are listed below:

1. Impact Area Use Monitoring - ADF&G
2. Den Site Use Monitoring - ADF&G
3. Food Resource Identification - ADF&G
4. Spring Plant Phenology Study (progress report only) - U of A Palmer
5. Moose Population Model Refinement - ADF&G/LGL
6. Bear Population Model Refinement - ADF&G/LGL
7. Moose Mitigation Plan Refinement - H-E/LGL/Agencies
8. Bear Mitigation Plan Refinement - H-E/LGL/Agencies

Figure 6-3. **LINKAGES AMONG COMPONENTS OF BEAR IMPACT ASSESSMENT AND MITIGATION PLAN REFINEMENT EFFORTS**



1. Work Effort: Impact Area Use Monitoring

   Primary Responsibility: ADF&G

   Issues Addressed: T-20, T-44

   Deliverable Due Dates: Draft Annual Report due 4/1/84

   Scope: Samples of approximately 20 brown bears and 20-25 black bears will be maintained. These bears will be relocated 6 times a month between late April and mid-June and 3-4 times a month the remainder of the active season.

2. Work Effort: Den Site Use Monitoring

   Primary Responsibility: ADF&G

   Issues Addressed: T-20, T-44

   Deliverable Due Dates: Draft Annual Report due 4/1/84

   Scope: Dens of radio-collared individuals will be marked and examined. Emphasis will be on black bear dens. This procedure will establish the proportion of available denning habitat that will be lost to the project. Examination of the dens will establish the characteristics of den sites in the impact zone, these data will permit evaluation of the degree of impact on bear populations when individuals are excluded from using current denning habitats.

3. Work Effort: Food Resource Identification

   Primary Responsibility: ADF&G

   Issues Addressed: T-20, T-44

   Deliverable Due Dates: Draft Annual Report due 4/1/84

   Scope: Special emphasis will be placed on identification of the food resources utilized by bears during the periods of seasonal concentrations believed to be motivated by food availability. The most important area of these investigations will be on foods utilized by bears during spring and early summer in the impoundment inundation area and vicinity. Emphasis will also be placed on food habits of bears that congregate around salmon spawning areas in order to evaluate the significance of salmon in the diets of these bears.

Bear scats will be collected by extensive on-the-ground searching. Contents of scats will be determined through laboratory analysis. These data will be supplemented by direct observation of bear feeding activity when possible.

Observations of bears feeding on ungulates will be made during radio-tracking flights. A selected sample of bears will be relocated twice a day in conjunction with calf mortality studies to estimate the rates of predation on ungulates by both species of bear.

4. Work Effort: Spring Plant Phenology Study (see Upstream Moose Studies)

5. Work Effort: Moose Population Model Refinement (see Upstream Moose Studies)

6. Work Effort: Bear Population Model Refinement

Primary Responsibility: ADF&G/LGL

Issues Addressed: T-20, T-44

Deliverable Due Dates: Final 1983 Terrestrial Model Report due 12/15/83, Draft 1984 Workshop Report (including terrestrial model status) due 6/30/84

Scope: Refinements to the bear population model will be made to the extent that budget and new data allow.

7. Work Effort: Moose Mitigation Plan Refinement (see Upstream Moose Studies)

8. Work Effort: Bear Mitigation Plan Refinement (identification of candidate lands for habitat enhancement)

Primary Responsibility: H-E/LGL/ADF&G

Issues Addressed: T-44

Deliverable Due Dates: Draft report due on 1/15/84, Draft Mitigation Plan Status Report due on 6/15/84

Scope: In general the bear mitigation plan will be refined to the extent that the moose mitigation plan is refined.

6.17.4.6 Wolf and Wolverine. Wolves are likely to be affected by a variety of project impact mechanisms, among which, reductions in prey populations and distribution may be most severe. It is desireable to have a large data base on the number and distribution of wolf packs and the size of each wolf pack using the upstream moose zone of impact in order to assess the project impact on wolves, as well as the impact of wolves on moose. Studies to be conducted by ADF&G are planned for each of these areas in FY 1984. In addition, information on wolverine distribution, abundance, home range size, habitat selection, and food habits will be collected opportunistically by relocating wolverine during wolf tracking flights. Brief descriptions of these work efforts are provided below.

1. Work Effort: Wolf Pack Territory and Food Habits Monitoring

Primary Responsibility: ADF&G

Issues Addressed: T-20, T-43

Deliverable Due Dates: Draft Annual Report due on 4/1/84

Scope: A sample of wolves will be radio-collared in each pack that is believed to make substantial use of the upstream moose zone of impact. Territory boundaries and areas of seasonal importance such as den sites and rendezvous sites will be mapped by plotting of relocation. Food habitats, with emphasis on prey species likely to be influenced by the hydroelectric project will be documented through observations of kills made on relocation flights and analysis of scats.

Relocation and food habitats data will be used to asses the dependence of each pack on moose in the moose zone of impact.

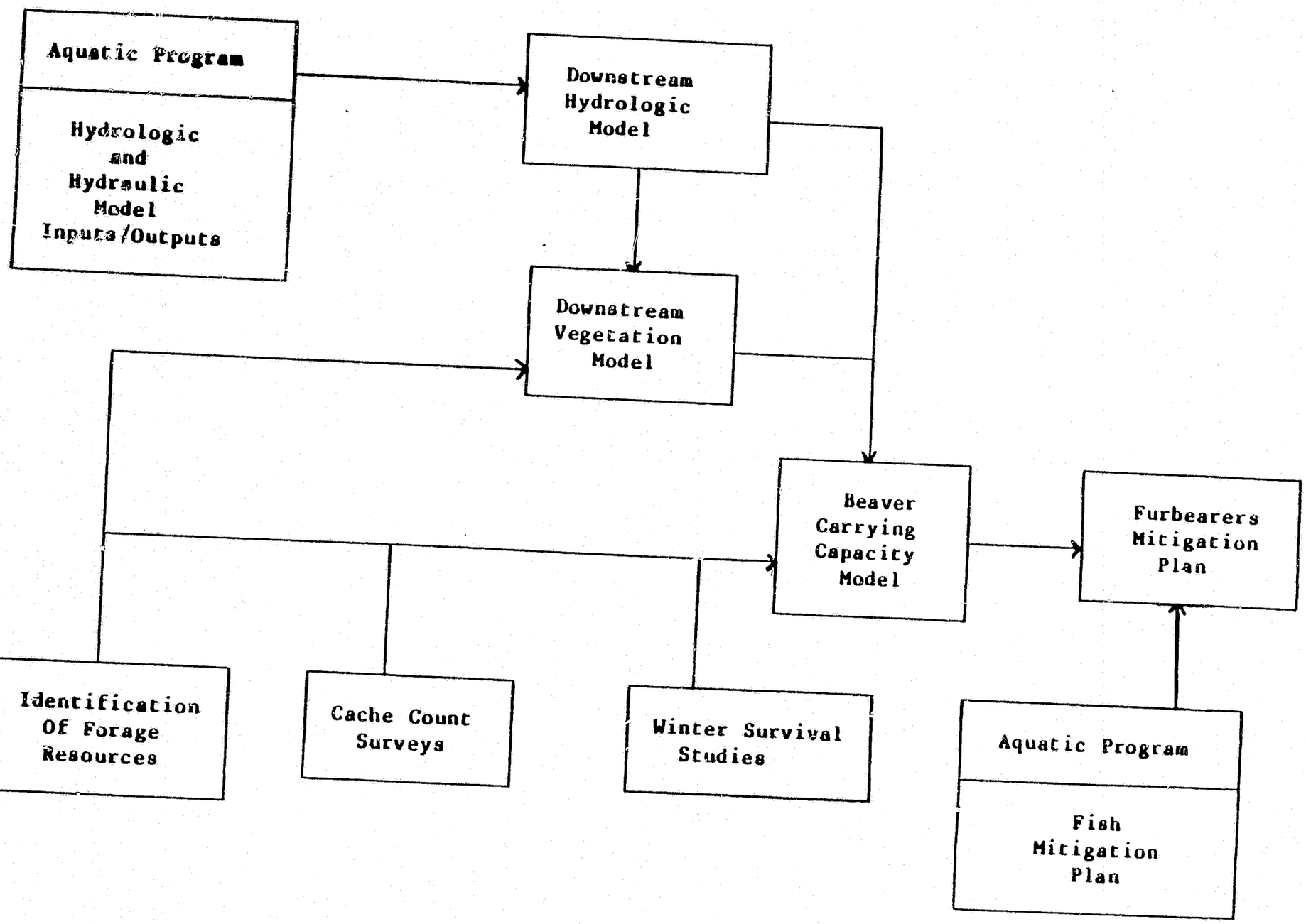
2. Work Effort: Wolf Numbers Monitoring
   Primary Responsibility: ADF&G
   Issues Addressed: T-20, T-43
   Deliverable Due Dates: Draft Annual Report due on 4/1/84
   Scope: Number of wolves in each pack will be monitored throughout the year through observation of radio-collared wolves and wolves accompanying them.

3. Work Effort: Wolverine Monitoring
   Primary Responsibility: ADF&G
   Issues Addressed: T-20
   Deliverable Due Dates: Draft Annual Report due on 4/1/84
   Scope: Wolverine radio-collared during FY 1983 will be relocated opportunistically during wolf tracking flights. No specific expenditures of money will be directed at wolverine less new information suggesting significant impacts arise.

6.17.4.7 Belukha Whale. Because of the potential for project effects on belukha whales near the mouth of the Susitna River, aerial surveys were flown in spring and summer 1982 and 1983. FY 1984 work will be limited to data analysis and report writing (Appendix B). No additional field studies will be conducted unless new information on the impacts of fish populations believed to be important to belukhas becomes available.

6.17.4.8 Other Species. The only other species for which special work is planned during FY 1984 is the beaver. FY 1984 work will be limited to refinement of the beaver carrying capacity model to the extent possible without additional beaver field work, and refinement of the downstream hydrologic and vegetation models and the furbearer mitigation plan. These efforts along with future field studies and the linkages among them are identified in Figure 6-4. Other species will be addressed through refinement of their mitigation plans.

Figure 6-4. **LINKAGES AMONG COMPONENTS OF DOWNSTREAM BEAVER IMPACT ASSESSMENT AND MITIGATION PLAN REFINEMENT**



1. Work Effort: Beaver Cache Count Surveys

   Primary Responsibility: U of A - Fairbanks

   Issues Addressed: T-20, T-46

   Deliverables Due Date: Draft Report due 11/30/83

   Scope: An aerial survey of the number of beaver caches (representing colonies attempting to overwinter) will be conducted in fall 1983 along the Susitna River between Portage Creek and Cook Inlet. A complete count will be made between Portage Creek and Talkeetna and a representative area count will be made between Talkeetna and Cook Inlet. This information will allow assessment of annual variability in colony numbers between Portage Creek and Talkeetna and will allow a general estimate of beaver abundance downstream of Talkeetna to be made.

2. Work Effort: Beaver Winter Survival Studies

   Primary Responsibility: U of A - Fairbanks

   Issues Addressed: T-20, T-46

   Deliverables Due Date: Draft Report due 5/30/84, if funding is available

   Scope: These studies will involve returning to beaver colony locations (marked during the cache surveys) shortly before and after break-up for colony overwinter survival determinations, to sample the quality of cache food, to determine if lodges or bank dens were destroyed by break-up, and to measure certain environmental parameters. This information will be used directly in refining the beaver model.

3. Work Effort: Downstream Hydrologic and Vegetation Model Refinement (see Downstream Moose Studies)

4. Work Effort: Beaver Carrying Capacity Model

   Primary Responsibility: LGL/U of A - Fairbanks

   Issues Addressed: T-20, T-45

   Deliverables Due Date: Final 1983 Terrestrial Model Report due 11/30/83. Draft 1984 Workshop Report (including terrestrial model status) due 6/30/84.

Scope: Refinements to the beaver carrying capacity model will be made to the extent that budget and new data allow.

5. Work Effort: Furbearer Mitigation Plan Refinement

   Primary Responsibility: H-E/LGL/U of A - Fairbanks

   Issues Addressed: T-20, T-45, T-47, T-49

   Deliverables Due Date: Draft Mitigation Plan Status Report due on 6/15/84

   Scope: Refinements to the furbearer mitigation plan will be made to the extent that budget and new data allow.

6. Work Effort: Bald Eagle Nest Impact Issue

   Primary Responsibility: H-E/LGL

   Issues Addressed: T-54

   Deliverables Due Date: Status Report due 12/15/83

   Scope: Because the Susitna Hydroelectric Project may be in conflict with the Bald Eagle Protection Act, the options for resolution of this conflict will be investigated. The options with the highest probability of success will be pursued and status reports will be issued.

7. Work Effort: Other Species Impact Assessment/Mitigation Plan Refinement

   Primary Responsibility: H-E/LGL

   Issues Addressed: Many

   Deliverables Due Dates: Draft Mitigation Plan Status Report due on 6/15/84, other reports as appropriate.

   Scope: Impact assessment and mitigation plan refinement efforts will be conducted for species not addressed above where the need is identified in technical meetings and to the extent that budget allows. Brief reports covering individual topics will be prepared and all refinements will be summarized in the Mitigation Plan Status Report. Current status of these efforts will be updated in the Tracking and Documentation System.

7.0 STUDY COORDINATION AND MANAGEMENT

7.1 HARZA-EBASCO

The Terrestrial Program will be performed by a study team under the overall guidance of the Harza-Ebasco Environmental and Regulatory Operations Manager, Dr. G. Lawley. Personnel participating in the Terrestrial Study Team under the direction of Dr. Lawley include:

Group Leader	R. Fairbanks
Sr. Terrestrial Ecologist	R. Densmore (part-time)
Support Terrestrial Ecologist	E. Dudley (part-time)
Support Terrestrial Ecologist	R. Lindsay (part-time)
Staff Biologist	A. Rivkin (part-time)

7.2 INTERACTION WITH OTHER STUDY TEAMS

The Terrestrial Study Team will work closely with members of the Licensing and Permitting Group to provide necessary support in complying with FERC and other agency licensing and permitting requirements and requests for additional information.

The assessment of potential impacts and the effectiveness (and impacts) of mitigation measures on aquatic and terrestrial habitats and organisms will be coordinated with the Aquatic and Hydrology Study Teams. Coordination will also take place between the Social Science and Terrestrial Study Teams especially relative to the impacts of and mitigation measures for wildlife users.

Members of the Terrestrial Study Team will also provide support to the Transmission Line Investigation and other special investigations, as required, in all matters relating to wildlife and botanical resources.

Finally, the Terrestrial Study Team will work closely with the H-E Logistics Task in coordinating the logistic requirements of the Team.

7.3 SUBCONTRACTORS

At the present time the subcontractors for terrestial studies and their areas of responsibility for the Susitna Project include:

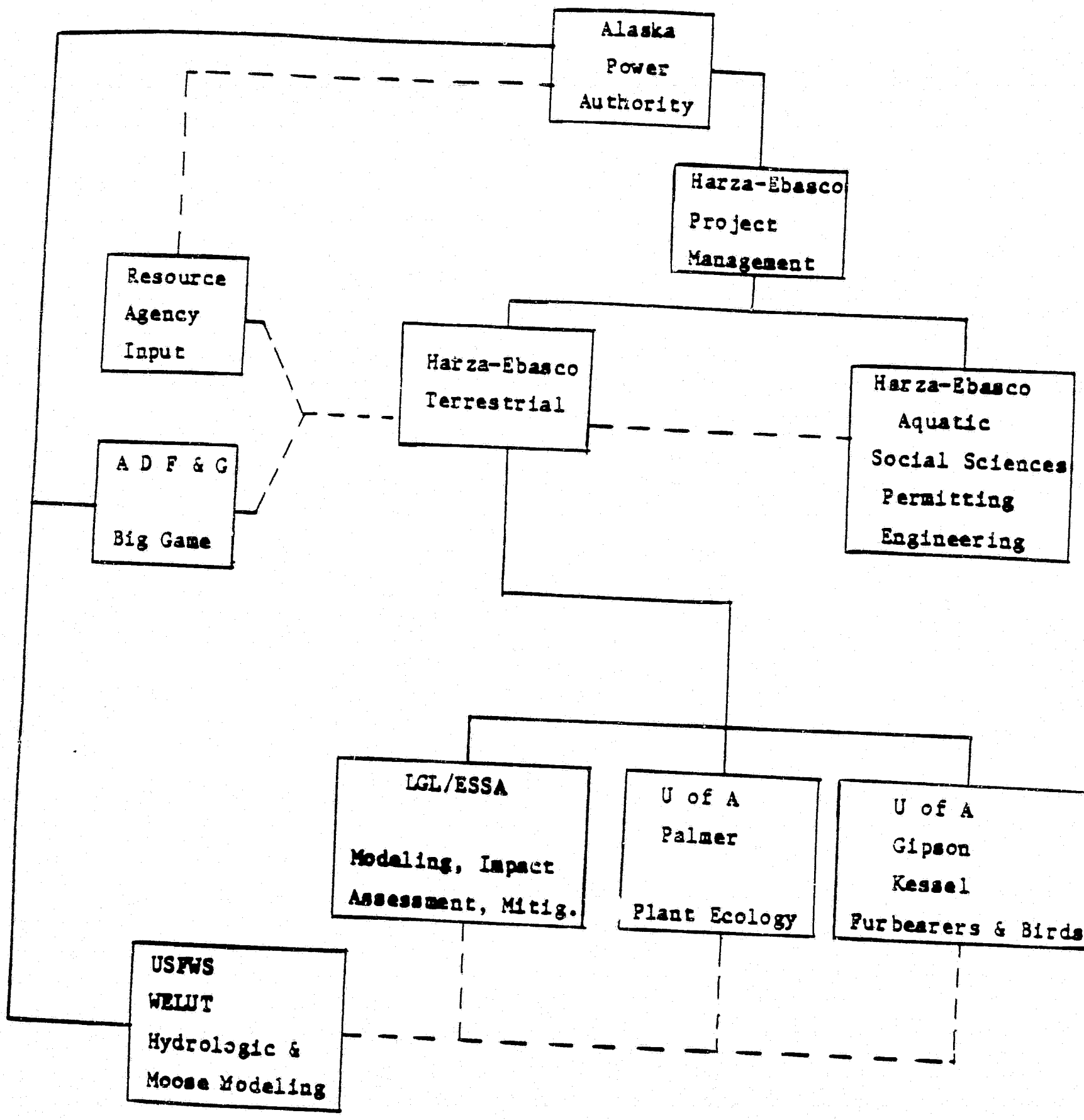
SUBCONTRACTOR	AREA OF RESPONSIBILITY
Alaska Department of Fish & Game (ADF&G)	Big game studies and moose and bear modeling
LGL Alaska Research Associates (LGL)	Impact assessment and mitigation planning; raptor studies; bear modeling; responses to agency comments on License Application
University of Alaska Palmer (U of A)	Botanical resource studies
University of Alaska P. Gipson (U of A)	Furbearer studies
University of Alaska B. Kessel (U of A)	Small bird and mammal studies
Environmental and Social Systems Analysts (ESSA)	Modeling coordination; vegetation; small bird and mammal, and beaver modeling
US Fish & Wildlife Service - WELUT	Hydrologic and moose modeling

The ADF&G contract is a Reimbursable Services Agreement (RSA) with the Power Authority. Similarly, the USFWS-WELUT contract is a Memorandum of Agreement with the Power Authority. Subject to the approval of the Power Authority, H-E will retain LGL, U of A-Palmer, and P. Gipson and B. Kessel of the U of A (as required) to conduct FY '84 work efforts. ESSA will remain a subcontractor to LGL. An organization chart for the Terrestrial Study team is presented in Figure 7-1.

7.4 COORDINATION AND MANAGEMENT OF SUBCONTRACTORS

In order to accomplish the Terrestrial Program Harza-Ebasco will enter into contractual agreements with the subcontractors identified above. Section 6.5 provides a description of the work activities involved with subcontractor coordination and management.

Figure 7-1. TERRESTRIAL STUDY TEAM ORGANIZATION



8.0 SCHEDULE AND DELIVERABLES

	Deliverables	Due Date
1.	General Investigation Memorandum	11/18/83
2.	Plan of Study for FY 1984	12/15/83
3.	Monthly Status Reports	Monthly
4.	Technical Meeting Minutes	As required
5.	Impact Assessment/Mitigation Planning Tracking & Documentation System	11/30/83
6.	Beaver Cache Survey Report	11/30/83
7.	Spring 1983 Terrestrial Modeling Workshop Final Report	12/15/84
8.	Transmission Line Investigation Report	12/15/84
9.	Bald Eagle Nest Impact Status Report	12/15/83
10.	Candidate Lands for Habitat Enhancement Report	1/15/84
11.	Responses to Agency Comments on License Application	1/19/84
12.	Pilot Browse Sampling Report	1/31/84
13.	FERC Supplemental Information Request Responses	2/9/84
14.	Update License Application	3/15/84
15.	Habitat Enhancement Techniques Review	3/15/84
16.	Spring Plan Phenology Study Report	3/31/84
17.	ADF&G Plan of Study	3/31/84
18.	ADF&G Annual Report Drafts	4/1/84
19.	Final FY 1985 Work Scopes	4/30/84
20.	Moose Food Habits Report	4/30/84
		(if funding is available)
21.	ADF&G Annual Report and Reviews	6/15/84
22.	Draft EIS Review Comments	5/30/84
23.	Beaver Overwinter Survival Study Report	5/30/84
		(if funding is available)
24.	Mitigation Plan Status Report	6/15/84
25.	Draft Forage Vegetation Maps	6/15/84
		(if funding is available)
26.	Spring 1984 Terrestrial Program Workshop Draft Report	6/30/84
27.	Extensive Browse Inventory Progress Report	6/30/84
		(if funding is available)
28.	Other Settlement Process Input	As required

9.0 BUDGET

Table 9-1 below presents the FY'84 budget for the Terrestrial Program. This budget provides one person-year for management of the program and 1.5 person-years for management assistance and technical input from the Harza-Ebasco staff.

TABLE 9-1

FY'84 TERRESTRIAL PROGRAM BUDGET

Position	Workhours
Group Leader	2,160 (one full-time person)
Sr. Terrestrial Ecologist	1,100 (one half-time person)
Support Terrestrial Ecologists	1,240 (two part-time persons)
Staff Biologist	900 (one half-time person)
TOTAL	5,400

10.0 ATTACHMENTS

APPENDIX A - AGENCY RAISED ISSUES

APPENDIX B - MAJOR SUSITNA PROJECT TERRESTRIAL STUDIES

PRELIMINARY

APPENDIX A

SUSITNA HYDROELECTRIC PROJECT: AGENCY-RAISED ISSUES

4 October 1983

Subtask: Terrestrial Resources

ISSUE	AGENCY	SOURCE	STATUS	COMPLETION DATE
T-1 Downstream Effects The assessment of the extent and severity of downstream habitat alteration needs to be refined. Need to continue hydrologic and vegetation succession modelling and additional field studies where necessary, in order to refine impact assessment and mitigation planning for downstream effects. Should use geomorphological cross-sections information and possibly monitor these cross-sections.	FWS ADFG	1. Testimony before APA Board 4/16/82 p.1 (FWS) Draft Ex. E Comments p. 34, 35, 37, 58 68, 69, 98 (FWS) Feb/Mar '83 Workshop Recommendation p. 155, 162 (FWS) Draft Ex. E Comments p. B-6, B-7 (ADFG) Feb/Mar '83 Workshop Recommendation p. 155, 162 (ADFG)	Models have been developed; continued refinement including further technical meetings are planned.	Dec. 1985
T-2 Downstream Vegetation Mapping Need to map floodplain vegetation in downstream areas including the Talkeetna to at least Delta Islands segment (10 year floodplain) in order to refine quantification of flow change impacts.	FWS	2. Draft Ex. E Comments p. 32, 34	New mapping not currently planned. Existing mapping consists of McKendrick et al. (1982) mapping of the Susitna floodplain downstream to Talkeetna at a scale of 1:24,000.	-
T-3 Matrix Approach to Summarize Impacts/Mitigation Measures Need to evaluate impacts and especially mitigation measures for each species relative to all others using a matrix format. Consider aquatic resources in this matrix analysis.	FWS ADFG	3. Draft Ex. E Comments p. 18-19 (FWS) Feb/Mar '83 Workshop Recommendation p. 163 (ADFG)	The use of this approach is being considered.	Jan. 1984
T-4 Map of Permafrost Areas Need to map and evaluate permafrost areas to assess impacts due to erosion and vegetation removal.	FWS	4. Draft Ex. E Comments p. 37, 98	The use of this approach is being considered.	-
T-5 Frost Impacts on Vegetation Need to study and quantify the effects of frost build-up on vegetation adjacent to the reservoir.	FWS	5. Draft Ex. E Comments p. 37	Studies are not currently planned.	-

ISSUE	AGENCY	SOURCE	STATUS	COMPLETION DATE
T-6 Reservoir Ice and Drawdown Zone Should evaluate information on the timing of formation, extent, thickness, and time of breakup of reservoir ice and the composition and physical characteristics of the reservoir shoreline and drawdown zones to assess wildlife impacts.	FWS	6. Letter 10/5/82-p.5		
T-7 Revegetation Study Need to initiate revegetation test plots as part of continuing project studies to provide information on which successful site restoration can be based. Wildlife food/cover plants should be considered in developing restoration plans.	FWS	7. Draft Ex. E Comments p. 78, Letter 10/5/82-p. 4	No specific studies are planned; however re-vegetation experience in the project area was gathered this year and in previous years.	-
T-8 Habitat Loss due to Various Dam Heights Should quantify the terrestrial habitat to be inundated due to the proposed dam height and an array of lower dam heights.	FWS	8. Letter 10/5/82-p.6		
T-9 Type and Siting of Construction Camp/Village Avoidance of adverse impacts was not given high enough priority in the siting and selection of type of construction camp and village.	FWS	9. Draft Ex. E Comments - p. 4 of letter	Under consideration	-
T-10 Scheduling of Construction and Reservoir Filling Avoidance of adverse impacts was not given high enough priority in the scheduling of construction and reservoir filling.	FWS	10. Draft Ex. E Comments - p. 4 of letter Letter 10/5/82-p.6	Under consideration	-
T-11 Estimates of Project Area Recreational Use Need better estimates of current and future recreational use of the project area.	ADPG	11. Feb/Mar '83 Workshop Recommendation p. 154		

ISSUE	AGENCY	SOURCE	STATUS	COMPLETION DATE
T-12 Project Recreation Development Avoidance of adverse impacts was not given high enough priority in the design of project recreation development.	FWS	12. Draft Ex. E Comments - p. 4 of letter	Under consideration.	-
T-13 Mode, Timing, and Routing of Construction Access Avoidance of adverse impacts was not given high enough priority in selection of the mode, timing and routing of construction access.	FWS	13. Draft Ex. E Comments - p. 4 of letter, p. 41	Under consideration.	-
T-14 Identification of Construction Traffic Mode and Restrictions The specific mode of construction traffic and restrictions on worker use of access roads needs to be identified.	FWS	14. Draft Ex. E Comments - p. 41	Under consideration.	-
T-15 Identification of Restrictions on Public Use of Access Road The extent of restrictions on public use of access roads needs to be identified.	FWS	15. Draft Ex. E Comments - p. 41		
T-16 Traffic-related Impacts Extent of and effects of increased traffic on various road and railroad segments have not adequately been evaluated and related to big game disturbance and collision mortality.	ADFG	16. Draft Ex. E Comments - p. B-52	Under consideration.	-
T-17 Quantification of Moose Impacts Along Access Routes Need to quantify current and potential hunter demand and harvests, area moose populations, and habitat quality for access route areas in order to fully assess impacts.	FWS	17. Draft Ex. E Comments p. 66	Under consideration.	-

PRELIMINARY

, October 1983

SUSITNA HYDROELECTRIC PROJECT: AGENCY-RAISED ISSUES

Subtask: Terrestrial Resources

ISSUE	AGENCY	SOURCE	STATUS	COMPLETION DATE
T-18 Secondary Effects of Improved Access Effects of secondary development and increased recreational use resulting from improved access have not been fully evaluated.	ADFG FWS	18. Draft Ex. E Comments - p. B-6 (ADFG) Testimony before APA Board 4/16/82 p. 1 (FWS)	Under consideration.	-
T-19 Cumulative Impacts Effects of cumulative impacts have generally not been adequately addressed.	FWS ADFG	19. Draft Ex. E Comments - p. 19 (FWS) Draft Ex. E Comments - p. B-5, B-55 (ADFG)	Under consideration.	-
T-20 Quantification of Impacts In general, impacts have not been adequately quantified and determinations of significance have not been well-documented.	ADFG FWS	20. Draft Ex. E Comments - p. B-3 (ADFG) Draft Ex. E Comments - p. 17 (FWS) Testimony before APA Board 4/16/82 p. 1 (FWS)	More quantification and documentation was added to the final License Application. Continuing studies will provide for further quantification.	Jan. 1986
T-21 Impacts Based on Current Populations Impact evaluations should be based on the range of population levels that could reasonably be expected to occur during the life of the project rather than on current population levels as is generally done.	ADFG	21. Draft Ex. E Comments - p. B-3, B-4, B-5	The impact sections of the final License Application have been largely rewritten to address this problem.	-
T-22 Resource Category Determination for Evaluation Species The habitat of caribou, brown bear, and wolf in the project area should be given a resource category determination of 2 for the purpose of defining mitigation goals.	FWS	22. Letter 1/24/83		
T-23 Habitat Based Approach A habitat based approach should be used as the primary means of assessing wildlife impacts.	FWS	23. Testimony before APA Board 4/16/82 p. 2 and 3		

PRELIMINARY

4 October 1983

SUSITNA HYDROELECTRIC PROJECT: AGENCY-RAISED ISSUES

Subtask: Terrestrial Resources

ISSUE	AGENCY	SOURCE	STATUS	COMPLETION DATE
T-24 Access Road & T-Line Borrow Areas Should conduct a complete wildlife impact assessment of borrow areas for the access road and transmission line and access to these sites.	FWS	24. Letter 10/5/82-p.6		
T-25 T-Line Buffer Around Swan Nests Recommend minimum 150 m buffers between swan nests and any portions of the transmission corridor.	FWS	25. Draft Ex. E Comments p. 42	Under consideration.	--
T-26 T-Line Moose Calving and Bear Denning Describe the presence/absence of moose calving grounds and bear denning sites along the T-Line segment between Cook Inlet and Willow.	FWS	26. Draft Ex. E Comments p. 61	Available data will be presented in upcoming transmission line report.	Dec. 1983
T-27 Specific T-Line Erosion Control Plan An erosion control plan specific to T-Line project features and schedules should be developed.	FWS	27. Draft Ex. E Comments p. ?	This will be developed in the near future.	1985
T-28 Snow Accumulation Data Need data on snow accumulation by elevation in the upper Susitna Basin.	ADFG	28. Feb/Mar '83 Workshop Recommendations p. 154		
T-29 Wetlands Mapping Need to delineate plant communities characteristic of wetlands (as defined by Cowardin et al, 1979) to a level of detail that will usefully support facility siting and design, quantification of wetland impacts, and preparation of permit applications required by Section 404 of the Clean Water Act.	FWS	29. Draft Ex. E Comments p. 17	Prepare large-scale (1:24,000) wetland maps of the impoundment, access road, borrow pit and other direct impact areas and adjacent areas.	1984

ISSUE	AGENCY	SOURCE	STATUS	COMPLETION DATE
T-30 Moose Browse Mapping Need to provide a quantifiable data base for precise type and areal extent of moose browse within the direct impact area to support carrying capacity modeling.	FWS ADFG	30. Draft Ex. E Comments p. 45 (FWS) Feb/Mar '83 Workshop Recommendations p. 160 (ADFG)	Prepare large-scale (1:24,000) maps of the impoundment, access road, borrow pit, and other direct impact areas and adjacent areas delineating shrub vegetation types in a detailed manner.	1984
T-31 General Vegetation Mapping Need to provide general mapping of vegetation types based on improved aerial imagery as a data base for refined impact assessment and mitigation planning. Include the three T-Line stubs in this new mapping.	FWS	31. Draft Ex E. Comments p. 17	Prepare 1:63,360-scale vegetation maps of the Watana and Gold Creek watersheds using larger-scale photography than was used previously. Although the dams-to-Intertie segment is included in this mapping (and the moose browse mapping above) the Willow to Anchorage and Healy to Fairbanks segments are not currently included.	1984
T-32 Assessment of Habitat Values Need to evaluate habitat values for species other than moose, furbearers, and birds rather than relying on analysis of populations only. The habitat assessment needs to be used in developing timely, comprehensive mitigation measures.	FWS	32. Draft Ex. E Comments p. 17-18 Letter 10/5/82 Letter 1/5/82 Letter 6/23/80 Letter 11/15/79 Testimony 4/16/82	Where habitat can be readily evaluated, it has been done. Further evaluation is under consideration.	--
T-33 Integration of Moose & Vegetation Data Need to correlate moose relocation data with the revised vegetation mapping in order to understand habitat use and preferences. Also consider incorporating elevation, slope, and other habitat parameters into the analysis.	FWS	33. Draft Ex. E Comments p.45	This analysis is planned to be conducted when new vegetation mapping is completed.	1985

PRELIMINARY

4 October 1983

SUSITNA HYDROELECTRIC PROJECT: AGENCY-RAISED ISSUES

Subtask: Terrestrial Resources

ISSUE	AGENCY	SOURCE	STATUS	COMPLETION DATE
T-34 Moose Carrying Capacity Model Need to conduct a habitat-based assessment of moose habitat loss/modification impacts as the basis for impact prediction and mitigation planning.	FWS ADFG	34. Draft Ex. E Comments p. 17, 18 52, 72 (FWS) Feb/Mar '83 Workshop Recommendation p. 161 (ADFG)	Continue to model moose carrying capacity in direct impact areas using bioenergetics, vegetation, and population models, modeling effort includes model validation and calibration under field conditions using four 1-m^2 pens at Kenai Nat'l Moose Range.	Dec. 1985
T-35 Moose Habitat Enhancement Need to evaluate techniques for increasing moose carrying capacity through habitat enhancement and identify candidate areas for habitat enhancement in order to mitigate for project-induced carrying capacity reductions.	FWS ADFG	35. Draft Ex. E. Comments p. 40, 72 (FWS) Letter 10/5/82 p. 4 (FWS) Feb/Mar '83 Workshop Recommendations p. 161, 162, 177 (ADFG)	Conduct Alphabet Hills burn, and document degree of and immediate effects of burn soon thereafter. Monitor plan succession and especially moose browse production in succeeding years in already-established permanent plots.	1984?
			Possibly conduct tests of other habitat enhancement techniques (e.g., crushing, chaining, logging). Monitoring of ADFG chaining area near Palmer could be conducted. Also sampling of browse production in disrupted areas along the lower Susitna River should be conducted and the results correlated with the age of disturbance.	1985
			Conduct a more complete evaluation of the potential size and locations of habitat enhancement areas in the project area.	1984
			Conduct a survey of the potential size and location of habitat enhancement areas in the lower Susitna Basin.	1984
T-36 Moose Browse Inventory Need to conduct a moose browse inventory in the impoundment areas to support the moose carrying capacity modeling efforts.	FWS ADFG	36. Draft Ex. E Comments p. 34 (FWS) Feb/Mar '83 Workshop Recommendation p. 160 (ADFG)	First, conduct a pilot study to develop efficient sampling methods (e.g., plot size, sample size, method of accounting for browse availability under variable snow depths) for an extensive browse inventory. The field portion of this effort has been completed. The analysis is in progress.	1985
			Then conduct an extensive browse inventory of the impoundment areas (stratified based on moose browse vegetation types) to estimate standing crop biomass, nitrogen content, and in vitro digestibility of browse species.	

ISSUE	AGENCY	SOURCE	STATUS	COMPLETION DATE
T-37 Moose Food Habits Need to conduct a limited moose food habits study to support the moose carrying capacity modeling efforts.	FWS ADFG	37. Draft Ex. E Comments p. 45 (FWS) Feb/Mar '83 Workshop Recommendation p. 160 (ADFG)	Conduct a limited moose food habits study through collection and laboratory analysis of fresh fecal pellets during winter, spring, summer and fall (pellets have already been collected for some seasons).	1984
T-38 Spring Plant Phenology Need to determine the temporal and spatial pattern of spring plant green-up in and adjacent to the impoundment zones in order to assess the significance of this seasonal forage resource to moose and bear reproduction and carrying capacity and to assess the portion of the resource to be lost due to impoundments. Also, need this information to refine the evaluation of microclimate changes, due to the reservoirs, on spring green-up.	FWS ADFG	38. Draft Ex. E Comments p. 36, 53 (FWS) Feb/Mar '83 Workshop Recommendation p. 159, 160 (ADFG)	Conduct plant phenology study during late April through early June along 32 transects running from the beach above the river down to the river in the impoundment areas. These field studies have been conducted; data analysis remains.	1984
T-39 Upstream Moose Field Studies Need more data on moose numbers, herd composition, calf mortality and movements (especially during the critical winter and spring periods) relative to the impoundment areas to refine impact assessment and mitigation planning.	ADFG FWS	39. Feb,'Mar '83 Workshop Recommendation p. 175, 176 (ADFG) Draft Ex. E Comments p. 47 (FWS)	Conduct a census and herd composition survey of moose in the zone of impact for the impoundments; monitor the movements of a sample of moose in and adjacent to the zone of impact, especially during winter and spring; correlate relocation data with new vegetation maps to determine seasonal habitat selectivity; correlate relocation data with phenology study results to assess the relationships between movements and spring green-up; determine calf mortality rates by cause through use of mortality-detecting radio collars in spring 1984.	1984
T-40 Downstream Moose Field Studies Need more data on moose use of downstream riparian areas during winter and spring to refine impact assessment and mitigation planning, especially because of the annual variability in this use. Also need more data on moose population, sex, and age composition on the downstream disturbed sites.	ADFG	40. Feb/Mar '83 Workshop Recommendation p. 177	Conduct periodic winter censuses along the river and in disturbed vegetation sites and maintain a minimal monitoring program for moose movements relative to riparian habitats. Use existing radio-collared moose primarily during winter and spring.	1984

PRELIMINARY

4 October 1983

SUSITNA HYDROELECTRIC PROJECT: AGENCY-RAISED ISSUES

Subtask: Terrestrial Resources

ISSUE	AGENCY	SOURCE	STATUS	COMPLETION DATE
T-41 Severe Winter Field Studies Need to gather intensive data on moose distribution, habitat selection and wolf predation during a severe winter.	ADFG	41. Feb/Mar '83 Workshop Recommendation p. 177	Intensify moose relocation efforts in upstream areas, map moose distribution, conduct a census during March within (5) miles of the impoundments, collect data on moose mortalities, and intensively monitor wolf movements and moose predation. In the downstream areas conduct additional censuses, map moose distribution, radio collar additional moose on the river over the winter, and intensify relocation surveys.	1984
T-42 Jay Creek Lick Enhancement A demonstration project should be conducted to verify that the lick can be enlarged by blasting or backup mitigation measures should be outlined.	FWS	42. Draft Ex. E Comments p. 19	Under consideration.	--
T-43 Wolf Field Studies Need to gather more information on movements, territory locations, predation rates, etc., of wolves in upstream zone of impact to refine assessment and mitigation planning.	ADFG	43. Feb/Mar '83 Workshop Recommendation p. 176	Conduct minimal relocation surveys and monitor numbers of wolves for each pack using the upstream moose zone of impact. Collect information on predation.	1984
T-44 Black and Brown Bear Field Studies Need to gather more information on habitat use (especially relative to the impoundments), denning habitats and availability of food habits to refine impact assessment and mitigation planning. Need to better evaluate importance of salmon to area bears. Overall, need to better quantify impacts and discuss cumulative impacts on brown bears.	ADFG FWS	44. Feb/Mar '83 Workshop Recommendation p. 171, 172, 179, 180, 181 (ADFG) Draft Ex. E Comments p. 57, 63 (FWS)	Conduct relocation surveys to document habitat use and determine timing and magnitude of use of seasonal concentration areas. Collect additional data on the location and characteristics of den sites. Collect and analyze bear scats and make direct observations to determine food habits especially during spring and near salmon spawning streams.	1984
T-45 Beaver Carrying Capacity Model Need to continue beaver carrying capacity model development as the basis for refining impact predictions and determining mitigation needs, if any.	FWS	45. Draft Ex. E Comments p. 74	Continue development of a model of beaver carrying capacity for the Devil Canyon to Talkeetna portion of the floodplain. Inputs to the model will include data on hydrology, slough morphology, and forage availability; and the results of different flow releases and water temperatures on availability of overwintering habitat will be tested. Continued monitoring of beaver populations will test the validity of the model and refine its accuracy.	1985

PRELIMINARY

4 October 1983

SUSITNA HYDROELECTRIC PROJECT: AGENCY-RAISED ISSUES

Subtask: Terrestrial Resources

ISSUE	AGENCY	SOURCE	STATUS	COMPLETION DATE
T-46 Beaver Field Studies Need additional beaver field studies to fill data gaps to support model development and to monitor beaver numbers for model testing.	FWS	46. Draft Ex. E Comments p. 48, 74 Feb/Mar '83 Workshop Recommendation p. 154, 165, 166, 167, 168	Conduct field studies to: (1) determine characteristics of successful and failed overwintering sites; (2) determine trapper harvest; (3) monitor the effects of break-up on known lodges and caches; (4) obtain data on forage vegetation near caches and near R&M cross-sections; (5) determine contents of one or more caches; (6) obtain an accurate estimate of the number of individuals per colony; (7) continue annual monitoring of mainstem populations between Portage Cr. and Talkeetna and in Prairie, Portage, and Deadman Creek areas; (8) monitor level of trapping. Also, FWS (p.48) recommended that the extent to which bank lodges are used downstream of Devil Canyon be investigated.	1985
T-47 Marten Habitat Model Need to continue marten habitat model development as the basis for refining impact predictions and determining mitigation needs. Need the assistance of a marten expert. Need better information on trapping intensity.	FWS	47. Draft Ex. E Comments p. 74 Feb/Mar '83 Workshop Recommendation p. 168, 169	Continue refinement of simple marten habitat - loss model using revised vegetation mapping.	1985
T-48 Marten Field Studies Need additional marten field studies to fill data gaps to support model development and to monitor marten numbers for model testing.	FWS	48. Draft Ex. E Comments p. 7	Additional studies not currently planned. Habitat loss is expected to support on the order of 100 martens or less.	--
T-49 Quantification of Lynx, Weasel, Mink, & Other Densities Need some quantification of the qualitative terms in Ex. E.	FWS	49. Draft Ex. E Comments p. 49, 64	Under consideration.	--
T-50 Peregrine Falcon Surveys Should conduct peregrine falcon surveys annually, in early July, throughout project studies and construction, or until there is sufficient evidence that peregrines do not inhabit the project area (i.e., no sightings over several years of helicopter surveys by a reputable observer during the proper time of year).	FWS	50. Draft Ex. E Comments p. 50	Conduct helicopter surveys of project area incidental to other raptor work.	1985

PRELIMINARY

4 October 1983

SUSITNA HYDROELECTRIC PROJECT: AGENCY-RAISED ISSUES

Subtask: Terrestrial Resources

ISSUE	AGENCY	SOURCE	STATUS	COMPLETION DATE
T-51 Bald Eagle Nest Surveys-Downstream Need to obtain accurate locations for bald eagle nest sites downstream of Gold Creek due to existing discrepancies in order to adequately assess project impacts.	FWS	51. Feb/Mar '83 Workshop Recommendation p. 170	Except for those nest sites that may be impacted by T-Line clearing, this survey does not appear to be needed. T-Line impact nest sites should be surveyed.	1984
T-52 Artificial Raptor Nest Sites A demonstration project should be conducted to verify that artificial raptor nest sites can be created satisfactorily or backup mitigation measures should be outlined. A survey is necessary to locate trees, cliffs, etc. for nest site enhancement.	FWS	52. Draft Ex. E Comments p. 19	Helicopter surveys will be conducted to locate trees, cliffs, etc. for nest site enhancement. The remainder of the proposed work is under consideration.	1984
T-53 Raptor Nest Surveys - Middle Basin Need to obtain accurate elevations of large raptor nests in the impoundment areas due to existing discrepancies.	FWS	53. Feb/Mar '83 Workshop Recommendation p. 169, 170	Helicopter surveys will be conducted to measure elevations and horizontal locations accurately.	1984
T-54 Project Impacts on Bald Eagle Nests Project development may be in conflict with the Bald Eagle Protection Act due to impacts on bald eagle nests.	FWS	54. Letter 6/9/83		
T-55 Correlation of Bird Species & Habitat Changes Should correlate bird species and their relative abundance with postulated negative and positive effects of habitat alteration.	FWS	55. Draft Ex. E Comments p. 61	Under consideration.	--

APPENDIX B

MAJOR SUSITNA PROJECT TERRESTRIAL STUDIES

Vegetation

Steigers, W.D., D. Helm, J. G. MacCracken, J.D. McKendrick and P.V. Mayer. 1983 Environmental Studies-Subtask 7.12, 1982 Plant Ecology Studies, Final Report. Alaska Power Authority, Susitna Hydroelectric Project. Prepared for LGL Alaska Research Associates, Inc. University of Alaska Agriculture Experiment Station, Palmer.

McKendrick, J., W. Collins, D. Helm, J. McMuller, and J. Koranda. 1982 Plant ecology studies, Phase I Report. Susitna Hydroelectric Project, Environmental Studies, Subtask 7.12. Submitted to Terrestrial Environmental Specialists, Inc. Prepared for Alaska Power Authority. University of Alaska Agricultural Experiment Station, Palmer.

Moose

Ballard, W. B., J.S. Whitman, N. G. Tankersley, L. D. Aumiller, and P. Hessing. 1983. Big Game Studies, Volume III, Moose-Upstream. Susitna Hydroelectric Project, Phase II Progress Report. Submitted to Alaska Power Authority. Alaska Department of Fish & Game.

Ballard, W.B., C. L. Gardner, J. H. Westlund, and J.R. Dau. 1982. Big Game Studies, Volume III, Moose-Upstream. Susitna Hydroelectric Project, Phase I Final Report. Submitted to Alaska Power Authority. Alaska Department of Fish & Game.

Ballard W. B., and K. P. Taylor. 1980. Upper Susitna Valley moose population study. Alaska Department of Fish & Game P-R Proj. Final Rep., W-17-9, W-17-10, and W-17-11. 102 p.

Ballard W. B., and K. P. Taylor. 1978. Upper Susitna River moose population study. Alaska Department of Fish & Game. Fed. Aid in Wildl. Rest. Proj. Final Rep W-17-9 and W-17-10, Job 1.20R. 61 p.

Modafferi, R. D. 1983. Big game studies, Volume II, Moose-Downstream. Susitna Hydroelectric Project, Phase II Progress Report. Submitted to Alaska Power Authority. Alaska Fish & Game.

Modafferi, R. D. 1982. Big game studies, Volume II, Moose-Downstream. Susitna Hydroelectric Project, Phase I Final Report. Submitted to Alaska Power Authority. Alaska Department of Fish & Game.

Caribou

Pitcher, K.W. 1983. Big game studies, Volume IV, Caribou. Susitna Hydroelectric Project, Phase II Progress Report. Submitted to Alaska Power Authority. Alaska Department of Fish & Game.

Pitcher, K. W. 1982. Big game studies, Volume IV, Caribou. Susitna Hydroelectric Project, Phase I Final Report. Submitted to Alaska Power Authority, Alaska Deprtment of Fish & Game.

Dall Sheep

Tankersley, N. G. 1983. Big game studies, Volume VIII, Dall Sheep. Susitna Hydroelectric Project, Phase II Progress Report. Submitted to Alaska Power Authority. Alaska Department of Fish & Game.

Tobey, R.W. 1981. Big game studies, Part VIII, Sheep. Susitna Hydroelectric Project, Annual Progress Report. Submitted to Alaska Power Authority. Alaska Department of Fish & Game.

Black and Brown Bears

Miller, S. D. 1983. Big game studies, Volume VI, Black bears and brown bears. Susitna Hydroelectric Project, Phase II Progress Report. Submitted to Alaska Power Authority. Alaska Department of Fish & Game.

Miller, S. D., J. S. Whitman, L. D. Aumiller, and P. Nessing. 1983. Big game studies, Volume V, Wolf. Susitna Hydroelectric Project, Phase II Progress Report. Submitted to Alaska Power Authority. Alaska Department of Fish and Game.

Wolf

Ballard, W.B., J.S. Whitman, L.D. Aumiller, and P. Messing. 1983. Big game studies, Volume V, Wolf. Susitna Hydroelectric Project, Phase II Progress Report. Submitted to Alaska Power Authority. Alaska Department of Fish and Game.

Ballard, W. B., C. L. Gardner, J. H. Westlund, and J. R. Dau. 1982 Big game studies, Volume V, Wolf. Susitna Hydroelectric Project, Phase I Final Report. Submitted to Alaska Power Authority. Alaska Department of Fish and Game.

Wolverine

Whitman, J. S., and W. B. Ballard. 1983. Big game studies, Volume VII, Wolverine. Susitna Hydroelectric Project, Phase II Progress Report. Submitted to Alaska Power Authority. Alaska Department of Fish and Game.

Gardner, C. L., and W. B. Ballard. 1982. Big game studies, Volume VII, Wolverine. Susitna Hydroelectric Project Phase I Final Report. Submitted to Alaska Power Authority. Alaska Department of Fish and Game.

Belukha Whale

Calkins, D. G. 1983. Big game studies, Volume IX, Belukha Whale. Susitna Hydroelectric Project, Phase II Progress Report. Submitted to Alaska Power Authority. Alaska Department of Fish and Game.

Other Wildlife

Buskirk, S. W. 1983. The ecology of marten in southcentral Alaska. Ph. D. Thesis, University of Alaska, Fairbanks.

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