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STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

JAY S. HAMMOND, GOVERNOR

333 RASPBERRY ROAD
ANCHORAGE 99502

September 28, 1979

Mr. Eric Yould, Director
Alaska Power Authority
333 W. 4th Avenue
Anchorage, Alaska 99510

Dear Mr. Yould:

In accordance with the request in your letter of August 28, the Department of Fish and Game has reviewed the plans of study prepared by Harza Engineering, Acres-American Inc., and International Engineering Inc. to evaluate the sufficiency of the environmental studies they propose. The emphasis of our review focused on those programs and interdisciplinary tasks related to determining project feasibility and impacts with respect to fish and wildlife. We appreciate the opportunity to make this Department's recommendations with regard to the selection of a private sector consultant to conduct the Susitna Hydro engineering and environmental feasibility studies and to advise you of related issues.

In earlier correspondence to you on August 10th, the Department of Fish and Game described our expectations with regard to the development of the three consultant plans of study and the specific points we would address in a review of their products and which are summarized as follows:

1. Scope of studies - that is, the degree to which the study objectives meet biological data needs and integrate biological studies into a multi-disciplinary effort which can provide an assessment of project impacts.

2. Statutory and regulatory requirements - that is, the degree to which Federal, State and local statutory and regulatory requirements are recognized in the planning process so there are no surprises resulting in delay of the environmental assessment process to determine the project feasibility.

3. Study time frames - that is, first, the degree to which biological studies must follow the natural events of biological cycles and the physical factors of habitat and environment influencing them, to arrive at a point where our best and most

timely judgement of project impacts and mitigation requirements can be made. And second, the degree to which project and task scheduling accomodates the development of the field staff and administrative organization to carry out studies, coordinate studies, and make logistic and equipment arrangements to maximize the results of these studies.

4. Funding - that is, the degree to which a commitment is made to guarantee equal consideration of fish and wildlife resources through all phases of the project from initial planning to construction (if the project is approved) and thereafter. Monitoring of the impacts and operation of mitigation and enhancement programs is also essential.

In reality, this Department had five plans of study before it in this review. They are:

1. Alaska Department of Fish and Game, December 1977.
2. U.S. Army Corps of Engineers, June 1978.
3. Acres-American, September 1979.
4. Harza Engineering, September 1979.
5. International Engineering, September 1979.

Overall, it is our opinion that each of these plans of study is inadequate for the reasons we discuss hereafter for each.

Alaska Department of Fish and Game December 1977

1. Scope of Studies - The scope of studies by the Department of Fish and Game basically covers the objectives for fish and wildlife investigations as viewed solely by this Department. While we did our best to cover multi-disciplinary aspects of an environmental program related to fish and wildlife resources, vegetation analysis, water quality, hydrology, recreation and socio-economics that could be conducted by the Department, the study does not display the advantages of the integration of a true multi-disciplinary effort by other specialists representing the engineering and other non-fish and wildlife disciplines.

2. Statutory and Regulatory Requirements - The current status of the National Environmental Policy Act, Fish and Wildlife Coordination Act, Coastal Zone Management Regulations, and the applicability of Alaska Statute 16.05.870, the Anadromous Fish Act, to this project are not clearly addressed.

3. Study Time Frames - The time frames fit those required to meet the fish and wildlife investigations goal of providing our best judgement of project impacts in relation to the cycles and life histories of fish and wildlife in this basin. Further, they provide the time which is essential for organizing

and administering these investigations. Important mileposts in coordination of possible alternatives for license application or EIS development are not detailed, however.

4. Funding - The budgets developed by ADF&G reflect the first steps toward a cost saving and minimization of duplication of effort that a coordinated multi- disciplinary effort could potentially provide (based upon limited data provided in the Corps of Engineers draft POS of October 1977). Interdisciplinary studies however, can and should be refined further. The budgets are the costs projected by ADF&G in 1977 dollars and don't reflect current and possibly inflationary values or costs of fish and wildlife investigations proposed by the U.S. Fish and Wildlife Service. I'd like to reiterate Commissioner Ronald O. Skoog's comment in his December 21, 1977 letter to Robert Ward, Chairman of the Alaska Power Authority, Board of Directors, transmitting this proposal, that is, "We believe from our extensive experience that we have excellent insight into what it actually costs to do business in the State."

U.S. Army Corps of Engineers, June 1978

1. Scope of Study - The biological investigations of this plan of study are the result of a limited coordination effort between the Corps and the Department of Fish and Game. Narratively, this plan of study covers the scope of task areas of the biological investigations in a manner satisfactory to the Department of Fish and Game. The plan of study also provides for the shift of certain tasks exclusively from the biological investigations to other task descriptions in hydrology and water quality, making this a better effort at an inter-disciplinary study than found in the Corps' original draft of October 1977.

2. Statutory and Regulatory Requirements - The Corps' June 1978 POS does not in our view reflect the current status or consideration of impacts of this project on fish and wildlife and mitigation in accordance with the Fish and Wildife Coordination Act and the National Environmental Policy Act. It also does not consider the application of AS 16.05.870, the new Federal Energy Regulatory Commission and Coastal Zone Management Regulations to this project.

3. Study Time Frames - The Corps' studies were scoped into a 46 month time frame, which we believed to be inadequate. The Corps did allow, however, that continuation studies beyond the 46 month period to 60 months may be required. However, the wording in their POS implies that the construction decision will occur before completing portions of the 5 year biological studies we consider essential.

4. Funding - The Corps's attachment of a 4.3 million dollar budget to biological investigations was inadequate in this Department's view. For the 46 month time frame, we proposed a 7.9 million dollar budget in 1977 dollars.

Acres American (Acres) - September, 1979
Harza Engineering (Harza) - September, 1979
International Engineering (IECO) - September, 1979

Scopes of Study - The present consultant plans of study are scoped in varying degrees of adequacy by the three firms. IECO's proposal is deficient in both the aquatic and terrestral segments. Acres' proposal does not have a satisfactory aquatic studies proposal but has a stronger description the terrestrial studies tasks. Harza's proposal contains the best aquatic studies presentation and has done a fair job on the terrestrial wildlife tasks also. In balance, Harza's biological investigations proposals provide for a better state-of-the-art application of study techniques and methodologies, such as radio telemetry, sonar application, and instream flow. I must point out, that although all three firms have adopted portions of the Department of Fish and Game's ideas or suggestions; the focus and results of their proposed activities are not totally in accord with the Department.

Statutory and Regulatory Requirements

All three consultant firms address FERC licensing and exhibit preparation requirements, but there is no specific discussion of the impact of the requirements of AS 16.05.870, the Fish and Wildlife Coordination Act, and Coastal Zone Management Act regulatory requirements regarding coordination, planning, and environmental protection in relation to this project.

Study Time Frames - All three firms were constrained to a 30 month time frame to FERC license application in accord with the APA contract specifications. IECO does emphasize a three-year study on anadromous species and a two-year study on large mammals but this is inconsistent with this Department's view of a required five-year study on some populations and habitats. Both Acres and Harza more strongly emphasize the continuation of fish and wildife investigations. We believe that APA must give the contractor for the final POS stronger direction to provide for the review of pre-FERC license studies, and provide a mechanism for the review, redirection and continuation of selected projects post-FERC license application.

Budgets - Because of the relatively short review time afforded this Department, we could not make an adequate assessment of the merits of the three consultant firms' POS budgets. Their interdisciplinary study plans and scoping of fish and wildlife tasks were not specifically budgeted in all cases. The numbers of personnel dedicated to fish and wildlife tasks detailed by two of the consultants (Acres and Harza) is also difficult to breakdown. We can only leave our final evaluation on the adequacy of the fish and wildlife investigations budgets to the one submitted in the final POS.

At this juncture, we recognize that the selection of a consultant to prepare a final POS and to implement the studies involved must be based on factors involving not only the fish and wildlife investigations. This Department desires to assure that the best final POS is developed. To accomplish this, we believe the fish and wildlife agencies must be the key participants in the development of the final POS. The consultant

firm selected should be one which has developed the best overall plan of study. That firm and the APA will have to make a commitment to synthesize a new final plan of study incorporating the concerns of the fish and wildlife agencies which meets our special statutory mandates for the protection of fish and wildlife resources. Funding for this planning and coordination will be required by ADF&G.

I would like to advise you here of some of the requirements of the Fish and Wildlife Coordination Act, Fish and Game Code, (Title 16), and Coastal Zone Management Act which can influence this project.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act, draft Uniform Procedures for compliance, May 1979 further standardizes procedures and interagency relationships to insure, "that wildlife conservation is fully considered and weighed equally with other project features in agency decision-making processes by integrating such considerations into project planning, National Environmental Policy Act (NEPA) compliance procedures, financial and economic analyses, authorization documents, and project implementation."

Subpart B-FWCA Compliance Procedures

Sec. 410.21 Equal consideration.
Equal consideration of wildlife resource values in project planning and approval is the essence of the FWCA compliance process. It requires action agencies to involve wildlife agencies throughout their planning, approval, and implementation process for a project and highlights the need to utilize a systematic approach to analyzing and establishing planning objectives for wildlife resource needs and problems and developing and evaluating alternative plans.

Sec. 410.22 Consultation
(a) Initiation. The FWCA compliance process may be initiated by a potential applicant, an action agency, or a wildlife agency.
(b) Potential Applicants. Implementing procedures of action agencies shall provide that applicants for those non-federal project approvals which require a water-dependent power project approval from the Federal Energy Regulartory Commission (FERC) (also applies to preliminary FERC permit) contain written evidence that they initiated the FWCA compliance process with both Regional Directors and the head of the State wildlife agency exercising administration over the fish and wildlife resources of the state(s) wherein the project is to be constructed and early site review (NRC) applicants. The intent of this paragraph (a)(1) of this section is to assist applicants in designing environmentally sound projects without waste of their planning resources and to minimize the potential for delay in the processing of applications. Action agency implementing procedures shall advise that consultation should be initiated by the applicant at the earliest stages of its project planning, and that its submissions to wildlife agencies shall indicate the general work or activity being considered, its purpose(s), and the general area in which it is contemplated.

In order to comply with these procedures, APA should initiate the process of consultation with the fish and wildlife agencies.

Title 16

Title 16, independently of Federal laws, mandates the Alaska Department of Fish and Game to manage, protect, maintain, enhance, and extend the fish, game, and aquatic plant resources and the habitat that sustains them including assisting the U.S. Fish and Wildife Service in the enforcement of federal laws and regulations pertaining to fish and wildlife.

> Sec. 16.05.870 also states that:
> b) If a person or governmental agency desires to construct a hydraulic project, or use, divert, obstruct, pollute, or change the natural flow or bed of a specified river, lake or stream, or to use wheeled, tracked, or excavating equipment or log-dragging equipment in the bed of a specified river, lake, or stream, the person or governmental agency shall notify the commissioner of this intention before the beginning of the construction or use.
> c) . . . . If the commissioner determines to do so, he shall, in the letter of acknowledgement, require the person of governmental agency to submit to him full plans and specifications of the proposed construction or work, complete plans and specifications for the proper protection of fish and game in connection with the construction or work, or in connection with the use, and the approximate date the construction, work, or use will begin, and shall require the person or governmental agency to obtain written approval from him as to the sufficiency of the plans or specifications before the proposed construction or use is begun.
>
> > Purpose. - The purpose of this section is to protect and conserve fish and game and other natural resurces. 1964. Att'y Gen., No. 10.

Alaska Coastal Management Program

The recently approved Alaska Coastal Management Program (ACMP) mandates that all State, Federal and Local government agencies must coordinate all planning and development activities in the State's coastal zone to ensure adequate consideration and protection of Alaska's coastal waters and resources. As the proposed Susitna Hydropower project will occur within Alaska's coastal zone and certainly will directly influence coastal waters all planning and development plans must be consistent with the Coastal Standards and the Mat-Su Borough's District Coastal Plan once it is completed and approved. The Coastal Standards are presently in effect and all State and Federal actions must be consistent with them. Section 6 AA C 80.130 states that:

(a) habitats in the coastal area which are subject to the Alaska Coastal Management Program include:

(1) offshore areas
(2) estuaries
(3) wetlands and tidal flats
(4) rocky islands and sea cliffs

(5) barrier islands and lagoons
(6) exposed high energy coasts
(7) rivers, streams and lakes
(8) important upland habitat

These habitats which are specifically defined in the Standards must be identified within the Susitna Hydro Study area during the feasibility studies. In addition, Section (b) states that habitats contained in (a) of this section shall be managed so as to maintain or enhance the biological, physical and chemical characteristics of the habitat which contributes to their capacity to support living resources. Specific guidelines are also provided for each coastal habitat. The Coastal Zone Management consistancy requirements are mandated in both the Alaskan and Federal CZM Acts and the Fish and Wildlife Coordination Act. The question of consistancy with CZM standards goes well beyond the FERC licensing requirements and should be treated as a separate step in determining the feasibility of Hydro Power alternatives.

Thank you for the opportunity to comment, we expect to provide more information to you during the next weeks regarding the development of a final POS.

Sincerely,

Thomas W. Trent

Thomas W. Trent
Regional Supervisor
Habitat Protection Section

cc: Commissiner R.O. Skoog, Juneau
Directors, ADF&G, Juneau
Murray Walsh, OCM, Juneau
Keith Schreiner, USFWS, Anchorage
Rep. Brian Rodgers, Fairbanks
Rep. Rick Halford, Chugiak

Susitna

ALASKA POWER AUTHORITY

333 WEST 4th AVENUE - SUITE 31 - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-2715

November 19, 1979

Mr. Thomas Trent
Susitna Coordinator
Alaska Department of Fish
and Game
333 Raspberry Road
Anchorage, Alaska 99502

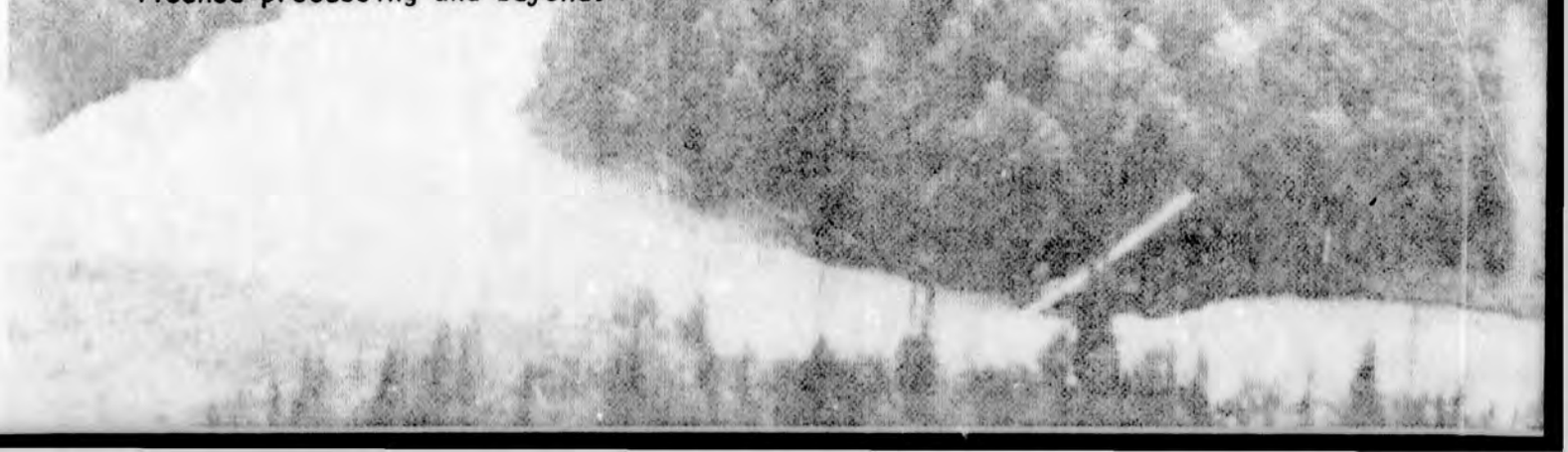
Dear Tom:

Thank you for your efforts last week in helping to formulate an efficient, thorough and realizable fish and game study program for the initial years of the Susitna investigations.

The Power Authority accepts the scope and budget of the big game studies as presented in your October 31, 1979 proposal and as discussed with Carl Schnieder on November 16, 1979. The total cost of the presently envisioned studies will not exceed $1,312,000, not counting the effects of inflation. Based on this understanding and pending release of appropriated funds, the Power Authority intends to request that ADF&G join in a reimbursable services agreement for the performance of these pre-license application studies in the area of big game.

Attached you will find a revised budget for fishery studies that reflects my understanding of the agreed upon program resulting from our November 15, 1979 meeting. I realize that there may be a few minor unresolved issues and therefore request that you review the figures. The only major component of the program about which there remains disagreement is the installation of a weir on Iron Creek. The opinion of our consultants is that the proposed program on Iron Creek will not provide useful information appropriate to analysis of the Susitna project. I hope that this issue will not prevent the acceptance of the remainder of the program.

If we can achieve a mutually agreeable fishery program in scope and budget, it is my intent to request that ADF&G conduct this program, also under a reimbursable services agreement. The agreement would cover pre-license application activities, with the understanding that required work would continue during license processing and beyond.



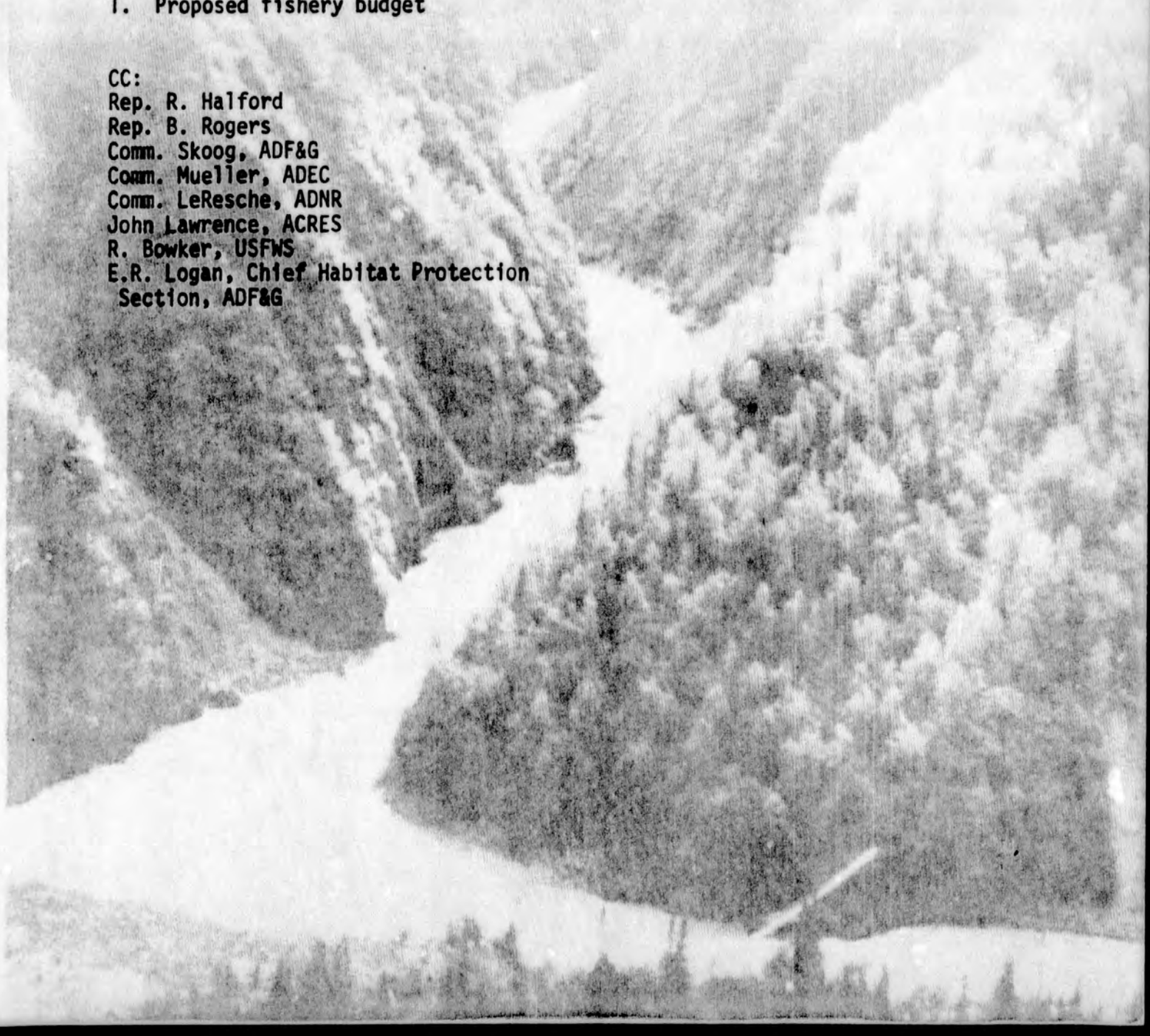
Please advise me as to the acceptability of the revised fishery budget at your earliest convenience. Thank you.

Sincerely,

Original Signed
by
Eric P. Yould
Eric P. Yould
Executive Director

Attachment:
1. Proposed fishery budget

CC:
Rep. R. Halford
Rep. B. Rogers
Comm. Skoog, ADF&G
Comm. Mueller, ADEC
Comm. LeResche, ADNR
John Lawrence, ACRES
R. Bowker, USFWS
E.R. Logan, Chief Habitat Protection Section, ADF&G



ALASKA POWER AUTHORITY

Proposed Fishery Budget

November 16, 1979

Administration	CY 80	CY 81	CY 82	Phase 1982
Line 100 - Personal Services				
Bio III - 6 mo @ 4,053	$12,159.00	$ 24,318.00	$ 12,159.00	$12,159
Programer - 6 mo @ 3,035	(3 mo)	18,200.00	9,200.00	9,200
Data Handler - 6 mo @ 2,100		12,600.00	6,300.00	6,300
CLT IV - 12 mo @ 2,100	12,600.00	25,200.00	25,200.00	
Publications Spec - 3 mo @ 2,841	(6 mo)	8,523.00		8,523
Maintenance Mech - 12 mo @ 2,730		32,760.00	32,760.00	
Total	24,759.00	121,601.00	85,619.00	36,182
Line 200 - Travel				
Travel and per diem		7,500.00	7,500.00	
Total	0.00	7,500.00	7,500.00	0
Line 300 - Contractual Services				
Equipment repair, freight and transportation - including air charter and vehicle rental (1)		11,100.00	11,100.00	
Total	0.00	11,100.00	11,100.00	0
Line 400 - Commodities				
Clothing, materials, parts, professional and scientific supplies, office and library supplies		13,500.00	13,500.00	
Total	0.00	13,500.00	13,500.00	0.
Line 500 - Equipment				
Cameras (6) and shop equipment		5,900.00	2,000.00	
Total	0.00	5,900.00	2,000.00	0.
GRAND TOTAL	$24,759.00	$159,601.00	$119,719.00	$36,182

NOTE: Phase I (per-license application activities) include CY 80, CY 81 and Phase I 1982. CY 82 represents the first year of Phase II (license processing activities).

Anadromous Adult - Stock Assessment

Task #1. Cook Inlet Stock Assessment

Scale Pattern Analysis	CY 80	CY 81	CY 82	Phase I 1982
Line 100 - Personal Services				
10.5 mm FT II @ 1,826		$ 19,173.00	$ 19,173.00	
21.0 mm FT III @ 2,056		43,176.00	43,176.00	
10.5 mm FB I @ 2,471		25,946.00	25,946.00	
Total	0.00	88,295.00	88,295.00	0.00
Line 200 - Travel				
Travel/per diem		1,000.00	1,000.00	
Total	0.00	1,000.00	1,000.00	0.00
Line 300 - Contractual Services				
Contractual services (computer time)		5,000.00	5,000.00	
Aircraft charter (10 hrs C185 @ 150/hr)		1,500.00	1,500.00	
Vehicle rental (3 @ 250/mo and 3,000 miles)		2,040.00	2,040.00	
Total	0.00	8,540.00	8,540.00	0.00
Line 400 - Commodities				
Scientific supplies (500/field crew)		1,500.00	1,500.00	
Food (312 days @ 10/day)		3,120.00	3,120.00	
Gill nets		1,000.00		
Housing (650/mo)		1,300.00	1,300.00	
Clothing (200/person)		1,200.00	1,200.00	
Total	0.00	8,120.00	7,120.00	0.00
Line 500 - Equipment				
Digitizer (Omega computer)		8,200.00		
Total	0.00	8,200.00	0.00	0.00
Total for Scale Pattern Analysis	0.00	$114,155.00	$104,955.00	0.00

Task #1. Cook Inlet Stock Separation

Electrophoresis	CY 80	CY 81	CY 82	Phase I 1982
Line 100 - Personal Services				
8 mm FT II @ 1,826		$14,608.00		
Total	0.00	14,608.00	0.00	0.00
Line 200 - Travel				
Travel/per diem		1,000.00		
Total	0.00	1,000.00	0.00	0.00
Line 300 - Contractual Services				
Contractual services (graduate student) includes all analysis of samples		15,000.00		
Aircraft charter (10 hrs C185 @ 150/hr)		1,500.00		
Vehicle rental (2 @ 250/mo and 2,000 miles)		1,360.00		
Total	0.00	17,860.00	0.00	0.00
Line 400 - Commodities				
Scientific supplies		1,000.00		
Food (208 days @ 10/day)		2,080.00		
Housing (650/mo)		1,300.00		
Clothing		800.00		
Total	0.00	5,180.00	0.00	0.00
Line 500 - Equipment	0.00	0.00	0.00	0.00
Total for Electrophoresis	0.00	$38,648.00	0.00	0.00

Task #2. Susitna River Mouth to Yentna River

Susitna Station (May 15 - October 15)	CY 80	CY 81	CY 82	Phase I 1982
Line 100 - Personal Services				
20 mm FB I @ 2,471		$49,420.00	$49,420.00	
Total	0.00	49,420.00	49,420.00	0.00
Line 200 - Travel				
Travel/per diem		200.00	200.00	
Total	0.00	200.00	200.00	0.00
Line 300 - Contractual Services				
Aircraft charter (18 hrs C185 @ 150)		2,700.00	2,700.00	
Freight (barge charter)		500.00	500.00	
Repairs of maintenance		1,200.00	1,200.00	
Total	0.00	4,400.00	4,400.00	0.00
Line 400 - Commodities				
Fish Tags (10,000)		7,000.00	7,000.00	
Food (552 days @ 10/day)		5,520.00	5,520.00	
Scientific supplies		300.00	300.00	
Gas and O/B oil (15 barrels @ 75)		1,125.00	1,125.00	
Camp supplies		500.00	300.00	
Clothing		400.00	400.00	
Total	0.00	14,845.00	14,645.00	0.00
Line 500 - Equipment				
2 side scan sonar counters		78,000.00		
2 recorders		600.00		
Oscilloscope		1,800.00		
Total	0.00	80,400.00	0.00	0.00
Total for Susitna Station	0.00	$149,265.00	$68,665.00	0.00
Yentna Sonar				
Line 100 - Personal Services				
10 mm FB I @ 2,471		$ 24,710.00	$ 24,710.00	
10 mm FT II @ 1,826		18,260.00	18,260.00	
600 hrs overtime @ 18.25/hr		10,950.00	10,950.00	
Total	0.00	53,920.00	53,920.00	0.00

Yentna Sonar (cont.)	CY 80	CY 81	CY 82	Phase I 1982
Line 200 - Travel		0.00	0.00	0.00
Line 300 - Contractual Services				
Freight (barge charter)		600.00	600.00	
Aircraft charter (35 hrs @ 150/hr)		5,250.00	5,250.00	
Repairs and maintenance		1,500.00	1,500.00	
Total		7,350.00	7,350.00	0.00
Line 400 - Commodities				
Food (616 days @ 10/day)		6,160.00	6,160.00	
Camp supplies		1,500.00	1,000.00	
Parts		1,500.00	1,500.00	
Tools		500.00	300.00	
Gas and O/B oil (45 barrels @ 75)		3,375.00	3,375.00	
Scientific supplies		300.00	300.00	
Fishwheels (2 - parts and labor)		2,400.00	500.00	
Clothing		800.00	800.00	
Total		16,535.00	13,935.00	0.00
Line 500 - Equipment				
2 boats		4,000.00		
Four 25 hp outboards		2,976.00		
2 side scan sonar counters		78,000.00		
Generator		350.00		
Compressor		350.00		
2 tape recorders (sonar)		600.00		
Oscilloscope (sonar)		1,800.00		
2 shotguns (bear protection)		400.00		
SSB radio		1,600.00		
Total		90,076.00	0.00	0.00
Total for Yentna Sonar		$167,881.00	$75,205.00	0.00

Task #3. Yentna River to Talkeetna

Sunshine Sonar Site	CY 80	CY 81	CY 82	Phase I 1982
Line 100 - Personal Services				
10 mm FB 1 @ 2,471		24,710.00	24,710.00	
20 mm FT II @ 1,826		36,520.00	36,520.00	
Overtime 1,200 hrs @ 18.25		21,900.00	21,900.00	
Total	____	83,130.00	83,130.00	0.00
Line 200 - Travel		0.00	0.00	0.00
Line 300 - Contractual Services				
Vehicle rental (250/mo and 2,500 miles)		1,700.00	1,700.00	
Repairs and maintenance		1,500.00	1,500.00	0.00
Total	____	3,200.00	3,200.00	0.00
Line 400 - Commodities				
Food (924 days @ 10/day)		9,240.00	9,240.00	
Camp supplies		1,500.00	1,000.00	
Parts		1,500.00	1,500.00	
Tools		500.00	300.00	
Gas and O/B oil (45 barrels @ 75		3,375.00	3,375.00	
Scientific supplies		300.00	300.00	
Fishwheels (4 - parts and labor)		4,800.00	500.00	
Fish tags (10,000)		7,000.00	7,000.00	
Clothing		1,200.00	1,200.00	
Total	____	29,415.00	24,415.00	0.00
Line 500 - Equipment				
2 boats		4,000.00		
4 outboards		2,976.00		
2 side scan sonar counters		78,000.00		
Generator		350.00		
Compressor		350.00		
2 tape recorders		600.00		
Oscilloscope		1,800.00		
2 shotguns		400.00		
SSB radio		1,600.00		
1 boat trailer		1,700.00		
Total	____	91,776.00	0.00	0.00
Total for Sunshine Sonar Site	0.00	207,521.00	110,745.00	0.00

Anadromous Adult - Stock Assessment

Creel Census	CY 80	CY 81	CY 82	Phase I 1982
Line 100 - Personal Services				
9 mm FT II @ 1,826	16,434.00	16,434.00		
Overtime 450 hrs @ 18.25	8,213.00	8,213.00		
Total	24,647.00	24,647.00	0.00	
Line 200 - Travel	0.00	0.00	0.00	
Line 300 - Contractual Services				
Vehicles (2 @ 250/mo and 2,000 miles)	860.00	860.00		
Total	860.00	860.00	0.00	
Line 400 - Commodities				
Food (276 days @ 10/day)	2,760.00	2,760.00		
Housing (500/mo)	750.00	750.00		
Gas and O/B oil	1,000.00	1,000.00		
Total	4,510.00	4,510.00	0.00	
Line 500 - Equipment				
	0.00	0.00	0.00	
Total for Creel Census	30,017.00	30,017.00	0.00	

Task #4. Budget is included in juvenile studies.

Task #5. Budget included in resident fisheries studies.

Program Supervisors				
Anadromous Fisheries Studies Supervisor	19,476.00	38,952.00	35,706.00	3,246.00
FB III @ 3,246/mo				
Total	19,476.00	38,952.00	35,706.00	3,246.00
Grand Total	88,141.00	707,791.00	395,285.00	3,246.00

Resident and Juvenile Anadromous Fishery Study

	CY 80	CY 81	CY 82	Phase I 1982
Devil Canyon to Tyone River Impoundment				
Line 100 - Personal Services				
3 FB I's @ 2,471 x 6 mo.		44,478.00	44,478.00	
Total		44,478.00	44,478.00	0.00
Line 200 - Travel				
Transportation (train)		750.00	750.00	
Private vehicle mileage @.25/mile		125.00	150.00	
Per diem 15 days @ 55		825.00	825.00	
Total		1,700.00	1,725.00	0.00
Line 300 - Contractual Services				
Communications		200.00	200.00	
Professional Services		300.00	200.00	
Repairs		500.00	500.00	
Freight & Transportation		500.00	200.00	
Air Charter				
Fixed wing @ 150/hr.		3,000.00	6,000.00	
Watercraft charter @ 300/day		1,000.00	6,000.00	
Vehicle lease @ 200/mo		1,000.00	1,000.00	
Miscellaneous		500.00	500.00	
Total		7,000.00	14,600.00	0.00
Line 400 - Commodities				
Clothing		750.00	750.00	
Subsistence @ 15/day (300 days)		4,500.00	4,500.00	
Outboard fuels @ 1.10/gal		55.00	200.00	
Camp materials, supplies, tents, stoves, heaters, etc.		700.00	500.00	
Trap and net materials		1,400.00	1,200.00	
Miscellaneous		500.00	1,000.00	
Total		7,905.00	8,150.00	0.00
Line 500 - Equipment				
Inflatable boat		2,000.00		
Outboard		1,000.00		
Radio		1,600.00		

Resident and Juvenile Anadromous Fishery Study

	CY 80	CY 81	CY 82	Phase I 1982
Devil Canyon to Tyone River Impoundment(cont)				
Electroshocker		1,200.00		
Guns (2)		500.00		
Thermographs @ 300 each		3,600.00		
DO Meter		600.00		
Conductivity meter		600.00		
ph meter		200.00		
Total		11,200.00	0.00	0.00
Total for Devil Canyon to Tyone River	0.00	72,283.00	68,953.00	0.00
Talkeetna River to Devils Canyon				
Line 100 - Personal Services				
4 FB i's @ 2,471 x 6 mos.		59,304.00	59,304.00	0.00
Total		59,304.00	59,304.00	0.00
Line 200 - Travel				
Transportation (train)		1,600.00	2,000.00	
Private vehicle mileage		300.00	500.00	
Per diem @ 55/day		1,100.00	1,100.00	
Total		3,000.00	3,600.00	0.00
Line 300 - Contractual Services				
Communications		250.00	300.00	
Professional services		150.00	150.00	
Repairs		750.00	1,000.00	
Freight & Transportation (train)		1,000.00	1,100.00	
Air charter				
Fixed wing @ 150/hr		1,350.00	900.00	
Helicopter @ 350/hr		2,800.00	2,100.00	
Watercraft Charter		500.00		
Cabin rental @ 150/mo		750.00	975.00	
Miscellaneous		500.00	400.00	
Total		8,050.00	7,025.00	0.00
Line 400 - Commodities				
Clothing (boots, waders, etc.)		1,000.00	1,200.00	
Gill nets @ 150 each		1,200.00	1,200.00	

Resident and Juvenile Anadromous Fishery Study

	CY 80	CY 81	CY 82	Phase I 1982
Talkeetna River to Devils Canyon (cont)				
Seines 2 @ 150 each for CY 80 CY 81 includes minnow traps		300.00	650.00	
Subsistence food @ 15/day		6,000.00	6,000.00	
Outboard fuel @ 1.10/gal		2,200.00	2,400.00	
Marine oils, lubes, etc.		200.00	250.00	
Building materials		500.00	500.00	
Trap materials, net frames, bouys, etc.		500.00	500.00	
Miscellaneous		600.00		
Camp gear, stove, lantern, etc.		300.00	600.00	
Total		12,800.00	13,300.00	0.00
Line 500 - Equipment				
Riverboat		2,500.00		
Thermographs @ 300 each		3,000.00	1,200.00	
DO meter		600.00		
Conductivity meter		600.00		
ph meter		200.00		
Outboard motor, 85 hp.		3,800.00		
Jet unit @ 600 each		600.00		
Rubber raft		3,500.00		
Outboard 25 hp - 2		2,400.00		
Radio		1,200.00		
Snowshoes @ 25 each		300.00		
Guns 2 @ 250		500.00		
Snowmachines 2 @ 1,600			3,200.00	
Snowmachine sleds (2)			150.00	
Ice Auger		300.00		
Electroshocker		1,200.00		
Total		20,700.00	4,550.00	0.00
Total for Talkeetna River to Devils Canyon	0.00	103,854.00	87,779.00	0.00
Cook Inlet to Talkeetna				
Line 100 - Personal Services				
4 FB I's for 26/mo. for CY 80 4 FB I's for 42/mos for CY 81		64,246.00	103,782.00	
Resident Fisheries Study Supervisor FB III @ 3,246/mo	19,476.00	38,952.00	35,706.00	3,246.00
Total	19,476.00	103,198.00	139,488.00	3,246.00
Line 200 - Travel				
110 days per diem @ 55/day		6,050.00	6,050.00	
Miscellaneous (pickup mileage)		600.00	1,000.00	
Total		6,650.00	7,050.00	0.00

Cook Inlet to Talkeetna	CY 80	CY 81	CY 82	Phase I 1982
Line 300 - Contractual Services				
Air charter @ 150/hr		9,600.00	12,000.00	
Vehicle @ 250/mo		5,250.00	5,250.00	
Engine repair		700.00	2,600.00	
Equipment rental		700.00	1,000.00	
Communications		700.00	1,000.00	
Total		16,950.00	21,850.00	0.00
Line 400 - Commodities				
Food @ 15/day		9,750.00	15,750.00	
Clothing		2,000.00	2,000.00	
Building materials		1,900.00	1,900.00	
Camp gear		600.00		
Net gear		4,300.00	4,000.00	
Fuel		4,700.00	7,540.00	
Oil		650.00	1,000.00	
Marine supplies		500.00	500.00	
Snowmachine supplies		500.00	400.00	
Miscellaneous		2,000.00	1,900.00	
Total		26,900.00	34,990.00	0.00
Line 500 - Equipment				
Riverboat		1,600.00		
75 hp outboard		2,700.00		
25 hp outboard		1,200.00		
Jet unit		600.00		
Trailer boat		500.00		
Radio		1,000.00		
Rifle		300.00		
4 snowmachines		6,400.00		
2 trailers (SM)		1,000.00		
2 ice augers		600.00		
2 chainsaws		600.00		
Canoe		600.00		
Backpack shocker		1,200.00		
Total		18,300.00	0.00	0.00
Total for Cook Inlet to Talkeetna	19,476.00	171,998.00	203,378.00	3,246.00
GRAND TOTAL	19,476.00	348,135.00	360,110.00	3,246.00

Spacial and Seasonal Habitat Studies

Cook Inlet to Portage Creek	CY 80	CY 81	CY 82	Phase I 1982
Line 100 - Personal Services				
Habitat Study Supervisor FB III @ 3,359	20,154	40,308.00	36,949.00	
FB I @ 2,471 (44 mm in 1981, 60 mm in 1982)		108,724.00	148,260.00	
Total	20,154.00	149,032.00	185,209.00	3,359.0
Line 200 - Travel				
120 days per diem @ 55/day		6,600.00	6,600.00	
Miscellaneous				
Total		6,600.00	6,600.00	0.0
Line 300 - Contractual Services				
Air charter 15 hrs/mo for 7 mo @ 150/hr		15,750.00	15,750.00	
Vehicle 12 mo @ 250/mo		3,000.00	3,000.00	
Engine repair and maintenance		1,000.00	1,000.00	
Equipment rental		300.00	300.00	
Boeing computer analysis		10,000.00	25,000.00	
Miscellaneous		500.00	500.00	
Total		30,550.00	45,550.00	0.0
Line 400 - Commodities				
Food: CY 81 700 days @ 15/day CY 82 980 days @ 15/day		10,500.00	14,700.00	
Clothing: boots, life jackets, tents, sleeping bags, etc.		2,500.00	1,000.00	
Fuel; 20 wks 200 gal/wk @ 1.25 gal.		5,000.00	5,000.00	
Oil, lube, etc.		700.00	700.00	
Marine supplies		1,500.00	1,500.00	
Snowmachine supplies		200.00	200.00	
Miscellaneous		1,800.00	1,800.00	0.0
Total		22,200.00	24,900.00	0.0
Line 500 - Equipment				
Survey Stakes		300.00		
2 measuring tapes & holders 300' @ 150		300.00		
2 35 mm SLR cameras (macro lens and polarized filter) @ 350 each		700.00		
2 rifles @ 250 each		500.00		
3 current meters (AA) @ 350		1,050.00		
3 current meters (pygmy) @ 400		1,200.00		
3 Marsh McBirney flow meters digital readout @ 1,600 each		4,800.00		
9 top setting wading rods @ 200 each		1,800.00		
Suspended flow support system		400.00		
2 boat mounted flow metering systems @ 1,600		3,200.00		

Cook Inlet to Portage Creek (cont)	CY 80	CY 81	CY 82	Phase I 1982
Sonar narrow beam system		3,000.00		
4 headsets @ 50/each		200.00		
two 2-way radio walkie talkie @ 1,000 ea.		2,000.00		
2 compasses @ 50 each		100.00		
Rebar		100.00		
4 cable tagliners 300' @ 150		600.00		
Tools for repair		175.00		
20' Wooldridge boat (capable of performance in Portage area)		4,000.00		
13' Avon riverboat		1,800.00		
85 hp (jet foot)		3,800.00		
25 hp (kicker)		1,200.00		
25 hp (for Avon)		1,200.00		
Boat trailer		2,000.00		
3 field calculators @ 35 each		105.00		
5 DO meters @ 600 each		3,000.00		
5 conductivity meters @ 600 each		3,000.00		
5 ph meters @ 200 each		1,000.00		
15 thermometers @ 25 each		375.00		
20 thermographs @ 350 each		7,000.00		
400 Leupold staff gages @ 11 each		4,400.00		
Total		53,305.00	0.00	0.00
Total for Cook Inlet to Portage Creek	20,154.00	261,687.00	262,259.00	3,359.00

Spatial and Seasonal Habitat Studies

Portage Creek to Tyone River	CY 80	CY 81	CY 82	Phase 1982
Line 100 - Personal Services				
See resident studies				
Line 200 - Travel				
See resident studies				
Line 300 - Contractual Services				
Air charter				
6 hrs/mo for 6 mos @ 150/hr		$ 5,400.00	$ 5,400.00	
Total	0.00	5,400.00	5,400.00	0
Line 400 - Commodities				
See resident studies				
Line 500 - Equipment				
DO meter		600.00		
Conductivity meter		600.00		
pH meter		200.00		
3 thermometers @ 25 each		75.00		
Marsh McBirney meter		1,600.00		
AA meter		350.00		
Pygmy meter		400.00		
2 measuring tapes 300' @ 150 each		300.00		
2 topsetting wading rods @ 200 each		400.00		
2 headsets @ 50 each		100.00		
35 mm camera, (macro lens and polarized filter) @ 350		350.00		
25 Leupoid staff gages @ 11.00		275.00		
Total	0.00	5,250.00	0.00	0
GRAND TOTAL	$20,154.00	$272,337.00	$267,659.00	$3,359

ADF&G SUMMARY BUDGET

	CY 1980	CY 1981	Phase I 1982	CY 1982
Administration	$ 24,759.00	$ 159,601.00	$36,182.00	$ 119,719.00
Adult Stock Assessment				
Scale Pattern Analysis		114,155.00		104,955.00
Electrophoresis	38,648.00			
Susitna Station		149,265.00		68,665.00
Yeutna Station		167,881.00		75,205.00
Sunshine Station		207,521.00		110,754.00
Creel Census	30,017.00	30,017.00		
Anad Fish Supervisor	19,476.00	38,952.00	3,246.00	35,706.00
Subtotal Anadromous	88,141.00	707,791.00	3,246.00	395,285.00
Resident & Juvenile				
Impoundment Area		72,283.00		68,953.00
Talkeetna-Devil Canyon		103,854.00		87,779.00
Cook Inlet-Talkeetna	19,476.00	171,998.00	3,246.00	203,378.00
Habitat	20,154.00	261,687.00	3,359.00	262,259.00
Above Portage Creek		10,650.00		5,400.00
Subtotal	39,630.00	620,472.00	6,605.00	627,769.00
GRAND TOTAL	$152,530.00	$1,487,864.00	$46,033.00	$1,142,773.00

NOTE: The office and administrative support to be provided by ACRES is not included in the above.

Arctic Environmental Information and Data Center
707 A Street
Anchorage, Alaska 99501

PHONE (907) 279-4523

Susitna Consult

UNIVERSITY OF ALASKA

October 18, 1979

Mr. Mark Wittow
c/o Representative Hugh Malone
and Representative Brian Rogers
Alaska State Legislature
727 N Street
Anchorage, Alaska 99501

Dear Mr. Wittow:

In response to your request, this letter describes the report AEIDC would submit to Representatives Malone and Rogers on the long-range socio-cultural impacts of the proposed Susitna Hydropower project.

SCOPE OF WORK

AEIDC will submit a report to Representatives Hugh Malone and Brian Rogers on the long-range socio-cultural factors which should be considered in connection with the Susitna hydropower project as presently proposed. The report will analytically survey, within the constraints of time and funding, the policy and planning issues which should be taken into account.

Relevant considerations include, but need not be limited to, the impacts on:

Human occupancy patterns in the affected region:
- Population trends
- Housing and attendant services
- Land ownership patterns

Infrastructure:
- Energy
- Transportation
- Communication
- Other public facilities

Employment opportunity patterns
- Government, corporate, private

Economic developments in:
- Manufacturing and commerce
- Mining and real estate
- Recreation and tourism
- Agriculture and fishing
- Other

Political developments in:
- Governmental jurisdictions
- Regional voting patterns and political strength
- Land use planning and regulation
- Taxation

Environmental impacts and cultural change

The cultural past

Attitudinal developments:
- Value framework
- The cultural mix: way of life/lifestyle

While the focus of this report will be on the long-term, appropriate attention will be paid to developments and trends in all phases of the proposed project: pre-construction, construction, post-construction. The underlying emphasis of the study will be on the effort to portray the interacting interrelationships between developments in the above noted areas which come together to form the cultural whole.

Time and funding permitting, an attempt will be made to find and research experiences with similar hydropower projects in other northern regions of the United States, Canada and Scandinavia.

It is anticipated that the costs of this study will amount to $8,500, with the report to be submitted by March 1, 1980.

Sincerely,

Charles Konigsberg

Charles Konigsberg
Research Associate

CK/bsm

Arctic Environmental Information and Data Center
707 A Street
Anchorage, Alaska 99501

PHONE (907) 279-4523

UNIVERSITY OF ALASKA

September 24, 1979

Mr. Brian Rogers
Alaska State Legislature
Juneau, Alaska

Dear Brian:

During the late 1950's environmental studies of the Susitna project were begun. From that time to today a good deal of scientific and resource information has been gathered which permits some understanding of impacts to be experienced around the project site and upstream within and adjacent to the planned impoundment. With the new project plans being developed by the state, further work will be done on assessment of effects on fish and wildlife. Plans for such studies are now being developed. The purpose of this letter is to emphasize the need for studies of downstream environmental and social impacts.

Even without undertaking a series of project plans, it appears certain that downstream flow regimes will be altered significantly. Among the changes we anticipate are a reduction in turbidity and silt load reduction in summer flows, increased winter flows, and changes in water temperature and timing of ice formation. Such changes could have profound effects on fish and wildlife habitat. Such changes give rise to a few questions I should like to flag for the committee's attention:

1. What effect will flow regulation and reduced silt load have on marsh and riparian habitats downstream, specifically for moose, waterfowl, and fur animals? Generally speaking, seasonal flooding by silt laden waters tends to create and maintain the productivity of these habitats.

2. What effect will flow regulation have on seasonally flooded aquatic habitats downstream? Similar processes to that mentioned in Number 1 above may also be important to some aquatic habitats.

3. Would changes in flow regimes affect fish migration into the Susitna River system? Chemical composition of riverine waters has been shown to be important to fish homing into similar river systems. Some tributaries of the Susitna are important salmon habitat.

4. How would changes in flow rates and turbidity affect riparian and marine habitats of Cook Inlet adjacent to the Susitna River mouth? The Susitna River may be an important source of nutrients for these varied habitats.

5. What type of sport fishing might develop downstream from the project and what would be the value of this fishery? There is a high demand for sport fishing throughout the area.

6. Would changes in ice regimes affect fish and wildlife habitat? Seasonal aspects of temperature and flow regimes will be altered and should be evaluated.

7. How would the project affect human occupancy and transportation on the lower river? Changes in flow regimes will alter water depths and flows within river channels and will affect human occupancy and facility patterns along the river.

These examples open several lines of inquiry which may shed some light on other value systems associated with the Susitna project. I hope they are of help.

Sincerely,

David M. Hickok,
Director

DMH/bsm

Arctic Environmental Information and Data Center
707 A Street
Anchorage, Alaska 99501

PHONE (907) 279-4523

UNIVERSITY OF ALASKA

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~~Sincerely~~,

David M. Hickok,
Director

DMH/bsm

climatological impacts of evaporation?

STATE OF ALASKA

JAY S. HAMMOND, GOVERNOR

DEPARTMENT OF FISH AND GAME

OFFICE OF THE COMMISSIONER

SUBPORT BUILDING
JUNEAU 99801

March 9, 1979

The Honorable Brian Rogers
Alaska State Legislature
Pouch V, State Capitol
Juneau, Alaska 99811

Dear Mr. Rogers:

Thank you for the opportunity to provide background information on the Susitna Hydroelectric Project. In keeping with a request from your aide, Mark Wittow, we have included a general summary of moose and caribou movement patterns in the Devil's Canyon area, and a general summary of the historical significance of moose and caribou harvests in the Nelchina Basin.

The impacts of a hydroelectric project of this scale on moose and caribou are difficult to assess, since the literature is deficient in providing detailed comparative information. Potential impacts on moose may be more easily estimated than caribou, however, as moose seasonal migrations and habits are more "fixed".

Major impacts on moose will occur through inundation of wintering areas on gravel bars above the dam, and also from diminuition and "evening out" of the downstream pattern of seasonal flooding and the generation of new sandbars and river braids. New gravel bars are important in setting back succession and providing young and tender willow shoots for winter moose food.

Obviously additional impacts will arise from the practical barrier to traditional movements that the lake will provide, particularly for post calving caribou. Secondary impacts in the form of increased human access to these areas will also accrue.

Our Department has proposed a series of research projects designed to evaluate more precisely the environmental impacts of the dam. I have enclosed a copy of these proposals for your consideration. Our philosophy is that if funding is reduced much below the amount required, we

will perform only those projects we consider most critical. I am sure you agree that it is dollar foolish to attempt only a cursory examination of such complex biological problems.

We have compiled a table illustrating the recent use patterns of the Nelchina moose and caribou herds. I believe this will answer your questions regarding the relative importance of the moose and caribou take in the area.

Background knowledge of the Susitna River fisheries is limited. The Susitna River basin is an important habitat for a wide variety of fish species, both resident and anadromous. Five species of salmon (chinook, coho, chum, pink, and sockeye) utilize the Susitna River drainage for spawning and rearing. The majority of the chinook, coho, chum, and pink salmon in the Cook Inlet area are produced in this drainage. Grayling, rainbow trout, Dolly Varden, burbot, lake trout, whitefish, and sculpins are the more common resident fish species.

Baseline environmental fisheries studies have been conducted by ADF&G intermittently since 1974. These projects were financed with Federal funding averaging $29,000 per year in 1974, 1975 and 1976, and an allocation of $100,000 in 1977. The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) first contracted ADF&G to conduct a one-year assessment of salmon populations utilizing the Susitna River in the vicinity of the proposed Devils Canyon dam site during 1974. The objectives of these studies were to determine the adult salmon distribution, relative abundance, and migrational timing and to identify juvenile rearing areas (Barrett, 1974). Funding was received in 1975, 1976, and 1977 from USFWS to continue and expand these studies and to monitor the physical and chemical parameters associated with the mainstem Susitna (USFWS, 1976; and Riis, 1977). Additional baseline studies were not initiated during 1978 due to lack of funding.

The construction and subsequent operation of the Devils Canyon and Watana dams will result in long-term ecological changes. The two dams will inundate an estimated 50,550 acres of aquatic and terrestrial habitat of the Susitna River Basin upstream of Devils Canyon. Regulation of the mainstem river will substantially alter the natural downstream flow regimes and temperature gradients. Secondary impacts such as improved road, water, and floatplane access may create some additional problems in regulating hunter and fishermen harvest.

Our preliminary studies have concluded that the effects of impoundment and construction activities will include alteration of the natural flow regimes, water temperatures, water chemistry, and transport of materials.

Habitat requirements of the critical life history phases for passage, spawning, egg incubation, and juvenile rearing of the Susitna salmon species studied are quite specific. The USFWS Cooperative Instream Flow Service Group has developed criteria which demonstrate the narrow tolerances of certain salmonid and resident species to the hydraulic parameters of velocity, depth, substrate, and temperature (Bovee, 1978). The seasonally wide fluctuations of water velocity, depth, temperature, substrate and sediment of the free flowing mainstem Susitna, its sloughs and tributuaries determine the availability and accessability of salmon habitat. Thus, any alterations to the existing Susitna aquatic ecosystem which restrict or reduce the availability of required habitat, will also reduce fish production in the Susitna Basin and Cook Inlet estuary.

For example, it is important to note that although the Susitna River is glacial and turbid more than half of the year, the river clears during the winter months and becomes the major winter rearing area for salmonids, replacing its clearwater tributaries and sloughs which freeze and dewater. Chinook and coho salmon, which are of high interest to both commercial harvesters and sport anglers in the Cook Inlet area, are dependent on these freshwater rearing areas of the Susitna for a period of one to two years before migrating to saltwater. These important rearing areas will be lost downstream of the dams because the river will be turbid year-round and have a higher water velocity due to a reversal of the natural seasonal flow and stage conditions after construction. Although total salmon escapement estimates have not been derived for this system, it is probably the second or third largest sockeye salmon production area within Cook Inlet. Economically, the estimated average annual commercial value of the sockeye, king, pink, chum, and coho Susitna salmon stocks was $8,721,780 in 1975. This does not include the 1975 estimated value of $3,701,745 for the additional salmon in the Susitna River Basin necessary for producing this estimated potential catch (Friese, 1975). Although figures for subsequent years are unavailable because of insufficient data, it can be assumed the value of this fishery has greatly increased.

Economic values related to recreation are unavailable but are assumed to be high due to high concentration of the population adjacent to the Susitna River. Non-consumptive economic values are also unavailable.

We will be sending under separate cover copies of the above cited reports. I hope this in large part answers your questions. Please feel free to contact us for more information.

Sincerely,

for Ronald O. Skoog
Commissioner

December 14, 1978

The Honorable Mike Gravel
United States Senate
3121 Dirksen Senate Office Bldg.
Washington, D.C. 20510

Re: Susitna Hydro Project

Dear Senator Gravel:

Thank you for your letter of October 11 requesting further information on the budgets required for fisheries investigations relative to the Susitna Hydro Project. Although you requested information related only to fisheries, I would like to take this opportunity to familiarize you with all of the biological investigations and inform you of our concerns regarding these fish and wildlife studies.

You asked: "How much money is required to conduct the required fishery impact study in the Upper and Lower Susitna River drainages?" Enclosed are the pages of the June 1978 Phase I Plan of Study (POS) prepared by the Corps of Engineers (Attachment 1) which address all proposed biological investigations. The information contained in these pages outlines the proposed biological studies which should be a part of work performed to aid in the determination of the feasibility of this Susitna Hydro Project. Studies B-2 through B-7 are required to assess the impact of the proposed project on the Susitna River's fisheries resources. Using the Corps projected cost the fisheries portion of these studies would amount to $2,264,000. The Department estimates that $5,158,000 would be required to adequately perform these studies.

Secondly, you requested: "Of the total amount of money that is needed, what is the breakdown on amounts and sources from which it can be obtained? Specifically how much can be made available for such a study from ADF&G, how much can be counted on from National Marine Fisheries Service, and finally,

how much must come from the Corps of Engineers?" The table in Attachment 2 shows the Phase I budgets proposed by the Corps (4.3 million dollars) and by the Department (7.9 million dollars) and the differences between the budgets in dollars and percent. As you will note, there is a 3.6 million dollar difference between the Corps and ADF&G budget proposals. A recent letter to Eric Yould, Executive Director of the Alaska Power Authority (Attachment 3), further expresses our concerns of the inadequacy of funding for the Phase I biological investigations.

We believe the money for the Phase I investigations should come from the federal government through the Corps of Engineers or through State appropriations for the full term (46 months) of the proposed studies. Funding may be available this year if the State of Alaska appropriates between 7 and 8 million dollars to initiate the first year of Phase I studies. However, there is no assurance that the remainder of the investigations will be funded.

This Department does not have the funds to divert into the study of the Susitna Hydro Project. Diversion of Federal Aid in Wildlife Restoration (P-R) or Federal Aid in Fisheries Restoration (D-J) funds and projects to study fish and wildlife impacts would result in sport hunters and fishermen subsidizing investigations of a project affecting not only these user groups but the broad spectrum of the public. Also, all of the Department's D-J and P-R funds are currently dedicated to ongoing studies.

The third question you asked: "What is the time frame involved in this type of fishery impact study?" is critical to our success in maintaining the fishery. As we stated in the attached letter to the APA, we believe a strong indication of the feasibility of this project with respect to fish and wildlife can be stated if the proposed Phase I studies in the POS are carried out. There are effectively three full field years possible in the 46 month Phase I time frame. The time frames are basically laid out in the enclosed biological investigations section of the POS (Attachment 1, pages 229-302). All salmon species have in excess of two year life cycles and certain studies, to accommodate the investigation of species with life cycles up to five years, should be extended beyond that three years to a full five year time frame. Earlier proposals by this Department for five years of study would have cost ten million dollars. Until the feasibility investigations are complete and the potential fish and wildlife impacts identified, projection on time and cost of fish and wildlife mitigation studies are not presently possible.

I hope that the material enclosed, and our discussion will point out that alternatives for providing the budgets for biological investigations must be explored. We seek your assistance in determining if the Susitna Hydro Project is feasible from a biological standpoint. If the decision is made

to proceed with construction, we also seek your assistance in seeing that the project is done in a manner which mitigates fish and wildlife resource losses. Please contact this Department if you need more information.

Sincerely,

Ronald O. Skoog
Commissioner

Attachments (4)

cc: R. Logan
T. Trent

bcc: K. Schneider
B. Hampson/N. Friese
L. Heckart

ROS:RL:mr

STATE OF ALASKA

JAY S. HAMMOND, GOVERNOR

DEPARTMENT OF FISH AND GAME

OFFICE OF THE COMMISSIONER

SUBPORT BUILDING
JUNEAU, ALASKA 99801

December 5, 1978

Eric P. Yould
Executive Director
Alaska Power Authority
313 West 4th Avenue, Suite 31
Anchorage, Alaska 99501

Dear Mr. Yould:

The Alaska Department of Fish and Game conducted a detailed review of the proposed biological studies in the Susitna Hydro Plan of Study (POS) during April of this year to assist the Corps of Engineers in POS revision. Subsequently, the results of this effort were printed in the June 1978 POS document.

In his June 28 letter transmitting the revised POS to the Alaska Power Authority, Colonel Robertson of the Corps stated, "the activities defined in this document have been developed to adequately address determination of project feasibility." This statement is only partially correct. Although the study objectives are adequate, the funding is totally inadequate to meet those objectives.

On page 40, paragraph 2 of the revised POS, it is stated that "The biological studies outlined in the Plan of Study are of sufficient depth to provide, at the end of Step 2, a strong indication of the probable magnitude of the impacts of the project and to evaluate project feasibility, but may be unable to define the magnitude of mitigation." We agree that the proposed range of the biological studies discussed in these narratives, if performed, should give a strong indication of the feasibility of the Susitna Hydro Project. The budget levels as presently apportioned by the Corps will, however, sorely impair the level of technical and professional sophistication needed to determine feasibility. On April 25, 1978, a letter (attached) by Tom Trent, the Susitna Hydro Studies Coordinator for the Department, forwarded to the Corps of Engineers this Department's basic agreement to the thrust of the biological studies and also included our recommended budget. The budgets proposed by the Department of Fish and

Game are those we believe necessary to provide the necessary information to provide project feasibility.

Although there is an aggressive effort to get the Phase I studies moving along the schedule proposed in the Susitna Hydro POS, both the private and governmental sectors must recognize that the Susitna Hydro Project will still be subject to the requirements of Federal environmental law, particularly the National Environmental Policy Act and the Fish and Wildlife Coordination Act. Inadequate Phase I studies and failure to meet the standards of these laws and regulations for project feasibility can, and probably will, result in delays from litigation by preservationist and anti-development interests.

The constraints placed on the Corps by the 25 million dollar figure in proposed Federal guarantee legislation for support of the Phase I investigations is unfortunate. It has resulted in reverse budgeting from the top down rather than from the bottom, and consequently, we believe a reduced concern for the adequacy of environmental study programs and their priorities. This Department believes the budgeting situation is poor at best, and every effort should be made by the State of Alaska and our congressional delegation to correct it by reviewing and revising the dollar figure for Federal guarantee legislation to reflect our Department's and other agencies' budget proposals.

Your support and leadership in addressing a solution to our concerns would be greatly appreciated.

Sincerely,

Carl L. Rosier

Ronald O. Skoog
Commissioner

Attachment

cc: R. Logan
T. Trent

Susitna Hydro Biolpgical Investigations

I. Background

The Alaska Department of Fish and Game (ADF&G) has been actively involved in coordinating, proposing, and conducting biological studies related to the Susitna Hydropower Project since 1974. From that time to today, we have had many problems in attaining the scope of study and funding the Department believes is necessary to adequately assess the biological impacts of this proposed hydropower development.

Initially our concerns were not only limited to funding of adequate studies, but also included geographic areas which would be studied. Early on in the Susitna Hydro environmental assessment, the Corps of Engineers (COE) restricted our work to the immediate impoundment area and downstream to the confluence of the Chulitna River. One gain we feel we have made is the consideration of the impacts of this project, the largest hydro development in North America, on the downstream environment below the Susitna dams and the area above the impoundment.

The Department of Fish and Game, through its data review of possible fish, wildlife and other environmental impacts of the Susitna Hydro project have identified a number of concerns. As a data base we have only a

limited amount of environmental assessment work the Department has done to date. We believe the assessment of fish and wildlife resources impacts in Phase I of the Susitna Hydro studies are fundamental to the determination of this project's feasibility. If the project proves feasible, these biological studies are basic to the mitigation of fish and wildlife impacts when the project is constructed.

A. Fisheries Studies Background

Background knowledge of the Susitna River basin is limited. The proposed hydroelectric development necessitates gaining a thorough knowledge of its natural characteristics and fish and wildlife populations prior to final dam design approval and construction authorization to enable protection of the aquatic and terrestrial communities from unnecessary losses.

The Susitna River basin provides important habitat to a wide variety of fish species, both resident and anadromous. Five species of Pacific salmon (chinook, coho, chum, pink, and sockeye) utilize the Susitna River drainage for spawning and rearing. The majority of the chinook, coho, chum, and pink salmon production in the Cook Inlet area occurs within this drainage. Grayling, rainbow trout, Dolly Varden, burbot, lake trout, whitefish, and sculpins are some of the more common and important resident fish species.

Baseline environmental fisheries studies have been conducted by ADF&G intermittently since 1974. The projects were financed with

Federal funding averaging $29,000 per year in 1974, 1975, and 1976, and an allocation of $100,000 in 1977. The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) first contracted ADF&G to conduct a one-year assessment of salmon populations utilizing the Susitna River in the vicinity of the proposed Devils Canyon dam site during 1974. The objectives of these studies were to determine the adult salmon distribution, relative abundance, and migrational timing and to determine juvenile rearing areas (Barrett, 1974). Funding was received in 1975, 1976, and 1977 from USFWS to continue and expand these studies and to monitor the physical and chemical parameters associated with the mainstem Susitna (USFWS, 1976; and Riis, 1977). Additional baseline studies were not initiated during 1978 due to lack of funding. A characteristic of ADF&G fish and wildlife studies to date on the Susitna Hydro Project area has been the discontinuity, uncertainty, and low levels of funding from several sources.

B. Wildlife Studies Background

The Susitna River basin has long been recognized as an extremely rugged wilderness area of high aesthetic appeal and as an important habitat to a wide variety of terrestrial wildlife species (ADF&G, unpubl. data). Most important to sport and subsistance users are moose and caribou, and to a lesser extent, grizzly bear and sheep. Hydroelectric development has been under consideration in this area for a number of years and some very general ungulate population

assessment work was begun in 1974 and completed in the spring of 1975 (USFWS, 1975). Additional studies were not conducted in the project area until March of 1977 when limited funds were made available to begin acquiring baseline information on moose and caribou populations within and adjacent to the project area. Funds received by Game Division for work to date were $2,000, $14,500, $46,700, and $16,500 for FY 74, FY 75, FY 77-78, and FY 78-79, respectively.

C. Evolution of the Proposed Phase I Susitna Hydro Biological Investigations

1. 1975 Proposal

The ADF&G entered its first comprehensive proposal for fish and wildlife investigations to the USFWS, and through that agency to the COE, on November 18, 1975. That proposal spread investigations over a five year period from FY 77 through FY 81, and indicated a cost of 3.62 million for ADF&G field work. To that figure should be added an additional cost for USFWS and NMFS coordination of $525,000, and therefore a total cost of 4.145 million dollars for proposed fish and wildlife work.

Estimated cost of the Susitna Hydro Project construction in 1975 was 1.5 billion dollars.

2. 1977 Proposal

On December 15, 1977, the ADF&G completed a review of the COE

prepared draft Susitna Hydropower Plan of Study (POS) of September 1977. In our comments to that document, we included the Department's estimate of fish and wildlife and habitat investigation costs and our recommendation of needed studies. Total costs for ADF&G field investigations for a five year period totaled 10.5 million dollars. This increase over 1975 was due not only to inflationary factors, but also because our limited studies from 1974 through 1977 indicated new problem areas where impacts on fish and wildlife must be assessed.

Estimated construction cost for the Susitna Hydro Project in 1977 was 2.1 billion dollars.

3. 1978 Proposal

The Department revised its December 1977 proposal early in 1978 to fit the 46 month time frame for Phase I studies which the Alaska Power Authority (APA) and COE said would be imposed. The Department objected then, and still does, to the compression of the time frame for biological investigations. My staff believes quite strongly that a minimum five year period is needed for an adequate biological study of the Susitna River Basin. The area encompassed is large and complex. Anadromous fish runs, for example, pose special problems of study because some salmon stocks have a five year life cycle.

In the June 1978 Susitna Hydropower Plan of Study, the COE gave some recognition to the need to complete fish and wildlife studies covering complete life cycles by stating in paragraph 2 on page 40 of the POS that: "some of the biological studies will require continuation through step 3 into construction to provide a base of life cycle, habitat, and other information needed to outline possible mitigation studies." However, we have no guarantee that funding to support these continuation studies will be made available. Furthermore, the preceding POS statement infers that the construction decision will occur before completing portions of the biological studies that are necessary for making the project feasibility decision. This clearly is in conflict with the Council on Environmental Quality Proposed Regulations under NEPA of June 9, 1978.

The Department's latest total budget recommendation of 7.9 million dollars for 46 months for Phase I feasiblility investigations related to fish and wildlife was submitted to the Corps on April 19, 1978. The Corps and APA, over our objections, finally included a budget of 4.3 million dollars in the Susitna Hydro POS in June of 1978, a difference of 3.6 million dollars. This is a difference we find hard to resolve considering the job we must do to adequately assess the feasiblity of this proposed project.

An independent analysis for Sport Fish Division by Milo Bell, a consulting engineer with extensive experience on Pacific Northwest hydro projects and fisheries related studies in Washington, indicated the fisheries feasiblity investigations for a hydro project the size of Susitna Hydro would run to about 5.0 million dollars, a figure comparable with our own estimate of 5.1 million dollars.

Estimated construction cost of the Susitna Hydro Project at this time, March 1979, is 2.6 billion dollars.

Therefore, the Department has seen the cost of the Susitna Hydro Project rapidly escalate from 1.5 billion dollars in 1975 to 2.6 billion dollars in 1979, a 73 percent increase. Meanwhile, the proposed budget for support of fish and wildife studies has gone from 4.145 million dollars in 1975 to 4.3 million dollars (imposed by the Corps and APA), a 3.7 percent increase.

4. 1979 Proposed One Year Funding of Fish and Wildlife Biological Investigations Funding

On November 3, 1978, the Department was contacted by the Corps of Engineers with a request to provide our estimated budget for 1979 biological investigation adjusted from our prior fiscal year development to a calender year and on a quarterly basis for the 1979 calendar year by November 4, 1978. These figures developed by ADF&G were:

1979	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
			$115,000.00	
Anadromous Fish Studies		$115,000.00	250,000.00*	$ 43,000.00
Resident Fish Studies		80,000.00	99,000.00	30,000.00
Aquatic Plants & Animals		5,000.00	15,000.00	
Economic Studies		10,000.00	90,000.00	
Support & Planning	$10,000.00	32,000.00		
Wildlife Studies		20,000.00	80,000.00	150,000.00
	$10,000.00	$262,000.00	$649,000.00	$223,000.00

*Sonar Development

II. Constraints and Things to be Done

A. Planning and Coordination

The Department's involvement with Susitna River Hydro Project has, in the past, been characterized by the implementation of short term projects, hastily contrived out of necessity, without the opportunity for long term and ongoing planning.

Due to the nature, magnitude, and complexity of the biological investigations necessary to assess the impacts of this project, detailed and comprehensive planning is essential. Only following this period of preparation can we insure the adequacy of fiscally responsible biological studies designed to fully assess project impacts.

In the first two quarters of this Department's proposed work on the Susitna Hydro biological investigations, we have a great need to do more detailed planning of specific project activities, methodology, and development of the organization and of the expertise to effectively carry through our proposed investigations and assure their integrity.

We consider it essential the very best expertise in the field of hydro projects be utilized during this planning process. This may necessitate contracting various qualified personnel from the northwest where the "state of the art" is well developed. It will likely necessitate travel to these northwestern states by key personnel to consult with qualified individuals and organizations.

A good deal of interagency coordination will be necessary and mutual fielding of various projects will require planning and organization. For example, we know the U.S. Fish and Wildlife Service will conduct specific study segments and the U.S. Geological Survey yet others. In the interest of economy and obtaining the best results, these activities require coordination.

We feel strongly that suitable time must be allocated to the process of planning and coordination before any field staff are hired, or biological studies fielded if adequate professional level results are expected.

Outcomes of the planning effort should be:

1. a table of organization for the administrative support and field staff to direct and carry out the biological investigations

2. the development of job descriptions and specific work plans and subcontract work items for Department biological investigations

3. the timetables for training personnel, development of special equipment, and the state of the art methodologies, and subcontracts for field studies.

7. Personnel

A project of this magnitude will necessitate employing personnel who possess both experience and knowledge of specific disciplines. For example, we will need people who are experts in the field of hydrology as it relates to fish and wildlife, those with engineering background, those capable of performing complex water/wildlife computer modeling, etc. It is going to be necessary for this Department to go outside its own organization to recruit many of these individuals, as we, to date, have not experienced the need which creates experience in these disciplines.

It should be understood that this hydro evaluation is going to require a staff of experts who work soley on this project. We cannot expect a biologically sound study to occur with adequate, professional solutions and answers if it is conducted on a part time basis by existing Department staff, as in the past. Personnel

constraints are particularly binding for the fisheries related work, because the Department's fisheries division staff are totally dedicated to management and research problems in other areas. There simply has to be a staff of qualified individuals, with the employment guarantees necessary to provide continuity to long term studies.

C. Funding

While the adequacy, or inadequacy of funding to perform fish and wildlife studies has been a major Departmental concern over the past several years, the continuity of it in the future is even a greater one. As this hydro project and initiation of the long term biological studies nears reality, it is paramount that money be appropriated for more than a few months or even a single fiscal year at a time. The accomplishment of the biological studies will require long term contracts for work, equipment development, and the maintenance of a qualified professional level staff. Personnel qualified to plan and conduct the involved research necessary to assess the impacts of the Susitna Hydro Project, cannot be recruited without long term employment guarantees.

Timing of funding appropriations are, and will continue to be, of critical importance; and again support the need for funding beyond a given fiscal year. For example, many of the studies can only be conducted at brief seasonal periods of the year due to particular

stream flow needs, migrational movements of wildlife, or spawning migrations of a specific fish species. To miss one of these periods, due to money appropriation difficulties, is to miss an entire study year.

D. Equipment and Material Aquisition

A great amount of materials, equipment, and scientific gear will be required for these studies. Much of it will require ordering well in advance. Major sonar and telemetry development is anticipated for fish migrational studies.

Many of these items will be ordered in one fiscal year and perhaps not received until the next one. Again, monies must be available beyond a single year. If funding terminates, we will likely have a number of commitments to purchase special equipment which will have to be honored.

E. Summation

Without continuity of funding beyond a single fiscal year, the personnel to plan and conduct the hydro related studies cannot be adequately recruited and/or retained. The large sum of money which may be authorized will, under these circumstances, be of little use.

The Department is being asked to participate in a biological evaluation of the largest hydroelectric project ever planned. It is critically important the project be planned, conducted, and finally assessed in a manner which brings credit to the State and which minimizes fish and wildlife resource protection and mitigation of project impacts.

The guarantee of continuity in study funding and timing may be the single most important factor in achieving this goal.

II. Potential Impacts

A. Fisheries

1. With considerable study of the project's impact on fish and wildlife resources yet to be accomplished, the ADF&G has collected sufficient information and addressed the potential biological impacts of the Susitna Hydro proposal in a number of documents which allow us to state that fish and wildlife resources will be adversely impacted.

The construction and subsequent operation of the Devils Canyon and Watana dams will result in long-term ecological changes. The two dams will inundate an estimated 50,550 acres of the Susitna River Basin aquatic and terrestrial habitat upstream of Devils Canyon. Regulation of the mainstem river will substantially alter the natural flow regime downstream.

Secondary impacts such as improved road, water, and floatplane access may create some additional problems in regulating hunter and fishermen harvest.

Following is a brief summation of the major impacts of the proposed dams illustrating the importance of comprehensive biological studies to determine the extent these impacts will affect fish and wildlife populations.

Susitna Fisheries and Aquatic Habitat

The fish populations are the most obvious aspects of the aquatic community where impacts will be evident due to their high economic and recreational importance to the people of Alaska and the nation. However, impacts are not limited to the fishery resource alone due to the complex interrelationships between all biological components of, and within, the aquatic community and the associated habitat. Our preliminary studies have partially defined that the effects of impoundment and construction activities will include alteration of the natural flow regimes, water temperatures, water chemistry, transport of materials, and the quantity of wetted habitat. Habitat requirements of the critical life history phases for passage, spawning, egg incubation, and juvenile rearing of the Susitna salmon species studied are quite specific. The USFWS Cooperative Instream Flow Service Group has developed criteria which

demonstrate the narrow tolerances of certain salmonid and resident species to the hydraulic parameters of velocity, depth, substrate, and temperature (Bovee, 1978). The seasonally wide fluctuations of water velocity, depth, temperature, substrate and sediment of the free flowing mainstem Susitna, its sloughs and tributaries determine the availability and accessability of salmon habitat. Thus, any alterations to the existing Susitna aquatic ecosystem which restrict or reduce the availability of required habitat, will also reduce fish production in the Susitna Basin and Cook Inlet estuary.

For example, it is important to note that although the Susitna River is glacial and turbid more than half of the year, the river clears during the winter months and becomes the major winter rearing area for salmonids as they migrate from the clearwater tributaries and sloughs which freeze and dewater. Chinook and coho salmon, which are of high interest to both commercial harvesters and sport anglers in the Cook Inlet area are dependent on these freshwater rearing areas of the Susitna for a period of one to two years before migrating to saltwater. These important rearing areas will be lost downstream of the dams because the river will be turbid year round and have a higher water velocity due to a reversal of the natural seasonal flow and stage conditions after construction. Although total salmon escapement estimates have not been derived for this system, it is probably the second or third largest sockeye

salmon production area within Cook Inlet. Economically, the estimated average annual commercial value of the sockeye, king, pink, chum, and coho Susitna salmon stocks was $8,721,780 in 1975. This does not include the 1975 estimated value of $3,701,745 for the additional salmon in the Susitna River Basin necessary for producing this estimated potential catch. Although figures for subsequent years are unavailable because of insuffient data, it can be assumed the value of this fishery has greatly increased.

Economic values related to recreation are unavailable but assumed to be high due to high concentration of the population adjacent to the Susitna River. Non-consumptive economic values are also unavailable.

B. Terrestrial Wildlife

2. The proposed Susitna Hydropower Project will have impacts on several wildlife species which either reside in the project area, use the area for migration or other seasonal purposes or use habitat downstream which will be altered by the stabilization of water flow. Although many species of animals could be potentially influenced, terrestrial studies to date have focused on ungulate populations, primarily moose and caribou.

Moose

Moose are likely to be adversely affected in several ways.

1. Loss of habitat by inundation within the impoundment areas.

Preliminary studies indicate that several moose subpopulations occupy drainges flowing into the impoundment areas. These moose spend much of the year outside of the impoundment areas but each winter tend to migrate into or across these areas. Much winter range will probably be lost. This will be particularly critical in severe winters. Therefore, a substantial reduction in the number of moose in a large area surrounding the impoundments will probably occur.

Moose numbers are currently reduced in the area probably because of a combination of severe winters and predation. Therefore, hunter harvest has been restricted in recent years. However, an average of 146 are taken annually by 475 to 500 hunters from the moose subpopulation that will probably be impacted directly by the impoundments. This comprises about 3.5 percent of the statewide harvest of moose. However, the importance of the area to hunters is expected to increase as new National Parks and private land holdings restrict the area available to many hunters. If there were a 50 percent reduction in these moose subpopulations, there could be a loss of harvest of over 7500 moose over the 100 year life span of the project.

The reduction in moose densities could also lead to chronic predation problems. The impact on non-consumptive use of moose is difficult to estimate at this time. The Watana impoundment is expected to impact more moose than the Devils Canyon.

2. Loss of browse downstream.

The river bottom downstream to Cook Inlet provide winter range for moose from Game Management Units 13, 14, and 16. Stabilization of water flows may cause much of the willow in this area to be replaced by spruce. This could lead to a reduction in moose numbers in all of these units especially in severe winters. Adequate data are not presently available to even roughly estimate the magnitude of this impact.

3. Accidents

Moose, especially calves, frequently become mixed in mud. Ice shelving caused by winter drawdown also could lead to accidental moose deaths. The Watana impoundment would greatly increase the potential of fatal accidents but there is no way to estimate the importance of this at present.

Caribou

While some loss of caribou habitat may occur, the greatest impact would be through blockage of migrations. In past years, many caribou have migrated across the Susitna River in the impoundment area after calving. Although specific harvest data on the Nelchina caribou herd for this area are currently unavailable, major harvests of these caribou occurs in the vicinity of the Denali Highway during years of high numbers of caribou migration across the Susitna River. At the present time, it is not known if the impoundments will block the caribou from portions of their range or whether they will attempt to cross or go around the impoundments. It could lead to overgrazing of portions of the range and abandonment of other areas or increase mortality due to accidents in attempts to cross the impoundment.

Other Species

The impoundments will almost certainly reduce numbers of bears, wolves, wolverines, other furbearers, small game, and non-game species through loss of habitat. Furbearers and waterfowl may be reduced downstream as a result of altered water flow and fluctuations in the river that are important in providing the stimulus for new riparian vegetative succession with plant species important to these wildlife populations.

A small population of Dall sheep may be adversely affected by disturbance during construction unless human activities, particularly aircraft traffic are controlled.

C. Socioeconomics and Recreation

It is important to recognize that any direct or indirect biological impacts of this project may, and likely will, affect the recreational and/or commercial utilization of major salmon and resident fish species, and wildlife species and their associated habitat. The close proximity of municipalities containing half the human population of Alaska emphasizes the socio-economic values of the fish, wildlife, and habitat resources of the Susitna River Basin. The Susitna drainage is highly used and important to the sport and commercial fisherman, the recreational enthusiast, industry, and municipalities. The popularity of Denali State Park and nearby Mt McKinley National Park further attests to the high social, recreational, and aesthetic qualities of the area. Specific data on these subjects in the hydroelectric project area watersheds are incomplete or lacking. Adding to the importance of the area for fishing and hunting is the enactment of the D-2 and Antiquities Act provisions on other lands where certain recreational uses may be restricted.

D. Navigability

Much of the Susitna River drainage downstream of the proposed hydro development is one of major recreational development. Stream side

recreational sites and subdivisions are markedly increasing the numbers of people utilizing the river for transportation during both the summer and winter seasons.

It is unknown to what degree the substantial change in natural stream flows may affect travel and transportation (both recreational and commercial) of these downstream river portions. They may, however, be quite significant.

3/7/79

Arctic Environmental Information and Data Center
707 A Street
Anchorage, Alaska 99501

PHONE (907) 279-4523

(Conservation)

UNIVERSITY OF ALASKA

September 24, 1979

Mr. Brian Rogers
Alaska State Legislature
Juneau, Alaska

Dear Brian:

During the late 1950's environmental studies of the Susitna project were begun. From that time to today a good deal of scientific and resource information has been gathered which permits some understanding of impacts to be experienced around the project site and upstream within and adjacent to the planned impoundment. With the new project plans being developed by the state, further work will be done on assessment of effects on fish and wildlife. Plans for such studies are now being developed. The purpose of this letter is to emphasize the need for studies of downstream environmental and social impacts.

Even without undertaking a series of project plans, it appears certain that downstream flow regimes will be altered significantly. Among the changes we anticipate are a reduction in turbidity and silt load reduction in summer flows, increased winter flows, and changes in water temperature and timing of ice formation. Such changes could have profound effects on fish and wildlife habitat. Such changes give rise to a few questions I should like to flag for the committee's attention:

1. What effect will flow regulation and reduced silt load have on marsh and riparian habitats downstream, specifically for moose, waterfowl, and fur animals? Generally speaking, seasonal flooding by silt laden waters tends to create and maintain the productivity of these habitats.

2. What effect will flow regulation have on seasonally flooded aquatic habitats downstream? Similar processes to that mentioned in Number 1 above may also be important to some aquatic habitats.

3. Would changes in flow regimes affect fish migration into the Susitna River system? Chemical composition of riverine waters has been shown to be important to fish homing into similar river systems. Some tributaries of the Susitna are important salmon habitat.

4. How would changes in flow rates and turbidity affect riparian and marine habitats of Cook Inlet adjacent to the Susitna River mouth? The Susitna River may be an important source of nutrients for these varied habitats.

5. What type of sport fishing might develop downstream from the project and what would be the value of this fishery? There is a high demand for sport fishing throughout the area.

6. Would changes in ice regimes affect fish and wildlife habitat? Seasonal aspects of temperature and flow regimes will be altered and should be evaluated.

7. How would the project affect human occupancy and transportation on the lower river? Changes in flow regimes will alter water depths and flows within river channels and will affect human occupancy and facility patterns along the river.

These examples open several lines of inquiry which may shed some light on other value systems associated with the Susitna project. I hope they are of help.

Sincerely,

David M. Hickok,
Director

DMH/bsm

SAVE THE SUSITNA

by Beau Bennett

Getting to know the Susitna is a gradual process. Soon after putting one's canoe in at the Denali Highway bridge, the river begins to unravel mystery after mystery as it bends and flows beneath your paddle. You are soon swallowed up in the predominantly mountainous upper Susitna River basin, bordered on the west and south by the rugged Talkeetna Mountains, on the north by the summits of the spectacular Alaska Range, and on the south and east by the flat Copper River plateau. The swiftness of the main current draws the canoe's bow down stream. You are on your way today . . . but what about tomorrow? Will the Susitna still be there for you?

The upper Susitna River is a scenic, free-flowing river with very few signs of man's presence. Three glaciers flow down the southern flanks of the Alaska Range near 13,832 foot Mount Hayes to form the three forks of the upper river which flows southward for fifty miles. The glacial silt-laden river then curves toward the west where it winds in a single deep channel through 130 miles of wilderness. The wilderness is the home of one of the regions' most significant wildlife resources, the wide-ranging Nelchina caribou herd. There are seasonal migration routes across the Susitna River to and from major calving areas. Moose, black bear, and grizzly bear (referred to as brown bear in Alaska) roam freely in the valley. Wolves, mountain goats, wolverines and dall sheep are seen frequently in the alpine and subalpine zones. The two subspecies of the peregrine falcon, both on the list of endangered wildlife of the United States, migrate through and are thought to be resident in the river basin. The upland spruce-hardwood forest is the habitat for hundreds of species of birds and small mammals.

The river abruptly changes character just above the steep walled Devil's Canyon. It is here that the river's gradient increases and its channel narrows. For the next 11 miles, the Susitna dances and swirls in rythmic fashion, causing waves 20 feet high to create an aquatic roller coaster through the canyon. It is certainly some of the foremost Class VI white-water in North America and it is here where the ultimate challenge lies for the paddler. These Devil's Canyon rapids and a group of kayakers' efforts to run them, were the subject of a segment of ABC's "American Sportsman" program last March 6th. It was the first opportunity for many Americans to see what more and more paddlers are calling "the Everest of white-water rivers."

Perhaps Dr. Walt Blackadar, one of the nation's finest white water paddlers, has best characterized this section of the "Big Su." Shortly after his successful run of the canyon, he made these observations. "Devil's Canyon on the Susitna vividly separates Satan from St. Peter, hell from heaven, Class VI from Class V, and frequently man from his kayak. It has never severed man from earth, but how it does try! This is the summit of big water boating by today's standards — surely the Everest of white water kayaking! Surprisingly enough, it is water which a good kayaker should be able to handle in stride, for he can expect a boost on his roll from the Devil or the Lord, depending on which one is not already to tangle with Him yet. To lose the Devil's Canyon section of white water would be a tragic loss to America and its' future generations, because there is no other place like it in North America, or for that matter the world as far as I know."

Almost without warning, the Susitna flattens out again near an old mining settlement called Gold Creek. It turns south at this point, as if exhausted from its turbulent trip down Devil's Canyon, and flows another 120 miles through a broad valley into Cook Inlet near Anchorage, almost 300 miles from its source. This lower section of the Susitna is incomparable in its own right. It is one of the most important rivers to commercial fisheries in the whole state of Alaska. The river and its tributaries serve as critical spawning grounds for thousands of chinook, sockeye, coho pink, and chum salmon. These annual fish migrations are necessary to support the substantial fish populations which in turn provide significant economic benefits to the state. During the 1973 season alone, over 14 million pounds of commercial salmon were caught in Cook Outlet. Not to be overlooked is the excellent sportfishing for grayling, rainbow trout, lake trout, dolly varden, and whitefish that exists in the Susitna River basin.

To know the Susitna is to appreciate it in its entirely. The river and its enormous basin provide so much life sustaining force and habitat that it must be considered a non-renewable resource. Its untamed nature is symbolic of the traditional Alaskan lifestyle which finds man working with and dependent on the land. Hunting and fishing for subsistance living is still a value of high priority in the lives of many of those who live in the Susitna River basin. The unique qualities of the Susitna River have not gone completely unnoticed. As early as 1973, the upper Susitna River was recommended for study as a possible addition to the National Wild and Scenic Rivers systems. This study is still pending. More recently, Congressman Morris Udall's bill, H.R. 39, calling for the creation of up to 112 million acres of Alaskan National Interest Lands, proposes that the Susitna be designated a wild river within the Scenic and Wild Rivers system. It would truly be an outstanding addition to the already protected wilderness areas of our country.

But time is running out for the Susitna. The river has been labeled desirable and feasible as a source of hydroelectric power to meet the state's speculative energy demands for the next 25 years. The threat is immediate. The U.S. Army Corps of Engineers has proposed a plan to build a two-dam system, on the Upper Susitna at Watana and Devil Canyon. This would be the biggest project ever undertaken by the Corps of Engineers. What's more, the Corps has never built a dam in the type of arctic environment that Alaska provides. Nevertheless, the project is gathering momentum. The state administration has given its conditional support. Politicians and investors seem united to dam the Susitna. However, the people of Alaska and this nation, have yet to speak.

The environmental impact of the proposed dams is staggering. Development of the Devil's Canyon site includes the construction of a concrete, thin-arch dam with a structural height of 625 feet and with a crest elevation of 1,455 feet. 31 miles further up on the river, the Watana site would include an 810 foot high earthfill dam, with a normal reservoir elevation of 2,200 feet. The burden the Susitna would bear, and the environ-

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mental costs to the public are overwhelming. Taken together, the two dam reservoirs would flood over 50,550 acres of pristine wilderness at normal pool elevation. At higher than normal levels, much more would be inundated. An almost continuous 84 mile reach of this beautiful river would be lost. All forest and plant biomes within the reservoir pools would be permanently lost. Substantial moose and caribou habitat (along with that of many other wildlife species) would be destroyed. Based on historical herd movement, caribou and other animals attempting to cross the reservoirs in the spring would die from ice-shelving conditions and other difficulties encountered in swimming both reservoirs. Gone would be nearly the entire 11 mile stretch of whitewater cascading through Devil Canyon. The Everest of rivers would be reduced to a fluid plain.

The impact on the salmon fisheries that use the Susitna could be just as dramatic. The potential for tragic losses to this commercial industry could be comparable to what has already happened in the Pacific Northwest. The proposed dams may create drastic downstream water quality problems, as the water leaving the turbines will be higher in temperature, nitrogen supersaturated and very low in dissolved oxygen. The threat of a hydrologic imbalance in the Susitna is compelling and could upset critical salmon rearing and spawning cycles.

Because of its glacial origin, the Susitna carries a heavy load of glacial sediment during the high runoff periods in the late spring and summer. It has reached as high as 5,000 ppm in certain areas of the river. Studies released by the Corps of Engineers indicate that the suspended sediment in releases at the Devil's Canyon dam will be at constant low levels of 15-35 ppm. The combination of reduced suspended sediment and water levels resulting from controlled water flow from the reservoirs will have significant effects on all living organisms in the river. One of nature's most important annual rituals, the cleansing and flushing out of debris from the river's channels will have been eliminated. As this debris builds up, the river will change its character, and in the process, die a slow death. While this may take place below the dams, tremendous amounts of sediment will settle out and become trapped in the reservoirs. Thus, although the Corps may have predicted a useful life for the reservoirs to be 100 years, increased sediment levels in the future of the Susitna can effectively cut the reservoirs usefullness in half. More than a few dams built in the United States in the last 30 years have had their reservoir storage capacity so reduced that they have proved to be economic and environmental catastrophes. The prospect of leaving useless holding areas of silt and mud covering thousands of acres to future generations is unthinkable.

The environmental impacts of the Corps' project go on and on. Very serious impacts will take place during the construction phase of the dams and power facilities, as 650 miles of transmission line cut through broad corridors to both Fairbanks and Anchorage, and as greatly increased access into this wilderness river basin stimulates more off-road vehicles use and hunting and fishing pressures. The proposed two dam system becomes more undesirable when one considers the risk of seismic activity in the Susitna region. One of the strongest earthquakes in recorded history struck southcentral Alaska is March of 1964. The magnitude of the quake was 8.4 Richter scale. The Corps seems to be inviting disas as that quake was centered only 120 miles from the proposed damsites. What is even more foreboding is the relationship of both damsites to the Denali fault system. The Susitna fault, truncated by the Denali fault, bisects the upper Susitna River basin a mere 2.5 miles west of the Watana damsite. Memories of the not soon to be forgotten Teton Dam failure should force us to take a more critical look at the desirability of any dam on the Susitna River.

Despite all this, environmental factors do not stand alone in evaluating a project of this dimension. Forntunately, Congress saw fit to enact the National Environmental Policy Act of 1970, which in turn has become one of the most important pieces of environmental legislation in recent decades. NEPA requires the preparation of an environmental impact statement for every major federal action that significantly affects the environment. For several reasons, the Corps is required to prepare an EIS for its two dam proposal on the Susitna River and circulate it for public and agency review. The statement must set out clearly, among other things, all adverse environmental impacts of the project and detailed consideration of any alternatives to the proposed action. At present, the Corps of Engineers has completed a seriously deficient final EIS and is preparing it for final agency and public review.

The courts have ruled that the key to effective administration of NEPA lies in the preparation of the final EIS. The public should concentrate its efforts in making certain that the final EIS is legally sufficient in its breath, and free of the defects of vague, general, and conclusory language.

Because of complexities of congressional funding, water resource projects such as the Corps' Susitna Dam proposals, are typically spread over twenty to thirty year periods. Consequently, 4 to 5 years of environmental, engineering, and design studies customarily preceed the construction phase. It makes sense then that for the NEPA process to be most effective, a final EIS should only be prepared after all pertinent environmental and socio-economic studies have been completed. However, the Corps appears to be circumventing this logical decision making process by submitting their final EIS even before crucial studies on project impacts have begun.

The deficiencies in the final upper Susitna River impact statement are glaring. Alternatives to the proposed hydroelectric development are given inadequate consideration. Alternative sources of energy such as geothermal, wind, and solid waste combustion are treated superficially despite the fact that all are potentially significant sources of energy in Alaska Similarly, the state's easily accessible Healy and Beluga coal fields, which already provide a portion of the power supply to Fairbanks and Anchorage respectively, are dismissed as being too environmentally damaging. Oddly enough, nothing could be more environmentally damaging than the Corps' proposed dams on the Susitna. The Corps is content to develop one massive source of energy under the guise that the Susitna River is a renewable resource. The fallacy of this argument is obvious. The Susitna River is intrinsically tied to

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...nding it, to the wildlife that populate ... and to the fundamental food chains that makes ...iver a body of life These aspects of the river are not renewable, and once destroyed, are gone forever.

It is in the best interests of the state of Alaska, and th nation as a whole, that the state develop a long range comprehensive energy development plan. It can coordinate the wide variety of energy sources available in a synergistic fashion so as to add flexibility to the problem of meeting future energy demands. Smaller scale hydroelectric projects, conservation, oil, gas, solar, wind, geothermal, and coal can all contribute to meet future energy problems head on.

Nowhere is the Corps' final impact statement more deficient than in its analysis of environmental impacts. It bases its evaluation of fish and wildlife resources in the Susitna River project area upon the inconclusive short term studies of a few species done three or four years ago. For example, the moose population in the affected portion of the Susitna basin is estimated by interpreting a 1973 Alaska Fish and Game fall aerial moose count. Yet, the Department of Fish and Game readily admits that such a count is of little or no scientific value today. The Alaska Fish and Game officials are so concerned about the proposed hydroelectric development on the Susitna River that they have prepared a thorough fish and wildlife study proposal for the areas of significant environmental impact. They feel that completion of this type of concentrated study is a prerequisite to any final decision to go ahead with construction of the dams, now tenatively set for 1980 and 1985. A reasonable estimate of the cost of this environmental impact analysis was set at 10-12 million dollars, and would take at least five years to complete.

The 1976 and 1977 omnibus bills passed by Congress set up the financial framework within which the Corps of Engineers must operate. A joint federal-state revolving hydroelectric fund was established to make 25 million federal dollars available to the Corps for phase one engineering, design, and environmental studies. However, for the coming fiscal year, only 5.4 million was officially appropriated for these studies. The Corps is certain to start geological testing at the damsites very soon after a 100 thousand dollar plan of study is completed in late August. How much money environmental impact analysis is to receive is an open question that the Corps will decide. If after the phase one studies are completed, the state decides to build the dams, the 25 million dollars will be reimbursed to the federal government, and the state will finance the construction of the dams itself through revenue bonds. But most importantly, starting this October, your federal tax money will be spent planning for the Susitna's demise.

The state, and more importantly the public has only the present environmental impact statement prepared by the Corps to look at in evaluating the costs and benefits of the project. Arguably, the environmental costs incurred are understated, and in part even overlooked in the final EIS. The value of lost fish and wildlife resources and the value various recreational and subsistense users place on their use of the upper Susitna River basin should be as accurately as possible factored into the cost-benefit analysis. On the other side of the coin, the Corps'-claimed 300 thousand dollars in recreation benefits is highly questionable in a state that already has thousands of lakes. The Corps' original projected cost for the two dam system in 1975 dollars was approximately 1.5 billion dollars. Given the inflationary rate, the technological difficulties of building these dams in an arctic environment, and the comparable cost overruns in other large develop-ment projects it has been suggested that the actual cost to the state could be as high as 6-8 billion dollars.

Yet, how well does this price tag represent the cost to the people of our nation as a whole? It seems every new proposal involving the loss of living rivers, like the Susitna, society must ask if the increased benefits of extending civilization really compensate for the loss to our culture of an increasingly rare wilderness. This should be the ultimate cost-benefit analysis.

The baseline data on which the final EIS is based raises some particular problems. The Alaska Power Administration conducted a power survey in 1974 and attempted to predict energy needs in the Susitna railbelt region based on speculative population and employment projections through the year 2000. The accuracy of these projections is questionable at best given the difficulties of making such estimations over a 25 year period. The Corps maintains that heavy industry will not be attracted by cheap secondary energy made available at periods of low demand. Also the proposed system of development is to require stage development (first the Watana dam, then the Devil Canyon) to insure that excessive energy production does not stimulate energy demand. The essential question is, will the projected load growth by the year 2000 actually be close to 15,000 gigawatt hours (more than 7 times the 1974 energy loads of Fairbanks and Anchorage)? More specifically, will that load growth be the result of continued sharp increases in population and employment in the state of Alaska, or will it ultimately be the result of substantial industrial development in the Susitna rainbelt region (the area between and including Fairbanks and Anchorage) which has been attracted by the surplus energy created by the hydroelectric projects on the Susitna River? At least one corporation has gone on record as believing there will be more than enough energy for industry. Just recently, executives of Kaiser Aluminum disclosed plans to the Whitehorse Chamber of Commerce, in the Canadian Yukon, for the construction of a 500 million dollar aluminum smelter employing 1,200 people in the area. The plans require the construction of a dam at Devil Canyon on the Susitna River, and certainly will be dependent on energy created by that hydroelectric development.

Historically, Americans have used the waterways as their lifelines. Our rivers have served as the source of drinking water, electric power, crop irrigation, industrial processes, transportation, recreation, and waste disposal. They have been damned, dredged, diverted, paved, piped, heated and treated. The American people as users of the waterways for both recreational and development purposes are gradually recognizing their responsibility to get involved in planning how and where the nation's rivers are to be used. But the hour is late for the "Big Su." The question whether the Susitna River should be altered at all or whether it should be left in its natural state may never be fairly answered. Given the prospect for the tragic loss of this magnificent river, can you afford not to get involved?

There are two sure ways you can help to save the Susitna. Write to:

Subcommittee on General Oversight and Alaska Lands
Hon. John Seiberling, Chairman
1327 Langworth House Office Building
Washington, D.C. 20515

and express your support for the inclusion of the Susitna River in the Wild and Scenic Rivers system as proposed in Morris Udall's bill H.B. 39. Secondly, make a contribution to the United States Canoe Association's Conservation Department so that the Susitna will be there to-

PLEASE NOTE: THE FOLLOWING PAGES WERE TREATED AS A UNIT IN THE ORIGINAL DOCUMENT.

Susitna

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

JAY S. HAMMOND, GOVERNOR

333 RASPBERRY ROAD
ANCHORAGE 99502

October 31, 1979

Mr. Eric Yould, Director
Alaska Power Authority
333 W. 4th Avenue
Anchorage, Alaska 99510

Dear Mr. Yould:

The Alaska Department of Fish and Game is providing the enclosed Phase I 25 month portion of the 5-year fisheries and wildlife study proposed to be conducted as part of the Susitna Hydroelectric feasibility investigations. The proposals were developed following discussions with Acres-American and their environmental studies subcontractor, Terrestrial Environmental Specialists. We have also met with representatives of the U.S. Fish and Wildlife Service and the Alaska Department of Natural Resources to obtain their suggestions and advice relative to portions of our proposals and the development of a final revised plan of study. I must indicate, however, that it should not be inferred that USFWS and ADNR have formally endorsed these proposals in their entirety. Their formal positions regarding the entire revised plan of study will undoubtedly come during the next agency and public review stage.

In his letter to me on October 4, Robert Mohn of your staff discussed a number of issues and subject areas which required our input on the development of the revised plan of study. The information provided herein should satisfy part of those requirements outlined by the APA, but specific refinements addressing our concerns outlined in our attached proposal and comments of other agencies will be needed during the period Acres or the Corps of Engineers is revising the POS next month.

Sincerely,

Thomas W. Trent

Thomas W. Trent
Regional Supervisor
Habitat Protection Section

cc: Representative R. Halford
Representative B. Rodgers
Commissioner R. O. Skoog - ADF&G
Commissioner E. W. Mueller - ADEC
Commissioner R. E. LeResche - ADNR
J. Lawrence - Acres
J. Barnes - TES
R. Bowker - USFWS
B. Petrie - ADNR
H. Hulsing - USGS

SUSITNA HYDROELECTRIC PROJECT

Preliminary Final Plan of Study

Fish and Wildlife Studies

proposed by the

Alaska Department of Fish and Game

November 1979

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PROGRAM JUSTIFICATION

The programs proposed by the Alaska Department of Fish and Game (ADF&G) are the first phase of a five year study program, necessary in the opinion of this Department, to meet the provisions of numerous federal and state laws and regulations providing for the consideration of fish and wildlife values in pre-project planning and evaluation of impact assessment, project possibility determination, mitigation of probable impacts should the project be constructed, and surveillance and monitoring during and after project construction. The biological objectives and justification are explained in the task work plans; the statutory and regulatory mandates for conducting these proposed work plans are outlined hereafter:

Federal/State Laws

Fish and Wildlife Coordination Act (FWCA)

The Fish and Wildlife Coordination Act, draft uniform procedures for compliance, May 1979 further standardizes procedures and interagency relationships to insure, "that wildlife conservation is fully considered and weighed equally with other project features in agency decision making processes by integrating such considerations into project planning, National Environmental Policy Act (NEPA) compliance procedures, financial and economic analyses, authorization documents, and project implementation."

As stated in the Federal Register (Vol 44, No. 98) this Act applies not only in the project area, but wherever project impacts may occur.

Subpart B FWCA Compliance Procedures

Sec. 410.21 Equal consideration
Equal consideration of wildlife resource values in project planning and approval is the essence of the FWCA compliance process. It requires action agencies (the Alaska Power Authority, APA) to involve wildlife agencies (the Alaska Department of Fish and Game and U.S. Fish and Wildlife Service, USFWS) throughout their planning, approval, and implementation process for a project and highlights the need to utilize a systematic approach to analyzing and establishing planning objectives for wildlife resource needs and problems and developing and evaluating alternative plans.

Sec. 410.22 Consultation
(a) Initiation. The FWCA compliance process may be initiated by a potential applicant, an action agency, or a wildlife agency.
(b) Potential Applicants. Implementing procedures of action agencies shall provide that applicants for those non-federal project approvals which require a water-dependent power project approval from the Federal Energy Regulatory Commission (FERC) (also applies to preliminary FERC permit) contain written evidence that they initiated the FWCA compliance process with both Regional Directors and the head of the State wildlife agency exercising administration over the fish and wildlife resources of the state(s) wherein the project is to be constructed and early site review (NRC) applicants.

The intent of this paragraph (a)(1) of this section is to assist applicants in designing environmentally sound projects without waste of their planning resources and to minimize the potential for delay in the processing of applications. Action agency implementing procedures shall advise that consultation should be initiated by the applicant at the earliest stages of its project planning, and that its submissions to wildlife agencies shall indicate the general work or activity being considered, its purpose(s), and the general area in which it is contemplated.

National Environmental Policy Act (NEPA)

The Council on Environmental Quality (CEQ), Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR, Parts 1500-1508, July 30, 1979) specifies provisions requiring the integration of the NEPA process process into early planning, the integration of NEPA reqirements with other environmental review and consultation requirements, and the use of the scoping process.

Clean Water Act

Section 404 of the Clean Water Act of 1977 and regulations for implementation of the permit program of the Corps of Engineers (33 CFR, Parts 320-329, July 19, 1977) requires that a Department of the Army permit(s) be obtained for certain structures or work in or affecting waters of the United States. The application(s) for such a permit(s) will be subject to review by wildlife agencies.

Executive Order 11990 (Wetlands)

This order was issued "in order to avoid to the extent possible the long-term and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable altenative," and Executive Order 11988 (Floodplains) was issued "to avoid to the extent possible the long-term and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative." All federal agencies are responsible to comply with these EO's in the planning and decision-making process.

Endangered Species Act

Section 7(c) of the Endangered Species Act, 87 Stat. 884, as amended, requires the APA to ask the Secretary of the Interior, acting through the U.S. Fish and Wildlife Service, whether any listed or proposed endangered or threatened species may be present in the area of the Susitna Hydroelectric Power Project. If the Fish and Wildlife Service advises that such species may be present in the area of the project, the APA is required by Section 7(c) to conduct a Biological Assessment

to identify any listed or proposed endangered or threatened species which are likely to be affected by the construction project. The assessment is to be completed within 180 days, unless a time extension is mutually agreed upon. No contract for physical construction may be entered into and no physical construction may begin until the Biological Assessment is completed. In the event the conclusions drawn from the Biological Assessment are that listed endangered or threatened species are likely to be affected by the construction project, the APA is required by Section 7(a) to initiate the consultation process.

Water Resources Council, Principles and Standards

The principles and standards for Planning Water and Related Land Resources (18 CFR, Part 704, April 1, 1978) were established for planning the use of the water and related land resources of the United States to achieve objectives, determined cooperatively, through the coordinated actions of the Federal, State, and local governments; private enterprise and organizations; and individuals. These principles include providing the basis for planning of federal and federally assisted water and land resources programs and projects and federal licensing activities as listed in the Standards. The President in his June 6, 1978 statement further defined federal water policies.

State Laws

Title 16

Title 16, independently of Federal laws, mandates the Alaska Department of Fish and Game to manage, protect, maintain, enhance, and extend the fish and game, and aquatic plant resources and the habitat that sustains them including assisting the U.S. Fish and Wildlife Service in the enforcement of federal laws and regulations pertaining to fish and wildlife.

Sec. 16.05.870 also states that:

(b) If a person or governmental agency desires to construct a hydraulic project, or use, divert, obstruct, pollute, or change the natural flow or bed of a specified river, lake or stream, or to use wheeled, tracked, or excavating equipment or log-dragging equipment in the bed of a specified river, lake, or stream, the person or governmental agency shall notify the commissioner of this intention before the beginning of the construction or use.

(c) . . . . If the commissioner determines to do so, he shall, in the letter of acknowledgement, require the person or governmental agency to submit to him full plans and specifications of the proposed construction or work, complete plans and specifications for the proper protection of fish and game in connection with the construction or work, or in connection with the use, and the approximate date the construction, work, or use will begin, and shall require the person or governmental agency to obtain written approval from him as to the sufficiency of the plans or specifications before the proposed construction or use is begun.

Purpose. The purpose of this section is to protect and conserve fish and game and other natural resources. 1964. Att'y Gen., No. 10

Alaska Coastal Management Program

The recently approved Alaska Coastal Management Program (ACMP) mandates that all State, Federal and Local government agencies must coordinate all planning and development activities in the State's coastal zone to ensure adequate consideration and protection of Alaska's coastal waters and resources. As the proposed Susitna Hydropower project will occur within Alaska's coastal zone and certainly will directly influence coastal waters all planning and development plans must be consistent with the Coastal Standards and the Mat-Su Borough's District Coastal Plan once it is completed and approved. The Coastal Standards are presently in effect and all State and Federal actions must be consistent with them. Section 6AA C 80.130 states that:

(a) habitats in the coastal area which are subject to the Alaska Coastal Management Program include:

(1) offshore
(2) estuaries
(3) wetlands and tidal flats
(4) rocky islands and sea cliffs
(5) barrier islands and lagoons
(6) exposed high energy coasts
(7) rivers, streams and lakes
(8) important upland habitat

These habitats which are specifically defined in the Standards must be identified within the Susitna Hydro Study area during the feasibility studies. In addition, Section (b) states that habitats contained in (a) of this section shall be managed so as to maintain or enhance the biological, physical and chemical characteristics of the habitat which contributes to their capacity to support living resources. Specific guidelines are also provided for each coastal habitat. The Coastal Zone Management consistancy requirements are manadated in both the Alaskan and Federal CZM Acts and the Fish and Wildlife Coordination Act. The Question of consistancy with CZM standards goes well beyond the FERC licensing requirements and should be treated as a separate step in determining the feasibility of Hydro Power alternatives.

The Alaska Department of Fish and Game has a strong mandate under these laws to insure that adequate planning study and evaluation of the fish and wildlife resources in the Susitna Hydro Project area are completed and become a part of the decision making information used to determine project feasibility. If the project is constructed these studies will be the basis for mitigation plans or the formulation of mitigation studies to offset project impacts. Mitigation as defined in Section 1508.20 of the National Environmental Policy Act Implementation Regulations includes:

(a) Avoiding the impact altogether by not taking a certain action or parts of an action.

(b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.

(c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.

(d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.

(e) Compensating for the impact by replacing or providing substitute resources or environments.

ISSUES, PROBLEMS, CONCERNS AND RECOMMENDATIONS REGARDING THE SUSITNA HYDRO PLAN OF STUDY

Project Review and Interagency Coordination

Because of the magnitude of the Susitna Hydroelectric Feasibility Study, continuous coordination in accord with the Uniform Procedures for compliance with the Fish and Wildlife Coordination Act will be best accomplished through formation of a Susitna Hydroelectric Steering Committee. The function of this committee would be to provide coordinated exchanges of information between the Alaska Power Authority and interested resource management agencies. Through this exchange, the concerns of all agencies involved would be identified early and hopefully prevent unnecessary delays in the progress of the feasibility study.

We propose that the Steering Committee be composed of representatives of resource agencies with responsibilities pertaining to the Susitna Hydroelectric Feasibility Studies (ADF&G, ADEC, ADNR, USFWS, USGS, and NMFS). This committee would provide for interagency coordination through joint review of project related materials and for development, through convening the committee, of more informed and uniform positions representing all resource interests to be transmitted to the applicant. This we believe provides that applicant with a more efficient process for information exchange.

The objectives of this committee are to:

1. develop plans of study which are based upon full agency participation throughout each phase of the planning process;

2. select the resource specialists who will undertake the required studies and investigations;

3. insure that the biological and related environmental studies, their timing, and technical adequacy are planned, implemented, and conducted to provide the quantitative and qualitative data necessary to: a) assess the potential impacts to fish and wildlife resources; b) provide the basis for mitigation and compensation of resource losses which will result from the project at the time of submisssion of a FERC license application; and c) select the favored mitigation and/or compensation alternative from the product generated by "b";

4. provide the forum for continued project review to jointly develop all aspects of the studies and to provide for a timely exchange of information and for redirection of studies should the accomplishment of specific objectives be in jeopardy;

5. assure that the studies are conducted in compliance with all state and federal laws, regulations, Executives Orders, and mandates as they apply to fish and wildlife resources; and

6. provide unified agency comments from the committee to the applicant.

The Susitna Hydroelectric Steering Committee should convene on a regular basis as dictated by planning and review requirements. However, it seems appropriate to meet at a minimum on a monthly basis to exchange reports and to be advised of progress toward objectives by the Alaska Power Authority and principle investigators. A record of agreements reached, recommendations and comments provided, and responsibilities assigned in meetings should be distributed to all parties involved.

Progress reports should be submitted to members of the committee quarterly. Comments from the committee to APA would then be submitted at a pre-established time thereafter. Comments provided to the Alaska Power Authority should be appropriately addressed and incorporated into project documents.

The participating members of the committee must have free access to all data collected during the study. In addition, principal project personnel should be accessible to members of the committee in case clarification of any aspect of the field studies is required.

Phase I Studies Initiation

The programs outlined in the work plans are scoped into a 24 month time frame for Phase I field work and one additional month covering Phase I annual report development during January 1982. The completion of several of these studies between January 1980 and January 1982 is not considered feasible.

A large amount of materials, equipment and scientific gear will be required for these studies. Many of these items will require ordering well in advance of the date on which they would be employed in the field. For example, major sonar and radio-telemetry development is anticipated for anadromous adult stock assessment and migrational work. The Bendix Corporation, the supplier of the sonar equipment the Department uses, has indicated a minimum of 18 months from order to delivery of sonar equipment. Also, members of the USFWS who have utilized radio-telemetry in the State have indicated an up to one year delay in the fielding of that equipment until radio frequencies are approved by the FCC.

New State personnel regulations may also affect this Department's timely implementation of studies unless an expedited procedure for employing staff dedicated to these studies is developed. If funds are released on January 1, 1980, several months will be required to obtain the staff needed to begin field work in 1980. These staff are crucial to the continued progress of specific planning and organizational work which

must necessarily begin as close to January as possible or further study delay will be encountered.

Allowance must be made for the impacts of equipment and personnel constraints on the ability of this Department to conduct the proposed fish and wildlife studies. These are realities which must be dealt with and are fundamental determinants of the adequacy of the work we have proposed to do.

Phase II Studies

A major position of the Department for the past several years is that many of the biological studies must be conducted through a five year period to provide the basic cyclical, environmental information needed to evaluate project impacts and the mitigation requirements or alternatives that are available. In the time availed us, we have not been able to provide a specific budget or work plan proposal for the studies that may be required in the years succeeding Phase I into Phase II, and it may not be reasonable to do so at this stage.

An acceptable Plan of Study must insure that studies are continued into Phase II. It is the position of this Department that study continuation and redirection should be based on the outcome of Phase I information. The proposed Susitna Hydroelectric Steering Committee, which has been proposed herein, is an important group, in our opinion, to insure scoping and budgeting of Phase II studies are executed in a consistent and systematic fashion.

Socioeconomic Considerations

Of primary importance to this Department is Objective 4: to determine the economic, recreational, social, and aesthetic values of the existing resident and anadromous fish stocks and habitat.

This objective will enable the Susitna Hydro environmental studies to assess the socioeconomic impacts on commercial, recreational, and subsistence users and industries supporting them. Over half of Alaska's growing population resides in the proximity of the impact area. Not only this population, but commercial fishermen, recreationists, and businesses from throughout the nation and other countries may be affected by the hydroelectric project. The popularity of Denali State Park and nearby Mt. McKinley National Park further attests to the high social, recreational, and aesthetic qualities of the area.

The basic problem in regard to the Susitna Hydro POS is to define and conduct the studies which will adequately evaluate the socioeconomic (monetary and nonmonetary) and cultural values of fish and wildlife and

the habitat that supports them when comparing them with other (more tangible) monetary resource values and uses associated with hydropower development.

It must be emphasized that to ultimately select the best uses of the natural resources of the Susitna Basin from which society will receive the most long term benefit, the net benefits (total benefit minus total costs) must be adequately evaluated. Consequently, values must be assigned to each potential resource use. When monetary terms are inappropriate, agencies will need to devise nonmonetary means of evaluating impacts to fish and wildlife resources. Existing regulations require agencies such as the Corps of Engineers (COE) or the Alaska Power Authority (APA) to search out, develop and follow procedures reasonably calculated to bring environmental factors to peer status with dollars and technology in their decision-making. NEPA directs action agencies to "the fullest extent possible":

> identify and develop methods and procedures which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations (42 U.S.C. S4332 (a) (B).

These methods should quantify habitat values which are equivalent to the extent and type of habitat affected by the planned project and estimate the quantity and quality of habitat needed to be acquired and/or improved to mitigate loss. It can then be determined if the socio-economic impacts of the project can be mitigated and at what cost. Furthermore, the Water Resources Council directs action agencies to devise nonmonetary means of evaluating fish and wildlife impacts:

> When effects cannot or should not be expressed in monetary terms, they will be set forth, insofar as is reasonably possible, in appropriate quantitative and qualitative physical, biological or other measures reflecting the enhancement or improvement of the characteristics relevant to the type of effect under consideration (38 F.R. 24797).

As a result, the often-cited excuse that the evaluation of supposedly "intangible" habitat values is difficult or impossible is no longer valid (Horvath 1978; Dwyer 1977; Copeland 1976; Morrow 1979).

Specific data to analyze both the nonmonetary and monetary socioeconomic recreational, social, and cultural values of the Susitna River Basin are lacking. It should also be stressed that an adequate assessment of monetary values by traditional methods must be based on commercial,

recreational, and subsistence use data which are not currently available and not being collected. Designs for this data collection and the data collection itself would best be done by the Department of Fish and Game, the traditional collector of data on these users. Therefore, this Department would like to actively participate in planning those portions pertaining to socioeconomics, recreational, cultural and aesthetic values of the Susitna River Basin.

Administrative Overhead and Time Delays

Overhead costs have not been included in the attached budget. The Alaska Department of Fish and Game (ADF&G) normally charges overhead to cover costs incurred by its Division of Administration. On most outside contracts, this amounts to approximately 10 percent of all costs except equipment. However, overhead is usually not charged on reimbursable service agreements (RSA) between State agencies. Susitna Hydroelectric Project studies will place an additional burden on the Division of Administration particularly during the first year when major equipment purchases and personnel hiring will occur. However, this additional work load is not likely to cost 10 percent of the proposed budget (approximately $600,000 during 1980 and 1981). Surplus money would presumably revert to the General Fund without accomplishing any purpose.

A more reasonable approach would be for the Division of Administration of the ADF&G, the Alaska Department of Administration, and the Alaska Power Authority to design a realistic program for administering the funds and to have APA reimburse the appropriate agencies for actual costs. These costs should be added to the overall budget.

The time normally required to process purchase requisitions and contracts is likely to create problems with APA's time table. A similar problem developed when the Legislature appropriated Bristol Bay disaster relief funds during 1974 after a failure in the salmon run. The problem was solved by funding a position in the Anchorage office of the Department of Administration to expedite purchasing. This allowed the rapid purchase of items without violating purchasing procedures and without excessively burdening the State's regular administrative staff. A similar approach would be beneficial to the Susitna Program. It is recommended that APA and Administration consider it as an option.

Monitoring & Surveillance

Monitoring and surveillance of Phase I and II project activities to minimize the impact of these activities on fish and wildlife and their habitats will be necessary.

The Susitna Hydro Coordinator will be responsible for assuring that the Department reviews and comments upon the host of State and Federal permit actions which may be required each year for land and water use.

He will be specifically responsible for ADF&G Title 16 permit applications review and development stipulations to protect fish and game.

Estuarine Studies

The Department of Fish and Game has not attempted to detail possible estuarine studies for the preliminary final POS. These studies can be delayed pending the outcome of Phase I studies.

If demonstrable hydrologic and water quality changes near the mouth of the Susitna River are shown or projected (based on the analysis of 1980 or 1981 data), estuarine studies should be initiated to identify the potential for project impacts on that environment.

AQUATIC STUDIES

Introduction

The Susitna River drainage, located north of Cook Inlet, encompasses an area of 19,400 square miles. The free-flowing Susitna River is approximately 275 miles long from its source in the Alaska Mountain Range to its point of discharge into Cook Inlet. The mainstem river and its major tributaries originate in glaciers and carry a heavy silt load during the ice-free months, but there are also many smaller tributaries which are perennially silt-free.

The construction of power dams on the Susitna River will adversely affect portions of the fish and wildlife resources of the Susitna River Basin. The two dam system proposed by the Corps of Engineers (COE) would inundate in excess of 50,500 acres of the Susitna River Basin aquatic and terrestrial habitat upstream of Devil Canyon. Regulation of the mainstem river will substantially alter the natural flow regime downstream. The transmission line corridor, substations, road corridor, and construction pad sites may also impact aquatic and terrestrial communities and their habitat. Historically, the long-and-short-term environmental impacts of hydroelectric dams have adversely altered the extremely delicate balance of ecosystems (Keller 1976; Hagan et al 1973).

Background knowledge of the Susitna River Basin is limited. The proposed hydroelectric development necessitates gaining a thorough knowledge of its natural characteristics and populations prior to final dam design approval and construction authorization in order to protect the aquatic and terrestrial populations from unnecessary losses. All engineering, hydrological, biological, and other project feasibility study activities conducted by the various governmental and private agencies will also have to be monitored and regulated to prevent ecological disturbances.

A survey of the fishery resources should cover complete life history cycles. A 30 month program prior to license application (Phase I), although supplying essential information about the fishery, is inadequate and should be continued through supplemental studies in Phase II. The proposed studies should be conducted for a minimum period of 5 years.

Five species of Pacific salmon (chinook, coho, chum, pink, and sockeye) inhabit the Susitna River drainage during their freshwater life history stages. The majority of chinook, coho, chum, and pink salmon production in Cook Inlet occurs within this drainage. An anadromous smelt, the eulachon, also utilizes the lower reaches of the river.

Cook Inlet is one of the major anadromous fish producing areas in the State of Alaska. The commercial catch of salmon reported for Cook Inlet during the five year period from 1971 to 1975 averaged over a million fish per year, and represented an average of 7.4 percent of the total catch for the State of Alaska. In addition to the commercial catch of

salmon, the recreational fisherery took about 90,000 salmon a year and the personal-use fishery, an additional 10,000 salmon per year. Sockeye, pink, and chum salmon are by far the most important commercial species in the area, making up over 90 per cent of the total catch from Cook Inlet; coho and chinook salmon make up the remainder. Chinook and coho salmon also are the species most favored by the recreational fishermen.

Grayling, rainbow trout, Dolly Varden, burbot, lake trout, and whitefish are some of the important resident fish species common to this system. Approximately 50 percent of the statewide sport fishing effort occurs within the Cook Inlet area. The recreational marine fishery is, however, very limited with the exception of a popular fishery at the vicinity of Deep Creek on Cook Inlet. The majority of the anadromous sport fish harvest occurs as the fish approach their spawning areas. Most, anglers within the Cook Inlet area show a preference for salmon rather than resident game fish when both types of fisheries are available. Resident populations are fished more heavily during fall and spring months during the absence of salmon runs.

Therefore, the proposed Susitna River hydroelectric project will have various impacts on both the indigenous organisms and the natural conditions within the aquatic environment. Potential impacts to fish populations are the most obvious source of concern due to their socioeconomic and recreational importance to the people of Alaska and the Nation.

STUDY PROPOSALS

Individual study proposals are designed to provide the necessary background information to enable proper evaluation of impacts. Six general objectives have been outlined:

1. Determine the relative abundance and distribution of adult anadromous fish populations within the drainage.

2. Determine the distribution and abundance of selected resident and juvenile anadromous fish populations.

3. Determine the spatial and seasonal habitat requirements of anadromous and resident fish species during each stage of their life histories.

4. Determine the economic, recreational, social, and aesthetic values of the existing resident and anadromous fish stocks and habitat.

   The Department has not developed a specific work plan for this objective but strongly believes the Acres-American POS must be strengthened to cover fish and wildlife concerns during Phase I.

5. Determine the impact the Devil Canyon project will have on the aquatic ecosystems and any required mitigation prior to construction approval decision. This is the primary objective of both Phase I and II studies. This will be discussed in detail in the Phase II work when it is written.

6. Determine a long-term plan of study, if the project is authorized, to monitor the impacts during and after project completion. This is also an objective of Phase II.

The study areas are generally categorized within the following locations:

A. Cook Inlet area

B. Cook Inlet to the Yentna River confluence

C. Yentna River to the Talkeetna River confluence

D. Talkeetna River confluence to the Devils Canyon dam site

E. Devil Canyon dam site to the Tyone River confluence

F. Proposed transmission line corridor(s), access roads, and construction pad sites

Scaling of the proposed studies with respect to timing, geographic locations, and intensity has been done with consideration of the resource knowledge available for each of the geographic locations identified above.

Title

Stock Assessment of Adult Anadromous Fish Populations

Objectives

To determine the relative abundance and distribution of the anadromous fish populations within the Susitna River drainage.

Background

The Susitna River salmon stocks are major contributors to the Cook Inlet area recreational and commercial fisheries. Determining total escapement into this system is complicated by the glacial conditions of the major streams and the enormity of the area. Management of the northern Cook Inlet salmon stocks has been difficult due to the mixed stock commercial fishery in Cook Inlet and the lack of adequate tools to provide accurate in-season escapement estimates for the drainage.

The major hydroelectric project impacts on the anadromous fish species are expected to be due to changes in habitat. Alteration of the normal flow regimes and the physical and chemical water characteristics will probably be the most critical impacts. It is difficult at this time to determine the distance downstream from the proposed dams that changes will occur. Studies conducted by Townsend (1975) in the Peace River demonstrate that effects were observed 730 miles downstream from the Bennett Dam.

Baseline fisheries inventories were conducted by the Alaska Department of Fish and Game in the upper Susitna River during the 1974-1977 field seasons. Emphasis has been on the inventory of adult and juvenile salmon stocks and habitat assessment. Ongoing Alaska Department of Fish and Game research investigations have concentrated on determining salmon escapement into the Susitna River and the distribution of these escapements. Emphasis has, however, been primarily on sockeye salmon. Successful tag and recovery projects were operated in the lower river during 1975 and 1977 and the feasibility of sonar operation was tested in the mainstem Susitna River approximately 25 miles upstream from Cook Inlet during 1976. Side-scan sonar counters have been utilized to determine escapements into the river since 1977 and are considered the state-of-the-art equipment for determining escapements in glacial river systems in Alaska.

Only through total stock assessment will it be possible to determine what portion of the Susitna River salmon stocks will be affected by the project and determine the level of mitigative measures which will ultimately be required. It is essential to know what portion the affected stocks contribute to the total Susitna River salmon escapement in order to determine potential changes in fish populations and numbers. An evaluation of the contribution of the Susitna River salmon runs to the Cook Inlet fisheries is essential to establishing the importance of the Susitna River salmon to the economy of the Cook Inlet area as a whole.

Ideally, since the Pacific salmon are cyclic in years of return, these studies should continue through at least one complete cycle. Differences do occur between the different year classes. The results obtained prior to license application may show, at least, the degree of variation that might be expected from year-to-year but with wide limits of confidence.

The real danger is, of course, the unpredictable conditions or events that might occur in any one year. For example, any one year could be completely abnormal with respect to weather or other environmental conditions which influence fish productions and would make interpretation of the results very difficult. The studies outlined should therefore continue through Phase II (post-license application). A minimum of five years would be required to complete the studies.

Study Approach

Adult anadromous fisheries studies will be divided into five major geographical areas. All studies, however, will be interrelated. The following outlines baseline studies required for each area and general work plans.

1. Cook Inlet Area. Contribution of the Susitna River salmon stocks to the Cook Inlet fisheries - Quantitative separation of stocks

Objectives

The objectives of this study are to:

1. Identify the proportion of the Susitna River salmon stocks harvested by the commercial and recreational fisheries; and

2. Determine quantitatively that portion of the total catch produced in the Susitna River drainage.

Background

The major area of salmon resource competition is within the Upper Cook Inlet area, i.e., that area north of the latitude of Anchor Point. The Susitna River salmon stocks are intermixed with other large salmon stocks produced from the Kenai Peninsula and west side of Cook Inlet.

All five species of Pacific salmon are harvested in Upper Cook Inlet The majority of these salmon pass through the area at the same time, thus creating a mixed species and mixed stock fishery. Any feasibility study of the Susitna River project will require an assessment of the contribution of the Susitna River salmon populations to the commercial and recreational fisheries.

Work Plan

Commercial catch data is available through the Alaska Department of Fish and Game. Final statistical runs are available through 1976 and preliminary

data is available through the current years harvest.

Identification and separation of the various stocks of salmon will be by scale pattern analysis and/or electrophoresis. Differences in scale patterns have already been found to exist in sockeye and coho salmon populations in Cook Inlet and the Susitna River stocks have been statistically separated from the other major Cook Inlet stocks. Data is, however, only available for one age class. Chum and pink salmon stocks have not successfully been separated on the basis of scale pattern analysis in other areas, due to the absence of freshwater growth. Electrophoretic techniques would be employed for stock identification of these species. An analysis of length-weight relationships may provide sufficient data for these two species.

The program requires the regular collection of scales and tissue samples from the commercial catch and from the major salmon producing areas (i.e., known escapement samples). Expansion of the on-going Alaska Department of Fish and Game Stock Separation Program would provide the necessary data base for stock assessment of sockeye, coho, and chinook salmon. Cost estimates and design of this program are based on incorporating these studies with ADF&G programs. If a separate program is designed, additional funding would be required for sampling crews and laboratory equipment and analysis.

Sampling design would be divided into two major components: collection of scales and laboratory and computer analysis of scale patterns.

A minimum of 250 scales per species and age class will be obtained during each fishing period. Known escapement samples would be obtained from existing research and management programs. Three additional cannery sampling crews (2 people each) will be required to obtain scale samples. Staff time will be required to design a program for chinook salmon. Existing crews should, however, be adequate to conduct sampling.

The ADF&G scale laboratory would be used to process samples. A supervisor and a second shift would be added to the staff to maximize the use of existing equipment. A digitizing station would have to be added to the existing microcomputer. Additional computer time would be required.

The feasibility of separating pink and chum salmon stocks by electrophoretic techniques probably could be determined after one sampling season. If this technique is unsuccessful it would be discontinued and other methods would be evaluated. Analysis could best be done by the University of Alaska. A minimum of 1,000 fish samples per fishery should be obtained for each species. Known escapement samples will also have to be collected. Three sampling crews would be required.

2. Cook Inlet/Susitna river confluence to the Yentna River confluence. Stock assessment of the adult salmon populations

Objectives

The objectives of these studies are to provide:

1. escapement data, by salmon species, into the lower Susitna River;

2. differentiation of the Susitna and Yentna river stock contribution;

3. timing of the salmon migrations;

4. movements as related to stream flow and water quality; and

5. utilization of the mainstem river for spawning.

Background

Total escapement information for the Susitna River drainage is generally lacking. Various methods have been utilized by the Alaska Department of Fish and Game since 1974. Recent developments in side-scan sonar have provided the most valuable tool, to date, for evaluating in-season escapement by species. Emphasis has, however, been on sockeye salmon.

Work Plan

Commercial Fisheries Division of the Alaska Department of Fish and Game currently operates an escapement project in the vicinity of Susitna Station as a part of their on-going sockeye salmon research program. Expansion of this program would provide the necessary escapement data required for the Susitna Hydro-Project baseline studies. Sonar counters and fishwheels would be operated from May through mid-October to determine escapement by species. This would require funding of the existing project beyond its normal operating dates. Data from this program would be correlated to the Stock Separation program within Cook Inlet and additional escapement studies in the upper Susitna River.

A sonar escapement enumeration program would be required in the lower Yentna River to differentiate between Yentna and Susitna river production. Comparative analysis of the Yentna River escapement data and the mainstem Susitna River sonar data would be made to determine stock contribution of each system. Two side-scan sonar counters and two fishwheels (for species apportionment) would be deployed on the Yentna River.

Migrational timing data would be obtained from fishwheel catch data at the sonar site.

Scale samples will be obtained from the fishwheel catch to provide a known data base for Cook Inlet stock separation studies. A minimum of 40 samples per day will be required for each species.

Radiotelemetry will be used to locate critical salmon habitat and define major migrational corridors of adult salmon in the Susitna River. This technique has been used successfully in other glacial river systems within Alaska, but the feasibility of this technique will have to be further evaluated for the Susitna River. Conductivity data will have to be compiled from various locations within the drainage, both within the mainstem river and clearwater tributaries.

Migrational characteristics may vary greatly for each salmon species and must therefore be determined for each separately. Data obtained from these studies may also be useful in the final selection of proposed sonar projects and deployment of gear.

Federal law requires obtaining an FCC license for transmitting. License application approval may require up to one year.

Feasibility studies will include testing of equipment and tags from major companies. Various companies will be contacted regarding the possibility of leasing equipment. If radiotelementry is a successful technique in the Susitna River, equipment will be purchased for the second field season and the program will be expanded. Emphasis will be on one species during the testing period. Chinook salmon are suggested as the first year target species.

Fish will be tagged at the Susitna Station of the "Deshka" site and tracking will be conducted daily by boat and bi-weekly by aircraft. A statistically valid sample size probably will not be attained during the first year of feasibility studies, but evaluations of equipment will be made. If deemed feasible, a maximum of 50 fish a season will be tagged in subsequent years.

Coordination with and assistance from USF&WS Research Section will be required throughout the project.

Eulachon, an anadromous smelt, utilize the lower mainstem Susitna and Yentna rivers for spawning. The extent of utilization of the mainstem river will be documented and evaluation of the populations will be made.

3. Yentna River confluence to Talkeetna. Stock Assessment of adult salmon populations

Objectives

The objectives of these stock assessment studies are to determine the:

1. numbers of adult salmon utilizing this area for migration and spawning;

2. migrational timing of the adult salmon;

3. recreational utilization of these stocks; and

4. movement of salmon as related to stream flow and water quality.

Background

Many of the important recreational use areas occur within this area of the river. These areas have road access on the east side of the river

and receive high use via aircraft transportation on the west side. All five species of adult salmon utilize this area for spawning and migration. Due to the braided nature of the Susitna River in this area many impacts are expected to be seen due to alterations of stream flow.

Work Plan

Two side-scan sonar projects will be established within this area of the river. Seasonal apportioned counts by species will be compared to the lower Susitna and Yentna river sonar projects to determine importance of this area to the entire drainage. Fishwheels and possibly other sampling gear will be used to apportion sonar counts.

One sonar project will be located between the Yentna River confluence and the Deshka River and a second sonar project will be located in the vicinity of Sunshine. These programs will provide information on: 1) the importance of this area of the river for spawning; 2) the extent to which this area is used for migration to spawning areas upstream of Talkeetna; and 3) the contribution of these salmon stocks to the total Susitna River drainage. A total of 4 side-scan sonar counters and 6 fishwheels will be required.

All salmon captured in the fishwheels at the "Sunshine site" will be marked with a color- and number-coded Peterson disc tag. Marked fish will be recaptured upstream to provide an assessment of stocks utilizing this area.

Migrational timing will be determined by fishwheel catches at the sonar projects and survey crews.

Recreational utilization of these salmon stocks will be determined partially by on-going ADF&G creel census programs. Expansion of these programs will be required to adequately monitor all species. The creel-census programs will also provide data on migrational timing and tag recoveries.

Movement of salmon through this geographic area will be monitored by remote sensing devices for radio tagged fish. Sonar counters may also provide horizontal distribution data for that particular area.

Alaska Department of Fish and Game survey data will be used to determine chinook salmon escapements into major tributaries. These surveys may have to be expanded to assure adequate coverage of major tributaries.

4. Talkeetna to Devil Canyon Dam Site. Stock assessment of adult salmon populations

Objectives

The objectives within this study area are to determine the:

1. abundance of adult salmon;

2. stock assessment of the Susitna-Chulitna-Talkeetna stocks;

3. migrational timing of the salmon stocks;

4. recreational utilization;

5. movement of salmon stocks through this area as related to stream flow and water quality.

Background

Population estimates of salmon species utilizing the Susitna River above the Chulitna River confluence were estimated during the 1974, 1975, and 1977 field seasons based on tagging and subsequent recovery of fish. These studies indicate a portion of the salmon tagged are not destined to spawn above the tagging site, but rather below it. The importance and extent of this milling behavior in the upper river areas requires definition. The alterations in flow and water quality in the mainstem river after project completion could significantly affect this behavior and consequently spawning success.

Observations of spawning areas between the Chulitna and Susitna river confluence upstream to Portage Creek during fall surveys indicate that a reduction in flow to proposed post-construction levels would prevent access to many important spawning areas.

Work Plan

Salmon escapement estimates will be determined by a tag and recovery program in this area. Fish marked at the "Sunshine site" will be recovered by ground survey crews upstream from the Chulitna River confluence.

Surveys of major spawning areas between Talkeetna and the Devil Canyon dam site will be conducted in conjunction with juvenile studies to determine distribution.

Escapement estimates will be compared to sonar project located in the lower river, primarily the "Sunshine site," and will provide information on importance of the upper river for spawning and also contribution of the Talkeetna and Chulitna river salmon stocks to the entire drainage.

Migrational timing of salmon stocks utilizing this area will be determined by stream surveys.

Recreational use within this area will be determined by a creel-census program.

Movement of salmon stocks through this area will be determined by the radio tagging program. Radio tags may be implanted in adults at the Sunshine site and movements monitored upstream. Data will be used to

determine areas where habitat utilization studies should concentrate (i.e., stream flow and water quality monitoring).

5. Devil Canyon dam site to the Tyone River confluence. Stock Assessment of adult salmon populations

Objective

To determine if salmon utilize that area of the Susitna River above Devil Canyon.

Background

Studies conducted during the late 1950's indicate that Cook Inlet salmon stocks are unable to ascend the Susitna River beyond Devil Canyon, the latter being a natural water velocity barrier to migration (U.S. Department of the Interior, 1957). Reports from local residents of salmon observations above Devil Canyon indicate that this should be investigated further.

Work Plan

Surveys and escapement sampling will be conducted in the proposed impoundment areas between the Denali Highway and Devil Canyon during periods of peak adult salmon abundance. Initial observations will be conducted by aerial surveys to document the presence or absence of adult salmon. Surveys will be done in conjunction with resident fish investigations. Data obtained will be utilized to determine necessary mitigation measures.

Title

Stock Assessment of Adult resident Fish and Juvenile Resident and Anadromous Fish Populations

Objectives

To determine the relative abundance and distribution of adult and juvenile resident fish and juvenile anadromous fish populations.

Background

Some resident game fish species make major migrations from lake and tributary systems into the mainstem Susitna for purposes of overwintering. The importance of this intra-system migration and the role of the mainstem Susitna River is not fully understood at this time. Surveys conducted between 1974 and 1977 document that a high quality sport fishery is provided by the Susitna River, its tributaries, and nearby lakes. These intra-system movements and periods of seasonal availability must also be better understood in terms of dependence upon mainstem hydrologic conditions.

Previous studies have defined important clearwater streams and spring fed sloughs within the Susitna River drainage which support juvenile anadromous fish species. Investigations have, however, concentrated primarily on summer rearing areas. Surveys indicate these populations are not static, but vary in abundance and distribution. Studies previously conducted indicate juvenile anadromous species also utilize the mainstem Susitna River during the critical winter period.

Data collected since 1974 provide only baseline information. Generalizations may be made, but sufficient information is not available to determine specific impacts of dam construction and operation on incubating and rearing anadromous species.

Study Approach

Adult and juvenile resident fisheries studies will be divided into three major geographical areas. All studies, however, will be interrelated. The following outlines baselines studies required for each area and general work plans.

1. Cook Inlet/Susitna River confluence to the Talkeetna River confluence. Stock assessment of the resident and juvenile anadromous fish populations.

Objectives

The objective of these studies are to:

1. Determine specific occurence and species composition of resident and juvenile anadromous stocks throughout the year

within the Susitna River mainstem and within the reaches of tributary streams regularly influenced by the Susitna River. of particular importance to this study are the Alexander Creek, Flat Horn Lake, Deshka River, Willow Creek, Iron Creek, and Rabideux Creek tributary systems;

2. Define any apparent seasonal changes in occurrence and relative abundance of resident and juvenile anadromous species at the confluence of tributary systems and the Susitna mainstem;

3. Develop suitable sampling techniques for the collection and determination of relative abundance of resident and juvenile anadromous species in the Susitna mainstem throughout the year;

4 Define and describe habitat type utilization by resident and juvenile anadromous species throughout the year and at varying hydrologic conditions;

5. Determine migratory directions and timing of fish species at Iron Creek;

6. Survey other tributary systems, particularly Rabideux Creek, for the purpose of establishing a weir.

Background

This reach of the Susitna River encompasses many important fish producing and recreational fishing tributaries and is an area of critical environmental concern because of the possible seasonal use and migration between clearwater tributaries and the Susitna River. Studies of these seasonal migrations and the distribution of resident and juvenile anadromous fish in and to habitats in the Susitna River are essential. The studies would be initiated for selected streams and for a prescribed distance: upstream throughout the year. Expansion or retirement of these studies would depend on confirmation for migration and habitat use by resident and juvenile anadromous fish in the Susitna River. If confirmation of these movements and distribution to the Susitna is positive, the basic inventory will, in conjunction with the study task on habitat evaluation, identify specific year to year study locations for ongoing programs required to determine fishery impacts on the fish populations.

While the time frame allotted for accomplishment of these six objectives is 30 months we feel that these same objectives should remain ongoing through the termination of the project with appropriate adjustment and redirection being made as resultant data are analyzed.

Also we see that it is imperative to incorporate the hydrologic studies as an intregal component in achieving our stated study goals.

Work Plan

The initial year of this study, 1980 will be comprised of essentially three field operations, a summer and winter program on the Susitna River and a weir established on Iron Creek.

A crew of three biologists, utilizing a riverboat as their primary means of transportation, will operate in the Susitna mainstem and tributary systems during the ice free months, May through October. Their responsibilities will include:

1. Sampling using established techniques and their adaptations including gill nets, minnow traps, adult traps, angling, seines, and electrofishing.

2. Developing suitable techniques for sampling the Susitna mainstem. Particular emphasis will be placed on the design of an effective stationary fish trap.

3. Classifying in terms of depth, velocity, turbidity, and substrate types in conjunction with the sampling of resident populations. It is essential that close cooperation is maintained between hydrologic and fisheries research.

4. Tag adult resident fish and note species, size, date and location of capture.

A crew of four biologists will carry out fisheries research during the winter months. This facit of the field operations will be based on road access until such time as the mainstem Susitna ice condition has stablized sufficiently to provide safe transportation via snowmachine. This crew will:

1. Survey in the proximity of areas surveyed during the previous summer using established sampling techniques such as gill nets and minnow traps. As ice conditions improve and data is analyzed this effort will be expanded to include as much of the study area as possible.

2. Design an effective resident species adult trap for use in this study area as established sampling techniques meet with limited success when applied under a cover of ice in the river environment.

3. Classify habitat in terms of ice cover, depth, velocity turbidity, and substrate in conjunction with sampling of resident populations.

A weir will be installed on Iron Creek as early in the spring as is feasible and will operate throughout the ice free months (May-October). This facility will be operated by a crew of three biologists, who will be responsible for:

1. Operation of the Iron Creek weir. The Iron Creek weir will be designed to capture both adults and juveniles and both immigrants and emigrants.

2. Conducting a tagging study utilizing adults captured in the weir. A reward will be offered to encourage the return of tags and data from the sport fishermen.

3. Utilizing minnow traps, gill nets, seines, and electro shocking devices, in addition to the weir to sample the resident population and recovering tagged fish in Iron Creek.

4. Conducting surveys on Rabideux Creek to determine the advisability of installing a weir in there in 1981.

A project leader position assisted by a Tech III is included in this segment. Responsibilities will include:

1. Organizational functions and oversight of entire Susitna Basin study.
2. Analysis of data and report preparation.

Following the first season's determination of resident and juvenile anadromous fish occurrence, areas of greatest availability and suitable methods of capture, the 1981 program will be directed to largely the same areas and intensified with respect to relative abundance and preferred habitat utilization. The 1981 study plan will again consist of three segments, summer field operations, winter field operations, and a crew operating the Iron Creek weir and possibly an additional weir facility located at Rabideux Creek.

A crew of three biologists utilizing a riverboat as their primary means of transportation will operate in the Susitna mainstem and tributary systems during the ice free months to:

1. Confirm previous seasons data base with regard to occurrence and species composition.

2. Determine relative abundance of resident stocks in predetermined locations by seasonal period and further establish patterns of intrasystem migration.

3. Further define preferred habitat parameters.

4. Continue to tag adult resident fish and note any recaptures from previous year.

A crew of four biologists will carry on the initial year's study from January through April. This four man crew will begin the second field season in December of 1981 and following the first season's determinations the program will:

1. be expanded to include additional areas;

2. be intensified at one or two predetermined locations; and

3. continue to determine habitat requirements.

The weir facility at Iron Creek will be reinstalled and operated by a crew of two biologists from May through October. Second year activities will include:

1. Continuation of first year activities.

2. Recovery of tagged fish.

3. Description of Iron Creek habitat utilized by seasonally present resident fish.

Closely associated with the Iron Creek weir will be a more temporary weir to be constructed in spring 1981 on Rabideux Creek pending results of the first years study. This weir and associated tributarial sampling will be carried out by a crew of two biologists who will be responsible for:

1. Construction and operation of a temporary weir on Rabideux Creek.

2. Sampling Rabiduex Creek and that portion of the Susitna mainstem adjacent to Rabideux Creek, on a regular basis using established sampling techniques.

3. Conducting a tagging program on resident fish.

A project leader position assisted by a Fishery Tech III will continue through 1981. Responsibilities will include:

1. Coordination of field activities.

2. Data analysis and report writing.

2. Talkeetna River confluence to Devil Canyon. Stock assessment of the resident and juvenile anadromous fish populations.

Objectives

The objectives of programs within this study area are to:

1. Determine specific occurance and species composition of resident and anadromous stocks utilizing the mainstem Susitna River and it's major tributaries;

2. Define seasonal changes in occurrence and abundance of resident and anadromous specis within the mainstem Susitna River and it's tributaries;

3. Define habitat types utilized by resident anadromous fish species, seasonally throughout this year, at varying hydrologic conditions, both within the mainstem Susitna River and the major tributaries; and

4. Establish the impacts of flow regulation upon the habitat which currently meets seasonal requirements of resident and anadromous fish stocks within the study area.

Background

This study area includes the mainstem Susitna River and a number of important clearwater tributaries which have indigenous populations of resident game fish and provide spawning and rearing habitat for anadromous species. Several of the more important lateral tributaries are Portage Creek, Indian River, Gold Creek, and Fourth of July Creek. All are located in the upper reaches of the study area and in the general vicinity of the railroad crossing at Gold Creek.

Five species of Pacific salmon, chinook, coho, sockeye, pink and chum are native to this portion of the study area. The most important resident fish species within this area are Arctic grayling and rainbow trout; however, burbot, whitefish, Dolly Varden, and various other species are also present.

While a higher degree of reliability in knowledge of possible flow, water quality, and stream morphology changes exists in this reach because of previously collected baseline data, baseline studies on resident and juvenile anadromous fish must be initiated to better detail specific occurrence, distribution, and seasonal migration and habitat use of the Susitna River as well as document the population sizes of resident fish.

Work Plan

Due to limited access to much of the Susitna River upstream of Talkeetna, and related high cost of transportation, work proposed for 1980 is limited to the Indian River - Portage Creek - Gold Creek area. This area is accessible by railroad and can be investigated by a single field crew located in the Gold Creek area. These investigations will be extended downstream into other areas in the second and third years of study.

A four man crew will be located in the Gold Creek or Indian River area housed in a local cabin or tent camp, and provided with a river boat and Zodiac type raft to conduct the following activities:

1. Establish the occurrence and species composition of resident and anadromous fish stocks utilizing the mainstem Susitna River during the period May through October of 1980. This

work will entail intensive netting, electro-shocking, trapping, or use of set lines or other suitable collection methods within the mainstem reach from Fourth-of-July Creek upstream to Portage Creek. Some of these collection devices are expected to require modification and/or development as the season progresses.

2. Perform similar sampling by net, electro-shock, trap or angling within the Indian River, Portage Creek, Gold Creek, and Fourth-of-July Creek tributaries. A program of fish tagging will be implemented to define intra-system movement.

3.) Creel census anglers utilizing these four streams to determine harvest of resident fish by: a) species, b) age class, c) size, d) seasonal period, and e) area of availability. The creel census will also help with recovery of tagged fish.

4. Conduct the adult anadromous studies in this area in cooperation with the anadromous program.

Following the first seasons determinations of resident and anadromous fish occurrence, areas of greatest availability, and suitable methods of capture, the 1981 program will be directed to largely the same areas and intensified to include population estimations and preferred habitat utilization.

A similar two man crew will be located in the Indian River or Gold Creek area, depending upon which seems more appropriate as a result of the first year study. The same equipment will be utilized. Study objectives for 1981 will be as follows:

1. Determine relative abundance of resident and anadromous fish stocks in Indian River and Portage Creek, at predetermined locations, by seasonal period, and further define intra-system movements and migrations. These studies will necessitate an intensified tag and recovery program to provide instantaneous population estimates at specific seasonal periods and also numerous aerial surveys. While the methods with which to accomplish this work may be more apparent after the first years efforts, it is at this time considered likely that trapping devices or a statistically designed angling scheme may be most appropriate.

2. Conduct similar studies in appropriate sections of the mainstem river and side channels during spring, summer, and fall. Techniques for this work segment will be similar to objective No. 1.

3. Define habitat utilization of resident and anadromous species both within the mainstem and the Gold Creek, Fourth-of-July

Creek, Indian River, and Portage Creek tributaries as related to hydrologic conditions.

Areas of resident and anadromous fish preference will be surveyed in terms of flow, substrate, turbidity, depth, etc. to determine if these parameters are responsible for instream movements and distribution. These data will be correlated with historical climatological data and mainstem flows. Particular emphasis will be placed upon this facet during periods when mainstem flows approach the proposed regulated flow.

4. Determine mid-winter occurrence and distribution of resident and juvenile anadromous fish species both in Indian River and the mainstem Susitna River.

   As Indian River is the only major accessible upper tributary stream during mid-winter, these studies will be limited to it.

   The mainstem river is characterized as being extremely dangerous to work in mid-winter due to poor ice conditions. As deemed possible, netting, trapping, and set lines will be utilized to determine occurrence and distribution of resident species during the winter months and to recapture fish tagged earlier in the year.

   Winter sampling of both the tributary and mainstem will be conducted during November and December on a field trip basis, on a monthly schedule. No permanent camp is contemplated.

It is expected that by the end of the 1981 field season estimates of the magnitude of intra-system migrations will be possible, by time; as will be population estimates of resident fish available at the mouths of the two tributaries throughout the seasonal period when sport angling occurs. Population estimates will also be formulated for the two years runs of salmon. It is further expected that habitat requirements or needs dictating spring/fall migrations of resident and juvenile anadromous fish will be definable, as will the role played by the mainstem Susitna River.

3. Devil Canyon to the Tyone River confluence. Stock assessment of resident and anadromous fish Populations

Objectives

The objectives in this study area are to:

1. Determine specific occurrence and species composition of fish stocks utilizing the mainstem Susitna River and it's major tributaries;

2. Define seasonal changes in occurrence and abundance of fish species within the mainstem Susitna River and tributaries;

3. Define habitat types utilized by fish species, seasonally throughout the year, at varying hydrologic conditions; both within the mainstem Susitna River and major tributaries;

4. Establish the impacts of inundation upon the aquatic habitat of the clearwater tributaries, necessary to sustain the indigenous fish species; and

5. Conduct complete hydrological surveys at the tributary mouths and at predetermined locations on each tributary.

Background

This area of study includes the more than fifty miles of the mainstem Susitna River and tributary streams, which will be either totally or partially inundated by construction of the Devil/Watana Hydroelectric Complex.

This portion of the Susitna River drainage lies in a truly wilderness setting, is roadless, is inaccessable except by boat or light aircraft, and is only moderately utilized by recreational anglers at this time. Angling in this reach of the Susitna River system can be termed a "quality experience."

This area has obvious identifiable habitat and biological impacts due to eventual inundation of segments of the clearwater tributaries feeding the impoundment. Critical habitat needs, as well as recreational fishing opportunities, are provided primarily at the mouths of these respective tributaries.

Workplan

A three man crew will work in the proposed impoundment area during the ice free months, utilizing helicopter and light aircraft for transportation throughout the study area. The study crew will be housed in a temporary/ portable field camp. Investigations will be directed to:

1. Conduct extensive on-the-ground surveys of Goose, Jay, Kosina, Watana, Deadman, Tsusena, and Fog creeks, and the Oshetna River. These investigations will include hydrological surveys and will determine the types of aquatic habitat currently available to resident species.

2. Determine the types, magnitude of, and location of aquatic habitats which will be lost upon inundation, by respective stream. Geographical features blocking upstream migration will be noted. Conversely, stream areas which will benefit in terms of improved access to fish stocks, upon impoundment, will be recorded.

3. Extensive netting, trapping, and fish collection will be conducted to determine the specific occurrence, and composition of resident species occupying these eight tributarial waters. As possible, efforts will be directed to determine the extent of seasonal intra-seasonal migrations.

4. To tag any and all adult fish captured for determination of intra-system movement and migrations.

Upon completion of the first year's (CY-81) assessment of aquatic habitats, and biological distribution of fish species within the impoundment area tributaries, investigations will be directed to the upland lake areas and the mainstem Susitna proper.

A two man field crew will again operate with a transportable field camp, utilizing helicopter and light aircraft for transportation. Investigations will begin as soon as "ice-out" occurs in the spring and continue until freeze up in the fall.

Studies in CY-1981 will be directed to:

1. Surveys of fish utilizing selected tributarial stream mouths throughout the season to determine intra-system movements of resident fish, and their reliance upon the mainstem river during the critical winter months. Tentative stream selections are Kosina, Jay, and Watana creeks.

   A semi-permanent camp will be located in the vicinity of these stream mouths, and the individual streams sampled for fish occurrence on an established sampling schedule throughout the season.

2. Conduct surveys of upland lakes associated with mainstem Susitna River tributary streams for fish population and related biological data. Habitat information will also be collected from inlet and outlet streams, and be used later in determining the impacts to seasonal migrations and biological requirements of resident fish as a result of impoundment, road construction, and transmission corridor placement.

3. To determine resident fish occurrence and distribution within the mainstem Susitna River throughout the spring-summer-fall periods. This work will be accomplished by the same field crew utilizing a chartered boat for transportation on a predetermined sampling schedule. Nets, trot lines, traps, etc. will be used to determine fish presence.

4. To continue to collect complete hydrological data.

It is anticipated the single two man crew will be capable of performing all the above tasks. Determination of mainstem fish occurrence and

distribution (#3) will be accomplished by two or three scheduled week long trips through the impoundment area.

The upland lake surveys will be accomplished during "non-sample" periods at the tributary mouths. Close coordination will be necessary, as will helicopter support at frequent intervals.

Title

Seasonal and Spatial Habitat Study

Objectives

Determine the spatial and seasonal habitat requirements of anadromous and resident fish species during each stage of their life histories.

Background

The proposed Susitna River hydroelectric project will have various impacts on the aquatic environment. Habitat studies will not be limited to the fishery resource alone due to the complex interrelationships between all biological components of, and within, the aquatic community and the associated habitat. The majority of the impacts on fish species will likely result from changes in the natural regimes of the river rather than direct impacts on the fish in the vicinity. Primary areas of concern are modification of seasonal instream flows, increased turbidity levels during winter months, and variation of thermal and chemical paramaters. Preliminary studies indicate that alterations of the habitat may adversely affect the existing fish populations and render portions of the drainage either nonproductive or unavailable in future years (ADF&G 1978; 1979).

Continuously moving water, or current, is the distinguishing physical habitat feature of the Susitna River and its tributaries. The Susitna River and the major rivers entering Knik Arm represent approximately 70-80% of the total freshwater entering Cook Inlet (Rosenberg 1967). The flow of water which appears in the Susitna River channel at a given time constitutes the "instream flow". This flow is closely related to, but different from, the underflow moving through permeable deposits immediately underlying the stream channel. The instream flows of the Susitna and its tributaries erode, transport, and deposit sediments and other materials and can, have profound effects on the surrounding environment as far downstream as the Cook Inlet Estuary.

A variety of physical parameters interact to create particular aquatic environments in the Susitna River Basin. The most important of these physical parameters are: flow regime (volume, velocity, and temporal variation of flows), channel morphology (size, shape, gradient, and geologic material of channel), water quality (temperature, turbidity, dissolved gases, etc.), and stream load (bed load, suspended solids, and other materials, such as watershed inputs, in transport).

The Susitna River and its tributary system are continually working to establish equilibrium among these parameters. Induced change in any one of these factors may initiate readjustment in others. For example (during the winter months), the controlled flow regimes of the dams may increase erosion and consequently increase the amount of sediment entering the downstream river system. The river system becomes overloaded (unable

to transport all of the material entering the channel), and begins to deposit sediments. Over time, this deposition process leads to changes in channel slope and hence stream velocity. Eventually channel slope will increase until the velocity of stream flow produces just enough energy to transport the amount of material entering the stream, and an equilibrium will be achieved.

Analogous chains of events follow any alterations of instream flow. The altered stream will attempt to establish equilibrium conditions; and this dynamic process may lead to substantial changes in flow regime, channel shape, wetted area, substrate characteristics, water quality, etc. Moreover, these changes will most likely be felt as far downstream from the dams as Cook Inlet (Bishop 1975). Channel geometry and discharge patterns in the lower reaches and mouths of tributaries to the Susitna River will also be altered by the flow regimes of the dams. The Susitna impoundments will also result in upstream readjustments. The Susitna dam reservoirs may, for example, reduce the stability of underlying and adjacent geologic materials by increasing hydrostatic pore pressure and lubricating joints and fractures, therefore, initiating tremendous readjustments in the physical environment (Keller 1976). Mouths and lower reaches of tributaries in the impoundment area will be inundated.

It is important to remember that the complexity of the physical interactions outlined above is compounded by the fact that natural flows fluctuate with seasonal and climatic variations. As a result, impacts produced by the dams will stem not only from the amount of flow modification but also from the timing of the modification in relationship to normal seasonal flow fluctuations. Certain periodic high flows (e.g. bankfull discharge) for example are responsible for maintaining channel morphology by flushing sediments, transporting bed load, etc. Reduction, elimination, or rescheduling of these naturally recurring high flows can have serious consequences on channel characteristics. An increase in flow can also induce profound changes in the lotic environment during naturally occurring low flows.

The physical conditions and interactions within the Susitna River Basin discussed above, provide essential habitats for aquatic, riparian, and other organisms. As a result, any alteration in the physical environment also affects the associated biological populations. Although our emphasis is on fisheries, it should be apparent that instream flows exert similar profound effects on other aquatic organisms, as well as on riparian and terrestrial wildlife, navigation and other instream flow related uses (Erickson 1977; Elser et al 1977; Hinz 1977; Newell 1977; Martin 1977; Klarich et al 1977; Fraser 1975; Judy et al 1978; American Fisheries Society et al 1976 a, b); Townsend 1975).

There are three major physical components of the Susitna River system related to instream flows which determine the productivity of the associated fisheries (Stalnaker 1979):

1. water quality (e.g. temperatures, dissolved solids, dissolved gases, sediments, particulate organic matter and nutrients, etc.);

2. flow regime (i.e. volume, wetted perimeter, stage, velocity, and timing of flows); and

3. physical habitat structure (channel form, substrate characteristics, and riparian vegetation).

Each of these components is intimately related to instream flows. Instream flow may, therefore, be considered one of the most essential determinants of aquatic habitat and hence fisheries productivity. Modifications of naturally occurring seasonal instream flows will produce a variety of changes in critical habitat areas such as spawning, incubation, rearing, overwintering, and passage habitats. Decreased flows in the spring and summer may for example lead to silt deposition, oxygen reduction in gravel redds, dewatering of sloughs, and may, result in suffocation of incubating eggs and pre-emergent fry. Increased flows in the winter may wash away spawning substrate or destroy sheltering areas. Decreases and increases in flows which alter stream productivity will modify food availability in rearing and overwintering habitats.

In addition to modifying essential habitats, alterations to the Susitna flow regimes may affect the seasonal behavior of fish species. Hynes (1970) presents the following examples of the important interrelationships between seasonal flow regimes, fish movement, and human alterations of lotic environment.

> Most fish are stimulated to move by rising water, and when the movement is to be upstream this enables them to pass over riffles with greater safety, because the increased width at such points spreads out the discharge and provides zones of slower water which are nevertheless deep enough to swim through.
>
> Descending fish, such as smolts ..., are also stimulated to move by rising water ... Under normal circumstances, descending fish readily overcome obstacles, and the cushioning of the water prevents damage at falls, or at any rate at falls which are small enough for them or their parents to have ascended. But descending fishes follow the bottom contour, not the surface.

The complex interrelationship between instream flows and seasonal behavior of fish species is compounded by the fact that seasonal variations in flows required by particular species may have to be quite large. Returning salmon species for example may need 30 - 50 percent of the mean annual flow to ascend the lower and middle reaches of a river system, and even more flow to ascend the headwaters (Hynes 1970). As a result, the protection of fisheries resources requires not only that certain volumes of instream flow be maintained, but also that specific flows be available at particular times of the year. Tennant (1975) discusses average percentages of seasonal stream flows required to maintain particular levels of aquatic resources. The U.S. Fish and Wildlife Service Instream Flow Group (Bovee 1978; Cooperative Instream Service Group 1979) has developed sophisticated electivity curves defining

the relationships between instream flows and life history stages of selected fish species. These curves are continually refined as new data become available. Recognizing the physical differences between and individual habitat requirements of various stocks of the same fish species, the Alaska Department of Fish and Game and Alaska Department of Natural Resources initiated a pilot instream flow study in 1979 using field and computer analysis techniques developed by the U.S. Fish and Wildlife Service Instream Flow Group, John F. Orsborn (1974; 1979), and the U.S. Geological Survey.

In summary, seasonal fluctuations in the physiochemical composition of the aquatic habitat are apparently the major factors influencing distribution of fish within the drainage. Any alterations resulting from the hydroelectric related project activities which restrict or reduce quality or quantity of required habitat will also reduce fish populations and associated members of the aquatic community.

Study Approach

Spatial and seasonal habitat studies will be divided into three major geographical areas. Sampling upstream of the Susitna-Talkeetna river confluence will be conducted primarily by fisheries study groups. Design of sampling programs will be done by the habitat studies supervisor. These studies will be performed in addition to work proposed by DNR, but will be done in close cooperation and coordination with that agency and other tasks performed by consultants as a part of the overall Susitna Hydro-feasibility study. If the DNR instream flow study (see Attachment I) is not funded, ADF&G will need to increase its budget in the amount that DNR requested in order to perform the required work. It is anticipated that other agencies such as the USGS and USFWS will also provide support for these instream flow studies.

The following outlines baseline studies required for each study area:

1. Cook Inlet to the Talkeetna-Susitna river confluence.* Spatial and seasonal habitat requirements of fish populations.

Objectives

The objectives within this study area are to:

1. define essential seasonal habitat requirements for incubation, rearing, spawning, and passage of anadromous and resident fish populations;

2. define the seasonal relationships between flow regimes and essential physical and biological habitat characteristics;

* Habitat study plans for the estuarine area will be based upon the findings of Phase I studies and initiated in the Phase II biological studies.

3. define the relationships between the tributary and slough physiochemical and biological habitats with the mainstem Susitna River at various flow regimes;

4. develop state-of-the-art capabilities to evaluate habitat characteristics in this difficult reach of river; and

5. generate data essential for evaluating the effects of various flow regimes on terrestrial and reparian habitat.

Background

This reach of the Susitna River provides important habitat for rearing, incubating, spawning, and migrating resident and anadromous fish species. Unfortunately, its physical characteristics also make it one of the most difficult to evaluate. Studies of seasonal habitat characteristics will be coordinated on an annual basis with the life history and distribution fish studies (both anadromous and resident).

Expansion or termination of these studies will depend upon determination and confirmation of:

1. The seasonal habitat requirements between various life history stages of the resident and anadromous fish.

2. The relationship of seasonal habitat to various discharges.

If positive confirmation is provided by the habitat study in conjunction with other biological studies, specific year to year study locations should be identified for ongoing programs to determine the effects of the project on the fish and wildlife resources in this portion of the basin.

Work Plan

The initial year of this study will be comprised of essentially three field operations:

1. mainstem seasonal instream flow measurements;

2. tributary seasonal instream flow measurements; and

3. collection of other physiochemical and biological habitat data.

A crew of two biologists utilizing a customized riverboat as their primary means of transportation will operate in the mainstem and selected tributary systems during the ice-free months May through October to:

1. Procure equipment.

2. Establish and refine large river instream flow measurement techniques.

3. Collect instream flow data in terms of depth, velocity, wetted perimeter, and substrate.

4. Collect water quality data as related to discharge.

It is essential that items 2 and 3 be coordinated with other fishery related and hydrological studies.

The Alaska Department of Natural Resources has submitted an instream flow proposal which will generate other required essential data. If their proposal is rejected the ADF&G will need to increase its budget requirements by $187,861 the first year and $110,000 each year after that to collect the data DNR was not funded to collect.

2. Talkeetna River confluence upstream to Devil canyon. Spatial and seasional Habiat requirements of fish populations

Ice Resident Fish Study Proposal.

3. Devil Canyon damsite upstream to the Tyone River confluence. Spatial and Seasonal habitarequirements of fish populations.

Ice Resident Fish Study Proposal.

GENERAL SAMPLING SCHEDULE 1/

Species	January	February	March	April	May	June	July	August	September	October	November	December
Sockeye												
Migration						----	----	----				
Spawning						----	----	----	----			
Incubation	----	----	----	----			----	----	----	----	----	----
Rearing	----	----	----	----	----	----	----	----	----	----	----	----
Pink												
Migration							----	----				
Spawning							----	----	----			
Incubation	----	----	----	----				----	----	----	----	----
Rearing	----	----	----	----	----	----	----	----	----	----	----	----
Chum												
Migration							----	----	----	----		
Spawning							----	----	----	----	----	
Incubation	----	----	----	----	----				----	----	----	----
Rearing	----	----	----	----	----	----	----	----	----	----	----	----
Coho												
Migration							----	----	----	----		
Spawning							----	----	----	----		
Incubation	----	----	----	----	----				----	----	----	----
Rearing	----	----	----	----	----	----	----	----	----	----	----	----
Chinook												
Migration					----	----	----					
Spawning					----	----	----	----				
Incubation	----	----	----	----				----	----	----	----	----
Rearing	----	----	----	----	----	----	----	----	----	----	----	----

1/ Lines represent months that sampling will be conducted.

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BUDGETS - SUSITNA HYDRO FISHERIES STUDIES

Administration and Support	CY 80	CY 81	Jan. 82
Line 100 - Personal Services			
FB IV at C step 12 mm @ 3,873/mo1/	46,476.00	46,476.00	3,873.00
Biometrician III 12 mm @ 4,053/mo	48,636.00	48,636.00	4,053.00
Biometrician II 24 mm @ 3,536/mo	42,432.00	42,432.00	3,536.00
Admin Asst. I 12 mm @ 2,181/mo	26,172.00	26,172.00	2,181.00
Publications Spec II 12 mm @ 2,841/mo	34,092.00	34,092.00	2,844.00
Clerk Typist III 12 mm @ 1,726/mo	20,712.00	20,712.00	1,726.00
Clerk Typist II 36 mm @ 1,636/mo	58,896.00	58,896.00	1,636.00
Maintenance Mechanic II 12 mm @ 2,730/mo	32,766.00	32,766.00	
Cartographer II @ 2,187/mo		13,123.00	2,187.00
Total	310,182.00	323,305.00	22,033.00
Line 200 - Travel			
Travel and Per Diem	10,000.00	10,000.00	850.00
Total	10,000.00	10,000.00	850.00
Line 300 - Contractual Services			
Office space for 12 mo 3,000 sq ft @ 1.25 sq ft/mo	45,000.00	45,000.00	3,750.00
Warehouse for 12 mo 1,000 sq ft @ .75 sq ft/mo	9,000.00	9,000.00	
Maintenance shop for 12 mo 1,000 sq ft @ .75 sq ft/mo	9,000.00	9,000.00	
Storage yard for 12 mo 20,000 sq ft @ .50 sq ft/mo	120,000.00	120,000.00	
Communications for 12 mo @ 400/mo	4,800.00	4,800.00	400.00
Professional services for 12 mo @ 400/mo	4,800.00	4,800.00	400.00
Equipment repair for 12 mo @ 100/mo	1,200.00	1,200.00	200.00
Freight and transportation for 12 mo @ 200/mo	2,400.00	2,400.00	
Air charter			
Fixed wing 30 hrs @ 150/hr	4,500.00	4,500.00	
Office equipment leases 4 mag card II's and xerox for 12 mo @ 1,500/mo	18,000.00	18,000.00	1,500.00
Vehicle rental 3 vehicles @ 750/mo	9,000.00	9,000.00	750.00
Total	227,700.00	227,700.00	7,000.00
Line 400 - Commodities			
Institutional supplies; clothing	500.00	500.00	
Structural materials and supplies	2,000.00	2,000.00	
Equipment parts and supplies	5,000.00	5,000.00	
Professional and scientific supplies	3,000.00	3,000.00	750.00
Office and library supplies @ 500/mo	6,000.00	6,000.00	500.00
Other operating supplies @ 100/mo	1,200.00	1,200.00	100.00
Total	17,700.00	17,700.00	1,350.00

Administration and Support (cont.)

Line 500 - Equipment

Desks, chairs, file cabinets, 21 office units @ approximately 750 each	15,250.00		
Optical and photographic Twelve 35 mm cameras @ 150/each	1,800.00		
Shop plant and industrial equipment	5,000.00	2,000.00	
Replacement, lost, damaged or stolen equipment to cover all project segments		36,000.00	
Total	22,050.00	38,000.00	0.00
GRAND TOTAL	$587,632.00	$616,705.00	$31,233.00
+ 10% CY 81 1/			
+ 20% CY 82 2/		$678,375.00	$37,480.00

1/ This position is the Susitna Hydro Fisheries Study Coordinator

2/ Percentage increases cover possible state employee wage increases under new contracts, merit increases, and inflation of costs of other items and services.

Task #1. Cook Inlet Stock Assessment

Scale Pattern Analysis	CY 80	CY 81	Jan 82
Line 100 - Personal Services			
10.5 mm FT II @ 1,826	19,173.00	19,173.00	
21.0 mm FT III @ 2,056	43,176.00	43,176.00	
10.5 mm FB I @ 2,471	25,946.00	25,946.00	
Total	88,295.00	88.295.00	0.00
Line 200 - Travel			
Travel/per diem	1,000.00	1,000.00	
Total	1,000.00	1,000.00	0.00
Line 300 - Contractual Services			
Contractual services (computer time)	5,000.00	5,000.00	
Aircraft charter (10 hrs C185 @ 150/hr)	1,500.00	1,500.00	
Vehicle rental (3 @ 250/mo and 3,000 miles)	2,040.00	2,040.00	
Total	8,540.00	8,540.00	0.00
Line 400 - Commodities			
Scientific supplies (500/field crew)	1,500.00	1,500.00	
Food (312 days @ 40/day)	3,120.00	3,120.00	
Gill nets	1,000.00		
Housing (650/mo)	1,300.00	1,300.00	
Clothing (200/person)	1,200.00	1,200.00	
Total	8,120.00	7,120.00	
Line 500 - Equipment			
Digitizer (Omega computer)	8,200.00		
Total	8,200.00	0.00	0.00
Total for Scale Pattern Analysis	$114,155.00	$104,955.00	0.00

Task #1. Cook Inlet Stock Separation

Electrophoresis			
Line 100 - Personal Services			
8 mm FT II @ 1,826	14,608.00	14,608.00	
Total	14,608.00	14,608.00	0.00

Electrophoresis (cont.)	CY 80	CY 81	Jan 82
Line 200 - Travel			
Travel/per diem	1,000.00	1,000.00	
Total	1,000.00	1,000.00	0.00
Line 300 - Contractual Services			
Contractual services (graduate student) includes all analysis of samples	15,000.00		
Aircraft charter (10 hrs C185 @ 150/hr)	1,500.00	1,500.00	
Vehicle rental (2 @ 250/mo and 2,000 miles)	1,360.00	1,360.00	
Total	17,860.00	2,860.00	0.00
Line 400 - Commodities			
Scientific supplies	1,000.00	1,000.00	
Food (208 days @ 10/day)	2,080.00	2,080.00	
Housing (650/mo)	1,300.00	1,300.00	
Clothing	800.00	800.00	
Total	5,180.00	5,180.00	0.00
Line 500 - Equipment	0.00	0.00	0.00
Total for Electrophoresis	38,648.00	23,648.00	0.00

Task #2. Susitna River Mouth to Yentna River

Susitna Station (May 15 - October 15)	CY 80	CY 81	Jan 82
Line 100 - Personal Services			
10 mm FB I @ 2,471	24,710.00	24,710.00	
Total	24,710.00	24,710.00	0.00
Line 200 - Travel			
Travel/per diem	200.00	200.00	
Total	200.00	200.00	0.00
Line 300 - Contractual Services			
Aircraft charter (18 hrs C185 @ 150)	2,700.00	2,700.00	
Freight (barge charter)	500.00	500.00	
Repairs of maintenance	1,200.00	1,200.00	
Total	4,400.00	4,400.00	0.00
Line 400 - Commodities			
Food (552 days @ 10/day)	5,520.00	5,520.00	
Scientific supplies	300.00	300.00	
Gas and O/B oil (15 barrels @ 75)	1,125.00	1,125.00	
Camp supplies	500.00	300.00	
Clothing	400.00	400.00	
Total	7,845.00	7,645.00	0.00
Line 500 - Equipment			
2 side scan sonar counters	78,000.00		
2 recorders	600.00		
Oscilloscope	900.00		
Total	79,500.00	0.00	0.00
Total for Susitna Station	$116,655.00	$36,955.00	0.00
Yentna Sonar			
Line 100 - Personal Services			
10 mm FB I @ 2,471	24,710.00	24,710.00	
10 mm FT II @ 1,826	18,260.00	18,260.00	
600 hrs overtime @ 18.25/hr	10,950.00	10,950.00	
Total	53,920.00	53,920.00	0.00

Yentna Sonar (cont.)	CY 80	CY 81	Jan 82
Line 200 - Travel	0.00	0.00	0.00
Line 300 - Contractual Services			
Freight (barge charter)	600.00	600.00	
Aircraft charter (35 hrs @ 150/hr)	5,250.00	5,250.00	
Repairs and maintenance	1,500.00	1,500.00	
Total	7,350.00	7,350.00	0.00
Line 400 - Commodities			
Food (616 days @ 10/day)	6,160.00	6,160.00	
Camp supplies	1,500.00	1,000.00	
Parts	1,500.00	1,500.00	
Tools	500.00	300.00	
Gas and O/B oil (45 barrels @ 75)	3,375.00	3,375.00	
Scientific supplies	300.00	300.00	
Fishwheels (2 - parts and labor)	2,400.00	500.00	
Clothing	800.00	800.00	
Total	16,535.00	13,935.00	0.00
Line 500 - Equipment			
2 boats	4,000.00		
Four 25 hp outboards	2,976.00		
2 side scan sonar counters	78,000.00		
Generator	350.00		
Compressor	350.00		
2 tape recorders (sonar)	600.00		
Oscilloscope (sonar)	900.00		
2 shotguns (bear protection)	400.00		
SSB radio	1,600.00		
Total	89,176.00	0.00	0.00
Total for Yentna Sonar	$166,981.00	$75,205.00	0.00
Radiotelemetry			
Line 100 - Personal Services			
5 mm FB I @ 2,471	12,355.00	12,355.00	
2.5 mm FT II @ 1,826	4,565.00	4,565.00	
9 mm FB I @ 2,471		22,239.00	
Total	16,920	39,159.00	0.00

Radiotelemetry (cont.)	CY 80	CY 81	Jan 82
Line 200 - Travel			
Travel/per diem	1,000.00	1,500.00	
Total	1,000.00	1,500.00	0.00
Line 300 - Contractual Services			
Aircraft charter (75/hrs C185 @ 150/hr)	11,250.00	11,250.00	
Equipment repair and maintenance	1,500.00	1,500.00	
Equipment rental (radio gear)	1,500.00		
Total	14,250.00	12,750.00	0.00
Line 400 - Commodities			
Food (228 days @ 10/day)	2,280.00	5,050.00	
Gas and O/B oil (20 barrels @ 75)	1,500.00	3,000.00	
Scientific supplies	300.00	300.00	
Miscellaneous equipment	500.00	500.00	
Camp equipment	800.00	1,200.00	
Radio tags	1,500.00	5,000.00	
Clothing	800.00	1,000.00	
Total	7,680.00	16,050.00	0.00
Line 500 - Equipment			
Boat	2,500.00	2,500.00	
Motors (2 - 35 hp)	1,752.00	1,752.00	
Radio	1,200.00		
Shotgun	200.00		
Radiotelemetry equipment		29,000.00	
Total	5,652.00	33,252.00	0.00
Total for Radiotelemetry	$45,502.00	$102,711.00*	0.00

* If technique is feasible.

Task #3. Yentna River to Talkeetna

Deshka Sonar Site	CY 80	CY 81	Jan 82
Same as Yentna Sonar			
Total	166,981.00	36,955.00	
Sunshine Sonar Site			
Line 100 - Personal Services			
10 mm FB I @ 2,471	24,710.00	24,710.00	
20 mm FT II @ 1,826	36,520.00	36,520.00	
Overtime 1,200 hrs @ 18.25	21,900.00	21,900.00	
Total	83,130.00	83,130.00	0.00
Line 200 - Travel	0.00	0.00	0.00
Line 300 - Contractual Services			
Vehicle rental (250/mo and 2,500 miles)	1,700.00	1,700.00	
Repairs and maintenance	1,500.00	1,500.00	
Total	3,200.00	3,200.00	0.00
Line 400 - Commodities			
Food (924 days @ 10/day)	9,240.00	9,240.00	
Camp supplies	1,500.00	1,000.00	
Parts	1,500.00	1,500.00	
Tools	500.00	300.00	
Gas and O/B oil (45 barrels @ 75)	3,375.00	3,375.00	
Scientific supplies	300.00	300.00	
Fishwheels (4 - parts and labor)	4,800.00	500.00	
Fish tags (10,000)	7,000.00	7,000.00	
Clothing	1,200.00	1,200.00	
Total	29,415.00	24,415.00	0.00
Line 500 - Equipment			
2 boats	4,000.00		
4 outboards	2,976.00		
2 side scan sonar counters	78,000.00		
Generator	350.00		
Compressor	350.00		
2 tape recorders	600.00		
Oscilloscope	900.00		
2 shotguns	400.00		
SSB radio	1,600.00		
2 boat trailers	3,400.00		
Total	92,576.00	0.00	0.00
Total for Sunshine Sonar Site	$208,321.00	$110,745.00	0.00

Anadromous Adult - Stock Assessment

Creel Census	CY 80	CY 81	Jan 82
Line 100 - Personal Services			
9 mm FT II @ 1,826	16,434.00	16,434.00	
Overtime 450 hrs @ 18.25	8,213.00	8,213.00	
Total	24,647.00	24,647.00	0.00
Line 200 - Travel	0.00	0.00	0.00
Line 300 - Contractual Services			
Vehicles (2 @ 250/mo and 2,000 miles)	860.00	860.00	
Total	860.00	860.00	0.00
Line 400 - Commodities			
Food (276 days @ 10/day)	2,760.00	2,760.00	
Housing (500/mo)	750.00	750.00	
Gas and O/B oil	1,000.00	1,000.00	
Total	4,510.00	4,510.00	0.00
Line 500 - Equipment	0.00	0.00	0.00
Total for Creel Census	$30,017.00	$30.017.00	0.00

Task #4. Budget is included in juvenile studies.

Task #5. Budget included in resident fisheries studies.

Program Supervisors			
Sonar Project Leader FB II @ 2,841/mo	34,092.00	34,092.00	2,841.00
Radiotelemetry Project Leader FB II @ 2,841/mo	34,092.00	34,092.00	2,841.00
Anadromous Fisheries Studies Supervisor @ 3,246/mo	38,952.00	38,952.00	3,246.00
Total	107,136.00	107,136.00	8,928.00
Grand Total	994,396.00	666,300.00	8,928.00
CY 81 + 10%1/		732,900.00	
CY 82 + 20%			10,700.00

1/ See explanation under Administration and Support

Resident and Juvenile Anadromous Fishery Study

Devil Canyon to Tyone River Impoundment	CY 80	CY 81	Jan 82
Line 100 - Personal Services			
3 FB I's @ 2,477 x 6 mos	44,478.00	44,478.00	
Total	44,478.00	44,478.00	0.00
Line 200 - Travel			
Transportation (train)	750.00	750.00	
Private vehicle mileage @ .25/mile	125.00	150.00	
Per diem 15 days @ 55	825.00	825.00	
Total	1,700.00	1,725.00	0.00
Line 300 - Contractual Services			
Communications	200.00	200.00	
Professional Services	300.00	200.00	
Repairs	500.00	600.00	
Freight and transportation	500.00	200.00	
Air charter			
Fixed wing @ 150/hr	3,000.00	6,000.00	
Helicopter @ 350/hr	28,000.00	14,000.00	
Watercraft charter @ 300/day	1,000.00	6,000.00	
Vehicle lease @ 200/mo	1,000.00	1,000.00	
Miscellaneous	500.00	500.00	
Total	35,000.00	28,600.00	0.00
Line 400 - Commodities			
Clothing	750.00	750.00	
Subsistance @ 15/day (4,300 days)	4,500.00	4,500.00	
Outboard fuels @ 1.10/gal	55.00	200.00	
Camp materials, supplies, tents, stoves, heaters, etc.	700.00	500.00	
Trap and net materials	1,400.00	1,200.00	
Miscellaneous	500.00	1,000.00	
Total	7,905.00	8,150.00	0.00
Line 500 - Equipment			
Inflatable boat	2,000.00		
Outboard (15 hp)	1,000.00		
Radio	1,500.00		

Resident and Juvenile Anadromous Fishery Study

Devil Canyon to Tyone River Impoundment (cont.)	CY 80	CY 81	Jan 82
Electroshocker	1,200.00		
Guns (2)	500.00		
Thermographs @ 300 each	3,600.00		
DO meter	600.00		
Conductivity meter	600.00		
pH meter	200.00		
Total	11,200.00	0.00	0.00
Total for Devil Canyon to Tyone River	$100,283.00	$82,953.00	0.00

Talkeetna River to Devils Canyon

Line 100 - Personal Services

3 FB I's @ 2,471 x 6 mos	44,478.00	44,478.00	
1 FB II @ 2,841 x 12 mos	34,092.00	34,092.00	
Total	78,570.00	78,570.00	0.00

Line 200 - Travel

Transportation (train)	1,600.00	2,000.00	
Private vehicle mileage	300.00	600.00	
Per diem @ 55/day	1,100.00	1,100.00	
Total	3,000.00	3,600.00	0.00

Line 300 - Contractual Services

Communications	250.00	300.00	
Professional services	150.00	150.00	
Repairs	750.00	1,000.00	
Freight and transportation (train)	1,000.00	1,100.00	
Air charter			
Fixed wing @ 150/hr	1,350.00	900.00	
Helicopter @ 350/hr	2,800.00	2,100.00	
Watercraft charter	600.00		
Cabin rental @ 150/mo	750.00	975.00	
Miscellaneous	600.00	600.00	
Total	8,050.00	7,025.00	0.00

Line 400 - Commodities

Clothing (boots, waders, etc.)	1,000.00	1,200.00	
Gill nets @ 150 each	1,200.00	1,200.00	
Seines 2 @ 150 each for CY 80			
CY 81 includes minnow traps	300.00	550.00	

Talkeetna River to Devils Canyon (cont.)	CY 80	CY 81	Jan 82
Subsistence food @ 15/day	6,000.00	6,000.00	
Outboard fuel @ 1.10/gal	2,200.00	2,400.00	
Marine oils, lubes, etc.	200.00	250.00	
Building materials	500.00	500.00	
Trap materials, net frames, bouys, etc.	500.00	500.00	
Miscellaneous	600.00		
Camp gear, stove, lantern, etc.	300.00	600.00	
Total	12,800.00	13,300.00	0.00
Line 500 - Equipment			
Riverboat	2,500.00		
Thermographs @ 300 each	6,000.00	1,200.00	
DO meter	600.00		
Conductivity meter	600.00		
pH meter	200.00		
Outboard motors @ 2,750 each	5,500.00		
Jet units @ 600 each	1,200.00		
Rubber raft	3,500.00		
Outboard 25 hp	1,400.00		
Radio	1,200.00		
Snowshoes @ 25 each	300.00		
Guns 2 @ 250	500.00		
Snowmachines 2 @ 1,600		3,200.00	
Snowmachine sleds (2)		150.00	
Ice auger	300.00		
Electroshocker	1,200.00		
Total	25,000.00	4,550.00	0.00
Total for Talkeetna River to Devils Canyon	$127,420.00	$107,045.00	0.00
Cook Inlet to Talkeetna			
Line 100 - Personal Services			
7 FB I's for 43/mos for CY 80 8 FB I's for 65/mos for CY 81	106,253.00	160,615.00	
1 FB III for 12 mos	38,952.00	38,952.00	
1 FT III for 4 mos	8,224.00	8,224.00	
Total	153,429.00	207,791.00	
Line 200 - Travel			
110 days per diem @ 55/day for CY 80 220 days per diem @ 55/day for CY 81	6,050.00	12,100.00	
Miscellaneous (pickup mileage)	600.00	1,000.00	
Total	6,650.00	13,100.00	0.00

Resident and Juvenile Anadromous Fishery Study

Cook Inlet to Talkeetna	CY 80	CY 81	Jan 82
Line 300 - Contractual Services			
Air charter @ 150/hr	9,600.00	12,000.00	
Vehicle @ 250/mo	5,250.00	10,250.00	
Engine repair	700.00	2,600.00	
Equipment rental	700.00	1,000.00	
Communications	700.00	1,000.00	
Total	16,950.00	26,850.00	0.00
Line 400 - Commodities			
Food @ 15/day	11,850.00	19,500.00	
Clothing	2,000.00	2,000.00	
Building materials	3,800.00	2,900.00	
Camp gear	600.00		
Net gear	4,300.00	4,000.00	
Fuel	4,700.00	7,540.00	
Oil	650.00	1,000.00	
Marine supplies	500.00	500.00	
Snowmachine supplies	500.00	400.00	
Miscellaneous	3,400.00	1,900.00	
Total	32,300.00	39,740.00	0.00
Line 500 - Equipment			
Riverboat	1,600.00		
75 hp outboard	2,700.00		
25 hp outboard	1,200.00		
Jet unit	600.00		
Trailer boat	500.00		
Radio	1,000.00		
Rifle	300.00		
4 snowmachines	6,400.00		
2 trailers (SM)	1,000.00		
2 ice augers	600.00		
2 chainsaws	600.00		
Canoe	600.00		
Backback shocker	1,200.00		
Total	18,300.00	0.00	0.00
Total for Cook Inlet to Talkeetna	$227,629.00	$287,481.00	0.00
Grand Total	$455,332.00	$477,479.00	0.00
CY 81 + 10%		$525,226.00	

Resident and Juvenile Anadromous Fishery Study

CY January 1982

Line 100 - Personal Services

1 Bio II for 1 mo	2,841.00
1 Bio III for 1 mo	3,246.00
2 Bio I's for 1 mo	4,942.00
Total	11,029.00

Line 200 - Travel

Travel and per diem (1,000 each)	2,000.00
Total	2,000.00

Line 300 - Contractual Services

Communications	250.00
Printing and professional services	750.00
Equipment rental	250.00
Vehicle lease @ 250/mo	250.00
Total	1,500.00

Line 400 - Commodities

Office supplies	500.00
Miscellaneous	250.00
Total	750.00

Line 500 - Equipment 0.00

Total for CY January 1982 $15,279.00

Spatial and Seasonal Habitat Studies

The Alaska Department of Natural Resources has submitted an instream flow proposal which is coordinated with the Alaska Department of Fish and Game's spatial and seasonal habitat instream flow studies and designed to generate other essential depth and velocity data we require. If their proposal is rejected we will need to increase our budget requirements by $187,861 the first year and 110,000 each year after that to collect the data they were not funded to collect.

It should be noted that the scope of these studies is based upon the assumption that other essential hydrological data will be generated and be available on a timely basis. A final determination as to the adequacy of the other proposed hydrological and habitat related studies prepared by Acres cannot and will not be made until the U.S. Geological Survey and other resource agencies also evaluate the entire revised draft proposal Acres or the Corps of Engineers is selected to prepare in November, 1979.

Cook Inlet to Portage Creek	CY 80	CY 81	Jan 82
Line 100 - Personal Services			
1 FB III Step B @ 3,359.00 for 12 mo	40,308.00	40,308.00	3,359.00
1 Hydrologist III Step B @ 3,359 for 12 mo	40,308.00	40,308.00	3,359.00
2 FB I/II's @ 2,841 for 12 mo	68,184.00	68,184.00	4,562.00
3 FB I's @ 2,471 (9 mo for CY 80)	66,717.00	88,956.00	7,413.00
Total	215,517.00	237,756.00	18,693.00
Line 200 - Travel			
240 days per diem @ 55/day	13,200.00	13,200.00	
2 trips to Ft. Collins @ 800 x 2 people	3,200.00	3,200.00	
Miscellaneous			800.00
Total	16,400.00	16,400.00	800.00

Spatial and Seasonal Habitat Studies

Cook Inlet to Portage Creek (cont.)	CY 80	CY 81	Jan 82
Line 300 - Contractual Services			
Air charter			
15 hrs/mo for 7 mo @ 150/hr	15,750.00	15,750.00	
Vehicle 12 mo @ 250/mo	3,000.00	3,000.00	
Engine repair and maintenance	1,000.00	1,000.00	
Equipment rental	300.00	300.00	
Communications	3,600.00	3,600.00	350.00
USGS, Instream Flow Group consultation and analysis	12,000.00	18,000.00	
Boeing computer analysis	10,000.00	25,000.00	2,000.00
Miscellaneous	500.00	500.00	1,000.00
Total	46,150.00	67,150.00	3,300.00
Line 400 - Commodities			
Food: CY 80 700 days @ 15/day CY 81 & 82 980 days @ 15/day	10,500.00	14,700.00	
Clothing; boots, life jackets, tents, sleeping bags, etc.	4,500.00	1,000.00	
Fuel; 20 wks 200 gal/wk @ 1.25/gal	5,000.00	5,000.00	
Oil, lube, etc.	700.00	700.00	
Marine supplies	1,500.00	1,500.00	
Miscellaneous	1,800.00	1,800.00	600.00
Snowmachine supplies	200.00	200.00	
Total	24,200.00	24,900.00	600.00
Line 500 - Equipment			
3 level Lietz 3-2 @ 1,600 each	4,800.00		
3 tripods (dome) @ 150 each	450.00		
Survey stakes	300.00		
2 measuring tapes and holders 300' @ 150 each	300.00		
Two 35 mm SLR cameras, (macro lens and polarized filter) @ 350 each	700.00		
Electronic surveying equipment, angle measurements, range measurements, field computer	20,500.00		
2 rifles @ 250 each	500.00		
5 current meters (AA) @ 350 each	1,750.00		
3 current meters (pygmy) @ 400 each	1,200.00		
3 Marsh McBirney flow meters, digital readout @ 1,600 each	4,800.00		
11 top setting wading rods @ 200 each	2,200.00		
Suspended flow support system	400.00		
2 boat mounted flow metering systems @ 1,600 each	3,200.00		

Spatial and Seasonal Habitat Studies

Cook Inlet to Portage Creek (cont.)	CY 80	CY 81	Jan 82
Sonar narrow beam system	3,000.00		
8 headsets @ 50 each	400.00		
Two 2-way radio walkie talkie @ 1,000 each	2,000.00		
2 compasses @ 50 each	100.00		
Rebar	100.00		
4 leveling rods @ 150 each	600.00		
4 cable tagliners 300' @ 150	600.00		
Tools for repair	175.00		
20' Wooldridge boat (capable of performance in Portage area)	4,000.00		
13' Avon riverboat	1,800.00		
85 hp (jet foot)	3,800.00		
25 hp (kicker)	1,200.00		
25 hp (for Avon)	1,200.00		
Boat trailer	2,000.00		
3 field calculators @ 70 each	210.00		
Desk calculator	700.00		
Office equipment	1,300.00		
5 DO meters @ 600 each	3,000.00		
5 conductivity meters @ 600 each	3,000.00		
5 pH meters @ 200 each	1,000.00		
15 thermometers @ 25 each	375.00		
40 thermographs @ 350 each	14,000.00		
400 Leupold staff gages @ 11.00	4,400.00		
Total	90,060.00	0.00	0.00
Total for Cook Inlet to Portage Creek	$392,327.00	$346,206.00	$23,393.00

Spatial and Seasonal Habitat Studies

Portage Creek to Tyone River	CY 80	CY 81	Jan 82
Line 100 - Personal Services			
See resident studies			
Line 200 - Travel			
See resident studies			
Line 300 - Contractual Services			
Air charter			
6 hrs/mo for 6 mos @ 150/hr	5,400.00	5,400.00	
Helicopter 5/hrs for 4 mos @ 350/hr	7,000.00	7,000.00	
Total	12,400.00	12,000.00	0.00
Line 400 - Commodities			
See resident studies			
Line 500 - Equipment			
DO meter	600.00		
Conductivity meter	600.00		
pH meter	200.00		
3 thermometers @ 25 each	75.00		
Marsh McBirney meter	1,600.00		
AA meter	350.00		
Pygmy meter	400.00		
2 measuring tapes 300' @ 150 each	300.00		
2 topsetting wading rods @ 200 each	400.00		
2 headsets @ 50 each	100.00		
35 mm camera, (macro lens and polarized filter) @ 350	350.00		
25 Leupold staff gages @ 11.00	275.00		
Total	5,250.00	0.00	0.00
Grand Total	$409,977.00	$358,206.00	$23,393.00
CY 81 + 10%		35,321.00	
CY 82 + 20%			4,679.00
		$394,027.00	$28,072.00

WILDLIFE STUDIES

Introduction

The Susitna River drainage contains a diverse array of terrestrial habitat types which support major concentrations of wildlife. The variety of species inhabiting this area is probably equal to any other northern terrestrial system in the world. Much of the area is only sparsely developed but is relatively accessible to Alaska's major human population centers. As a result this area is among the most popular wildlife use areas providing opportunities for both consumptive and non-consumptive users. While wildlife uses in the area are primarily recreational, subsistence and commercial uses are also important.

Development of the Susitna River's hydroelectric potential is likely to affect many wildlife species. A number of mechanisms of impact are possible, some direct and obvious and others indirect and subtle. The primary mechanisms that have been identified include total loss of habitat in impoundments, alteration of habitat downstream through vegetation changes, restriction of movement patterns leading to altered habitat use patterns, changes in interspecific relationships such as changes in prey availability to predator populations, and increased accidental mortality from hazards such as ice shelves and mud flats.

Probable impacts vary from species to species and area to area. In some cases enough information is presently available to predict that adverse impacts will occur. An example is the inundation of moose winter range. In such cases studies are needed to quantify predictions and identify secondary impacts. In other cases such as those involving alteration of vegetation downstream, a possibility of significant impacts can be perceived but too little is known to predict with certainty whether actual impacts will occur. In these cases it is necessary to both identify impact mechanisms and quantify them.

Assessment of impacts on wildlife requires more than information on wildlife populations. Strong supporting data on wildlife habitat and environmental conditions are needed. Therefore a coordinated multi-disciplinary approach is required from the outset. The Alaska Department of Fish and Game will be conducting studies directed at certain large mammal species. These studies are only pieces of the terrestrial impact assessment puzzle. Other pieces such as studies of other wildlife, vegetation, climatology, hydrology socio-economics, etc., will be produced by other agencies or firms. It is essential that a broad study approach be laid out before studies begin to ensure that the pieces fit together to form a satisfactory impact assessment.

Title

Moose distribution, movements and habitat use in the vicinity of proposed impoundments.

Objectives

To identify moose subpopulations using habitat that will be inundated by proposed impoundments.

To determine the seasonal distribution, movement patterns, size and trends of those subpopulations.

To determine the timing and degree of dependency of those subpopulations on habitat to be impacted by the Susitna Hydroelectric Project.

Background

Preliminary studies indicated that several loosely defined subpopulations of moose inhabit proposed impoundment areas for all or part of the year. Most moose studied exhibited altitudinal migration patterns, spending summers at higher elevations often outside of the proposed impoundment areas and winters at lower elevations often within or adjacent to impoundment areas. Therefore the most severe impacts of the Susitna Hydropower project on moose upstream from Devils Canyon are expected to result from inundation of and blockage of migrations to critical winter range. Since some moose migrate to summer range up to 60 miles from their winter range, reductions in the capacity of winter range may result in reduced densities of moose over a vast area.

The basic approach of this study is to identify the subpopulations of moose using potential impoundment areas and to quantify their dependence on those areas. For example, winter range of each subpopulation will be delineated and the proportion of available winter range that will be lost will be estimated. Factors such as browse production, quality and availability under varying environmental conditions will be considered. Since environmental conditions influencing these factors vary from year to year it will be necessary to continue these studies for several years.

Both the short term impact on the present moose population and the longer term loss of potential population size will be estimated by determing the size and trends of the existing population and assessing its status in relation to the present capacity and trends of the range.

The relationship between moose habitat and moose populations is complex. It is difficult to quantify this relationship and impractical to attempt to measure all aspects over the entire impact area. Therefore it will be necessary to conduct intensive studies in only

portions of the area to estimate the relative capacity of certain habitat types under certain environmental conditions. These estimates will then be extrapolated to the entire impact area on the basis of more extensive moose population studies and habitat maps.

Data derived directly from the moose will be collected under this subtask while data derived from the moose's habitat will be collected under other subtasks, particularly 7.12 Plant Ecology.

It is anticipated that by the end of Phase I the basic distribution and movement patterns of the major moose subpopulations will be known. The present number of moose using the study area will be estimated. A rough estimate of the percentage of winter habitat used during the winter of 1980-81 that will be lost should be possible. In other words it should be possible to estimate the overall scope and a range of magnitude of potential impacts. Studies must be continued through Phase II to determine impacts under a wider variety of environmental conditions and to test and refine the estimates made at the end of Phase I.

Procedures

1. Approximately 60 moose will be radio-collared during the first year of study. Most of these will be collared in March 1980 when moose are on winter range and most likely to be in or near proposed impoundment areas. Subsequent collaring operations will be conducted as needed to replace collars and to fill data gaps. Moose will be collared from Devils Canyon to the confluence of the Maclaren and Susitna Rivers, however it is anticipated that most will be collared in the vicinity of the proposed Watana impoundment which is expected to impact more moose than the Devils Canyon impoundment. Radio-collared moose will be relocated at least twice a month to delineate seasonal ranges. More intensive monitoring will be conducted as needed to determine migration patterns and calving areas and to delineate critical winter range. The specific location, habitat type, activity, and association with other moose will be recorded for each relocation. Habitat type will be classified according to the system that will be used in habitat mapping under subtask 7.12.

2. Periodic systematic aerial surveys will be made during winter to further delineate winter ranges and quantify the relative use of specific areas and habitat types in and out of proposed impoundment areas. To the extent possible moose will be classified by sex and age class as an aid in identifying segregation patterns and determining population trends.

3. Moose numbers will be estimated through quadrat sampling techniques during late winter.

4. The long and short term nutritional status of moose captured for collaring will be assessed through established techniques using morphometric measurements, condition classification, blood chemistry and hair mineral element levels.

Relationship to Other Subtasks

Procedures for recording and handling data will be coordinated with those of other wildlife studies to ensure efficiency in later impact analysis.

Personnel and logistics will be coordinated among all big game studies. In particular wolf and wolverine tagging will be coordinated with moose tagging and when feasible several species will be radio-tracked on the same flight.

Moose studies will be closely coordinated with plant ecology studies. Moose distribution data collected between January and March 1980 will be used to delineate areas for detailed habitat mapping and for selection of intensive vegetation study areas. These habitat maps will be used in the analysis of moose distribution data. It is anticipated that continual coordination between investigators of both subtasks will be maintained to ensure efficiency of study design and compatability of data.

Snow conditions strongly influence moose movements and browse availability. Requirements for snow data will be determined on the basis of final project design and selection of detailed vegetation study areas. If possible these needs will be coordinated with those of the hydrologic field data collection program. It may be necessary to establish additional stations solely on the basis of moose study needs.

Title

Moose distribution, movements and habitat use downstream from Devils Canyon.

Objectives

To identify moose subpopulations using habitat that will be altered by changes in stream flow below Devils Canyon.

To determine the seasonal distribution, movement patterns, size and trends of those subpopulations.

To determine the timing and degree of dependency of those subpopulations on habitat to be impacted by altered flow regimes of the Susitna River.

Background

Islands and bars in the Susitna River are heavily used by moose during winter, particularly in years of deep snow. A major factor making these areas attractive to moose appears to be the maintenance of vegetation in a subclimax stage by the existing flow regime of the river. The mechanism setting back plant succession in not known. Periodic flooding may be the dominant factor but other factors such as siltation, normal channel errosion, ice scouring and soil moisture may also be important.

Alteration of the Sustina River flow regime by the Susitna Hydroelectric Project will probably result in changes in vegetation downstream. The nature and magnitude of these changes are unknown but could be significant to moose and other species of wildlife. It is possible that even minor changes in flow such as dampening of extreme flood levels by a few inches could alter many acres of critical moose winter range. Such alterations could influence moose abundance over a large area.

Because of the many unknowns, assessment of the impact of the Susitna Hydroelectric Project on moose populations in the lower Susitna River drainage will require synthesis of information from several disciplines including hydrology, geomorphology, plant ecology and wildlife ecology. Under ideal circumstances a systematic progression of studies starting with hydrology and ending with wildlife ecology should be followed. However, the scheduled time frame for developing the Sustina Hydroelectric Project is incompatible with this approach. Therefore it will be necessary to conduct a number of studies simultaneously.

The basic approach will be to identify mechanisms of impact and roughly estimate the potential magnitude of impact during Phase I. If significant impacts are identified the studies will be redesigned

to produce a more reliable estimate of impact and to provide an initial assessment of mitigation possibilities.

Studies of the effects of water conditions on moose habitat will be conducted under Subtask 7.12 Plant Ecology. It is anticipated that by the end of Phase I these studies will indicate if substantial changes will be caused by the predicted post-construction flow regime. A habitat map, which will also be prepared under Subtask 7.12 during Phase I, will provide a basis for preliminary estimates of acreages that might be altered. If significant vegetation changes are indicated by the Phase I studies these estimates will be refined during Phase II.

The dependency of moose on habitat subject to alteration will be assessed under this subtask. During Phase I moose wintering areas on and adjacent to the river will be delineated and the relative use of various habitat types, particularly those subject to periodic flooding, will be determined. This will provide the basis for a preliminary estimate of the proportion of winter range that may be altered, however, this estimate will be valid only for the environmental conditions existing during the winters of 1979-80 and 1980-81.

Characteristics of moose use of habitat subject to flooding will be determined by more intensive study of moose using one or more limited study areas. These study areas will include areas selected for intensive vegetation studies. Movements of individual moose will be monitored to determine whether habitat subject to flooding is used transiently by large numbers of moose or more regularly by smaller numbers. Moose use of specific plots being studied under Subtask 7.12 will be assessed through direct observation and pellet group counts.

Seasonal ranges of moose wintering on the intensive study area will be superficially delineated to indicate the approximate geographic scope of any impacts that are identified.

If Phase I studies indicate that the Susitna Hydroelectric Project will cause significant alteration of habitat downstream and that alteration of this habitat is likely to result in significant changes in moose distribution and numbers, Phase II studies will be designed to delineate moose subpopulations using the entire area of potential habitat alteration and to predict the impact on each subpopulation.

Procedures

The following procedures are for Phase I studies only:

1. Existing data on moose distribution and movements adjacent to the lower Susitna River will be compiled. Sources will include historic fall sex and age composition counts, records of road and railroad kills, and incompletely analyzed data on a major winter die-off that occurred along the river in 1970-71.

2. Periodic systematic aerial surveys will be made during winter to delineate winter ranges and quantify the relative use of specific areas and habitat types adjacent to the Susitna River. To the extent possible moose will be classified by sex and age class as an aid in identifying segregation patterns and determining population trends.

3. A limited number of moose (up to 20 during 1980) will be radio-collared in areas selected for intensive vegetation study (see subtask 7.12). These moose will be relocated approximately weekly while they are in the vicinity of the river to determine the pattern of use of specific habitats. They will be relocated approximately monthly at other times of year to roughly delineate other seasonal ranges and ensure continued contact with each animal.

4. Pellet group counts will be conducted within the intensive study areas to provide a quantitative comparison of moose use of specific habitats that will also be studied under subtask 7.12.

Relationship to Other Subtasks

Procedures for recording and handling data will be coordinated with those of other wildlife studies to ensure efficiency in later impact analysis.

Moose studies will be closely coordinated with plant ecology studies. Moose distribution data collected between January and March 1980 will be used to delineate areas for detailed habitat mapping and for selection of intensive vegetation study areas. These habitat maps will be used in the analysis of moose distribution data. It is anticipated that continual coordination between investigators of both subtasks will be maintained to ensure efficiency of study design and compatability of data.

Snow conditions strongly influence moose movements and browse availability. Requirements for snow data will be determined on the basis of final project design and selection of detailed vegetation study areas. If possible these needs will be coordinated with those of the hydrologic field data collection program. It may be necessary to establish additional stations solely on the basis of moose study needs.

Title

Wolf distribution, abundance, habitat use and prey selection.

Objectives

To identify wolf packs occupying areas that will be impacted by the Susitna Hydroelectric Project.

To delineate the territories of each pack and identify den sites, rendezvous sites and major feeding areas.

To determine the numbers of wolves and rates of turnover for each pack.

To determine the food habits of each pack.

Background

Recent studies indicate that the Nelchina Basin supports moderate densities of wolves. Wolves may be affected by the Susitna Hydroelectric project if critical portions of a pack's territory are inundated or if the abundance or condition of prey is altered.

Limited available data indicate that portions of the territories of several packs may be inundated. Since all parts of a pack's territory may not be equally important to the maintenance of the pack, the effect of this loss of territory may vary from pack to pack. Therefore it is necessary to delineate the territories of each pack and determine the degree and nature of use of areas within proposed impoundments.

A major factor influencing wolf numbers and distribution is prey availability. Recent studies in other parts of the Nelchina Basin indicate that large ungulates, particularly moose, are the most important prey of most packs of wolves. Since moose and caribou tend to be migratory it is possible that the Project will result in reduced prey availability in the territories of wolf packs many miles from the impoundments.

An assessment of the impact of the Project on wolves requires a knowledge of prey populations. Therefore wolf studies will be closely coordinated with studies of potential prey species.

Initially studies will be concentrated on wolf packs that are likely to be directly impacted through loss of territory. If studies of prey species indicate that prey densities are likely to be altered in other areas, the wolf study will be expanded to delineate packs in those areas.

Procedures

1. Several members of each wolf pack will be radio-collared. Each radio-collared wolf will be relocated at least twice a month. More frequent relocations will be made when necessary to provide specific information such as location of dens and rendezvous sites. Territories will be delineated by plotting relocations on maps. Numbers of wolves in each pack will be monitored continuously by direct observation of radio-collared wolves and other wolves accompanying them.

2. Habitat selection will be determined by recording the habitat type and activity of the wolves for each sighting made.

3. Standardized track count censuses will be conducted after fresh snowfalls to provide additional information on wolf distribution and numbers and identify packs not radio-collared.

4. Food habits will be determined by observation of kills located during radio-tracking flights and analysis of scats collected at dens. When possible the age, sex and condition of prey will be determined.

Relationship to Other Subtasks

Procedures for recording and handling data will be coordinated with those of other wildlife studies to ensure efficiency in later impact analysis.

Personnel and logistics will be coordinated among all big game studies. In particular wolf and wolverine tagging will be coordinated with moose tagging and when feasible several species will be radio-tracked on the same flight.

Data from studies of prey, particularly moose and coribou will be used in modification of design of wolf studies. Studies of both predators and prey will be closely coordinated so that interactions between species which might influence impacts of the Sustina Hydroelectric Project can be identified.

Title

Wolverine distribution, abundance, movement patterns and habitat use.

Objectives

To determine the distribution and abundance of wolverines in the vicinity of proposed impoundments.

To determine movement patterns and home range size of wolverines.

Background

Little is known about wolverine movement patterns and habitat requirements. A basic understanding of these questions is necessary before impacts of the Susitna Hydroelectric Project can be addressed. For example if wolverines have well defined home ranges and strict habitat requirements impacts might be quite different than if they have large and loosely defined home ranges and are able to exploit a wide variety of habitat types.

Observations made in the vicinity of the study area indicate that techniques that will be employed in the wolf study could be adapted to provide the necessary basic information on wolverines.

Since very little is known of wolverines at the present time it is anticipated that only rough estimates of the mechanisms and potential magnitude of impacts will be possible at the end of Phase I. At that time it may be necessary to redesign studies to provide a more reliable basis for assessment of impact.

Procedures

1. The distribution and abundance of wolverines will be assessed through track counts and direct observations made during wolf census surveys.

2. Wolverine (up to 10 in 1980) will be radio-collared and relocated approximately twice per month to determine movement patterns and home range.

3. Habitat selection will be determined by recording habitat type and activity for each sighting made.

Relationship to Other Subtasks

Procedures for recording and handling data will be coordinated with those of other wildlife studies to ensure efficiency in later impact analysis.

Personnel and logistics will be coordinated among all big game studies. In particular wolf and wolverine tagging will be coordinated with moose tagging and when feasible several species will be radio-tracked on the same flight.

Personnel from the University of Alaska are expected to have opportunities to collect additional information on wolverines in the course of studies directed at other furbearers. All aspects of both studies will be coordinated to maximize data collection with a minimum of duplication of effort.

Title

Bear distribution, movements, abundance and habitat use.

Objectives

To determine the distribution and abundance of black and brown/grizzly bears in the vicinity of proposed impoundment areas.

To determine seasonal ranges, including denning areas, and movement patterns of bears.

To determine seasonal habitat use of black and brown/grizzly bears.

Background

Much of the Nelchina Basin is known to support high densities of brown/grizzly bears. Black bears are believed to be less abundant and less widely distributed. The main mechanism of impact affecting bears is likely to be direct loss of habitat particularly seasonally important feeding areas or denning areas. Some bears may be indirectly affected through reduction in ungulate densities in areas outside of proposed impoundments as moose and perhaps caribou constitute a major portion of bears' diet during summer in adjacent areas. Shorter term impacts will result from bear-human conflicts which are likely to occur when field facilities are established for the Susitna study program and subsequent dam construction if the project is approved.

Studies in other parts of Alaska indicate that bears have specific habitat and food preferences. These preferences often vary seasonally in a manner that suggests very specific seasonal habitat requirements. While both species of bear sometimes occur in close proximity, their habitat requirements are probably different. Therefore the impact of inundation of bear habitat may not be in direct proportion to the number of acres lost and the impact on one species of bear may be quite different from that on the other.

Procedures

1. Adult bears will be radio-collared in and adjacent to the proposed impoundment areas. Approximately 35 bears will be collared the first year. Incidentally caught bears too small to be radio-collared will be marked with visual tags. Black bears and brown/grizzly bears will be marked in the approximate proportion of their occurrence in the area. At this time it is not known if significant members of black bears will be found.

2. Radio-collared bears will be relocated periodically throughout their active period to delineate seasonal ranges and determine movement patterns. The den location for each radio-collared bear will be recorded each year.

3. All observations of both marked and unmarked bears will be recorded. For each sighting the location, habitat type, activity and association with other animals will be recorded.

4. Information on seasonal food habits will be gathered through observations of bear feeding and to the extent possible through scat analysis.

Relationship to Other Subtasks

Procedures for recording and handling data will be coordinated with those of other wildlife studies to ensure efficiency in later impact analysis.

Personnel and logistics will be coordinated among all big game studies. When feasible several species will be radio-tracked on the same flight.

Title

Caribou herd identity, migration patterns and habitat use.

Objectives

To delineate calving areas.

To determine the numbers and sex and age composition of caribou occupying habitats on both sides of proposed impoundments at different seasons.

To determine migration routes and the timing of major movements in the vicinity of proposed impoundments.

Background

The distribution and movement patterns of the Nelchina caribou herd were extensively studied during the 1950's and 1960's. At that time large numbers of caribou regularly crossed proposed impoundment areas during migrations between seasonal ranges, particularly on their migration from calving areas south of the Susitna River to summer range north of the river and subsequent fall migrations to the east. Early assessments of the impact of various Susitna hydroelectric proposals suggested that impoundments could block migrations and isolate caribou from portions of their traditional range.

A number of major changes have occurred during the last decade which limit the value of data collected prior to 1970. The herd suffered a major decline in the early 1970's dropping from an estimated peak of over 70,000 to less than 10,000. The herd is currently increasing and estimated to number 20,000. Current management plans call for stabilizing the herd at the present level. Movement patterns appear to have become quite variable from year to year. While movements across proposed impoundment areas still occur it is not clear whether they are as significant to the population as they were thought to be in past years.

Location of calving areas is believed to be the most consistent characteristic of caribou distribution and movement patterns. The traditional concept of a herd assumes a well defined common calving area. The Nelchina herd still uses its traditional calving area south of the Susitna River, however, in the last few years there have been indications of significant numbers of caribou north of the river during the calving period. These caribou may represent a subherd with all sex and age classes represented or they may be segments of the main herd that are not involved in calving.

If a new subherd exists the "need" to migrate across the proposed impoundment areas may be reduced. But if different sex and age classes are on opposite sides of the river at that time of year the need to migrate would be great.

It is not likely that caribou would be completely excluded from any part of their range other than those areas that are inundated. However, even a partial barrier to movements could result in reduced use of portions of the present range and increased use of other portions. If the desire to migrate along routes blocked by impoundments is strong, caribou may attempt to cross impoundments. Potential hazards such as ice shelves and mud flats could increase mortality rates among caribou attempting to cross.

Unfortunately there is no way to predict with confidence the reaction of caribou to impoundments. The caribou impact assessment will necessarily be more subjective than those for other big game species. The approach of this study is to describe the existing patterns of caribou distribution, movements and habitat use. This should provide a basis for estimating the importance of specific migration routes to the present population and for determining the availability of alternative migration routes.

Procedures

1. Aerial surveys will be made to delineate distribution of caribou on both sides of proposed impoundments and to determine if calving is occurring north of the Susitna River.

2. Post-calving concentrations on both sides of the river will be censused by commonly used photo extrapolation techniques to determine the proportion of the herd occupying habitat north of the river.

3. Sex and age composition counts will be made in spring and fall as part of the census procedure. These counts will also indicate if the sexes and ages caribou using habitat on one side of the river are different from those using habitat on the other side.

4. Caribou (up to 40 in 1980) on both sides of the river will be radio-collared. Collars will be placed on animals in different groups of caribou scattered throughout the herd. The frequency of relocation of radio-collared caribou will vary depending on the location and activity of the caribou. Relatively low levels of monitoring will be maintained when caribou are away from the impoundment areas or are sedentary to provide basic information on seasonal ranges and habitat use and to ensure continued contact with collared individuals. The frequency of monitoring will be increased when caribou are close to impoundment areas, particularly during migrations.

5. Habitat type will be recorded for all caribou sightings.

Relationship to Other Subtasks

Procedures for recording and handling data will be coordinated with those of other wildlife studies to ensure efficiency in later impact analysis.

Personnel and logistics will be coordinated among all big game studies. In particular individuals working on other species will record caribou observatons and periodically scan radio frequencies in the vicinity of impoundments to assist in identifying periods when intensive caribou monitoring is needeed.

Title

Distribution and abundance of Dall sheep.

Objectives

To determine the distribution and abundance of Dall sheep adjacent to proposed impoundments.

Background

Relatively isolated groups of Dall sheep inhabit mountainous areas on both sides of the proposed Watana impoundment. At the present time it is not believed that sheep regularly use habitat that will be inundated or that they regularly migrate through areas which will be inundated. It is possible that the Watana impoundment might further isolate groups north of the river from larger adjacent populations south of the river reducing possibility of repopulation should these groups decline in the future.

The main concern is the effect of disturbance during construction of hydroelectric generation and transmission facilities. It may be possible to zone construction activities in both time and space to minimize this disturbance. The purpose of this study is to provide a basis for decisions on such zoning.

Procedures

Aerial surveys will be made to delineate seasonal ranges including rutting and lambing areas.

Relationship to Other Subtasks

Since the scope of this study is limited, only minor coordination of personnel and logistics will be necessary.

BIG GAME STUDIES - PHASE I
(all costs in 1000 x 1980 dollars)

Adminstration and Support

100 Salaries and Benefits

Job Class	Rate/month *	1980 Man Months	1980 Cost	1981 Man Months	1981 Cost	1982 Man Months	1982 Cost
Game Biologist IV	4442	6	26.7	6	26.7	1	4.4
Biometrician II	3475	6	20.9	6	20.9		
Programmer III	3035	3	9.1	6	18.2		
Administrative Assistant I	2386	2	4.8	2	4.8		
Clerk Typist III	1726	9	15.5	12	20.7	1	1.7
Total:			77.0		91.3		6.1
200 Travel			4.0		4.0		
300 Contractual Services			6.0		6.0		
Total: (rounded to nearest $1000)			87.0		101.0		6.0

Big Game Studies

100 Salaries and Benefits

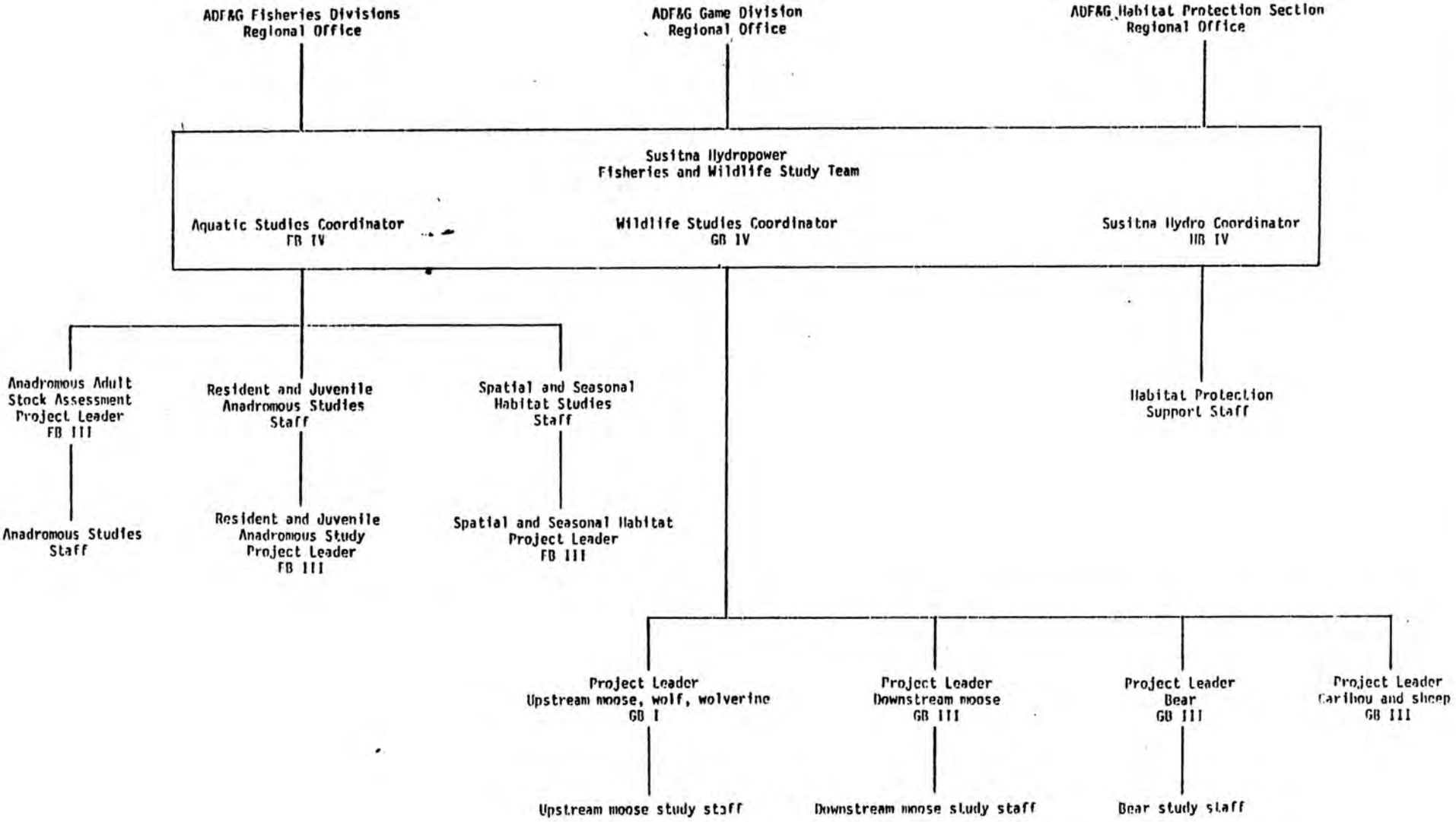
Job Class	Rate/month *	1980 Man Months	1980 Cost	1981 Man Months	1981 Cost	1982 Man Months	1982 Cost
Game Biologist III	3773	40	150.9	40	150.9	4	15.1
Game Biologist I	2841	24	68.2	20	56.8		
Fish and Game Technician III	2163	16	34.6	10	21.6		
Total:			253.7		229.3		16.8

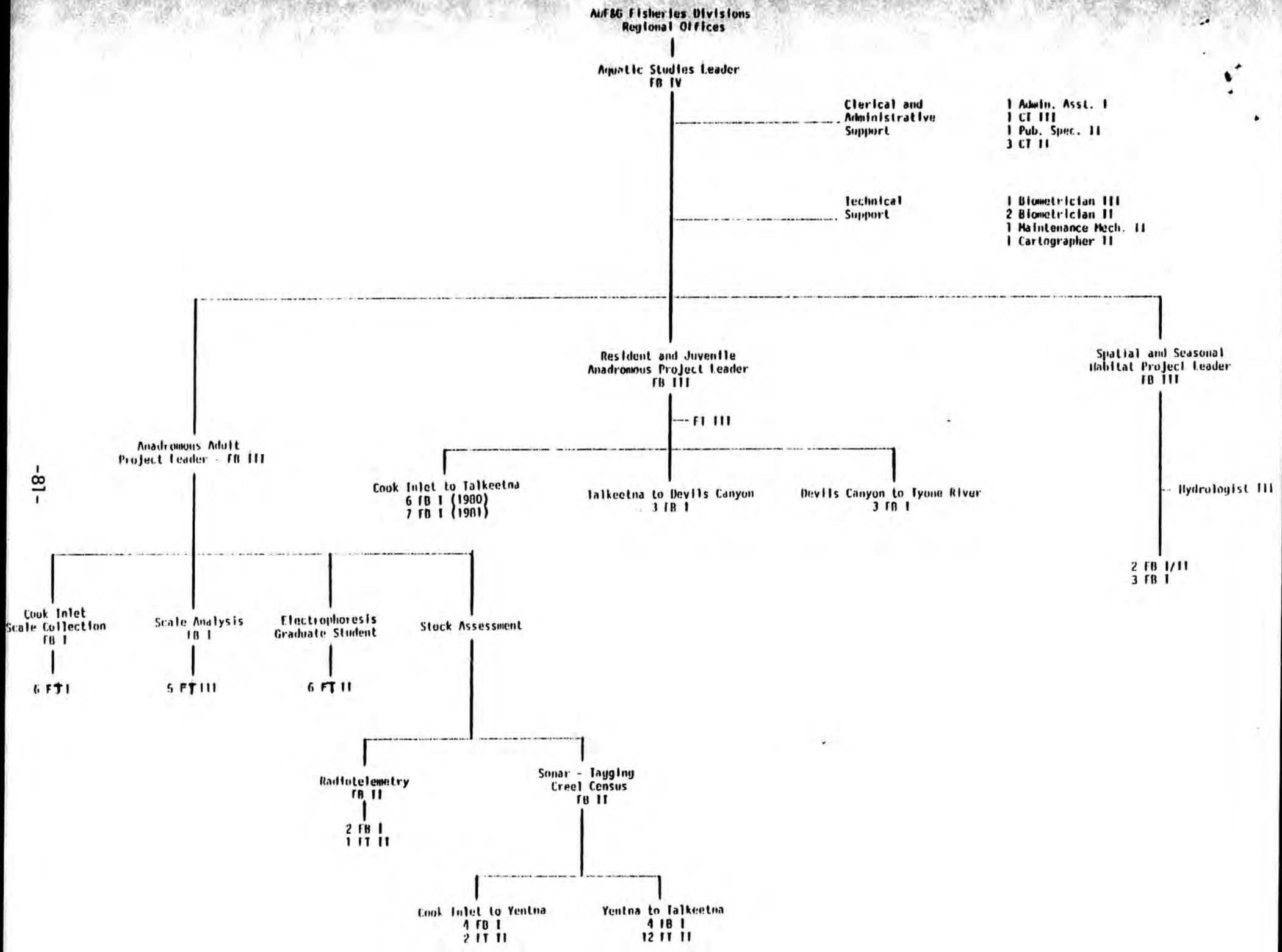
* Rates are averaged where several positions with different merit step levels or area diferentials are involved.

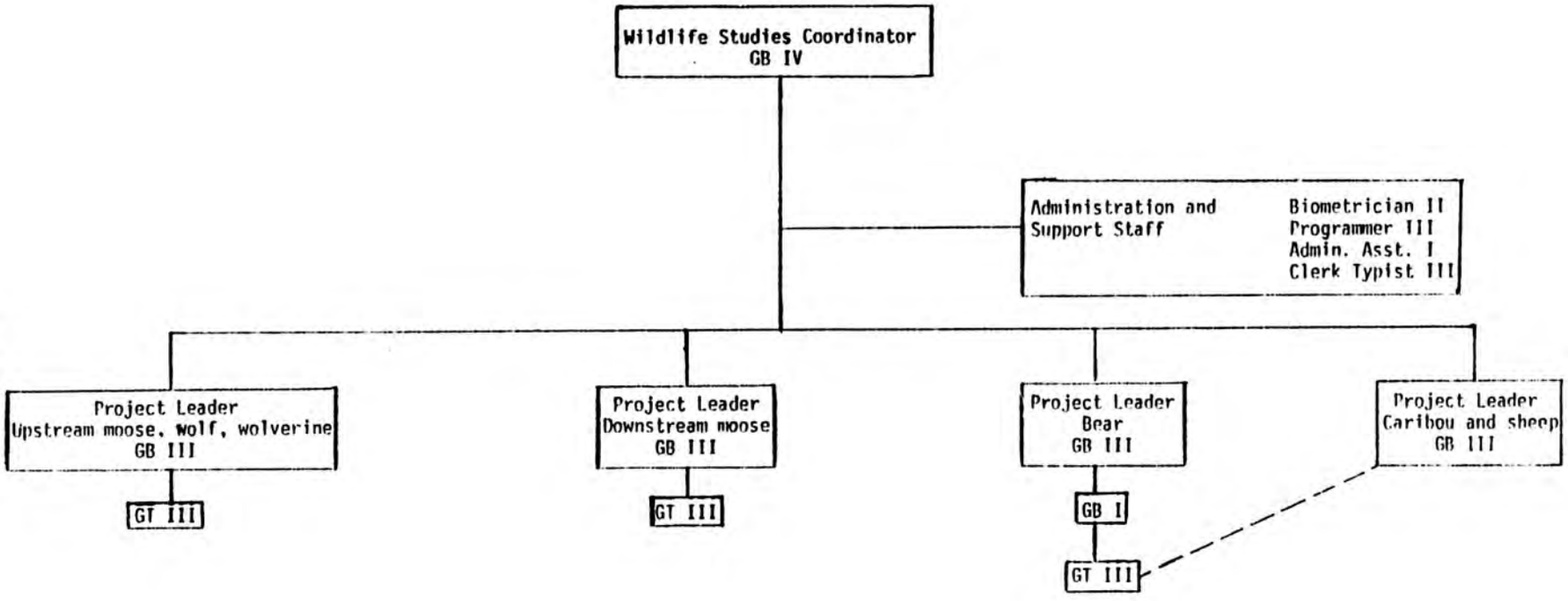
200 Travel	21	14	
300 Contractual	254	222	
400 Commodities	62	29	
500 Equipment	14	2	
Total: (rounded to nearest $1000)	605	496	17
Combined Administrative and Support and Big Game Studies TOTAL:	692	597	23

BUDGET SUMMARY AQUATIC AND WILDLIFE
STUDIES AND SUPPORT PHASE I
(All costs in 1980 dollars)

Study Task	Year		
	80	81	Jan. 82
I. Administration and Support Aquatic Studies	588.0	617.0	31.0
II. Anadromous Adult Fishery Studies	994.0	666.0	9.0
III. Resident and Juvenile Anadromous Fishery Studies	455.0	477.0	15.0
IV. Spatial and Seasonal Habitat Studies	410.0	358.0	23.0
V. Administration & Support Wildlife Studies	87.0	101.0	6.0
VI. Wildlife Studies	605.0	496.0	17.0
VII. Susitna Hydro Coordinator (including support)	75.0	75.0	6.0
TOTAL: Rounded to the nearest $1,000	3,214.0	2,790.0	107.0


ADF&G Fisheries Divisions
Regional Office
ADF&G Game Division
Regional Office
ADF&G Habitat Protection Section
Regional Office
Susitna Hydropower
Fisheries and Wildlife Study Team
Aquatic Studies Coordinator
FB IV
Wildlife Studies Coordinator
GB IV
Susitna Hydro Coordinator
HB IV
Anadromous Adult
Stock Assessment
Project Leader
FB III
Resident and Juvenile
Anadromous Studies
Staff
Spatial and Seasonal
Habitat Studies
Staff
Habitat Protection
Support Staff
Anadromous Studies
Staff
Resident and Juvenile
Anadromous Study
Project Leader
FB III
Spatial and Seasonal Habitat
Project Leader
FB III
Project Leader
Upstream moose, wolf, wolverine
GB I
Project Leader
Downstream moose
GB III
Project Leader
Bear
GB III
Project Leader
Caribou and sheep
GB III
Upstream moose study staff
Downstream moose study staff
Bear study staff


AdF&G Fisheries Divisions
Regional Offices
Aquatic Studies Leader
FB IV
Clerical and
Administrative
Support
1 Admin. Asst. I
1 CT III
1 Pub. Spec. II
3 CT II
Technical
Support
1 Biometrician III
2 Biometrician II
1 Maintenance Mech. II
1 Cartographer II
Resident and Juvenile
Anadromous Project Leader
FB III
FT III
Spatial and Seasonal
Habitat Project Leader
FB III
Hydrologist III
2 FB I/II
3 FB I
Anadromous Adult
Project Leader - FB III
Cook Inlet to Talkeetna
6 FB I (1980)
7 FB I (1981)
Talkeetna to Devils Canyon
3 FB I
Devils Canyon to Tyone River
3 FB I
Cook Inlet
Scale Collection
FB I
6 FT I
Scale Analysis
FB I
5 FT III
Electrophoresis
Graduate Student
6 FT II
Stock Assessment
Radiotelemetry
FB II
2 FB I
1 FT II
Sonar - Tagging
Creel Census
FB II
Cook Inlet to Yentna
4 FB I
2 FT II
Yentna to Talkeetna
4 FB I
12 FT II


Wildlife Studies Coordinator
GB IV
Administration and
Support Staff
Biometrician II
Programmer III
Admin. Asst. I
Clerk Typist III
Project Leader
Upstream moose, wolf, wolverine
GB III
GT III
Project Leader
Downstream moose
GB III
GT III
Project Leader
Bear
GB III
GB I
GT III
Project Leader
Caribou and sheep
GB III

STATE OF ALASKA

Attachment I

JAY S. HAMMOND, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

LAND AND WATER MANAGEMENT 323 E. 4TH AVENUE – ANCHORAGE 99501

October 26, 1979

Mr. Eric Yould
Executive Director
Alaska Power Authority
333 W. Fourth Avenue
Anchorage, Alaska 99501

Dear Mr. Yould:

Enclosed is a proposal for evaluation of stream flow manipulation effects downstream of the Devil's Canyon dam site as part of the Susitna Dam feasibility studies. During preparation of this proposal our staff coordinated closely with the Alaska Department of Fish and Game so that this proposal and their proposal for spatial and seasonal habitat studies would maximize joint use of field personnel, equipment, and transportation to eliminate any duplication and redundancy.

The Alaska Department of Natural Resources has major management and regulatory responsibilities under AS 46.15 (the Alaska Water Use Act) and AS 38.05 (Alaska Land Use Act). The Department will have to process applications for water rights and construction permits prior to the Federal Energy Regulatory Commission licensing process. In the process of acting upon such applications the Department is directed by AS 46.15.080, to consider the following relevant items:

1. the benefit to the applicant resulting from the proposed appropriation
2. the effect of economic activity resulting from the proposed appropriation
3. the effect on fish and game resources and public recreational opportunities
4. the effect of loss of alternate uses of water that might be made within a reasonable time if not precluded or hindered by the proposed appropriation
5. the effect upon access to navigable or public waters

The commissioner is authorized by AS 46.15.100 to issue a permit subject to terms, conditions, restrictions or limitations necessary to protect the rights of others and the public interest.

In addition to the statutory directives listed above, my division is charged with conducting the state land disposal program. We presently have 117,399 acres of land west of the Susitna River and south of

10-J4LH

Trapper's Creek classified for disposal. During this fiscal year alone We will be selling 31,375 net acres. With the price of gold rising, we also expect additional activity in the area, particularly in the Kahiltna drainage. The only means of access is by aircraft, snowmachine, or riverboat via the lower Susitna River with major access points from Talkeetna and from Willow via the Little Susitna River.

We understand that the preliminary plan of study submitted by Acres American suggests terminating the downstream study boundary at Talkeetna. Examination of existing hydrological records and project show that approximately 43% of the average flow in the Susitna main stem near Talkeetna will be subject to manipulation by the power project. Given this situation we can not adequately address concerns that will arise over navigation and fisheries downstream from Talkeetna to salt water without studies being conducted on this reach of the river. By including these essential issues in the scope of APA funded investigations, management agencies and the public will have the necessary information to objectively consider tradeoffs between downstream resource uses and optimum operation of the dam and reservoir for power generation.

We would prefer the opportunity to review Acres revised plan of study in comparision to the Corps of Engineers year old plan of study prior to APA's final selection decision. Given the timeframe for APA's decision process it appears this will not be possible. Therefore by copy of this letter I am forwarding the attached proposal to Acres for their consideration for inclusion into their POS.

Should Acres and APA desire to use the Department of Natural Resources or Fish and Game as a subcontractor in this effort I suggest that any authorization of funds to DNR be executed by a Reimbursable Service Agreement (RSA) with payments subject to approval by Acres as the study manager. The reason for this is to avoid delays in accepting and receiving authorization to expend funds from non-state sources which requires conduct of the Revised Program (RP) process. Work under an RSA between state agencies could commence within a month whereas the RP process could take up to three months.

While we feel that state agencies could adequately conduct elements of the feasibility study in a compatible time frame for FERC licensing submission, the basic concern is that work be done which enables appropriate management agencies to execute their responsibilities in a timely manner for all concerned. Should a private subcontractor be selected for all elements of the study, I suggest that APA consider retention of certain scientific and durable equipment (flow recorders, meters, boats, etc.) that may be purchased for the project. Your agency will undoubtably be conducting such studies across the state for a number of years, whereas outside contractors may or may not be working in the state in future years. Such an arrangement could reduce outlays for future studies by providing a pool of certain necessary equipment instate.

I hope this information is helpful. Please do not hesitate to contact me or my staff if you have any questions. We look forward to continued involvement in this project.

Sincerely,

Theodore G. Smith, Director
Division of Forest, Land and Water Management

cc: John Lawrence, Acres American
Jeff Haynes, Deputy Commissioner, DNR Tom Trent, ADF&G
Charles Behlke, Chairman, Alaska Power Authority
Brent Petrie, WMS
Bill Long, DGGS

50407

TASK: **Assessment of Instream Flow Requirements for the Susitna River. (In cooperation with ADF&G Spatial and Seasonal Habitat Studies)**

BACKGROUND:

Increased water demands and significant changes in flow regimes sometimes result in conflicts over water use. A major concern of many resource agencies is the conflict between out-of-stream uses of water or flow regime changes and the needs of fish and wildlife, navigation, recreation and ot :r instream flow uses. DNR, in conjunction with ADF&G, USFWS, USGS, ADEC, ADOTPF, and the U.S. Water Resources Council, is presently pursuing an instream flow program for the State of Alaska. The program is patterned after the procedures developed by the Cooperative Instream Flow Service Group, Department of the Interior, U.S. Fish and Wildlife Service, located at Fort Collins, Colorado.

Work has initially begun during this past summer by ADF&G, DNR, and other interested agencies to obtain field data from Willow and Deception Creeks in the Susitna Basin and analysis of this data is currently underway. Additional funding for ADF&G and DNR to pursue the Willow and Deception Creeks study has recently been authorized by the U.S. Water Resources Council. Data produced as a result of this federal grant will augment the instream flow work performed as part of the Susitna Dam feasibility study.

PARTICIPATION:

This study will be performed in addition to work proposed by ADF&G, but will be done in close cooperation and coordination with that agency and other tasks performed by consultants as part of the overall Susitna Dam feasibility study. If the ADF&G instream flow study as part of their Spatial and Seasonal Habitat Studies is not funded, DNR will need to increase this budget in the amount that ADF&G was not budgeted, in order to perform the necessary work. It is anticipated that other agencies such as USFWS and USGS will participate in these instream flow studies, particularly the USFWS during data processing and analysis.

TASK OBJECTIVES:

This study will extend the field methods in use in the Willow and Deception Creek basins to serve as a tool to assess the effects of different flow regimes on aquatic and riparian habitat in the Susitna River. The study will provide data to the Alaska Power Authority (APA) on which decisions may be made regarding dam location, design, and operation through the following objectives.

A. The study will provide data to allow the APA to make decisions regarding the magnitude and timing of flow releases from the proposed dams.

B. The study will allow the APA to evaluate the effects of altered flow regimes on fisheries in the Susitna River along with other instream uses of the Susitna River such as boating and navigation.

C. Data generated from this study will aid the APA in evaluating dam design and operation to optimize power production.

D. Data generated from this study can be utilized by the APA for planning and evaluating necessary mitigation measures for downstream resources.

E. Results of this study will provide necessary data to regulatory and management agencies, such as DNR, ADF&G, DEC, USFWS, NMFS and FERC, such that these agencies can adequately perform their permitting and management responsibilities.

LIST OF SUBTASKS:

The above stated objectives will be accomplished through the following subtasks. Cooperating agencies and/or firms are also indicated.

A) Consultation with state and federal agencies and consulting firms to coordinate the plan of study (DNR, APA, Acres, R&M, TES, ADF&G, USGS, USFWS).

B) Order equipment and arrange logistical support (DNR, ADF&G, USGS, CIRI/H&N).

C) Training in field techniques and data interpretation for project personnel (DNR, ADF&G, USFWS, USGS).

D) Conversion of software to an accessible computer and training of computer personnel (ADF&G, USFWS, ACRES, DNR).

E) Development and refining of preliminary probability of use curves (ADF&G, DNR, USFWS, USGS).

F) Collection of data to refine and validate probability of use curves (ADF&G, DNR, USFWS, USGS).

G) Collection of hydrological (stream flow) data (DNR, ADF&G, USGS, USFWS).

H) Data processing and analysis (ADF&G, USFWS, USGS, and DNR).

I) Utilizing this data and analysis, provide information to licensing and management agencies (APA, FERC, DNR, ADF&G, DEC).

STUDY LOCATION:

Selection of study reaches in the Susitna River System will be required to provide the necessary flow information for this study. Sites will be required on the main stem of the Susitna River downstream from the proposed dam sites to salt water with additional sites located on major tributaries in the proposed study area. A wide variety of representative selections will be required to delineate the probability of use curves for the aquatic environment. Location of the transects will require close coordination with state and federal wildlife agencies,

the USGS and involved consultants to satisfy hydrologic and hydraulic considerations for determining channel morphology and aquatic habitat parameters for defining preferred habitat in these areas.

SCHEDULE:

This study will require three years of data collection and analysis as outlined below.

A. First Year:

1. Coordination of plan of study, personnel, equipment, and site selection of transects.
2. Order equipment and arrange logistical support.
3. Project staffing.
4. Conversion of software to an accessible computer in Alaska.
5. Development and refinement of preliminary probability of use curves.
6. Initial collection of stream flow data.
7. Initial data processing and analysis.

B. Second Year:

1. Continue data collection.
2. Continue data processing and analysis.
3. Refine and validate probability of use curves.

C. Third Year:

1. Complete data collection.
2. Complete data processing and analysis.
3. Complete probability of use curves.
4. Report writing and submission of data to APA for utilization in FERC licensing and permitting processes.

BUDGET:

The total budget for DNR involvement in this study will be $407,861.00 over the three year duration of the study. This is broken out per year below, with a detailed budget for the first year attached.

A. First Year:

Personal Services	$ 92,706.00
Travel	14,400.00
Commodities	2,100.00
Contractual	21,000.00
Equipment	57,655.00
Total First Year Budget	$187,861.00

B. Second Year:

Little extra equipment will be needed. This year's budget will be comprised primarily of Personal Services, Travel and Commodities as shown above totaling approximately $110,000.00.

C. Third Year:

This year's budget will approximate the second year, totaling $110,000.00.

PROPOSED BUDGET SUSITNA
INSTREAM FLOW PROJECT

Personal Services

(1) Hydrologist III 18A 12 months = 34,178.64
(1) Ecologist I 16A 12 months = 29,750.76
(2) Temp. Land Management Tech II 14A 6 months = 21,563.40
Overtime for LMT II = $7214.00

Total $92,706.00

Travel

2 positions 800.00 per month x 8 months = 6,400
2 positions 800.00 per month x 6 months = 4,800

(Training) 2 positions (out-of-state) 800.00
each = 1,600 x 2 trips = $3,200.00

Total $14,400.00

Commodities

$250/year x 2.5 positions = $625.00
Gas, oil, motor $1,500.00

(2 ea.) Hard hats, hip boots and chest waders = $475.00

Total $2,100.00

Contractual

A. Consult instream flow group. 3 of them will fly to Alaska from Ft. Collins, Colorado and return. 1 person from Alaska to fly to Ft. Collins and return. $3200.00.

B. Repairs of boat, motor and other equipment $1000.00.

C. Phone 200.00 per month per phone x 2 x 12 mo. = $4,800.00. This includes long distance calls.

D. Plane charter to fly over sites $2,000.00.

E. Computer analysis of field data $10,000.00.

Totals $21,000.00

Equipment

Office equipment

1. 2 desks, 2 chairs, 1 bookcase, 1 file cabinet = $1,300.00
2. 1 calculator 300.00
3. (Special) paper, rite in rain, forms, and printing = $700.00

Field equipment

1.	Level, Lietz B-2 (32x)	$1,600.00
2.	Tripod (dome)	250.00
3.	Survey stakes	150.00
4.	Measuring tape & holder (300 ft.)	150.00
5.	35 mm camera and lens, film and development	900.00
6.	Electronic surveying equipment, angle measurements, range measurements, field computer	20,500.00
7.	Current meters, pygmy and AA meter	500.00
8.	Marsh-McBirny flow meter, digital readout	1,600.00
9.	(2) topsetting wading rods	400.00
10.	Suspended system (flow metering system)	400.00
11.	Boat mounted (flow metering system)	1,600.00
12.	Sonar - narrow beam	3,000.00
13.	Headset and battery	50.00
14.	2 way radio, walkie talkie (2 sets)	2,000.00
15.	Compass	100.00
16.	(2) portable ultrasonic level and flow recorder	6,800.00
17.	(2 ea.) First Aid Kit	200.00
18.	Bank anchors ½" x 48" rebar	20.00
19.	(2) leveling rod (Philadelphia)	300.00
20.	(1) Cable tagline 300+feet	150.00
21.	Tools for repairs	175.00

Boat equipment

20 foot riverboat	$4,000.00
13 foot Avon riverboat	1,800.00
85 hp (jet boat)	3,000.00
25 hp (Kicker) jet foot	1,200.00
10 hp for Avon (jet foot)	700.00
25 gallon gas tank	350.00
(2) 10 gallon gas tanks	60.00
(4) life vests	150.00
Boat trailer (service contract)	2,000.00
Oars (2 sets)	150.00
(2) Anchor, anchor rope	100.00

Camping equipment

Tents, stoves, lanterns, personal sleeping bags, cooking equipment	1,000.00

Total all equipment:	$ 57,655.00
Total Personal, travel, contractual, commodities:	$130,206.00
Total budget:	$187,861.00

Budget for additional years would be less because little extra equipment would be needed. Estimated cost for additional years $110,000.00 per year.

PLEASE NOTE: THE PRECEDING PAGES WERE TREATED AS A UNIT IN THE ORIGINAL DOCUMENT.

B. Rogers

STATE OF ALASKA

JAY S. HAMMOND, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

LAND AND WATER MANAGEMENT / 323 E. 4TH AVENUE – ANCHORAGE 99501

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STUDY LOCATION:

Selection of study reaches in the Susitna River System will be required to provide the necessary flow information for this study. Sites will be required on the main stem of the Susitna River downstream from the proposed dam sites to salt water with additional sites located on major tributaries in the proposed study area. A wide variety of representative selections will be required to delineate the probability of use curves for the aquatic environment. Location of the transects will require close coordination with state and federal wildlife agencies,

the USGS and involved consultants to satisfy hydrologic and hydraulic considerations for determining channel morphology and aquatic habitat parameters for defining preferred habitat in these areas.

SCHEDULE:

This study will require three years of data collection and analysis as outlined below.

A. First Year:

1. Coordination of plan of study, personnel, equipment, and site selection of transects.
2. Order equipment and arrange logistical support.
3. Project staffing.
4. Conversion of software to an accessible computer in Alaska.
5. Development and refinement of preliminary probability of use curves.
6. Initial collection of stream flow data.
7. Initial data processing and analysis.

B. Second Year:

1. Continue data collection.
2. Continue data processing and analysis.
3. Refine and validate probability of use curves.

C. Third Year:

1. Complete data collection.
2. Complete data processing and analysis.
3. Complete probability of use curves.
4. Report writing and submission of data to APA for utilization in FERC licensing and permitting processes.

BUDGET:

The total budget for DNR involvement in this study will be $407,861.00 over the three year duration of the study. This is broken out per year below, with a detailed budget for the first year attached.

A. First Year:

Personal Services	$ 92,706.00
Travel	14,400.00
Commodities	2,100.00
Contractual	21,000.00
Equipment	57,655.00
Total First Year Budget	$187,861.00

B. Second Year:

Little extra equipment will be needed. This year's budget will be comprised primarily of Personal Services, Travel and Commodities as shown above totaling approximately $110,000.00.

C. Third Year:

This year's budget will approximate the second year, totaling $110,000.00.

PROPOSED BUDGET SUSITNA
INSTREAM FLOW PROJECT

Personal Services

(1) Hydrologist III 18A 12 months = 34,178.64
(1) Ecologist I 16A 12 months = 29,750.76
(2) Temp. Land Management Tech II 14A 6 months = 21,563.40
Overtime for LMT II = $7214.00

Total $92,706.00

Travel

2 positions 800.00 per month x 8 months = 6,400
2 positions 800.00 per month x 6 months = 4,800

(Training) 2 positions (out-of-state) 800.00
each = 1,600 x 2 trips = $3,200.00

Total $14,400.00

Commodities

$250/year x 2.5 positions = $625.00
Gas, oil, motor $1,500.00

(2 ea.) Hard hats, hip boots and chest waders = $475.00

Total $2,100.00

Contractual

A. Consult instream flow group. 3 of them will fly to Alaska from Ft. Collins, Colorado and return. 1 person from Alaska to fly to Ft. Collins and return. $3200.00.

B. Repairs of boat, motor and other equipment $1000.00.

C. Phone 200.00 per month per phone x 2 x 12 mo. = $4,300.00. This includes long distance calls.

D. Plane charter to fly over sites $2,000.00.

E. Computer analysis of field data $10,000.00.

Totals $21,000.00

Equipment

Office equipment

1. 2 desks, 2 chairs, 1 bookcase, 1 file cabinet = $1,300.00
2. 1 calculator 300.00
3. (Special) paper, rite in rain, forms, and printing = $700.00

Field equipment

1.	Level, Lietz B-2 (32x)	$1,600.00
2.	Tripod (dome)	250.00
3.	Survey stakes	150.00
4.	Measuring tape & holder (300 ft.)	150.00
5.	35 mm camera and lens, film and development	900.00
6.	Electronic surveying equipment, angle measurements, range measurements, field computer	20,500.00
7.	Current meters, pygmy and AA meter	500.00
8.	Marsh-McBirny flow meter, digital readout	1,600.00
9.	(2) topsetting wading rods	400.00
10.	Suspended system (flow metering system)	400.00
11.	Boat mounted (flow metering system)	1,600.00
12.	Sonar = narrow beam	3,000.00
13.	Headset and battery	50.00
14.	2 way radio, walkie talkie (2 sets)	2,000.00
15.	Compass	100.00
16.	(2) portable ultrasonic level and flow recorder	6,800.00
17.	(2 ea.) First Aid Kit	200.00
18.	Bank anchors ½" x 48" rebar	20.00
19.	(2) leveling rod (Philadelphia)	300.00
20.	(1) Cable tagline 300+feet	150.00
21.	Tools for repairs	175.00

Boat equipment

20 foot riverboat	$4,000.00
13 foot Avon riverboat	1,800.00
85 hp (jet boat)	3,000.00
25 hp (Kicker) jet foot	1,200.00
10 hp for Avon (jet foot)	700.00
25 gallon gas tank	350.00
(2) 10 gallon gas tanks	60.00
(4) life vests	150.00
Boat trailer (service contract)	2,000.00
Oars (2 sets)	150.00
(2) Anchor, anchor rope	100.00

Camping equipment

Tents, stoves, lanterns, personal sleeping bags, cooking equipment	1,000.00

Total all equipment:	$ 57,655.00
Total Personal, travel, contractual, commodities:	$130,206.00
Total budget:	$187,861.00

Budget for additional years would be less because little extra equipment would be needed. Estimated cost for additional years $110,000.00 per year.