january 1982

the susitna hydro studies

This is the third of several newsletters published by the Alaska Power Authority for citizens of the railbelt. The purpose is to present objective information on the progress of the Susitna hydroelectric feasibility studies so that readers may make their own conclusions based on accurate information.

Eric P. Yould, Executive Director
Nancy Blunck, Director of Public Participation

Alaska Power Authority
334 W. 5th Avenue
Anchorage, Alaska 99501
phone (907) 276-0001

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ALASKA POWER AUTHORITY
PUBLIC PARTICIPATION OFFICE
334 W. 5th Avenue
Anchorage, Alaska 99501
phone (907) 276-0001

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Background information on proposed Susitna project

The upstream dam, Watana, is proposed to be developed first. It would be an earth/rockfill dam, approximately 900 feet high, creating a 54-mile long reservoir. The downstream dam at Devil Canyon would be a concrete arch dam approximately 650 feet high, creating a 28-mile long reservoir.

The feasibility study is being conducted by Acres American, Inc. for the Alaska Power Authority. A draft feasibility report detailing research efforts in 10 different areas including economics, engineering, and environmental aspects of the proposed power project is due March 15, 1982.

Total installed capacity would be 1600 MW with average annual energy of 6.7 million Mwh.

This newsletter is dedicated to discussing the environmental aspects of the proposed project.

C.D. Evans

Preliminary information available on fish and wildlife impacts

Studies describe possible changes in upstream and downstream moose habitat

Studies of moose populations and habitat focused on two separate areas: upstream and downstream of the proposed dam sites.

Upstream of the dams: Moose populations in the upper Susitna basin are estimated to be about 3,300 animals. The primary impact would be the loss of habitat (and the resultant loss of moose) in the portion of the basin to be inundated. Studies to date suggest that areas to be inundated are used by moose during winter and spring. Loss of this habitat during this time would result in a reduced moose population for the area.

These areas do not appear to be important for calving or breeding. It appears that the period of time moose occupy the impoundment areas is heavily dependent on winter severity. During the 1980-81 winter (which was mild) 72 moose were counted in the impoundment areas. During severe winters significantly more moose would use the area with a resultant larger impact.

Available data indicate that the Watana impoundment is likely to have a greater impact on moose than Devil Canyon.

The only mitigation option that might prove usable in the upper Susitna area is controlled burning of areas to improve moose habitat. However, moose habitat management in other areas could be used to compensate for moose habitat losses in the upper basin.

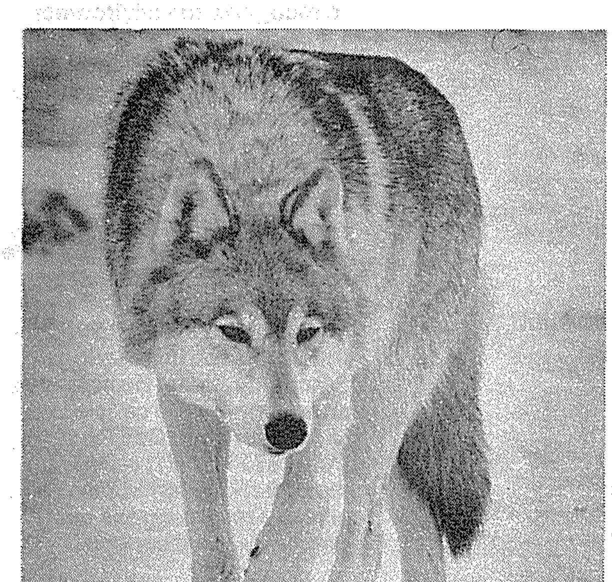
Downstream of the dams: Current data by the Alaska Department of Fish and Game indicate that most moose use the areas nearest the Susitna River in the winter and tend to range away from it the rest of the year. Some moose remain year-round on the larger river islands.

Changes in downstream river flow (due to operation of Susitna) may change the plant succession trends downstream. In the long run, this could reduce the amount of winter browse available for moose to eat.

Moose feed on willow, balsam poplar, birch, high bush cranberry, and rose. These plants grow on the river bars and islands that are created in part by natural floods.

Two changes could occur by lessening the occurrence of the natural floods.

First, many areas that currently are washed away by river flooding will no longer be washed away. This would stabilize those habitats and create an initial 15 to 20 year increase in the amount of moose browse in those areas.



Fran Durner/Anchorage Daily News

Fewer moose could mean fewer wolves

Moose are a major source of food for all the packs identified in the area of the proposed Susitna reservoirs. In the long term, any reduction in the number of moose would also reduce the number of wolves for a considerable distance from the proposed reservoirs.

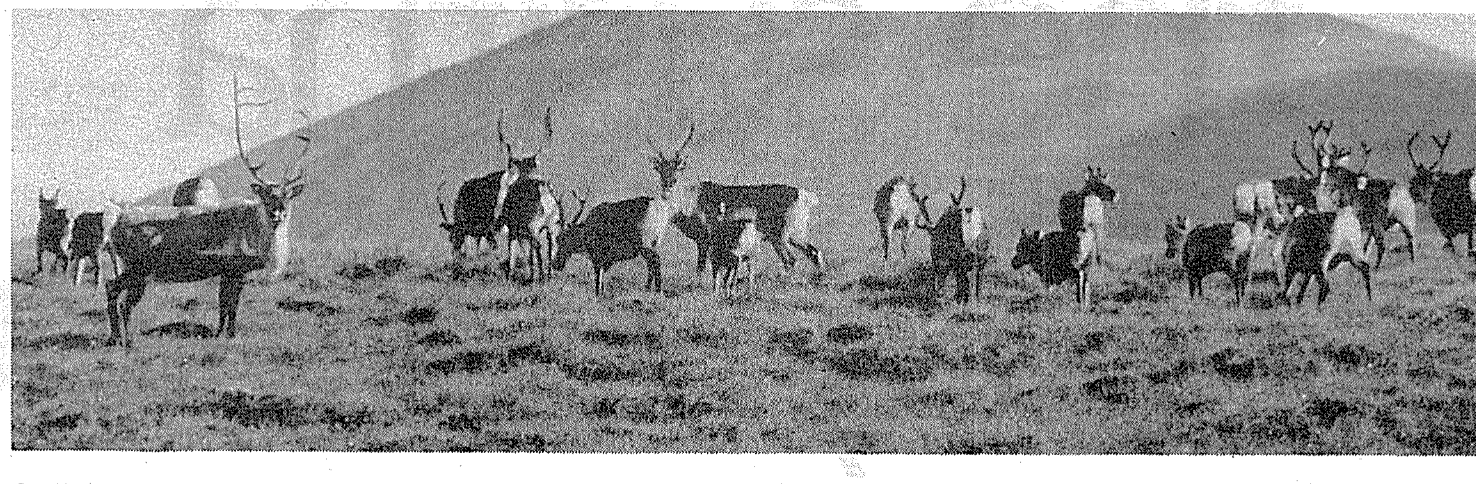
Second, without the constant washing away, plant succession would continue and vegetation would become too tall or mature for moose to eat. The problem would be greatest in years of deep snow because there would be more moose in the river competing for the same amount of browse.

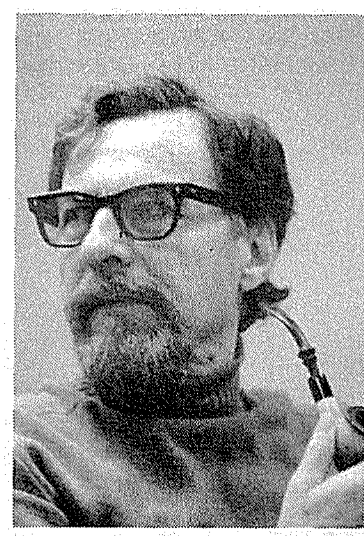
The downstream loss of moose habitat could be offset by habitat management. This would entail encouragement of commercial logging of mature balsam poplar, the burning of vegetation on selected river islands, and the use of a vegetation crusher in areas east of the river. *Sources 1 and 2.*

1. Susitna Hydroelectric Project Environmental Studies Annual Report 1980 Subtask 7.11 - Big Game, July 1981, Terrestrial Environmental Specialists, Inc.

2. Susitna Hydroelectric Project Draft Analysis of Wildlife Mitigation Options, December 1981, Terrestrial Environmental Specialists and Acres American, Inc.

Questions and answers on caribou





Banfield

Dr. Frank Banfield is a wildlife zoologist specializing in the study of mammals, particularly caribou and reindeer; he has studied mammals in the Soviet Union, Japan, Canada, and Alaska. He also serves on the Susitna Wildlife Mitigation core group which is assessing the impacts of the proposed Susitna project on wildlife.

After obtaining his PhD in 1951 from the University of Michigan (where he focused on the utilization and management of caribou), Dr. Banfield began work for the Canadian Wildlife Service. In 1957 he was appointed chief of the zoology section of the National Museum of Canada and from 1963 to 1968 was director of the National Museum of Natural Sciences.

In 1969, Dr. Banfield was appointed professor of ecology at Brock University near Niagara Falls. Of his move from government he says, "I became disenchanted with government work and more attuned to the environmental imperative... I decided to try teaching the next generation to recognize the environmental crisis." Before retiring in 1979, he became director of Brock's Institute of Urban and Environmental Studies.

Dr. Banfield is currently a full-time consultant in the environmental field specializing on the problems of caribou. He has visited and worked in Alaska numerous times since 1951 and has studied the Central Arctic and International Porcupine herds. He served as an environmental consultant to Alaska Arctic Gas Company from 1971 to 1977, studying the effect of alternative pipeline routes across northern Alaska on caribou.

Question: What are the major issues concerning caribou on the Susitna project?

Banfield: I believe that the most important issue is the indirect effect of providing new access to the relatively inaccessible heartland of the Nelchina caribou herd.

Unless controls are imposed, the access road could provide a jumping off point for all-terrain-vehicles (ATV's) to take off on unplanned trails across alpine tundra. In this case, it would become possible for campers, hunters, and fishermen to reach sensitive areas of caribou range such as calving grounds and main migratory paths.

Caribou biologists generally accept that certain sensitive areas that caribou use necessitate special protection. These include the calving grounds, the post-calving aggregation areas, as well as traditional migration routes.

As you can well appreciate, such an unplanned network of ATV tracks would make control of hunting opportunities far more difficult for the agencies. Speaking of agencies, this would represent a real challenge to the state and federal agencies responsible for management of the caribou herd and adequate protection of the caribou habitat.

Some public attention has also been focused on the risk to caribou attempting to cross the proposed Watana reservoir during their migrations, particularly during the spring migration when the reservoir would be at its lowest level in late April or mid-May.

At that time the shores of the reservoir are expected to be covered with steeply sloping, stranded iceshelves. These ice shelves are expected to be broken up and detached from the floating ice covering the middle of the reservoir.

Conditions like this are generally perceived as being hazardous to migrating caribou, particularly pregnant cows that are attempting to reach the calving area south of the Susitna River in the Kosina Creek and Oshetna River drainages.

Other important issues include the disturbance to caribou by the construction of ancillary facilities such as access roads, transmission lines, and the activities of construction workers and operational personnel on the project. This would include vehicle traffic on the access roads, the use of aircraft, and any hunting opportunities allowed the Susitna project personnel.

Question: What is "ice shelving"?

Banfield: A reservoir with an ice sheet on it, such as in northern parts of the continent, must be drawn down during the winter to provide power. Not much water is being added to the reservoir from the river during this time because the rivers are freezing and drying up.

The ice in the middle of a reservoir is really supported and floating on the water. As you start drawing down the water, the ice collapses to the new water level. When you draw water down again, the ice collapses again.

All winter long the ice goes through a series of collapses following the level of the water down to the minimum level of the reservoir.

Something different happens on the sides of the reservoirs. As the water recedes from the shoreline, the ice collapses onto the shore where the shore is now exposed. With each subsequent drawdown, there is more shore exposed. Each time the ice collapses on the reservoir, more ice comes to rest onto the exposed shore.

Furthermore, pressure from the expanding ice on the reservoir pushes the shore ice up into ridges that break up into chunks. Eventually you have a shelf of ice or ridges of piled ice that follow the slope of the shore.

In the case of Susitna, the Watana reservoir will be a very deep reservoir with very steep shorelines. The ice shelf will be tilted quite precipitously in spots. There will also be large areas of relatively flat shore ice in the big bays. An example of this would be where Watana Creek comes into the Susitna.

Question: How does ice shelving create problems for caribou?

Banfield: In the spring the sun would have had some time to melt this ice shelf. This is the time of the spring migration and the caribou might have to cross areas of smooth tilted ice behind other areas of piled up ridges of broken ice near the shore line.

If the migration period were delayed into late spring the sun might have caused much of the shore ice to disintegrate and the reservoir ice might be rotten and covered with pools of melt water.

Question: Are there natural occurrences that caribou encounter that are similar to ice shelving?

Banfield: Yes. Ice shelves are naturally produced along river banks after the first flood of spring water and at ice jams. Generally, however, I would say that ice shelving will be a new experience locally for the Nelchina caribou.

Question: What impacts could result from ice shelving?

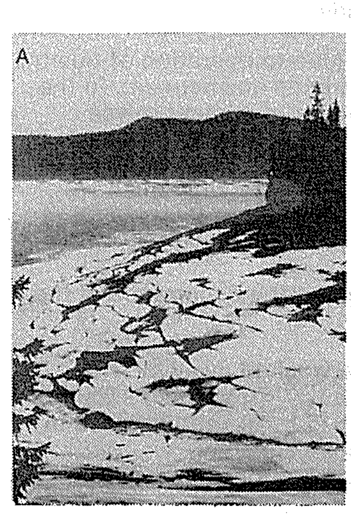
Banfield: There are several levels of impact that could result from ice shelving.

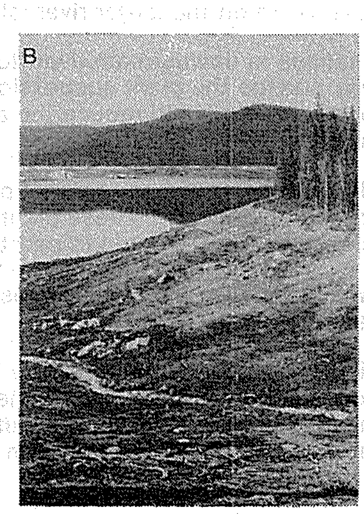
First, the icing conditions resulting from the drawdown may not prove to be a barrier to migrating caribou. The situation may not be that much different from the existing ice that now forms on the river banks.

Ice shelving on a Swedish hydroelectric reservoir

A:
Spring: the water is at its lowest level and the shore is covered with ice. This is suggestive of ice shelving that could occur on the Watana reservoir. The ice on Watana would be thicker than what is shown.
B:
Early summer: the water is still at its lowest level but the ice has melted and the shore is exposed.
C:
Late summer: the water is at its highest level.

Source:
Dynamics of the Shore Vegetation of a North Swedish Hydroelectric Reservoir During a 5-year Period, 1981, doctoral thesis at Umea University, Christer Nilsson.

A


B


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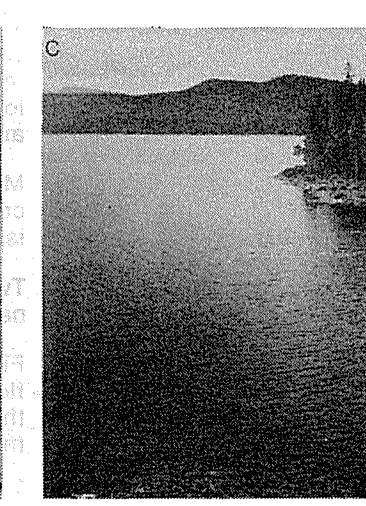


Second, substantial mortality may occur in attempted crossings at dangerous spots. Generally, however, caribou are known to seek safe crossing points and avoid hazardous conditions.

Third, the migrating herd may refuse to cross the reservoir and would turn back to calve in the northwestern portion of their range. This would probably result in increased calf mortality since the calves would be dropped in less than optimal terrain.

This could also confine the herd to a much smaller portion of its total range. In this event, it is likely that a second calving area may be established over time. The entire movement pattern of the Nelchina herd would be reorganized, including the possibility of an isolated portion of the herd forming in the northwestern portion of the range.

Fourth, the possibility exists that if the crossing is too hazardous, the caribou would travel eastward along the north shore of the reservoir and cross above the Oshetna River where the channel of the impoundment would be dry and covered by grounded ice or contain a natural flowing river.

This would result in a longer, but less hazardous route to the traditional calving grounds.

Question: Are there any access routes that could impact the caribou more than others?

Banfield: Considering only caribou, the proposed access route from the Denali Highway south to the Watana reservoir would have a greater impact on caribou than other alternative access routes to the west (from the Parks Highway or from the Alaska Railroad at Gold Creek).

This is because the plateau that the Denali route would cross is actually the home of a part of the Nelchina herd. At various times in the past this plateau has been occupied by even larger numbers of caribou than are occupying it at the present.

There could be two problems with the Denali access route.

The first deals with activities during the construction phase: some loss of habitat to borrow pits for road construction, disturbance by workers, and possible direct mortality of migrating caribou as a result of collisions with vehicles.

A second problem could be created by providing public access to the area after the construction period. This could bring campers with ATV's and hunters into the calving and post-calving aggregation areas.

Question: What was learned about caribou from the construction of the Trans-Alaska pipeline?

Banfield: Caribou studies were conducted in connection with the original environmental assessment, prior to the approval of the Trans-Alaska pipeline. Probably most of the undesirable impacts were alleviated by mitigative procedures during construction.

These procedures included burying and insulating sections of the pipeline where caribou tend to cross. It appears that the most negative impacts that were possible during construction did not occur.

Question: What about ongoing impacts on caribou from the pipeline and its accompanying haul road?

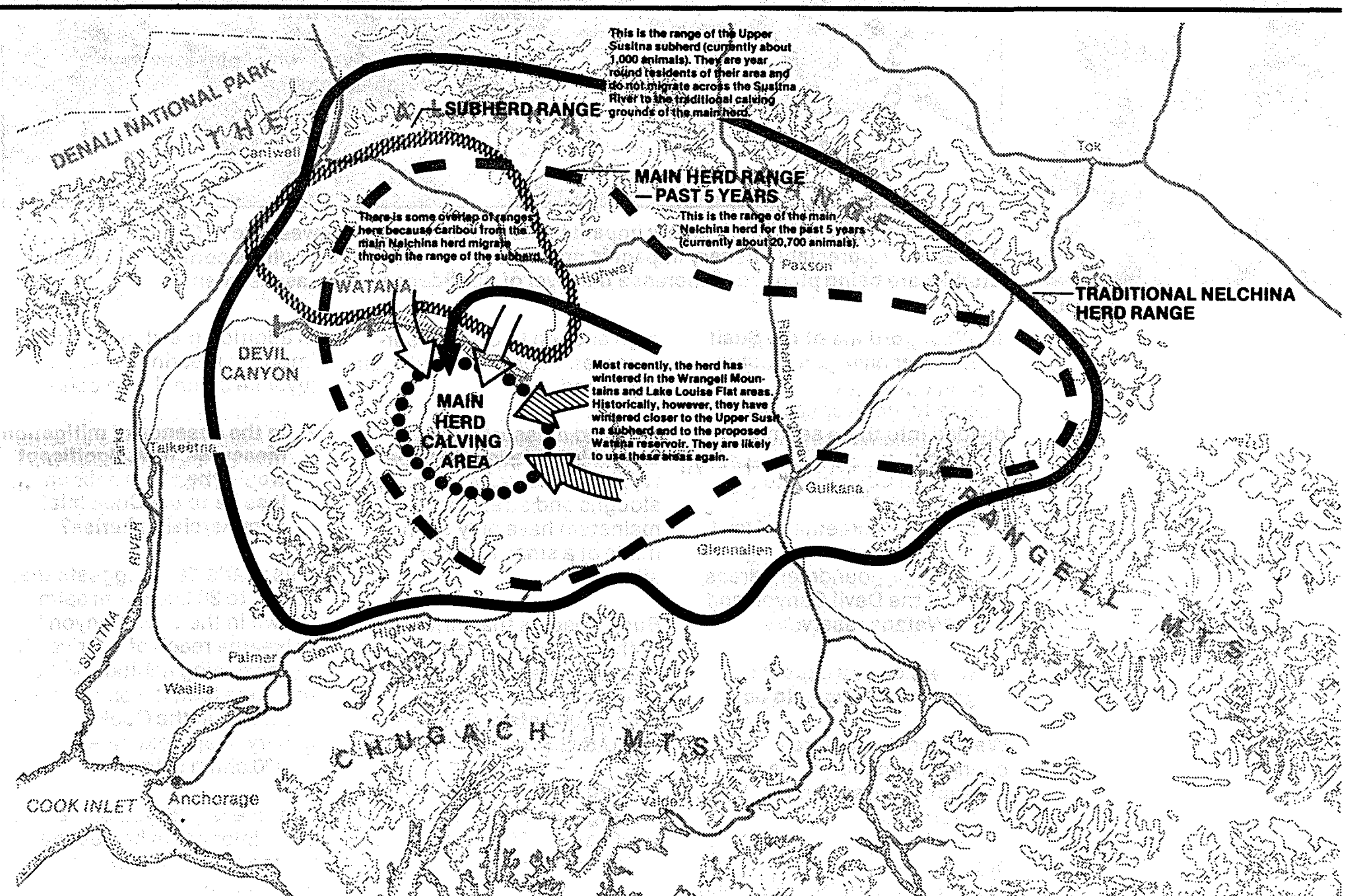
Banfield: The impacts that currently occur along the pipeline and haul road are of a more subtle nature. For example, there has been an avoidance reaction to the haul road, particularly by the cows and calves. The bulls are less disturbed by the pipeline and haul road.

There is also some indication that the pipeline corridor has tended to divide the north and south movements of the Central Arctic herd into two parallel ribbons, one on each side of the pipeline corridor from winter ranges to the calving grounds and not permitting or encouraging a crossover during migration.

There's also some indication that wolf predation on caribou is facilitated along the haul road.

Overall, however, the Central Arctic herd is managing to maintain its population. This points to the conclusion that the herd is coping with the disturbances caused by the pipeline.

Caribou in the Susitna area



The Nelchina caribou herd area is bounded by four mountain ranges: the Alaska Range; the Talkeetna Mountains; the Chugach Mountains; and the Wrangell Mountains.

Within this very large area there is a heartland range that is most frequently occupied by the core population of the Nelchina caribou herd. This area is about half the size of the entire range.

The caribou still cross the Richardson and Denali Highways with some regularity.

major routes a. historical

b. current

minor routes c. current

Recent history of the Nelchina caribou herd

About 1962 the Nelchina caribou herd reached a peak of about 71,000 animals. Between 1962 and 1969 the herd stopped growing and began a steep decline which resulted in an estimated population of 8,000 caribou in 1972.

Biologists have attributed this decline primarily to poor survival of calves to one year of age. A secondary reason was hunting (65,000 caribou were reported legally harvested between 1962 and 1972).

Possible contributing factors to this decline included emigrations of caribou to other herds to the north and increased natural mortality of adults by wolves and bears.

In 1972, the Alaska Department of Fish and Game initiated restrictive hunting regulations on the herd. Hunting is currently controlled by a permit system.

Currently, the herd has recovered back to 20,700 caribou. 16,000 of these are adults (one year old or older). This is approaching the management goal of 20,000 adults, set by the Alaska Department of Fish and Game. This goal may be reached within the next several years, and is the number of caribou the range can support without problems of overpopulation.

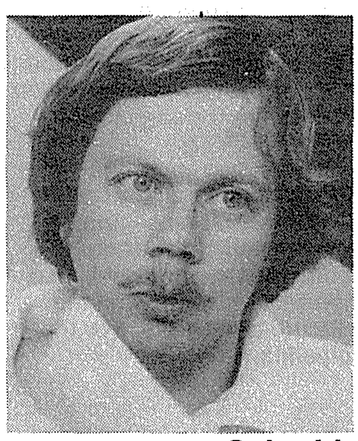
Written by Ken Pitcher, Research Biologist, Alaska Department of Fish and Game.

ARCO

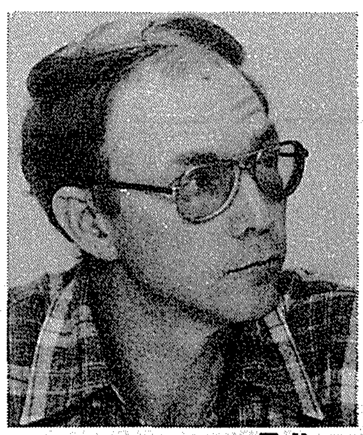
We've been asked

The following responses to questions about the effects of the proposed Susitna hydroelectric project on fish have been provided by Dana Schmidt and Woody Trihey, two members of the Fisheries Mitigation core group.

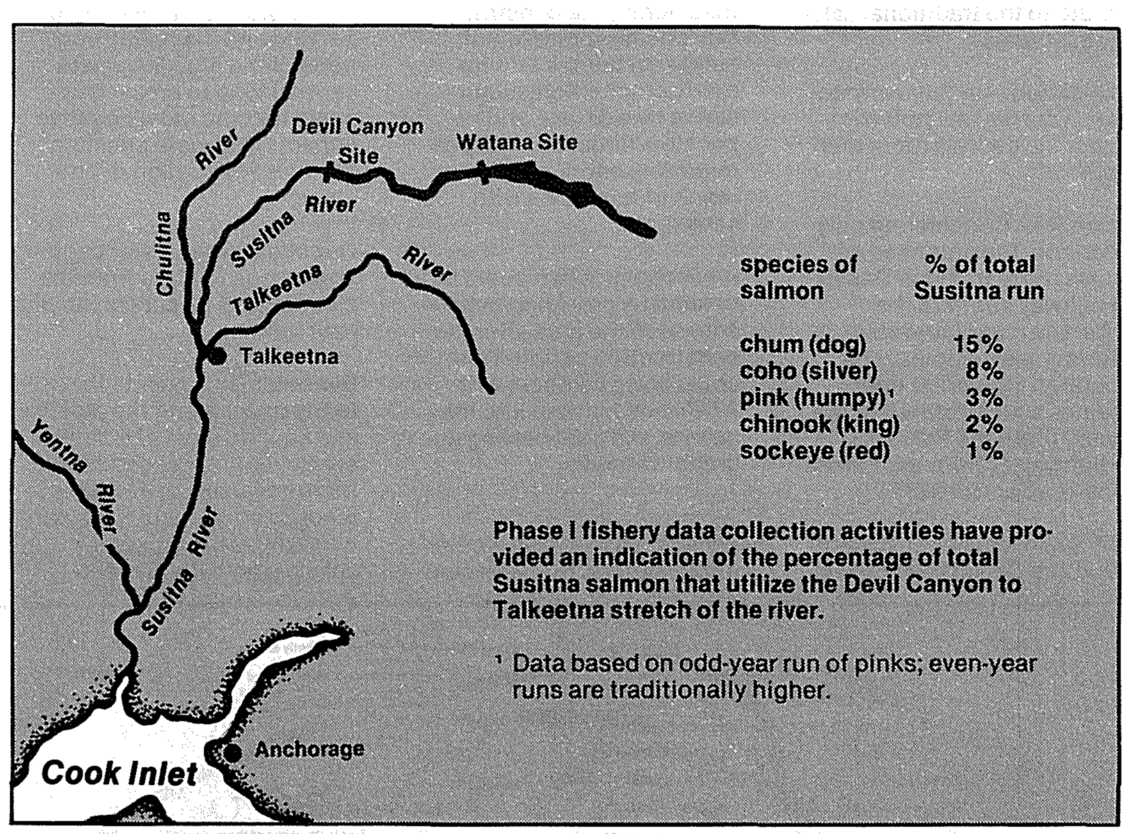
The Fisheries Mitigation core group has reviewed and concurred with them.



Schmidt



Trihey



The primary area of salmon fishery impact is the stretch of river between Devil Canyon and Talkeetna. Appreciable fishery impact is not anticipated below the Chulitna confluence. Further studies are being planned to increase the level of confidence in this assessment.

1. What portions of the Susitna River have you studied?

Basically the river has been divided into three segments for study:
1. from Cook Inlet to Talkeetna;
2. from Talkeetna to Devil Canyon; and
3. the impoundment areas of the Devil Canyon and Watana reservoirs.

2. Where do you expect the greatest changes to occur?

We expect the greatest changes to occur in the impoundment areas and in the Talkeetna to Devil Canyon reach of the river. The first phase of downstream fishery studies has concentrated on determining effects from the project in the river segment between Talkeetna and Devil Canyon.

3. Will the post-project flows from the dams significantly affect the fisheries between Talkeetna and Devil Canyon?

The final decision regarding post-project flows has not been made. However, a set of post-project flows which optimize power production has been proposed as a starting point for impact assessment and mitigation planning.

Our assessment of these flows indicates that they will result in a major loss of spawning habitat between Devil Canyon and Talkeetna for the species of salmon which have traditionally used these habitats.

4. Where is this spawning habitat?

Most of the spawning habitat is located within the side channels and sloughs that adjoin the mainstem Susitna. These sloughs are only accessible to adult salmon when the river is high enough to cause a surface water connection at their lower end.

Detailed measurements to determine relationships between the water levels in the sloughs and stream flow in the mainstem have only been made at a small number of sites.

But it appears that virtually all of the sloughs measured are inaccessible to adult salmon when mainstem flows are less than 10,000 cfs at Gold Creek (the U.S.G.S. gauging station).

5. Would stream flow in the range of 12,000 to 14,000 cfs at Gold Creek maintain the slough habitat?

No. Stream flows in this range would only maintain access to the slough from its downstream end. To maintain the slough habitat, significantly larger flows would also have to be occasionally provided.

At present, stream flows in excess of 25,000 cfs at Gold Creek are common during summer months. These flows enter the sloughs from the upstream end and flush out undesirable sediments. Without periodic flows through the sloughs, the sloughs would gradually silt-in and become covered with vegetation.

Our preliminary analysis of existing information indicates that stream flows in the range of 19,000 cfs at Gold Creek are necessary to allow water to flow into the sloughs from the upper end.

6. Which fish species use the slough habitat?

All species of Pacific salmon except chinook have been observed spawning in the side channels and slough areas. The chum salmon is the predominant user.

In addition the sloughs provide important rearing habitat for juvenile chinook and coho.

7. In the absence of mitigation measures, how significant would the chum salmon loss be to the Cook Inlet commercial fisheries?

This year's data suggests that 20,000 to 30,000 chum salmon spawn in the Devil Canyon to Talkeetna reach of the river. If the spawning habitat for these fish were lost, it would mean a reduction in the Cook Inlet fishery of approximately 70,000 chum salmon.

Over the last 20 years, the total Cook Inlet chum harvest has ranged from 270,000 to 1.2 million fish.

With available data, the best estimate we can provide of the significance of the chum salmon loss to the Cook Inlet commercial fishery would be approximately a 15% reduction in harvestable chum salmon.

This percentage is based on two assumptions: 1) a total loss of the chum salmon population between Devil Canyon and Talkeetna; and 2) that this year's salmon spawning data reflects the average size of the run of chum salmon using this portion of river during the last 20 years.

8. How might other species be affected?

Sockeye salmon use spawning habitats similar to chum salmon in the Devil Canyon to Talkeetna reach, but this year's sockeye populations utilizing the sloughs are rather small in comparison to the chum population.

Very little is known about the pink salmon runs that use this river segment. Even-year runs (1980, 82, 84, etc.) are normally larger than odd-year runs.

We will have to wait until spawning areas are studied in 1982 before an assessment can be made of project impacts on pink salmon spawning in the Devil Canyon to Talkeetna River segment.

Chinook and coho salmon primarily spawn in tributary streams below Devil Canyon. These streams should not be directly affected by post-project flows.

However, juvenile chinook and coho depend upon the side channels and sloughs of the mainstem Susitna for summer and winter rearing habitat. Rearing habitat in side channels and sloughs may be affected under flows which optimize power production.

The average monthly stream flows resulting from optimizing power production range from 5,000 to 17,000 cfs during the summer.

9. What options exist for mitigating the loss of the side channel and slough habitats?

Several mitigation options are being explored at this time.

Although the preferred method of mitigating this loss would be to avoid the impact altogether (by adopting reservoir operating recommendations), it seems unlikely that this can be done if the project is operated for optimal power production.

The next best method of mitigation would be a combination of things. The first is to provide adequate downstream flows and design structural features into the dams to minimize adverse impacts. The second is to undertake feasible mitigative actions such as river channel modifications (to provide replacement spawning areas), in an attempt to offset the losses that do occur.

However, numerous technical questions still remain concerning the overall feasibility of depending upon stream channel modifications for the continued propagation of salmon in this river segment.

Compensatory types of mitigation alternatives such as fish hatcheries, artificial spawning channels, or enhancement activities in other parts of the Cook Inlet basin are also being considered.

10. Besides affecting stream flow, what other types of impacts on the fishery resources are possible from the construction of Susitna?

Other concerns to the fishery that are being evaluated are: changes in ice cover and channel morphology; changes in intergravel temperature and flow rates in spawning areas; as well as changes in stream temperatures, water quality, and suspended sediment concentrations.

11. How would the dams affect the turbidity (suspended sediment concentrations) in the Susitna River?

During the summer, mainstem river sediment concentrations should be reduced by the reservoirs to levels that would be similar to the lower Kenai River. This should provide improvements in mainstem rearing habitat for resident fish and rearing salmon.

Turbidity should increase above the current levels in the winter. This is not expected to adversely affect the fisheries.

12. Will changes in water quality and temperature prevent salmon from homing (finding their spawning areas)?

No. Salmon use their sense of smell to find their spawning areas. Changes in water quality and stream temperature are not known to affect this, providing the original scent source is still present.

Large decreases in stream temperature can delay the upstream migration of fish, postpone the time of spawning and ultimately affect their spawning success. However, post-project stream temperatures during the spawning period are not predicted to be sufficiently different from pre-project temperatures to affect the migratory behavior of the fish.

Salmon in streams in the lower 48 that have been drastically altered by hydro projects appear to be able to home to their natal areas. These projects often decreased salmon runs but this is attributable to factors other than homing.

13. Could any other homing problems develop?

A homing problem could develop with construction of spawning areas in the main channel (as mitigation for the lost slough habitats).

Fish will attempt to return to traditional spawning areas in the sloughs. It is uncertain whether they will accept new man-made spawning areas. This would be a matter of concern if the decision is made to depend entirely on man-made spawning areas in the mainstem river (as replacement for lost slough habitat) to sustain the existing run.

14. Will the Susitna project affect water quality?

Preliminary investigations have not identified any chronic water quality problems which would cause a toxic downstream condition for young fish or food organisms.

15. What are the possible impacts from increases in winter stream temperature?

Increases in river temperatures will affect the formation of an ice cover on the upper Susitna River. It is predicted that an ice cover will not form above Talkeetna in most years. The effects of this on fisheries are unknown, but are not suspected as being significant.

However, the increased winter stream temperatures may have a significant adverse effect on salmon eggs incubating in streambed gravels.

Warmer temperatures in the gravel may cause the fry to emerge early. If the newly emerged fish swim downstream (below Talkeetna) they will encounter cold winter water temperatures and suffer notable mortalities due to temperature change and a lack of food.

Both pink and chum salmon juveniles outmigrate to Cook Inlet within a few weeks of emerging from streambed gravels. These immature fish would likely incur the greatest mortalities.

16. Will the reservoirs cause any problems on fisheries above the Canyon?

Yes. Grayling habitat in the river and tributary streams within the impoundment zones will be lost as a consequence of building the project. Compensatory types of mitigation for this loss are being examined.

17. Will there be any impacts downstream of the confluence of the Chulitna and Susitna Rivers?

There are several unknowns regarding the effects of the proposed Susitna project on the river below the Chulitna confluence. No obvious adverse impacts on fisheries have yet been determined. In part, this is because the Phase I studies have been concentrated in the impoundment areas and in the Devil Canyon to Talkeetna reach.

It is also due to the fact that the upper Susitna River contributes about 40 percent of the total stream flow at the confluence. Water from the Talkeetna and Chulitna Rivers will mute most project effects downstream of this confluence during summer months when fish are most active.

Further studies are being planned to increase the level of confidence in the present assessment.

18. Will there be adequate flows for the fish that spawn in major tributary streams above the town of Talkeetna, like Indian River and Portage Creek?

The project will not affect spawning areas in these streams, nor does there appear to be any problem with post-project stream flows adversely affecting the ability of adult salmon to enter the major tributary streams.

These streams have high enough seasonal flows and gradients which should downcut through their delta fans to the new level of the Susitna River and establish a new channel to the mainstem river.

However, the rearing habitat for the juvenile chinook and coho from these streams may be adversely affected. These young fish depend on the slough habitat during the summer months. These sloughs are expected to be sustantially dewatered (left without enough water for fish to survive) if power production is optimized.

19. Is the data currently available adequate to determine the full extent of fishery impacts from Susitna and to provide detailed mitigation solutions to the problems?

No. The data base collected by the Alaska Department of Fish and Game to date, as well as the precision of the engineers' current forecasts regarding post-project flows and water temperatures, are adequate only to identify major areas of impact and to support generalized statements concerning the project's feasibility.

The actual determination of the degree of impact and the development of specific mitigation recommendations will require additional information and study.

This was foreseen at the beginning of the feasibility study, however. In fact Acres' February 1980 plan of study includes a statement to this effect:

> "A preliminary impact analysis will be done prior to license application using the data available. However many of the fisheries studies will be extended to include a complete life cycle of the fish, as much as five years. The final impact study will be prepared during the post-license application period when the data are available."

20. Is it possible to construct the dams and improve the fisheries?

Yes, if it were decided to do so, and the fish cooperate.

Habitat improvement would be most probable if we did several things in concert: 1) provide adequate stream flows to maintain or minimize the impact on the slough habitats; 2) store undesirable peak flows in the reservoirs to prevent destruction of mainstem spawning areas; and 3) install the necessary outlet works in the Watana and Devil Canyon dams to provide acceptable downstream temperatures and to prevent other water quality problems such as gas supersaturation.

If these actions were taken, it is quite likely that the existing fishery resource could be improved.

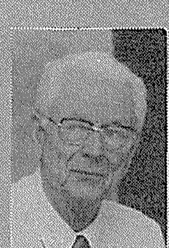
Were additional mainstem spawning areas constructed, and the fish cooperate, the fishery could be improved even more.

Conceptually, it may also be possible to improve fish habitat elsewhere in the lower Susitna basin to more than offset the losses which would occur in the Talkeetna to Devil Canyon reach. Other methods to offset the losses or to improve the fisheries include the construction of artificial spawning channels or fish hatcheries.

Each of these alternatives would require a feasibility study before making a decision.

Specialists assess impacts of Susitna on fish


Atkinson


Bell


Schmidt


Trihey


Williams

A team of five specialists with a wide variety of experience and knowledge in the area of fisheries has been assembled to serve as the core group of the Fish Mitigation Task Force.

They are analyzing the fisheries data collected during the Phase I field studies in order to determine general impacts and to begin formulating mitigation concepts.

The impact and mitigation information will be incorporated into the March 1982 Susitna feasibility report.

If the State of Alaska decides to apply for a FERC license on Susitna, the core group will continue to refine their impact assessments and mitigation plans. The results of the Phase I study will determine the nature of Phase II study.

Members of the Fisheries core group include Dr. Clint Atkinson, Mr. Milo Bell, Dr. Dana Schmidt, Mr. Woody Trihey, and Mr. Robert Williams.

Clint Atkinson is an internationally recognized expert in nearly all phases of salmon fishery. For more than forty years, he has worked in industry, government, and academia studying the Pacific and Atlantic salmon fisheries.

For nearly 15 years, Mr. Atkinson served as director of the Montlake Laboratory in Seattle and later served for several years as fisheries attache at the American Embassy in Tokyo, Japan.

Milo Bell has over 50 years of experience in fisheries working primarily in the state of Washington and the Pacific Northwest. He is considered a pioneer in the design of fishways and fish ladders and is a professor emeritus at the University of Washington where he taught and researched the engineering-biological aspects of fisheries programs.

Dr. Dana Schmidt received his PhD in Fisheries from Oregon State University in 1973. Since then he has worked on fisheries impact analysis studies in several western states on projects ranging from the effects of coal development and thermal plants on fish populations to in-stream flow studies.

Most recently he has worked for the U.S. Fish and Wildlife Service conducting telemetry and habitat requirement studies on juvenile salmon in the Kenai River.

Woody Trihey is a civil engineer specializing in hydraulics and in-stream flow assessments. While employed by the U.S. Fish and Wildlife Service, he participated in the development of the Fort Collins, Colorado in-stream flow group's incremental methodologies.

For nearly 10 years, he has worked in all phases of in-stream flow assessment including instructor, special project engineer, and author of manuals on field methods and data reduction.

Robert Williams serves as the coordinator of the Fisheries Mitigation Task Force and also serves as fisheries ecology coordinator for Terrestrial Environmental Specialists, Inc. (TES). TES is the firm coordinating the environmental studies on Susitna.

Since receiving his master's degree in zoology from the University of Vermont in 1969, Mr. Williams has coordinated and supervised numerous biological studies on river and lake systems throughout the eastern United States. These studies were on hydroelectric, thermal generation, and nuclear power plants.

Intensive fishery investigations conducted in 1981 by Alaska Department of Fish and Game

During the summer of 1981 the Alaska Department of Fish and Game conducted baseline surveys of the fishery resources of the Susitna River basin.

These studies focused on those portions of the basin that would be most affected by the proposed Susitna project: the impoundment areas above the proposed dams and the river between Devil Canyon and Talkeetna.

The surveys were part of Phase I of the Susitna Hydro Aquatic studies. Phase I is the beginning of the process by which the impact of the Susitna project on the river's fishery will be assessed and mitigation measures will be recommended.

The Phase I fish studies fall into three major categories:
- the adult anadromous studies;
- the resident and juvenile studies; and
- the aquatic habitat studies.

These categories cover all fish species and habitats found in the Susitna River and its primary tributaries. There are many elements to each of these studies.

Data collected during the summer is currently being analyzed to identify general impacts and to discuss fishery mitigation on a conceptual basis.

If developmental efforts on Susitna proceed, further study will be necessary to more clearly define impacts and to prepare a detailed mitigation plan required by the Federal Energy Regulatory Commission (FERC) licensing process.

The adult anadromous studies

Anadromous fish are fish which spawn in fresh water, rear in salt water, and return to fresh water to spawn. The predominant anadromous fish in the Susitna River basin are the five species of Pacific salmon: coho, chum, chinook, pink, and sockeye salmon.

Five monitoring stations were operated to assess the adult anadromous fish returning to the Susitna River basin to spawn. At nearly all of these stations, side scan sonar (SSS) counters and fishwheels were utilized.

Sonar counters

Sonar counters are devices that use sound waves to count fish migrating upstream.

An aluminum tube called a substrate is placed on the river bottom. Fish are directed over the aluminum tube by nets attached to the shore.

A sound wave is continuously projected just above the tube. When a fish passes over the tube, sound waves are reflected to the scanner. The scanner will not count objects such as logs or boats because it sorts out echoes that are not moving at the same speed as the fish.

Fishwheels

Fishwheels were used to capture and tag salmon. The salmon were sampled daily for age, length, and sex, and were tagged with color and number coded tags.

Data from fishwheel catches and from the sonar counters provide information on how many fish are migrating, when, and where.

Radio telemetry

Radio telemetry studies were conducted in the mainstem Susitna River between Talkeetna and Devil Canyon. Low frequency radio transmitters were placed in the stomachs of adult salmon collected at two fishwheel sites near Curry and Talkeetna. These radio-tagged fish were tracked by boat and aircraft during their migration and spawning.

The telemetry studies provided information on rate of movement and milling behavior of adult salmon in the vicinity of Devil Canyon. This investigation provided information on salmon spawning areas which had not previously been known.

The juvenile anadromous studies

Field investigations focused on chinook and coho salmon, the predominant juvenile salmon species that overwinter in the Susitna River.

Information on the numbers and habitats of juvenile salmon were also collected. These data are necessary to determine the downstream effects of the Susitna project on the over-wintering habitat for juveniles.

Although sockeye juveniles also use the river, detailed information gathering on the rearing habitats of this species was not planned for Phase I study.

Young pink and chum salmon outmigrate to Cook Inlet shortly after hatching and do not use the river for rearing.

The resident fish studies

The resident fish studies provided information on the types, numbers, migrational patterns, and habitats of resident fish (fish that live year-round in the river). Of particular importance are the tributary creeks which will flow into the proposed impoundment areas.

Gill nets, hook and line, beach seines, electrofishing, minnow traps, as well as tagging and recapture, were used to gain information on migration.

Data on numbers and habitat location of Arctic grayling, rainbow trout, burbot, round whitefish, long nose suckers, slimy sculpins, and other species were collected to determine the possible impacts of the Susitna project on resident fish.

The aquatic habitat studies

The aquatic habitat and instream flow investigations were undertaken to describe physical and chemical characteristics of the various types of fish habitat within the project area.

Detailed water quality and hydraulic measurements were collected at five side channel sloughs between Devil Canyon and Talkeetna.

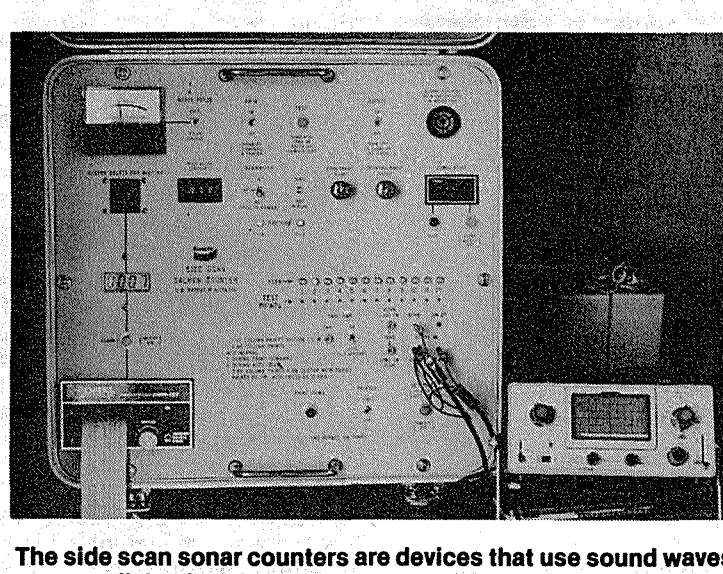
These data were used to estimate the Susitna River flow in areas of important fisheries habitats (i.e. the sloughs and side channels).

In addition, similar, but less detailed, data were collected at numerous mainstem and other side channel slough locations.

Used in conjunction with the rest of the studies, the aquatic habitat information clearly demonstrates that clear water sloughs provide the most important salmon habitat in the Devil Canyon to Talkeetna segment of the river.

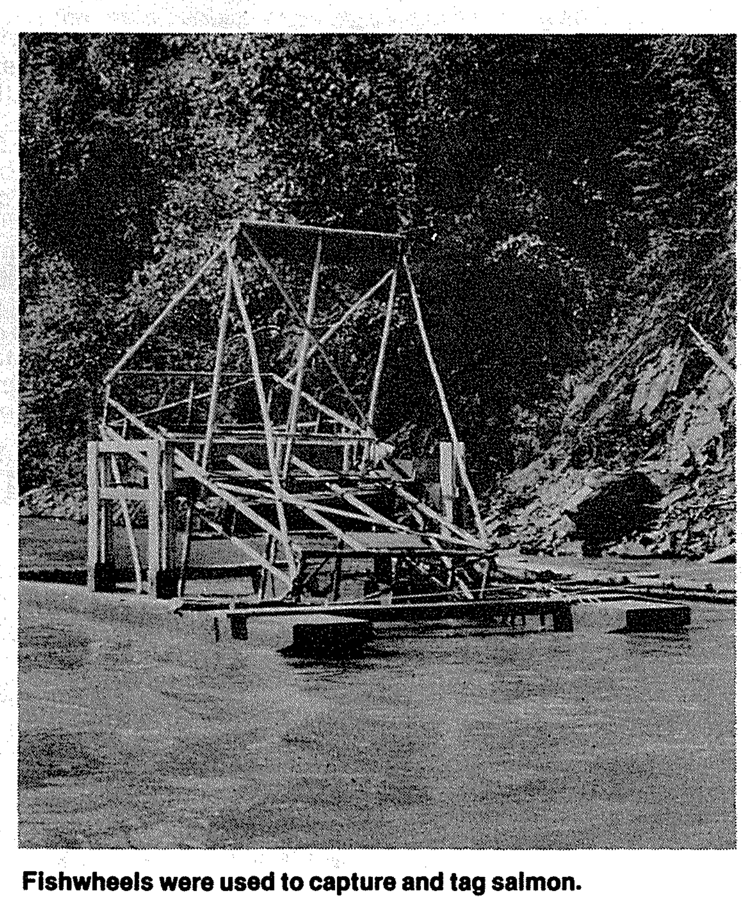
Sources: "Adult Anadromous Fisheries Project, Phase I Final Draft Report," Subtask 7.10, Alaska Department of Fish and Game, Su Hydro 1981.

Draft of "Juvenile Anadromous Fish and Resident Fish Investigations, Phase I Report," Alaska Department of Fish and Game, Su Hydro 1981.

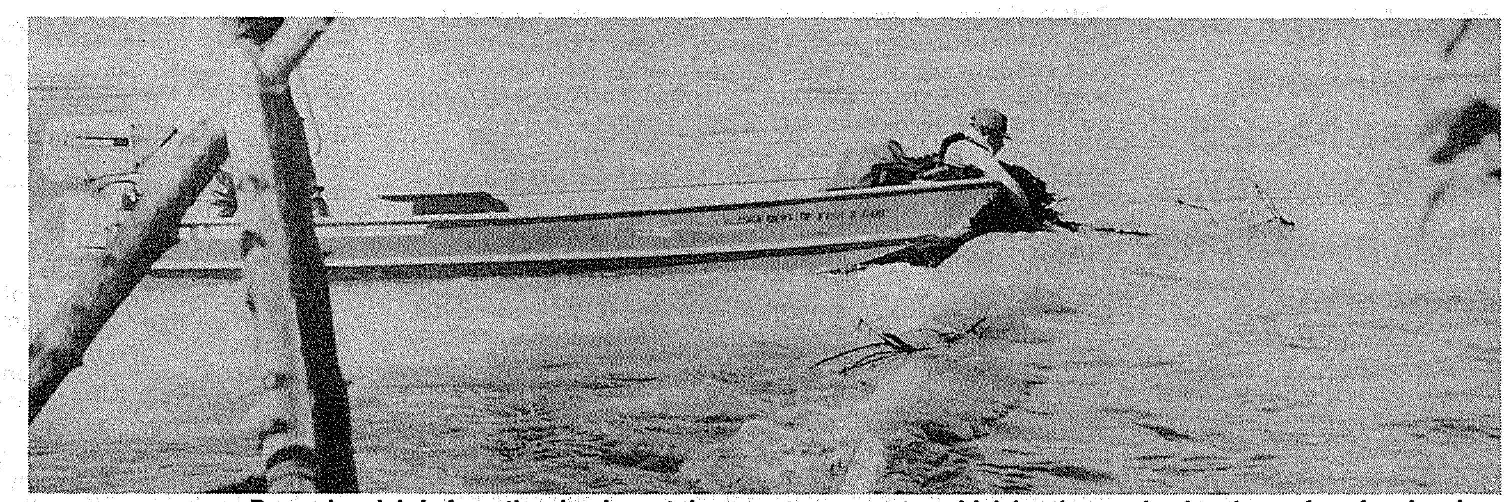


The side scan sonar counters are devices that use sound waves to count fish migrating upstream.

This photograph shows a sonar counter (left) and oscilloscope (right).



Fishwheels were used to capture and tag salmon.



Removing debris from the aluminum tube on a sonar counter which has been raised to the surface for cleaning.

Investigators prepare to release a radio-tagged salmon while tracking another chum in the Susitna River near the Curry station.

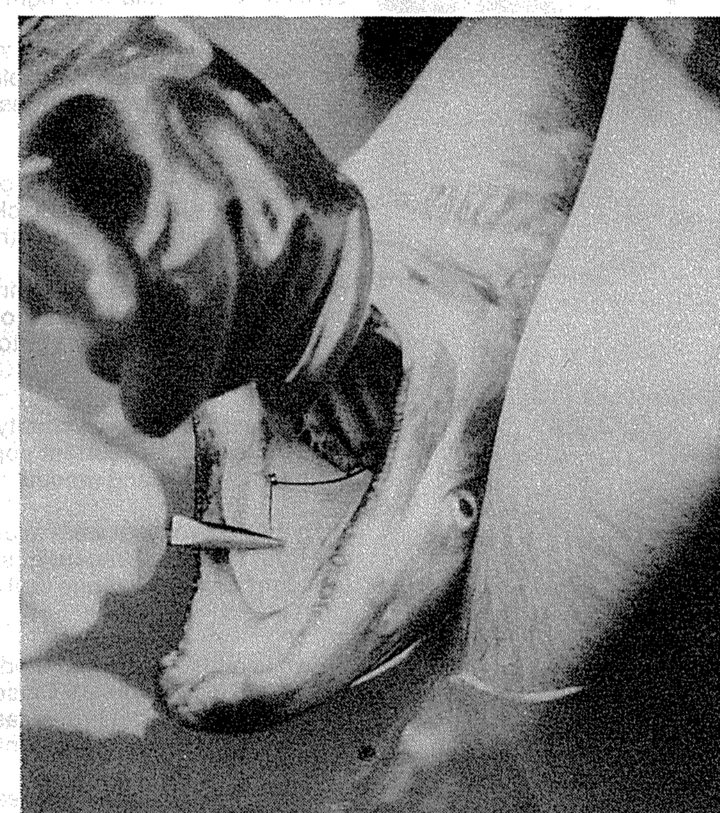
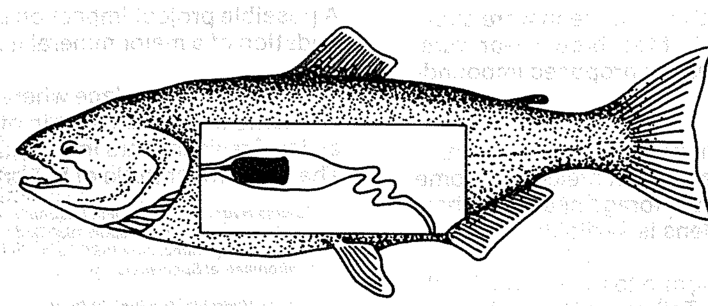


Photo Series Alaska Department of Fish & Game

Low frequency radio transmitters were placed in the stomachs of adult salmon.



The transmitters were placed in the front portion of the stomach.

Can the Susitna be another Columbia?

The history of hydroelectric development on the Columbia River in Washington state is a good illustration of the conflict that can develop between the construction and operation of dams and the maintenance of a viable salmon fishery.

Because of this, comparisons to the Columbia River system are sometimes made when a project is proposed on a river that supports a salmon fishery.

This article is intended to clarify some of the similarities and differences which exist between the Columbia and Susitna systems.

Hydroelectric development on the Columbia had severe effects on the natural salmon runs in that river.

The first large Columbia hydroelectric projects (Bonneville and McNary) were quite far downstream and reduced access to upstream spawning grounds. Later downstream projects (Dalles, John Day, Priest Rapids, and Wanapum) further blocked passage and also flooded spawning areas.

The large reservoirs also caused problems for young salmon finding their way downstream through the new lake-like conditions of the impoundments. The fish suffered high mortalities when they reached the dams because they could only pass the dams by going through the turbines or over the spillways.

In summary, the fish impacts on the Columbia can be listed in three general categories. They are:

1) the blockage of upstream salmon migration and the flooding of spawning areas;
2) high mortalities of young salmon migrating downstream past the dams; and
3) the lack of adequate downstream flows and water quality conditions to maintain the fisheries.

The first two of these situations, which occurred on the Columbia, would not occur on the Susitna. Because the steep gradients and rapid flows in Devil Canyon already prevent salmon migration into the upper Susitna, access to upstream spawning areas and downstream migration are not problems for the Susitna hydroelectric project.

The third situation on the Columbia (that of inadequate downstream flows for fisheries) has some application to the Susitna. On both rivers, the maintenance of adequate downstream flows is important. The reasons, however, are different.

Downstream flow requirements in the Columbia are generally necessary to maintain outmigrating fish passage.

On the Susitna, adequate downstream flows would be necessary to preserve access to the side sloughs between Devil Canyon and Talkeetna. These sloughs are the most productive spawning and overwintering areas between Devil Canyon and Talkeetna.

The loss of these side sloughs between Devil Canyon and Talkeetna has implications for the fishery resources in the Susitna and in Cook Inlet. The magnitude of these implications is discussed in the article entitled "We've Been Asked..."

Source: analysis provided by Milo Bell, Woody Trihey, and Bob Williams, all members of the Fish Mitigation core group.

If you want to get future newsletters

This public information document on the Susitna hydropower project was developed by the Alaska Power Authority Public Participation Office, Nancy Blunck, Director. Comments on the substance of this newsletter and ideas for future publications should be forwarded to the Public Participation Office by way of the following coupon.

Name (Last / First / Initial) ____________________

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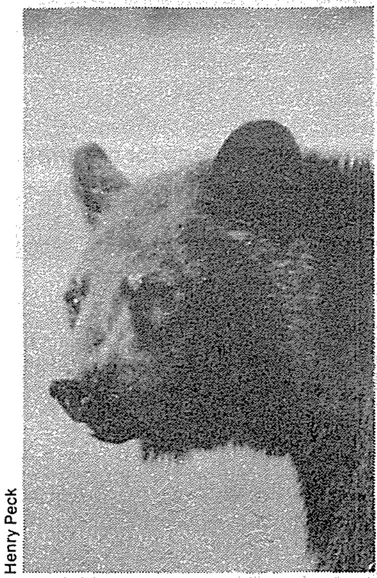
and mail to: Alaska Power Authority
Public Participation Office
334 W. 5th Avenue Anchorage, Alaska 99501

THANK YOU FOR YOUR INTEREST

Black bear populations to be affected more severely than brown bear populations



Henry Peck

Both black and brown bear will lose habitat to the proposed Susitna impoundments. This loss will be more severe for black bear populations, which will lose both denning and foraging areas from the fill of the reservoirs. Brown bear will lose habitat utilized primarily in spring and early summer.

Black bear populations in the area are restricted to a narrow band of spruce forests along the Susitna River during most of the year. These forests provide important escape habitat from the surrounding large and healthy population of brown bears.

Brown bears are less restricted to areas that will be inundated by the dams than black bears and will lose a lower proportion of their total annual habitat. Habitat used by brown bears, especially in the spring and early summer, however, will be affected by the dams.

Black bears: Until the Susitna study, no black bear research had been done in the Susitna River basin. The abundance of black bears and relatively light hunting pressure has permitted light hunting restrictions.

For this study, twenty-seven black bears were radio collared. Results indicate that black bear density is higher near Devil Canyon than near Watana.

Black bear are more common on the north side of the river than on the south side. Overall black bear density in the area is moderate to high relative to other Alaskan black bear habitats.

Because bear habitat loss cannot be directly mitigated, the only compensation possible for black bear is to improve their habitat in some other area or to improve habitat for some other wildlife species.

Brown bears: In the past twenty years, brown bear populations have increased. The current population is thought to be abundant, young, and productive.

Forty-two brown bear were captured and nineteen were successfully radio collared for this study. Most brown bear were found to den at elevations well above the proposed impoundment levels.

Brown bear use of the impoundment areas was greatest in spring and early summer. These are the first areas to become clear of snow and the first areas where forage needed by bears after emergence from their winter dens is available.

In the summer, many brown bear migrate to the Prairie Creek area between Stephan Lake and the Talkeetna River where there is an abundant king salmon run. *Sources 1 and 2.*

Overall impact on bird populations not seen as high

During field studies of birds in the upper Susitna basin, 136 species of birds were identified. Twenty-one of these were waterfowl. No endangered species of birds were found or identified.

Overall, the ponds and lakes of the region support relatively few waterfowl during both summer and migratory periods.

The project's overall impact on most bird populations should not be great because the habitats lost to the project are common in other parts of Alaska.

The impoundments created by Susitna would reduce the number of suitable cliff nesting sites used by raptors. To lessen this impact, measures would be needed to keep people away from the remaining sites during sensitive nesting times, to avoid clearing in areas that could provide nesting habitat after flooding, and to restrict helicopter and air traffic over known nesting areas.

The impoundments will also eliminate several nesting sites of bald eagles. Despite this, the bald eagle population could possibly increase. Proper clearing of the reservoirs would be needed to leave clumps of tall spruce trees at half to one mile intervals along the reservoirs. The clumps would have to be far enough from the high water zone to keep the trees from being washed away. *Sources 2 and 3.*

Watana reservoir would inundate Dall sheep mineral lick

Three populations of Dall sheep were identified in areas above 4,000 feet, well above the level of the proposed reservoirs. A possible project impact on Dall sheep would be the partial inundation of a major mineral lick at Jay Creek.

A mineral lick is a place where sheep go to get certain mineral elements that are lacking in other parts of their range. The lick at Jay Creek appears important to the Dall sheep population. The exact magnitude of importance is currently unknown. *Sources 1 and 2.*

1. *Susitna Hydroelectric Project Environmental Studies Annual Report 1980 Subtask 7.11 - Big Game, July 1981, Terrestrial Environmental Specialists, Inc.*
2. *Susitna Hydroelectric Project Draft Analysis of Wildlife Mitigation Options, December 1981, Terrestrial Environmental Specialists and Acres American, Inc.*
3. *Susitna Hydroelectric Project Environmental Studies Annual Report 1980, Subtask 7.11 Wildlife Ecology Birds and Non-Game Mammals, April 1981, University of Alaska Museum and Terrestrial Environmental Specialists, Inc.*