

4K94-44

A PROPOSAL TO THE UNITED STATES FISH WILDLIFE SERVICE TO
TEMPORARILY USE SALTERY LAKE SOCKEYE SALMON FOR STOCKING
SPIRIDON LAKE AND ADJUST MANAGEMENT OF THE TERMINAL FISHERY IN
THE SPIRIDON BAY SPECIAL HARVEST AREA

Regional Information Report¹ No. 4K94-44

Alaska Department of Fish and Game
Commercial Fisheries Management and Development Division
211 Mission Road
Kodiak, Alaska 99615

December 1994

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INTRODUCTION

At the November 1994 Kodiak Regional Aquaculture Association meeting, the U.S Fish and Wildlife Service (FWS) was apprised of the Alaska Department of Fish and Game's (ADF&G) intention to temporarily change the sockeye salmon *Oncorhynchus nerka* brood stock source for the Spiridon Lake Enhancement Project. The proposed change was from the Upper Station late run stock to the Saltery Lake stock. The FWS was also informed that ADF&G has progressed beyond the conceptional stage by collecting eggs from the Saltery Lake escapement during September 1994. We acknowledge that this was errant and that FWS approval for the temporary brood stock change should have been obtained prior to any action.

ADF&G's long term plan is to retain Upper Station late run fish as the brood source for Spiridon Lake. However in the interim (a maximum of three years), we propose to use Saltery Lake fish for the brood stock. For several years, the Kitoi Bay Hatchery staff has been working to develop an annual return of Upper Station late run fish to the hatchery solely to meet the egg-take requirements for the Spiridon Lake project. By 1997 or earlier, Upper Station late run fish should be returning to the hatchery in sufficient numbers. If by some fate the Upper Station late run brood source is not fully developed at the Kitoi Bay Hatchery by 1997, a late run sockeye egg-take will be re-instituted at Upper Station Lakes.

Currently, ADF&G has about 7.6 million sockeye eggs from the Saltery Lake escapement incubating at the Pillar Creek Hatchery. We need FWS approval to release 5 million fry produced from these eggs into Spiridon Lake in May 1995. Authorization is further requested to temporarily use the Saltery brood stock for a maximum of two more years (1996 and 1997).

In addition to using Saltery Lake as a brood source, we hereby propose to modify the fishery in the Spiridon Bay Special Harvest Area to further reduce the potential of impacting Spiridon Bay wild salmon stocks and improve fishery performance, including focusing on a more orderly fishery. The details of this proposed management strategy are provided in Appendix A and referenced later in an assessment of the Saltery Lake brood stock.

From a FWS November 1994 letter and subsequently during an inter-agency meeting on 8 December 1994, we understand the concerns that the FWS has with the temporary use of the Saltery Lake brood stock. These include:

1. Prevalence of the IHN virus in the Saltery brood stock may risk Spiridon River chum and sockeye salmon and or Spiridon Lake resident fish.
2. Saltery Lake brood stock timing may more closely approximate the timing of Spiridon River chum and sockeye salmon than the Upper Station stock. Depending on fishery management actions, the timing change may increase the risk of local wild stocks being harvested.
3. The Spiridon Lake Enhancement Project is authorized under a 1991 Environmental Assessment (EA; Appendix B) and changes in the operation must be coordinated with FWS to ensure compatibility.

To assist the FWS in determination of the suitability of the proposed action, we herein define the purpose and need for the amendment, environmental consequences of the proposed action, and provide a conclusion.

PURPOSE AND NEED FOR ACTION

The objective of the ADF&G Spiridon Lake Sockeye Salmon Enhancement Project is to increase the availability of sockeye salmon for the common property fishery within the Northwest Kodiak District (ADF&G 1993). For the project to be viable, Spiridon Lake must be stocked annually with sockeye fry as the system does not support a natural run due to a series of barrier falls on the lake outlet stream, Telrod Creek.

The Spiridon project is important to the fishing community of Kodiak and the Native villages of Larsen Bay, Karluk, Akhiok, Ouzinkie, Port Lions, and Old Harbor. The current value of the Spiridon project is further accentuated by the recent down-turn in salmon prices coupled with the diminished production of the nearby Ayakulik sockeye run caused by the 1989 Exxon spill. For 1994 season, the harvest of Spiridon Lake sockeye salmon is an estimated 263,750 fish (Nelson and Barrett 1994). This represents about 11% of Kodiak's total 1994 sockeye catch and an ex-vessel value of 1.1 million dollars to Kodiak's common property fishery (Dave Prokopowich, ADF&G, personal communication).

ADF&G did not conduct a normal egg-take from the Upper Station late run sockeye salmon in 1994 but instead collected eggs from an alternate source, the Saltery Lake run. The decision to take the eggs were based on five factors: (1) initial uncertainty of achieving the Upper Station late run sockeye escapement levels required for a normal egg-take; (2) opposition among some Alitak Bay District set netters to continue Upper Station egg collections; (3) an escapement surplus of Saltery Lake sockeye salmon; (4) Similar stock characteristics between Saltery Lake and Upper Station late run fish; and (5) reduced logistics and field crew costs.

The 1994 Saltery Lake egg take will provide approximately 5 million sockeye fry which are intended to meet the 1995 fry stocking objective for Spiridon Lake. There is no other option for supplying fry to Spiridon Lake for 1995. Further, it is not advisable to release 5 million fry into Saltery Lake because the lake was overescaped in 1994 and a supplemental fry release could risk damage to an already stressed system.

CHARACTERISTICS OF THE SALTERY LAKE BROOD STOCK SOURCE

Run, Size, and Timing

Saltery Lake is the single largest sockeye producing system on the eastside of Kodiak Island (Brennan et al. 1994). The Saltery Lake sockeye escapement goal is 20 to 40 thousand fish, and the average run potential is estimated to be 100 thousand fish (Barrett and Nelson 1994). The

escapement goal has been exceeded for three of the last four years with an escapement of 53,000 fish, 77,000 fish and 59,000 fish occurring in 1991, 1993, and 1994, respectively (Brodie 1994).

About 90% of the SALTERY escapement occurs from late June through mid August (Barrett and Nelson 1994). The midpoint of the escapement timing is about 18 July.

In 1994, 77% of the escapement occurred after 15 July; more specifically, about 50% of the escapement occurred during the two week period of 14-27 July (Brodie 1994).

The SALTERY escapement may not be a truly precise indicator of run timing because of variation in harvest rates. Anecdotal information suggests that the influence of the commercial fishery is stronger on the latter half of the run. The potential bias from using the escapement counts as a gauge of run timing is probably about one week. Accordingly, the estimated actual run timing of the Spiridon Lake run using the SALTERY brood stock would be 3 July to 8 August on westside of Kodiak Island (Table 1). At Telrod Cove, the timing should be just one day later (4 July- 9 August). The SALTERY stock timing begins and ends about two to three weeks earlier than that of the Upper Station late run stock (Figure 1).

Preliminary escapement tagging and survey results for 1994 indicate that there is no time-of-entry difference between SALTERY Lake shoal and tributary stream spawners (Table 2). Since the eggs from the 1994 SALTERY Lake sockeye escapement were collected approximately proportional to the escapement, they are assumed to represent the entire population with respect to timing, age, and other genetic characteristics. The egg-take period at SALTERY was from 12-19 September which corresponds favorably to historical Upper Station egg-takes (Chris Clevenger, ADF&G, personal communication).

Age Composition

Based on escapement age samples, the SALTERY sockeye run is primarily comprised of fish having spent three winters in the ocean as adults (Table 3). The dominant ages are 1.3 and 2.3 fish; combined they average about 73% annually. Two ocean age fish, limited to ages 2.2 and 1.2, average about 26%. In comparison, the Upper Station late run brood stock averages about 79% two-ocean age fish and 21% three-ocean age fish.

Disease History

SALTERY Lake sockeye salmon, as with all anadromous sockeye salmon examined in Alaska, have been found to be a carrier of infectious hematopoietic necrosis virus (IHNV; Ted Meyers, ADF&G, personal communication). Ovarian samples collected from SALTERY Creek sockeye spawners in 1986 and 1994 revealed that 34% and 92%, respectively, were IHNV positive (Table 4). This is not dissimilar to the Upper Station late run stock which has tested IHNV positive in every sample collected during a 20-year period (1974-1993; Table 5) or to the two major stocks Karluk and Frazer which tested IHNV positive at 97% and 73% respectively in 1992 (Table 4).

ENVIRONMENTAL CONSEQUENCES

Physical, Chemical, and Cultural Impacts

Under the proposed use of the Saltery brood stock, fry loading will not be increased over that which is authorized in the 1991 EA. Consequently, no change is expected in lake nutrient levels, ratios or demands. Nutrient level monitoring will continue as planned.

There is not expected to be any change from existing physical, chemical, or cultural impacts of the project from the proposed usage of the Saltery Lake brood stock.

Biological Impacts

Spiridon Lake Resident Biota

Fry loading rate and time of release will not change. Therefore, the proposed action is not expected to cause any additional impact on the zooplankton and phytoplankton communities.

Resident fish densities in the Spiridon Lake drainage including Telrod Creek are not expected to be altered under the proposed action. Growth characteristics of the resident fish should also remain constant. Again, the justification is that neither the fry loading density nor the time of release will change.

Homing

The Saltery brood stock, unlike the Upper Station late run stock, lacks the genetic tendency to produce age 0 smolt. Saltery Lake brood stock fish should rear in Spiridon Lake for at least one year thereby ensuring adequate imprinting and decreasing the likelihood of straying. Characteristically, the homing ability of sockeye salmon is highly refined (Groot and Margolis 1991).

IHNV

The probability of IHNV transmission to Spiridon River chum or sockeye salmon is not expected to be any higher or lower if Saltery sockeye salmon are used for stocking Spiridon Lake versus the Upper Station late run fish. Spiridon River sockeye salmon have not been sampled for IHNV. However, the virus is likely present in the Spiridon River system due to the presence of a resident sockeye stock (Ted Meyers, ADF&G, personal communication). Hence, "a little or a lot" of virus exposure of sockeye and chum salmon likely occurs naturally without any introductions of other sockeye stocks.

The Upper Station Lake sockeye stock is also an IHNV carrier. An IHNV prevalence of 55% in the Upper Station stock for 1993 was lower than the 92% prevalence found in Saltery Lake fish in 1994 (Table 4). However, a significant concentration of IHNV is shed from infected individuals into the environment (Ted Meyers, ADF&G, personal communication). Only one

infected adult fish could result in an 100% IHNV infection of spawning sockeye salmon. Thus, there is little difference between a 55% prevalence versus a 92% prevalence of the virus in the population when speaking in terms of individual fish exposure over several days or weeks. In either case, all fish could become infected over time. Despite the known virus prevalence in the Upper Station Lake stock, it was acceptable for use as outlined in the 1991 EA.

IHNV levels within sockeye stocks can fluctuate (very low prevalence to very high prevalence) from year-to-year and even within the same year (Ted Meyers, ADF&G, personal communication). This is seen in the historic variation at Upper Station, where IHNV prevalence has ranged from a high of 73% in 1989 to a low of 21% in 1987 (Table 5). These prevalence values are from only one point in time. Before or after the sample date, the numbers of virus-infected fish may be quite different. The variation is also dependent upon what part of the fish run was sampled and the environmental conditions which can influence horizontal fish-to-fish transmission of the virus. Low water flows, high water temperature, and high fish densities all result in more stress and greater virus exposure and production. This translates to a higher prevalence of the virus in the population. In 1994, Saltery Lake hydrological and escapement conditions were conducive to the potential for a high IHNV prevalence (Chris Clevenger, ADF&G, personal communication).

Brood stock prevalence of virus is not directly proportional to the level of virus that may occur in the progeny fish to be transplanted (Ted Meyers, ADF&G, personal communication). High levels of virus in adult spawners is a threat to fish culture in the hatchery, but not necessarily to juvenile fish after transplant where most of their virus exposure will come from other adult or resident sockeye salmon. Statewide ADF&G policy and procedures for the culture of sockeye salmon greatly reduces exposure of progeny fish to virus from the adult parent fish. At a hatchery, some vertical transmission of the virus can occur during egg incubation, resulting in IHNV disease in some lots of fish. These fish are destroyed at the hatchery and not transplanted per ADF&G policy.

Overall, it is ADF&G's evaluation that the Saltery Lake stock poses no higher disease risk than the Upper Station stock to the resident fish in Spiridon Lake or wild anadromous stocks in nearby systems.

Spiridon Bay Resident Biota

The Northwest Kodiak District excluding Telrod Cove will be managed **exclusively** for local wild salmon stocks based upon escapement requirements. Any increase in fleet effort brought about by the Spiridon Lake run will be countered by a reduction in area fishing time to ensure that wild stocks are not over exploited. Directed fishing on Spiridon Lake sockeye salmon will be limited to Telrod Cove. Terminal catch sampling and harvest data for 1994 indicate that non-Spiridon Lake origin fish, including Spiridon River pink, chum, and sockeye salmon, do not concentrate in Telrod Cove and therefore should not be impacted (Patricia Nelson, Alaska Department of Fish and Game, personal communication). To ensure that Telrod Creek pink salmon are not at risk, ADF&G will manage the sockeye fishery in Telrod Cove to provide a minimum indexed escapement of 100 pink salmon. Overall, the risk to wild salmon should be significantly reduced since commercial effort will be more terminally focused. A ten fold reduction in the designated harvest area from that identified in the 1991 EA is proposed (Figure 2).

Waterfowl and seabird density and diversity should not be adversely impacted. As proposed, there could be more fleet activity in Telrod Cove than addressed in the 1991 EA. However, the impact should be compensated by the approximate ten fold reduction in the size of the terminal fishing area (Figure 2). Since the fry stocking density will not be altered, the expected forage base addition from Spiridon Lake outmigrant smolt is not expected to change.

The proposed Saltery Lake sockeye brood stock is not expected to impact bald eagles any more than the Upper Station brood stock. There may be less impact to bald eagles due to the reduced size of the terminal harvest area proposed for 1995. The added food source provided by outmigrant smolt in May and June is not expected to change. Therefore there should not be any reduction in the density of bald eagles (75-100 birds (Dick Munoz, Fish and Wildlife Service, personal communication)) utilizing this nutrient source. Although fishing activity in Telrod Cove could begin two to three weeks earlier, disturbance to the bald eagle nest on the east side of Telrod Cove is not anticipated. ADF&G proposes to monitor the nest at least biweekly during the fishery. The work will comply with prescribed FWS survey and reporting standards and continue for a period of not less than three years. If necessary, changes in the harvest strategy will be recommended to prevent adverse impact .

Marine mammal disturbance, most notably to sea otters, is not expected to be a factor. While increased fishing activity in Telrod Cove may cause a minor displacement of animals, any impact should be offset by the absence of a fishery outside of Telrod Cove.

Subsistence Impacts

Kodiak Island residents, including people from the village of Larsen Bay, are expected to sustain no net loss of salmon harvest opportunity and or supply from the proposed switch in brood stock. If any change were to occur, it is most likely to be favorable due to an expected higher frequency of three ocean age fish in the catch which would translate to an increase in average fish size harvested.

Economic Impact

Although no precise estimate is possible, the economic return to the fishing fleet may improve slightly due to an increase in average fish size. Overall, operating costs are not expected to increase even though the terminal area may be open longer due to the timing variation between the Saltery and Upper Station brood stock. The fleet should be more efficient due to the reduction in the size of the terminal area. Further, there may be fewer boats participating in the fishery because a continuous 24-hour open period is proposed which would eliminate fish buildup.

CONCLUSION

Based upon our assessment, we find that a temporary change to the Saltery Lake brood stock does not compromise the biological, cultural, physical, subsistence, or economic resources of the westside of Kodiak Island in the area of Spiridon Bay. Further, the proposed change will have no greater impact, and in some instances potentially less impact, on area resources than detailed in the 1991 Spiridon Lake project EA. This is predicated on a more restrictive and controlled fishery, as identified in Appendix A.

LITERATURE CITED

- ADF&G (Alaska Department of Fish and Game). 1993. 1993 Cook Inlet/Kodiak/Chignik Commercial Fishing Regulations, Alaska Department of Fish and Game, Division of Commercial Fisheries, Juneau.
- Barrett, B.M., and P.A. Nelson. 1994. Estimated run timing of selected sockeye salmon stocks on the west and east sides of Kodiak Island. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 4K94-6, Kodiak.
- Brennan, K., D. Prokopowich, and D. Gretsich. 1993. Kodiak Management Area commercial salmon annual management report, 1992. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K93-28, Kodiak.
- Brodie, J.R. 1994. Kodiak Management Area salmon escapement cumulative counts for fishweirs, 1985-1994. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 4K94-41, Kodiak.
- Groot, C., and L. Margolis, editors. 1991. Pacific Salmon Life Histories. UBS Press ISBN 0-7748-0359-2, Vancouver, Canada.
- Nelson, P.A., and B.M. Barrett. 1994. An estimate of the number of Spiridon Lake sockeye salmon commercially harvested within the Northwest Kodiak and Southwest Kodiak Districts, 1994. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 4K94-43, Kodiak.

Table 1. Estimated run timing of Spiridon Lake sockeye salmon on the westside of Kodiak Island and Telrod Cove for the brood stocks: Saltery Lake and Upper Station late run fish.

Brood Stock	Westside Kodiak ^a Timing			Telrod Cove (Estuary)		
	Midpoint	Central	90%	Midpoint	Central	90%
Saltery	14-Jul	26-Jun	01-Aug	15-Jul	27-Jun	02-Aug
Saltery ^b	21-Jul	03-Jul	08-Aug	22-Jul	04-Jul	09-Aug
Upper Station, Late	10-Aug	23-Jul	24-Aug	11-Aug	24-Jul	25-Aug

^a The reference location for the westside is Cape Ugat.

^b The Saltery brood stock timing data are adjusted one week later in time from the baseline estimate. This change accounts for a perceived bias in the escapement count database.

Table 2. SALTERY Creek sockeye salmon weekly escapement, proportions weighted by tagging period and proportions observed at spawning areas, 1994.

Date		SALTERY Escapement			Sockeye Salmon Spawning Areas		
Calendar	Period	Number	Percent	Weighted	M.E.Crk ^a	East Creek	Lake Shoals
20 - 26 Jun	1	708	1.2%	NA	NA	NA	NA
27 May - 3 July	2	4,154	7.3%	NA	NA	NA	NA
04 - 10 July	3	3,500	6.2%	NA	NA	NA	NA
11 - 17 July	4	11,181	19.7%	NA	NA	NA	NA
18 - 24 July	5	11,776	20.7%	33.1%	30.7%	36.6%	49.1%
25 - 31 July	6	11,122	19.6%	31.3%	27.4%	38.8%	30.9%
01 - 07 August	7	7,551	13.3%	21.2%	30.0%	16.9%	10.6%
08 - 14 August	8	5,087	8.9%	14.3%	11.8%	7.7%	9.4%
15 - 21 August	9	1,807	3.2%	NA	NA	NA	NA
Totals		56,886	100.0%	100.0%	100.0%	100.0%	100.0%

^a Mouth of East Creek - brood stock collection area.

Table 3. Saltery sockeye escapement age composition, in percent, for selected years.

Year	Sample Size	Ages				
		1.2	.2	1.3	2.3	other
1985	305	26.7	.7	49	16.2	0.4
1986	602	2.6	0.4	88.8	5.1	3.1
1987	629	54.1	4.4	36.9	2.7	1.9
1988	477	2.1	7.8	80.9	.2	0.0
1989	479	10.9	11.5	26.5	50.3	0.8
1993	513	0.8	23	10.5	64.7	1.0
1994	485	22.0	6.0	6.0	64.0	2.0
	average	17.0	8.7	42.7	30.3	1.3

Table 4. Prevalence of IHN virus in Kodiak Island sockeye salmon spawners.

System	Sample Year	Sample Size	Positive for IHNV (%)
Saltery	1986	60	34.0
	1994	60	92.0
Karluk	1992	60	97.0
Frazer	1992	60	73.0
Buskin	1992	60	45.0
Rose Tead	1992	53	<0.5

Table 5. Prevalence of IHN virus in Upper Station sockeye salmon spawners, 1974-1993.

Sample Date	Sample Size	Positive for IHNV (%)
03 Oct. 1974	NA	yes ^a
24 Oct. 1975	NA	yes ^a
20 Sept. 1987	58	20.7
22 Sept. 1988	60	46.7
18 Sept. 1989	63	73.0
04 Sept. 1992	62	38.7
19 Sept. 1993	56	55.4
25 Sept. 1993	59	40.7

^a Presence of IHNV identified.

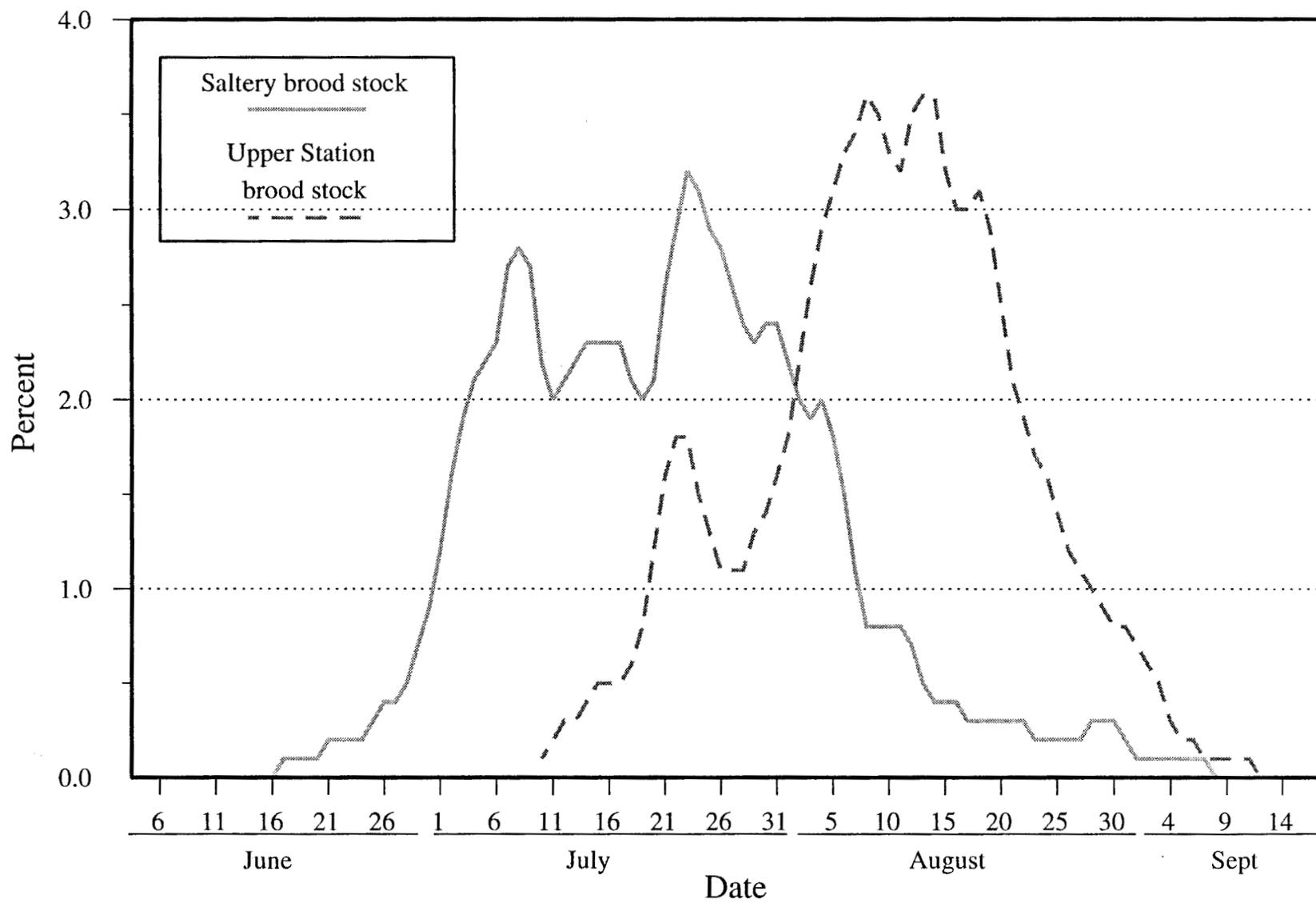


Figure 1. Estimated run timing of the Spiridon Lake sockeye salmon run on the westside of Kodiak Island for the brood stocks: Saltery Lake and Upper Station late run.

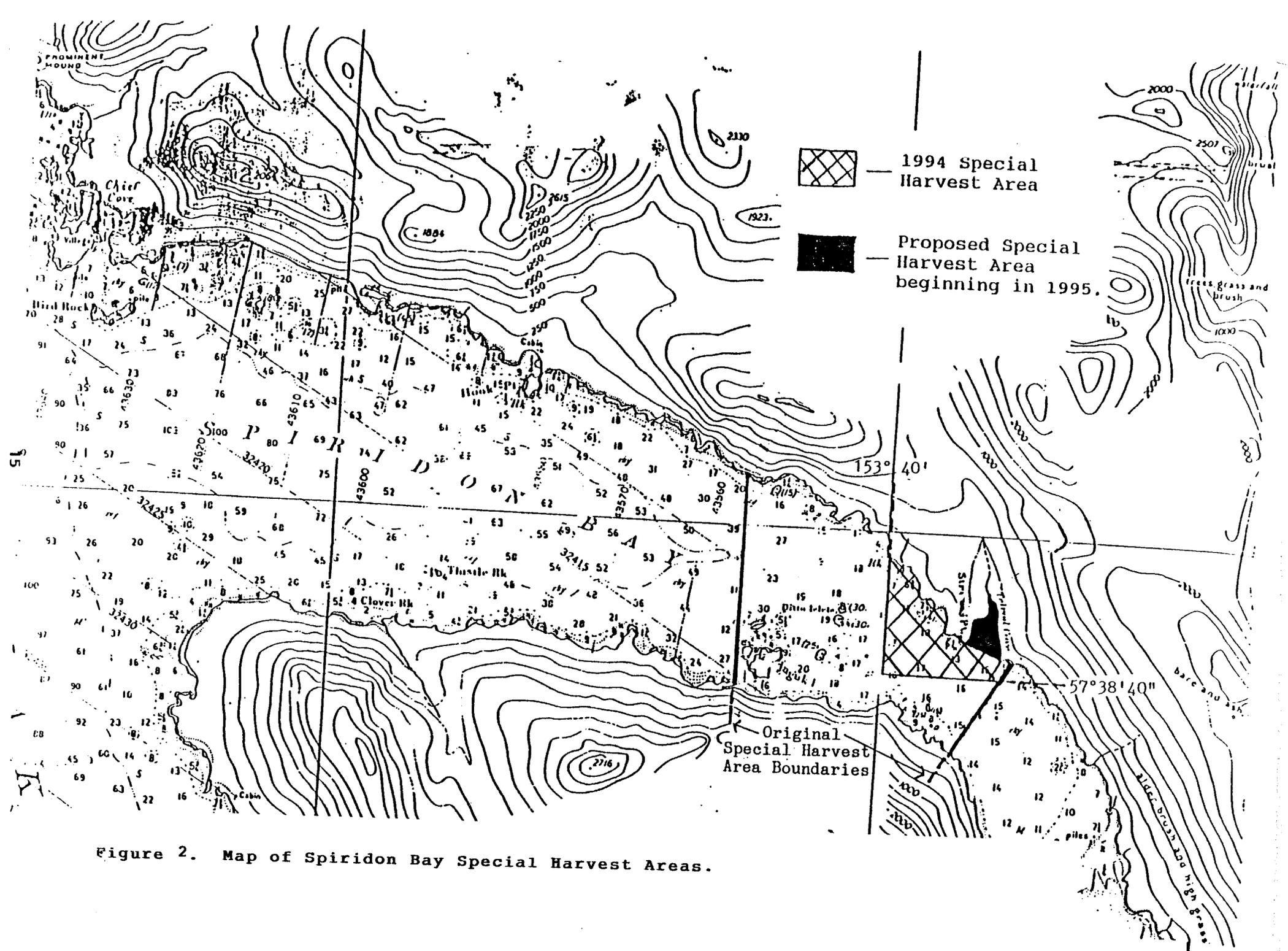


Figure 2. Map of Spiridon Bay Special Harvest Areas.

APPENDIX



**ALASKA DEPARTMENT OF
FISH AND GAME**

***COMMERCIAL FISHERIES MANAGEMENT AND
DEVELOPMENT DIVISION***
MEMORANDUM

TO: Pete Probasco
Regional Supervisor
CFMDD
Kodiak

DATE: December 7, 1994

FROM: Dave Prokopowich
Kodiak Area Biologist
Commercial Fisheries Management
and Development Division
Department of Fish and Game
Kodiak

SUBJECT: Spiridon Lake sockeye salmon management scenario utilizing Saltery Lake sockeye salmon for brood stock.

Commercial salmon fisheries which occur in the traditional harvest locations in the Northwest Kodiak District are prosecuted under guidelines set forth by the regulatory Westside Kodiak Management Plan (5 AAC 18.362).

Sockeye salmon returning to Telrod Cove are not a factor in providing for additional fishing time in the traditional fishing areas of Kodiak's westside.

Directed fisheries on sockeye salmon returning to Telrod Cove can only occur within the Spiridon Bay Special harvest Area, under guidelines set forth in the Spiridon Lake Sockeye Salmon Management Plan (5 AAC 18.366).

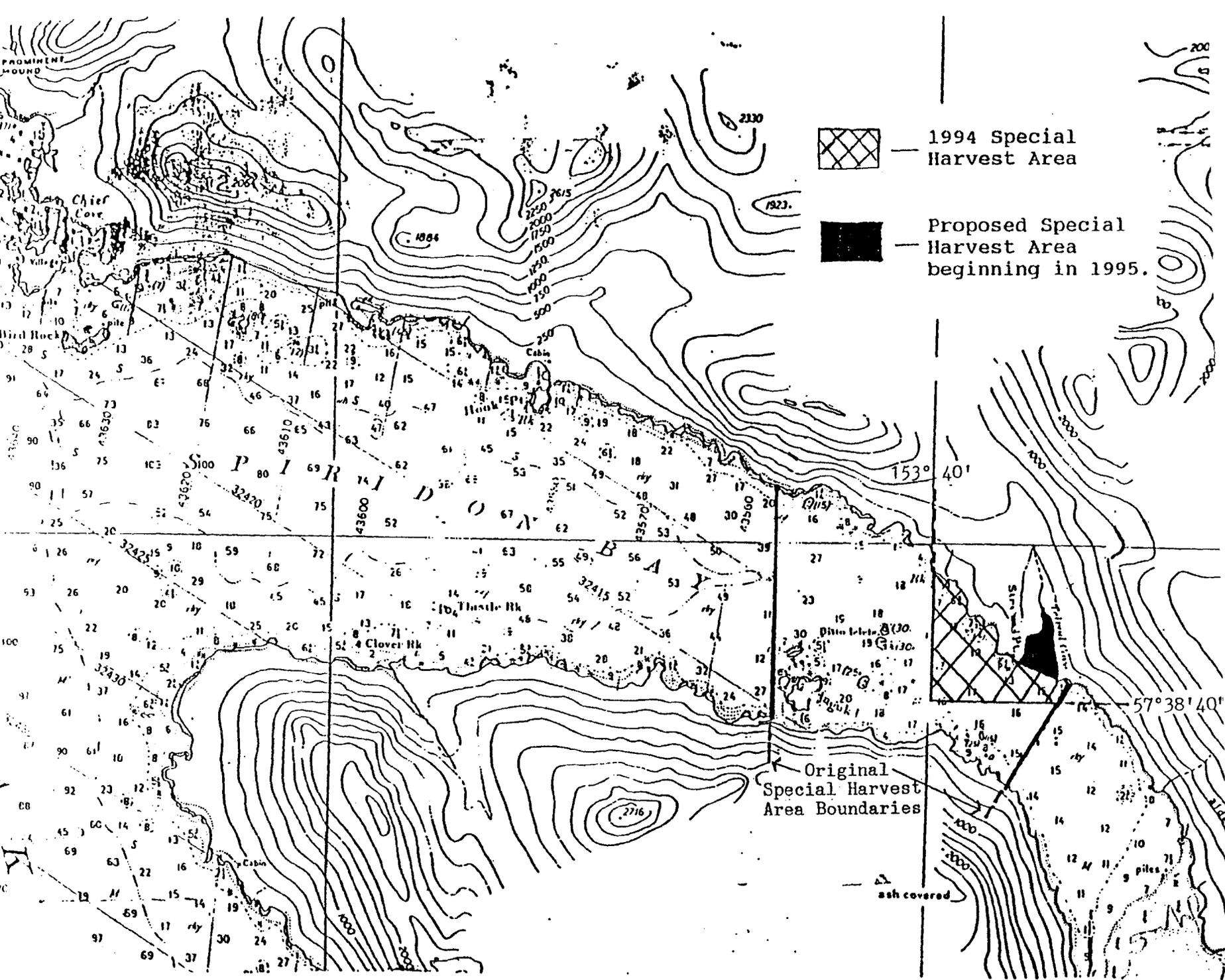
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In order to provide for a much more orderly fishery in the Special Harvest Area (see attached) we are proposing to reduce the area open to fishing to Telrod Cove proper and to allow for continuous fishing periods. We expect this type of special harvest area fishery to provide adequate protection for local natural salmon stocks returning to other streams in the bay while promoting a harvesting scenario which minimizes concentrated "build-up" flare openings.

Taking into consideration that returning Saltery lake sockeye salmon usually peak approximately 3 weeks earlier than Upper Station sockeye fisheries may be necessary in the special harvest as early as July 1.

Due to the actual fisheries which occur in the traditional fishing locations in the Northwest Kodiak District from late June through July, a higher proportion of the sockeye returning to Telrod Cove may be harvested as a bycatch in these fisheries which are dependent on early run sockeye bound for Karluk and instead weekly fishing periods which are dependent on the pink salmon forecasted return.

Attachment: Map of Spiridon Bay Special Harvest Area



Spiridon Bay Special Harvest Areas.



IN REPLY REFER TO:

United States Department of the Interior



FISH AND WILDLIFE SERVICE

1011 East Tudor Rd.
Anchorage, Alaska 99503

FINDING OF NO SIGNIFICANT IMPACT

For the Introduction of Sockeye Salmon
into the Spiridon Lake on the Kodiak
National Wildlife Refuge

Based on a review and evaluation of the information contained in the supporting references listed below, I have determined that the proposed project to permit the stocking of sockeye salmon into Spiridon Lake on the Kodiak National Wildlife Refuge in Alaska is not a major Federal action which would significantly affect the quality of the human environment within the meaning of section 102(2)(c) of the National Environmental Policy Act of 1969. The environmental assessment, along with the other references, support the conclusion that no impact of this action exceeds the threshold of significant for refuge resources. Accordingly, the preparation of an environmental impact statement on the proposed action is not required.

Supporting References

1. Environmental Assessment "For the Introduction of Sockeye Salmon in Spiridon Lake" on the Kodiak National Wildlife Refuge (1991).
2. Kodiak National Wildlife Refuge Final Comprehensive Conservation Plan, Environmental Impact Statement and Wilderness Review (1987).
3. Fishery Management Plan, Kodiak National Wildlife Refuge (1990).
4. "Limnological and Fisheries Assessment of the Potential Production of Sockeye Salmon in Spiridon Lake", Kodiak Island, Alaska (1990) Alaska Department of Fish and Game Report.
5. Draft Spiridon Bay Harvest Strategy (1990) Alaska Department of Fish and Game.
6. NEPA Documentation Spiridon Lake Sockeye Salmon Research Project (1990).

7/5/91
Date

Walter D. Stegitz
Regional Director



United States Department of the Interior



IN REPLY REFER TO:

FISH AND WILDLIFE SERVICE

1011 E. TUDOR ROAD
ANCHORAGE, ALASKA 99503

ENVIRONMENTAL ACTION MEMORANDUM

Within the spirit and intent of the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following administrative record and have determined that the action of a proposal to introduce sockeye salmon into Spiridon Lake on the Kodiak National Wildlife Refuge:

_____ is a categorical exclusion as provided by 516 DM 6 Appendix 1. No further documentation will be made.

XX _____ is found not to have significant environmental effects as determined by the attached Environmental Assessment and Finding of No Significant Impact.

_____ is found to have special environmental conditions as described in the attached Environmental Assessment. The attached Finding of No Significant Impact will not be final nor any actions taken pending a 30-day period for public review (40 CFR 1501.4 (e) (2)).

_____ is denied because of environmental damage, Service policy, or mandate.

_____ is an emergency situation. Only those actions necessary to control the immediate impacts of the emergency will be taken. Other related actions remain subject to environmental review.

Walter D. Stegitz 7/5/91
Regional Director Date

(1) Jay Bellinger 7/1/91
Initiator Date

(2) W. D. Seiler 7/3/91
PM/ARD Date

(3) Mandy Natin 7-3-91
EC/REC Date

(This signature page is amended by the stipulations listed on the attached page.)

DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

ENVIRONMENTAL ASSESSMENT

FOR THE INTRODUCTION OF SOCKEYE
SALMON INTO SPIRIDON LAKE ON THE
KODIAK NATIONAL WILDLIFE REFUGE

PREPARED BY

KODIAK NATIONAL WILDLIFE REFUGE
1390 BUSKIN RIVER ROAD
KODIAK, ALASKA 99615

MAY 1991

and dollar/pound value plus the 1980-1990 average harvest, the average annual ex-vessel value of all fish harvested in the Spiridon Bay section would be approximately 671,360 dollars. The average annual ex-vessel value of sockeye in this section would total 235,400 dollars.

- 4.2 Proposed Action - To allow the Stocking of Sockeye Salmon into Spiridon Lake.

Physical and Chemical Impacts

General water quality parameters identified in table two are expected to remain within observed ranges, but balanced nutrient levels in Spiridon Lake may be limited by the amount of annual loading of phosphorus. The nutrient ratio of nitrogen to phosphorus (N:P by atoms) is $\geq 170:1$ which indicates low concentrations of phosphorus relative to nitrogen. The only source of phosphorus input into the lake is via natural input from the watershed. Seasonal ranges of nutrients in Spiridon are currently \leq those values observed for Frazer Lake prior to fertilization in 1988. Under this alternative, no nutrient recharge other than natural watershed input is expected as observed in other systems like Frazer where spawner carcasses contribute annually to the nutrient loading of lakes. Thus, a percentage of the annual uptake of phosphorus by primary producers (phytoplankton) will not be recycled back into the lake environment because it will have been converted via zooplankton into sockeye smolt biomass. As result, there will be an annual net export of nutrients, which must be balanced with the natural nutrient recharge capabilities of the watershed.

Under the proposed action alternative, incremental stocking in conjunction with the monitoring of nutrient levels and ratios will be necessary to balance nutrient import from the watershed with that which is exported through fish production. If nutrient export exceeds the lake's natural recharge capability, mitigation for this action will require a significant reduction or temporary cessation in stocking sockeye fry. The recharge of nutrients from artificial fertilization is not considered under this alternative because the action may be required on an intermittent long-term basis. Fertilization would indicate the lake rearing environment may intermittently or continuously be stressed which would be contrary to refuge objectives for conservation of in-lake habitat.

Biological Impacts

The production of algal species (phytoplankton) in Spiridon Lake is directly related to the available nutrient in the proper ratio. The desired nitrogen to phosphorus ratio for algal production is 16:1. Although the N:P ration for Spiridon is $\geq 170:1$ the algal biomass in Spiridon under the proposed action, as measured by chlorophyll *a*, is expected to remain at or below 1.39 ug/l which is the upper end of the range observed in the epilimnetic zone (Table 2). This value is comparable to the upper 1.18 ug/l observed in Frazer Lake prior to fertilization (Koenings et al. 1987). The low algal biomass indicates that limited nutrient availability, particularly phosphorus, is the major controlling factor in addition to light and temperature, for algal production. As a consequence any net export of nutrients from the system may result in a reduction of phytoplankton. Similarly a dramatic

decrease in the zooplankton density reduces grazing pressure on phytoplankton which would place a larger demand on available nutrients.

Contrary to the No Action alternative, the proposed action will result in a net reduction of the seasonal mean density of macro-zooplankton. The target level for macrozooplankton densities in Frazer Lake is approximately 3,590/m³ (USFWS 1988) based on observed changes at low, moderate, and high escapement levels (Fyle et al. 1988). For the purposes of this assessment the observed changes of zooplankton density in Frazer Lake with increased escapements is utilized to pattern baseline zooplankton densities for Spiridon Lake. In Frazer Lake macrozooplankton density at moderate escapement levels (1970-1976) was 3,950/m³ which is a decrease of 67% from the period 1964-1969 with low escapements and high (10,620/m³) macrozooplankton density. In Spiridon the macrozooplankton density without sockeye predation is 4,909-11,059/m³. Thus projecting a 67% decrease in macrozooplankton density for Spiridon with moderate introduced sockeye predation the macrozooplankton density should range between 1,620-3,650/m³. Although it is realized that predation pressure of foraging fish can affect zooplankton densities, it is also known that environmental conditions can affect zooplankton density and size (George and Harris 1986, Goldman et al. 1979).

Under the proposed action alternative fry stocking will be incremental (Kyle et al. 1990) with an initial stocking of 5 million fry for the first two years followed by 8 million for two years, then 11 million fry in succeeding years. Under this action it will be extremely critical that zooplankton densities ($\geq 1620/m^3$), the cladoceran: copepod ratio (0.17:1) and the mean body size of preferred prey ($\geq 0.55mm$) do not substantially change. Intensive evaluation of zooplankton response at each stocking level will be needed prior to proceeding to higher stocking levels. Overgrazing zooplankton by sockeye fry may result in a detrimental change in the zooplankton community. As stated previously overgrazing would indicate that the rearing environment is being stressed and the relative abundance and diversity of indigenous species (zooplankton) is not being maintained which is contrary to refuge objectives for conservation of habitat. In addition, the project objective of producing yearling smolt $\geq 85mm/5g$ may not be met on a consistent basis if the rearing environment is stressed.

Under the proposed action alternative the survival of sockeye salmon smolts migrating downstream from the lake outlet will be enhanced by construction of a smolt-bypass system to circumvent the falls. This facility (Appendix I, Figure 3) will be manned on an annual basis from mid-May through June. There are no anticipated adverse impacts projected from this structure on resident char in the Telrod River.

Resident fish densities in Spiridon Lake are not expected to decrease under the proposed action. Since the dominant species in the lake appears to be char, a baseline zooplankton density, ratio and size as outlined above is projected to afford an adequate food base for emergent juvenile char during their initial growth phase. In addition, since larger char target salmon fry as part of their diet, the introduction of sockeye fry is expected to result in an increase in available food supply for char. On the contrary, if the nutrient level is reduced below the capability of the lake to recharge and zooplankton density decreases significantly, interspecific competition between emergent char and sockeye fry is expected to develop. Emergent char survival will decrease

lowering annual recruitment into the lake system. Reduced recruitment of char into the lake may result in a reduction of catchable fish for sport fishermen. Although there is no documented sport fishery for char which would be negatively impacted sport fishing for these species could develop in future years, therefore, under this alternative it is recommended that data on density and age-length-weight of char be obtained concurrent with any stocking of sockeye fry to monitor any significant changes in the char population.

The harvest of pink, early-run chum and sockeye salmon in the ADF&G Spiridon Bay harvest section (254-40) from mid-June through July would continue to be dependent upon the buildup and escapement of these species into the river systems of Uyak Bay, and early-run sockeye escapement into the Karluk River. Harvest of chinook salmon is considered incidental due to the low number caught annually (≤ 200), thus there is no directed ADF&G management strategy for these species. Project sockeye returning from early-August to mid-September (White, ADF&G Pers. Comm.) will be harvested coincidentally in the traditional fisheries for natural stocks of pinks, late run chums and coho salmon destined for Spiridon River and other systems in Uyak Bay. Openings will also be dependent upon late run Karluk sockeye escapement.

In this assessment the harvest of project sockeye is based on the distribution of the 1990 westward Kodiak area sockeye harvest. It is projected that depending on the stocking level approximately 55% (110,000-242,000) of the returning project sockeye will be harvested within the various sections of the Afognak District and those outer Northwest District sections. The remaining 45% (90,000-198,000) sockeye will be harvested in the Spiridon-Uyak Bay complex (Figure 1) and the Special Terminal Harvest Area located off Telrod River inside Spiridon Bay (Appendix 11). Under this alternative the average annual harvest of sockeye in or near the Spiridon section 254-40 is projected to increase between approximately 300-650% above the 1980-1990 average of 30,180 fish. This increase may also be supported by an increase in returns of Karluk sockeye if Karluk production of sockeye rebounds to historic levels. It is expected that the average annual harvest of 200 chinook, 5,290 coho, 309,990 pink, and 20,170 chum salmon will continue within the Spiridon section 254-40 under this alternative.

Returning project sockeye staged in Spiridon Bay will also be available for harvest by sport fishermen.

It is expected that a large increase in available sockeye will result in a temporary shift in the seine fleet into the Spiridon harvest area (254-40). As an alternative, numerous other sections in the southwest Kodiak and Alitak Bay District (Figure 1) may be open concurrently with Spiridon for harvest of late run-sockeye, pink, chum and coho salmon. For the purpose of this assessment the seasonal average of 89 permits (units of gear) may temporarily increase to a maximum of approximately 133 (50%) within the Spiridon area (254-40) at any one time. A portion of this effort may shift into the inner Spiridon Bay if a large percentage of project sockeye escape the traditional fisheries and are staged within the special terminal harvest area off Telrod River.

Returning project sockeye may be mixed in the terminal area during August and early-September with natural stocks of Spiridon River pink, chum and early coho salmon. As a result any terminal area fishery will need to b

closely monitored by ADF&G personnel in the bay to determine fish build, and species composition prior to any directed commercial openings. In addition, to insure that the average indexed Spiridon River escapement of 15,000-45,000 pink, 15,000-45,000 chum and 4,000-12,000 coho salmon is met, an increased effort to determine in-season escapement of these species will be necessary under this alternative.

Under the proposed action alternative important brown bear habitat in the Spiridon area would continue to support an estimated 0-2 bears/km². With increased efforts to insure the continued average annual indexed escapement of pink, chum and coho salmon into Spiridon River, it is expected that the river and Spiridon flats would remain as key feeding habitat with \geq five bears congregating in feeding areas. If large numbers of project sockeye are staged off Telrod River and some fish escape upstream it is expected that bear concentrations may increase above the observed \leq 2 bears. A concentration of bear numbers observed at other sites on the refuge such as the Frazer Lake fishway and Dog Salmon flats where \geq 5 bears have been observed at each site during peak fish concentrations may occur. The concentration of bears in close proximity with harvest activities inside or in close proximity to Telrod Cove may result in bear-human conflicts. If some sockeye move upstream where bears could feed undisturbed, and the potential for bear-human conflicts would be reduced.

It is assumed that if natural Spiridon River pink, chum and coho are not jeopardized the intensive short commercial openings in the terminal harvest area will result in very few (< 2,000) sockeye escaping into Telrod River.

The use of a temporary camp from mid-May through June to maintain the smolt weir and diversion pipeline is not expected to result in additional bear-human conflicts. It is recommended that all camp facilities with the exception of the pipeline and stored weir materials be removed at the end of each operational period. To determine the effects of this temporary camp on a long-term basis it is recommended that current radio-collared brown bears under study by the refuge which have home ranges in the immediate area be re-collared. This action would allow the refuge to monitor the response of marked bears to the camp and make management changes in camp operations, if needed, to avoid bear/human problems.

Seabird and waterfowl diversity and density as recorded by FWS (1978) is expected to remain consistent but may fluctuate in response to environmental conditions not associated with the proposed action. During commercial openings the fleet activity within the special harvest management area targeting on sockeye which escape traditional fisheries is expected to result in some short-term displacement of birds foraging along reef areas and small points of land within the bay. In contrast, sockeye smolts migrating out Spiridon Lake into the bay may provide an additional forage base for nesting seabirds in Spiridon Bay. Long-term significant impacts on seabirds and waterfowl are not expected since most terminal area commercial openings would be \leq 6 hours duration during daylight hours.

Bald eagle nesting activity will continue to remain dependent upon the availability of prey items. Project sockeye which escape into Telrod River may increase the availability of food for nesting eagles in the bay. An increase in fleet activity may also result in short-term

displacement of eagles feeding in the marine environment but long-term significant impacts are not expected. However, since most bald eagles in Spiridon Bay utilize coastal nests (\leq 100 m of the shoreline) a concentrated increase in fleet activity in close proximity to a nest site may result in fledgling(s) abandoning the nest early and significantly reducing chances of survival (Zwiefelhofer FWS pers. comm.).

The relative indexed density of sea otters using Spiridon Bay from June through September is expected to remain within the 90-117 animals observed by FWS. Sea otter concentrations will be dependent upon the available prey items of shellfish in the bay. Short-term displacement of otters is expected within the terminal harvest area with an increase in fleet activity, particularly in Telrod Cove. It is assumed that under this action a majority of the fleet will exit the bay immediately after any terminal opening, and displaced otters will return from other sections of the bay.

Overall, the effect of the commercial fleet within the special terminal harvest area is largely unknown. It is recommended that general surveys be conducted within inner Spiridon Bay from mid-July through mid-September at periodic intervals. These surveys would document the distribution and density of seabirds, waterfowl, eagles and sea otters for 3 years prior to the expected return of project sockeye. In addition, observation of increased fleet activities on displacement, if any, on these species will be required for 3 successive years of harvest to evaluate and recommend any changes needed in management strategy for the terminal area.

Cultural Impacts

There are no cultural impacts expected in the project area as a result of the proposed action alternative.

Economic Impacts

It is expected that economic impacts from the proposed action alternative would result in an increase in harvest of salmon stocks within the Spiridon Bay area (254-40). Based on 1990 preliminary average pound/species and dollar/pound value and using the 1980-1990 average harvest as a base the total average annual ex-vessel value of fish harvested in the Spiridon Bay area would range between 1.6 and 2.5 million dollars. This total includes an average annual ex-vessel value for project sockeye ranging from 0.9 - 1.8 million dollars. The remainder of the project sockeye harvest (~ 55%) contribute an additional estimated ex-vessel value of 0.9 - 1.9 million dollars to the harvest in other areas.

4.3 Subsistence Section 810(a) Evaluation and Findings

Local residents within Uyak Bay area which includes the village of Larsen Bay have traditionally relied on salmon for subsistence (ADF&G) 1985(b). The No Action alternative is not expected to change the availability of pink, chum, and coho salmon for subsistence use. Residents of Larsen Bay and other areas within the bay will still need to fish either within the Spiridon area (254-40), outer Uyak (254-30) or travel to Karluk Lagoon to obtain sockeye under the No Action alternative.

The proposed action alternative is also not expected to reduce subsistence opportunities within the bay. Pink, chum and coho salmon are expected to remain at stock levels where conflicts between subsistence and commercial harvest do not occur. The availability of sockeye for subsistence is expected to change dramatically within the bay. Residents of Larsen Bay and the surrounding area may experience an increased opportunity for sockeye harvest without traveling the long distance to Karluk or fishing the outer areas of Uyak Bay.

Availability of Other Lands

The availability of other lands to achieve the purposes sought by these proposals were not evaluated because of the site specific nature of the stocking proposal for Spiridon Lake.

Other Alternatives

Under all alternatives, including the two alternatives which were rejected, salmon stock levels available for subsistence users are expected to remain the same or increase. Consequently it is felt that there would be no adverse impacts on subsistence use.

Findings

This evaluation concludes that neither the No Action or the proposed action will result in a significant restriction or reduction of subsistence use in the Uyak Bay area.

4.4 Endangered Species

There are no endangered species within the project area and neither the No Action or proposed action is expected to affect endangered species listed by the Service.

SECTION 5.0 SELECTION OF THE PREFERRED ALTERNATIVE (2.2): TO ALLOW THE STOCKING OF SOCKEYE SALMON INTO SPIRIDON LAKE.

Evaluation of the proposed project under those criteria listed in section 1.5 indicate the proposed (preferred) action alternative may be compatible with the purposes of the refuge under the specific guidelines and commitments listed below:

1. Stocking levels in the lake proceed incrementally with a full evaluation of nutrient, algal and zooplankton response at each stocking level. This evaluation to be reviewed jointly by ADF&G and FWS prior to any increase in stocking level.
2. If negative impacts to the nutrient base are detected stocking will be reduced or terminated until the lake recovers naturally.
3. An evaluation of the population trends of resident char in the lake be determined by ADF&G concurrent with stocking.

4. There will be increased effort by ADF&G and the Refuge to determine and evaluate indexed escapement of natural stocks of the pink, chum and coho salmon into Spiridon River through additional aerial surveys. This increased effort would be required for a period of 3 years prior to the expected first year return of project sockeye and in subsequent year returns.
5. A general monthly survey of wildlife in Spiridon Bay be conducted by ADF&G from July through early September for 3 years prior to and 3 years after initial returns of sockeye to the bay warrant fleet operations in the Special Terminal Harvest Area.
6. A specific number of brown bears which utilize the project area near the proposed smolt diversion camp or the Telrod River will be tagged with radio collars from 1991-1996 to evaluate and recommend changes, if any, to camp operations the objective is to avoid any long-term bear/human problems. In addition, the marked bears will allow the evaluation of the bears response to any increase in salmon abundance in the lower Telrod River. This work will be a cooperative effort between ADF&G and the refuge.

During the preparation of this environmental assessment ADF&G has agreed to these conditions and will coordinate with the refuge to plan for specific strategies to meet the condition listed above. In addition, a time line and need for funding will be outlined by ADF&G for the KRAA to process.

This document is a general evaluation of the available data and although the stocking will produce additional fish for harvest there is no conclusive proof that the preferred alternative will result in the stated numbers of sockeye for harvest.

If after review of this document, the Service declares a Finding of No Significant Impact (FONSI) for the stocking of sockeye salmon into Spiridon Lake the principal preparer (See Section 6.3) recommends the selection of the action alternative (2.2). **It must be stressed that this alternative is not needed to meet refuge goals for the conservation of fish and wildlife populations and habitat on the refuge.** This document is a general evaluation of the available data and there is no conclusive proof that the preferred alternative will accomplish the stated objectives for sockeye production.

It is recommended that if a FONSI is declared for this project, a cooperative agreement between the FWS and ADF&G be used as the vehicle to implement the project and the additional commitments listed above.

SECTION 6.0 CONSULTATION AND COORDINATION WITH OTHERS

6.1 Professional Contacts

Staff from the ADF&G Commercial Fisheries, FRED, and Game Divisions (Kodiak and Soldotna), the Kodiak National Wildlife Refuge and the Alaska Fish and Wildlife Research Center Kodiak Field Station were consulted and instrumental in developing this environmental assessment.

Table 2 - General Water Quality Parameters in Spiridon Lake 1987 - 1990⁽¹⁾

Parameter	Units	Range	Average
Light Penetration	m	20.5-25.1	23
Turbidity	NTU	0.2-2.3	0.5
Color	Pt.	4.0-10.0	N/A
Conductivity	u mhos/cm	7.0-92.0	73.0
PH	N/A	6.8-7.6	N/A
Alkalinity	mg/l	N/A	22.0
Iron	ug/l	< 3.0-25.0	N/A
Calcium	ug/l	4.4-9.6	N/A
Magnesium	ug/l	<0.24-4.5	N/A
Total Kjeldahl Nitrogen	ug/l	93.0-98.0	N/A
Nitrate & Nitrite	ug/l	53.0-267.0	206.0
Ammonium	ug/l	2.8-18.0	7.4
Total Phosphorus	ug/l	1.3-5.8	N/A
Nutrient Ratios (TN:TP)	N/A	N/A	198:1
(Si:N:P)	N/A	N/A	592:169:1
(Si:N)	N/A	N/A	3.5:1
Chlorophyll a (epilimnion)	ug/l	0.03-1.39	0.3

Table 3 - General Zooplankton Characteristics Spiridon Lake 1987-1990⁽¹⁾

Parameter	Unit	Range	Average
Seasonal Mean Density	Copepods/m ³	3867-9458	N/A
Seasonal Mean Density	Cladocerons/m ³	724-2500	N/A
Seasonal Mean Density	Macro-Zooplankton/m ³	4909-11059	N/A
Bosmina	Body size mm	N/A	> 0.55
Daphnia	Body size mm	0.73-1.50	N/A
Cyclops	Body size mm	0.59-0.82	N/A
Diaptomus	Body size mm	0.88-1.11	N/A

(1) From Kyle et al. (1990).

DRAFT SPIRIDON BAY HARVEST STRATEGY

(a) The purpose of the Spiridon Bay harvest strategy is to allow for the harvest of sockeye salmon returning to Spiridon Lake (Telrod Cove) which were produced from the Spiridon Lake enhancement project and provide adequate safe guards protecting the escapements of natural salmonid stocks returning to the various streams of this bay. The Department realizes, that the intent of this enhancement project is for the harvest of the returning enhanced salmon to occur in traditional commercial fishing areas of the Northwest Kodiak District during openings directed only to harvest Karluk sockeye and west side pink and chum salmon stocks. Currently there are no escapement or broodstock requirements for sockeye salmon returning to Spiridon Lake at Telrod cove. A special terminal harvest area is required to provide for an orderly harvest of enhanced sockeye which have migrated past the traditional commercial fishing areas of the Northwest Kodiak District. The special harvest area addressed in this management plan, will only be used for short mop-up type openings if a surplus warrants a commercial fishery.

(b) The Spiridon Bay special harvest area will address that area of Spiridon Bay west of a line drawn from 153 37' 21" W. long., 57 38' 54" N. lat. to the opposite shore at 153 38' 27" W. long., 57 38' N. lat. to the longitude of 153 42' 24" W. long.

(c) By regulation, the legal gear type for the special harvest area is seine gear only.

(d) If a harvestable surplus of enhanced sockeye salmon is documented in the special harvest area, than short openings not to exceed 6 hours in duration, occurring during daylight hours, not to start any earlier than 3 hours prior to the daylight high tide and concluding 3 hours after the daylight high tide would be announced. This fishery will start by a flare launched by an ADF&G representative. Special harvest openings will be coordinated, if possible, to occur at the beginning of fishing periods scheduled for management sections in the Northwest Kodiak District.

(e) The Department recognizes that some incidental harvest of natural stocks could occur in this area while the fishery is managed to harvest the enhanced Spiridon Lake sockeye salmon. The Department intends, however, to prevent jeopardizing the escapement of natural salmonid stocks and will forgo if necessary, a harvest of the enhanced Spiridon Lake sockeye salmon.

(f) To avoid harvest of natural stocks and/or target more discretely on Spiridon sockeye salmon the Department may adjust the size of the special harvest area opened to commercial fishing.

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