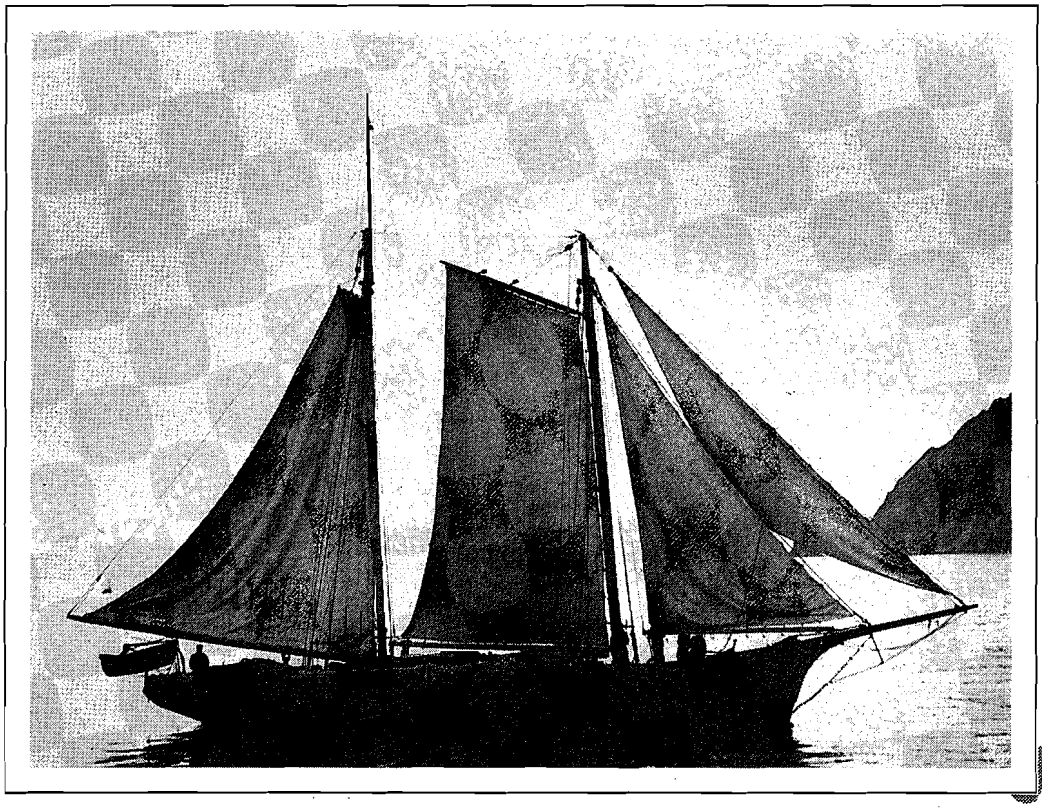
Alaska Peninsula/Aleutian Islands/Area M Regional Comprehensive Salmon Plan 1993 – 2004



Developed by
The Alaska Peninsula/Aleutian Islands/Area M
Regional Planning Team

December 1993

Alaska Department of Fish and Game

Carl L. Rosier, Commissioner

STATE OF ALASKA
DEPARTMENT OF FISH AND GAME
OFFICE OF THE COMMISSIONER

WALTER J. HICKEL, GOVERNOR

P.O. BOX 25526
JUNEAU, ALASKA 99802-5526
PHONE: (907) 465-4100

March 4, 1994

Mr. David Osterback
Chairman
Area M Regional Planning Team
P.O. Box 144
Sand Point, AK 99661

Dear Mr. Osterback:

This letter is to officially inform you, as the chairman, and all members of the Area M Regional Planning Team (Area M RPT) of my approval of the "Alaska Peninsula/Aleutian Islands/Area M Regional Comprehensive Salmon Plan, 1993-2004."

Prior to the submittal of the plan for my consideration, I have been informed that, in compliance with AS 16.10.375, the Area M RPT distributed a public review draft in May 1993 and solicited public comments on proposed revisions through published notices in regional newspapers, public notices posted in community post offices throughout the region, and a scheduled Area M RPT meeting in Cold Bay to address comments and questions. The plan has also undergone complete technical reviews by staffs from the Aleutians East Borough; Alaska Department of Fish and Game (i.e., Commercial Fisheries Management and Development, Sport Fish, Subsistence, and Habitat Divisions); U.S. Fish and Wildlife Service; and National Park Service. I am confident that the Area M RPT has been responsive to the comments and suggestions resulting from this thorough review process.

Based on the efforts of the Area M RPT in preparing this plan and comments I have received on the quality of those efforts, I believe a viable and responsible document has been produced for the Area M region that emphasizes investigative studies, habitat restoration, reconfiguration of the Russell Creek Hatchery as a central incubation facility, and improved management strategies for increasing local production of salmon and equitably providing benefits to all user groups. Therefore, I offer my congratulations and appreciation to you and all members of the team for cooperating with the department and me in producing this comprehensive plan.

Sincerely,

Carl L. Rosier

Carl L. Rosier
Commissioner

cc: ADF&G Division Directors
Area M RPT Members

11-K2LH

EXECUTIVE SUMMARY

Development of a comprehensive salmon plan for the Alaska Peninsula/Aleutian Islands/Area M region was initiated by the Alaska Department of Fish and Game (ADF&G) in the winter of 1990 in compliance with the Commissioner's statutory mandate for salmon planning and in response to interests expressed by the Aleutians East Borough (AEB), Concerned Area M Fishermen (CAMF), the Peninsula Marketing Association (PMA), local fish and game advisory committees, and seafood processors operating in Area M.

Desires and objectives of the area fishermen, as expressed by the Alaska Peninsula/Aleutians Islands/Area M Regional Planning Team (AREA M RPT), indicate an emphasis on better management, rehabilitation, and possible enhancement of local wild stocks of sockeye and coho salmon. There is very little support or desire for large-scale hatchery production of pink and chum salmon stocks, such as that proposed by private nonprofit hatchery corporations or regional aquaculture associations in other parts of the state. There is also strong recognition of the need to protect genetic integrity of local stocks and a desire to promote a more comprehensive understanding of local watersheds and their potential for increased production of sockeye and coho salmon.

Specific actions promoted by this plan include the following:

Improve management of existing regional salmon fisheries by (1) upgrading enforcement of fishery regulations and surveillance of fishery practices; (2) increasing fishery management presence and communication with fleet (e.g., station a full-time, year-round biologist in region); (3) ehancing observations of sockeye and coho escapements in region; and (4) fostering knowledge of stock identity of salmon harvested in region (e.g., support efforts for genetic stock identification).

Advance knowledge of salmon production in regional waters by (1) conducting comprehensive limnological surveys of Area M lakes and (2) encouraging studies of nearshore and marine environments and their capacity to support salmon populations.

Investigate rehabilitation and enhancement opportunities by (1) evaluating results of limnological surveys for fry-stocking, lake enrichment, or other rehabilitation or enhancement potentials and (2) assessing area watersheds for removal of stream blockages or other barriers to fish migration.

Develop central incubation and stream-side incubation facilities by (1) reconfiguring Russell Creek Hatchery to a central incubation facility for sockeye and coho salmon and (2) pursuing placement and operation of stream-side incubators in locations identified in the studies outlined above.

The Area M RPT has set preliminary target harvest goals that will result from existing natural production and any rehabilitation or enhancement work conducted under this plan. These goals, which should be achieved by the year 2004, are listed below by species for the entire Area M salmon fishery; the recent twelve-year average harvest by species is also included. Rather than harvest levels exhibiting more normally erratic annual fluctuations, it is the intent of the Area M RPT for them to become stabilized, with the exception perhaps of pink salmon. This intent will require prudent execution of each rehabilitation or enhancement project.

Species	Average harvest	Target goal
Chinook	28,500	30,000
Sockeye	4,312,900	6,300,000
Coho	477,500	1,000,000
Pink	6,600,700	10,000,000
Chum	1,982,100	2,500,000

In all its efforts, the Area M RPT hopes this plan will initiate equitable benefits to all user groups and increase local production of salmon. To accomplish these goals, the RPT believes that the formation of a regional aquaculture association will be necessary to provide a forum for fishermen's control and review of enhancement and rehabilitation efforts and also as a potential mechanism to provide funding for specific projects (through a fishermen-approved assessment on catch). The RPT recognizes that, regardless of the formation of a regional aquaculture association, funding will need to be obtained to support the programs outlined in this plan.

Pursuit of this plan will also require conduct of a suite of limnological and habitat studies of the region's watersheds, access to some form of hatchery or central incubation facility (e.g., Russell Creek), and provision of adequate funding for the Department of Fish and Game's fishery management and development programs.

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INTRODUCTION

Authority for Writing the Plan

The commissioner of the Alaska Department of Fish and Game (ADF&G), in accordance with Alaska Statutes 16.10.375-470, has designated salmon production regions throughout the state. In each region, the commissioner is responsible for the development and amendment of a comprehensive salmon production plan. The commissioner has placed this responsibility with regional planning teams (RPT) that statutorily consist of representatives from ADF&G and the regional aquaculture associations. The mission of RPTs is to plan for the long-term future of the salmon resources within their regions by initiating and continuing orderly processes that examine the full potentials of regions' salmon production capacities.

During the past several years, participants in the Alaska Peninsula/Aleutian Islands/Area M salmon fisheries have expressed interest in initiating planning for the rehabilitation, enhancement, and development of salmon production in the region encompassed by the Aleutians East Borough (AEB). This interest was initially stimulated by concerns for state fiscal support for and definition of the mission of the Russell Creek Hatchery in Cold Bay. Discussions among interested parties also addressed more general topics such as establishment of a geographic salmon production region, comprehensive salmon planning, and future formation of a regional aquaculture association. Sharing these interests were the Aleutians East Borough, the Peninsula Marketing Association, Concerned Area M Fishermen, local fish and game advisory committees, and seafood processors operating in Area M.

The Aleutians East Borough Assembly formally supported the salmon planning concept at its meetings and provided a forum for Alaska Department of Fish and Game (ADF&G) staff to explain the planning process. During other meetings with interested parties, ADF&G staff distributed information and materials on comprehensive salmon planning. Based on this interest, the commissioner of ADF&G, in May 1990, initially established boundaries for a salmon production region and for comprehensive salmon planning purposes that were the same as the boundaries for the Aleutians East Borough. However, at the initial May 23, 1990, meeting of the Area M RPT, participants identified Area M fisheries district boundaries as more extensive than those of the AEB. They additionally indicated that adoption of AEB boundaries for the Area M RPT's jurisdiction would leave some limited entry permit holders unrepresented and exclude some potential enhancement sites. With the concurrence of the AEB Assembly, the commissioner rescinded the original geographic determination and established Area M fisheries district boundaries as a salmon production region for comprehensive salmon planning purposes. The Alaska Peninsula/ Aleutian Island/ Area M Region includes all Bering Sea waters of Alaska between Cape Menshikof and the longitude of Cape Wrangell on Attu Island and all Pacific Ocean waters between Kupreanof Point and the longitude of Cape Wrangell on Attu Island, including all adjacent islands (Fig.1).

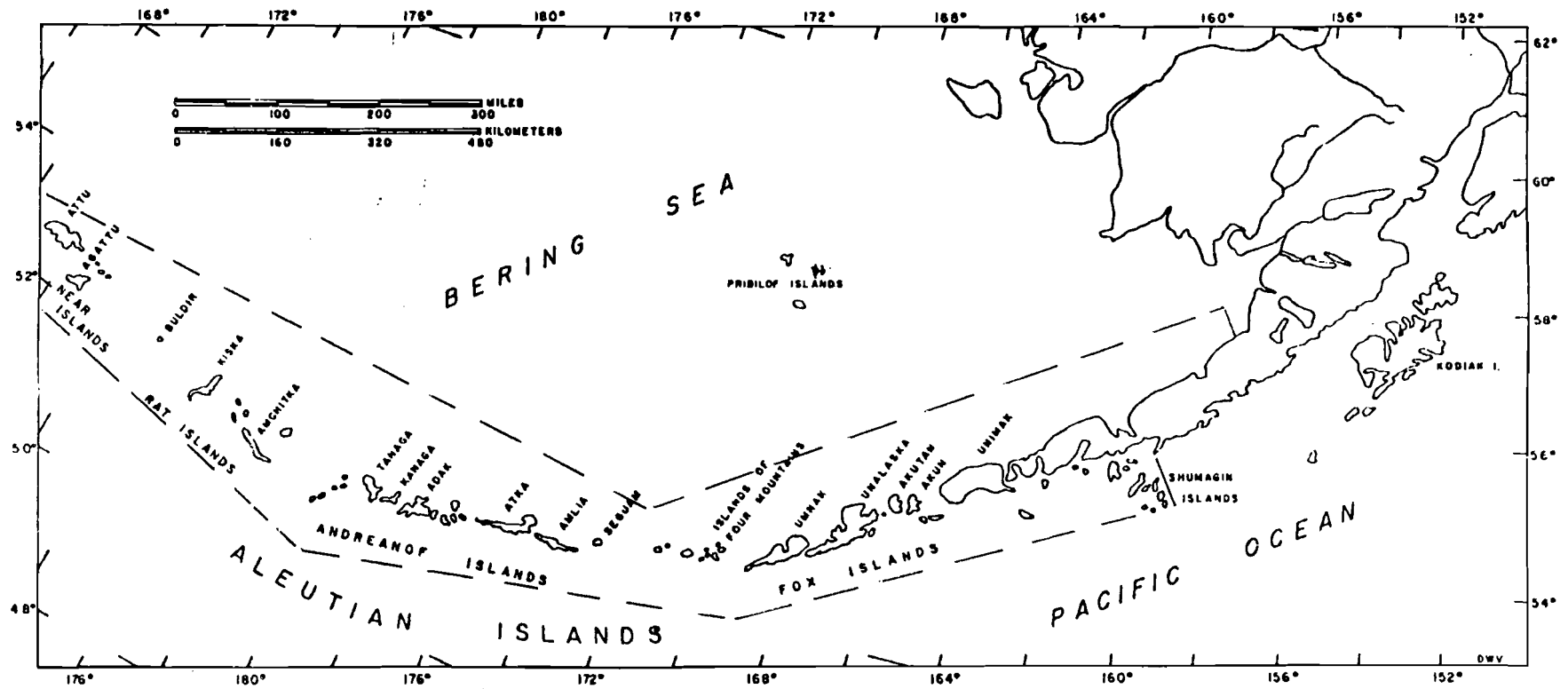

Figure 1. Map of the Alaska Peninsula, Aleutian Islands/Area M region.

The Alaska Peninsula/Aleutian Islands/Area M Regional Planning Team (Area M RPT) was established by the Commissioner in May, 1990. The RPT is composed of representatives from the ADF&G Commercial Fisheries, Sport Fish, and Fisheries Rehabilitation, Enhancement and Development Divisions; Aleutians East Borough; Stepovak-Shumagin Set Net Association; Concerned Area M Fishermen; Peninsula Marketing Association; and U.S. Fish and Wildlife Service (ex officio). David Osterback from Sand Point was elected standing chairman for the Area M RPT.

Regional planning teams are the only legislatively mandated planning groups with ADF&G and private sector participation. Alaska statutes define certain duties of an RPT as follows:

1. Plan development and amendment;
2. Review of private nonprofit (PNP) hatchery permit applications and recommendations to the commissioner;
3. Review and comment on proposed permit suspensions or revocations by the commissioner.

A regular exchange of information, discussion of objectives, and active cooperation between the regional associations (i.e., AEB, PMA, CAMF), Area M RPT, U.S. Fish and Wildlife Service, and various divisions of ADF&G is possible with this planning effort. Comprehensive salmon planning in Alaska progresses in stages. The actual plans that have been thus far developed and approved have consisted of two phases: Phase I sets the goals, objectives, and strategies for the area; and Phase II identifies potential projects and establishes criteria for evaluating the enhancement and rehabilitation potentials of the salmon resource. However, the intent of the Area M RPT was to generate a regional comprehensive salmon plan that considered both the long-term goals and objectives and the short-term strategies and projects over a period of 12 years in one document.

Area M Questionnaire

In order to invite public participation to the comprehensive salmon planning process, the Area M RPT drafted a 42-part questionnaire (Appendix A) to identify user needs. In October 1991 over 400 questionnaires were mailed to fishermen holding limited-entry seine, drift gillnet, and setnet permits, as well as to representatives of each of the processors in the region. This questionnaire provided Area M RPT with valuable information for long-range planning that have been incorporated into this plan.

Acknowledgments

The Alaska Peninsula, Aleutians Islands, Area M Regional Planning Team respectfully acknowledges its members for contributions to programs of the Department of Fish and Game, Aleutians East Borough, and the people of the State of Alaska through their collective efforts in drafting the regional comprehensive salmon plan:

Chairman David Osterback, AEB, Sand Point; Dave Adams, Stepovak-Shumagin Setnetters, Sand Point; Tom Bertman, Concerned Area M Fishermen, Port Angeles, WA; Rick Eastlick, Stepovak-Shumagin Setnetters, Sand Point; Gary Ferguson, AEB, Cold Bay; Justine Gundersen, AEB, Nelson Lagoon; Augie Kochuten, Dutch Harbor/Unalaska; Jim Larson, U.S. Fish and Wildlife Service, King Salmon; Buck Laukitis, False Pass; Don McCallum, King Cove; Pete Probasco, ADF&G, Commercial Fisheries, Division, Kodiak; Len Schwarz, ADF&G, Sport Fish Division; Arnie Shaul, ADF&G, Commercial Fisheries Division, Cold Bay/Kodiak; and Lorne White, ADF&G, FRED Division, Kodiak.

The Area M RPT extends its acknowledgment and appreciation to Kevin Duffy, Salmon Rehabilitation and Enhancement Coordinator, ADF&G, FRED Division; Tom Kron, Region II Supervisor, ADF&G, FRED Division; Denby Lloyd, Chief Resource Analyst, AEB; and Sid Morgan, Planner, ADF&G, FRED Division for their coordination of the planning efforts and assistance in preparing the initial and final drafts. Additionally, the Area M RPT acknowledges Jim McCullough, Area Management Biologist, ADF&G, Commercial Fisheries Division, Sand Point/Kodiak and Bob Murphy, Area Management/Research Biologist, ADF&G, Commercial Fisheries Divison, Port Moller/Kodiak for their participation at the meetings and contributions to the plan. The RPT further extends its appreciation to Carol Schneiderhan, Drafting Technician, ADF&G, FRED Division for drafting regional maps and to Kurt Savikko, Publication Specialist, ADF&G, Commercial Fisheries Division for his assistance in developing the cover (cover photograph is from the John E. Twaites collection [photo No PCA 18-183] at the Alaska State Library).

GUIDING PRINCIPLES AND PLANNING ASSUMPTIONS

Principles

Restoration and enhancement activities shall be consistent with the protection of the existing wild salmon stocks and the habitats upon which they depend. Artificial propagation shall not be used as a substitute for effective fishery regulation, stock conservation, and habitat management or protection. The priorities for implementing restoration and enhancement projects shall be in this order: (1) restoring habitat and wild stocks, (2) enhancing habitat, and (3) enhancing wild stocks. At this time, projects designed to simply create new runs of fish returning to hatcheries (e.g., ocean ranching) are specifically not favored. Projects that benefit the production of local sockeye and coho stocks are preferred.

Careful planning is necessary before undertaking any restoration or enhancement projects that might impact any wild stock. Projects shall be evaluated by the RPT in accordance with a region-wide stock rebuilding/restoration plan. A careful assessment and inventory of wild stocks and their health, habitat, and life history must be an integral part of restoration and enhancement planning. Alaska fish genetics and fish disease policies will necessarily be applied to all salmon restoration or enhancement projects. When appropriate, the regional planning team will solicit an evaluation of the ecological and genetic risks and socioeconomic impacts and will identify alternative actions, including but not restricted to fishery management actions. The RPT shall establish levels for restored stocks that are consistent with natural habitat capacity.

Assumptions

For the purposes of this plan, it is assumed that the following conditions will exist. If some of these conditions change or are proved false, then added difficulty will be encountered in implementing this plan.

1. The Area M Regional Planning Team will take a conservative approach to the project planning process to ensure perpetuation of natural stock production;

2. Enhancement and rehabilitation projects will be designed to restore or supplement wild stock production and harvest opportunities with minimal impacts on wild stocks and the priority for wild stock management;

3. Benefits to all user groups will be considered and equity will be a primary consideration as part of the long-term planning process;

4. To the extent possible, the highest possible quality of harvested fish will be promoted;

5. The flexibility to adapt to changes in the fishery will be incorporated into the updating process of the comprehensive salmon plan;

6. This comprehensive salmon plan will use the best data available;

7. It will be biologically feasible to bring about a sustained increase in harvest rates of salmon beyond the past 12-year average, if appropriate technology and management practices are utilized;

8. The technology exists or will be developed to meet production objectives (e.g., promising techniques for identifying the contributions of enhanced stocks are otolith marking and genetic stock identification);

9. Research programs will be implemented to obtain information needed for optimizing salmon production, using the strategies of habitat and fishery protection, management, enhancement, and rehabilitation;

10. Marine and freshwater habitats will be safeguarded to remain favorable for salmon survival;

11. Accessibility to project sites will be an important consideration in the planning process;

12. Cost-effectiveness will also be an important consideration in the planning process;

13. Political support will continue and sufficient funding will be provided to achieve the goals within the time frame indicated, although, unfortunately, in some cases this assumption will need to be revisited and updated (e.g., state support for Russell Creek Hatchery);

14. State funding for marketing of Alaska salmon and involvement of fishermen in these efforts will continue;

15. National and international markets will absorb the increased production of salmon;

16. The goals and objectives of this plan will be periodically reviewed and revised as needs, knowledge, and resources change;

17. A regional aquaculture association will be formed in Area M; and

18. Funding of the Department for Fish and Game's management and development programs for Area M will be maintained and, preferably, increased.

GOALS, OBJECTIVES, STRATEGIES, AND PROJECTS

The primary goal of participants in Area M salmon fisheries (commercial, sport, subsistence) is to protect wild stocks while increasing and stabilizing production and harvests. Associated with this goal is the recognized need to increase our knowledge of local salmon resources and improve management so that we can generally improve related biologic, habitat, and socioeconomic conditions throughout the region. Four integrally related tools are needed to accomplish the following goals: (1) larger production/harvest of salmon, (2) collection/evaluation of data/research, (3) revision of management policies and practices, and (4) maintained or increased budgets for ADF&G. Three underlying considerations for pursuit of this plan follow: (1) salmon resources need to be maintained in the strongest possible condition through protection of wild stocks and habitat, (2) most effective management/ rehabilitation/enhancement strategies can only be realized through a complete database, and (3) harvest of salmon to the greatest extent possible is beneficial to all participants, the region, and the state.

Goals

Harvest Goals:

The target goals for total salmon harvests, to be achieved by the year 2004, are based upon obtainable increases to the recent twelve-year average harvests for the years 1981-1992 (*see* Table 1). Harvest data for the 1981-1992 period were used as a foundation, because salmon runs were generally stronger during this period than for any other comparable period since statehood and therefore best reflect current and anticipated conditions of relevant salmon stocks.

Between 1981 and 1992 the average Area M annual harvest of chinook salmon was about 28,500 fish. Although, the target goal of 30,000 fish recognizes that none of the projects outlined in this plan directly address chinook stocks, a moderate increase in chinook production may arise from projects focused on sockeyes and cohos and improved management of chinook escapements. Average annual sockeye salmon harvests for the past twelve years are about 4.3 million fish; most recent harvests, however, range between 4.7 and 7.0 million. A target for stable annual harvests of 6.3 million fish, two million above the twelve-year average, is based upon possible increases of several hundred thousand fish from improved management (e.g., weirs to monitor escapements) on a number of South Peninsula systems, several hundred thousand fish via improved management of the June fishery chum catches and thus better attainment of the June sockeye allocation, and several hundred thousand fish through rehabilitation and enhancement of wild sockeye salmon stocks on both the north and south side of the Alaska Peninsula.

The average annual coho salmon harvest for 1981-1992 period is nearly 500,000 fish. By virtue of extending fishing and processing activities further into the fall, particularly on the North Peninsula, and through conducting a number of stream clearance and enhancement projects on watersheds supporting coho salmon, an annual target harvest goal of 1,000,000 fish can be achieved.

Table 1. Area M commercial salmon harvests, 12-year average harvest (1981-1992) and 12-year target goals (1992-2003).

Year	Area	Chinook	Sockeye	Coho	Pink	Chum	Total
1981	SP	10,200	2,255,200	162,200	5,035,900	1,770,300	9,233,800
	NP	18,300	1,844,900	155,400	11,200	706,800	2,736,600
	Aleu	0	5,400	200	302,800	6,600	315,000
	Total	**28,500**	**4,105,500**	**317,800**	**5,349,500**	**2,483,700**	**12,285,400**
1982	SP	9,800	2,346,600	256,000	6,734,900	2,272,500	11,619,200
	NP	30,100	1,435,300	238,000	12,300	331,100	2,046,800
	Aleu	0	2,700	0	1,447,800	6,100	1,456,600
	Total	**39,900**	**3,784,000**	**494,000**	**8,195,000**	**2,609,7000**	**15,122,600**
1983	SP	26,900	2,556,600	127,700	2,827,600	1,707,100	7,245,900
	NP	29,500	2,093,400	75,100	3,400	348,700	2,550,100
	Aleu	0	4,400	0	2,000	11,400	17,800
	Total	**56,400**	**4,654,400**	**202,800**	**2,833,000**	**2,067,200**	**9,813,800**
1984	SP	9,200	2,318,000	309,100	11,589,300	1,656,500	5,882,100
	NP	23,000	1,734,900	198,600	27,400	796,700	2,780,600
	Aleu	0	67,200	0	2,309,700	33,900	2,410,800
	Total	**32,200**	**4,120,100**	**507,700**	**13,926,400**	**2,487,100**	**21,073,500**
1985	SP	7,900	2,214,600	172,500	4,433,700	1,393,100	8,221,800
	NP	23,500	2,600,500	167,800	3,100	671,100	3,466,000
	Aleu	0	2,800	0	100	14,200	17,100
	Total	**31,400**	**4,817,900**	**340,300**	**4,436,900**	**2,078,400**	**11,704,900**
1986	SP	5,600	1,223,000	235,900	4,031,500	1,749,700	7,245,700
	NP	11,700	2,436,700	164,100	22,600	271,200	2,933,300
	Aleu	0	7,700	100	42,600	38,800	89,200
	Total	**17,300**	**3,694,400**	**400,100**	**4,096,700**	**2,059,700**	**10,268,200**
1987	SP	9,200	1,449,800	224,700	1,208,600	1,376,300	4,268,600
	NP	14,200	1,209,400	171,800	3,500	368,700	1,767,600
	Aleu	0	100	0	0	0	100
	Total	**23, 400**	**2,659,300**	**396,500**	**1,212,100**	**1,745,000**	**6,036,300**

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Table 1. Continued

Year	Area	Chinook	Sockeye	Coho	Pink	Chum	Total
1988	SP	11,100	1,472,900	505,500	7,044,800	1,905,200	10,939,500
	NP	16,800	1,528,100	234,000	65,200	393,500	2,237,600
	Aleu	0	4,300	0	183,100	500	187,900
	Total	**27,900**	**3,005,300**	**739,500**	**7,293,100**	**2,299,200**	**13,365,000**
1989	SP	7,000	2,660,700	443,800	7,292,700	994,200	11,398,400
	NP	10,900	1,718,700	227,600	4,100	157,200	2,118,500
	Aleu	0	8,200	0	6,700	0	14,900
	Total	**17,900**	**4,387,600**	**671,400**	**7,303,500**	**1,151,400**	**13,531,800**
1990	SP	16,500	2,386,600	307,200	2,865,900	1,237,800	6,814,000
	NP	12,300	2,415,900	192,800	517,700	125,800	3,264,500
	Aleu	0	12,400	100	282,800	1,000	296,000
	Total	**28,800**	**4,814,900**	**500,100**	**3,666,400**	**1,364,600**	**10,374,800**
1991	SP	8,000	2,322,400	317,000	10,615,800	1,587,400	14,850,600
	NP	9,400	2,391,200	218,300	4,200	191,300	2,814,400
	Aleu	0	800	0	0	0	800
	Total	**17,400**	**4,714,400**	**535,300**	**10,620,000**	**1,778,700**	**17,665,800**
1992	SP	8,000	3,445,900	418,200	9,770,400	1,316,700	14,959,200
	NP	13,100	3,575,100	206,700	194,400	341,600	4,331,400
	Aleu	0	3,100	0	312,000	1,200	316,400
	Total	**21,100**	**7,024,100**	**624,900**	**10,276,800**	**1,659,500**	**19,607,000**
12-year Annual Average Harvest Total[a] and 12-year Target Goal							
	SP	10,800	2,221,000	290,000	6,120,900	1,580,600	10,223,300
	NP	17,700	2,082,000	187,500	72,400	392,000	2,751,600
	Aleu	0	9,900	0	407,400	9,500	426,800
	Total	**28,500**	**4,312,900**	**477,500**	**6,600,700**	**1,982,100**	**13,401,700**
Target Goal		**30,000**	**6,300,000**	**1,000,000**	**10,000,000**	**2,500,000**	**19,830,000**

[a] annual average harvest totals rounded to nearest hundred fish

Pink Salmon harvests have averaged about 6.6 million per year from 1981 to 1992, with fairly wide fluctuations. Because the emphasis of this plan is not directed toward large-scale hatchery production of pink or chum salmon, pink salmon production is not targeted to increase by tens of millions of fish; however, by virtue of a number of stream clearance projects, construction and operation of fish ladders, better management for escapements, and, perhaps, gear modifications to extend available fishing time, this plan projects an annual target harvest goal of 10 million fish.

The average annual harvest of chum salmon for the past twelve years (1981-1992) is nearly 2.0 million. With management efforts now pointed toward reducing the harvest of chum salmon in June and with no effort to produce large quantities of chums at a hatchery facility, only modest increases in chum salmon harvests are targeted. An annual harvest goal of 2.5 million fish is based upon consideration of increased production arising from several stream clearance projects, better management of escapements, more complete enforcement of fishery regulations, and potential gear modifications that might allow more fishing time in July.

In summary, target harvest goals to be pursued over the next twelve years include a nominal increase in chinook salmon harvests, about a 50% increase in sockeye salmon harvests, a 100% increase in coho salmon harvests, a 50% increase in pink salmon harvest, plus some annual stability, and a 25% increase in chum salmon harvests. Attainment of these goals will rely upon success in conducting a suite of baseline studies, maintenance of ADF&G's budgets for Area M, reconfiguration of the Russell Creek Hatchery (or suitable alternative), and implementation of specific projects to promote fish passage and increased production.

Management, Research, and Planning Goals:

These goals are aimed at maintaining and improving salmon runs by achieving proper escapement for each stock and full utilization of fish surplus to escapement needs. However, the precision of management policies is sometimes limited by insufficient knowledge of run size, stock composition, timing, optimal escapement rates and levels, and behavioral characteristics, which represent the essential information needed for optimal production of both wild and supplementally produced fish. There are many necessary and associated studies that will not directly be expressed in production or harvest numbers, but they may directly or indirectly result in more fish. Such studies will contribute to a stronger fisherman/manager/resource relationship that, in turn, will contribute to increased production and more efficient harvests.

Management and Research Goals. (1) Protect wild stocks and increase their production; (2) improve accuracy of salmon forecasts; (3) improve accuracy of escapement enumeration and refine estimates of optimal escapement levels for all species; (4) assess spatial and temporal distribution and migration paths of salmon in the region as well as age, size at return, and location of return; and (5) assess stock composition of the harvest.

Planning Goals. (1) Inventory and catalog spawning and rearing habitat in conjunction with habitat protection, stream clearance and improvement activities, carrying capacity and

productivity assessments, limnological investigations, and stocking assessments and (2) periodically review and reevaluate needs of commercial, sport, and subsistence users in the regional fisheries.

Objectives

Establishing objectives is a process whereby long-term goals are broken down into attainable short-term increments (for example, 4-year increments within a 12-year plan). In this sense, objectives are benchmarks taken at specified intervals of a plan to determine whether or not it is adequately proceeding toward meeting its goals. The following objectives set the stage for accomplishment of the harvest goals outlined above and are based upon a set of strategies and projects discussed later in this plan.

Regional Aquaculture Association:

The RPT believes that the formation of a regional aquaculture association (RAA), made up of Area M fishermen and their representatives, is integral to the operation and viability of this comprehensive salmon plan. While the RPT can set out overall goals and objectives, an aquaculture association would be best able to implement the plan; moreover, only a regional aquaculture association, by virtue of a majority vote of Area M permit holders to assess themselves, can provide the funding necessary to conduct the projects needed to rehabilitate and enhance local runs of salmon.

As a means of acknowledging the importance of such an association, the state, under the authority of Alaska Statute 16.10.510(9), has provided grants for organizing and planning purposes to qualified regional associations in amounts not exceeding $100,000 per region and up to an additional $100,000 on a 50/50 cash matching basis to those RAAs that have authorized a royalty assessment under AS 16.10.530 or AS 16.10.540. The state portion of the matching share would be available when a final vote for assessments has been made. Moreover, under AS 16.10.510(10), the state will make loans available to qualified regional associations that have formed a nonprofit corporation for planning and implementing fisheries enhancement and rehabilitation activities, including, but not limited to, lake fertilization and habitat improvement.

The formation of an RAA is a procedural matter that could readily be implemented, provided that articles of incorporation, by-laws, and regional boundaries (i.e., Area M RPT's boundaries) were drafted and a board of directors selected. An objective of this plan is to have an RAA in place by January 1995. To achieve that objective, the RPT in September 1993 established a steering committee, charging them to assess community interests in an RAA throughout Area M and provide the mechanism for accomplishing its formation. Members of the steering committee are as follows: Justine Gundersen, Rick Eastlick, Augie Kochuten, Tom Bertman, and Robert Newman. Subsequent to formation of the regional aquaculture association, fishermen could then consider whether they wish to impose an assessment on their catch to help support the work proposed in this plan; however, such an assessment upon fishermen's catch is not required for the formation and basic function of a RAA.

Sand Point Airport Mitigation:

The Aleutians East Borough is required to perform some form of mitigation project under the permitting requirements imposed on construction of extensions to the Sand Point airport. Current planning for appropriate mitigation centers upon projects that will rehabilitate or enhance local sockeye and/or coho production. An objective of this plan is to have final commitments on appropriate mitigation for the airport to be formulated by December 1993.

Limnological Studies:

Almost any rehabilitation or enhancement of the region's sockeye salmon systems will require baseline studies of lakes and streams supporting existing stocks. Such limnological studies, over a period of years, will illustrate the productive potential of these systems and, through analysis of the information, lead to suggestions on how best to increase their productivity. An objective of this plan is to complete a comprehensive suite of limnological studies on sockeye systems throughout the Alaska Peninsula by December 1995.

Russell Creek Reconfiguration:

The Russell Creek Hatchery was originally constructed as a world-class pink and chum salmon production facility; however it is apparent that most residents of the Alaska Peninsula/Aleutians Islands region do not support the large-scale production of pink and chum salmon, nor the associated cost-recovery fisheries normally created to fund the operation of such hatchery operations. Alternatively, the RPT believes that the Russell Creek Hatchery can be successfully reconfigured as a central incubation facility for rehabilitation and enhancement of local sockeye and coho salmon stocks. It is an objective of this plan to have engineering and design for the reconfiguration of the Russell Creek Hatchery completed by December 1995. It is an objective of Aleutians East Borough to establish a coastal research laboratory at Russell Creek to increase scientific research in southwest Alaska and supplement costs of maintaining the facility while studies for future salmon rehabilitation and enhancement work are undertaken.

Stream Clearance:

The clearance of periodic blockages to stream mouths can facilitate the passage of salmon into creeks that otherwise would lose potential production of salmon. Many of these blockages occur on an intermittent basis and are of a size that removal could be accomplished by the fishermen themselves. To give fishermen the authority to remove these stream blockages, it may be necessary to establish an agreement between ADF&G Habitat Division and area fishery management biologists that would allow the area management biologist to give permission to fishermen on a case-by-case basis to remove an identified blockage. It is an objective of this plan to have such an agreement established by May 1994.

Area M Enhancement/Development Biologist:

Currently the Department of Fish and Game is undergoing a reorganization that will combine the functions of the Commercial Fisheries Division with those of the Fisheries Rehabilitation, Enhancement, and Development (FRED) Division. For the past several years there has been no direct involvement of FRED Division in Area M, other than intermittent operation of the Russell Creek Hatchery. In order to pursue the goals and projects outlined in this plan and to improve the effectiveness of ADF&G's reorganization, it is an objective of this plan to have an "enhancement/development" biologist assigned to the region on a full-time basis as of July 1994.

Project Timetable:

As limnological studies progress and formation of a regional aquaculture association is pursued, a timetable will need to be established for obtaining funding and implementing various management, rehabilitation, and enhancement projects. While such a detailed timetable cannot be presented in this plan, it is an objective of the Area M RPT to keep abreast of funding opportunities and study results so that appropriate projects can be implemented according to the 12-year goals. The conduct of limnological studies, reconfiguration of the Russell Creek Hatchery, and completion of specific rehabilitation or enhancement projects will require substantial funding. The RPT cannot, by itself, act as a funding source; however, avenues to acquire funds are available to regional aquaculture associations, local governments, seafood processors, or state and federal agencies. It is an objective of this plan that a source(s) of funding be identified by April 1994.

Strategies and Projects

General statements of priorities to guide specific actions of agencies or associations working toward research, management, or production goals and objectives for salmon are strategies. The specific tactics and actions employed to address strategies are projects. As such, strategies and projects represent the heart of the plan--the means of resolving the production/harvest/ management/research needs of the region's users of the salmon resource. In the context of the Area M comprehensive salmon plan, strategies and projects are provided for each of the following categories: (1) production/harvest, (2) management, and (3) research/data collection and evaluation.

Production/Harvest Strategies:

These strategies are designed to replenish depressed natural stocks of fish and increase their numbers beyond levels they would attain without intervention or to their historic highs. These strategies are also designed to supplement production and increase harvests throughout the region. General strategies that may be addressed during the course of the planning process include (1) escapement monitoring (e.g., fish weirs & aerial surveys), (2) reconfiguration of Russell Creek Hatchery, (3) installation of instream incubation boxes, (4) stream clearance, (5)

fish pass construction, (6) lake fertilization, (7) spawning channel construction, (8) water flow control, (9) lake stocking or stream stocking, and (10) increased monitoring on fishing grounds.

Management Strategies:

These strategies are designed to preserve and enhance wild stocks and achieve proper escapements into the major spawning systems. One of the distinguishing characteristics of these strategies is they are directed at the user, rather than the resource, implemented by the Alaska Departments of Fish and Game and Public Safety, and governed by regulations set down by the Alaska Board of Fisheries. These strategies should increase management precision and accuracy and enhance reasonable enforcement activities. General strategies that may be addressed during the planning process include (1) imposing prudent fishing periods, (2) coordinating emergency closures and openings, (3) monitoring escapement, (4) monitoring harvests (5) implementing test fisheries, (6) reanalyzing escapement goals, (7) establishing bag limits and licensing procedures, (8) imposing gear specifications, (9) opening and closing fishing areas, and (10) increasing education and enforcement of fishing regulations.

Improved fishery management data can directly result in short- and long-term increases in harvests. In the short term, harvests could be increased if better escapement data were available. Aerial surveys often result in an underestimation of the escapement; i.e., more fish could be in the system than such surveys indicate, resulting in unnecessary restrictions to fishing opportunity. More direct counting methods, such as weirs or sonar, would provide better escapement data and thereby increase fishing opportunities. In the long term, management of fisheries for maximum sustained yield would provide the greatest harvestable surplus of salmon for the fishery.

Research and Evaluation Strategies:

These strategies will produce fish, but only through the use of projects they support. They are effective tools for resource management; however their value for increasing production are more indirect than the other categories of strategies. By necessity, these strategies are applied for long periods of time and therefore require a dedication of funding, staff, and consistency of approach in order to get useful results. General strategies that may be addressed during the course of the planning period follow: (1) field surveys, (2) computer modeling, (3) data gathering and analyzing, (4) qualitative sampling, (5) fish enumerating, and (6) tagging and genetic stock composition studies.

Monitoring and Evaluating Strategies:

The Area M RPT supports existing state policies and processes that relate to the monitoring and evaluating of rehabilitation and enhancement projects. The size, nature, and potential impacts of a project will determine the degree of monitoring required. Low-cost, low-risk projects often need only cursory monitoring, while high-cost, high risk projects or projects involving new technologies may need more intensive monitoring. If many similar projects are implemented,

only a representative sample needs to be monitored. Projects that may significantly impact wild stocks or alter allocations among user groups will have a comprehensive evaluation and monitoring plan approved by the department.

The monitoring plan developed for a project may include specific reporting and terminating dates and identify specific data needs. Monitoring actions may include the following: (1) implementation of approved monitoring plan, (2) evaluation of results, (3) preparation and distribution of periodic evaluation and performance reports, as described in the monitoring plan, and (4) storage of reports for future reference. The information realized from monitoring activities will be used to help in the formulation of project plans as well as revisions to the comprehensive salmon plan. Cooperative funding among interested parties will also be emphasized for monitoring and evaluating activities.

12-YEAR ACTION PLAN

Projects

The following projects have been identified as fitting the strategies outlined in the preceding chapter and will be the initial actions necessary to accomplish the goals of this plan.

Stream Clearance:

The purpose of these investigations is to acquire data and knowledge relative to blockages in stream/lake systems near Sand Point, Alaska. Three systems (Red Cove, Wosnesenski, and John Nelson) systems will be investigated to evaluate the seriousness of blockages of outlet streams. These systems have characteristics that suggest good potential to produce substantial numbers of sockeye salmon, but they also have blockages or a reputation for developing frequent blockages of their outlet streams. These blockages either prevent fish migration or cause the stream flow to become subterranean. Selective removal of a portion of a barrier sufficient to allow the passage of fish upstream without substantially altering the flow of water or downstream conditions will be required on an annual basis over the long term.

Evaluation of potential stream clearance or habitat alteration will be conducted by a fisheries biologist and a professional engineer (work will be accomplished through coordinated effort of Aleutians East Borough and ADF&G staffs). Assessments of spawning or rearing habitat that will be made available, the portion of the barrier to be removed and/or modified, availability of sufficient spawning populations, and the relative costs of each project will also be determined.

Sand Point Airport Mitigation:

The Aleutians East Borough or permittee will propose (to federal and state resource agencies) mitigation alternatives to mitigate environmental damage caused by construction of improvements to the Sand Point airport. Mitigation options aimed at enhancing salmon habitat and production include, but are not limited to, such things as lake fertilization, fish stocking, barrier removal/stream clearance, or any combination thereof. Federal and state criteria for such mitigation work requires a site that is in reasonable proximity to Sand Point and feasibility studies not exceed 25% of total cost of proposed project.

Limnology Investigations:

Over a two-year period, it will be necessary to acquire data and knowledge relative to the productive potential of typical and atypical (e.g., shallow, salt water intrusion) sockeye salmon lakes in the region. Limnology sampling would entail taking a suite of physical measurements (for light penetration, salinity, temperature, oxygen concentration, and water depth), water samples (for analysis of nutrient concentrations and phytoplankton abundance), zooplankton samples (to determine food availability for salmon fry), and fry samples (to determine growth patterns and diet. Limnology sampling on each lake must be conducted an average five times

per year (May through October) for two years to assess seasonal and annual fluctuations. Further accumulation of fishery and limnological data on shallow lakes will provide necessary information to assess and model carrying capacities of such lakes. These limnological studies of physical, chemical, and biological attributes of regional lakes will assess their respective potential feasibility for fertilization or application of other enhancement or rehabilitation techniques for increased production of sockeye and, perhaps, coho salmon.

These types of limnological studies have not been extensively conducted in Area M, even though some very comprehensive limnology work has occurred in many other areas of the state. Some of the problems have been the remoteness of the region, the commensurate high costs of transportation, and other difficult logistical constraints. These studies are necessary, however, not only to provide a foundation for future restoration and enhancement work, but to provide a basic understanding of fishery production in the southwest portion of Alaska.

The Alaska Department of Fish and Game and the Aleutians East Borough conducted some limited limnological sampling on a few lakes near the communities of Sand Point and Cold Bay in 1991 and 1992. Preliminary results indicated some unique characteristics of several highly productive systems in Area M, such as shallow depth and saltwater influences (i.e., hydrogen sulfide layer at bottom) not typically associated with sockeye production. Other results show that production in some lakes can probably be increased with a scientific approach to lake enrichment or fry outplanting. ADF&G conducted further lake limnology studies in 1993 on 23 lakes in Area M, utilizing float-equipped aircraft and both Russell Creek Hatchery and ADF&G facilities for housing and laboratory space. The data from this study will be used to outline a strategic lake-by-lake approach to developing the salmon resources of Area M.

Hatchery Reconfiguration:

The recently moth-balled Russell Creek Hatchery is located at the tip of the Alaska Peninsula, about three miles south of the town of Cold Bay and about 1.5 miles upstream from salt water on Russell Creek (see Fig. 7); it was initially constructed in 1977-78, but because of serious flaws in the design, it was redesigned, repaired, and reconstructed in 1987. The total cost of this state-built facility was approximately $12 million. Funding for construction was approved by Alaska voters as part of the 1976 Bond Issue.

Although state funding for the operation of the facility was suspended in September 1992, effectively closing it down, as a world class facility it is capable of incubating up to 175 million eggs if it were to become fully operational. As of October 1993, the state has transferred ownership and responsibility of the Russell Creek Hatchery to the Aleutians East Borough. The Borough intends to establish a coastal research laboratory at Russell Creek, both to increase scientific research in southwest Alaska and also to help cover costs of maintaining the facility while studies for future salmon rehabilitation and enhancement work are undertaken.

Although during its last year of operation (FY92) most of the production was dedicated to pink and chum salmon (12.6 & 8.0 million eggs taken, respectively), compared with only 1.1 million

sockeye and 250,000 coho salmon eggs, significant benefits to the region would be realized if the Russell Creek Hatchery was converted to a central incubation facility (CIF) for sockeye and coho salmon. It would be a simple matter to modify the structure and operation of the hatchery, because it would only entail construction of walls, internal baffling, and plumbing modifications to isolate stocks rearing in the hatchery and installation of smaller pumps to more effectively circulate water. This CIF could become a working central focus for salmon rehabilitation and enhancement by providing key production for increased local-stock commercial sockeye/coho fisheries through stream clearance, restoration, limnology, and restocking projects.

Thermal Marking Project. Thermal marking is the process where a visibly enhanced increment or ring is induced in the microstructure of the otolith (ear bone) through controlled and repeated temperature fluctuations of the incubation water. These fluctuations result in an ordered complex of rings known as a thermal mark, which discretely identifies a treated or marked group of fish. This is a process where incubation water is heated to 4 degrees Centigrade for 24-48 hours to make the otolith mark and then dropped immediately. It is a procedure that can be applied to all fish in the hatchery or selected numbers. One important consideration in developing a thermal mark is the ease in recoverability when visually scanning the otoliths for the mark. Equidistant spacing of the rings and a crispness of the ring edge produces a ring structure that is easy to identify. Otoliths must be extracted from mature fish when harvested and evaluated in a laboratory. Part of a complete thermal marking program involve disciplines of a biometrician to develop the system for recovery and interpretation of the otolith data.

Fish Ladder Sites:

Middle (Priest) Creek. This system is blocked by a falls (approximately 15-20 feet high) located on the main fork about 2 miles from the creek's mouth. This barrier prevents salmon access to approximately 5 miles of pink salmon spawning area within the stream. A fish ladder would need to be installed or blasting would be necessary to modify the falls to allow passage of fish. Although pink salmon do not pass up fish ladders as well as other species (e.g., cohos or sockeyes), a low-gradient ladder and weir to lead to them to the entrance of the ladder would enable them to ascend the height. The installed ladder or removal/modification of the falls into a series of ascending resting pools through blasting would potentially add a production of 500,000 pink to the Pavlof Bay harvest during most years and could potentially contribute 1 to 2 million fish to the harvest during years with ideal marine survival conditions. Middle Creek has been surveyed by ADF&G staff, and it seems a reasonable site for such a project.

Fox Bay (main channel). The primary creek there is a pink salmon system that is blocked by a small falls about half-way up from the mouth. This system has been surveyed by ADF&G staff, and because of its relatively low gradient it is considered a reasonable fish ladder site; however the benefits in increased pink salmon harvests in that location are likely to be less than 10,000 fish per annually.

Weir Sites:

Thin Point. The sockeye run at the Thin Point is responding well to an ADF&G stream-guard program. The system is managed through aerial surveys of sockeye salmon in Thin Point Lagoon, where the fish remain for about two or three weeks before moving into Thin Point Lake. Because of time delays, aerial surveys will always be a necessary tool; however, later in the season, when fish are moving into the lake and while later components of the run are moving into the lagoon, it would be desirable to know how many fish are in the lake at a given time. Occasionally, large numbers of sockeye back out of the lagoon and into the fishery, causing a fishery closure that may be longer than necessary to insure that the needed escapement is achieved (e.g., 1992 season). Also, water visibility at Thin Point Lagoon is often too poor for aerial surveys, and when runs are small, errors caused by these problems may have minor impacts on the fishery; however, with the larger runs, such as those anticipated after 1992, these errors could have a substantial impact on the harvest (i.e., fishermen's earnings). Locating a weir at or close to the lake outlet would alleviate these problems and resulting errors. It is anticipated that such a weir would be substantially large, and because of that there may be attendant problems in maintaining it. Also new living facilities close to the weir would be required.

Middle Lagoon. During the late 1920s and throughout the 1930s a weir on the outlet stream from Morzhovoi Lake was operated by the U.S. Fish and Wildlife Service. Although it was a relatively easy installation site for a weir, it took over one month for most sockeye salmon to access it after passing through the fishery. Because most of these sockeyes were counted in late August and early September, a weir must be installed at a lower point in the system in order to obtain more timely counts and efficiently manage the fisheries there. The best location for such a weir is in an intertidal area located about one mile above the lagoon mouth; the weir at that point would be 300 feet wide. Because of the ADF&G stream-guard program there, the Middle Lagoon sockeye run is building, and fishing has been allowed up to 1,000 yards from the lagoon terminus, although little fishing occurs there because sockeye salmon do not appear to use it as a schooling area. In the future, it may be desirable to reduce the area closed to fishing if an adequate number of salmon have been counted through the weir.

Urilia Bay. Some type of salmon enumeration device is needed at the Christianson Lagoon outlet at Urilia Bay. Because of the sandy bottom there, a weir would be difficult to install and maintain; however, a counting tower may be effective and would require only a small amount of material. Living facilities would also need to be constructed at this site for two people, who would be there for about 1.5 months annually. Urilia Bay's sockeye salmon run timing has been pushed later into the season because of highly effective fishing from early through mid-June, and it has become necessary to delay the fishery until a substantial number of sockeyes have escaped; however it is difficult to make accurate aerial counts of salmon until they arrive at the spawning creeks, which occurs well after the fishery has concluded. Therefore a better inseason method of determining the escapement would make management of the fishery much more efficient.

Sandy River. This system is located approximately 20 miles northeast of Port Moller. The sockeye salmon run there, one of the largest in the area, occurs from early June through late July. It is difficult to detect fish in both Sandy River and Sandy Lake unless ideal aerial survey conditions are present. Between 1961 and 1964, an ADF&G counting tower was located about two miles below the outlet of the lake; in 1994 a 200-foot-long tripod weir will be installed near that old site. Placement of a weir there was selected because the river immediately below the site is highly turbid and full of root wads and other debris. The weir will provide accurate enumeration of the sockeye escapement; and age, length, and sex composition data will be collected from both sockeye adults and smolts. This information will result in more efficient management of the common property fisheries and increased harvests of surplus fish.

Potential Systems for Restoration or Enhancement

The following lakes and/or streams throughout the region (Fig. 2) have been identified as systems where production of salmon may be increased through implementation of various enhancement or rehabilitation techniques, thereby benefitting regional fishermen with increased harvests. In view of the recent ADF&G decision to close Russell Creek Hatchery, of those techniques presented earlier in the text, the regional planning team has selected fertilization and/or habitat restoration/improvement as the most practical and cost-effective strategies to investigate in the region; however, before any of the techniques can be actualized in the form of projects, it is necessary to learn as much as possible about the physical, chemical, and biological characteristics of selected systems through steam clearance feasibility and/or limnological investigations and determine feasibility of proposed projects.

Lakes selected for investigation were based on information received from fishermen, regional planning team members, ADF&G staff, and public comments received during Area M RPT meetings. The criteria used to determine lakes that would initially be investigated included (1) size of lake, (2) proximity to communities, (3) potential for increased salmon production based on historical escapement and harvest information, and (4) status of land surrounding the lake.

Selected South Peninsula Systems:

Orzinski (Orzenoi). This is a deep circular-shaped lake approximately 0.5 mile in diameter; because it appears to be rearing limited, lake fertilization would be a possible means of increasing production. Logistically, it would be an easy lake to fertilize, and the resident sockeye salmon are relatively large; i.e., the older age classes are in the 8-pound category. This system has been selected as a primary candidate for limnology investigations to determine feasibility of adding nutrients to increase production of sockeye salmon. The lake has a limited saltwater and hydrogen sulfide layer at the bottom.

Wosnesenski. This system has the potential for producing substantial runs of sockeye salmon; however, access to the lake, which is shallow and approximately 1 mile long by 0.75 mile wide, is partially blocked. Coho salmon also return to the system. This system potentially could also benefit from lake fertilization for increasing its production of sockeye salmon. Accordingly, it

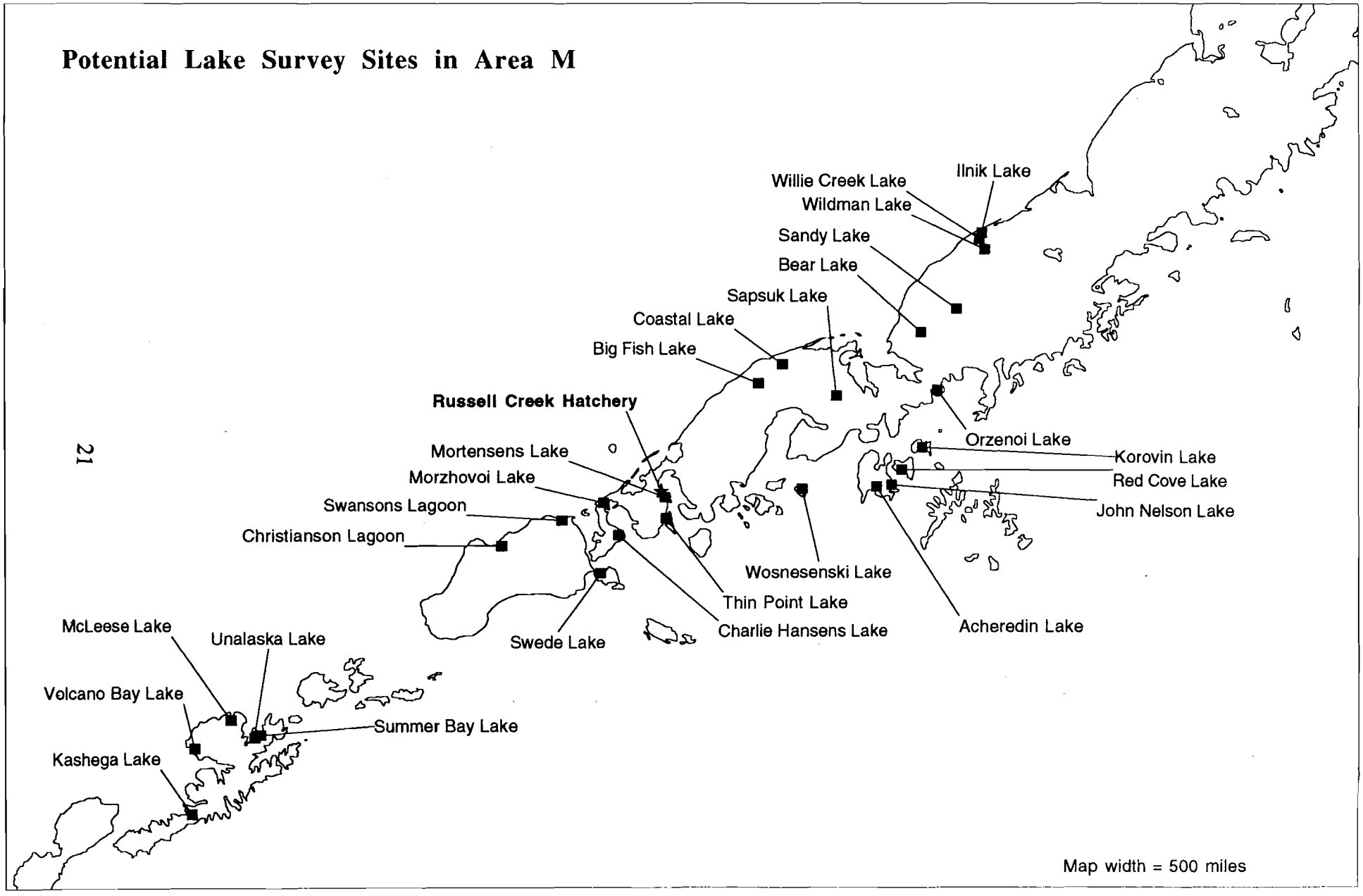

Figure 2. Lakes to be investigated for their potential for increasing salmon production in Area M.

has been selected as a candidate for both stream clearance and lake fertilization (limnology) feasibility studies .

Swedes. This narrow lake, which is approximately 0.5 miles wide by 2.0 miles long, has a maximum depth of 12 feet. There is a fair amount of spawning area, although its quality is questionable. Logistically, lake fertilization would be inexpensive because of easy access to the beach. It also has been selected as a secondary candidate for limnology investigations to determine feasibility of adding nutrients to increase production of sockeye salmon.

Mortensens. The lake is 1 mile long by 0.5 mile wide and shallow (i.e., 6 ft); however, the potential exists for increasing production through lake fertilization. Because of its close proximity to Cold Bay, logistically, the costs for such work would be reduced. This system has been selected as a primary candidate for limnology investigations to determine feasibility of adding nutrients to increase production of sockeye salmon. Mortensens Lagoon receives a substantial amount of subsistence pressure.

Thin Point. This shallow lake (i.e., no more than 10 feet deep) is approximately 2.5 miles wide by 3.3 miles long. It appears to be spawning limited, and its rearing area could also be a limiting factor. Because early plankton sampling indicated the lake was nutrient deficient, there is the possibility of increasing production through lake fertilization. This system has been selected as a primary candidate for limnology investigations to determine feasibility of adding nutrients to increase production of sockeye salmon.

Charlie Hansens. The lake is two miles long by 1 mile wide and has a maximum depth of 50 feet. It has only a small sockeye salmon run and appears to be a good candidate for enhancement. It has been selected as a primary candidate for limnology investigations to determine feasibility of adding nutrients and/or fry to increase production of sockeye salmon.

John Nelson. This lake is circularly shaped; its diameter is approximately 0.5 mile. It produces sockeye, pink, chum, and coho salmon, but access to the lake is frequently blocked. Local fishermen have been opening the barrier each year to let fish into the lake; however, a permanent labor agreement, fashioned to assure permanent access for fish, is needed. This system has also been selected as a primary candidate for fishery investigations to determine the early life history of sockeye and coho salmon in saline lakes.

Acheredin. The lake is approximately 1 mile wide by 1.5 miles long and extremely shallow. Although, this system has been selected as a primary candidate for limnology investigations to determine feasibility of adding nutrients to increase production of sockeye salmon, access by float plane is exceedingly difficult because of the lake's shallowness.

Red Cove. The lake is 0.5 mile wide by 1.0 mile long, has a maximum depth of 52 feet, and access is often blocked. Sockeye and coho production could be increased there, provided the outlet is kept open to provide permanent access. This system has also been selected as a primary candidate for limnology investigations to determine feasibility of adding nutrients to

increase production of sockeye salmon. There is also a potential there for planting coho fry. This lake also has a saltwater and hydrogen sulfide layer at the 20-foot depth.

Selected North Peninsula Systems:

Sapsuk (Hoodoo). This lake is approximately 4.0 miles long by 1.0 mile wide and has a maximum depth of 285 feet. It is part of the Nelson River system and the second-largest sockeye salmon producer on the North Peninsula. The lake appears to be rearing limited, and application of fertilizers could potentially increase the sockeye run. Annual escapement goals have recently been exceeded. Sapsuk Lake has been selected as a candidate for limnology investigations to determine feasibility of adding nutrients to increase production of sockeye salmon.

Bear. This lake is approximately 1.75 miles wide by 6.0 miles long and has a maximum depth of 340 feet. It is the largest sockeye salmon producing system on the North Peninsula. This system appears to be spawning limited. It also has been selected as a secondary candidate for limnology investigations to determine feasibility of adding nutrients to increase production of sockeye salmon.

Sandy Lake. This lake is approximately 3.0 miles wide by 2.0 miles long and has an average depth of 15.0 feet. Sockeye salmon migrating to the Sandy Lake system provide significant contributions to the local North Peninsula commercial harvests; the run occurs from early June through late July. To provide a more accurate accounting of the sockeye escapement there, a weir will be installed in Sandy River in 1994.

Big Fish. This lake is 1.25 miles wide by 2.0 miles long and has a maximum depth of 9 feet. It is part of the Nelson Lagoon system and appears to be the major producer of late sockeye salmon (i.e., late July to early August) to that system. This system has been selected as a secondary candidate for limnology investigations to determine feasibility of adding nutrients to increase production of sockeye salmon.

Ilnik. It is a complex system that includes three lakes (i.e., Wildman, Willie Creek, and Ilnik). Ocean River, which drains Wildman Lake, changes its terminus every several years, and in some years drains into Ilnik Lake; during other years it drains directly into the Bering Sea. There is also another lake about 0.5 mile in diameter in the Ocean River system below Wildman Lake; however, it has no spawning habitat. Wildman Lake is colder and appears moderately deep; it is 1.0 by 1.5 miles in size, has a maximum depth of 43 feet, and appears to be very rich in nutrients (i.e., phytoplankton bloom), although it may be spawning limited. Sockeye production may be increased there by stabilizing the terminus of Ocean River and installing gravel incubators in Wildman Lake. Willie Creek is 0.3 by 3.0 miles and very shallow. The spawning area is very limited, consisting of a large spring area at the beginning of the creek. There may be a potential for increasing sockeye production by using gravel incubators and stabilizing the terminus of Ocean River. Ilnik Lake is approximately 0.3 by 6.0 miles and very shallow. It is a rearing area for sockeye and coho salmon from all Ilnik spawning systems.

This system has been selected as a secondary candidate for limnology investigations to determine feasibility of adding nutrients to increase production of sockeye salmon. It has also been proposed as a potential site for rehabilitation and enhancement of sockeye salmon using other strategies such as stream-side incubators.

Nameless Lake Southwest of Coastal Lake . It is a shallow lake, is approximately 1.0 by 2.8 miles in size, and has a maximum depth of 6 feet. It is part of the Nelson Lagoon system and produces late sockeye salmon (i.e., late July-early August). This system has been selected as a secondary candidate for limnology investigations to determine feasibility of adding nutrients to increase production of sockeye salmon.

Unalaska Lake Systems:

Morse Cove Lake. It is a very small lake located about 2 miles northeast of Summer Bay Lake in Unalaska Bay. It is 0.2 mile wide, 0.3 mile long, and shallow. The outlet is frequently blocked by gravel and difficult to reopen. The average, observed escapement has been less than 100 sockeye salmon.

Summer Bay Lake. It is about 0.4 mile wide by 1.0 mile long and has a maximum depth of 35 feet. The system produces small runs of sockeye salmon. Although escapement data are limited, sockeye salmon exploitation by commercial and subsistence fishermen have been low in that location. The lake is on the road system; therefore, if it is determined to be a beneficial site for fertilization or other enhancement or rehabilitation options, logistical costs would be low.

Unalaska Lake. It is about 0.5 mile wide by 0.8 mile long, with a maximum depth of 30 feet. It produces a small sockeye salmon run. Because of it location near the community of Unalaska, logistical costs for lake fertilization would be low.

McLeese Lake. It is about 1.0 mile wide by 2.0 miles long and has a maximum depth of 43 feet. This lake provides subsistence sockeye salmon needs for Unalaska/Dutch Harbor residents. The run appears to be a healthy one.

Volcano Bay Lakes. It is a two-lake system. The north lake is 54 feet deep and about 1.3 miles wide by 1.5 miles long. The south lake has a maximum depth of 6 feet and is about 0.8 mile wide by 1.3 miles long. The sockeye salmon run appears to be healthy, but the system may be spawning limited.

Kashega Bay Lakes. It is also a two-lake system. The east lake is about 0.3 mile wide by 2.5 miles long and has a maximum depth of 9 feet. The west lake is about 1.0 mile in diameter and appears to be somewhat deeper than the east lake. Production there potentially may be increased through lake fertilization. Both lakes are close to the beach, resulting in lower logistical costs for implementing such projects. The system receives very little fishing pressure because of its remote location.

CONTINUED IMPLEMENTATION OF THE PLAN

The Regional Planning Team's Role

Alaska statutes specify three functions of the Regional Planning Team: (1) development of a comprehensive salmon plan, including provisions for both public and private nonprofit hatchery systems (AS 16.10.375); (2) review of private nonprofit hatchery permit applications (AS 16.10.400 [a]); and (3) review of the proposed suspension or revocation of a permit (AS 16.10.430). The remainder of this chapter provides further elaboration on the responsibilities identified above and also a description of the annual updating process.

Ongoing Planning

Alaska Statute 16.10.375 provides the Area M RPT with the responsibility for development of a comprehensive salmon plan. Plan development is a constantly evolving process, as opposed to one that is fixed or static. This nature of the planning process gives Area M RPT a continuing role in salmon rehabilitation and enhancement planning, because it is responsible for relating actual events to the plan and making the plan responsive to new knowledge, ideas, and changing conditions. Opportunities have thus far been presented within a 12-year time-frame. Numerous unknowns surround many of these opportunities, and some will never become actual projects. As projects in the 12-year action plan become implemented or are determined to be infeasible or undesirable, they will be replaced with new projects for the following planning period. The comprehensive plan will be revised as necessary. A procedure for periodic updating of the action plan will allow for revision of certain sections. At times new information and events will require the reevaluation of goals, objectives, area and site-specific strategies/projects, or assumptions used for planning.

Evaluation Criteria

When evaluating proposals or projects for rehabilitation, enhancement, or management of fisheries in the region, the Area M RPT will use the following criteria:

1. No detrimental impacts to production or management of existing fisheries or stocks;

2. Overall equity of benefits to wide ranges of user groups;

3. Cost-effectiveness, scientific credibility, and practicality; and

4. Compliance with the guiding principles of this comprehensive plan.

Updating Process

The comprehensive salmon plan is designed to be a working document that provides a framework for increasing salmon production for the Alaska Peninsula/Aleutian Islands Area M

region; therefore, it will be updated periodically and a report on regional comprehensive salmon planning progress submitted to the commissioner of ADF&G. To maintain these updates, the Area M RPT will meet at least once a year to discuss (1) reports on current projects; (2) new projects under consideration; and (3) new opportunities that may be investigated as potential future projects. A statement of progress toward achievement of the goals and objectives in the plan and a project status report will be incorporated into the periodic report. Over time, this report will reflect achievement of the goals and objectives of the plan.

REGIONAL PROFILE

Physical Environment

> The Aleutian Chain is a bridge between two continents and the slender wedge between two seas, the longest archipelago of small islands in the world (Morgan et al. 1980).

The Aleutian Islands are volcanic outpourings along the southern rim of the North American plate, one of 12 rigid tectonic plates that make up the outer shell of the earth. These volcanos rise to a maximum height of 9,372 above sea level and 32,472 feet from the ocean floor. The approximately 200 islands are treeless, windswept, and foggy; volcanic activity and earthquakes are frequent. Tectonic uplift has continued to alter the coastline just as it did when the Aleutian Islands were originally raised above the sea millions of years ago (Laughlin 1980). While the Shumagin Islands (location of Sand Point on Popof Island) lie immediately south and west of Kupreanof Point on the Alaska Peninsula, the Aleutian Islands are spread out from east to west in a 1200-mile archipelago, varying in width from 20 to 40 miles and extending to within 500 miles of the Kamchatka Peninsula. From east to west, the five principal groups into which the Aleutian Islands are divided are the Fox, Four Mountains, Andreanof, Rat, and Near Islands. With the exception of Amchitka, these islands are mountainous, having irregular shorelines and generally rocky cliffs jutting into the ocean (Desautels et al. 1970).

The Alaska Peninsula is divided into two major physiographic subprovinces: the Aleutian Mountain Range and the Bering Sea lowlands. The Alaska Peninsula is an area of persistent volcanic activity. This area is on the Pacific "ring of fire" of seismically active areas, but has been generally free of earthquakes of more than five on the Richter scale. There is high seismic activity in southern and southwestern Alaska. This seismicity is due to subduction of the Pacific Plate under the North American Plate, which is an ongoing process, with most of the accumulated strain being released in the form of great earthquakes (magnitude greater than 7.0 on the Richter scale). Because the Pacific Plate is being subducted beneath the Alaska Peninsula, the earthquake foci tend to be deeper to the north, away from the Aleutian Trench, which is the point of the initial interaction between the two plates.

Water in a variety of forms is a major feature of the region. Several lakes and rivers, streams, ponds, wetlands, coastal bays, ports, tidal flats, and harbors are found there. The two major water bodies included in this region have significantly different physical characteristics. The southern Bering Sea along the northern Alaska Peninsula is relatively shallow, consisting of a gradually sloping, relatively featureless continental shelf. The shelf edge extends in a northeasterly, then northwesterly direction from Unimak Pass. To the south, the Pacific Ocean sea floor is rugged and complex. It is a narrow and irregular continental shelf frequently incised by deep submarine canyons. Coastal habitats occurring in the region include offshore areas; estuaries; barrier islands and lagoons; wetlands and tideflats; rocky island and sea cliffs; exposed high energy coasts; rivers, lakes and streams; and upland areas. Deep passes between many of the islands are in regions that possess some of the world's highest nutrient concentrations that are products of an oceanic upwelling that are caused by deep currents from the Pacific moving up the continental slope. The importance of these upwelling systems is that they promote vertical mixing of water, raising the basic nutrients into the upper sunlit zones where they

become available to the great variety of life forms that range from phytoplankton to whales. In turn, these life forms have supported the people who collect and eat the fish, birds, mammals, marine plants, and invertebrates. Moreover, the island passes channel migrating fish, seals, and whales, bringing them to within range of the people living within the region (Laughlin 1980).

Climate

Oceanic waters and the frequent cyclonic storms that cross the North Pacific Ocean and Bering Sea are the major influences on the regional maritime climate that is characterized by heavy precipitation, cool summers, warm winters, and persistent strong surface winds. Somewhat less precipitation and greater temperature extremes are characteristic of the north shore of the Alaska Peninsula and Unimak Island, where the climate is transitional. Precipitation on southern coastal areas and Gulf of Alaska islands averages 40 to 100 inches annually. The Bering Sea side of the region receives an average of 40 to 80 inches of precipitation. Average maximum temperature is 56° F, and the average minimum temperature ranges from 22° F to 28° F. Cloudiness and fog prevail throughout the year but are most common in spring and summer. Table 2 presents selected meteorological data for Aleutian localities (Veltre and Veltre 1982). Average wind speeds range from 10 to 20 knots, although extreme wind conditions are common;e.g., winds have been clocked at 104 knots on Adak Island (Laughlin 1980). The combined conditions of fog, wind, and precipitation often cause aviation and navigation hazards. Waters south of the Alaska Peninsula are generally ice free year-round. Bering Sea winter ice conditions vary greatly and are highly variable.

Vegetation

There are about 600 to 700 species of plants in the Aleutian Islands/lower Alaska Peninsula area, which is essentially treeless, vegetated by arctic-alpine species, and dominated by heath, grasses, sedges and composite families. Despite the generally poor soil, heavy rainfall and relatively mild summers cause abundant growth below elevations of 1,000 feet, although the lack of sunshine places limitations on species. Crowberries, cranberries, blueberries, salmon berries, wild celery, and mushrooms thrive in the region, and there are large fields of lupine, yellow monkey flowers, monkshood, orchids, rhododendron, primrose and marsh marigolds (Morgan 1980). One of the hardiest indigenous species is rye grass, on which aboriginal Aleuts depended for woven baskets, matting, and clothing. Many of the edible seaweeds (i.e., red dulse, alalia, laminarie, ulva) are abundant throughout the area, and Aleuts have long used them to supplement their diets.

Fish and Wildlife Resources

Introduction:

The Alaska Peninsula/Aleutians Island area supports an abundance of fish and wildlife resources having local, statewide, national, and international significance. The bays and lagoons of the north side of the Alaska Peninsula are among the most biologically productive estuarine systems

Table 2. Selected meteorological data for Aleutian Island localities (NOAA 1992).

Annual means	Cold Bay	Unalaska	Adak	Attu
precipitation (inches)	32.2	61.9	70.5	—
temperature (F)	37.9	42.7	43.2	42.5
cloud cover	85%	86%	87%	86%
days with fog	53%	8%	14%	15%
last freeze (spring)	early May	early May	early May	early May
first freeze (fall)	late Oct	late Oct	mid-Oct	mid-Oct

in the state; the North American populations of emperor geese and black brant stage in this area during spring and fall migration. Much of the world population of Steller eider winter in this area. Unimak Pass is one of the major migration corridors for birds and marine mammal populations entering and departing the Bering Sea. Major populations of humpback, fin, and gray whales andnorthern fur seals seasonally migrate through the pass. Of significant economic value, the area has abundant and commercially important fish and shellfish resources in the coastal waters of the Bering Sea and Gulf of Alaska: herring, halibut, groundfish, and shellfish (i.e., crab, shrimp, and scallop). Most streams in the eastern Aleutians (i.e., east of Umnak Island) and lower Alaska Peninsula support spawning populations of salmon, upon which the region's economy is based.

Marine Fish and Shellfish:

An abundance and variety of marine fish inhabit regional waters, including Pacific herring, rainbow smelt, capelin, Pacific saury, and salmon shark. Of these species only herring is currently of commercial importance. Similar groundfish species are found in both the waters of the southeast Bering Sea and the northwest Gulf of Alaska, but they differ in relative abundance. Pollock is by far the most abundant species in both areas, although the size of the resource in the Bering Sea is much greater. Pacific cod reaches its greatest abundance in the Bering Sea. Yellowfin sole, the dominant flounder in the Bering Sea, is relatively scarce in the

Gulf of Alaska, where arrowtooth flounder is the dominant species. Both the Bering Sea and Gulf of Alaska support large numbers of commercially important shellfish species, including Dungeness crab, tanner crab, red king crab, shrimp, and scallops, although many shellfish populations have exhibited low abundance during the past decade.

Anadromous and Freshwater Fish:

Five species of Pacific salmon are indigenous to the region (Table 3); however, pink, sockeye, and chum salmon are most abundant. In addition to the significant local salmon runs, salmon migrate throughout the coastal waters of the eastern portion of the region; i.e., as juveniles from natal streams to rearing areas in the Pacific Ocean and as adults from rearing areas to natal streams to spawn. North and South Peninsula/Eastern Aleutians salmon stocks exhibit differences in species composition and the run timing. North Peninsula rivers and streams support large runs of sockeyes and chums, as well as a few locally important chinook and coho salmon runs. Pink salmon streams are few. Along the South Peninsula, pink and chum salmon are the predominant species; however, sockeye salmon are also important. Salmon enter South Peninsula waters before reaching North Peninsula waters and, with the exception of sockeyes, spawning continues in South Peninsula waters until September and October. Other anadromous fish including eulachon, rainbow smelt, Dolly Varden/Arctic char, steelhead, and Pacific lamprey are also present in the region. Freshwater species that inhabit rivers, streams, and lakes include rainbow trout, slimy sculpin, longnose sucker, and round whitefish.

Marine Mammals:

Twenty-four species of marine mammals are indigenous to the region. Steller sea lions, harbor seals, and sea otters are the most visible and numerous marine mammals of the nearshore area. Other species of marine mammals include minke, sei, finback, gray, blue, right, sperm, and killer whales. Dall's porpoise and Pacific white-sided dolphin are also present. Two occasional marine visitors to the regions are the northern fur seal and walrus. Fur seals breed in the Komandorskies, Pribilofs, and recently on Bogoslof Island and migrate in waters adjacent to the Aleutians and through Unimak Pass.

Terrestrial Mammals:

Not many land mammals are native to the islands between Unimak and Attu; rather, most have been introduced. Unimak Island is the natural western limit of caribou, brown bear, wolf, wolverine, river otter, ground squirrel, and weasel. Caribou, moose, and brown bear are the most conspicuous mammals of the region, and lemmings have been reported as far west an Umnak. The arctic fox, which are indigenous to the Komandorskies and Attu may have found their own way to the other island lying to the east, but mice, rats, rabbits, reindeer, sheep, horses, cattle, bison, and caribou have all been introduced. The red and blue foxes were transplanted by fur traders during the Russian period as well as in the 1920s in tremendous numbers that devastated entire colonies of migrating birds.

Table 3. Life cycles of salmon species in the Alaska Peninsula/Aleutian Islands drainages.

Lifestage	Activity	Chinook	Coho	Sockeye	Pink	Chum
Egg	Incubation location	clean gravel riffle	small streams; clean gravel	streams near lakes; springs	clean gravel, intertidal,lower stream	intertidal lower stream
Alevin	Hatching (remain in gravel)	midwinter	late winter	mid/late winter	midwinter	midwinter
	Emergence (swim-up)	April-May	May-June	April-May	April-May to estuary	April-May to estuary
Fry	Rearing location	stream, river edges	lakes, streams, ponds, sloughs	mostly lakes; some sloughs	nearshore, marine	nearshore, marine
	Time in fresh water	1 year	1-2 years	1-2 years	short-term	short-term
	Food	aquatic insects	aquatic insects	plankton	plankton	plankton
Smolt	Migration	May-June	June-July	May-June	May-June (as fry)	May-June (as fry)
	Size	3-4 inches	4 (+) inches	3 (+) inches	1.5 inches	1.5-2.0 inches
	Age	1 year	2 years	1 or 2 years	1-3 weeks	1-6 weeks
Ocean rearing & development	Food	fish/other	fish/other	large plankton	fish/other	fish/other
	Growth	rapid	rapid	rapid	rapid	rapid
	Time in ocean	1-5 years	1 year	3 years	1 year	2-4 years
Homing Migration	Timing	June-July	August-October	June-September	July-August	July-August
	Size	15-70+ lb	10-15+ lb	6-15 lb	4-6 lb	10-20 lb
Spawning	Timing	July-August	September-October	June-August	July-August	July August
	Location	streams, rivers	streams	streams, near lakes lake upwelling, sloughs	intertidal; lower stream	intertidal; lower streams, sloughs

Birds:

Gulls, cormorants, ptarmigan, and puffins are year-round residents of the region. Some species such as the Arctic tern migrate to the area in the summer to breed and depart in the fall for wintering areas as distant as South America. The region is a critical spring and fall staging area for many species of waterfowl that breed in areas farther north. Among the species using the area during migration are emperor geese, black brant, Steller's eider, Taverner's Canada geese, oldsquaw, and black scoters. Preferred waterfowl habitats are lagoons, vegetated intertidal zones, and lake margins found primarily on the Bering Sea side of the region. Izembek Lagoon with its rich growth of eelgrass and the Nelson Lagoon-Port Moller are outstanding waterfowl use areas. A unique resident population of tundra swans nest and overwinter in the region. Thousands upon thousands of shorebirds migrating to and from breeding grounds use the intertidal areas along the Alaska Peninsula and Unimak Island, especially Izembek and Nelson Lagoons. Principal species include western sandpipers, dunlins, and rock sandpipers. The region also hosts a variety of raptors, other birds of prey, and songbirds.

Human Environment

History:

The oldest archeological site in the Aleutians at Anangula, which is just off the southwest coast of Umnak Island opposite the village of Nikolski (Fig. 3), is 8,000 years old. The history of human settlement in the region began sometime before the establishment of Anangula and before Beringia (i.e., the Bering Land Bridge) had been covered by the Bering Sea 10,000 years ago (Campbell 1963). According to Sellkreg (1976) human habitation occurred generally in the Alaska region sometime between 20,000 and 15,000 B.C. There is yet little agreement on the origin, development, and cultural affinities of the modern and prehistoric populations of the region, except a general linkage to northern Japan and the Siberian Pacific Rim (Morgan 1980).

The Aleuts, who called themselves Unangan, were divided into various island-oriented groups, with the eastern-western division at Amchitka Pass (Fig. 4). Although the languages of the western and eastern Aleut had diverged and the various groups conducted wars against each other, all Aleut groups shared important aspects of material culture, and they had sophisticated technologies designed to exploit the marine environment (e.g., baidarkas or kayaks, water pumps, raingear, harpoons, nets, hooks, and lines). Aleut men generally wore ankle-length parkas of bird skins. Women wore parkas of seal skins trimmed in otter (Morgan 1980).

Fish, marine mammals, and marine invertebrates furnished most of their food, shelter, weapons, tools, and adornments. The initial European contact that occurred when Vitus Bering reached the Aleutians Islands in 1741 began more than a century of exploitation by Russian fur traders (i.e., promyshleniki). From the first interaction between Russians and Aleuts, violence was commonplace, and within the first 75 years from the initial contact the Aleut population had diminished to 20% (i.e., 3,200) of its precontact size, which has been estimated at about 16,000 (Lantis 1970, Veltre and Veltre 1982). As a consequence of the economic/political/cultural

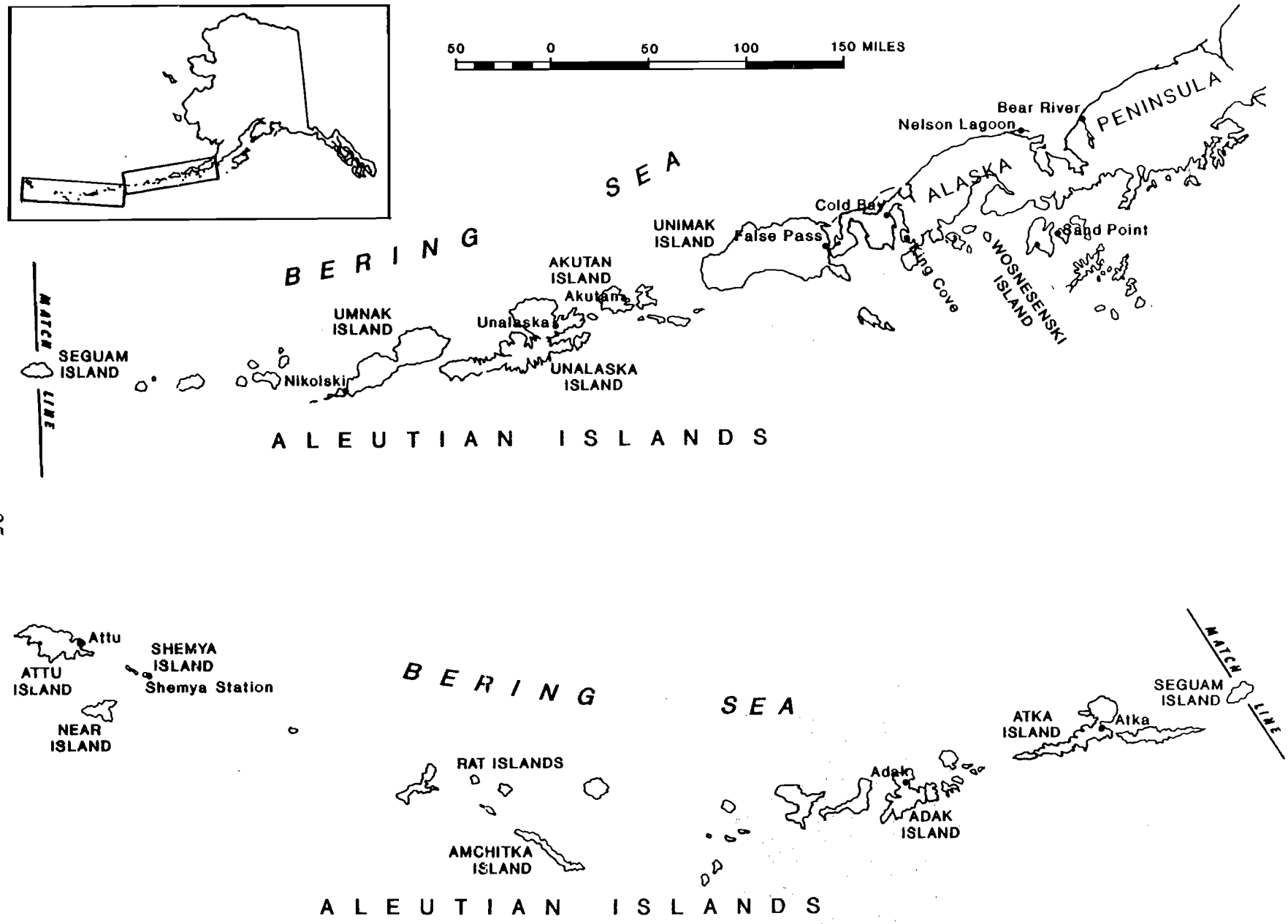

Figure 3. Map of the Alaska Peninsula/Aleutian Islands/Area M region, including location of principal communities.

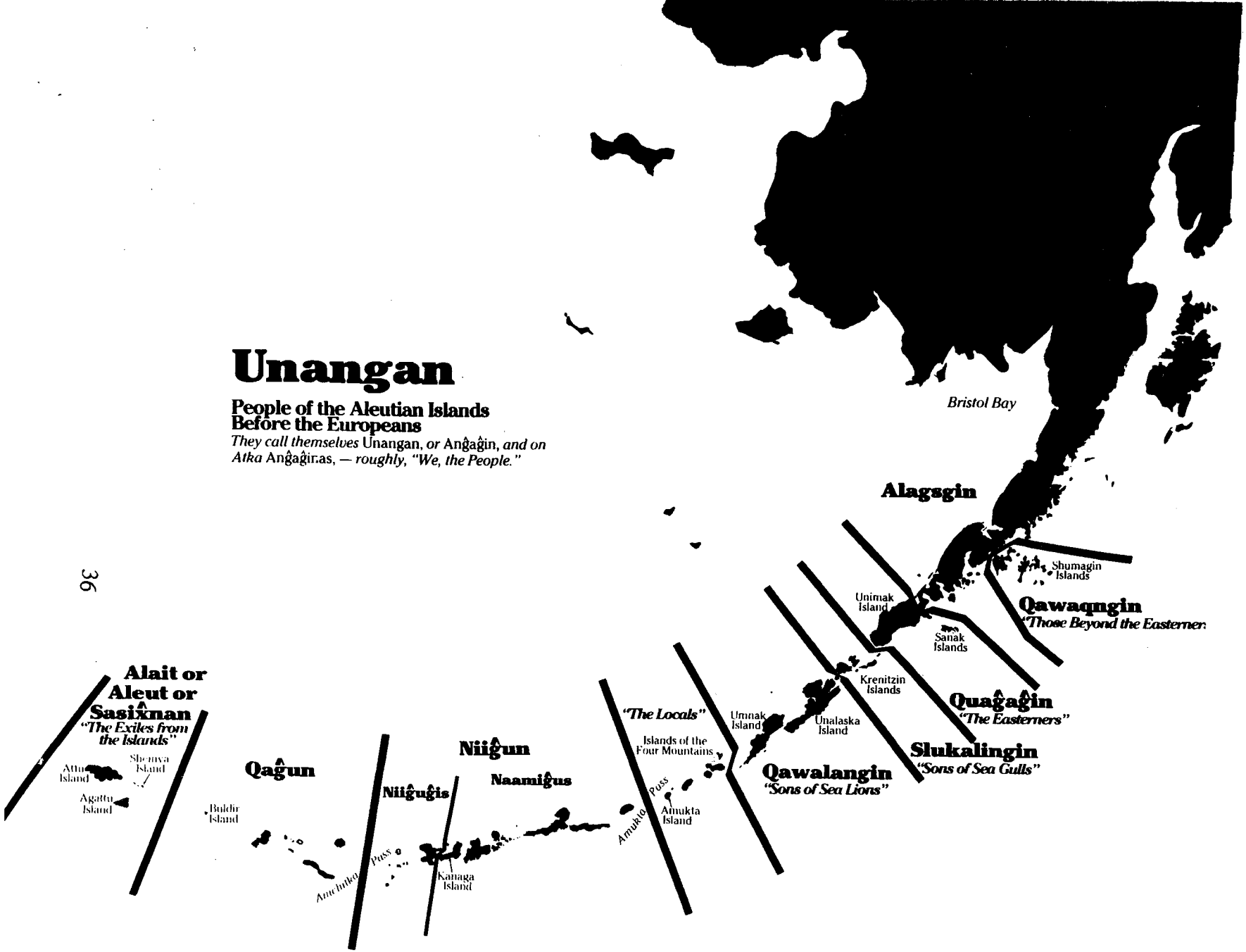

Figure 4. Tribal or island-group orientation of the eastern and western Aleuts at the time of European intervention.

intervention, the aboriginal culture of the Aleuts also was changed forever, their numbers decimated by disease, relocation, and forced labor in the fur industry.

By 1900 the cod fishery had replaced the fur (otter and fur seal) industry as the primary economic activity. Fishermen, predominately Scandinavian, immigrated to the region, with many of them marrying into Aleut families. After the cod fishery peaked in 1918, the industry declined steadily and was discontinued in the 1950s. A herring fishery was established in the area in the 1920s and continued until after World War II. During the 1920s fox farming and trapping became very important in the region, continuing as an economic activity until the Great Depression of the 1930s and beginning of World War II in Europe caused the market to become nonviable. The salmon fishery emerged in the region about 1900 and remains the basis of the regional economy east of Unalaska Island. The establishment and growth of communities were directly related to the establishment and growth of processing plants. Residents of outlying areas sometimes abandoned established smaller villages to move to communities offering employment and a variety of goods and services.

Community Profiles:

Fourteen communities make up the population centers in the region (Table 4). In 1990 the U.S. Census Bureau accounted for approximately 12,021 residents in the region. Excluding military bases and installations, the largest community in the region is Unalaska/Dutch Harbor (population = 3,089), followed by Sand Point (population = 878). With the exception of Adak, Shemya Station, and Cold Bay, the region's population is predominately Aleut, although many residents also have Russian and Scandinavian forbearers.

Adak. As a counter offensive effort against the Japanese during World War II, harbor facilities and an airport were built Adak, the second largest of the Andreanof Islands about 1,200 miles southwest of Anchorage and 90 miles west of Atka (Figs. 1 and 3). Facilities were built for 11,000 personnel, and by the spring of 1943 all major military branches had headquartered there; at the height of the war, Adak had a military population of 96,000. The only continuous military presence in the region following World War II has been at Adak. It was reduced to housekeeping status by the Army, turned over to the Air Force in 1948 and, in turn, to the Navy in 1950. The Adak Base population had dwindled to 1,500 when military planners transferred Fleet Air Alaska Command there in 1971. A number of World War II facilities were rejuvenated, modern housing built, and it now supports a military, federal, and support population approximately 5,000; i.e., Adak Station 1980 and 1990 U.S. Census populations of 3,315 and 4,633, respectively (Table 3).

Akutan. The community of Akutan is located on Akutan Island (18 by 12 miles in size), one of the Krenitzin Islands of the Fox Island group (Figs. 3 and 5), 17 miles east of Unalaska and 20 miles west of Unimak Pass. The harbor is surrounded by snow-covered peaks of approximately 2,000 feet. The highest point on the island is Akutan Volcano (4,257 ft) located 7 miles to the west; the last full eruption of the volcano occurred in 1978. The present village was established in 1879 as a fur storage and trading port by the Western Fur and Trading

Table 4. U.S. Census Bureau population counts for communities in the Alaska Peninsula, Aleutian Islands, Area M Region, 1980 and 1990.

Community	1980 Population	1990 Population
Aleutians East Borough		
Akutan	169	589
Cold Bay	88	148
False Pass	70	68
King Cove	460	451
Nelson Lagoon	59	83
Sand Point	625	878
Balance of Aleutians East Borough	58	247
Total	**1,539**	**2,464**
Aleutians West Census Area (AWCA)		
Adak	3,315	4,633
Amchitka	0	25
Atka	93	98
Attu	29	23
Nikolski	50	35
Shemya Station	600	664
Unalaska	1,322	3,089
Ships in Port (Unalaska) & Balance AWCA	7	990
Total	**5,416**	**9,557**
GRAND TOTAL	**6,955**	**12,021**

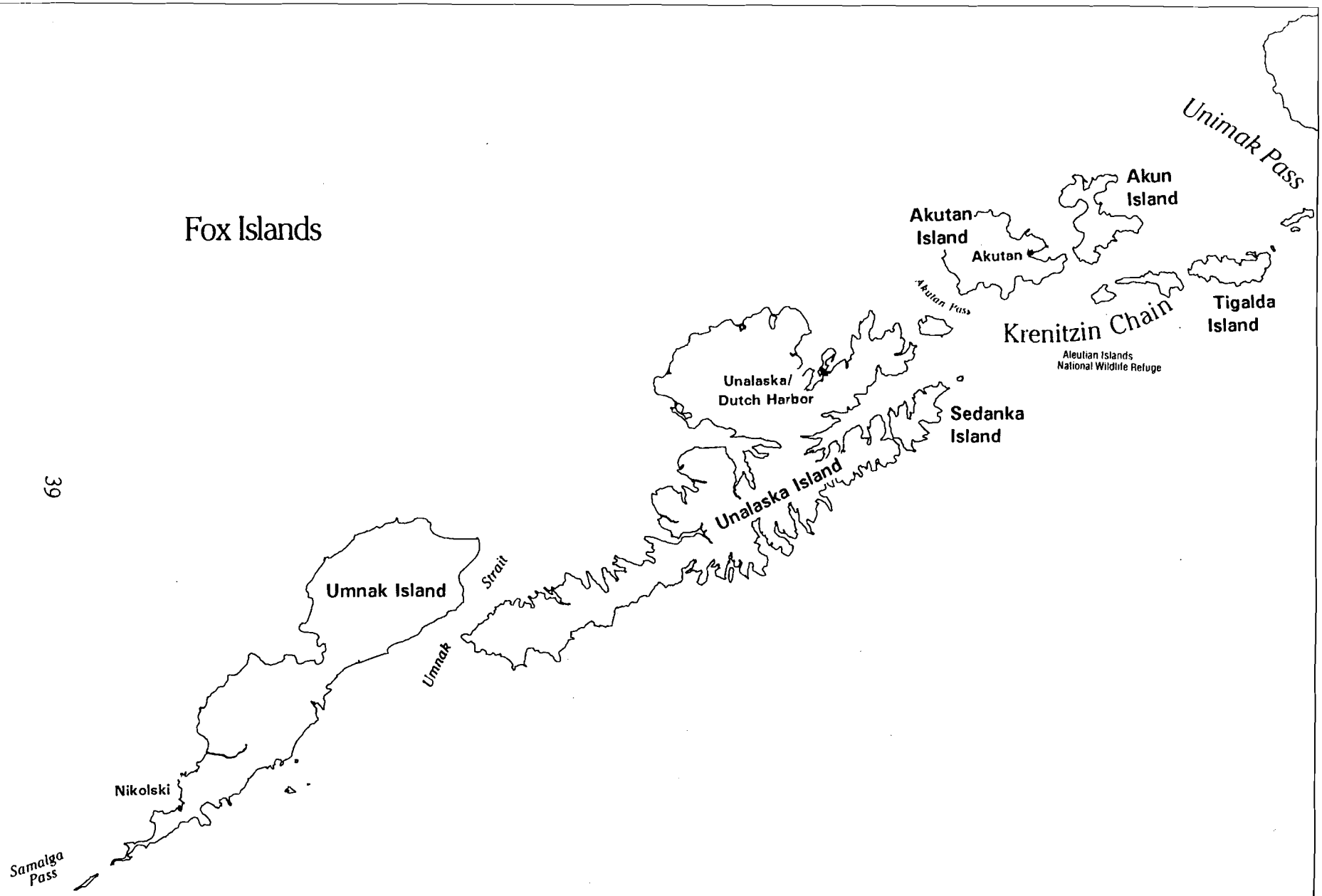

Figure 5. Communities of the Fox Island group, west of Unimak Pass and east of Islands of Four Mountains.

Company. In 1912 the Pacific Whaling Company built a processing station across the bay from Akutan, operating there until 1939. Commercial fishing and fish processing currently dominate Akutan's economy; its close proximity to Unalaska and major harvest grounds makes it a key port for future development activities. Trident Seafoods has a major bottomfish plant just west of the village. Deep Sea Fisheries also has a permanent processing vessel in the bay and are planning to build an 18-acre plant complex. Akutan Harbor is frequently used by other processing vessels during the fishing season. Processing and crew work provide seasonal employment for about 25 residents; additional employment is provided by the school, post office, store, tavern, and clinic. According to the 1990 U.S. census, the population there was 589, a 350% increase over 169 counted in 1980. The community has a school (grades K-12), electricity, water, and sewer systems, and freight arrives by ship on a weekly basis.

Amchitka. It is the southernmost of the Rat Islands, lying approximately 50 miles southeast of Kiska (Figs. 3 and 6). An air base was constructed there in January and February 1943 just prior to the Battle of Attu during World War II. Military personnel moved out of Amchitka for good in 1950. During the 1960s the Atomic Energy Commission (AEC) selected the island as a testing site for nuclear weapons. In response to litigation to prevent testing, the U.S. Supreme Court decided to allow it to occur. The nuclear device was buried 5,875 feet beneath the ground surface and set off on November 6, 1971, registering 7.0 on the Richter Scale and creating a large lake by draining 5 smaller ones. The AEC still annually monitors the site for radiation, but the possibility of leakage is considered so remote that the USFWS has established a recovery station there for Aleutian Canada goose (Morgan 1980); according to the 1990 U.S. Census, 25 people lived there in 1990 (Table 4).

Atka. The village of Atka is the most western and isolated village on the Aleutians, the largest island of the Andreanof Islands group (Figs. 3 and 7). The community has persisted despite the lack of local job opportunities, the economy resting primarily on subsistence living and wages earned from seasonal employment. Many residents are employed in the fishing/crabbing industry elsewhere in the region. Although Atka offers a fairly good location for crab-processing activities, plants and ships have concentrated around Adak because of excellent water supply, communication, and transportation facilities (Univ. of Alaska 1978). During the last 60 years, excluding 1942-1944 when residents were relocated to Southeast Alaska during World War II, the population of Atka has been stable; e.g., in 1930 it was 103 and in 1990 it was 98 (Table 4).

Attu. Attu is the westernmost of Near Islands; it is 37 miles long and dominated by Mount Attu (Figs. 3 and 6). The island was occupied by the Japanese during World War II, its Aleut residents imprisoned by the Japanese and sent to Japan. Described by a visiting botanist in the 1930s as a "little Eden" (Morgan 1980), it was devastated by bombing of American forces during the battle to retake it. After the war, resident Attuans were informed by the U.S. government they would not be allowed to resettle there; instead, they were resettled in Atka. The huge installations built there were evacuated in 1949 and eventually turned over to the U.S. Coast Guard, who now maintains a 20- to 30-person Loran station.

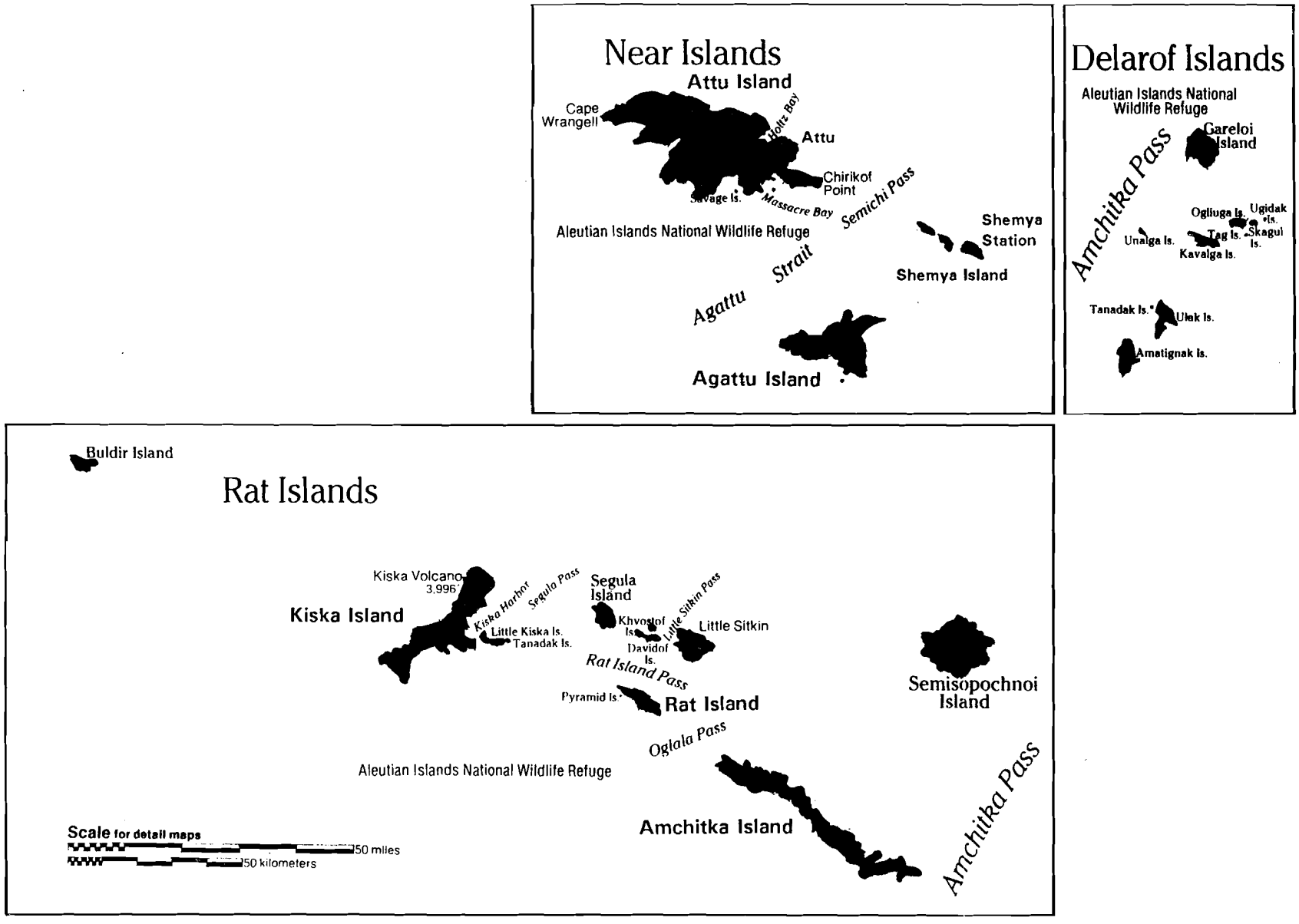

Figure 6. **Communities of the Near and Rat Islands in the western Aleutian Islands.**

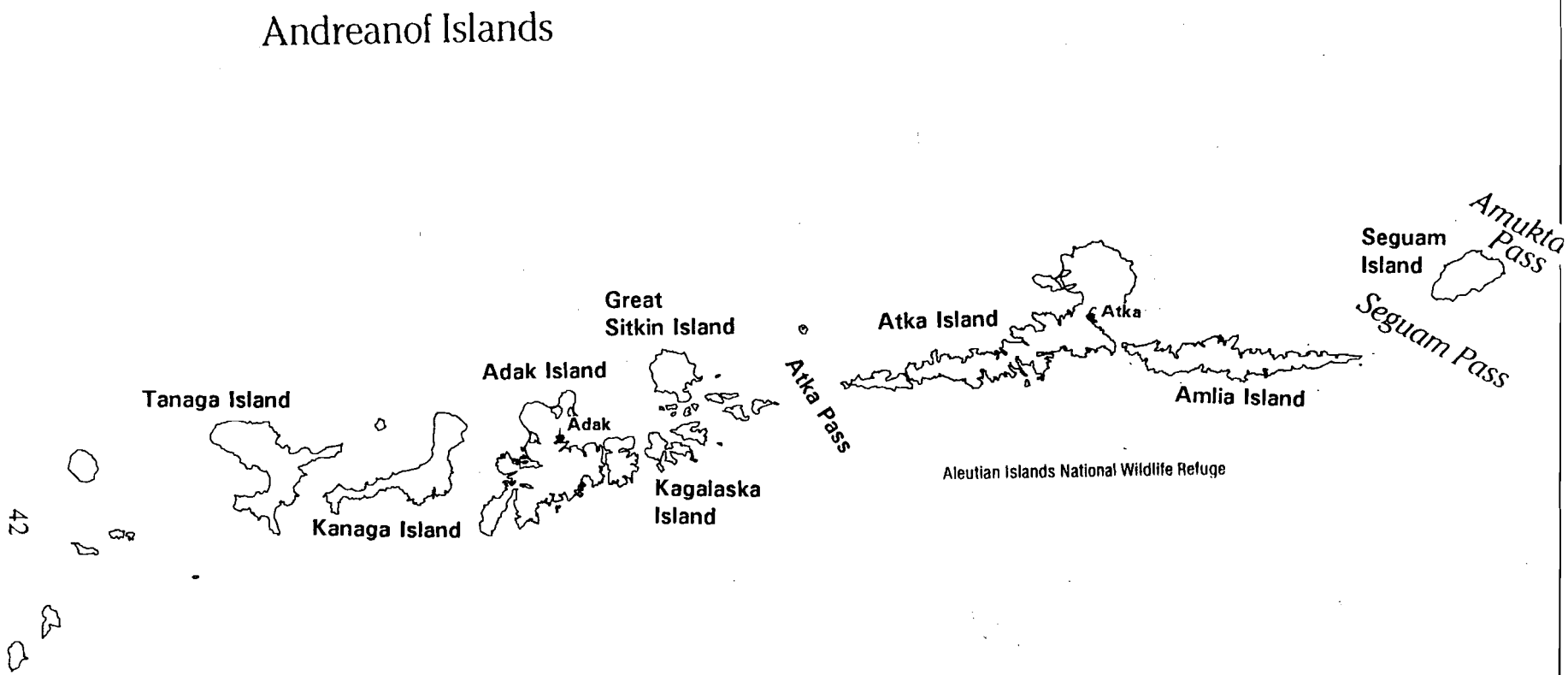

Figure 7. Communities of the Andreanof Islands in the western Aleutian Islands.

Cold Bay. The community of Cold Bay is located on the southern side of the Alaska Peninsula approximately 18 miles northwest from King Cove (Figs. 3 and 8). Just before U.S. entry into World War II, the Alaska Defense Force secretly began building a military base and airfield there under the auspices of the Blair Fish Packing Co. (Morgan 1980). The airport is now one of the largest in the state, providing a 10,000-foot runway. Most residents are employed directly or indicrectly in its operation and maintenance. The community also has a major fuel dock, and planning for its expansion and upgrading is underway. Because of its central location and modern airport, Cold Bay is a hub for the surrounding communities. It has a promising future as a service center for the bottomfish industry in regard to product transportation, crew changes, emergency medical care, fuel and other supplies. Cold Bay is also the home to a world-class production hatchery at Russell Creek. Until its closure by the state in July 1992, this facility produced pink, chum, sockeye, and coho salmon for the areas commercial, sport, and subsistence fisheries. The final status for this production facility has yet to be decided. Additionally, Cold Bay is adjacent to both the the Izembek and Alaska Peninsula Refuges. The community is served by a church, health clinic, and a school (K-12). Community water, sewer, and electricity are available, and freight arrives on a regularly scheduled basis. According to U.S. Census Bureau counts (Table 4), Cold Bay nearly doubled its population between 1980 (88) and 1990 (148).

False Pass. False Pass is strategically located on the eastern side of Unimak Island on Isanotski Strait, which connects the waters of the Pacific Ocean to those of the Bering Sea--about 1 mile west of the tip of the Alaska Peninsula (Figs. 3 & 8). The name False Pass was derived from the fact that the Bering Sea portion is extremely shallow and could not accommodate large sailing vessels. The community began with the establishment of a cannery in 1918, and its economy has always been directly associated with the fishing and processing industries. The cannery burned down in 1981 and has never been rebuilt. A fish company provides services for the salmon and crab fleets from their facilities at False Pass. A large public dock that was completed in 1992 is able to accomodate Alaska Marine Highways vessels and heavy traffic from crab boats, floating processors, freighters, and barges. Subsistence activities are an important part of the economy. Based on U.S. Bureau census counts the year-round population has never dropped below 40 or risen beyond 90; i.e., 1930 = 59; 1940 = 88; 1950 = 42; 1960 = 41; 1970 = 62; 1980 = 70; 1990 = 68 (Table 3).

King Cove. The community of King Cove is located on a sand spit on the south side of the Alaska Peninsula, about 18 miles southeast of Cold Bay (Figs. 3 and 8). It was founded in 1911 when Pacific American Fisheries built a salmon cannery there. Early residents included a significant population of Scandinavian fishermen; i.e., of the initial 10 families settling there, five consisted of a European father and an Aleut mother (Univ. of Alaska 1978). As in the other eastern communities of this region, Western influence has had profound impacts on cultural, economic, and social structures. According to U.S. Census Bureau counts from 1940 through 1980, the population of King Cove has steadily increased, reaching a peak resident population of 460 in 1980--in 1990 that number decreased slightly to 451 (Table 4). King Cove's stable economy is based almost entirely on the fishing and seafood processing industries, and many residents are involved as fishermen or employed in the processing plants. The Peter

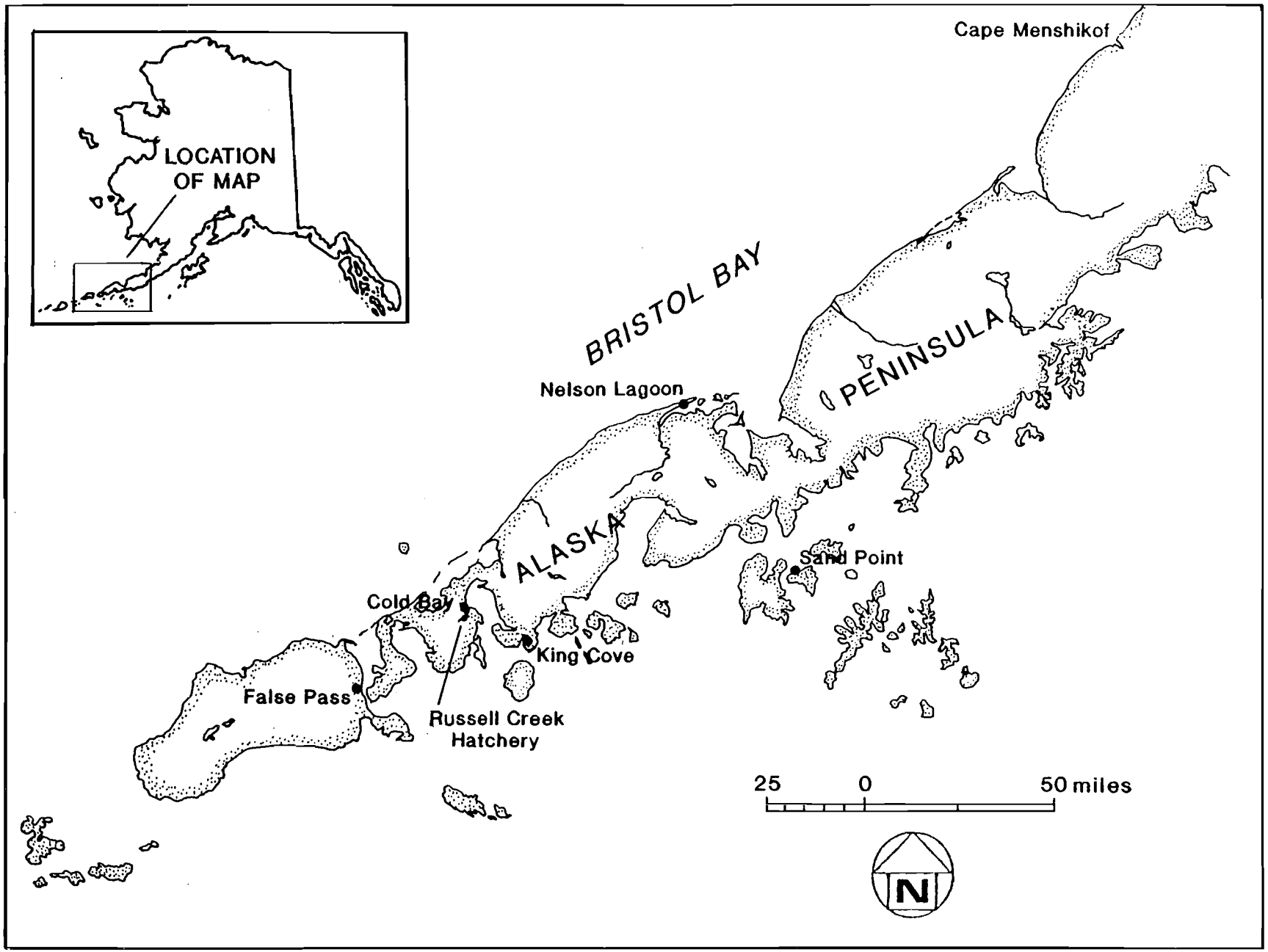

Figure 8. Communities of the Alaska Peninsula, including Sand Point and False Pass.

Pan cannery there is one of the largest fish processing operations in the United Sates, its facilities attracting boats from both the Pacific Ocean and the Bering Sea. The King Cove harbor has over 80 spaces for vessel moorings, a 150-ton boat haulout, uplands boat storagte, and a large warehouse with individual storage lockers. The harbor is alos one of the region's premier crab pot storage locations, with over 10,000 pots stored each year. The community has a modern school, medical clinic, community center, library, recreation facilities, and runway. Marine freight arrives weekly from Seattle. Subsistence activities add salmon, caribou, waterfowl, eggs of marine birds, ptarmigan, and berries to the diets of a substantial portion of the community.

Nelson Lagoon. The community of Nelson Lagoon is located on a sand spit that separates the lagoon and coastal area on the Bering Sea side of the Alaska Peninsula about 30 miles west of Port Moller (Figs. 3 & 8). Although the area had been a Aleut fish camp for years, it was not permanently settled until about 1906 with the establishment of a salmon saltery there. A cannery operated there from 1915 to 1917, but there has been no local facility since that time. The community is situated in the middle of a productive salmon fisheries (e.g, drift and set net fisheries), which are the basis for both the subsistence and cash economies. The most important and prevalent salmon species is sockeye. The community has a 3,300-foot airfield, school, and utility system. Freight arrives by 1 ship/year or barges via Port Moller or False Pass. According to U.S. Census Bureau data, Nelson Lagoon's population increased from 59 in 1980 to 83 in 1990 (Table 3).

Nikolski. The community of Nikolski is located on the southwest end of Umnak Island, one of the Fox Islands (Figs. 3 and 5). Anangula Island, on the north side of Nikolski Bay, is the site of the earliest presently documented evidence of human habitation in the region (i.e., 8,500 years). In the 1920s a sheep ranch that is still operating was established there; it was acquired by the village corporation in about 1975. Three hundred cattle and a few horses are also raised on the ranch. There are only a few local jobs in Nikolski, and because of an inadequate harbor and lack of corresponding facilities, the community has been ignored by the seafood processing industry, despite its proximity to rich crabbing grounds. Consequently, the population has been in a steady decline since 1960 when the population was 92; i.e., 1970 population = 57, 1980 = 50, 1990 = 37. Most residents support themselves by working outside the village in the processing, fishing, and warehousing industries. Subsistence hunting and fishing provide an appreciable part of the diets of village residents.

Sand Point. The community of Sand Point, the second largest in the region, is located on the northwestern portion of Popof Island, one of the Shumagin Island group near the southern coast of the Alaska Peninsula (Figs. 3 and 8), approximately 570 and 350 miles southwest of Anchorage and Kodiak, respectively. It was originally founded as a cod fishing supply station in 1887, although early industries included fox farming, gold mining, salmon canning, and commercial fishing. Commercial fishing and processing are the major sources of income for Sand Point, accounting for 85% of local employment (Darbyshire & Associates et al. 1986).

While salmon is the primary species harvested, tanner and Dungeness crab, halibut, herring, black cod, Pacific cod, and pollock have also been landed and processed there. Sand Point's 25-acre boat harbor was built in the mid-1970s to facilitate the largest resident fishing fleet in the Aleutian chain, including 140 boat slips and a 150-ton marine travel lit. A 700-foot dock provides additional moorage. Trident Seafoods has a major bottomfish and salmon plant in the community that also provides fuel and other services. Peter Pan Seafoods has a new dock and storage/transfer facility near the airport. Average annual incomes have been high relative to average incomes for the remainder of Alaska (e.g., in 1980 average household income = $56,00); however, incomes are in direct proportion to the success of the fishing/processing seasons (Cushing 1983) and include capital needed to make boat payments and other business expenses. Because of expanding employment opportunities in fishing and processing industries, the community has grown steadily from less than 100 in 1950 to 625 in 1980 to 878 in 1990 (Table 3); however, according to Cushing (1983) the actual population exceeded the U.S. Census count in 1980 by about 170 people because the transient population employed in processing and persons residing on fishing boats were unaccounted for by U.S. census takers. Because of this steady growth and the accompanying immigration of non-Native families, many of the traditional Aleut characteristics of the community are absent, although ties to the Native culture remain strong at the social and personal levels. Sand Point has serveral churches, a school (grades K-12), restaurants, stores, hotel, and community water, sewer, and electricity systems. The airport, whose expansion has recently been completed, has direct service to Anchorage.

Shemya Station. It is one of the smaller Semichi Islands group of the westernmost Near Islands (Figs. 3 and 6). An air base was constructed there in the spring of 1943 during World War II and shortly after the battle of Attu. Shemya was abandoned in 1951, but then it taken over by Northwest Airlines as a refueling site. In 1958 during the Cold War, the Air Force reclaimed it, turning it into a top secret military installation where outsiders are not permitted to land without clearance (Morgan 1980). Since then its base population has been about 600 (Table 3).

Unalaska/Dutch Harbor. Unalaska is one of the Fox Islands and the second largest island in the Aleutian Archipelago, lying about 760 miles southwest of Anchorage (Figs. 3 & 5). Its 450 miles of coastline far exceeds any other island in the chain, and its three major inlets have provided shelter to mariners since prehistoric times. Most important of these is Unalaska Bay on the northern shore, which is the largest and best protected harbor in the Aleutians, near the head of which lies Amaknak Island. The fishing port of Dutch Harbor is on Amaknak, connected by a bridge to the mainland where the community of Unalaska is situated (Rennick 1991; Fig 9). The permanent population of these communities (U.S. Census Bureau count = 3,089 in 1990, Table 4) is close to what it was during its thousands of years of prehistoric occupation by the Aleuts. Unalaska's economy has always depended on the wealth of nearby natural resources, and the city has developed an extensive seafood industry. Seven shore-based processors and a number of floating processors produce millions of pounds of seafood each year. About 50% of the community engages directly in fish processing, while 90% of the local employment is dependant on the fishing industry (Rennick 1991). It is the nation's leading fishing port; in 1990 the value of the catch was $126 million.

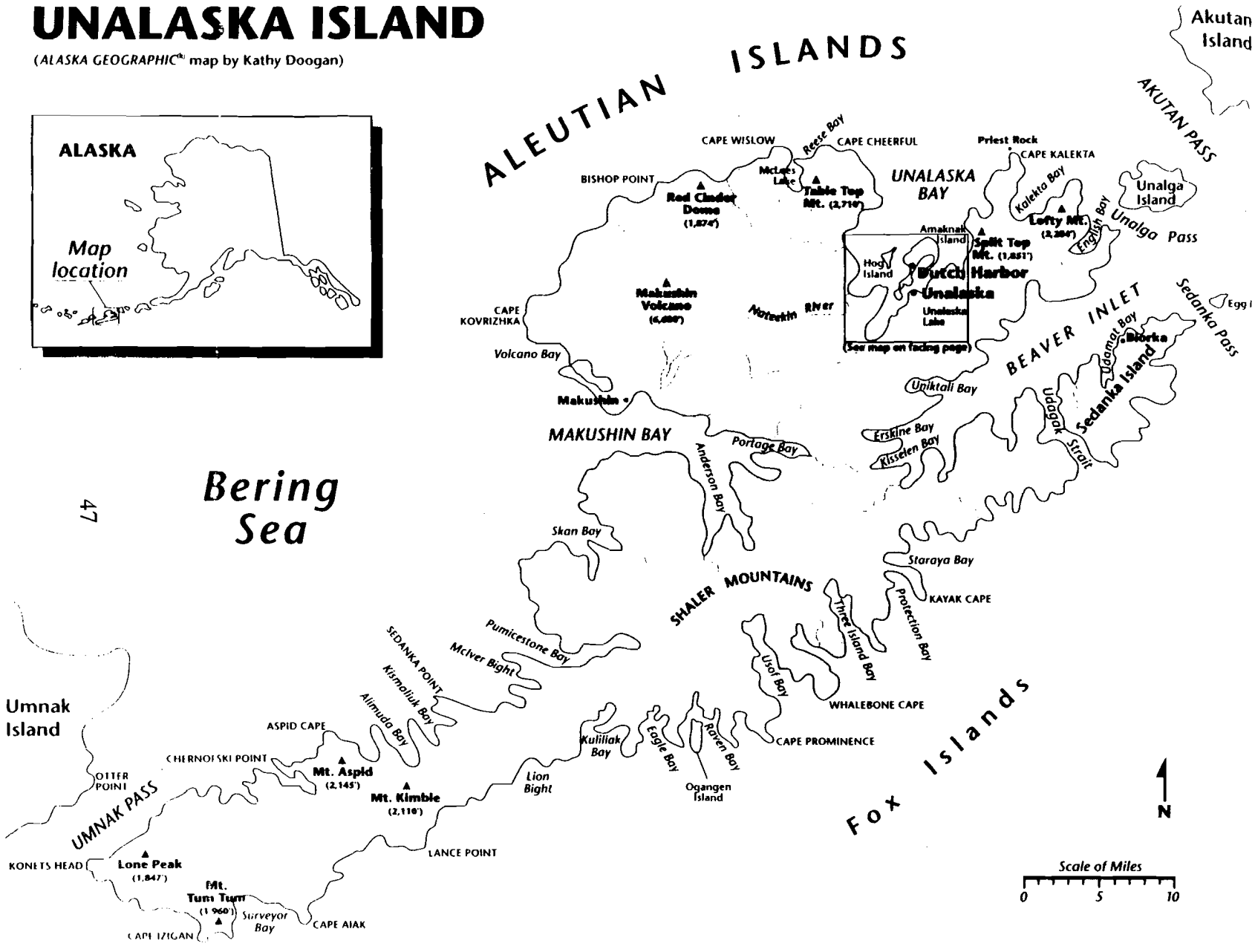

Figure 9. Communities of Unalaska Island in the Fox Islands in the Aleutians.

Commercial Salmon Fisheries Development and the Economy:

The salmon fisheries in the Alaska Peninsula Area date back at least 1888 when canneries were constructed at Orzinski Bay and Thin Point Cove; however, the earliest catch records for the Alaska Peninsula Area date back only to 1906 (Shaul et al. 1991). The first Aleutians Islands Area salmon catches were in 1911. These early catches were predominately sockeye salmon with a few chinook and coho salmon. The first year in which pink and chum salmon catches exceeded 500,000 each was 1916. Area-wide historical annual harvests for the period 1960 to-1990 are provided in Appendix B. Salmon populations have been healthy for the last 10 years and the harvests have been at or near maximum allowable levels; these populations of salmon are not expected to exhibit significant natural increases in the future. Entry into the salmon fishery in the region is limited to approximately 400 permit holders. Since many fishermen hold more than one permit, it is possible that the number of fishermen participating in the Alaska Peninsula salmon fishery will increase through permit sales and transfers.

Excluding the military bases/sites and the community of Cold Bay, the regional economy is centered on commercial fishing and seafood processing industries and subsistence activities. Nearly all residents are involved in the fishing industry either as fishermen, processing employees, or service providers. Although the diverse commercial fisheries, consisting of salmon, herring, shellfish (primarily crab), halibut, and groundfish, provide the basis of the region's economy. Fish and crabs are processed onshore and nearshore at major port facilities or floating processors located at King Cove, Sand Point, Akutan, Unalaska, False Pass, and Nelson Lagoon. Both king crab and tanner crab populations have been at low levels. South Peninsula commercial seasons for king crab have been closed since in 1983, and there are few positive signs to indicate that stocks will recover quickly. Tanner crab populations are also low, and commercial seasons on the South Peninsula have been closed since 1989. Shrimp populations have also been low in the area for more than 10 years.

Like the harvesting sector of the economy, the greatest period of activity for the seafood processing industry is during the summer salmon seasons, particularly for that portion of the region east of Unalaska Island because there are no significant salmon or herring fisheries west of Unalaska (Shaul et al. 1991), although there now is a small salmon fishery at Atka. Employment is also generated by the groundfish and crab fisheries, particularly in Unalaska/Dutch Harbor; however, a significant number of employees in the processing industry are brought in from outside the region, thereby limiting local participation. During the winter when overall employment levels are lower, a larger number of residents are employed in these facilities. Other sources of employment within the region include government, schools, transportation (e.g., aviation industry), Native corporations, and local businesses. The military installations on Adak, Attu, and Shemya as well as the community Cold Bay are the only population centers not economically dependent on the fishing industry.

Land Status and Use:

The majority of the land in the region is undeveloped. Commercial fishing-related enterprises use relatively small amounts of land with shore-based processing facilities located in communities throughout the region. Land ownership in the region is dominated by the federal holdings (e.g., Alaska Maritime, Izembek, and Alaska Peninsula National Wildlife Refuges, which were set aside largely as a result of the Alaska National Interest Lands Conservation Act (ANILCA) of 1980. Significant portions of these refuges have been designated as wilderness areas. Moreover, a major military presence on Adak controls a significant portion of the land there.

The state owns all tide and submerged lands offshore to three miles and the beds of all inland navigable waterbodies. State land acquisitions occur mostly on the northern Alaska Peninsula in the Nelson Lagoon/Port Moller/Port Heiden areas, extending up to Cape Menshikof, the northern limit of the region. There is one state game refuge in the region (i.e., Izembek) that lies due west of the national refuge, and there are several state critical habitat areas scattered mostly along the northern shore of the Alaska Peninsula. Because these state land selections are limited to the Alaska Peninsula, state policies for managing them are provided in the Bristol Bay Area Plan for State Lands (1984). Enhancement or rehabilitation projects proposed for state lands will require the issuance of appropriate permits that are identified through the Alaska Coastal Zone review process, Office of Management and Budget, Division of Governmental Coordination. The purpose of this review process is to identify all necessary state and federal permits required for the proposed projects to proceed.

The largest private landholders in the region are the native regional and village corporations, formed pursuant to the Alaska Native Claims Settlement Act (ANCSA) of 1971, who made their land selections in the whereabouts of their respective communities and islands. The Aleut Regional Corporation controls the subsurface rights to all village and regional corporation lands. Several of these corporations have expressed their willingness to work with salmon rehabilitation and enhancement projects on their lands, subject to a case-by-case review.

U.S. Fish & Wildlife Service Policy. Proposed fishery rehabilitation, restoration, and enhancement activities in Area M could potentially occur on three National Wildlife Refuges: Alaska Maritime, Alaska Peninsula, and Izembek. The Alaska National Interest Lands Conservation Act of 1980 (ANILCA) states in section 304(e):

> Where compatible with the purposes of the refuge unit, the Secretary (of Interior) may permit, subject to reasonable regulations and in accord with sound fisheries management principles, scientifically acceptable means of maintaining, enhancing, and rehabilitating fish stocks.

In Section (303) of ANILCA, the purposes of the refuges are defined. Purposes common to the refuges are as follow:

(i) to conserve fish and wildlife populations and habitats in their natural diversity;

(ii) to fulfill the international treaty obligations of the United States with respect to fish and wildlife and their habitats;

(iii) to provide, in a manner consistent with the purposes set forth in subparagraphs (i) and (ii), the opportunity for continued subsistence uses by local residents; and

(iv) to ensure, to the maximum extent practicable and in a manner consistent with the purposes set forth in paragraph (i), water quality, and necessary water quantity within the refuge.

A fifth purpose, unique to the Alaska Maritime National Wildlife Refuge, is to provide, in a manner consistent with subparagraphs (i) and (ii), a program of national and international scientific research on marine resources.

In 1987, the Fish and Wildlife Service (Service) Regional Director issued further policy clarification on restoration and enhancement on Service lands based on ANILCA, The Wilderness Act, and the Refuge Manual as follows:

On all refuge lands in Alaska (including designated wilderness) maintaining, rehabilitating, and enhancing existing fish populations is permitted, where compatible with the purposes of the refuge.

In general, restoration activities will be looked upon more favorably than enhancement activities on refuges in Alaska.

Long-term (i.e., permanent) facilities may be permitted outside of designated wilderness areas for maintenance, restoration, and enhancement activities.

In designated wilderness areas, temporary facilities (i.e., any structure or human-made improvement that can be readily and completely dismantled and removed from the site when the period of authorized use terminates) may be permitted to maintain, restore or enhance fisheries if the stocks have been reduced or are threatened as long as the facilities do not significantly detract from wilderness values.

New permanent facilities will not be permitted in designated wilderness for fisheries management purposes unless they are essential to accomplish refuge management purposes.

Existing facilities may remain and new facilities may be built for fisheries research and monitoring on all refuge lands in Alaska.

In making compatibility determinations in designated wilderness areas the Service will consider wilderness values.

Compatibility Determination. Since 1987, the Service in Alaska has followed and applied this policy on a case by case basis. Rehabilitation, restoration, and enhancement projects implemented both within and outside Alaska have demonstrated the need for protecting existing wild stocks. In particular, compatibility between hatchery operations and long-term wild stock conservation has been questioned by many fishery professionals and is the subject of intense debate. Although hatcheries have been used successfully, experience gained over past decades from a multitude of management agencies with a variety of species demonstrates the need for monitoring and evaluation of rehabilitation, restoration, and enhancement activities to ensure that proposed projects conserve wild stocks and are compatible with the purposes of the refuge. With a monitoring program in place, projects that conform to sound conservation principles could proceed without adversely affecting the purposes for which the refuge was established.

Decisions on compatibility are governed by the National Wildlife Refuge Administration Act and ANILCA, and follow National Environmental Policy Act (NEPA) guidelines. NEPA documents may be prepared by either the Service or the applicant, but they must be reviewed by the Service. Following NEPA compliance, the refuge manager must make a compatibility determination.

Because a NEPA document is a decision-making document, a range of viable alternatives must be described and evaluated to assess the costs, benefits, and risks of a proposed project. The document should include, but not be limited to, effects on fish and wildlife populations and habitats; cumulative impacts of rehabilitation, restoration, and enhancement projects; potential impacts on wild stock diversity; competition, harvest, and impacts to other fish stocks; impacts to vegetation and water quality; effects on recreation, commercial and subsistence uses; and other environmental impacts. Non-invasive techniques, such as improved management information and harvest management, are preferred actions over habitat alteration, lake fertilization, and stocking.

CURRENT SALMON PRODUCTION/MANAGEMENT STATUS

Commercial Fisheries

Introduction:

According to Shaul et al. (1992), there are a total of approximately 247 streams supporting various species of salmon in the Alaska Peninsula-Aleutians Islands area (Figs. 10 & 11). This region is divided into eight commercial fisheries management districts: (A) Northern District, (B) Northwestern District, (C) Unimak District, (D) Southwestern District, (E) South Central District, (F) Southeastern District, (G) Akutan District, and (H) Unalaska District (Fig. 12). The Alaska Department of Fish and Game (ADF&G), Division of Commercial Fisheries, manages the fisheries in these districts to achieve optimal salmon escapements and provide orderly harvests of the surplus. All five species of Pacific salmon are commercially harvested, including chinook, sockeye, pink, coho, and chum salmon. Significant harvests of migrating salmon occur along the South Peninsula. The South Peninsula fisheries include the South Unimak (also known as False Pass) June fishery, the Shumagin Islands June fishery, and the Southeastern District Mainland (also known as Balboa-Stepovak or just Stepovak) fishery. Commercial fishing has been the region's most important cash-producing activity for much of the twentieth century; it has also been a factor for the harvesting of local resources for subsistence uses.

Access to commercial salmon fishing within state waters is limited to persons holding a permit issued by the Commercial Fisheries Entry Commission (CFEC). Beginning in 1975 CFEC has been issuing commercial purse seine permits to qualified persons. Eligibility was initially determined by a complex system based on points awarded by criteria such as residency and past participation in the fishery. According to information provided by CFEC staff (Elaine Dinneford, Research Analyst, personal communication), in 1992 there were 125 purse seine permits (91 permanent resident, 28 permanent nonresident, and 6 resident interim [Type E]); 164 drift gillnet permits (88 permanent resident, 71 permanent nonresident, 1 nonresident interim, and 4 resident interim); 114 set gillnet permits (93 permanent resident, 20 permanent nonresident, and 1 resident interim).

Southeastern District Mainland Fishery:

The Southeastern District Mainland fishery (Fig. 12) includes the Beaver Bay, Balboa Bay, Southwest Stepovak, Northwest Stepovak, East Stepovak, and Stepovak Flats sections. Fishing efforts during June and July primarily target on what are considered to be Chignik-destined sockeye. There is a local sockeye salmon run (Orzinski Bay run) in the Northwest Stepovak section and an early July chum salmon run in the Stepovak Flats section; therefore, the Northwest Stepovak and Stepovak Flats sections are managed on a local-stock basis throughout the season. After July 25, the entire area is managed for local stocks. Pink and chum salmon runs peak during late July through mid-August. The fishery is usually closed during mid- and late August to top off escapements and opened again in September to harvest coho salmon. Traveling sockeye salmon migrate through the area during the entire season.

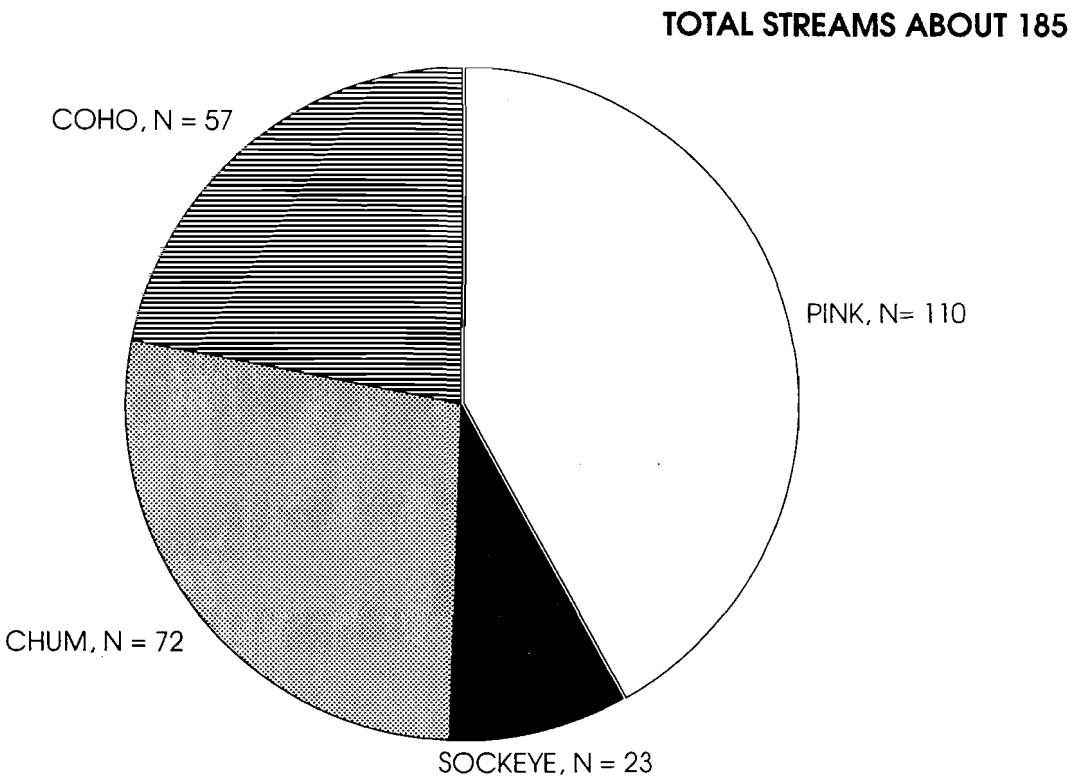

Figure 10. Number of streams in the north Alaska Peninsula supporting salmon.

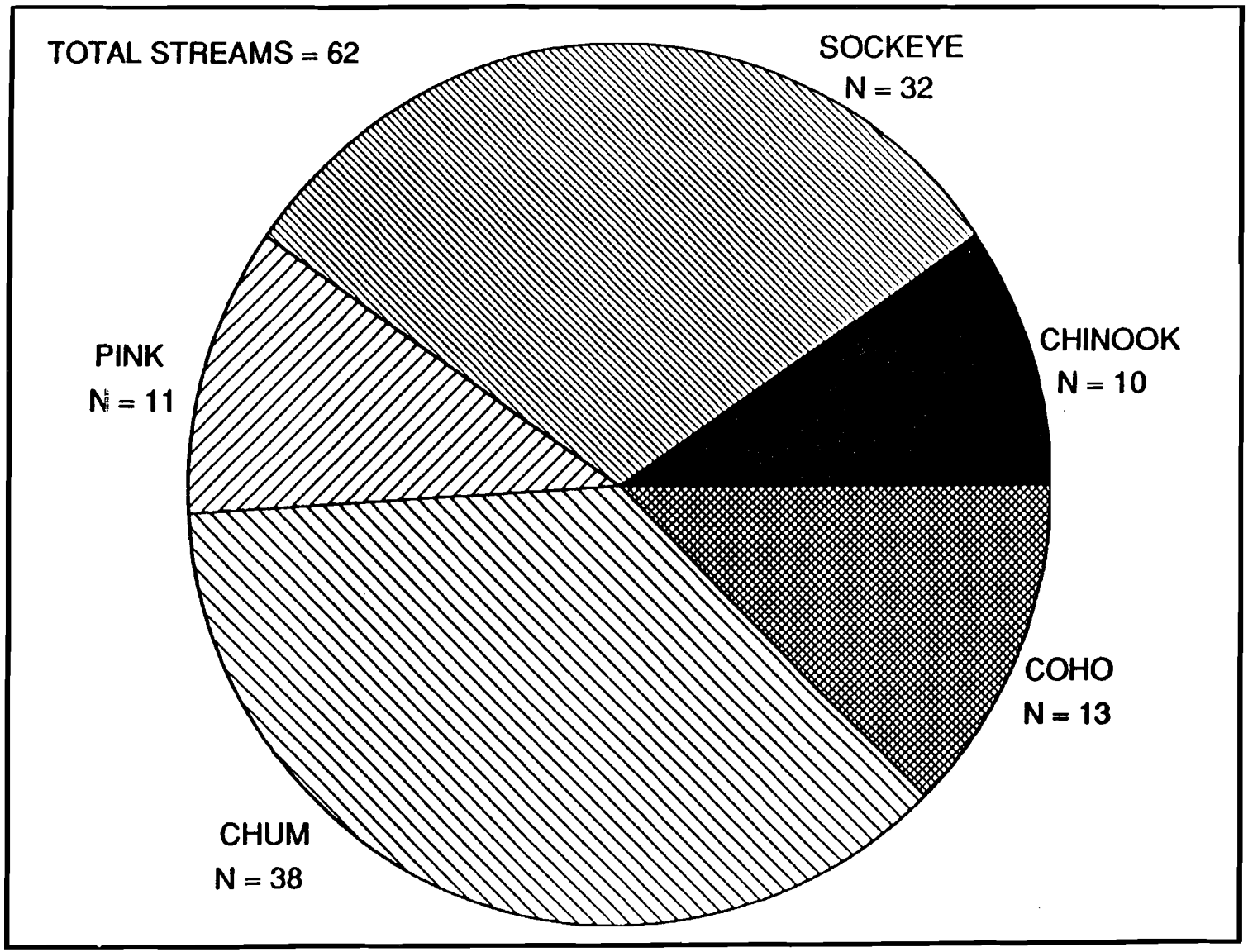

Figure 11. Number of streams in the south Alaska Peninsula supporting salmon.

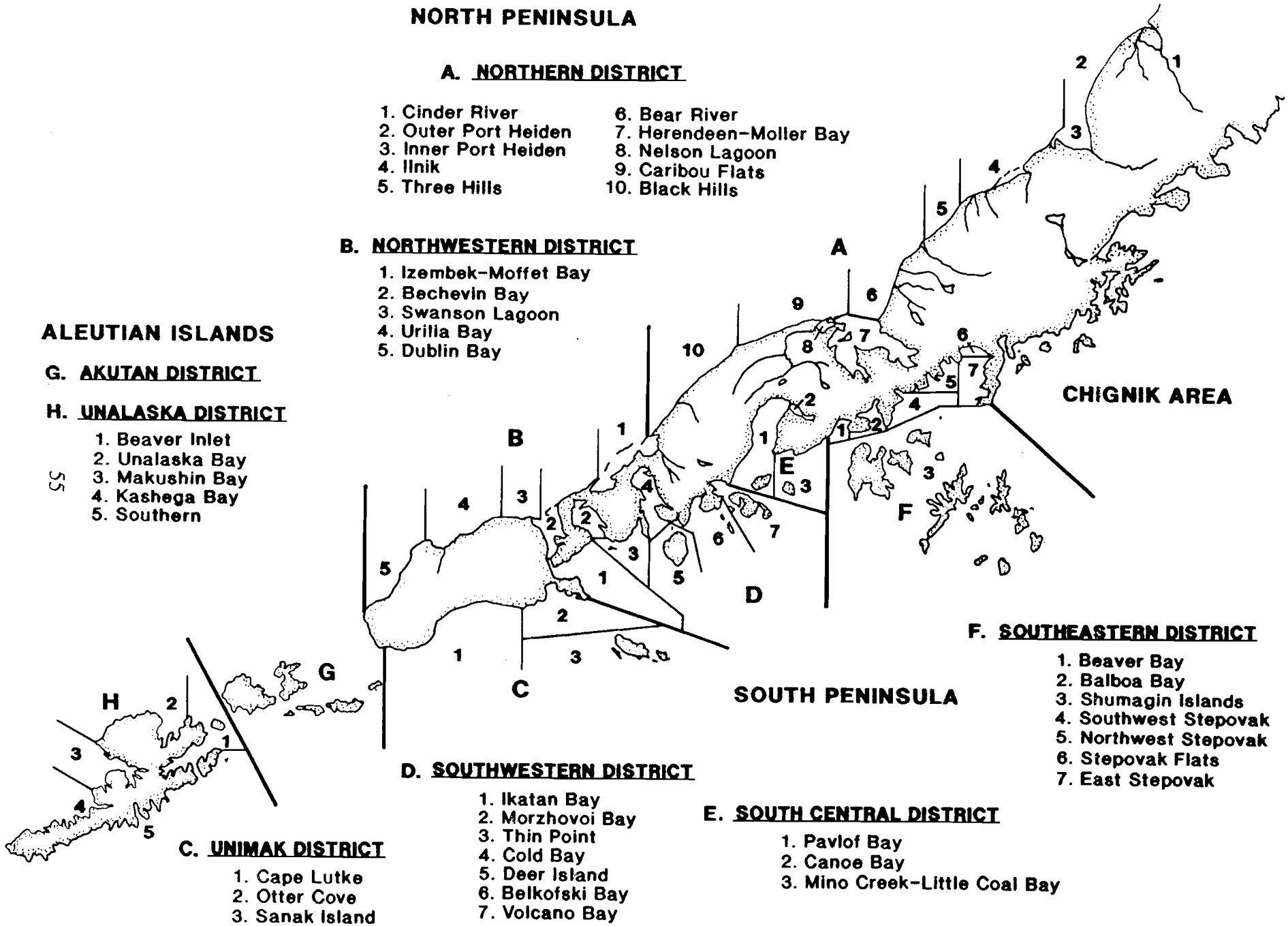

Figure 12. Alaska Peninsula/ Aleutian Islands/Area M management areas from Cape Menshikof to Unalaska. Districts are represented by letters A-H, and sections are designated numerically.

Through July 25 approximately 7% of the total estimated Chignik-destined sockeye harvest is taken in that portion of the Southeastern District Mainland located outside the Northwest Stepovak Section; however, if it appears these sockeye stocks will not reach 600,000 through July 25, then fisheries will be closed there as well as in the Cape Igvak Section in the Kodiak management area until the run passing through those locations is assessed to be in excess of escapement needs. This assessment is made at Chignik. The total Chignik-destined sockeye salmon harvest is determined by adding 80% of the Southeastern District Mainland (excluding Northwest Stepovak Section) harvest to 80% of the Cape Igvak harvest--plus the entire Chignik area harvest. This management plan was first used for the Southeastern District Mainland during the 1985 season, and a similar plan has been used at Cape Igvak since 1978. Since the plan has been in effect, the harvest of Chignik-destined sockeye salmon by Southeastern District Mainland fishermen has ranged from 0.9% to 12.7% (Shaul et al. 1992). Annual harvests of Chignik bound sockeye salmon in these fisheries from 1964 to 1990 are provided in Table 5.

South Unimak-Shumagin Islands June Fishery:

The South Unimak and Shumagin Islands June fisheries date back to at least 1911. The dominant stocks targeted by these facilities are Bristol Bay bound sockeye salmon; this factor alone has caused controversy between Alaska Peninsula/Aleutian Island and Bristol Bay fishermen for many years. During the late 1960s, the South Unimak-Shumagin fisheries were open to fishing seven days per week regardless of the Bristol Bay run strength; this caused many controversial confrontations at Fish and Game Board meetings. Management strategies for this fishery were decided on a year-by-year basis during 1972 through 1974 because of low anticipated Bristol Bay sockeye returns. Beginning in 1975, the Alaska Board of Fisheries implemented an allocation plan where the South Unimak-Shumagin June fisheries would be managed on guideline harvest levels allocated on the basis of predicted Bristol Bay inshore sockeye harvests. Based on historical catch information, 6.8% of the forecasted inshore Bristol Bay harvest was allocated to the South Unimak June fishery and 1.5% allocated to the Shumagin Islands. To reduce the possibility of over-harvesting any segment of the Bristol Bay run, the guideline harvest level was allocated to discrete time periods based on historical catch data.

Chum salmon are also harvested during the South Unimak-Shumagin Islands June fisheries. The annual harvests for sockeye and chum salmon from 1960 to 1991 are provided in Table 6. In 1982 an atypically large harvest of approximately 1.1 million chums, accompanied by a failing fall Yukon River chum salmon run, resulted in pressure from fishermen in the Arctic-Yukon-Kuskokwim (AYK) region to curtail or eliminate the South Unimak-Shumagin June fisheries. Unlike the sockeye salmon that are primarily bound for one area (Bristol Bay), chum salmon are headed for a variety of areas, ranging from Japan and the Russian coast to Kotzebue and Prince William Sound.

Since 1975 the Alaska Peninsula Area M South Unimak and Shumagin Islands June fishery has been managed under Alaska Board of Fisheries-approved regulatory plans. After 1983 the Board adopted over a period of several years various regulations intended to limit the incidental harvest of chum salmon. Among the actions taken, they imposed a cap on the number of chum salmon

Table 5. Harvest of Chignik-bound sockeye salmon in the Chignik, Cape Igvak, and Southeastern District Mainland areas, 1964-1992[a].

	Chignik		Cape Igvak		Southeast District Mainland		
Year	Catch	%	Catch	%	Catch	%	Total
1964	556,890	90.6	14,980	2.4	43,021	7.0	614,890
1965	599,890	89.9	11,021	1.7	56,020	8.4	666,594
1966	219,794	88.0	18,003	7.2	12,011	4.8	249,808
1967	462,000	91.5	23,014	4.5	20,021	4.0	505,034
1968	977,382	82.5	135,951	11.5	70,959	6.0	1,184,292
1969	394,135	79.0	97,982	19.6	7,013	1.4	499,130
1970	1,325,883	72.8	427,339	23.5	68,181	3.7	1,821,403
1971	1,016,136	77.0	253,044	19.2	50,952	3.8	1,320,132
1972	378,669	86.3	42,012	9.6	17,999	4.1	438,680
1973	769,256	89.0	57,098	6.6	38,102	4.4	864,456
1974	530,728	74.1	120,602	16.9	64,563	9.0	715,443
1975	115,984	81.8	23,635	16.7	2,205	1.5	141,824
1976	792,024	83.1	117,926	12.4	43,356	4.5	953,306
1977	1,547,285	90.6	128,852	7.6	31,498	1.8	1,707,635
1978	1,454,389	85.5	225,078	13.2	22,029	1.3	1,701,496
1979	794,504	92.0	13,950	1.6	55,344	6.4	863,798
1980	670,001	91.2	32	0.0	64,862	8.8	734,895
1981	1,606,290	79.9	282,342	14.0	121,870	6.1	2,010,502
1982	1,250,939	84.5	166,219	11.2	62,767	4.3	1,479,925
1983	1,450,832	72.6	320,932	16.0	227,392	11.4	1,999,156
1984	2,474,405	73.9	449,360	13.4	423,068	12.7	3,346,833
1985	696,169	79.9	123,627	14.2	51,421	5.9	871,217
1986	1,456,729	82.6	188,017	10.7	118,006	6.7	1,762,752
1987	1,659,915	78.0	320,813	15.1	146,886	6.9	2,127,614
1988	678,912	95.0	10,520	1.5	35,565	3.5	714,997
1989	502,477	99.1	0	0.0	4,485	0.9	506,962
1990	1,211,097	83.7	107,706	7.4	128,599	8.9	1,447,402
1991	1,966,986	80.5	324,329	13.3	152,714	6.3	2,444,029
1992	1,066,732	81.3	152,358	11.6	93,845	7.2	1,312,935
1981-1992 Averages							
	1,335,124	82.6	203,852	10.7	130,552	6.7	1,668,694

[a] an estimated 80% of the sockeye salmon caught in Cape Igvak and Southeastern District Mainland sections are destined for Chignik (source: Shaul et al. 1992).

Table 6. South Unimak-Shumagin Islands June fisheries sockeye and chum salmon harvests, 1960-1992 (Source: Shaul et al. 1992).

	Sockeye			Chum		
Year	Shumagins	South Unimak	Total	Shumagins	South Unimak	Total
1960	19,000	137,000	156,000	11,000	84,000	95,000
1961	55,000	199,000	254,000	36,000	157,000	193,000
1962	54,000	272,000	326,000	61,000	209,000	270,000
1963	33,000	116,000	149,000	36,000	81,000	117,000
1964	85,000	159,000	244,000	67,000	161,000	228,000
1965	207,000	568,000	775,000	45,000	121,000	166,000
1966	54,000	528,000	582,000	17,000	215,000	232,000
1967	69,000	186,000	255,000	51,000	73,000	124,000
1968	233,000	342,000	575,000	51,000	115,000	166,000
1969	76,000	781,000	857,000	13,000	254,000	267,000
1970	153,000	1,530,000	1,683,000	49,000	403,000	452,000
1971	45,000	565,000	610,000	115,000	554,000	669,000
1972	76,000	443,000	519,000	108,000	468,000	576,000
1973	23,000	239,000	263,000	23,000	189,000	212,000
1974	no fishing	no fishing	no fishing	no fishing	no fishing	no fishing
1975	49,000	190,000	239,000	36,000	65,000	101,000
1976	72,000	235,000	307,000	74,000	327,000	401,000
1977	46,000	193,000	239,000	22,000	93,000	115,000
1978	68,000	419,000	487,000	18,000	105,000	123,000
1979	179,000	683,000	862,000	41,000	64,000	105,000
1980	572,000	2,731,000	3,303,000	71,000	457,000	528,000
1981	351,000	1,474,000	1,825,000	54,000	521,000	575,000
1982	451,000	1,670,000	2,121,000	160,000	934,000	1,094,000
1983	416,000	1,545,000	1,961,000	169,000	615,000	784,000
1984	257,000	1,131,000	1,388,000	109,000	228,000	337,000
1985	367,000	1,495,000	1,862,000	134,000	345,000	479,000
1986	156,000	314,000	470,000	99,000	345,000	479,000
1987	141,000	652,000	793,000	37,000	406,000	443,000
1988	282,000	474,000	756,000	62,000	465,000	527,000
1989	397,000	1,348,000	1,745,000	48,000	408,000	456,000
1990	256,000	1,091,000	1,347,000	64,000	455,000	519,000
1991	333,000	1,216,000	1,549,000	103,000	669,000	772,000
1992	411,834	2,046,022	2,457,856	102,312	323,891	426,203

(i.e., chum cap) allowed to be taken in the South Unimak-Shumagin Island June fishery. The chum cap was initially set at 400,000 in 1986; however, because only 470,00 of the sockeye salmon allocation (i.e., 1,107,000 fish) were harvested that year, the cap was removed during the 1987 season. Although a tagging program in 1987 indicated that chums go to a variety of places after passing the South Peninsula in June, the Board reestablished the cap (raising it to 500,000) because Yukon River fall chum harvests were small during that year. This action again precluded fisherman from harvesting their allocated sockeyes. After the 1989 season, the Board made further changes to these fisheries: (1) the starting date was delayed until June 13; (2) the chum cap was raised to 600,000; (3) the sockeye salmon allocations by time period and percentage were changed to June 13-18 (35%), June 19-25 (45%), and June 26-30 (20%); (4) gillnet & seine gear restrictions were set; and (5) the South Unimak fishery boundaries were extended. In November 1991 the Board raised the chum cap to 900,000, prompting repeated requests by AYK area interest groups to reconsider the increase. The Board responded by dropping the June chum cap to 700,000, whereupon AYK fishermen initiated litigation. The matter has yet to be resolved by the court. These changes to the chum cap reflect ongoing efforts by the Board to strike a balance between two goals: (1) attainment of the sockeye quota and (2) control of the incidental chum harvest. In its most recent action the Board voted to retain a limit on the chum salmon catch.

The draft revision to the South Unimak-Shumagin Island June fishery (March 18, 1992) follows: (f) the department (ADF&G) shall close the June fishery before the sockeye guideline harvest levels are taken if harvest of chum salmon reaches 700,000 fish. When harvest reaches 400,000 chum salmon the department shall take appropriate management action, in season, to reduce the remaining chum salmon harvest rate while attempting to allow full harvest of the sockeye salmon guideline harvest level. The documented contribution of Russell Creek Hatchery chum salmon to the June fishery shall be added on over the existing chum salmon numerical quota (chum cap) beginning in 1993. (g) If it becomes necessary for the department to take management actions, as specified in (f) of this section, to reduce the chum salmon harvest rate, the fishing periods for set gill gear shall not be less than 16 hours in duration, unless such a period will result exceeding the chum salmon guideline harvest level.

South Peninsula Post June Fisheries:

The major species produced by South Peninsula streams are pink salmon. Runs fluctuate dramatically over time because of the magnitude of parent escapements and environmental conditions. Although commercial harvests slipped to an all-time low of 58,000 in 1973, during the 1978-90 period commercial catches ranged from 1.2 million in 1987 to 11.6 million in 1984 and averaged 5.6 million (Table 7, Fig. 13). Most systems produce large runs on both even- and odd-year cycles, except most of the streams between Cold Bay and Unimak Pass that are even-year producers. Dry Lagoon and Apollo Creeks on Unga Island also seem to be even-year systems. Pink salmon runs usually arrive in force about July 20 and peak about August 1. After mid-August the quality of pink salmon is usually poor because of water marking.

Table 7. Historical annual harvests for all species of salmon in the South Peninsula fisheries, including the June fisheries, 1962-1992 (source: Shaul et al. 1992).

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1962	3,300	420,000	12,500	1,965,400	824,800	2,401,200
1963	1,900	204,400	16,500	2,367,700	461,300	3,051,800
1964	2,000	370,800	13,600	2,740,300	751,000	3,877,700
1965	2,100	915,700	34,200	2,884,100	556,400	4,392,500
1966	1,400	606,200	6,300	305,800	494,400	1,414,100
1967	1,600	294,100	2,900	78,300	245,200	622,100
1968	1,400	699,800	31,100	1,287,100	325,300	2,344,700
1969	1,900	912,800	10,900	1,219,100	389,200	2,533,900
1970	1,800	1,794,600	32,200	1,723,400	981,700	4,533,700
1971	2,200	715,500	16,800	1,450,100	1,366,600	3,551,200
1972	1,300	557,800	8,000	78,000	727,500	2,017,700
1973	400	330,200	6,600	58,300	293,000	688,500
1974	500	204,700	9,400	100,200	71,500	386,300
1975	100	268,400	--	61,700	132,900	463,100
1976	2,100	375,000	200	2,367,700	532,500	3,742,700
1977	500	311,700	2,100	1,448,600	243,200	2,006,100
1978	800	579,500	60,700	5,490,000	547,000	6,678,000
1979	2,100	1,149,700	356,500	6,570,600	483,000	8,561,900
1980	4,800	3,613,000	274,200	7,861,500	1,351,200	13,104,700
1981	12,200	2,255,200	162,200	5,035,900	1,770,300	9,235,800
1982	9,800	2,346,000	256,000	6,734,900	2,272,500	11,619,200
1983	26,900	2,556,600	127,700	2,827,600	1,707,100	7,245,900
1984	9,200	2,318,000	309,100	11,589,300	1,656,500	15,882,100
1985	7,900	2,214,600	172,500	4,433,700	1,393,100	8,221,800
1986	5,600	1,223,000	235,900	4,031,500	1,749,700	7,245,700
1987	9,200	1,449,900	224,700	1,208,600	1,376,300	4,268,700
1988	11,100	1,472,900	505,500	7,044,800	1,905,200	10,939,500
1989	7,000	2,660,700	443,800	7,292,700	994,200	11,398,400
1990	16,500	2,386,600	307,200	2,865,900	1,237,800	6,814,000
1991	8,000	2,322,400	317,000	10,615,800	1,587,400	14,850,600
1992	8,000	3,445,900	418,200	9,770,400	1,316,700	14,959,200

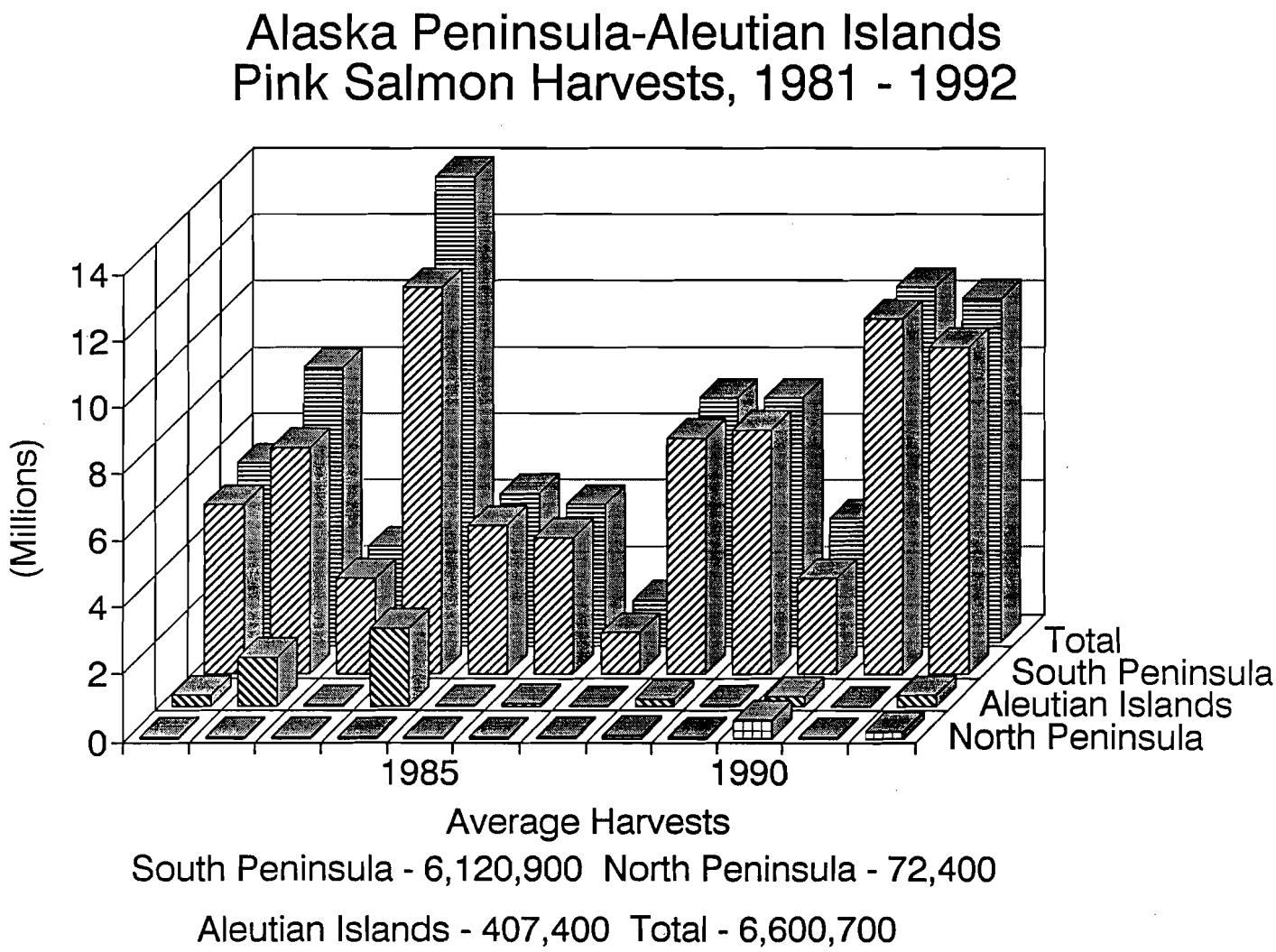

Figure 13. Annual pink salmon harvests for Area M (South Peninsula, North Peninsula, and Aleutian Islands), including average annual harvests, 1981-1992.

Chum salmon are the second most important locally produced species along the South Peninsula. Although fishing was extremely poor during the early to mid-1970s (e.g., annual harvest of 72,000 chum salmon in 1974), the 1978-90 chum salmon harvests have ranged from 483,000 in 1979 to 1.48 million during 1986 (Table 7, Fig. 14). Chum salmon runs are somewhat more stable than pink salmon because of their tendency to select spawning locations less susceptible to scouring and freezing. Chum salmon runs start earlier and last longer than those of pink salmon, and there is a large variation in run timing between different stocks.

The South Peninsula also has a number of sockeye salmon stocks. Most stocks are small, although Thin Point and Middle Lagoon (Morzhovoi Bay) have a history of substantial runs (i.e., during the 1920s and 1930s). We believe these two systems can be brought back to their former levels by a good escapement monitoring and enforcement program. Thin Point and Morzhovoi Lakes are suspected of having rearing capacities greatly in excess of the spawning capacities; therefore the potential to produce substantially larger runs through supplemental methods exists. Orzinski Lake is also an important contributor to the harvest of sockeyes in the Southeastern District.

South Peninsula sockeye harvests after June are often substantial. Many of the fish are taken in the Balboa-Stepovak fishery that targets on Chignik destined sockeye; however, a substantial number (i.e., 50,000 to 400,000) are taken annually in the Shumagins and lesser numbers taken throughout the balance of the area. Many of these fish are undoubtedly bound for other areas, although south and north Peninsula streams are contributors. Table 7 and Figure 15 provide historical annual harvest figures.

Most South Peninsula coho salmon are taken while the fishery is targeted on pink and chum salmon during mid-July to mid-August, and a smaller amount are harvested during September. Commercial fishing is usually closed during late August to achieve good pink and chum escapements. Historically, South Peninsula coho catches have demonstrated long periods of different abundance levels. From 1923 through 1946 catches averaged 148,000 fish annually; during 1947 through 1958 the average fell to 50,000; and the 1959-77 average was only 12,000 Shaul et al. 1991). During 1978 and 1979, however, the annual harvests averaged 261,000, reaching a record high of 505,500 in 1988 (Table 7, Fig. 16).

An average of only 10,400 chinook salmon were harvested between 1978 and 1990 on the southern side of the Alaska Peninsula (Table 7, Fig. 17). There are no chinook salmon natal streams there. The Chignik River system is the only major producer on the Gulf side of the Alaska Peninsula.

North Peninsula:

Sockeye are the dominant species along the North Peninsula. The major producing systems are Bear River, Nelson Lagoon, Meshik River, Sandy River, Ilnik, and Urilia Bay. Bear River is the number-one producer, and Nelson Lagoon is second. There are also numerous, less

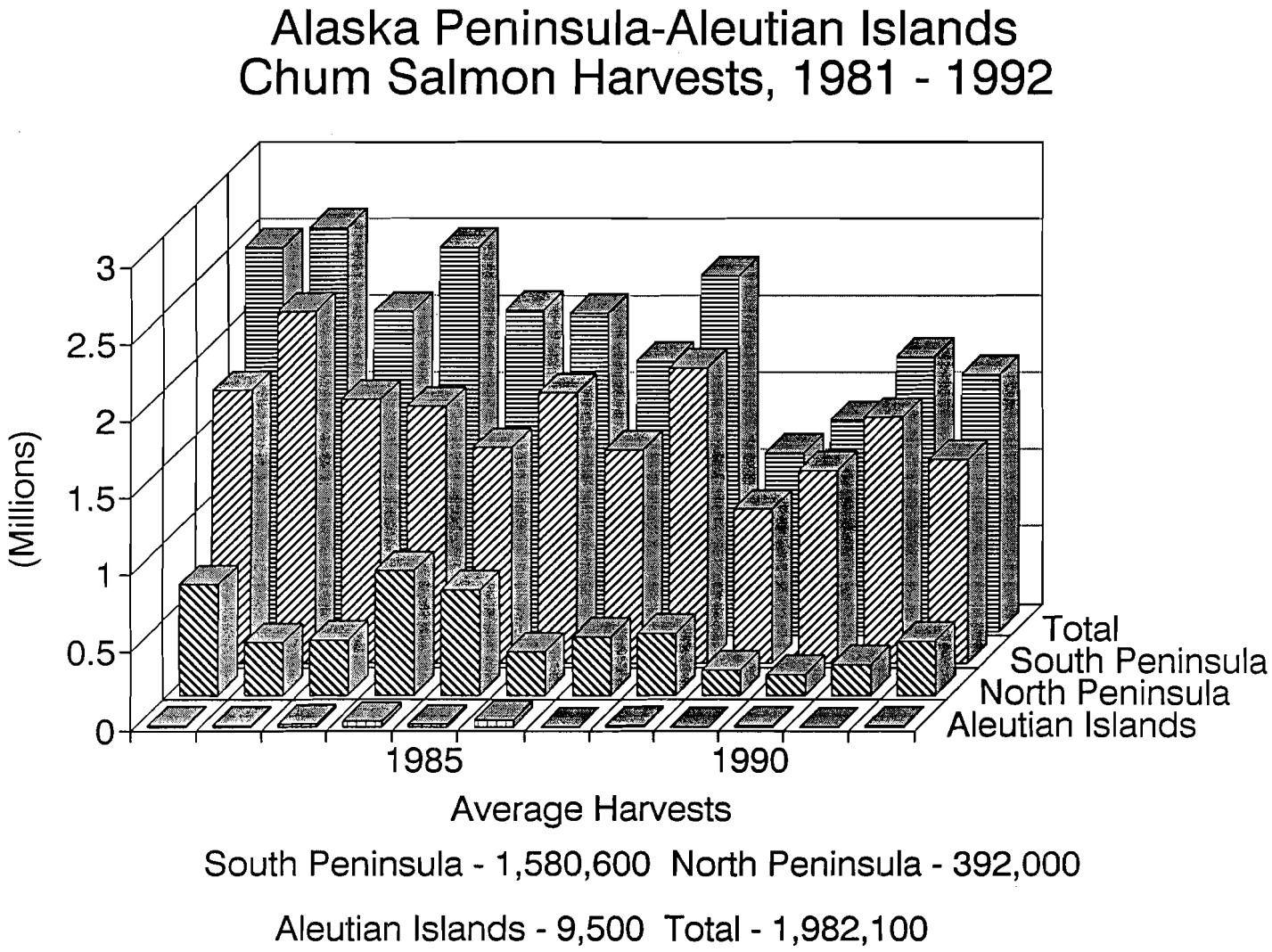

Figure 14. Annual chum salmon harvests for Area M (South Peninsula, North Peninsula, and Aleutian Islands), including average annual harvests, 1981-1992.

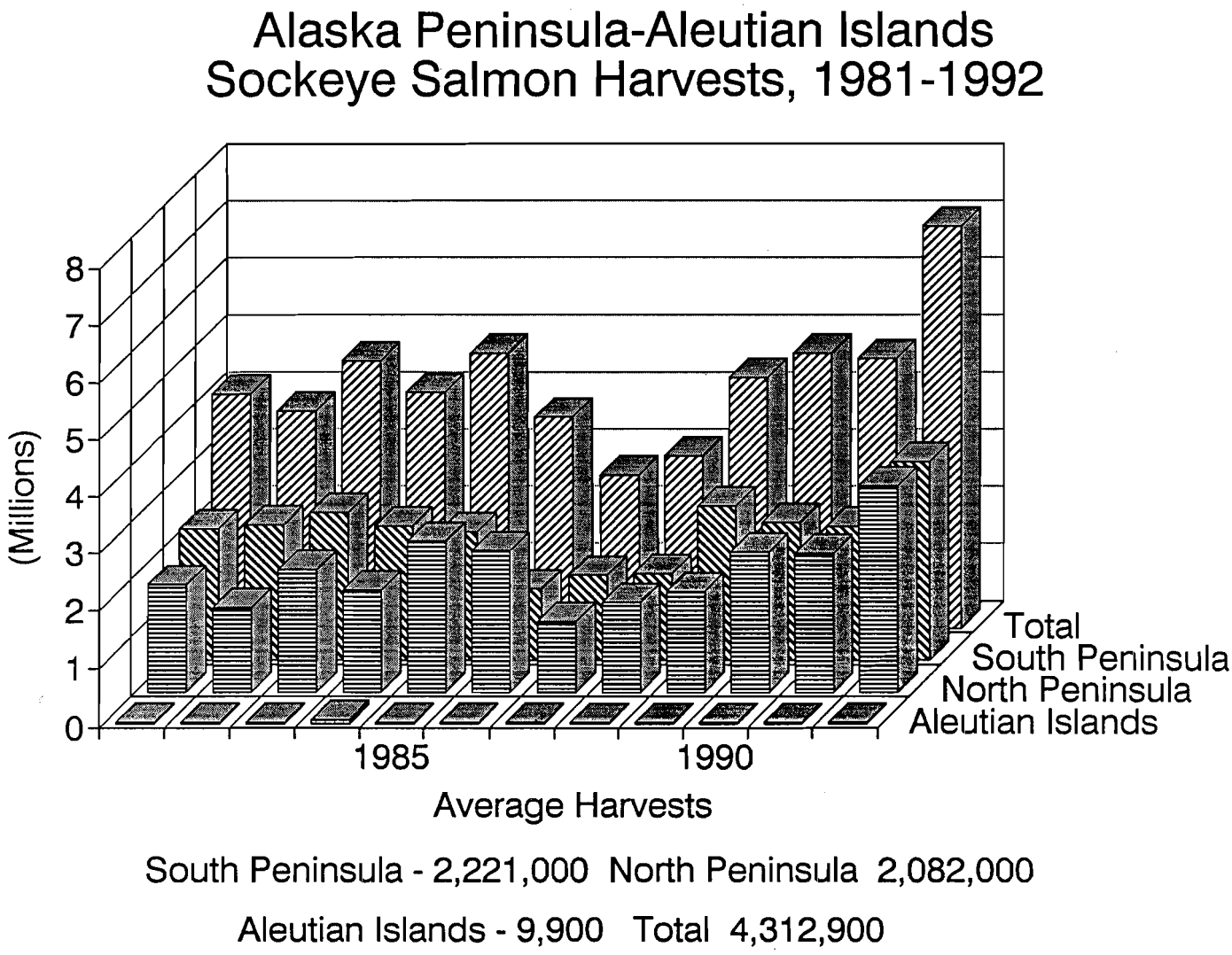

Figure 15. Annual sockeye salmon harvests for Area M (South Peninsula, North Peninsula, and Aleutian Islands), including average annual harvests, 1981-1992.

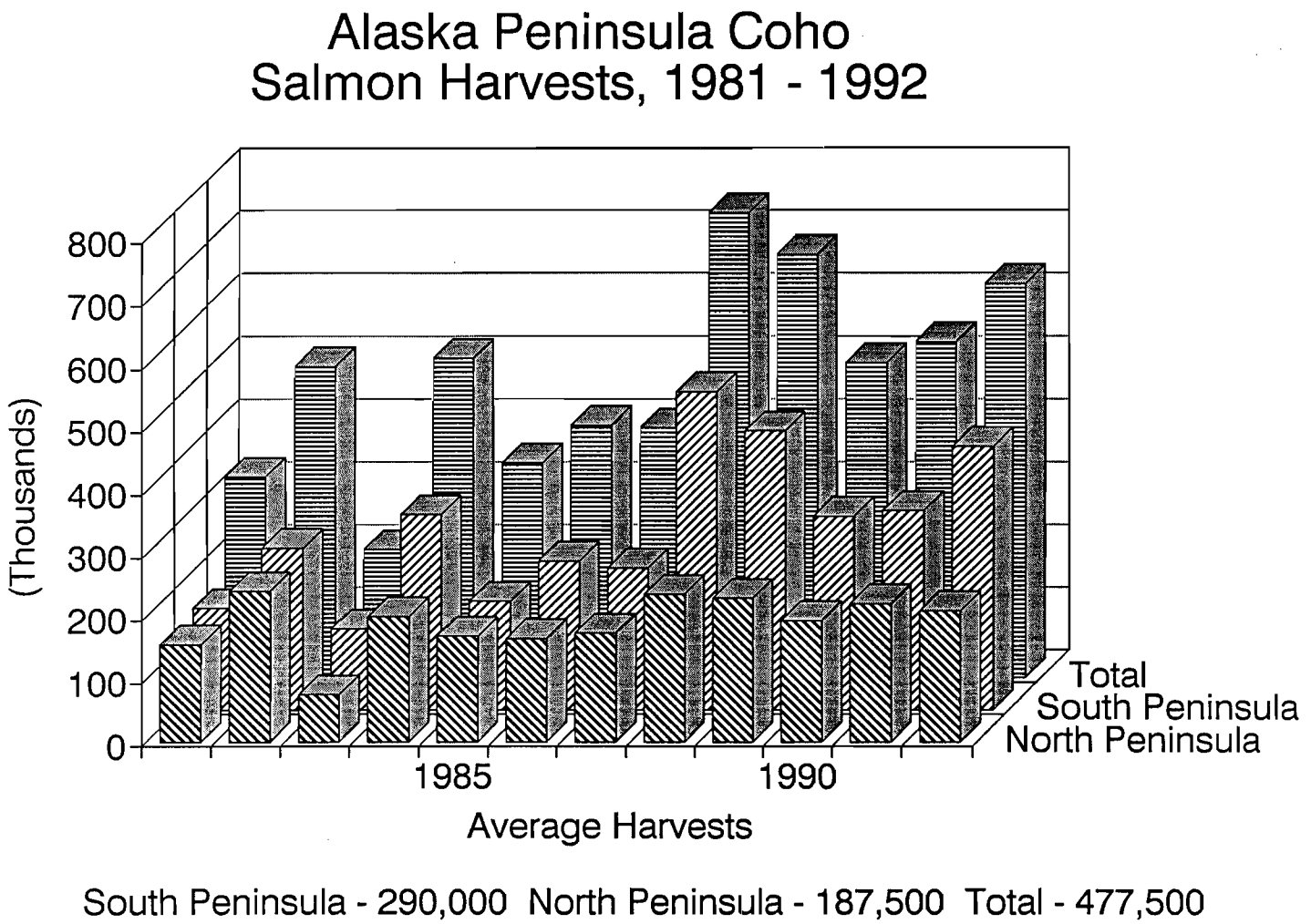

Figure 16. Annual coho salmon harvests for Area M (South Peninsula, North Peninsula, and Aleutian Islands), including average annual harvests, 1981-1992.

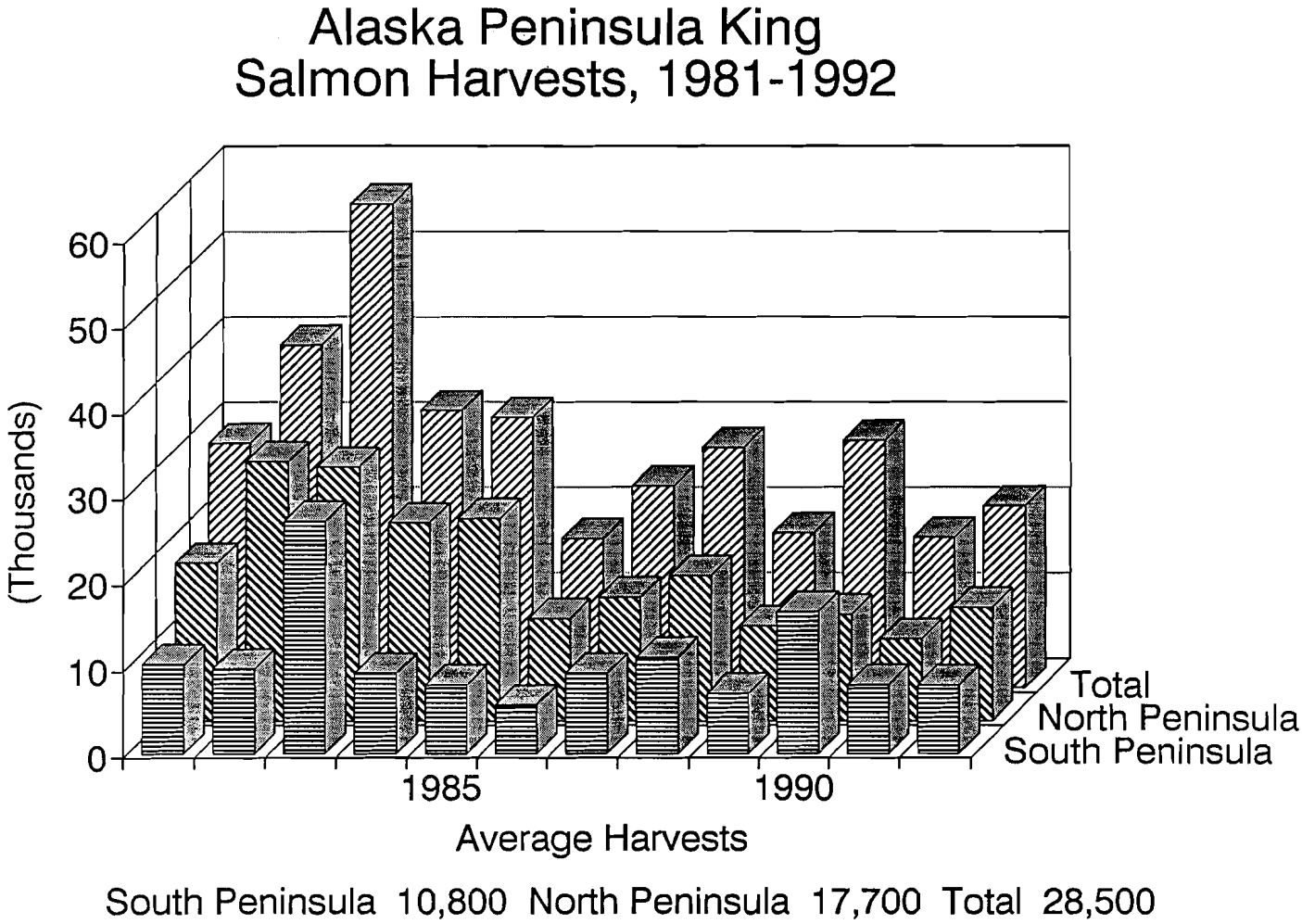

Figure 17. Annual king salmon harvests for Area M (South and North Peninsula), including average annual harvests, 1981-1992.

important systems. North Peninsula sockeye salmon harvests averaged 239,500 between 1962 and 1975; 669,600 between 1976 and 1978; and 1,819,000 between 1979 and 1989 (Table 8.). Harvests during the 1962-90 period ranged from 172,000 in 1973 to 2,601,000 (record high) during 1985 (Fig. 14). The peak of North Peninsula sockeye harvests occur during the first 10 days of July, although the Urilia Bay return is slightly earlier. The runs of most returning stocks are stocks are over by the end of July; however, the run returning to Bear River peaks in August and lasts well into September. There is also a small late return (i.e., early August) of sockeye salmon in Nelson Lagoon. These fish spawn in lakes along the west side of the Nelson Lagoon drainage.

Chum salmon harvests averaged 392,000 between 1978 and 1990 (Table 8, Fig. 14). The record harvest of 797,000 fish occurred in 1984 (Shaul et al. 1992). The major chum producing locations are the Izembek-Moffet Bay, Herendeen-Port Moller Bay, Bear River, and Bechevin Bay areas. The North Peninsula chum salmon runs usually begin in June, continuing steadily throughout July and early August. Nelson Lagoon's run begins in late July and is of short duration. Trader's Cove and Warm Springs chum salmon return during August amd early September.

Because of the late timing of their runs (i.e., August through September), virtually no commercial fishing effort was directed towards coho salmon on the North Peninsula until 1948--and then only in limited locations. During recent years, more stocks have been exploited; however, there are stocks on both sides of the Alaska Peninsula that have not been identified or exploited; therefore,escapement information is very limited. North Peninsula coho harvests averaged 33,500 fish per year from 1948 through 1978, jumping dramatically to an average of 165,000 fish per year between 1978 and 1990; harvests ranged from 63,300 in 1978 to 238,000 in 1982 (Table 8, Fig. 16). Nelson Lagoon is the largest North Peninsula coho salmon producer; major runs also return to Port Heiden, Cinder River, Ilnik, and Swanson Lagoon. Although run timing varies among stocks, most returning coho salmon begin in early August, peak in late August and early September, and conclude by mid-September. The Ocean River coho salmon run is an exception to this because it peaks during late September.

Nelson Lagoon, Port Moller, and Port Heiden are the major chinook salmon producing locations on the North Peninsula. Although there has been only an average annual harvest of 18,300 fish between 1978 and 1990, (Table 8, Fig 17), they are an extremely important species to some fishermen;for example, they are one of the two most important species at Port Heiden (i.e., the other is sockeye salmon) and an important contributor to the economy of Nelson Lagoon. The record catch was 44,200 during 1916 (Shaul et al. 1992). The harvests ranged from 11,700 in 1986 to 30,100 in 1982. The chinook salmon run begins during the last week in May, peaks during mid- and late June, and then gradually declines until its conclusion in late July. Most spawning occurs during the first half of August.

Pink salmon returns are quite small, and value per fish is lower than that for the other species; however, Bechevin Bay has occasionally produced large returns during even-numbered years. From 1978 to 1990, the average annual harvest was 110,000 fish, ranging from 3,000 in 1985 to 518,000 in 1990, which represents the record catch. Historically, the high harvests in 1978, 1980, and 1990 were the only times harvests exceeded 65,000 fish per year. It has not been determined why the

Table 8. Historical annual harvests of all species of salmon on the North Peninsula, 1960-1992 (source: Shaul et al. 1992).

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1960	10,400	692,800	44,000	34,700	607,400	1,389,400
1961	6,100	387,700	24,600	3,000	153,300	574,700
1962	5,400	249,700	35,200	31,200	34,900	356,400
1963	3,600	225,200	40,500	6,900	49,900	326,100
1964	3,600	250,800	36,600	6,800	139,000	436,800
1965	6,100	199,500	34,500	2,100	69,700	311,900
1966	5,600	245,300	37,300	16,000	82,800	387,000
1967	5,500	224,700	46,800	700	41,300	319,000
1968	4,500	237,100	64,900	200	73,500	380,200
1969	4,800	321,300	49,100	100	28,100	403,400
1970	3,200	213,000	26,400	7,800	50,200	300,600
1971	2,200	354,200	8,200	300	64,200	429,200
1972	1,800	179,500	9,600	0	84,700	275,600
1973	4,400	171,800	26,900	300	155,700	359,100
1974	5,100	247,900	24,000	10,500	35,300	322,800
1975	2,100	233,500	28,200	300	8,700	272,800
1976	4,900	641,100	26,000	600	73,600	746,200
1977	5,500	471,100	34,100	900	129,100	640,700
1978	14,200	896,200	63,300	466,600	163,200	1,603,500
1979	17,100	1,979,500	112,800	5,000	65,700	2,180,100
1980	16,800	1,397,100	127,900	301,700	700,200	2,543,700
1981	18,300	1,844,900	155,400	11,200	706,800	2,736,600
1982	30,100	1,435,300	238,000	12,300	331,100	2,046,800
1983	29,500	2,093,400	75,100	3,400	348,700	2,550,100
1984	23,000	1,734,900	198,600	27,400	796,700	2,780,600
1985	23,500	2,600,500	167,800	3,100	671,100	3,466,000
1986	11,700	2,436,700	164,100	22,600	271,200	2,933,300
1987	14,200	1,209,400	171,800	3,500	368,700	1,767,600
1988	16,800	1,528,100	234,000	65,200	393,500	2,237,600
1989	10,900	1,718,700	227,600	4,100	157,200	2,118,500
1990	12,300	2,415,900	192,800	517,700	125,800	3,264,500
1991	9,400	2,391,200	218,300	4,200	191,300	2,814,400
1992	13,100	3,575,100	206,700	194,400	341,600	4,331,400

North Peninsula produces such small numbers of pink salmon (Table 8, Fig. 13). While some of the streams periodically receive large enough escapements to produce a substantial return, the runs generally have been erratic. Possibly there is a factor in the marine environment that is not conducive to good pink salmon survival. Only the Bechevin and Herendeen Bays have produced large pink salmon returns.

Aleutian Islands Area:

The Aleutian Islands Area produces runs of sockeye, coho, pink, and chum salmon; however, only pink salmon are commercially important (Table 9). The following islands produce large pink salmon runs during some years: Adak; Amlia; Attu; Atka; Umnak; and Unalaska. Tanga, Kanaga, and Kiska Islands all have at least one important pink salmon stream. Except for occasional fishing on Umnak Island during the 1950s and early 1960s and on Attu in 1963, all commercial efforts have been confined to Unalaska Island. It is possible that Attu Island salmon runs have been heavily impacted by Japanese high seas fishing, considering they were allowed to fish near the island until 1988. Japanese salmon fishing was closed by court action during 1988 in all U.S. waters to protect marine mammals and birds. The other islands also may have been impacted to a lesser degree than Attu by foreign fishing fleets.

Aleutian Islands pink salmon runs tend to be much larger during the even-year cycle (Fig. 13). Unalaska Bay has a history of producing large runs during both odd and even years. Pink salmon runs are very unstable in the Aleutians. They produce legendary high returns at times and then collapse for no apparent reason. Aleutian pink and sockeye salmon tend to be a smaller size than those of Alaska Peninsula stocks. Prior to 1979 markets were a limiting factor at Unalaska. There was often no market unless pink salmon abundance warranted sending tenders from False Pass or King Cove. From 1979 to the present, most fish have been processed by buyers at Unalaska-Dutch Harbor or Akutan. The record Aleutian pink salmon harvest of approximately 2,600,000 occurred in 1980 (Table 9); approximately 2 million were taken out of Makushin Bay alone (Shaul et al. 1991). Although Unalaska pink salmon runs seem to arrive about the same time as those in the South Peninsula, the run timing varies from year to year; i.e., the time they enter freshwater streams and the length of the runs vary from year to year. During years with large runs, Unalaska pink salmon may trickle in through the end of September.

Subsistence Fisheries

Subsistence use of resources involves more than just the actual utilization of fish, game, and plants. The harvest, distribution, and consumption of resources are an integral part of a society, because these actions have ties to the economic, the social, and the ideological aspects of a complex cultural system (Veltre and Veltre 1982). Wolfe and Ellanna (1983) characterized a subsistence-based socioeconomic system as follows: (1) a mixed economy with mutually supportive market and subsistence sectors; (2) a domestic mode of production where extended kinship-based production units control capital, land, and labor; (3) a stable and complex seasonal round of production activities within the community; (4) substantial noncommercial sharing, distribution, and exchange networks;

Table 9. Historical annual sockeye, pink, and chum salmon harvests in the Aleutian Islands fisheries, 1960-1992[a].

Year	Sockeye	Pink	Chum	Total
1960	7,600	444,900	300	452,800
1961	2,700	94,000	200	96,900
1962	5,500	2,001,700	1,200	2,008,500
1963	4,500	93,900	300	98,700
1964	200	194,100	2,300	196,600
1965	no data	no data	no data	no data
1966	1,000	63,500	700	65,200
1967	200	7,900	0	8,100
1968	2,000	902,800	800	905,700
1969	1,900	242,000	1,500	245,600
1970	200	672,500	3,300	676,100
1971	300	45,500	100	45,900
1972	100	2,800	0	2,900
1973	100	7,000	0	7,100
1974	no data	no data	no data	no data
1975	no data	no data	no data	no data
1976	no data	no data	no data	no data
1977	no data	no data	no data	no data
1978	1,800	38,100	0	39,900
1979	12,200	539,400	200	551,800
1980	9,200	2,597,500	4,900	2,611,600
1981	5,400	302,800	6,600	315,000
1982	2,700	1,447,800	6,100	1,456,600
1983	4,400	2,000	11,400	17,800
1984	67,200	2,309,700	33,900	2,410,800
1985	2,800	100	14,200	17,100
1986	7,700	42,600	38,800	89,200
1987	100	0	0	100
1988	4,300	183,100	500	187,900
1989	8,200	6,700	0	14,900
1990	12,400	282,800	1,000	296,300
1991	800	0	0	800
1992	3,100	312,100	1,200	316,400

[a] coho salmon harvests have been excluded because data indicates none were landed from 1960 to 1981 and only a total of 400 subsequently (i.e., 200 in 1981, and 100 each in 1986 & 1990; source: Shaul et al. 1992).

(5) traditional systems of land use and occupancy, and (6) complex systems of belief, knowledge, and values associated with resource uses passed on between generations as the cultural and oral traditions and custom of a social group. The analysis of resource utilization in some of the communities of the region (e.g., Unalaska) is difficult because of the complex socioeconomic/ethnic makeup of the community, and subsistence activities are interrelated to a number of variables, including commercial fishing and processing (Veltre and Veltre 1982).

Although the communities of the region vary in their reliance on supplemental subsistence harvest and distribution of fish, it is an integral part of the lifestyle of most residents of the region as well as a contributing facet of their economies. For example, the distribution of fish according to established sharing patterns throughout entire communities in the early 1800s (Lantis 1970) remains prevalent among Aleut communities (Spaulding 1955, Berreman 1954). Sharing was also uniformly reported to be based on need and was not equally distributed throughout the community households (Langdon and Worl 1981). Salmon, halibut, cod, Dolly Varden char, shellfish (primarily crab), and marine invertebrates constitute the principal fisheries-related subsistence foods (Veltre and Veltre 1983).

Subsistence salmon harvests are estimated from permit return information (Table 10). Information is then used to extrapolate catches for all permits issued. It is likely that many fish from commercial harvests are kept for subsistence use and not reported. Permits are not required to subsistence fish in the Akutan and Umnak Districts; consequently, no harvest estimates are made by Commercial Fisheries Division staff for those districts. Subsistence salmon fishing is not allowed in the Adak District; however, a personal use salmon fishery is allowed on Adak and Kagalaska Islands for Alaska residents and military personnel (not their dependents) who have been stationed in Alaska for the preceding 12 months (Table 10).

Sport Fisheries

From 1977 through 1990, sport anglers have spent an annual average of 22,300 angler-days fishing in the region (Fig. 18), representing approximately 1% of the total sport effort for Alaska over that period. Since 1986 the sport fishing effort has been increasing; i.e., a record number of angler-days were expended in 1990. This recent increase can be attributed to growth in the marine and freshwater sport fisheries throughout the Aleutian Islands (particularly in Adak) as well as increased coho salmon availability in Cold Bay attributed to Russell Creek Hatchery production funded through Aleutians East Borough. There are major freshwater sport fisheries near Adak and Unalaska/Dutch Harbor; major marine fisheries are located near Adak, Unalaska/Dutch Harbor, and Cold Bay (Schwarz 1991). From 1977 through 1990, the average annual harvest for sport anglers was 23,500 fish (Fig 19). Pink salmon have accounted for 30% of the sport catches, while coho and sockeye salmon have accounted for 10% and 8%, respectively (Fig. 20).

Table 10. Subsistence salmon harvests by species by community for the lower Alaska Peninsula and Unalaska from 1985 to 1992, including estimated personal use harvests for Adak-Kagalaska Islands for 1988-1992[a].

Year	Permits Issued	Species					Total
		Chinook	Sockeye	Coho	Pink	Chum	
			SAND POINT				
1985	60	30	1,410	1,686	420	1,146	4,692
1986	75	45	2,505	1,208	1,560	1,005	6,323
1987	84	87	2,018	1,508	1,160	1,114	5,887
1988	74	146	2,694	853	1,326	1,175	6,194
1989	86	53	6,347	1,050	731	1,149	9,330
1990	80	160	5,648	620	429	1,051	7,908
1991	84	420	6,636	1,092	1,260	2,772	12,180
1992	76	318	4,733	518	1,228	1,036	7,833
			KING COVE				
1985	39	0	784	3,292	105	20	4,201
1986	24	2	1,834	919	14	120	2,889
1987	39	3	2,320	1,662	206	334	4,525
1988	28	3	555	2,855	265	43	3,721
1989	39	3	1,982	1,973	294	690	4,942
1990	43	24	1,054	2,832	265	367	4,542
1991	60	0	1,477	3,611	225	386	5,669
1992	61	9	1,452	2,891	327	1,177	5,856
			COLD BAY				
1985	10	0	293	84	34	3	414
1986	18	0	184	264	14	26	488
1987	10	0	293	84	34	3	414
1988	24	0	737	66	2	0	805
1989	18	0	231	55	4	22	312
1990	14	0	322	70	1	22	415
1991	23	0	517	30	6	4	557
1992	15	0	336	38	0	0	374
			FALSE PASS				
1985	10	30	578	1,858	13	395	2,874
1986	12	13	158	215	188	299	873
1987	12	14	103	443	163	389	1,112
1988	10	11	401	834	29	192	1,467
1989	7	0	231	55	4	22	312
1990	9	1	170	193	19	79	462
1991	17	17	724	500	354	165	1,760
1992	12	12	1,082	502	242	248	2,086

--Continued--

Table 10. Continued

Year	Permits Issued	Species					Total
		Chinook	Sockeye	Coho	Pink	Chum	
			NELSON LAGOON/PORT MOLLER				
1985	9	5	207	252	2	0	466
1986	9	13	284	302	3	5	607
1987	10	22	245	254	5	14	540
1988	13	26	284	184	0	25	519
1989	9	21	250	227	0	11	509
1990	8	11	291	224	0	0	526
1991	8	20	370	139	1	4	534
1992	9	17	298	191	7	12	525
			TOTAL ALASKA PENINSULA AREA				
1985	128	65	3,272	7,172	574	1,564	12,647
1986	138	73	4,965	2,908	1,779	1,455	11,180
1987	175	126	5,306	4,022	1,547	1,905	12,906
1988	149	186	4,671	4,792	1,645	1,435	12,706
1989	159	81	9,146	3,405	1,204	1,919	15,755
1990	163	196	7,485	3,939	714	1,519	13,853
1991	192	418	9,223	5,388	1,817	3,252	20,498
1992	173	356	7,901	4,140	1,904	2,473	16,674
			UNALASKA				
1985	65	0	897	208	1,293	20	2,418
1986	121	0	3,449	847	2,468	375	7,139
1987	81	0	1,097	378	1,780	151	3,406
1988	74	1	962	390	2,662	83	4,062
1989	70	2	1,064	470	1,292	36	2,864
1990	94	0	1,294	666	1,075	45	3,080
1991	89	0	1,294	666	1,075	45	3,080
1992	144	7	2,739	587	1,723	11	5,067
			ADAK-KAGALASKA ISLANDS				
1988	43	0	503	23	150	0	676
1989	64	0	382	0	117	0	499
1990	61	0	800	47	41	0	888
1991	37	0	281	6	34	0	321
1992	52	0	572	30	4	0	606

[a] source: Shaul et al. 1992.

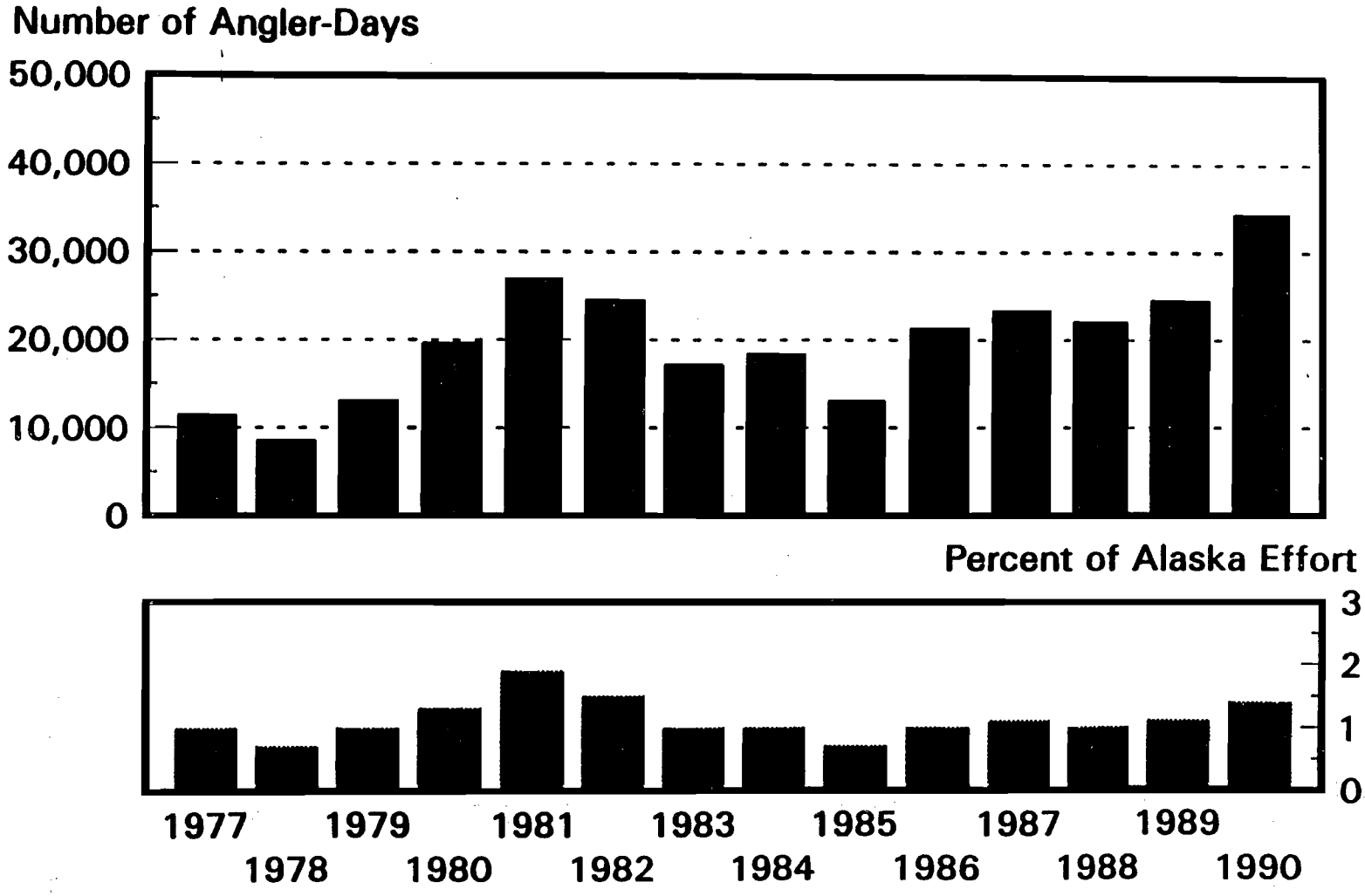

Figure 18. **Number of angler-days of effort expended by recreational anglers fishing Alaska Peninsula and Aleutian Islands, 1977-1990.**

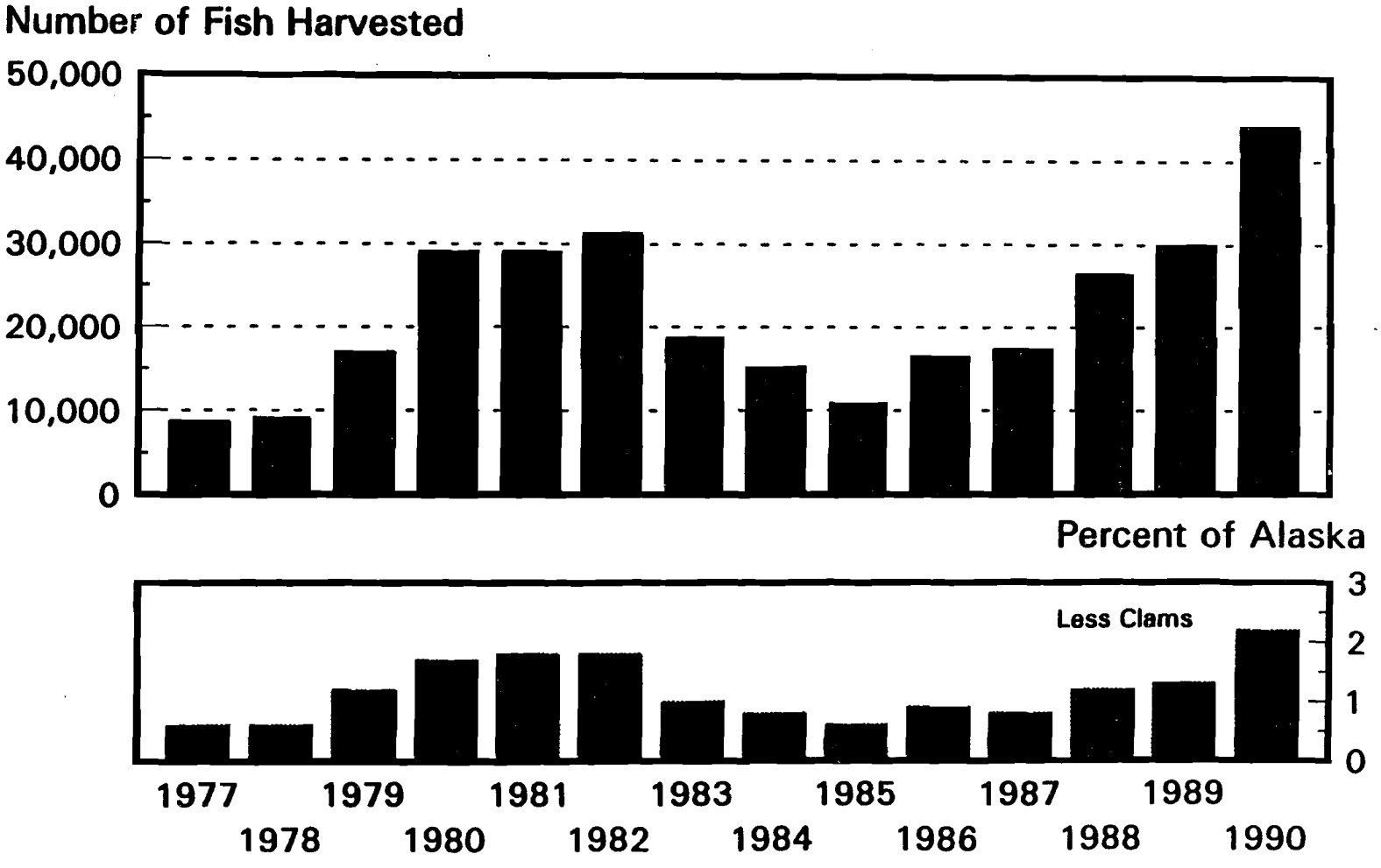

Figure 19. **Number of fish harvested by recreational anglers fishing Alaska Peninsula and Aleutian Islands, 1977-1990.**

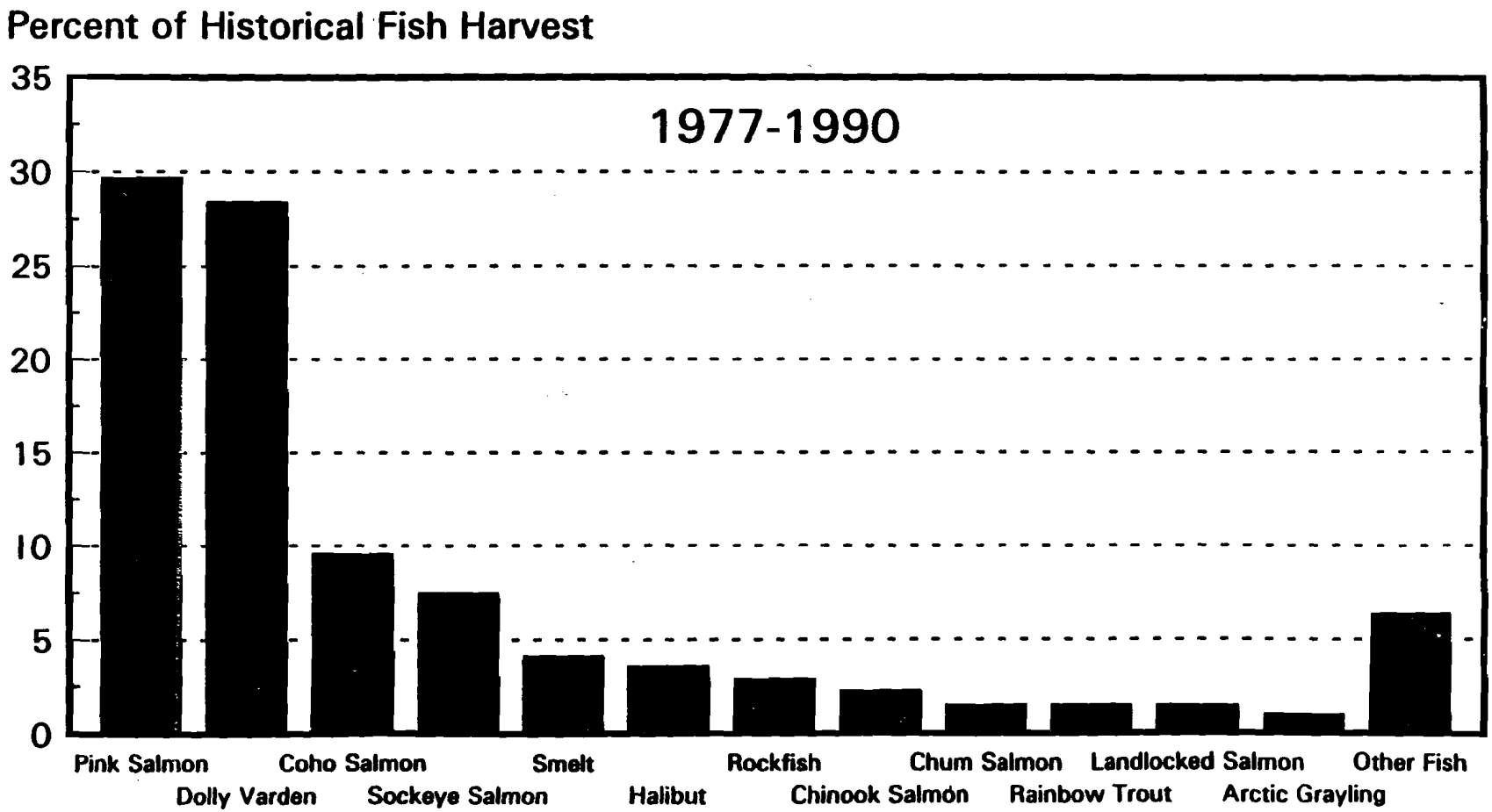

Figure 20. **Average composition of the historical harvests of fish by reacreational anglers in Area M, 1977-1990.**

SUPPLEMENTAL PRODUCTION METHODS

Definitions

The techniques used in the supplemental production of salmon will fall into one of two categories: (1) Enhancement--the application to a stock already at natural capacity of procedures designed to increase the numbers of harvestable fish to a level beyond that which could naturally be produced. This may be accomplished by using production systems (e.g., hatchery) or by increasing the natural productive habitat through physical or chemical modifications. (2) Rehabilitation--the application to a depressed stock or endangered habitat of fish propagation, habitat restoration, or management techniques to return those stocks to a previously recorded level of production.

A risk assessment study is necessary to determine if significant biological, social, and economic impacts will result from implementation of enhancement or rehabilitation projects. In this context three primary issues are normally addressed: (1) planning procedures governing enhancement and rehabilitation efforts, (2) fishery management implications, (3) and genetic, disease, fish stocking, and lake fertilization policies and guidelines (Appendix C). Genetic impacts to wild, indigenous fish stocks may occur during the transporting of fish from one location to another to release them and when hatchery fish are created to enhance existing wild stocks. Two potential genetic hazards to wild fish populations are associated with producing hatchery stocks and then transporting them to other locations for release: (1) effects of gene flow between fish stocks and (2) maintenance of adequate genetic diversity within and between fish populations (Davis and Burkett 1989).

The state of Alaska has a genetics policy that governs rehabilitation, enhancement, and development of salmon populations (Davis et al. 1985). This policy was written to provide guidelines for such activities while protecting the integrity and diverstiy of wild stocks, the mainstay of the commercial fishing economy. Projects addressed in this plan will be evaluated for conformance to the genetic policy. Before approval, the commissioner will determine that a proposed project can be conducted in a manner to ensure the health and diversity of the stocks and species in the affected area.

The long-range goal of established fish disease policies is to prevent dissemination of infectious finfish and shellfish diseases within or outside the borders of Alaska without introducing impractical constraints for aquaculture and necessary stock-renewal programs (Meyers et al. 1987). Lake fertilization policies guide the efficient use of nutrient enrichment to effectively increase productivity of natural systems.

Hatcheries

Generally, hatchery facilities are used as a production base for salmon rehabilitation and enhancement programs because they are approximately eight times more efficient in converting eggs to juvenile fish than the natural environment (McMullen et al. 1983). The efficiency of such production shortens the time involved in rehabilitating depleted stocks. Because of sizable initial capital investments, hatcheries may appear to be an expensive means of supplementing salmon production. Also, the longer a hatchery holds fish, the more money it invests in each one; however, this factor is mitigated by improved survivals of fish because of their fuller development prior to release. Short-term rearing, for example, can double marine survivals and substantially increase hatchery

feasibility. Criteria for regional planning team review of proposed enhancement/rehabilitation projects are provided in Appendix B.

In-Stream Incubation Units

The application of this technique involves use of a large container containing fertilized eggs and substrate in alternating layers that is placed in or alongside a stream. A plumbing system forces water up through the substrate. Such units control the water flow, substrate type, sedimentation, and predation to provide green-egg-to-fry survival rates as high as 90%. In-stream incubators are a low-cost enhancement technique that are ideally suited for small operations at remote sites. After artificial spawning of the brood stock and placing of eggs in the unit, minimal care is required. When they are used for enhancement of indigenous stocks, these units can eliminate the genetic and pathology concerns associated with transport of eggs or fry. To effectively apply this technique, the following prerequisites are needed: (1) high-quality water source, (2) adequate head (i.e., height differential to provide sufficient flow) without installing excessive length of piping, (3) suitable stream bottom, and (4) protected area for incubation units. These units can be used to bolster fry production independently or in combination with lake fertilization and fishpass projects.

Lake Stocking

When spawning area is limiting salmon production, the natural rearing area of lakes can be maximized through hatchery stocking; that is, lakes serving as rearing habitat for juvenile salmon (including chinook, coho, and sockeye) that are underutilized because low escapements can be maximized through lake stocking; i.e., release into the aquatic environment of artificially propagated fish at any life stage. Before a stocking project is implemented, specific criteria and procedures need to be considered, including but not limited to (1) prestocking studies as required by ADF&G stocking policy, including limnological and fisheries investigations to determine suitability of lakes for stocking and the rearing/stocking capacity and ensure optimal fry growth and survival; (2) basic tenets of genetic and pathology policies and guidelines need to be followed to preserve genetic/disease integrity of both wild and hatchery stocks; and (3) salmon returning to a stocked lake must be available for harvest and have minimal impact to returning wild salmon.

Stream Stocking

When streams have areas of underutilized habitat that can serve as natural rearing areas, a variety of stream stocking techniques may be helpful in rehabilitating declining populations of wild stocks: (1) after artificial spawning, green eggs are planted; (2) after artificial spawning and partial incubating, eyed eggs are planted; (3) after artificial spawning and incubating, unfed fry are released; (4) after artificial spawning, incubating, and partial rearing, fed fry are released; and (5) after artificial spawning, incubating, and rearing, smolts are released into the stream.

Lake Fertilization

Addition of nutrients to lakes that serve as nurseries for rearing salmon, particularly sockeyes, increases the quantity of phytoplankton and, in turn, the quantity of zooplankton, which is the major source of food for rearing fish (particularly sockeye juveniles). There are many lakes within Alaska and Canada that have been treated with nutrient additions and have greatly benefitted wild and introduced sockeye salmon stocks; however, there have been some lakes whose stocks have not benefitted; therefore, it is necessary to know as much as possible about the physical, chemical, and biological characteristics of candidate lakes.

The ADF&G lake fertilization guidelines mandate observation of selection criteria and evaluation requirements prior to implementing lake fertilization projects. There are essentially seven criteria for selecting lakes: (1) food supply must limit salmon growth and/or numbers by limiting nutrient supply; (2) for added nutrients to be available to phytoplankton, mean depth of lake should be greater than depth of euphotic zone (lake depth should be at least 10 m), epilimnion should be less than twice the depth of euphotic zone, flushing rate of epilimnion should be low enough so turnover time is at least one year, shoreline should be steep and have little periphytic and macrophytic vegetation, and light penetration and temperatures should not limit production; (3) nutrient enhancement is compatible with preexisting water usage; (4) ability to evaluate, monitor, and manage adult salmon returns to all fisheries; (5) initial salmon populations of 300-400 fry /lake-surface-hectare or the potential to stocking to that density; (6) spawning or rearing areas should be sufficient for increased numbers of returning adults or of a size that would not limit salmon production; and (7) predators and /or competitor populations should be of a size that would not limit salmon production. Basically, these criteria favor lakes larger than 300 acres that are steep-sided and deep (>10 m), have a low density of predators/competitors, and have a water residence time of one year (Koenings et al. 1979).

From the varying responses of lakes to nutrient enrichment in Alaska, it is evident that extrapolation of results from one treated lake to another of similar size and morphometry cannot and should not be done. Thus the efficacy of nutrient enrichment is lake specific and dependent on biological factors, such as food-web processes of fish densities, predators/competitors, and other abiotic factors (e.g., cool rearing temperatures and turbidity). After a thorough and systematic fisheries and limnological pre-assessment study has been conducted, only lakes that offer the most potential, relative to existing productivity and selection criteria, should be enhanced. The goal of lake fertilization projects is to increase growth and survival of juvenile sockeye through increasing primary productivity without significantly changing the plankton community or the lakes oligotrophic condition.

Studies have shown significant correlations between the availability of food to juvenile salmon, their size at outmigration as smolts, and their survival in marine waters. Because of inherent variability within and between lake systems, before an enrichment project is initiated, both limnological and fisheries investigations are done at least two years prior to actual fertilization. Such evaluations of the physical, biological, and chemical status of a lake is required to determine if fertilization is feasible, based on lake-specific information and to use such information as a gauge to measure the

success of a nutrient enrichment project. Without an evaluation program, scientific and monetary benefits from lake fertilization projects cannot be clearly identified, nor will maximal production be realized. After two years of studies, a pre-fertilization report is prepared and distributed for review and discussion before projects are implemented. During the fertilization phase, monitoring at all trophic levels is conducted; after fertilization monitoring is continued for another two years (at a reduced level) to assess the return of the lake to a nonfertilized state. All the time-phase monitoring and assessments are done to relate the overall physical, chemical, and biological conditions of the lake to growth and production of juvenile salmon and to the subsequent contributions of adults to the common property fisheries.

Limnological Investigations

Prior to lake fertilization or stocking, a set of studies should be conducted to assess the potential feasibility and performance of any enhancement or rehabilitation effort. Limnology field sampling entails water samples collected from two depths, temperature profile from surface to bottom, dissolved oxygen profile from surface to bottom, light penetration measurements, and two replicate zooplankton tows. Additional, if a morphometric map is unavailable, mapping of the lake (transect depth soundings) will be necessary. Field sampling by trained personnel should take from 1.o to 1.5 hours/station for data/sample collection. Water samples will need to be preserved and filtered prior to their shipment to a limnology laboratory for analysis. Limnology field sampling occurs in two stages (years) as follows: (1) feasibility surveys and (2) pre-enhancement surveys. During the feasibility stage each lake/station is sampled four times/year (1 spring, 2 summer, 1 fall). Generally, lakes will have one station; however, for those lakes greater than 1 mile long (e.g., Bear and Sapsuk Lakes), two stations should be used. Based on the lake's enhancement potential determined during the feasibility stage, the second year of sampling is intensified. During this pre-enhancement stage each lake/station is sampled at a minimum of six times/year.

Fish Habitat Restoration and Improvement

Spawning Channel:

Artificial spawning channels are designed to increase and enhance natural spawning habitat through control of such factors as water flow, substrate, sedimentation, and predation, thereby increasing egg-to-fry survival rates. While the average egg-to-fry survival rate in a natural stream may be as little as 10% or 15%, the introduction of spawning channels may increase those rates by as much as 80%. Implementation of this technique requires a controllable water source, proper terrain, and sufficient brood stock.

Stream Clearance/Improvement:

Despite its simplicity and cost-effectiveness, this technique has some accompanying risks. Complete removal of physical barriers (e.g., beaver dams, rocks, logs, driftwood, or other debris) may result in an increase in water velocity, downstream scouring, and elimination of pooling areas; therefore,

selective removal of a portion of a barrier sufficient to allow the passage of fish upstream without substantially altering the flow of water or downstream conditions is required. When evaluating potential stream clearance projects, assessments should be made of spawning or rearing habitat that will be made available, the portion of the barrier to be removed, availability of sufficient spawning populations, and the relative costs (e.g., time and equipment) involved.

Required applications vary from system to system; in some instances the rearranging of rocks or logs by hand to provide resting pools and shorten jumps over falls may be all that is needed. One of the aftereffects of storms in the area is that beach gravel deposits and other debris frequently block the mouths of streams, effectively denying access to upstream spawning/and or rearing habitat. The partial removal of these obstructions can be an effective means of providing that access. Providing access to blocked side channels, lakes, or sloughs can also in some instances provided additional rearing area for sockeye and coho.

Fishpassage Improvements:

The construction of a fishpass (fish ladder, steep pass, fishway) is a permanent form of habitat modification to enable fish access to spawning and rearing habitat beyond impassable barriers such as high-velocity rapids or waterfalls. This technique can be applied either as a (1) construction made of concrete, steel, or aluminum to bypass a barrier or (2) as an alteration of the barrier itself through explosives to provide a series of ascending/resting pools. The success of either of these applications will depend on an adequate preconstruction or preblasting evaluation, including estimates of high- and low-water flows and number and species of fish using the system to ensure sufficient utilization and absence of conflicts with any unique fish stocks above a barrier. Generally, experience in the application of this technique over a broad range of barriered systems indicate that a well-placed fishpass can result in a significant increase in production.

Other Restoration and Improvement Techniques:

In addition to spawning channels, stream clearance projects and fishpasses discussed in the foregoing sections, there are a number of other techniques that can be used to restore or improve fish habitat. Techniques such as stream bank stabilization or structures to maintain stream riffles and pools have been used in other areas of Alaska to improve salmon spawning and rearing habitat. Habitat structures such as boulders and large woody debris can be utilized in certain situations to improve rearing areas, thereby increasing production. Water level or water flow direction can be adjusted with the use of various structures to improve fish production. It is also possible to connect ponds to existing systems to expand available rearing areas and improve production. As with the other techniques discussed here, habitat manipulation projects must be carefully evaluated by the Area M Regional Planning Team prior to their installation. Before implementing these projects, sites should be monitored and evaluated for a one-year period. Seasonal visits will be most critical during low-water flow and during extremely cold periods. The most important parameters to evaluate include water temperature, volume, velocity, and dissolved oxygen content. A map of the existing and proposed habitats should be drawn, and engineering plans may need to be developed. Finally, when

the project has been completed, it must be monitored and maintained on a regular basis to assure that it is operating as designed.

Fish Tag/Recovery and Stock Separation Studies

Information concerning salmon biology, valuable migration characteristics, and level of contribution to various fisheries can be obtained from well designed tagging studies. Information from this type of work is very helpful in fishery management decision making process to assure that both hatchery and wild stock harvest levels and escapement can be maintained in balance and to allow for continued healthy perpetuation of the salmon runs. Additional information concerning movements and residence time of Alaska Peninsula salmon in coastal waters would be very helpful. In certain instances, tagging studies are required in association with large-scale productions of salmon that exceed the natural production capabilities of wild stocks; for example, a large-scale release directly from a hatchery. These types of mark/recovery studies (e.g., thermal marking of otiliths, coded wire tagging, or genetic marking) allow managers to identify hatchery fish in the common property harvest to the extent that it is possible to assure that the wild stocks are not overharvested. Additionally, stock separation studies (for example, age-structure, run timing, scale analysis, genetics, etc.) in systems throughout the region will further increase our understanding of the resources potential.

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LIST OF TERMS

ADF&G - Alaska Department of Fish and Game

AEB - Aleutians East Borough

alevins - newly hatched fish on which the yolk-sac is still apparent.

allocation - to apportion, through regulation, salmon harvest to various user groups (i.e., subsistence, sport, or commercial fishermen).

anadromous - fish such as salmon that are born in fresh water, migrate and feed at sea, and return to fresh water to spawn.

aquaculture - culture or husbandry of salmon (or other aquatic fauna/flora).

Area M RPT - Alaska Peninsula/Aleutian Islands/Area M Regional Planning Team.

benthic - bottom-dwelling fish such as halibut and rockfish.

biomass - the combined weight of a group of organisms; for example, a school of herring.

brood stock - salmon contributing eggs and milt for supplemental culture purposes.

CAMF - Concerned Area M Fishermen

coded wire tag - magnetically detectable pin-head sized tag implanted in the nose of a young fish for identification as an adult.

commissioner - principal executive officer of the Alaska Department of Fish and Game.

commissioner approval - formal acceptance of a salmon development plan or other RPT products by the Commissioner.

comprehensive salmon production plan - a statutorily-mandated, strategic plan, spanning 20 years, for perpetuation and increase of salmon resources on a regional basis.

criteria - accepted measures or rules for evaluation of program and project proposals and operations.

depressed stock - a stock which is currently producing at levels far below its historical levels.

enhancement - strategy designed to supplement the harvest of naturally produced salmon species by using artificial or semi-artificial production systems or to increase the amount of productive natural habitat. Procedures applied to a salmon stock to supplement the numbers of harvestable fish to a level beyond what could be naturally produced. This can be accomplished by artificial or semi-artificial production systems. It can also be an increase of the amount of productive habitat in the natural environment through physical or chemical changes.

epilimnion - layer of water overlying the thermocline of a lake and subject to action of the wind.

escapement - salmon which pass through the fisheries to return upstream to a spawning ground or used as brood stock in a hatchery.

euphotic zone - constituting the upper layers of a body of water into which sufficient light penetrates to permit growth of green plants.

ex-vessel value - price paid to the commercial fishermen for their catch.

eyed egg - stage in which the eyes of the embryo become visible.

fecundity - number of eggs per adult female salmon (or other fish).

fingerling - stage of salmon life between fry and smolt.

fishery - legally sanctioned harvesting of a particular species in a specific time and place; for example, the Chignik Lagoon sockeye salmon fishery.

fishpass - fish ladder to enable salmon to get past a barrier to reach spawning grounds.

five-year action plan - section of phase II planning that recommends projects for implementation within the next five years.

FRED - Division of Fisheries Rehabilitation, Enhancement and Development, Alaska Department of Fish and Game.

fry - stage of salmon life from emergence from gravel until it doubles its emergence weight.

goals - broad statements of what a planning team, with input from the user groups, hopes to see accomplished within a specified period of time.

green egg - stage of salmon egg development from ovulation until the eye becomes visible, at which time it becomes an eyed egg.

hatchery - facility in which people collect, fertilize, incubate, and rear fish.

incidental catch - harvest of a salmon species other than the desired species for which the fishery is managed. Fish of another species and/or stock caught during harvest of specific species and/or stock.

instream incubator - device located adjacent to a stream that collects water from the stream and is used to incubate and hatch salmon or trout eggs.

littoral zone - pertaining to the shore and, in fresh waters, confined to those zones in which rooted vegetation occurs.

macrophytic vegetation - plant life on a body of water large enough to be viewed by the naked eye.

mixed stock fishery - harvest of salmon at a location and time during which several stocks are intermingled. Harvest of more than one stock at a given location and/or period.

natural production - salmon which spawn, hatch, and rear without human intervention (i.e., in a natural stream environment).

otolith - calcified ear bones of fish, otiliths offer future environmental marking promise. Manipulation of water temperature can produce distinctive otolith banding patterns in juvenile salmon, and these patterns can be used to identify specific groups of hatchery fish or differentiate between hatchery and wild fish stocks.

pelagic - pertaining to the open ocean as opposed to waters close to shore.

periphytic vegetation - reltating to small plant organisms that live attached to underwater surfaces or substrate; e.g., algae, diatoms.

pot - box-like or conical trap covered with mesh for catching fish or shellfish.

plan development - composing, drafting, revising, and finalizing a planning document.

PNP - private nonprofit: level and/or operational status of a private sector organization without profit motives.

PMA - Peninsula Marketing Association

present condition - average catch for the last five years.

private nonprofit hatchery permit application - request presented by a private nonprofit corporation to the Department of Fish and Game for a permit to operate a private nonprofit hatchery.

private sector - that group active in salmon resource development which is not employed by government.

production - perpetuation or increase of the salmon resource through maintenance, rehabilitation, or enhancement programs and techniques.

project - unit of work having a beginning, middle, and end that functions according to defined performance criteria.

projected status - continuation of the present condition without additional supplemental production.

public sector - that group active in salmon resource development that is employed by government.

recruitment - upcoming or next generation of fish.

regional aquaculture association (RAA) - statutorily-based nonprofit corporation comprised of representatives of fisheries user groups organized for the purpose of producing salmon.

regional planning team (RPT) - statutorily mandated planning group, composed of ADF&G staff and regional aquaculture association representatives, designated to develop a comprehensive salmon plan.

rehabilitation - procedures applied to a depressed natural stock that increase it to historical abundance. A strategy directed towards restoring depressed natural stocks to previous levels of production.

restoration - increasing the annual harvest of salmon to historic levels using management, habitat protection, enhancement, and rehabilitation strategies.

review and comment process - collection of accepted procedures to solicit and generate examination and remarks.

revised plan - document resulting from incorporation of commissioner-approved material into a plan.

roe - eggs of a fish.

run - returning salmon stock(s) bound for its spawning area which is often further described by its timing and numbers.

run strength - total run of salmon, including escapement plus harvest.

salmon:

Chinook (king) - Oncorhynchus tshawytscha
Chum (dog) - Oncorhynchus keta
Coho (silver) - Oncorhynchus kisutch
Pink (humpy or humpback) - Oncorhynchus gorbuscha
Sockeye (red) - Oncorhynchus nerka

salmon stock - population of salmon identified with a specific water system, or portion thereof. Salmon of a single species that are produced from a single geographic location and are of the same genetic origin.

seine (purse) - long net that is drawn through the water encircling fish in its path; the bottom of the net is eventually closed and the captured fish brailed into the boat's fish hold.

smolt - salmon, trout, or char which has passed through the physiological process of becoming ready to migrate to salt water.

sonar - technology that uses sound waves in water to detect submerged objects such as schools of fish.

supplemental production - salmon produced by method other than natural spawning using enhancement and/or rehabilitation methods.

spawn - (verb) to produce or deposit eggs; (noun) A mass of spawned eggs.

stock - group of fish that can be distinguished by their distinct location and time of spawning.

terminal fishery - area where a terminal fishery harvest could be conducted.

thermal band - several closely grouped and equidistantly spaced thermal rings that visually blend together at low magnification (< 100K).

thermal cycle - occurrence of one ambient and one treated water event at a pre-identified temperature differential and combination of hours; one thermal cycle produces one thermal ring. A band or separation cycle is a modiefied thermal cycle designed to separate thermal bands by 2.5 times teh distance betweent he rings.

thermal mark (TM) - discrete complex of rings on otolith resulting from temperature manipulations that identifies a specific brood stock or group.

thermal marking - process where a visibly enhanced increment or ring is induced in the microstructure of the otolith through controlled and repeated temperature fluctuations of the incubation water; these fluctuations result in an ordered complex of rings.

thermal ring - a single dark ring on the otolith resulting from temperature decline within one cycle. Microscopic viewing at high magnification (>100K) is required to resolve ring structure. A hatchmark is a dark ring or a tight complex of rings that are naturally induced in the otolith during hatching. Its visual structure is often similar to a thermal ring; therefore, marking the prehatch embryo is preferred.

thermocline - layer of water in a lake separating an upper warmer lighter oxygen-rich zone for a lower colder heavier oxygen-poor zone.

total run (run strength) - number of salmon returning in a year for a stock or area (escapement plus harvest number).

uniform procedures - those practices that have been accepted by planning participants as appropriate for conducting or accomplishing a task.

user group - identification by method and/or reason for the harvest of salmon (commercial, sport, or subsistence).

weir - fence, dam, or other device by which the stream migrations of salmon (or other fish) may be stopped or funnelled through for enumeration or holding purposes.

wild stock - any stock of salmon that spawns naturally in a natural environment and is not subjected to human-made practices pertaining to egg deposition, incubation, or rearing. Stocks that have not been rehabilitated or enhanced.

zooplankton - free-swimming, drifting, or floating organisms, mostly microscopic in size, which are found primarily in open water and are an important source of food for small fish.

APPENDIX A

Area M Questionnaire

In order to invite public participation to the comprehensive salmon planning process, the Area M RPT drafted a 42-part questionnaire (Appendix A) to identify user needs. Because of the relative isolation of the region, participation by many commercial fishermen in subsistence and sport fishing, logistical problems in obtaining accurate lists of sport and subsistence fishermen as well as for commercial crew members, nonpermit-holders, and aspiring fishermen (many of whom live outside the area), the RPT determined that a statistically accurate sampling scheme would be too costly, time consuming, and difficult to implement. Therefore, in October 1991 approximately 410 questionnaires (including stamped return envelopes) were mailed to fishermen holding limited-entry seine ($n = 126$), drift gillnet ($n = 164$), and setnet ($n = 114$) permits (Area M total of 404 permits in 1991) as well as to representatives of each of the processors in the region; 96 responses (23%) were returned. Keeping in mind that fishermen may hold limited-entry permits for different gear groups, 51 driftnetters (31%), 32 set gillnetters (28%), and 26 seiners (21%) responded. Despite the statistical shortcomings and the collective use of the commercial fishing component's data (i.e., not separated by gear group), the questionnaire provided valuable information for long-range planning in the region.

Sport Fisheries:

Sixty percent of the respondents said they had sport fished; these respondents indicated the effort is widely distributed throughout the region. Only moderate concentrations of effort occur at King Salmon River (18% of sport fishing respondents), and smaller concentrations occur in other areas. Fishing from shore or wading and casting from a boat were ranked as the two most preferred method of fishing. Rankings of species in order of preference were as follows: (1) coho, (2) chinook, (3) sockeye, (4) chum, and (5) pink. The four most important problems (ranked in order of importance) with the sport fisheries were (1) lack of enforcement, (2) lack of access, (3) lack of fish, and (4) management of fisheries.

Subsistence Fisheries:

Approximately 50% of those responding to the questionnaire said they had subsistence fished in the region, and an additional 13% said they intended to subsistence fish. The three most often used types of gear (ranked from highest to lowest) were set gillnets, drift gillnets, and pole, hook, and line. The ranking of preferred salmon species were (1) sockeye, (2) chinook, (3) coho, (4) chum, and (5) pink. Of those participants responding, 68% said the subsistence salmon they had caught were adequate for their needs and 29% indicated that their subsistence catch had been inadequate.

Commercial Fisheries:

Approximately 97% (93 of 96) respondents had commercially fished in Area M. Taking into consideration that respondents may hold commercial fisheries entry permits in different gear groups, 51 respondents were drift gillnetters, 32 were set gillnetters, and 26 were seiners. About 90% of the fishermen from all gear groups were dissatisfied with their 1991 earnings from commercial

catches of salmon, and only 4% were satisfied; 6% had no opinion. The three changes needed to improve fishing incomes (ranked in order of importance) were (1) better prices or expansion of markets, (2) removing or raising chum cap, and (3) more fishing time. The species of salmon fishermen wanted to see increased (ranked according to preference) were (1) sockeye, (2) coho, (3) chinook, (4) chum, and (5) pink. The seven most important problems with commercial fisheries in the region ranked in order of greatest concern were (1) price/markets, (2) regulations, (3) management, (4) enforcement, (5) lack of fish, (6) overcrowding, and (7) habitat. The methods of enhancing and/or rehabilitating salmon runs receiving the highest approval ratings are listed in order of preference: (1) stream clearance--82% approval, (2) streamside incubation boxes--68%, (3) tagging studies--66%, (4) fishpass--64%, (5) lake fertilization or transporting of fish to barren lakes--61%,, (6) lake stocking--58%, (7) hatchery construction--37%, and (8) harbor construction--34%.

Summary:

From the general trends in the data contained in the questionnaire, certain points can be established. Sockeyes were selected as the priority fish they would like to see increased by both commercial and subsistence fishermen. The preferred rehabilitation and enhancement strategies (ranked according to preference) were (1) stream clearance, (2) instream incubation boxes, (3) tagging studies, (4) fishpasses, and (5) lake fertilization or lake stocking. New hatchery construction was considered a low priority. The three most important fisheries-related problems (ranked in order of importance, with one being the highest) were (1) price/markets, (2) regulations (i.e., Board of Fisheries actions), and (3) management by ADF&G.

QUESTIONNAIRE

FOR COMMERCIAL FISHERMEN WHO MAY USE THE SALMON RESOURCES OF THE ALASKA PENINSULA/ALEUTIAN ISLANDS/ AREA M REGION

Dear Salmon Fishermen:

As chairman of the Alaska Peninsula/Aleutian Islands/Area M Regional Planning Team (Area M RPT), this letter is to officially acquaint you with the comprehensive salmon planning efforts that have been made in the region thus far. Also, a better understanding of the RPT's authority and duties will assist you in identifying your own needs when responding to the enclosed questionnaire.

The Commissioner of the Alaska Department of Fish and Game (ADF&G), under Alaska Statute 16.10.375, is authorized to designate regions of the state for the purpose of salmon production. In each region, the Commissioner is responsible for the development and amendment of a comprehensive salmon production plan. Accordingly, he has placed this responsibility with regional planning teams that statutorily consist of representatives from the ADF&G fisheries divisions and members of regional aquaculture associations (i.e., representatives from gear groups, processors, and subsistence users). Other representatives from federal agencies, academic or scientific organizations, and local governments or communities are also invited to serve on the RPT in an ex officio capacity. The planning process is coordinated by staff from the Division of Fisheries Rehabilitation, Enhancement and Development (FRED).

Regional Planning Team Members

The chairman of Area M RPT is David Osterback, representing Aleutians East Borough (AEB), Sand Point. Members representing regional fisheries and communities are as follows:

Thomas Bertman Concerned Area M Fishermen Port Moeller	Rick Eastlick Stepovak-Shumagin Setnet Assoc. Sand Point
Justine Gundersen AEB, Nelson Lagoon	Harvey Mack Peninsula Marketing Assoc. (PMA) King Cove
Gary Ferguson AEB, Cold Bay	Emil Berikoff AEB, Unalaska

Members representing ADF&G are as follows:

Tom Kron FRED Division Anchorage	Pete Probasco Commercial Fisheries Division Kodiak

Len Schwarz
Sport Fish Division
Kodiak/Alaska Peninsula

Comprehensive Salmon Planning

The purpose of comprehensive salmon planning is to provide for long-term stability and growth in the region's salmon resources and to identify potential rehabilitation, enhancement, habitat protection, or management projects that can be undertaken to achieve those ends. Activities to consider for increasing the region's salmon runs include (1) elimination of stream blockages, (2) streamside incubators, (3) fry releases in spawning-area-limited systems, (4) lake fertilization, (5) fish ladders, or (6) additional hatchery facilities.

Summary of Area M Regional Planning Team Actions

The inaugural Area M Regional Planning Team meeting was in Sand Point on May 23, 1990. Because it was an organizational meeting, the only actions taken were to unanimously (1) **elect** David Osterback as chairman and (2) **recommend to the Commissioner** that Russell Creek Hatchery's Basic Management Plan (BMP) and Annual Management Plan (AMP) be approved. The Area M RPT next met in Cold Bay on September 26, 1990; Arnie Shaul, Commercial Fisheries Division, was asked to summarize historical salmon (all species) escapement and harvest data for all lake and river systems that have been monitored. Gary Kyle and Bill Hauser, FRED Division, were asked to develop criteria for selecting lakes for prestocking or prefertilization projects and streams for rehabilitation projects. During the December 13, 1990, meeting in Sand Point, Gary Kyle reviewed draft criteria for selecting lakes for prefertilization or prestocking, and Bill Hauser, FRED Division, addressed habitat enhancement options. Briefly, the status of fish ladders at Middle and Apollo Creeks were addressed, and the RPT discussed the importance of having an area biologist located in the AEB to document potential rehabilitation and enhancement sites and to realize full utilization of the Russell Creek Hatchery.

At the February 27, 1991 meeting in Cold Bay the Area M RPT **recommended to the Commissioner** that the scientific/educational permit application for sockeye streamside incubation project at Willie Creek not be approved. Although the RPT felt it was important not to discourage members of the public from potential rehabilitation projects, the Willie Creek project proposal appears to be production oriented, the species is difficult to work with from a fish culture standpoint, and the affected lake system needs to be studied to determine if additional sockeye in the system is warranted before any project is initiated. Dave Osterback said he was hopeful that the AEB could provide some additional financial support to the Russell Creek Hatchery for sockeye salmon broodstock development using Mortensen Creek as a source as well as chum salmon rearing and tagging programs. Gary Ferguson said that there was support by the AEB for the facility and that there was also

interest in developing a Regional Aquaculture Association. A map of some of the region's lakes that had potential for enhancement and rehabilitation projects (enclosed) was provided by Arnie Shaul. In its final action the Area M RPT unanimously **recommended** that they officially approach the AEB and ADF&G and request supplemental funding for 2 projects related to the Russel Creek Hatchery Program, including funding for (1) limnology studies in the amount of $50,000 to analyze a portion of the lakes selected by Arnie Shaul and (2) a sockeye salmon broodstock development program in the amount of $47,153.

At the March 21, 1991, meeting in Anchorage the RPT unanimously **supported** (i.e., motion) extension of existing contract between Russel Creek Hatchery and AEB related to the coho program. Further, the RPT unanimously **reendorsed** the supplemental funding request from either the state or the borough to initiate limnology investigations and sockeye broodstock development. They unanimously **recommended to the Commissioner** that FRED Division pursue funding for an area biologist position to conduct the types of studies needed in the region. They further **recommended** that a representative from False Pass be encouraged to attend the meetings. Dave Osterback was unanimously **elected** as standing chairman of the RPT for an additional year.

An important part of the planning process is the adoption of key assumptions, which are certain conditions or concepts that guiude the development and implementation of the projects identified in the comprehensive salmon plan. Of the 16 planning assumptions the RPT identified for the plan, the intitial two follow:

1. The plan will consider benefits to all user groups. Equity will be a primary consideration as part of the long-term planning process.

2. Enhancement and rehabilitation projects will be designed to supplement natural stock production and harvest opportunities with minimal impacts on natural stocks and the priority for wild stock management.

Before adjourning the RPT discussed the King Crab Initiative (i.e., king crab enhancement via production level hatcheries, etc., that had been prepared by the FRED Division and submitted to the Legislature for consideration), which initially focuses on Kodiak but would branch out to other regions of the state. Dave Osterback supported Pavlof Bay in Area M, which used to be full of king and tanner crabs, as an important site to consider for a remote station. The borough is also interested in proceeding with the intitiative.

At its last meeting on June 7, 1991, in Sand Point, the RPT **recommended to the Director of FRED Divison** that the (1) cooperative agreement with AEB and ADF&G for the Russel Creek Hatchery be continued, (2) ADF&G fund limnology investigation beginning in FY 93, (3) sockeye broodstock development program at

Russell Creek be included in the FRED budget request for FY 93, and (4) the need for placing an area biologist in Cold Bay beginning in FY 93. The RPT **recommended** that U.S. Fish and Wildlife Service refuge managers be contacted to (1) make them aware of RPT planning activities, (2) inform them that some site investigations may be initiated on the refuge, and (3) request a copy of their draft Izembek management plan. Tom Bertman said it would be appropriate to get input from the region's permit holders on the list of potential systems to be studied, and it was decided to include that list (supplied by Arnie Shaul) with the questionnaire. The RPT reviewed the list of lakes and prioritized those systems for initiation of limnological investigations and site surveys, identifying funding opportunities and constraints. Gary Kyle said that prefeasiblity efforts for limnological investigations of 5 lakes would cost $25,000. The RPT decided that because of logistics, vicinity to Russell Creek Hatchery, and limited funding for field work and personnel that the 1991 investigations should focus on lakes near Cold Bay and at 2 lakes where ADF&G personnel were already stationed. Accordingly, the RPT **recommended to ADF&G and AEB** that studies be initiated at Bear, Orzenoi, Red Cove, Mortensen, and Thin Point Lakes. The first 2 lakes are more traditional sockeye lakes because they are deep and steep-sided; although the remaining 3 lakes are shallow, they currently support moderate runs of sockeye salmon. The RPT readdressed the AEB funding for a sockeye salmon broodstock development program (cost = $42,000) using Mortensen Lake stock to be conducted at Russel Creek Hatchery and **recommended** (by a vote of 5 to 1) that such a program be initiated. Historically, the Mortensen Lake system has produced a significant commercial and subsistence sockeye salmon fisheries at the mouth of the lagoon. They further **recommended** that they contact ADF&G and AEB and assist them in formalizing the necessary cooperative agreements for funding of those studies **(Note: Cooperative Agreements Nos. 92-005 and 92-006 between AEB and ADF&G for the sockeye salmon broodstock program and limnological investigations, respectively, were entered into on July 1, 1991).**

The RPT discussed three programs related to Russell Creek Hatchery that had been previously funded by AEB: (1) chum salmon rearing (cost = $23,655), (2) chum salmon marking and tagging (cost = $15,331), and (3) increased production of pink/chum salmon eggs (cost = $45,110). The RPT **recommended** (vote of 6 to 1) that the AEB fund these programs. The RPT in its final action also agreed to support the coho smolting program at Russell Creek Hatchery because of their late return (September) and availability to the commercial fishermen, noting that further discussion of cohos and chums will be taken up as an agenda item at the next meeting.

The Importance of Responding to the Enclosed Questionairre

The goal of the Area M RPT is to have a draft of the comprehensive salmon plan available for public review and comment by November or December 1991. In order for the RPT to identify needs and priorities in the fisheries and identify the types of projects and areas where they will be most productive, we need vital information

from the fishermen of Area M as well as from other user groups. It is our intention to gather as much public information as possible into the planning process of deciding what projects should be undertaken to enhance the region's salmon runs. Factors the RPT will consider when deciding which systems should be implemented include (but are not limited to) the following: (1) feasibility, (2) benefit/cost ratio, (3) which of the various user groups benefit, (4) potential management problems, and (5) is it a one-time or annual project. Please be aware that the amount of money available to study these systems may be limited, and there is no guarantee that all ideas will be pursued.

Your answers to these questions will be kept confidential, and there is no requirement that you sign your questionnaire. The results will be made public, but no fisherman will ever know how another fishermen answered the questions. So please take some time to respond and return it in the self-addressed and stamped envelope by _____, 1991. This will be the best means of making sure that **your opinions are heard!**

A draft of the comprehensive salmon plan should be available for your review and comment as scheduled, and it will not be approved by the Commissioner of ADF&G until an adequate public review process has been completed.

Sincerely,

Dave Osterback
Chairman
Alaska Peninsula/Aleutian Islands/Area M
Regional Planning Team

Enclosures

COMPREHENSIVE SALMON PLANNING QUESTIONNAIRE FOR COMMERCIAL, SPORT, AND SUBSISTENCE FISHERMEN WHO USE OR MAY USE THE SALMON RESOURCES OF THE ALASKA PENINSULA AND ALEUTIAN ISLANDS REGION (Area M)

The Alaska Peninsula/Aleutian Islands/Area M region includes all Bering Sea waters of Alaska between Cape Menshikof and the longitude of Cape Wrangell on Attu Island and all Pacific Ocean waters between Kupreanof Point and the longitude of Cape Wrangell on Attu Island, including all adjacent islands.

SPORT FISHERIES:

1. **Which categories describe your sport fishing activities in Area M?**

_____ I have sport fished for salmon in the region.

_____ I plan to sport fish for salmon in the region.

2. **In which areas in this region have you sport fished for salmon? (please specifically indicate where [fresh and marine waters] you fished and the species of fish targeted.**

3. **How many years have you sport fished in this region?**

_____ years.

4. **Which methods of salmon sport fishing do you prefer? (please rank in order of preference with your first preference indicted by No. 1, etc.)**

_____ Casting from a boat

_____ Trolling

_____ Drift fishing in a boat

_____ Fishing from shore or wading

_____ Ice fishing

_____ Snagging in marine waters

_____ Other (please specify)

5. Which four aspects about sport fishing are most important to you? (please rank in order of importance)

_____ Scenery

_____ Catching your limit

_____ Fishing by yourself

_____ Boating

_____ Peace and quiet

_____ Fishing with your friends

_____ Eating your catch

_____ Hooking, playing, and landing the fish

_____ Other (please specify)

6. Which species of salmon do you prefer to fish for? (please rank in order of preference)

_____ Pink (humpback)

_____ Red (sockeye)

_____ King (chinook)

_____ Silver (coho

_____ Dog (chum)

7. What other marine and freshwater species do you sport fish for? (please specify)

_____

8. How many salmon did you catch on sport gear in the region in 1990?

_____ Pink

_____ Red

_____ Silver

_____ Dog

_____ King

9. Overall, was you 1991 sport catch adequate?

_____ Yes

_____ No

_____ No Opinion

10. Do you need to catch your daily limit to feel satisfied?

_____ Yes _____ No Opinion

_____ No

11. What species of salmon do you think need to be either rehabilitated or enhanced?

ENHANCEMENT: The application, to a stock already at natural capacity, of procedures designed to increase the numbers of harvestable fish to a level beyond that which could naturally be produced. This may be accomplished by using artificial or semiartificial production systems or by increasing the natural productive habitat by physical or chemical modification.

REHABILITATION: The application, to a depressed stock or endangered habitat, of management, fish propagation, or habitat restoration techniques to return them to a previously recorded level of production.

Rehabilitated	Enhanced
_____ Pink	_____ Pink
_____ Red	_____ Red
_____ Silver	_____ Silver
_____ Dog	_____ Dog
_____ King	_____ King

12. What are the four most important problems with the salmon sport fisheries in the region? (please rank in order of priority, with No. 1 representing the most important problem)

_____ Lack of fish

_____ Management of fisheries

_____ Lack of enforcement

_____ Lack of boat slips

_____ Lack of access

_____ Restrictive regulations

SUBSISTENCE FISHERIES:

13. Which categories describe your subistence fishing activities in the region?

_____ I have subsistence fished in this region.

_____ I intend to subsistence fish in this region.

_____ I have not subsistence fished in this region.

14. What type of fishing gear do you use to subsistence fish?

_____ Dip net _____ Purse seine

_____ Drift gillnet _____ Beach seine

_____ Set gillnet _____ Pole, hook, and line

_____ Other (please specify) _____

15. Rank the species of salmon for personal use in order of preference.

_____ Pink _____ Silver _____ King

_____ Red _____ Dog _____ Halibut

16. Please list other species of fish (including shellfish) in order of preference.

_____ Halibut _____ Cod ----- Herring

_____ King Crab _____ Tanner Crab _____ Dolly Varden char

_____ Dungeness crab _____ Other (please specify)

17. How many subsistence salmon did you or your family catch in this region in 1991?

_____ Pink _____ Silver _____ King

_____ Red _____ Dog

18. Was this amount adequate for your needs?

_____ Yes _____ No ____ No Opinion

19. How many of the following species did you take home for personal use?

_____ Tanner crab _____ Cod _____ Halibut

_____ Dolly Varden _____ Herring _____ King crab

_____ Dungeness crab _____ Others (Please specify

COMMERCIAL FISHERIES:

20. Which category describes your commercial fishing activities in Area M?

_____ I have commercially fished for salmon in this region.

_____ I have not commercially fished for salmon in this region.

21. If you are now a commercial salmon fisherman in Area M, please indicate in which salmon fishery and in which capacity.

_____ Purse seine permit holder

_____ Drift gillnet permit holder

_____ Set gillnet permit holder

22. What percentage of you gross 1991 gross income was derived from the following sources?

_____% Salmon purse seining in Area M

_____% Salmon beach seining in Area M

_____% Salmon hand purse seining in Area M

_____% Salmon set gillnetting in Area M

_____% Salmon drift gillnetting in Area M

_____% Other fisheries in Area M

_____% Fisheries in other areas

_____% Nonfishing sources

100% Total

23. Were you satisfied with the breakdown of your 1991 income?

_____ Yes _____ No _____ Did not fish in 1991

24. If not satisfied, what would you like to see changed?

25. Was your commercial catch of salmon in Area M adequate in 1990?

_____ Yes _____ No _____ No opinion

26. Were you satisfied with you earnings from commercial salmon fishing in Area M in 1991?

_____ Yes _____ No _____ No opinion

27. If you are paying for a permit, are your earnings adequate to cover this cost?

_____ Yes _____ No _____ No opinion

28. Do you own a licensed commerical fishing boat?

_____ Yes _____ No

29. Is your boat financed?

_____ Yes _____ No

30. What is the total investment you have in your permit, boat, and gear for the salmon fishery?

$_____ Permit $_____Gear $_____Boat $_____Total

31. What do you need to gross from all sources of income in an average year to pay for your fishing and living expenses?

$_____

32. What other fisheries do you participate in Area M?

_____ King crab _____ Tanner crab _____Halibut

_____ Dungeness crab _____ Herring _____ Cod

_____ Dolly Varden char _____ Other (please specify)

33. **What species of salmon would you like to see increased? (please rank your choices according to preference, with No. 1 representing the most important species)**

_____ Pink _____Red _____ Silver

_____ Dog _____ King

34. **Which salmon species do you prefer to take home for personal use? (please rank in order of preference, with No. 1 representing the most preferable)**

_____ Pink _____ Red _____ Silver

_____ Dog _____ King

35. **How many of the following salmon species did you take home for personal use during the 1991 commercial season?**

_____ Pink _____ Red _____ Silver

_____ Dog _____ King

36. **In which district do you prefer to gillnet (set or drift) for salmon? (please rank in order of preference, with No. 1 representing the district most preferred)**

_____ Northern District _____ Northwestern District

_____ Unimak District _____ Southwestern District

_____ South Central District _____ Southeastern District

_____ Akutan District _____ Unalaska District

_____ Umnak District _____ Adak District

37. **In which district do you prefer to seine for salmon? (please rank in order of preference, with No. 1 representing the district most preferred)**

_____ Northern District _____ Northwestern District

_____ Unimak District _____ Southwestern District

_____ South Central District _____ Southeastern District

_____ Akutan District _____ Unalaska District

_____ Umnak District _____ Adak District

38. What are the most important problems with commercial fisheries in the region? (please rank them in order of most concern, with No. 1 representing the greatest concern)

_____ Lack of fish _____ Management _____ Enforcement

_____ Overcrowding _____ Regulation _____ Price/Markets

_____ Habitat protection _____Other (please specify below)

39. Should the Alaska Peninsula Aleutian Islands Aquaculture Association (APAIAA) consider salmon hatcheries if locations could be found where reasonable segregations from natural stocks could be accomplished?

_____ Yes _____ No _____ Possibly _____ No opinion

40. What are your concerns when considering locating a hatchery in your region? (please rank 1 through 5, with No. 1 representing your greatest concern)

_____ Virus _____ Harm to natural stocks

_____ Too expensive to build and run

_____ Problems can be overcome _____ Other (please specify)

41. Enhancing and/or rehabiltating the salmon runs and increasing the benefits of this resource will require various activities to take place. Please indicate if you approve, disapprove, or have no opinion concerning the following activities. (Please circle your answer)

Approve Disapprove No Opinion Construct fish hatcheries

Approve Disapprove No Opinion Install streamside incubation boxes

Approve Disapprove No Opinion Build fish ladders

Approve Disapprove No Opinion Fertilize lakes

Approve Disapprove No Opinion Stock lakes

Approve Disapprove No Opinion Clear streams of obstructions

Approve Disapprove No Opinion Transport fish to barren lakes

Approve Disapprove No Opinion Initiate tagging studies

Approve Disapprove No Opinion Build more boat slips/harbors

42. **Please write down any other comments, questions, or suggestions below:**

RESPONSES TO QUESTIONNAIRE

There were 90 responses to the comprehensive salmon planning questionanaire for commercial, sport, and subsistence fishermen of the Alaska Peninsula and Aleutian Islands region.

SPORT FISHERIES:

1. Which categories describe your sport fishing activities in Area M?

55 respondents (60%) indicated they had sport fished for salmon in the region. Of those 55, thirteen indicated they planned to sport fish for salmon in the region.

2. In which areas in this region have you sport fished for salmon? (please specify where you fished [fresh and marine water] and the species targeted.

40 respondents provided specific information regarding location and/or species that break down as follows (number of respondents selecting location in parenthesis):

Port Moller (1)
Thin Point (4)
Mortensens Lagoon (4), coho
Kenesarof Lagoon (1)
Charlie Hansens (2)
Swedes Lake (3), sockeye
Akutan Bay (1)
Kupreanof (1), pink
Unga Cape (1), halibut
Swansons Lagoon (2), coho
Volcano Bay (1)
Popof Head (1), coho, sockeye
Bear Lake (1)
Mollek Bay (1)
Shumigan Islands (3), coho
South Unimak (1)
King Cove (2)
Bird Island (1), halibut
John Nelson (1)
Murder Cove (1), coho
Cape Aksit (1), sockeye
Squaw Harbor (1), coho
King Salmon River (9), king, coho
King Cove Lagoon (2), coho
Russell Creek (1)
Belkofski Bay (1)
Whalebone (1)
Morzhovoi Bay (1)
False Pass (1), sockeye, chum
Kelly Rock (1), coho
Ilnik Lagoon (1)
Urilia Bay (2), cohos, sockeye
Sand Point (4), coho
Franks Lagoon (1)
Sandy Lake (1)
Unalaska Island (1)
Nelson Lagoon (5) king, coho
Cold Bay (1)
Sapsuk River (1)
Fox Bay (1)
Apollo Creek (1)
Hereendeen Bay (1)
Cape Lazaref (1), sockeye

The sport fishing effort is widely distributed throughout the region, and only moderate concentrations of effort occur at King Salmon River (10% of sample and 18% of those

respondents involved in sport fishing activities) for king and coho salmon. Smaller concentrations of sport fishing occur at Nelson Lagoon (6% of sample, 9% of those who had sport fished) and at Thin Point, Sand Point, and Mortensens Lagoon at 4% and 7%, respectively.

3. How many years have you sport fished in this region?

The average number of years for the 51 respondents was 16. Two respondents said they had been sport fishing in the region for 50 years.

4. Which methods of salmon sport fishing do you prefer (ranked in order of preference)?

44 respondents ranked the foregoing methods of sport fishing in terms of their preferences, although not all of the respondents ranked all 6 of them. The over all ranking follow:

1. Fishing from shore or wading (68% of 1st-place votes, 14% 2nd-place votes)--41 votes cast.

2. Casting from a boat (23% of 1st-place votes, 39% 2nd-place votes)--31 votes cast.

3. Drift fishing in a boat (5% 1st-, 19% 2nd-, and 35% 3rd-place votes)--21 votes cast.

4. Snagging in marine waters (11% 2nd-, 17% 3rd-, and 20% 4th-place votes)--17 votes cast.

5. Ice fishing (2% 1st-, 11% 2nd-, 9% 3rd-, 13% 4th-, and 50% 5th-place votes)--16 votes cast.

6. Trolling (2% 1st-, 6% 2nd-, 9% 3rd, 27% 4th, and 25% 5th-place votes)--13 votes cast.

5. Which four aspects about sport fishing are most important to you (please rank in order of importance).

The choices were as follows: scenery, catching your limit, fishing by yourself, boating, peace and quiet, fishing with your friends, eating your catch, and hooking, playing, and landing the fish.

43 respondents ranked their choices in order of preference as follows:

1. Hooking, playing, and landing the fish (38 votes--44% 1st-, 10% 2nd-, and 14% 3rd-place votes)

2. Fishing with your friends (34 votes--23% 1st-, 27% 2nd-, and 20% 3rd-place votes)

3. Eating your catch (29 votes--12% 1st-, 15% 2nd-, and 17% 3rd-place votes)

4. Scenery (26 votes--7% 1st-, 24% 2nd-, and 11% 3rd-place votes)

5. Peace and quiet (27 votes--9% 1st-, 15% 2nd, and 14% 3rd-place votes)

6. Fishing by yourself (14 votes--2% 1st-, 5% 2nd-, 9% 3rd-, 7% 4th-, 7% 5th-, and 25% 6th-place votes)

7. Catching your limit (13 votes--2% 1st-, 6% 3rd-, 3% 4th-, 13% 5th-, 30% 7th-, and 40% 8th-place votes)

8. Boating (16 votes--5% 2nd-, 11% 3rd-, 10% 4th-, 7% 5th-, 8% 6th-, and 50% 7th-place votes)

6. Which species of salmon do you prefer to fish for? (Please rank in order of preference)

Pink, Red, King, Silver, or Dog?

50 respondents ranked their choices by preference as follows:

1. Silver (47 votes--58% 1st- and 42% 2nd-place votes)

2. King (38 votes--28% 1st-, 37% 2nd-, and 22% 3rd-place votes)

3. Red (32 votes--14% 1st-, 18% 2nd-, and 38% 3rd-place votes)

4. Dog (28 votes--22% 3rd-, 45% 4th-, and 31% 5th-place votes)

5. Pink (29 votes--16% 3rd-, 35% 4th-, and 50% 5th-place votes)

7. What other marine and freshwater species do you sport fish for?

The choices of the 45 respondents follow

1. Halibut--24 votes 2. Trout--15 votes

3. Char--14 votes 4. Cod--9 votes

5. Crab--3 votes 6. Rock Fish--2 votes

7. Eel, Black Bass, and Sole--1 vote each

8. How many salmon did you catch on sport gear in the region in 1990?

37 respondents enumerated the number and species of fish as follows:

1. Silvers--29 votes, totalling 339 silvers.

2. Pinks--12 votes, totalling 187 pinks, although one respondent was responsible for 100 pinks.

3. Reds--10 votes, totalling 102 reds.

4. Kings--12 votes, totalling 84 kings.

5. Dogs--8 votes, totalling 36 dogs.

9. Overall, was your 1991 sport catch adequate?

Twenty-nine (54% of respondents) said yes, sixteen (30%) had no opinion, and nine (16%) said no.

10. Do you need to catch your daily limit to feel satisfied?

Of 54 respondents, forty-three (80%) said no, six (11%) had no opinion, and five (9%) said yes.

11. What species of salmon do you think need to be either rehabilitated or enhanced?

Fifty-five responded:

REHABILITATION	ENHANCEMENT
Reds--28 votes (51%)	Reds--37 votes (67%)
Silvers--27 votes (49%)	Kings--30 votes (55%)
Kings--23 votes (42%)	Silvers--27 votes (49%)
Dogs--11 votes (20%)	Pinks--9 votes (16%)
Pinks--8 votes (15%)	Dogs--4 votes (7%)

12. What are the four most important problems with the salmon sport fisheries in the region (ranked in order of importance)?

The ranking for 40 respondents follows:

1. Lack of enforcement--24 votes (28% 1st-, 21% 2nd-, and 22% 3rd-place votes)

2. Lack of access--27 votes (23% 1st-, 28% 3rd-, and 33% 3rd-place votes)

3. Lack of fish--20 votes (35% 1st-, 18% 4th-, and 22% 5th-place votes)

4. Management of fisheries--21 votes (8% 1st-, 35% 2nd-, and 33% 3rd-place votes)

5. Restrictive regulations--16 votes (8% 1st-, 10% 2nd-, 6% 3rd-, 35% 4th-, nad 33% 5th-place votes)

6. Lack of boat slips--12 votes (7% 2nd-, 6% 3rd-, 18% 4th-, 11% 5th-, and 71% 6th-place votes)

SUBSISTENCE FISHERIES:

Please Note: Because of the (1) "personal use" language in questions 15 and 19 may have been misleading and resulting responses to those questions sparse and (2) redundant nature of the last category selection for question No. 13 (i.e., I have not subsistence fished in this region), all those responses to subsistence-related questions by those who indicated **they had not been involved in subsistence fishing activities in the region** have been deleted from consideration. Accordingly, forty-four (48% of those returning questionnaires) responded completely to subsistence fisheries'questions.

13. Which categories describe your subsistence fishing activities in the region?

There were 44 responses (48% of total); forty-two said they had subsistence fished in the region, and twelve said they intended to subsistence fish in the region.

14. What type of fishing gear do you use to subsistence fish?

There were 44 responses; please note that some of the respondents indicated more than one type of gear. The methods are listed in descending order from the most commonly used to the least used methods; the number of votes for each are also included in parenthesis.

1. Set gillnet (33)
2. Drift gillnet (15)
3. Pole, hook, and line (10)
4. Purse seine (6)
5. Beach seine (5)
6. Dip net (3)

15. Rank the species of salmon for personal use in order of preference.

Forty respondents (44% of total) ranked species as follows:

1. Red--39 votes (58% 1st-, 18% 2nd-, and 21% 3rd-place votes)
2. King--33 votes (35% 1st- and 24% 2nd-place votes)

3. Silver--40 votes (5% 1st-, 44% 2nd-, and 29% 3rd-place votes)
4. Halibut--30 votes (2% 1st-, 15% 2nd-, 15% 3rd, and 36% 4th-place votes)
5. Dog--27 votes (9% 3rd-, 13% 4th-, 50% 5th, and 27% 6th-place votes)
6. Pink--28 votes (3% 3rd-, 16% 4th-, 32%, 5th, and 59% 6th-place votes)

16. Please list other species of fish (including shellfish) in order of preference.

Thirty-six respondents (40% of total) ranked species as follows:

1. King crab--35 votes (64% 1st- and 26% 2nd-place votes)
2. Halibut--36 votes (31% 1st-, 23% 2nd-, and 31% 3rd-place votes)
3. Tanner crab--24 votes (23% 2nd-, 25% 3rd-, and 18% 4th-place votes)
4. Cod--27 votes (3% 1st-, 9% 2nd-, 16% 3rd-, 21% 4th-, 22% 5th-, and 24% 6th-place votes)
5. Dungeness crab--27 votes (14% 2nd-, 16% 3rd-, 15% 4th-, 17% 5th-, 5% 6th-, and 36% 7th-place votes)
6. Dolly Varden char--23 votes (2% 1st-, 6% 3rd-, 21% 4th-, 22% 5th-, 29% 6th-, and 21% 7th-place votes)
7. Herring--13 votes (13% 5th-, 29% 6th, and 29% 7th-place votes)

17. How many subsistence salmon did you or your family catch in this region in 1991?

There was a total of 39 responses (43% of total).

1. Red--39 responses for a total of 2,574 subsistence reds or 66 fish/fisherman.
2. Silver--33 responses for a total of 1,574 subsistence silvers or 48 fish/fisherman.
3. Pink--16 responses for a total of 594 subsistence pinks or 37 pinks/fishermen.
4. Dog--19 responses for a total of 478 subsistence dogs or 25 dogs/fisherman.
5. King--24 responses for a total of 200 subsistence kings or 8 fish/fisherman.

18. Was this amount adequate for your needs?

There were 41 responses (45% of total): 28 (68%) respondents indicated **Yes**, 12 (29%) indicated **No**, and 1 (3%) had **No Opinion.**

19. How many of the following species did you take home for personal use?

Twenty-nine responses (32% of total) were recorded as follows:

1. Cod--17 responses for a total of 320 subsistence cod or 15 fish/fisherman.
2. Tanner crab--11 responses for a total of 168 subsistence tanner crab or 19/fisherman.
3. Dolly Varden char--9 responses for a total of 148 subsistence char or 18/fisherman; however, please note that 1 respondent said he had caught and unspecified "100s" of Dolly Varden char for subsistence purposes, which would bring the number up considerably.
4. King crab--13 responses for a total of 134 subsistence King crab or 10/fisherman.

5. Herring--2 responses for a total of 85 subsistence herring or 42/fisherman.
6. Dungeness crab--5 responses for a total of 44 subsistence crabs or 9/fisherman.

COMMERCIAL FISHERIES:

20. Which category describes your commercial fishing activities in Area M?

Eighty-seven of 90 respondents (97%) indicated they had commercially fished in Area M. Two (2%) indicated they had not commercially fished in Area M, and one did not respond to the question.

21. If you are now a commercial salmon fisherman in Area M, please indicate in which salmon fishery and in which capacity.

Eighty-seven responses (97%) were recorded as follows (please note that respondents may hold permits for different gear groups):

1. Forty-seven respondents indicated they had drift gillnet permits.

2. Thirty-one respondents indicated they had set gillnet permits.

3. Twenty-four respondents indicated they had purse seine permits.

22. What percentage of your 1991 gross income was derived from the following sources? Eighty-three responses (92% of total) were recorded as follows:

Twenty-seven (32%), nine (11%), and six (7%) responses indicated 100% of their gross income for 1991 was derived from the drift gillnet, set gillnet, and purse seine fisheries, respectively. Eighteen (22%) additional responses indicated that 100% of their gross income for 1991 was derived totally from a combination of fisheries in Area M, and six (7%) others indicated that the 100% was derived solely from fisheries within Area M as well as fisheries in other areas. Ten (12%) more respondents indicated that over 80% of their gross income was derived from fisheries in Area M, while the remaining 20% or less was derived from nonfishing sources. Three (4%) respondents reported 60% of their gross income for 1991 from drift gillnetting and the remaining 40% from nonfishing sources, and two (2%) respondents reported 50% from fishing sources in Area M and 50% from non fishing sources. Only two (2%) respondents indicated earning less than 50% of their gross income for 1991 from fishing sources in Area M and the remainder from nonfishing sources.

23. Were you satisfied with the breakdown of your 1991 income?

Eighty-four (93% of total) responses were recorded as follows:
1. Sixty-one (73%) voted **No,** and twenty-three (27%) voted **Yes.**

24. If not satisfied, what would you like to see changed?

Forty-four (49% of total) responses were recorded as follows:

1. Better price or expansion of markets received 28 votes (56%).
2. Removing or revisiting for purpose of raising it received 10 votes (20%).
3. More time fishing received 12 votes (24%).

25. Was your commercial catch of salmon in Area M adequate in 1990?

Eighty-six (96%) responses were recorded as follows:

Forty-three (50%) voted **Yes**, thirty-nine (45%) voted **No**, and four (5%) had **No Opinion.**

26. Were you satisfied with your earnings from commercial salmon fishing in Area M in 1991?

Ninety (100%) responses were recorded as follows:

Eighty-one (90%) respondents voted **No**, four (4%) voted **Yes**, and five (6%) had **No opinion.**

27. If you are paying for a permit, are your earnings adequate to cover this cost?

Seventy-six (84%) responses were recorded as follows:

Forty-two (55%) respondents had no opinion, twenty-five (33%) voted **No**, and nine (12%) voted **Yes.**

28. Do you own a licensed commercial fishing boat?

Eighty-seven (97%) responses were recorded as follows:

Eighty respondents (92%) indicated they owned their commercial boats and seven said they did not own them.

29. Is your boat financed?

Eighty (89%) responses were recorded as follows:

Thirty-two respondents (40%) said **Yes** their boats were financed and 48 respondents (60%) said **No** they were not financed.

30. What is the total investment you have in your permit, boat, and gear for the salmon fishery? Please note that gear groups have not been specified.

Fifty-eight (64%) respondents indicated that the average investment for a permit was approximately $258,000; sixty-eight (76%) respondents indicated the average investment for gear was approximately $42,000; sixty-one (68%) respondents indicated the average investment for a boat was approximately $227,000; and seventy-three ((81%) respondents indicated that their average total investment was $441,000.

31. What do you need to gross from all sources of income in an average year to pay for your fishing and living expenses? Please note that all gear groups have been combined.

Seventy-four respondents (82%) indicated that the average income needed in an average year was $145,000.

32. In what other Area M fisheries do you participate?

Thirty-seven respondents (41% of total) indicated participating in the following commercial fisheries:

King crab, 5 (14% of the fishermen responding to the question); Tanner crab, 6 (16%); Halibut, 31 (84%); Dungeness crab, 2 (5%); Herring, 8 (22%); Cod, 21 (57%); Dolly Varden char, 1 (3%)

33. What species of salmon would you like to see increased? (ranked according to preference)

Seventy-four respondents (82%) ranked salmon species as follows:

1. Red--71 votes (92% 1st- and 5% 2nd-place votes)
2. Silver--67 votes (51% 1st- and 47% 3rd-place votes)
3. King--60 votes (8% 1st-, 28% 2nd-, 27% 3rd-, 8% 4th-, and 31% last-place votes)
4. Dog--51 votes (15% 2nd-, 15% 3rd-, 50% 4th-, and 15% last-place votes)
5. Pink--51 votes (2% 2nd-, 11% 3rd-, 34% 4th-, and 54% last-place votes)

34. Which salmon species do you prefer to take home for personal use (ranked in order of preference)?
Eighty respondents (89%) ranked salmon species as follows:

1. Red--78 votes (70% 1st-, 13% 2nd-, and 17% 3rd-place votes)
2. King--69 votes (23% 1st-, 35% 2nd-, and 31% 3rd-place votes)
3. Silver--70 votes (6% 1st-, 49% 2nd-, and 41% 3rd-place votes)
4. Dog--51 votes (1% 1st-, 3% 2nd-, 9% 3rd-, and 63% 4th-place votes)
5. Pink--48 votes (2% 3rd-, 29% 4th-, and 69% last-place votes)

35. How many of the following salmon species did you take home for personal use during the 1991 commercial fishing season?

Sixty respondents (67%) indicated taking the following number of species:

1. Red--55 respondents reported taking 2,177 reds for personal use or 29/person.
2. Silver--42 respondents reported taking 1,125 silvers for personal use or 28/person.
3. King--40 respondents reported taking 278 kings for personal use or 7/person.
4. Dog--13 respondents reported taking 367 dogs for personal use or 28/person.
5. Pink--only 10 respondents reported taking 286 pinks for personal use or 29/person.

36. In which district do you prefer to gillnet (set or drift) for salmon? (ranked in order of preference)

There was essentially a tie between the Northern and Unmimak Districts; the results for each follow:

1. Northern District--48 votes (44% 1st- and 29% 2nd-place votes)
   Unimak District--48 votes (41% 1st- and 31% 2nd-place votes)

3. Northwestern District--21 votes (5% 1st-, 14% 2nd-, 17% 3rd-, and 15% 4th-place votes.

4. Southcentral District--18 votes (5% 1st-, 6% 2nd-, 22% 3rd, and 31% 4th-place votes)

5. Southwestern and Southeastern Districts, with 15 votes each, tied for 5th place--the preferences equally ranked between them.

The number of votes for the remaining districts (i.e., Akutan, Umnak, Unalaska, and Adak) were insufficient to establish any significant correlations.

37. In which district do you prefer to seine for salmon? (ranked in order of preference)

The rankings are as follows:

1. Unimak District--18 votes (35% 1st- and 64% 2nd-place votes)
2. Southcentral District--17 votes (30% 1st-, 7% 2nd-, and 50% 3rd-place votes)
3. Southeastern District--10 votes (25% 1st-, 14% 2nd-, and 17% 3rd-place votes)
4. Southwestern District--11 votes (10% 1st-, 14% 2nd-, and 25% 3rd-place votes)

The number of votes for the remaining districts (i.e., Northern, Akutan, Umnak, Unakaska, and Adak) were insufficient to establish any significant correlations

38. What are the most important problems with commercial fisheries in the region (ranked in order of greatest concern)?

Eight-one respondents (90%) ranked the problems as follows:

1. **Price/Markets**--76 votes (48% 1st-, 32% 2nd-, and 14% 3rd-place votes)
2. **Regulation**--53 votes (22% 1st-, 8% 2nd-, 19% 3rd-, and 13% 4th-place votes)
3. **Management**--53 votes (15% 1st-, 15% 2nd-, 18% 3rd-, and 18% 4th-place votes)
4. **Enforcement**--55 votes (9% 1st-, 22% 2nd-, 12% 3rd-, and 25% 4th-place votes)
5. **Lack of fish**--47 votes (5% 1st-, 11% 2nd-, 9% 3rd-, 18% 4th-, and 26% 5th-place votes)
6. **Overcrowding**--39 votes (1% 1st-, 11% 2nd-, 19% 3rd-, 11% 4th-, 8% 5th-, and 10% 6th-place votes)
7. **Habitat**--33 votes (1% 1st-, 9% 3rd-, 7% 4th-, 23% 5th-, 20% 6th-, and 16% last-place votes.

39. Should the Alaska Peninsula Aleutian Islands Aquaculture Association (APAIAA) consider salmon hatcheries if locations could be found where reasonable segregations from natural stocks could be accomplished?

Eighty-eight respondents (98%) addressed the question as follows:

No, 30 (34%); **Yes,** 25 (28%); **Possibly**, 25 (28%); **No Opinion,** 8 (9%)

40. What are your concerns when considering locating a hatchery in your region (ranked in order of greatest concern to lesser concerns)?

Eighty-two respondents (91%) ranked concerns as follows:

1. **Harm to natural stocks**--75 votes (67% 1st- and 17% 2nd-place votes)
2. **Virus**--61 votes (17% 1st- and 63% 2nd-place votes)
3. **Too expensive to build and run**--44 votes (11% 1st-, 17% 2nd-, and 57% 3rd-place votes)
4. **Problems can be overcome**--35 votes (2% 1st-, 2% 2nd-, 12% 3rd-, and 47% 4th-place votes)

Other concerns (total of 6 votes, ranging in preference from 1 to 5) related to management, marketing, and excessive production.

41. Enhancing and/or rehabilitating salmon runs and increasing the benefits of this resource will require various activities to take place. Please indicate if you approve, disapprove, or have no opinion concerning the following activities.

1. Construct fish hatcheries--81 votes (37% APPROVE, 41% DISAPPROVE, and 22% NO OPINION)

2. Install streamside incubation boxes--83 votes (68% APPROVE, 17% DISAPPROVE, and 15% NO OPINION)

3. Build fish ladders--85 votes (64% APPROVE, 13% DISAPPROVE, and 23% NO OPINION)

4. Fertilize lakes--83 votes (61% APPROVE, 15% DISAPPROVE, and 24% NO OPINION)

5. Stock lakes--81 votes (58% APPROVE, 20% DISAPPROVE, and 22% NO OPINION)

6. Clear streams of obstructions--87 votes (82% APPROVE, 9% DISAPPROVE, and 9% NO OPINION)

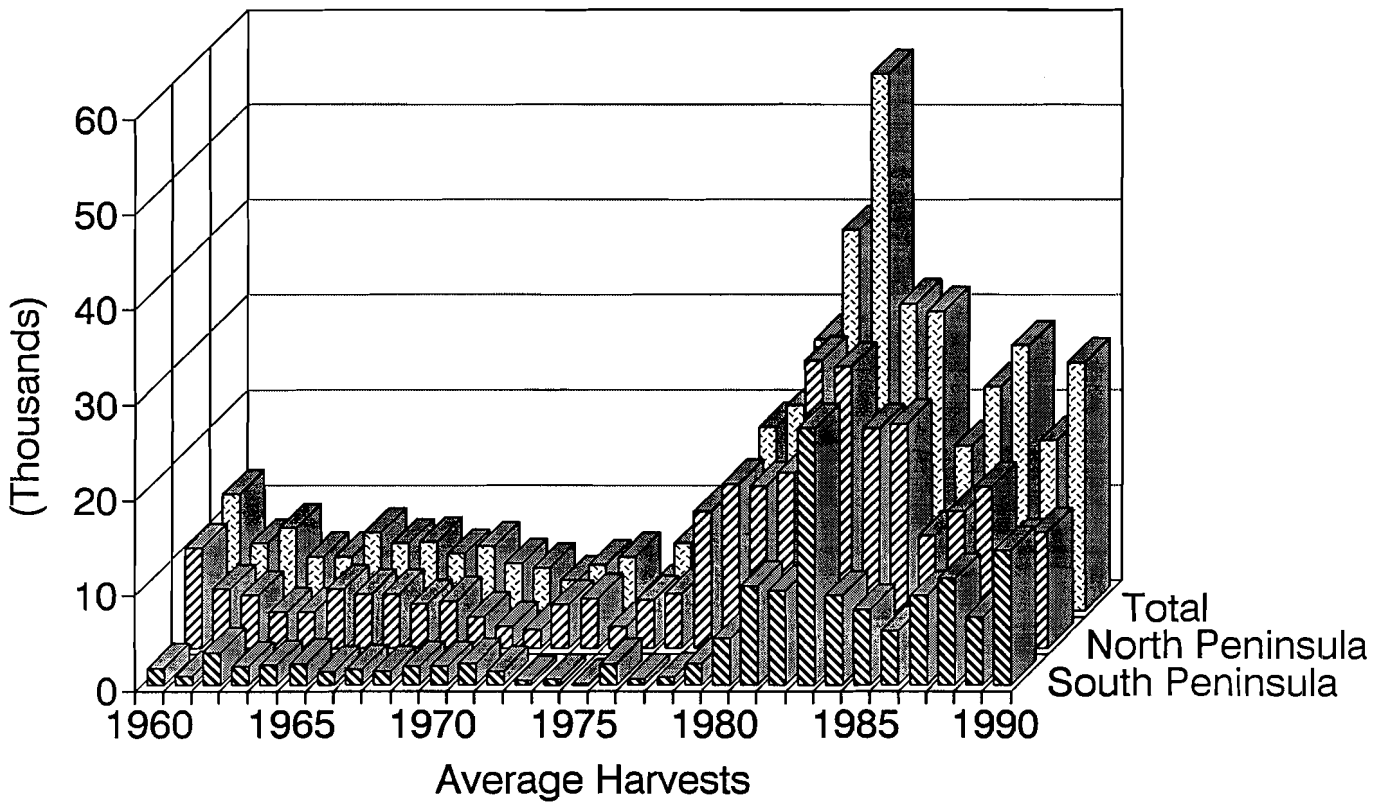
7. Transport fish to barren lakes--84 votes (61% APPROVE, 19% DISAPPROVE, and 20% NO OPINION)

8. Initiate tagging studies--84 votes (66% APPROVAL, 20% DISAPPROVAL, and 14% NO OPINION)

9. Build more boat slips/harbors--83 votes (34% APPROVAL, 26% DISAPPROVAL, and 40% NO OPINION.

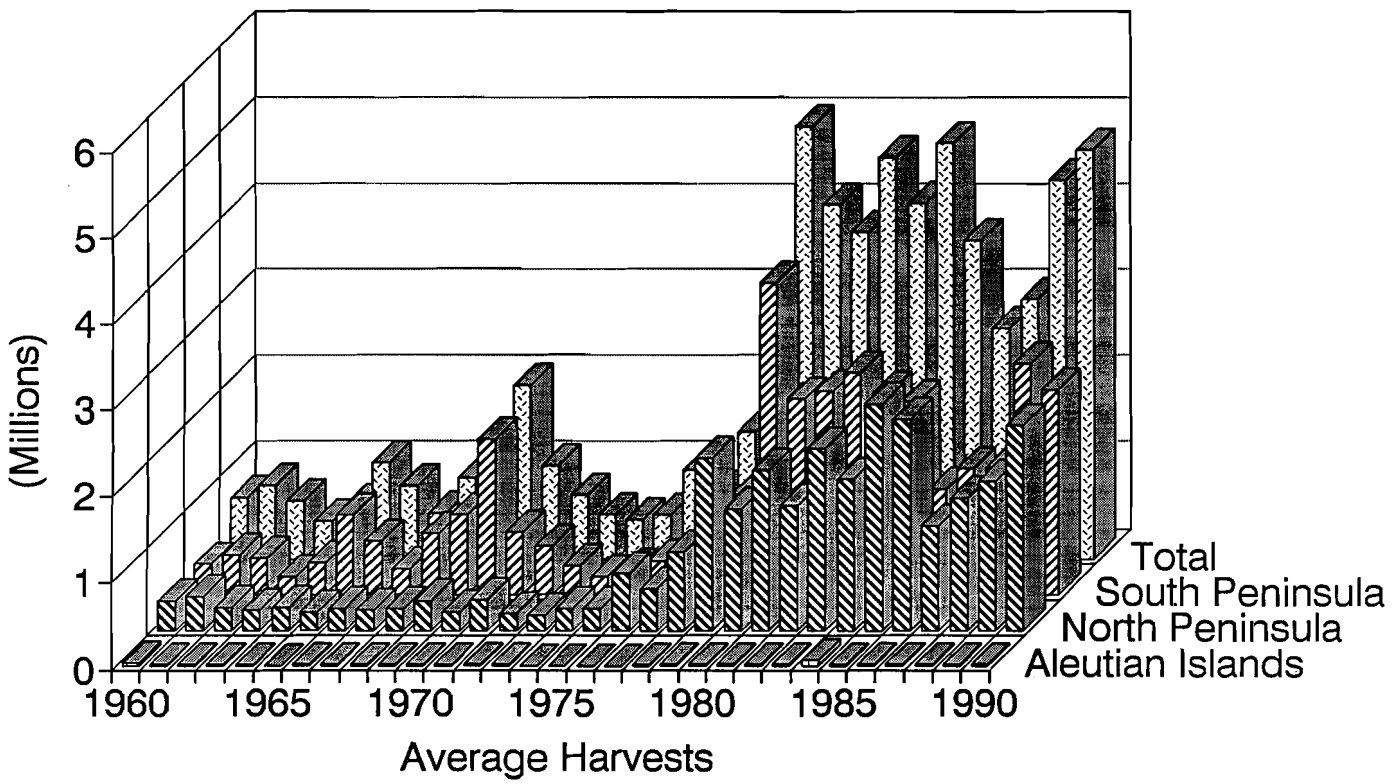
APPENDIX B

Alaska Peninsula
King Salmon Harvests 1960-1990



South Peninsula - 4,700 North Peninsula - 10,416 Total - 14,681

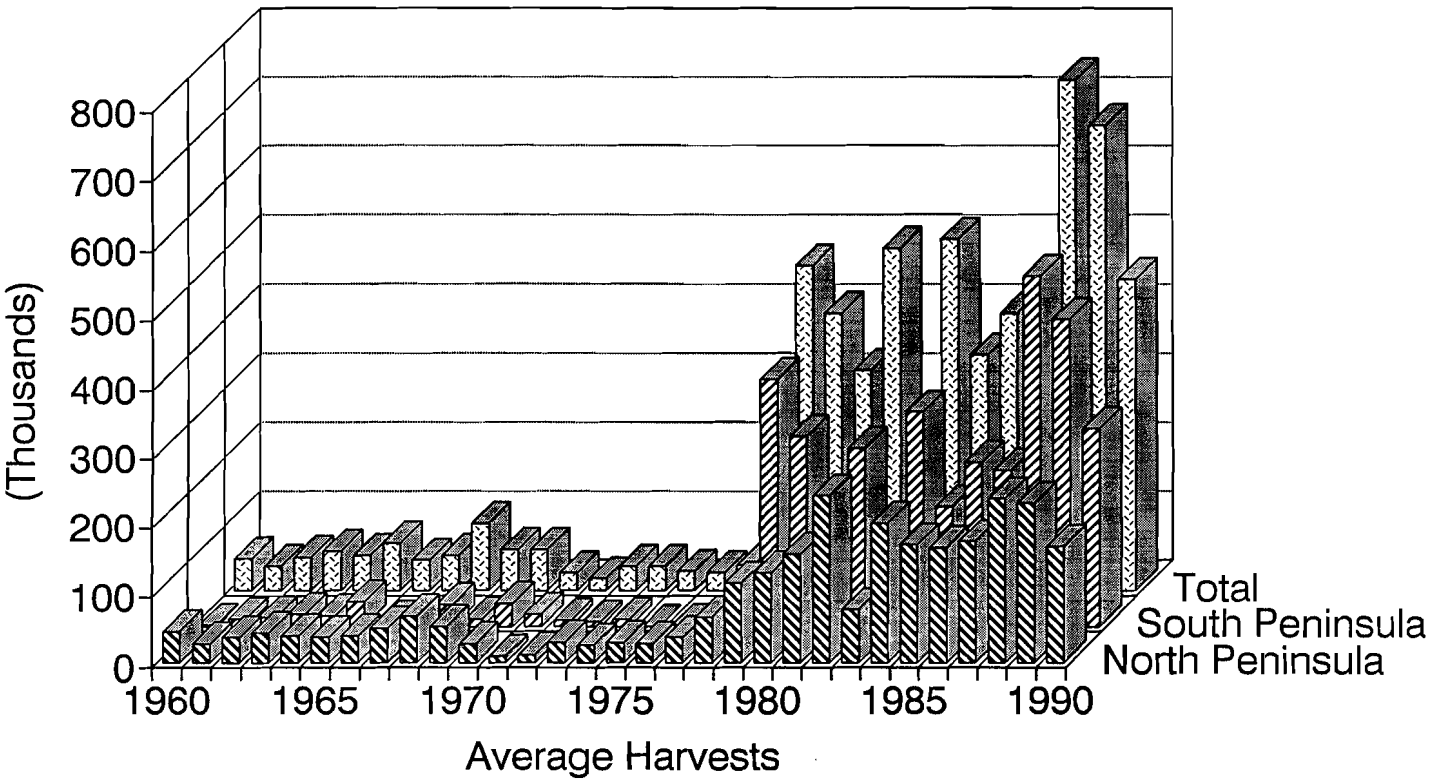
Alaska Peninsula - Aleutian Islands
Sockeye Salmon Harvests 1960-1990



South Peninsula - 1,160,852 North Peninsula - 916,871 Aleutians 5,806

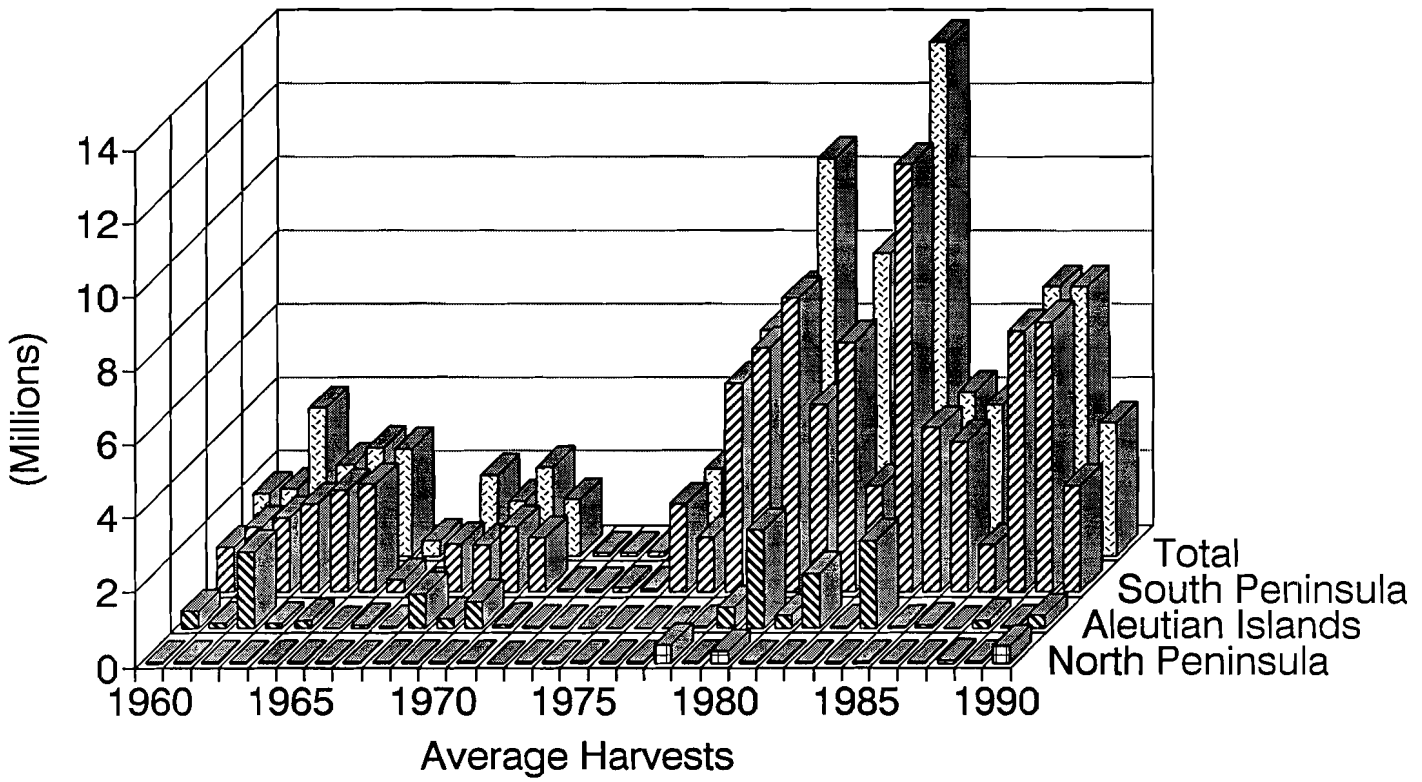
Total 2,084,684

Alaska Peninsula Coho Salmon Harvests
1960 - 1990



South Peninsula - 117,106 North Peninsula - 87,042 Total 204,168

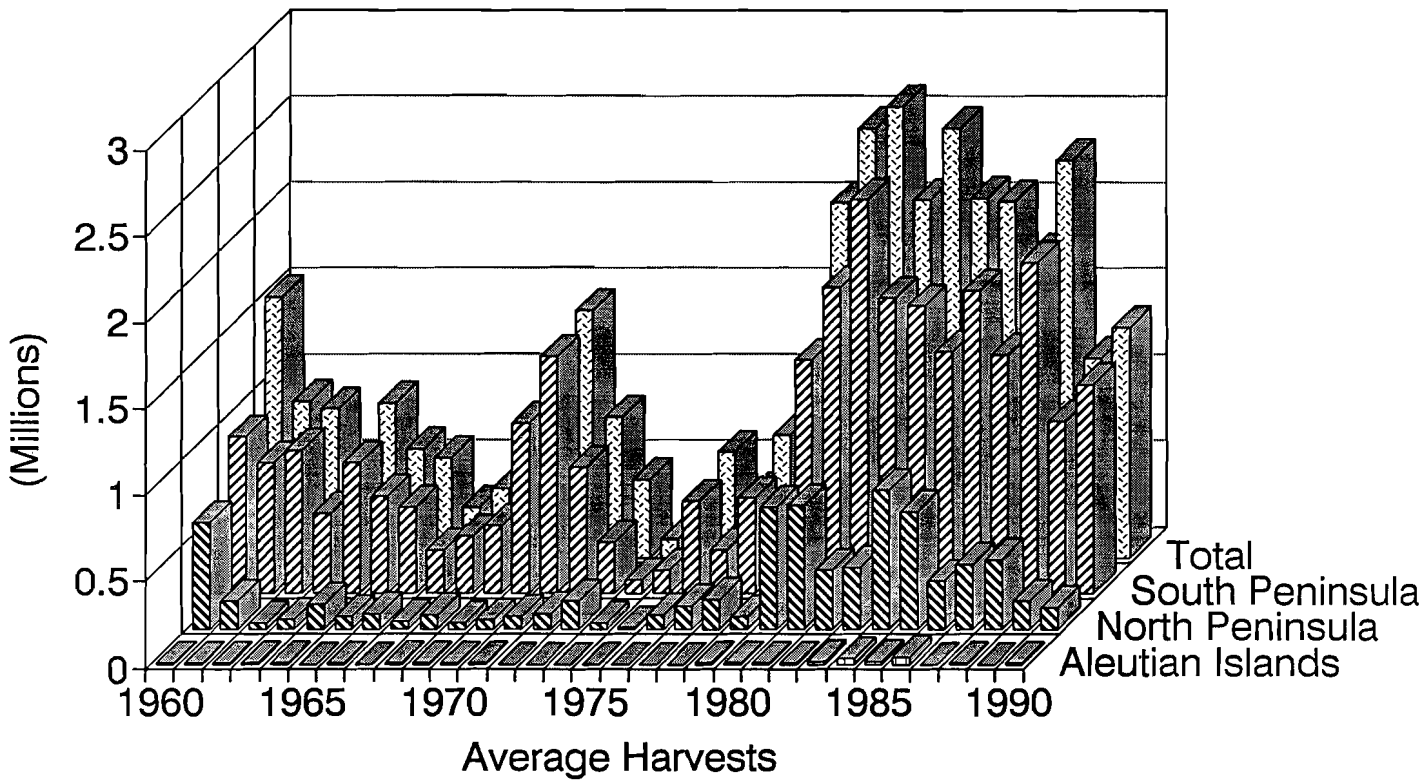
Alaska Peninsula - Aleutian Islands
Pink Salmon Harvests 1960-1990



South Peninsula - 3,104,481 Aleutian Islands - 404,600 North Peninsula - 48,242

Total - 3,554,097

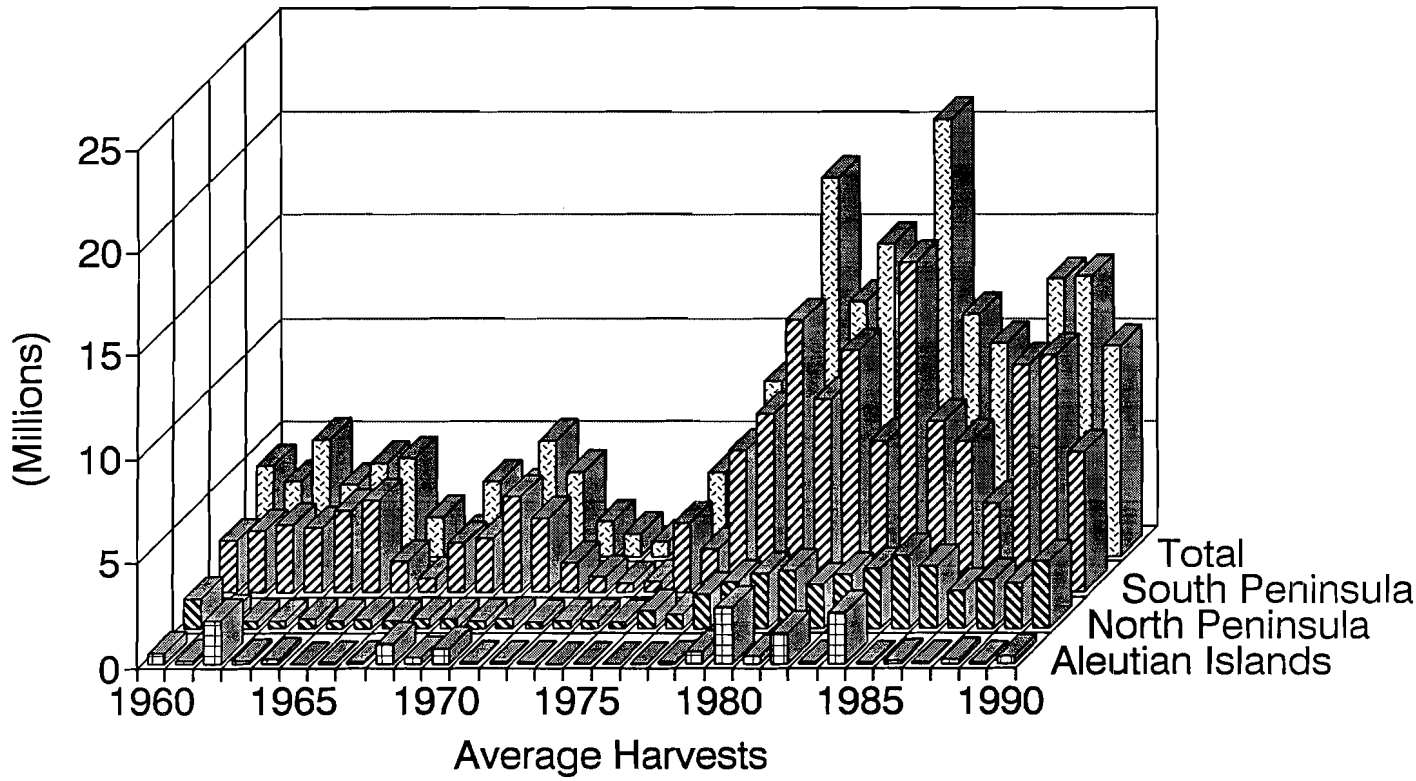
Alaska Peninsula - Aleutian Islands
Chum Salmon Harvests 1960-1990



South Peninsula - 918,242 North Peninsula - 224,945 Aleutian Islands - 4,139

Total - 1,147,329

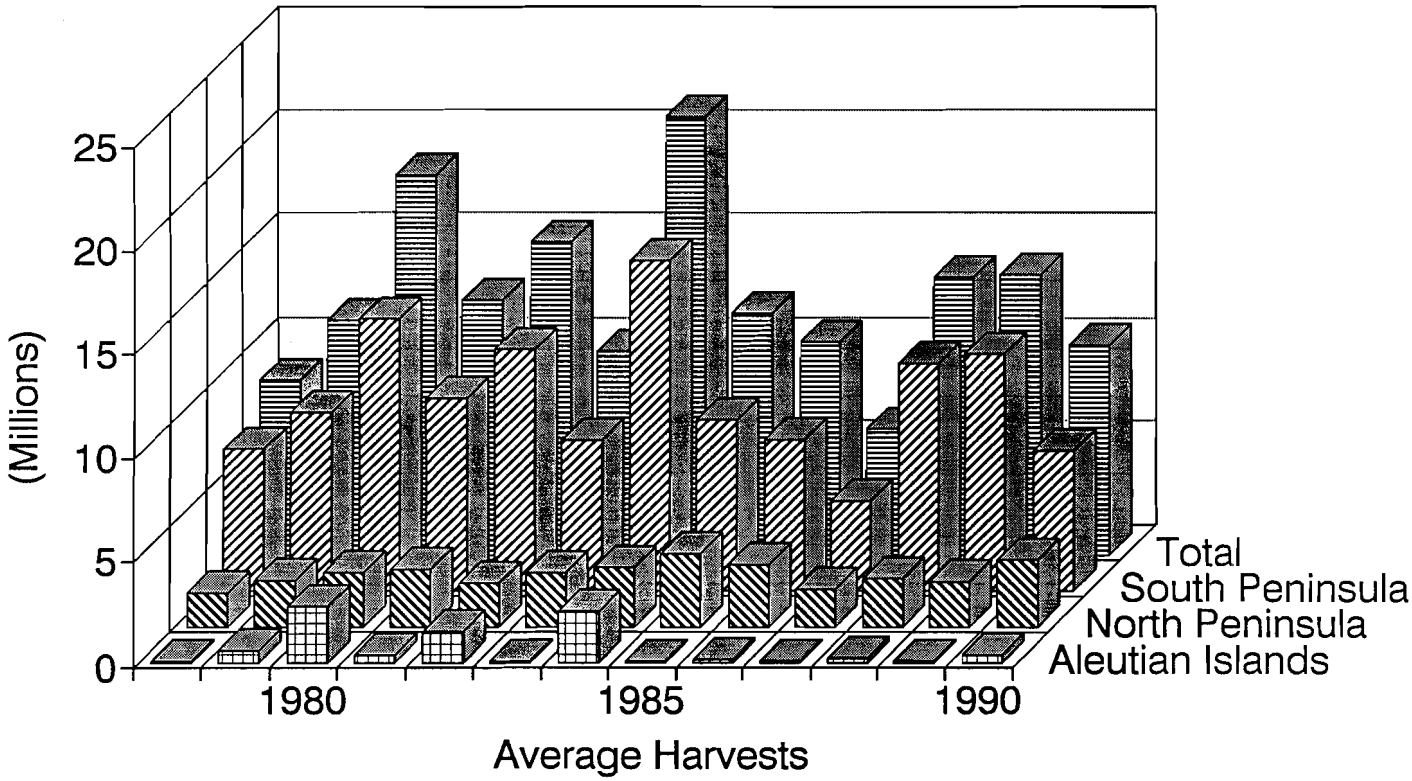
Alaska Peninsula - Aleutian Islands
Total Salmon Harvest 1960-1990



South Peninsula - 5,303,284 North Peninsula - 1,300,448 Aleutian Islands - 413,929

Total - 7,017,732

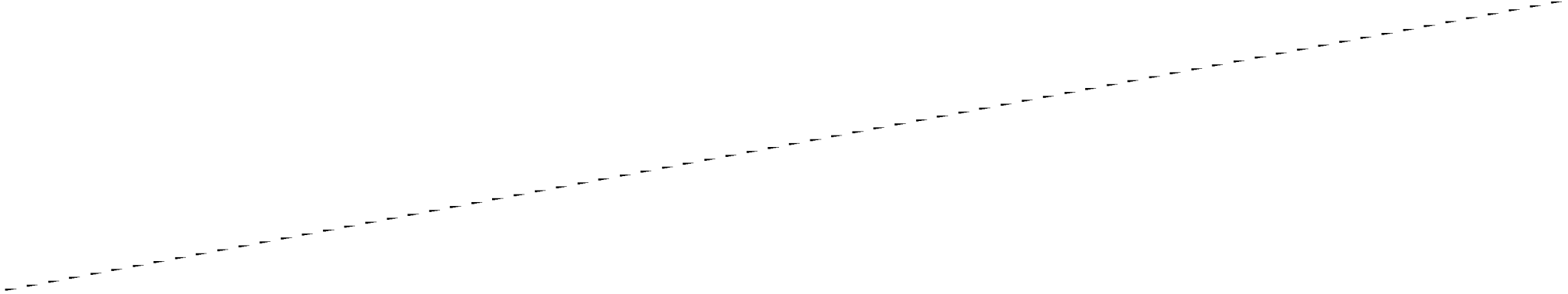
Alaska Peninsula-Aleutian Islands
Total Harvest, All Species 1978-1990



Average Harvests

South Peninsula - 9,326,023 North Peninsula - 2,467,877

Aleutian Islands - 617,054 Total - 12,410,954



APPENDIX C

CRITERIA FOR RPT REVIEW OF PNP HATCHERY PERMIT APPLICATIONS

AS 16.10.400(a) provides that a hatchery application must be at least evaluated in the context of its compatibility with the comprehensive salmon plan by the RPT, as well as criteria established by current regulations and statutes. AS 16.10.400(g) identifies conditions that must be satisfied if permits are to be issued by the Commissioner before the regional comprehensive salmon plan is complete.

Part (f) of the same law requires that the commissioner shall classify a stream as suitable for enhancement purposes prior to a permit being issued. There are, however, more than 330 anadromous streams in the Kodiak area. The process of evaluating a stream to determine whether or not it would be suitable for enhancement is very complicated, time consuming, and expensive.

To accomplish a full inventory and classification of all the anadromous streams in the Kodiak area was, therefore, beyond the financial and temporal limits of the plan. Instead, the RPT decided to formally make recommendations to the Commissioner at the time the department initiates the RPT review of a project for rehabilitation or enhancement of the fisheries.

The following criteria are hereby set forth in the Phase II Plan and are consistent with the language and the charge provided in AS 16.10.400(a), (f), (g). In reviewing and making recommendations to the Commissioner on nonprofit hatchery permit applications, the RPT will consider the following criteria in their review. The criteria will also be used to the extent practicable, in their review of other projects.

1.Will it make a significant contribution to the common-property fisheries? (Authority: Section 1, Chapter 111, SLA 1974). The RPT will consider and make its recommendations on each species to be produced if there is a reasonable opportunity for common property harvest consistent with the average Western Region common property fishery exploitation rate for that species. For a site to be suitable for private nonprofit development, there must be capability to generate common property harvest and at the same time provide adequate cost recovery for the facility.

Considerations pertinent to determining the potential common property benefits include:

--Does the application contain significant omissions or error in assumptions? If so, the use of more accurate assumptions might indicate increased hatchery needs and decreased benefits to common property fisheries. Pertinent assumptions might include those relating to 1) interception (harvest) rates in common property fisheries, 2) harvest in the special harvest areas, and 3) survivals of green eggs to adults.
--If returns cannot provide the "significant" common property benefit in the traditional fisheries, is there an adequate terminal area where new fisheries, is there an adequate terminal area where new fisheries could be created for the desired common property benefit without endangering the wild stock?
--If the application provides insufficient information for adequate RPT evaluation, the team will request additional information. If they conclude that basic production and harvest assumptions are

not realistic, they will recommend that changes in the proposed projects be incorporated by the applicant.

2. Does it allow for continued protection of wild stocks? (Authority: Section 1, chapter 111, SLA 1974) (AS 16.400(g) and AS 16.10.420/10). Any judgment as to the acceptability of impacts on natural stocks from an enhancement project should be make on only on the actual and potential size of the affected wild stocks, but also on the extent of benefits from enhancement and alternative enhancement opportunities in the area that may have less impact on natural stocks. Considerations include:

-- Can management or harvest strategies be developed to allow harvest of enhanced returns while protecting natural stocks?
-- Is there a segregated area for hatchery harvest that will provide adequate cost recovery without impacting wild stocks?
-- Does the affected stock actually or potentially support a commercial, sport, and/or subsistence fishery?
-- Does the affected stock have unique characteristics or are there special circumstances (e.g., a unique early run of coho)?
-- What is the degree of risk and the probable degree of loss to the natural stock?

3. Is the proposed project compatible with the Comprehensive Plan? (Authority: Section 1, chapter 111, SLA 1974) (AS 16.10.375, AS 16.10.400(g)). The goals and objectives of the Comprehensive Plan, Phase I, are directed toward substantial public benefits. Phase II identifies ongoing and proposed projects that are compatible with management strategies for the wild stocks. Thus, the goals and objectives of Phase I and the recommendations in Phase II provide a basis for evaluating all projects.

The project should also be compatible with management concerns and guidelines set forth in the plan and with specific recommendations concerning strategies and projects.

The RPT, in its recommendation to the commissioner, will take all of those factors into consideration in determining the project's compatibility with the comprehensive plan.

4. Does it make the most appropriate use of the site's potential? (Authority: AS 16.10.400(g), AS 16.10.430(b)). A number of very good opportunities for further enhancement programs exist in the Kodiak management area. If the plan goals and objectives, as well as substantial public benefits, are to be achieved, enhancement sites must be developed to their fullest potential with appropriate species using the best available technology.

In most instances, investigation will show one strategy to be far more effective than the others. Within a given strategy, it will be extremely important that the proposed project will develop the site appropriately and to its full potential.

Given technical feasibility, the RPT's determination of the appropriate development of a site will be based on such factors as the magnitude of its water supply, harvest potentials, manageability, and potentials to address user needs.

The applicant, in his application and presentation to the RPT, should demonstrate adequate plans for the site and the capabilities to carry them out. If the applicant does not show adequate planning and documentation, the RPT cannot judge the proposed project's ability to satisfy any criteria or determine in general whether the proposed hatchery would result in substantial public benefit as required under AS 16.10.400(g), AS 16.10.430(b), and the Mission Statement of the plan (Phase I).

An applicant should document to the RPT an ability to develop the site properly and to its full potential. This documentation should include:

-- Plans for implementation and full development of long- and short-term production goals and objectives; and
-- An adequate description of facility plans for incubation and rearing.

The RPT will formulate a recommendation based on its review of the application and forward it to the commissioner within 14 days of the date when the application is considered. The RPT's recommendation should not be construed as denoting the decision to be made by the Commissioner. The ADF&G staff as well as concerned members of the public also provide reviews and recommendations to the Commissioner. The Commissioner may uphold or reject the recommendations of the RPT after reviewing all the merits and potential problems associated with the proposal.

Since the RPT need adequate review time prior to considering an application, it will generally require that applications and attendant materials be received by the RPT members at least two weeks before the meeting at which the application is to be considered. It may also request additional information during the initial review if the information in the application is inadequate. A representative from the corporation making the application will be expected to make a presentation of the proposal at the RPT meeting.

Alaska statutes specifically grant the RPT an opportunity to review a permit suspension or revocation. However, revocation by the Commissioner would occur only as a very last, unavoidable course of action. It is far more desirable to identify problems early and attempt to remedy them. Existing procedures provide for an annual evaluation of operating hatcheries. The annual report supplies information on the hatchery's past performance, while the annual management plan provides a mechanism for monitoring and modifying hatchery operations on a year-to-year basis. These documents are subject to standard departmental review. RPT review of annual reports and annual management plans is a part of ongoing planning and is also the logical extension of review of hatchery applications. Actual hatchery performance will show whether it contributes to the fishery as planned. This departmental and RPT review allows for monitoring or ongoing performance.

If the department has determined that a hatchery's performance is inadequate and that a permit suspension or revocation is being considered, the Commissioner will notify the RPT, and the RPT will be provided with an opportunity to make a recommendation on the proposed action. In evaluating any PNP operation that is referred to the RPT by the Commissioner, the RPT will use the specific performance criteria in their review, evaluation, and recommendation to the Commissioner. The criteria are established in 5 AAC 40.860 of the 1986 edition of the "Alaska Statutes and Regulations for Private Nonprofit Hatcheries." The RPT, in this evaluation, will also consider any mitigating circumstances that were beyond the control of the hatchery operator.

In addition to the fish culture information provided in the annual report for each PNP hatchery, one additional tool is needed for evaluation of performance. The RPT recommends mandatory tagging of hatchery-released salmon of all species for at least several cycles in order to measure contributions to the fishery as well as to provide valuable information for management. This tagging must, of course, be accompanied by an adequate program for tag recovery.

Contribution to the fishery will be the ultimate measure of hatchery performance. However, it is not easy to define this criterion in measurable terms or to delineate what actions should be taken if the criterion is not met. Furthermore, the build-up of production at any facility may be slow, so that the ultimate success or failure cannot be determined for many years. As experience with hatchery operations is gained, the performance criteria should be reviewed and refined as needed.

PROJECT REVIEW CRITERIA AND NEW PROJECT SOLICITATION FORM
ALASKA PENINSULA/ALEUTIAN ISLANDS/AREA M

FISHERY CONCERNS:

1. Is supplemental salmon production needed and desirable?

    a. What is the socioeconomic impact on local residents and fishermen?

    b. Do the public and user groups want a hatchery in that location?

    c. Will the hatchery fulfill a substantial portion of the region's 20-year salmon goals?

SITE LOCATIONS:

1. Can the hatchery be constructed?

    a. Is the land available for reasonable purchase or lease, and will the landowners consent to construction?

    b. What is the likelihood of site and construction permit applications being approved or disapproved.

    c. Is the site area suitable and of sufficient size for hatchery construction?

    d. Will the site require special biological and/or engineering studies and surveys (i.e., land, soil, water, and organisms)?

    e. Will the hatchery be compatible with existing and future development in the area (i.e., potential habitat conflicts)?

2. Can the hatchery be operated and maintained?

    a. How accessible and logistically difficult will the hatchery be to operate (i.e., access by road, air, or sea and distance from supply point)?

    b. Protected and deep water bay for vessel docking and supply?

    c. Winter access and supply problems (i.e., bay ice conditions)?

    d. Is the beach suitable for amphibious aircraft and landing craft (i.e., surf and wind protection, tidal changes,beach slope, and stability)?

e. Can electrical and fueling requirements be met?

f. Can personnel (including families) and support service be provided?

g. Is the site capable of the type of hatchery (incubation and rearing systems) that would be needed?

3. Is the water supply adequate and suitable?

a. Adequate flow year around for intended operations?

b. Are water quality and seasonal temperature regimes suitable for intended operation?

c. Are exclusive water rights available, and can water quality be maintained to hatchery standards?

d. Are prime and secondary back-up water sources available?

e. Is gravity surface flow available, or will well field development and pumping be required?

f. What is the anticipated pipeline size, length, head, and route?

g. Anticipated hazards to the pipeline and intake?

h. Will future land/habitat uses conflict with quality or quantity of the water supply?

i. What is the probability of disease transmission in the water supply (i.e., virus shed by salmonids)?

4. Can brood fish be obtained and held?

a. Are local brood fish stocks available and in sufficient number at the right time?

b. Is brood fish disease history known, and are disease problems anticipated?

c. Are brood fish stocks genetically and biologically suitable and matched to hatchery water conditions (incubation and rearing schedules?

d. Can brood fish be protected from the fishery and held in estuary or other holding area for ripening?

5. Can hatchery fry production be reared?

a. Is the estuary suitable for saltwater rearing pens (i.e., protected from seas, sufficient depth, salinities, temperature, fouling organisms, etc.)?

b. Can rearing be accomplished with land-based facilities (water and facility requirements)?

6. What is the capacity of the estuary and bay for additional salmon rearing?

   a. Are food organisms abundant and available at time of release?

   b. Will abundance of predatory and competitor species severely limit survival of hatchery fish?

   c. Are estuarine and bay conditions suitable for good fry survival?

   d. Will hatchery fish displace or decrease wild salmon fry (compete and prey upon wild fry)?

7. Can adult returns of hatchery fish be readily evaluated?

   a. Will returning fish be mixed with other hatchery stocks and/or wild stocks?

   b. What type and quantity of evaluation effort will be required to assess hatchery operation and goal achievement?

FEASIBILITY CONCERNS:

Is the hatchery feasible?

1. Are cost/benefit ratios and Net Present Value (NPV) acceptable and justifiable?

2. Are there specific or special economic impacts, benefits, and costs involved?

3. If constructed, will the hatchery distract from other worthwhile or perhaps more feasible projects and facilities for the region?

CRITERIA FOR FISHPASSES

FISHERY CONCERNS:

Criteria for hatcheries are applicable, with the frequent addition of increased need for regulation enforcement in remote areas as a salmon run is increased and additional escapement is required.

SITE CONCERNS:

1. Can the fish pass be constructed?

   Criteria for hatcheries are applicable, with additional engineering requirements on high and low water flows and velocity, rock competence and fracture zones (geomorphology), fishpass location (protection) and salmon entrance, and passage capability. Each site requires specialized studies to determine the best engineering design for a specific location and target species.

2. Can the fish pass be operated and maintained?

   Many of the same criteria for hatcheries apply, especially during the construction stage; however, they become less restrictive and demanding once fish pass has been built. Fish passes require only seasonal operation and maintenance before, during, and after salmon migration. Larger fishpasses with salmon diversion weirs and manual water control structures require manned operation. Smaller installations require only opening, maintenance, spot-checking operation, and end-of-season closure. Manned facilities require construction, operation, and maintenance of field living quarters, equipment, and seasonal logistical support of personnel.

3. Is the water supply adequate and suitable?

   Many of the same water quantity and quality concerns for hatcheries are also important for fishpasses. Fishpasses require adequate flow for efficient salmon attraction and passage. Salmon are attracted to the area of greatest flow. Falls close to a fishpass entrance will tend to attract salmon to the falls rather than the fishpass unless diversion weirs are operated.

   High water flows are of more concern for fishpasses than most hatcheries. Fishpasses can be flooded-out by high flows or permanently damaged by debris and ice during floods. Weirs and other associated fishpass structures have a high risk of wash-out and damage by debris at a falls. Low water flows require either self-controlling or manual water control diversion to the fishpass.

4. Will wild salmon naturally use the fishpass and establish upstream spawning?

   Some systems and stocks will require a hatchery and fry or egg transplants to establish new spawning area. Brood-stocks, therefore, become a consideration for fishpasses, as well as for hatcheries. Natural stock below the falls may be sufficient to extend spawning range and use the fishpass without assistance. Stocks that are genetically programmed to spawn downstream or in site-specific areas (i.e., intertidal pink salmon, chum salmon that spawn in spring areas, etc.) may be slow to use a fishpass or may not extend spawning range.

   Increased escapements are usually necessary to increase salmon density below the fishpass and, in turn, increase range extension upstream and salmon passage. Salmon passage through a fishpass is to some extent density related.

5. Is the upstream spawning and rearing area adequate?

   The quality and quantity of spawning and rearing area above the falls area needs to be assessed to determine potential production capability. Biological evaluation of egg-to-fry survival may be required as part of this assessment.

6. Will emigrant fry or smolts survive to reach salt water?

   Fry and/or smolt survival at falls requires assessment. Substantial mortality might occur at high vertical drop-offs on underlying rock. A series of falls may have greater mortality risk than a single fall.

7. What is the capacity of the estuary and bay for additional salmon rearing?

   Same considerations as for hatchery fish releases.

8. Can adult returns of fish produced by a fish pass project be readily evaluated?

   Both escapement and catch assessment is required. Counts at the fishpass and on spawning areas, in addition to commercial catch information, are a minimum evaluation effort. Frequently, mark and recovery projects are needed. Evaluation concerns for fishpasses are the same as for hatcheries. Additional evaluation to improve fishpass effectiveness and salmon passage is often required.

FEASIBILITY CONCERNS:

1. Is the fishpass feasible?

   The same criteria required for hatcheries apply. Normally, benefits are high for dollars spent on fishpasses, but the return on investment is usually more limited than that for hatcheries and therefore may take longer to realize.

SPORT FISH PROJECT REVIEW CRITERIA

1. Fishery Status
   - Is it a depressed fishery?
   - Has the fish population been decimated or eliminated?

2. Habitat Assessment
   - Lakes should be five acres in size or large, at least eight feet deep.
   - Predator/competitor concerns must be identified.
   - Available spawning area should be identified/estimated.
   - Water quality characteristics.
     - D.O., Temp., Alkalinity, Conductivity
     - Morphodaphic Index-richer lakes are stocked prior to poorer lakes.

3. Access
   - Will it create new fisheries (has to have the potential)?
   - Accessible to the fishing public, anything you can hike to from the Kodiak road system within two hours would be a priority over fly-in.

4. Effect on Management
   - New sport fish projects should not complicate commercial fisheries management plans.

5. Lake Stocking Guidelines
   - ADF&G guidelines should be adhered to with any new projects.

6. Genetics Consideration
   - Donor stocks would have to be taken from as close to the area as possible.

COMMERCIAL FISHERIES PROJECT REVIEW CRITERIA

Regarding supplemental production (enhancement):

1. What are the potential effects on management plans with the placement of a hatchery?

2. What effects will the proposed production, by species, have on present management schemes?

3. What effects will the hatchery stocks (and their harvest) have on natural stocks in the area?

4. Can returns be harvested to provide "significant" common property benefits in traditional fisheries?

5. Is there an adequate terminal area where new fisheries could be created to affect the desired common property benefit?

6. Does the hatchery as proposed allow for the continued protection of natural stocks?

    a. Can management or harvest strategies be developed to allow harvest or enhanced returns while protecting natural stocks?

    b. Is there a segregated area for hatchery harvest that will provide adequate cost recovery without impacting wild stocks?

    c. Does the affected wild stock actually or potentially support a commercial, sport, and/or subsistence fishery?

    d. Does the affected stock have unique characteristics or are there special circumstances (e.g., an unique early run of coho)?

    e. What is the degree of risk and the probable degree of loss to the natural stocks?

7. Does the hatchery proposal make the most appropriate use of the site's potential?

Ref./File#:_____
Date:_____

ALASKA PENINSULA/ALEUTIAN ISLANDS/AREA M
REGIONAL PLANNING TEAM
FISHERIES REHABILITATION AND/OR ENHANCEMENT
NEW PROJECT SOLICITATION FORM

This form is to be used by Fish and Game and other government agency personnel and the public to identify opportunities that may be worthy to pursue to help rehabilitate and/or enhance the fisheries.

PROJECT DESCRIPTION:

1. WHAT: (Give a brief description of the project):

_____
_____
_____
_____
_____
_____

2. WHERE (be specific as to project location):

_____
_____
_____
_____
_____
_____

3. BENEFITS TO USER GROUPS:

_____
_____
_____
_____

4. COST ESTIMATE OF PROJECT (IF KNOWN):

5. SUBMITTED BY:

Name:_____ Date:_____

Address:_____ Phone:_____

_____ Occupation:_____

6. ADF&G COMMENTS:

7. COMMERCIAL FISH MANAGEMENT COMMENTS:

8. SPORT FISH MANAGEMENT COMMENTS:

9. HABITAT PROTECTION COMMENTS:

10. FRED MANAGEMENT COMMENTS:

11. REMARKS:

Ref./File #:_____
Date:_____

POTENTIAL PROJECT VERIFICATION FORM

NAME:_____ Date:_____

LATITUDE:_____ SURVEYEDBY:_____

LONGITUDE:_____

GEODETIC MAP NO:_____

LOCATION:_____

AERIAL SURVEY

NOTES:_____

_____

TRAILS:_____

_____

PROJECT WILL PRIMARILY BENEFIT:_____

_____

AVAILABLE ESCAPEMENT DATA:

Year Pink Chum Coho Sockeye King Steelhead

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Other Species Present:_____

_____

ELEMENTS OF BENEFIT /COST ANALYSIS

Steps for undertaking the projects identified in this plan will incorporate variables such as the facilities and equipment, cost of operations, and the financing.

Feasibility of a Project

In determining the feasibility of a project, the team may consider the four following questions:

1. Are benefit/cost ratios and Net Present Value acceptable?

2. What special economic impacts, benefits, and costs are involved?

3. If a hatchery or other facility is constructed, will it detract from other more worthwhile projects in the region?

4. Will the cost for an annual hatchery or other facility operation and maintenance decrease funding available for other projects in the region?

Costing a Project

The cost of a project can generally be segregated into three major categories, depending upon the nature and the scope of the task. These are as follows:

Facility and Equipment:

- Site section, including studies of alternative areas.

- Site acquisition.

- Construction costs, including planning fees.

- Equipment acquisition.

Operations:

- Cost of labor, utilities, fish feed, personnel, and maintenance costs.

- Administrative.

- Project evaluation costs.

Financing:

- Available funding sources.

- Current interest rates.

Economic benefits to most groups directly affected by specific projects are easier to identify. However, the benefits of an enhanced fishery to sport and personal use fishermen are, again, very subjective and therefore difficult to assign a dollar value. The dollar impact to this group may not vary significantly from project to project and, when compared to the total economic benefit/cost ratio, will not have a significant effect on the overall analysis.

Economic Benefits to Commercial Fishermen and Processors

The economic benefits to these two groups can be expressed in dollar terms throughout the analysis of two major components; the anticipated increase product available for catch and the dollar value of the catch increase. Regardless of the nature of the project, however, the amount of product available depends on the annual adult salmon rate of return and the annual catch rate, expressed in terms of pounds of product.

Variables to Consider in Determining the Product Value

The value of the caught product includes a scrutiny of the following variables:

1. Type of product;

2. Anticipated market price, including the effect of world supply and demand on the market price; and

3. Cost of catching and processing the product.

In order to prepare a benefit/cost analysis for hatchery stock development, a form is available from ADF&G which provides in detail the variables required to determine the quantity of catchable product, value of the catch, impact multipliers, and cost information relating the development of fish hatcheries. For further information, contact ADF&G, FRED Division in Kodiak.