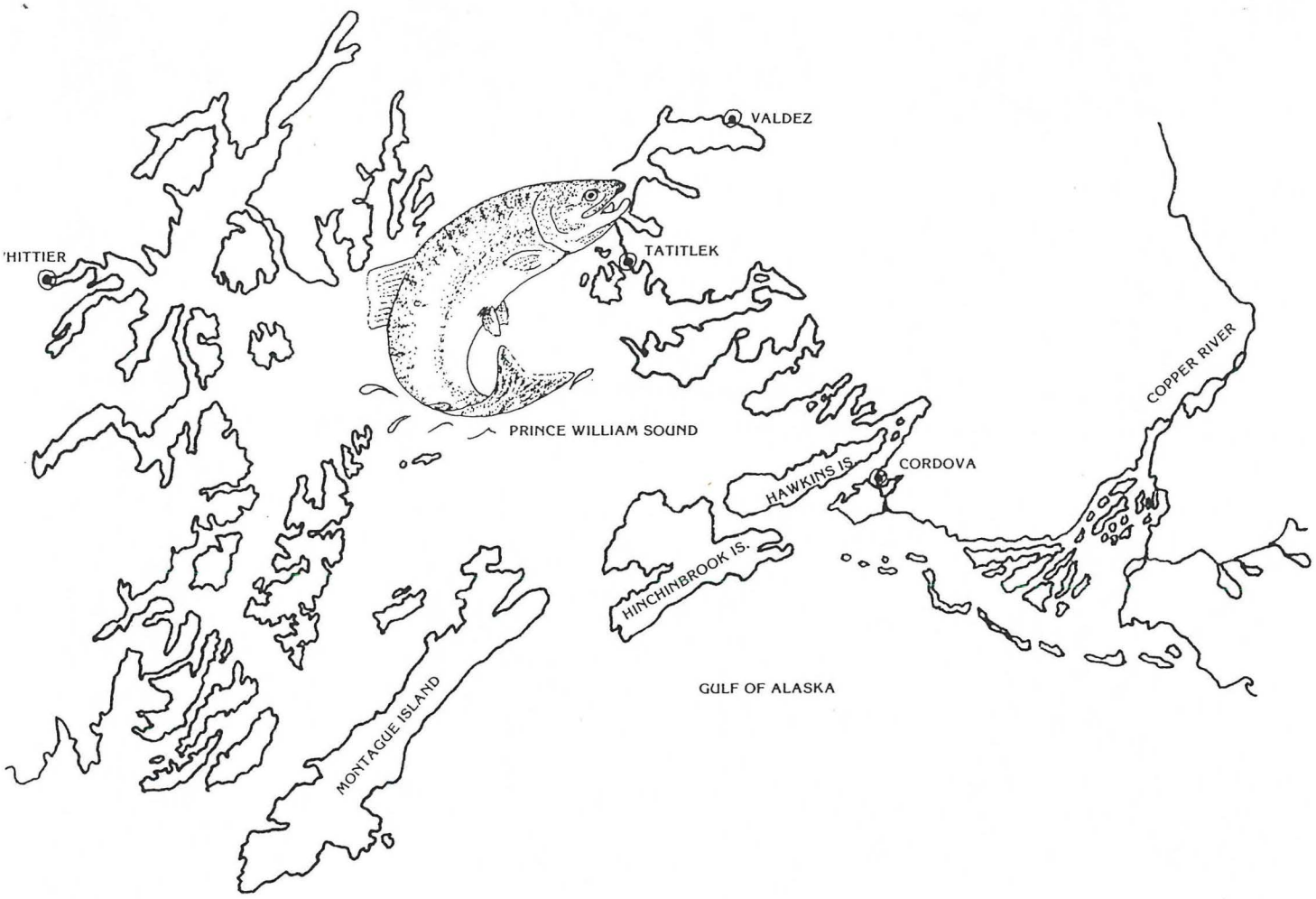
EIS
I



Prince William Sound — Copper River Comprehensive Salmon Plan

Phase I — 20 Year Plan (1983-2002)

Prince William Sound Regional Fisheries Planning Team.

STATE OF ALASKA

BILL SHEFFIELD, GOVERNOR

DEPARTMENT OF FISH AND GAME

OFFICE OF THE COMMISSIONER

P.O.BOX 3-2000
JUNEAU, ALASKA 99802
PHONE: (907) 465-4100

September 20, 1983

Mr. Michael L. McCurdy
Chairman
Prince William Sound Regional
Fisheries Planning Team
P.O. Box 699
Cordova, Alaska 99574

Dear Mr. McCurdy:

This letter is to inform the members of the Prince William Sound Regional Fisheries Planning Team (PWSRPT) and you, as team chairman, of my formal approval of the Prince William Sound-Copper River Comprehensive Salmon Plan, Phase I - 20 Year Plan.

This plan has been reviewed by the Directors of the Alaska Department of Fish and Game (ADF&G) divisions responsible for managing, enhancing, and protecting Alaska's fishery and its habitat. Previous to my review, an opportunity was provided for comment by ADF&G technical staff and the general public. Comments and suggestions generated during the technical review and public review of the draft document were addressed prior to the final draft being developed and submitted to the Department.

I believe that a viable and responsible document has been produced as a result of considerable effort by the members of the PWSRPT. I offer my congratulations and appreciation to all members of the team and Planner, Tom Namtvedt, for cooperating with the Department and me in producing a comprehensive salmon plan for the Prince William Sound-Copper River Region.

Sincerely,

Don W. Collinsworth
Commissioner

cc: PWSRPT Members
ADF&G Division Directors
Tom Namtvedt

Table of Contents

List of Figures

List of Appendices

CHAPTER 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

This document is the comprehensive plan for the management, rehabilitation and enhancement of the Prince William Sound Region's salmon resources during the next twenty years. The Region encompasses Alaska Department of Fish and Game (ADF&G) Commercial Fisheries Management Area E and includes the marine waters and freshwater drainages between Cape Suckling and Cape Fairfield (Figure 1-1). The communities of Valdez, Cordova, Glennallen, Whittier, Chitina, Copper Center, Gulkana, Gakona, Chistochina, Tatitlek, McCarthy, Paxson and Mentasta Lake are located within the Region.

Salmon resources of the Region are heavily utilized by commercial, sport and subsistence fishermen from within the Region and from nearby communities, such as Anchorage, Fairbanks and Seward. Fishermen from other communities, states and countries also derive benefit from the resource.

Commercial fishermen since 1960 have taken approximately 99 percent of all salmon harvested in the Region. From 1960 through 1981 the average commercial catch of the Region was 6.6 million salmon or 12.3 percent of the statewide harvest.

The average sport catch during this period cannot be determined. A regional harvest survey has only been conducted since 1977. The average sport harvest from 1977 through 1981 was approximately 39,208 anadromous salmon or 9.0 percent of the statewide sport harvest of anadromous salmon.

The average annual reported subsistence harvest during the years 1962 through 1981 was 23,395 salmon. The average reported catch during recent years, 1974 through 1979, constituted approximately 3 percent of the reported statewide subsistence harvests.

The history of the Region's commercial salmon fishery is characterized by drastic fluctuations in harvest levels and a depressed period between the 1940's and the 1970's (Figures 1-2 through 1-7 and Appendix 1-1). The pink and chum salmon fisheries were essentially closed during 1954, 1955, 1959, 1972 and 1974. The Copper River commercial sockeye salmon fishery experienced extensive closures in 1979 and 1980. The Copper River subsistence fishery was also adversely affected in 1979 and 1980. Since 1979, however, the commercial pink salmon fishery has achieved record high levels. The chum salmon fishery in 1981 also experienced record catches.

Catches of all salmon species statewide have displayed similar bust and boom patterns. It is not known how long the current high phase in the pink and chum salmon fisheries will continue. The unstable nature of these fisheries has been at times catastrophic for commercial fishermen, processors and others dependent on the resource for their well being.

Legislative Background

The State Legislature recognized the distressed nature of salmon fisheries statewide and took action during the 1970's to seek solutions to these recurring problems. In 1971, the Legislature created the Fisheries Rehabilitation, Enhancement and Development (FRED) Division within ADF&G. The FRED Division's goals were to plan, rehabilitate, enhance and develop the fisheries using the latest techniques and scientific advancements available worldwide.

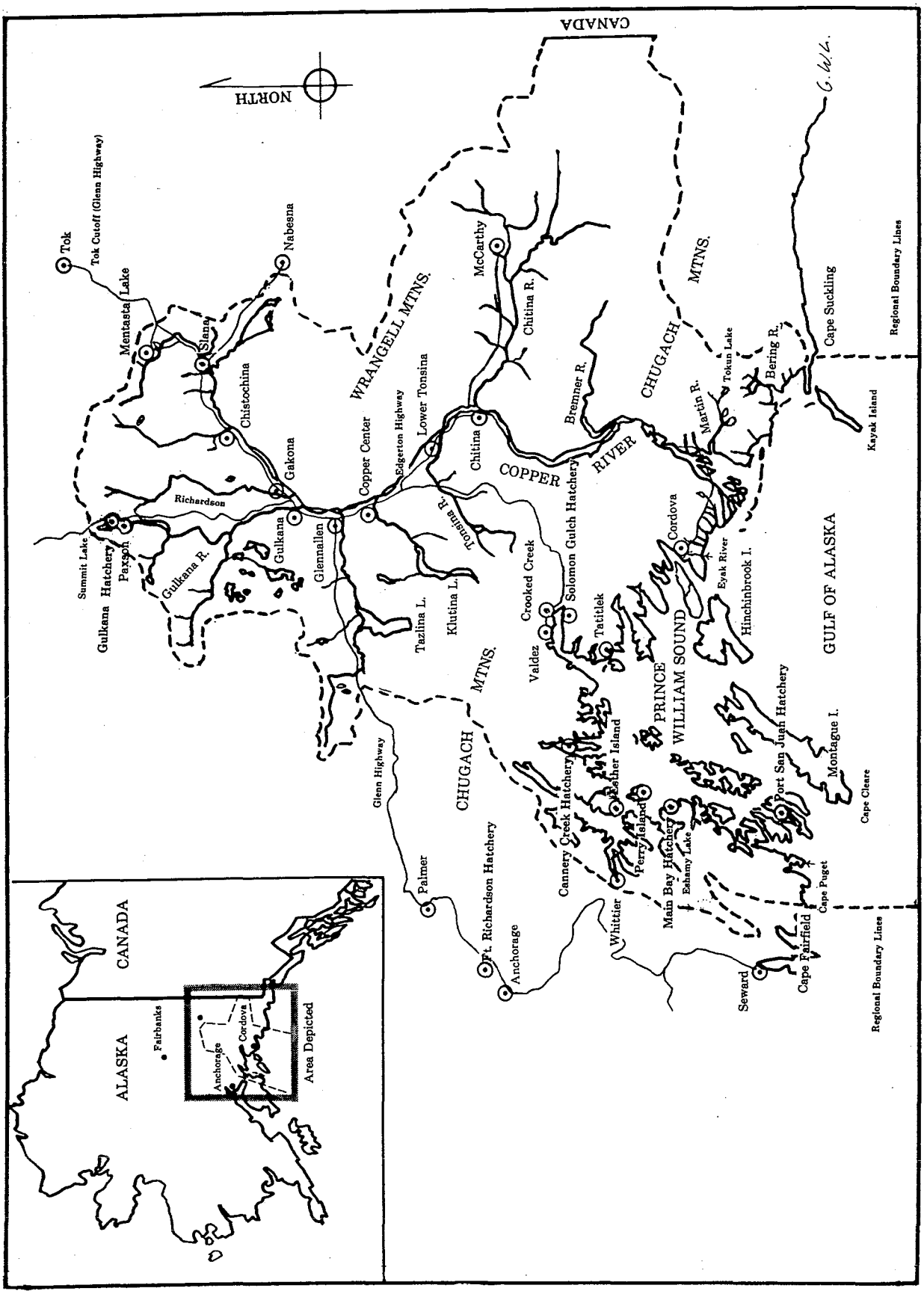


Figure 1-1. The Prince William Sound Region.

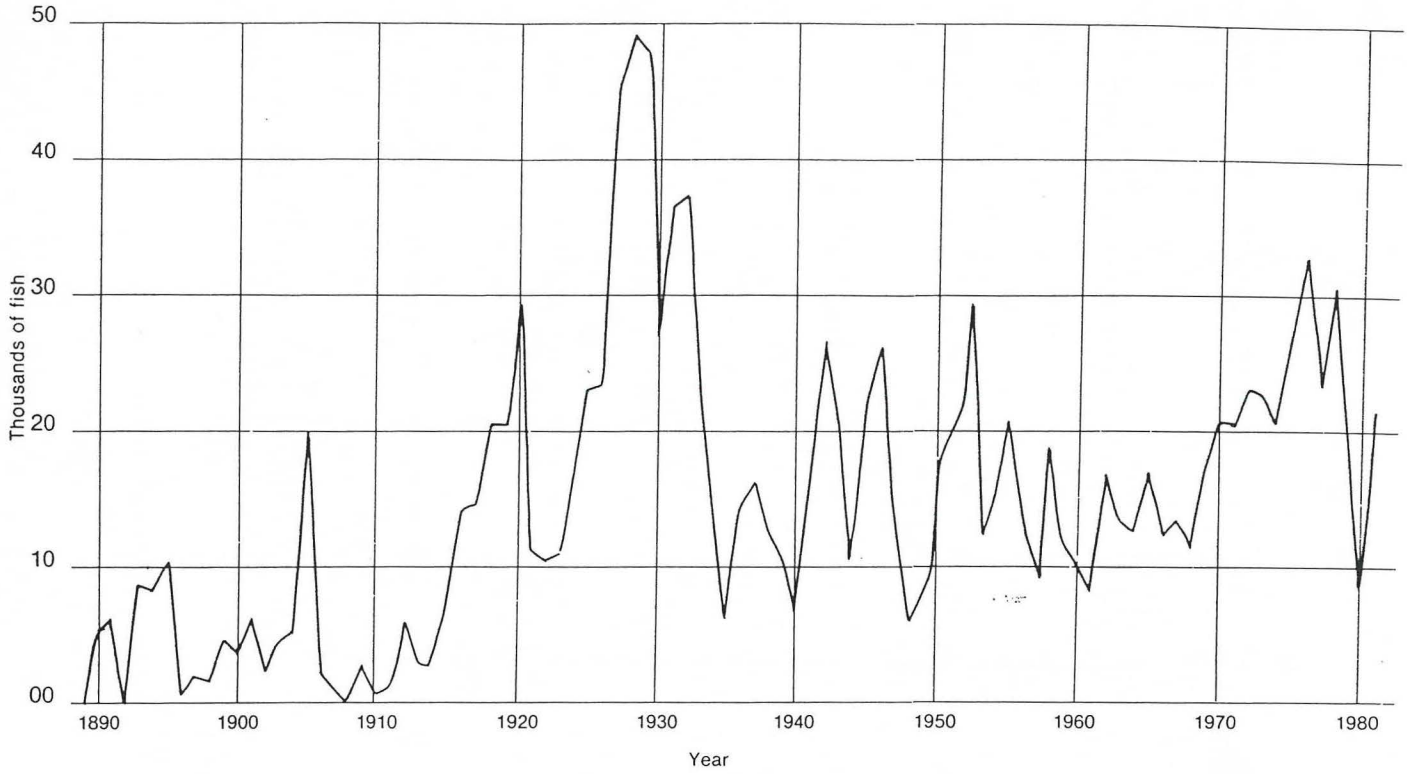


Figure 1—2. Commercial catches of king salmon, all districts, Prince William Sound Region, 1889 — 1981.

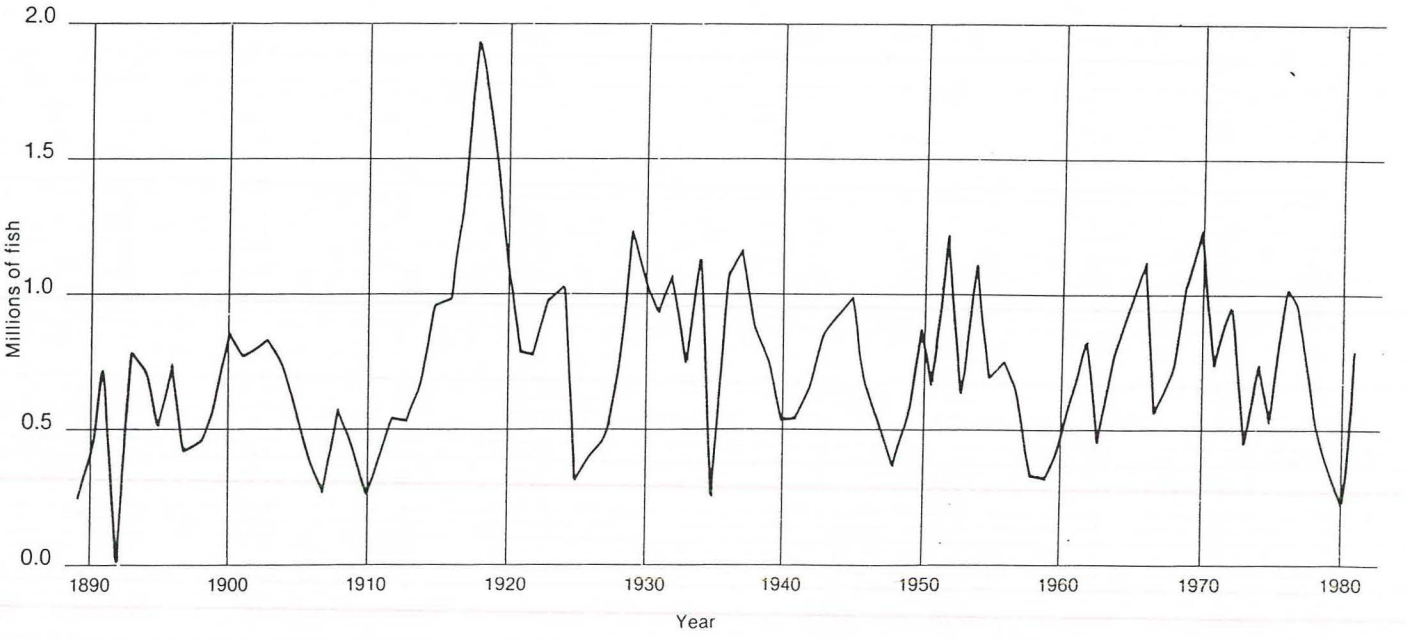


Figure 1—3. Commercial catches of sockeye salmon, all districts, Prince William Sound Region, 1889 — 1981.

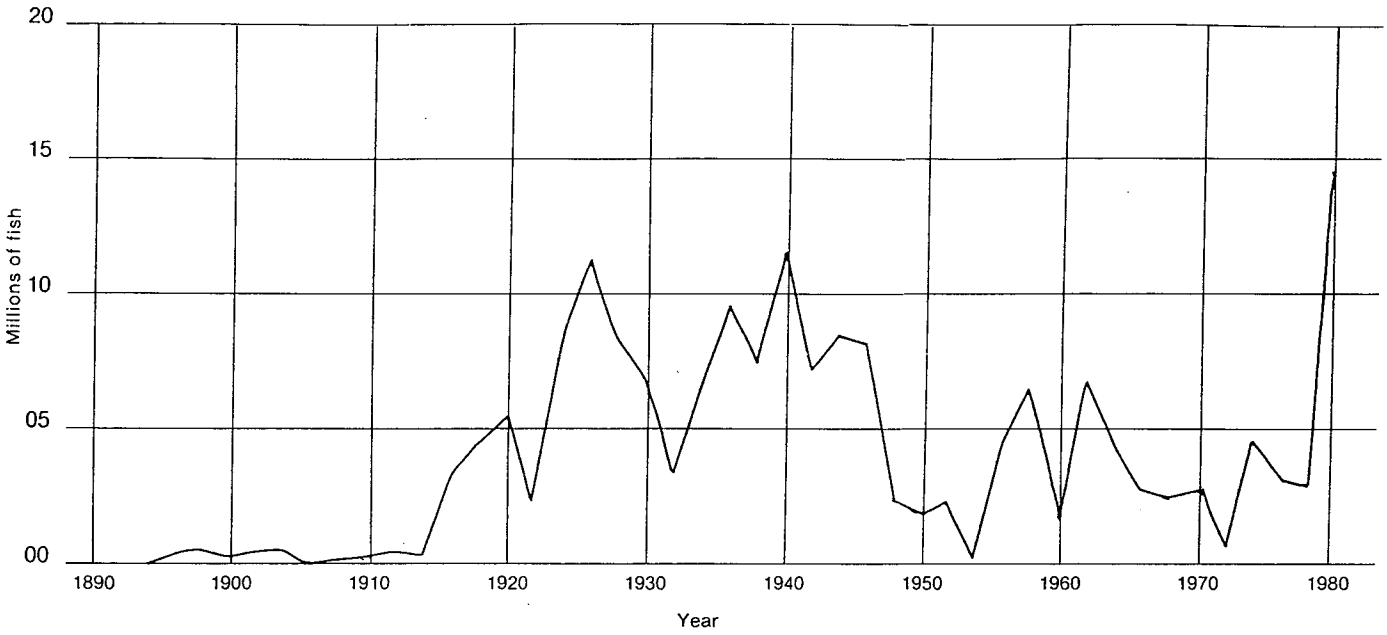


Figure 1—4. Commercial catches of even year pink salmon, all districts, Prince William Sound Region, 1889 — 1981.

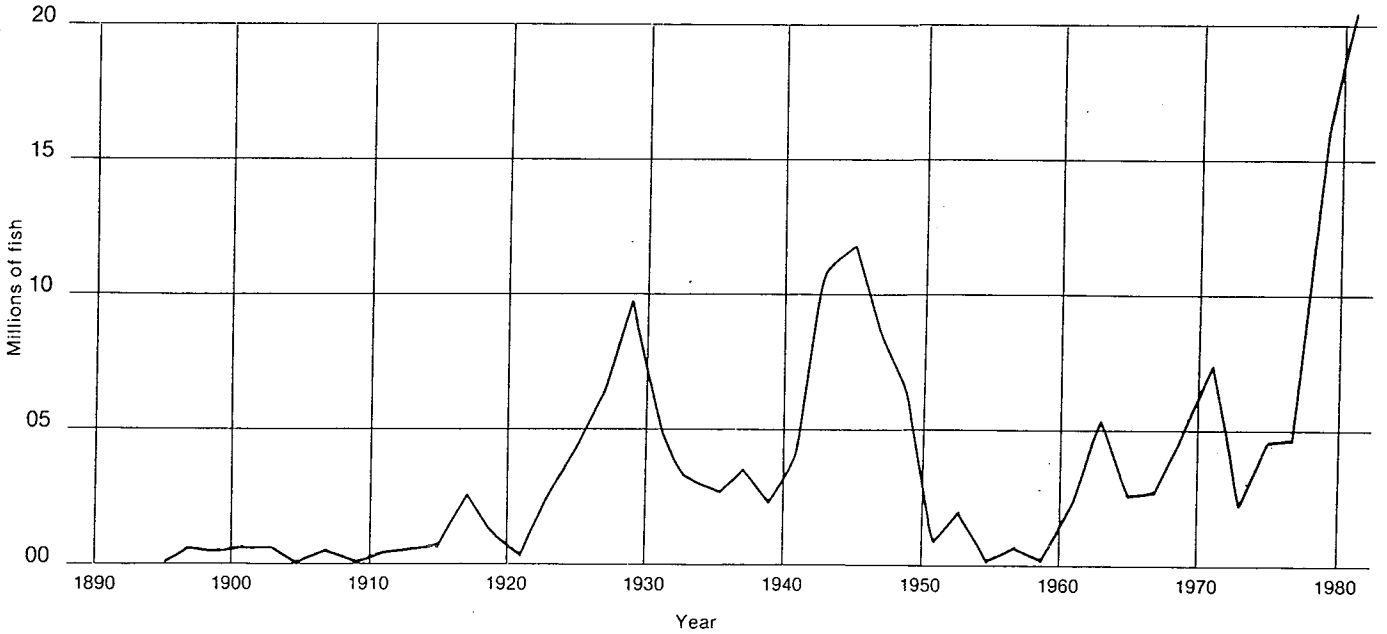


Figure 1—5. Commercial catches of odd year pink salmon, all districts, Prince William Sound Region, 1889 — 1981.

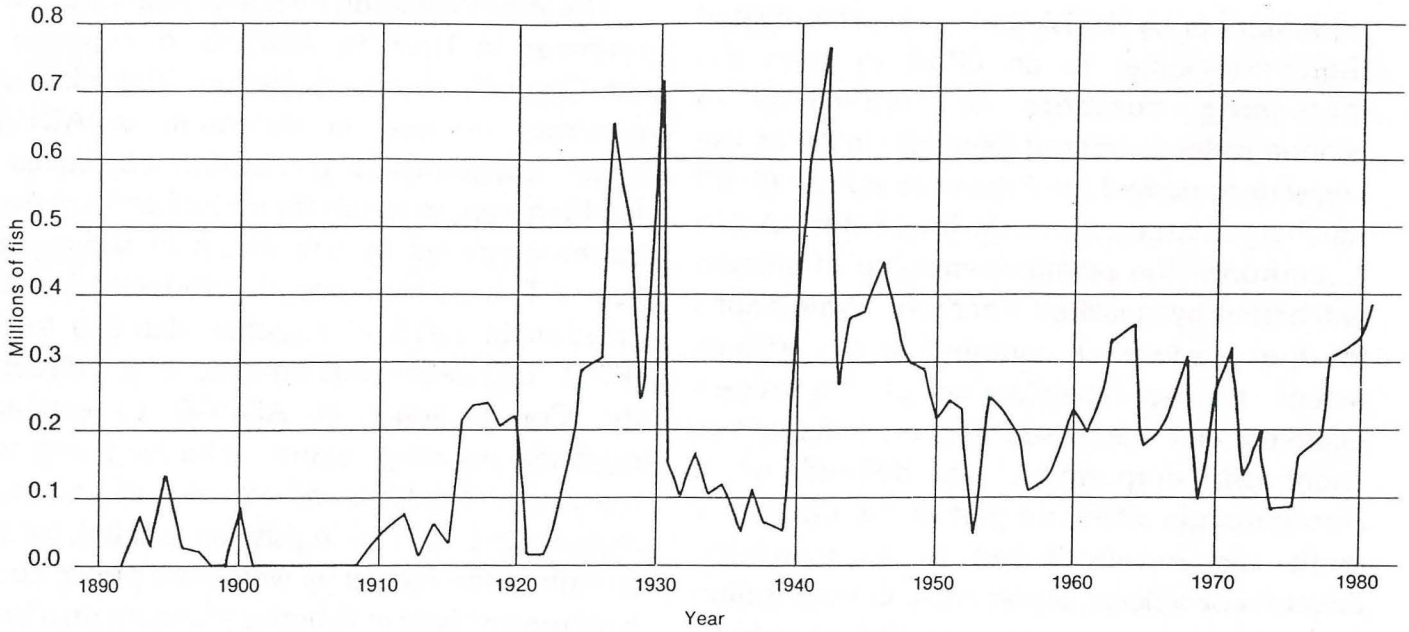


Figure 1—6. Commercial catches of coho salmon, all districts, Prince William Sound Region, 1889 — 1981.

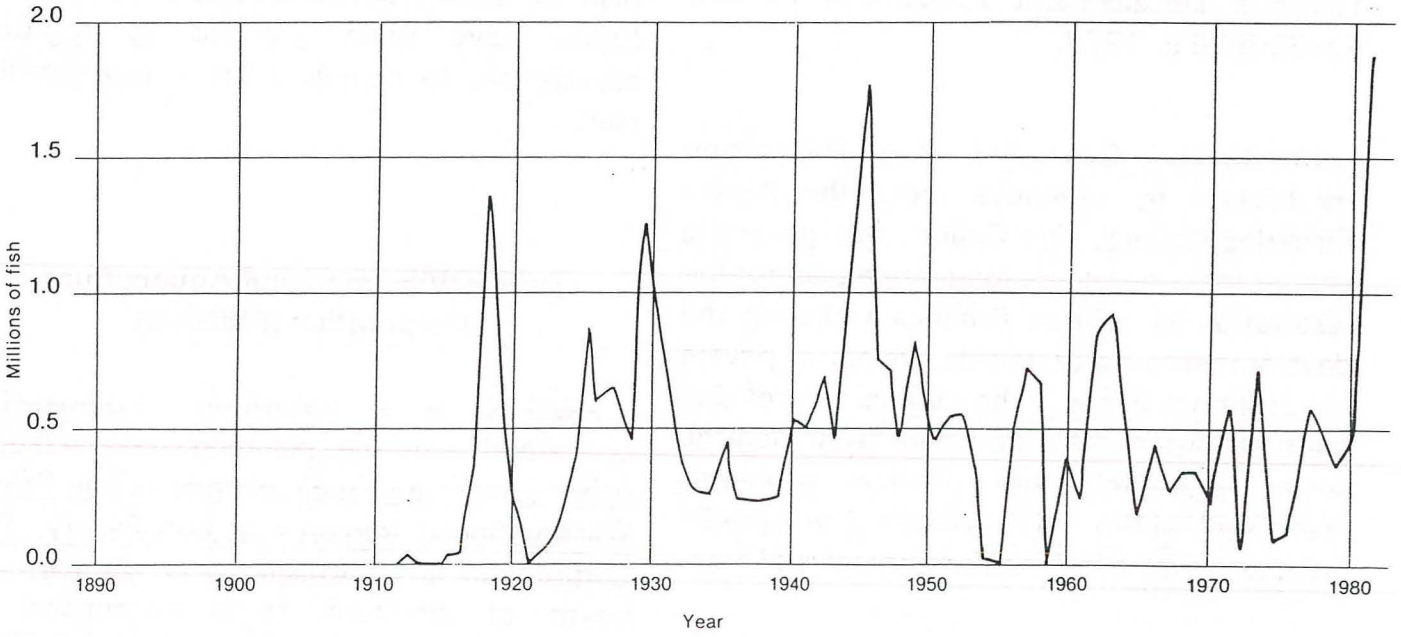


Figure 1—7. Commercial catches of chum salmon, all districts, Prince William Sound Region, 1889 — 1981.

Limited entry legislation was promulgated shortly thereafter in an effort to stem the increasing numbers of fishermen in economically distressed fisheries. In 1974 the Legislature passed the Private Nonprofit (PNP) Hatchery Statutes. It was the intent of the Act to "...authorize the private ownership of salmon hatcheries by qualified nonprofit corporations for the purpose of contributing by artificial means to the rehabilitation of the State's depleted and depressed salmon fishery."[1] A "nonprofit corporation" is defined as a corporation in which no part of the income or profit can be distributed to its members, directors or officers. Reasonable compensation may, however, be paid to its members, directors or officers for services rendered.[2]

Two PNP hatchery corporations were established in the Prince William Sound Region in 1974, the Prince William Sound Aquaculture Corporation (PWSAC) and NERKA, Inc. A third group, the Valdez Fisheries Development Association (VFDA) was formed in 1978.

In 1976, Governor Jay Hammond established by executive order the Alaska Fisheries Council. The Council was given the charge to "...develop a long-range plan for the restoration of salmon fisheries including the development of a Statewide system of private nonprofit hatcheries." The Council "...provided the first forum in Alaska where technological, social, economic and political problems associated with a major salmon development program could be discussed and solved."[3]

Footnotes to the text are presented at the end of the text on page 175.

The Alaska Salmon Fisheries Plan (draft) was prepared in 1976 by ADF&G in response to the Council's recommendation. This plan was generally an internal statement of ADF&G goals. Supplemental production objectives in the Plan were the basis for major hatchery bond issues approved by the voters in subsequent years. The Council was also influential in the creation in 1976 of regional planning teams (RPT). Legislation was enacted which directed the Commissioner of ADF&G to establish regional planning teams, planning regions, regional associations and regional salmon plans (Appendix 1-2). This legislation created, for the first time, the means by which the public could become involved in fisheries planning on a local level.

In 1979, a sum of $100,000 was granted by the Legislature through ADF&G to each qualified regional association. The funds were to be used "...to participate with the department on the regional planning teams in the development of a comprehensive salmon plan for each respective region."[4] Additional funds have been granted to regional associations to complete the comprehensive plan.

Prince William Sound Aquaculture Corporation (PWSAC)

PWSAC is a voluntary organization concerned with the planning, rehabilitation, enhancement and maintenance of the Prince William Sound Region's salmon fishery. The Corporation is controlled by a 45 member board of directors. It is comprised of commercial fishermen of each gear type, sport fishermen, subsistence fishermen, processors, community groups, native corporations and

other interested groups. Commercial fishermen who are members of the Cordova Aquatic Marketing Association (CAMA) constitute 60 percent of the Board.

PWSAC has its offices in Cordova and conducts its affairs openly under scrutiny of the public. The large membership and diversity of the Board of Directors and the Corporation's newspaper substantially contribute to public involvement and awareness in the operation of the corporation.

PWSAC is recognized by the Commissioner of ADF&G as the qualified "regional association" in the Prince William Sound Region and as such has been given a diverse role by the State Legislature. As an "association" PWSAC has the following responsibilities, rights and authorities:

(1) form a private nonprofit corporation for the purpose of building and operating salmon hatcheries;[5]

(2) organize and execute, in accordance with State statutes, a voluntary and/or royalty assessment on the sale of salmon;[6]

(3) review and approve local nonprofit hatchery corporations for the purpose of qualifying corporations for State fisheries enhancement loans of up to $10 million (without regional association approval, the statutory loan limitation is $1 million);[7]

(4) has preference right among private nonprofit hatchery corporations to hatchery water sources in the region exceeding one cubic foot per second;[5]

(5) obtain from the Alaska Department of Commerce and Economic Development a $100,000 planning and organizational grant;[5]

(6) advise the Commissioner of Fish and Game on a wide range of matters relating to salmon production and planning in the region;[5]

(7) form a regional salmon enhancement authority;[5]

(8) appoint three members of the regional planning team;[5]

(9) enter into cooperative agreements with other agencies and

(10) act as a contractor for the purpose of doing fisheries planning and research.

PWSAC predates the legislation creating the regional association concept and was incorporated December 30, 1974. It is recognized by the Internal Revenue Service as a (c) 3 "tax exempt organization" and is authorized to accept tax deductible estate and gift contributions. The regional assessment is a self imposed tax on the sale of salmon. It serves as collateral for State loans and operating funds for PWSAC. CAMA members have voted to assess themselves on a voluntary basis.[8] Other fishermen, processors and tender operators have also contributed.

Regional Planning Team (RPT)

The RPT brings together biological and technical expertise with the needs and concerns of the user groups in an effort to achieve concensus on the directions of resource development. Public involvement in the planning process is formally channeled through PWSAC.

It is the responsibility of the RPT to:

(1) develop and recommend regional comprehensive salmon plans for approval by the Commissioner of ADF&G;

(2) solicit public input and arrange for public review of the plans throughout the region;

(3) review and comment on hatchery permit applications and other proposed enhancement and non-regulatory rehabilitation projects and

(4) review and comment on proposed hatchery permit suspensions and/or revocations.[5]

The Commissioner has sole legal authority for the approval of plans and recommendations presented by the RPT.

The RPT consists of three members appointed by the Board of Directors of PWSAC, three members representing ADF&G, an elected chairman and one non-voting member from the US Forest Service. During the development of this Phase 1 plan the members were:

Chairman, Mike McCurdy,
Commercial Fisheries Div.,ADF&G

Robert Blake, PWSAC

Connie Taylor, PWSAC

Armin Koernig, PWSAC

Paul Krasnowski, FRED Div., ADF&G

(Alternate) Jerald Madden,
FRED Div., ADF&G

Dennis Haanpaa,
Commercial Fisheries Div., ADF&G

(Alternate) Alan Kingsbury,
Commercial Fisheries Div., ADF&G)

Dave Watsjold,
Sport Fish Div., ADF&G

The chairman had no voting power; therefore, there were six voting members.

To augment the RPT, a planner, Thomas B. Namtvedt, was hired by PWSAC. It was his responsibility to coordinate all planning activities and serve as principal writer of the plan. Meetings were held on a periodic basis.

Two-Phase Planning

The fisheries plan for the Prince William Sound Region will be developed in two phases. This document is the Phase I plan. It integrates and assembles all relevant information regarding the development and protection of the salmon resources into a long-range strategic plan. It establishes the twenty-year objectives and sets forth the framework upon which the more detailed Phase II planning will take place.

The Phase II plans will deal with short-term (2 to 5 year) objectives and operational plans for individual projects. These taken together over time will achieve the long-term goals for the fishery.

Specifically this Phase I plan has been prepared to:

(1) describe the demography and economy of the Region;

(2) describe the Region's salmon production status;

(3) analyze the Region's harvest demands;

(4) describe the shortfalls or "gaps" in salmon production;

(5) describe the knowledge and data gaps;

(6) develop goals and objectives to eliminate these gaps and

(7) identify alternative strategies and recommended projects.

This plan is certain to undergo modification in its life span as goals are achieved or deemed unattainable and technological advances open new avenues and potentials. Changes in the plan must be brought about by the RPT.

This plan was completed during 1982; however, due to time constraints, catch and egg take data for 1982 are not included in this document.

Public participation

Public participation in the preparation of this Phase I plan was solicited in various ways: RPT meetings, a public involvement questionnaire and wide-spread distribution of the Public Review Draft.

RPT meetings were held in Anchorage and Cordova:

March 4, 1982	Anchorage
March 24, 1982	Anchorage
May 19, 1982	Cordova
June 16-17, 1982	Cordova
September 30, 1982	Cordova
October 29, 1983	Anchorage
November 29, 1982	Anchorage
January 12, 1983	Cordova
April 28, 1983	Anchorage

RPT meetings were advertised as public meetings in the legal advertisement sections of newspapers in Anchorage, Fairbanks, Cordova and Copper Center. In addition, these advertisements were broadcast as public service announcements on radio station KLAM in Cordova and notices were posted in the offices of the Cordova Aquatic Marketing Association.

The questionnaire is discussed in Chapter 4.

A total of 2,000 copies of the Public Review Draft Plan were made available for review. The RPT convened on April 28, 1983 and each comment was reviewed by the Team. Alterations, deletions or additions to the text were also discussed.

Approval and Authority of the Plan

This Plan has been approved by the Commissioner of ADF&G and is an official guideline for salmon enhancement efforts in the Prince William Sound Region.

Key Assumptions

A critical part of the planning process is the adoption of key assumptions. These describe the things that are probable and/or must occur if goals are to be achieved. Admittedly, assumptions are the weak point in the planning process, but by periodically reviewing, updating and testing these assumptions against reality, erroneous assumptions can be identified and plans can be revised.

Two levels of assumptions are utilized in the plan. The key assumptions listed below are important to the whole plan. Chapter assumptions have been included at the end of some chapters.

The key assumptions are:

(1) It is biologically feasible to bring about a sustained increase in harvest rates of salmon beyond the past twenty-year average if appropriate technology and management practices are utilized.

(2) National and worldwide markets will absorb the increased production of salmon.

(3) Marine and freshwater habitats will remain favorable for salmon survival.

(4) The technology exists or will be developed to meet the production objectives of the plan.

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

(6) Political support will continue and sufficient funding will be provided to achieve the goals within the time frame indicated.

(7) This plan, its goals and objectives will be periodically reviewed and revised as needs, knowledge and resources change.

(8) This plan utilizes the best data available and most accepted interpretation of these data.

CHAPTER 2

REGIONAL PROFILE

CHAPTER 2

REGIONAL PROFILE

The Region encompasses 38,000 square miles. Natural resources of economic importance are abundant and include fisheries, wildlife, timber and minerals. The Region is comprised of three geographic entities: Prince William Sound drainages and estuary, the Copper River drainage and estuary and the Bering River drainage and estuary. Prince William Sound is a relatively deep, island studded embayment. The Copper River is Alaska's fifth largest river and drains large portions of interior Alaska as well as Canada. Its headwaters are heavily glaciated. The Bering River is a relatively short river, draining the Bering Glacier. Each of these areas has relatively distinct salmon fisheries.

Exploration of the Region by caucasians initiated in the 18th century. Early explorers included Russians, Englishmen and Spaniards. The natives residing in the Region in the 18th century were the Chugach Eskimo, the Ahtna Indians, Eyak Indians and the Tlingit Indians. Chugach Eskimo were dominant along the coastal areas of the Region. Ahtna Indians occupied the Copper River Basin.[9] Eyak natives occupied the area of present-day Cordova and the Copper River Delta.[9a] Tlingit Indians were principally residents of areas southeast of the Region but extended westward to the mouth of the Copper River in later times.[9] Aleuts were transported into the area by Russians and today's native population reflects the intermarriage of these native groups as well as other races.

American influence started with the Alaska purchase in 1867 and accelerated successively with the development of commercial salmon fishing, the discovery of oil, the gold rush and the discovery and mining of copper and gold. The first salmon cannery was established in the Region at Eyak in 1889. Oil was discovered at Katalla in 1894. Valdez became an important point of debarkation for Klondike gold seekers in 1898. The Kennicott copper discoveries were made between 1899 and 1901. Development of the copper mines led to the establishment of the communities of Cordova, Chitina and McCarthy. Copper mines were also developed at Latouche Island and Ellamar. Gold mines were staked throughout the Region. Fox farming was conducted on many of the islands of Prince William Sound. The Kennicott Copper Mines closed in 1938, and, until the construction of the trans-Alaska pipeline and terminal at Valdez, salmon fishing was the mainstay of the Region's economy.[10]

Climate

The climate of the Region is largely influenced by the Gulf of Alaska and the coastal mountains. Three climate zones are definable: maritime, continental and transitional (Figure 2-1). The maritime zone is characterized by heavy precipitation, relatively cool summers and warm winters, and heavy surface winds in most areas. Within this zone are the northern-most ice-free ports in Alaska, Valdez and Whittier. The relatively warm, moist climate of this zone is important to the maintenance of stream flows and the production of pink and chum salmon in the numerous streams of Prince William Sound. The continental zone is noted for extreme temperature differences between summer and winter, light precipitation and light surface winds. The transition zone has intermediate weather conditions.[11]

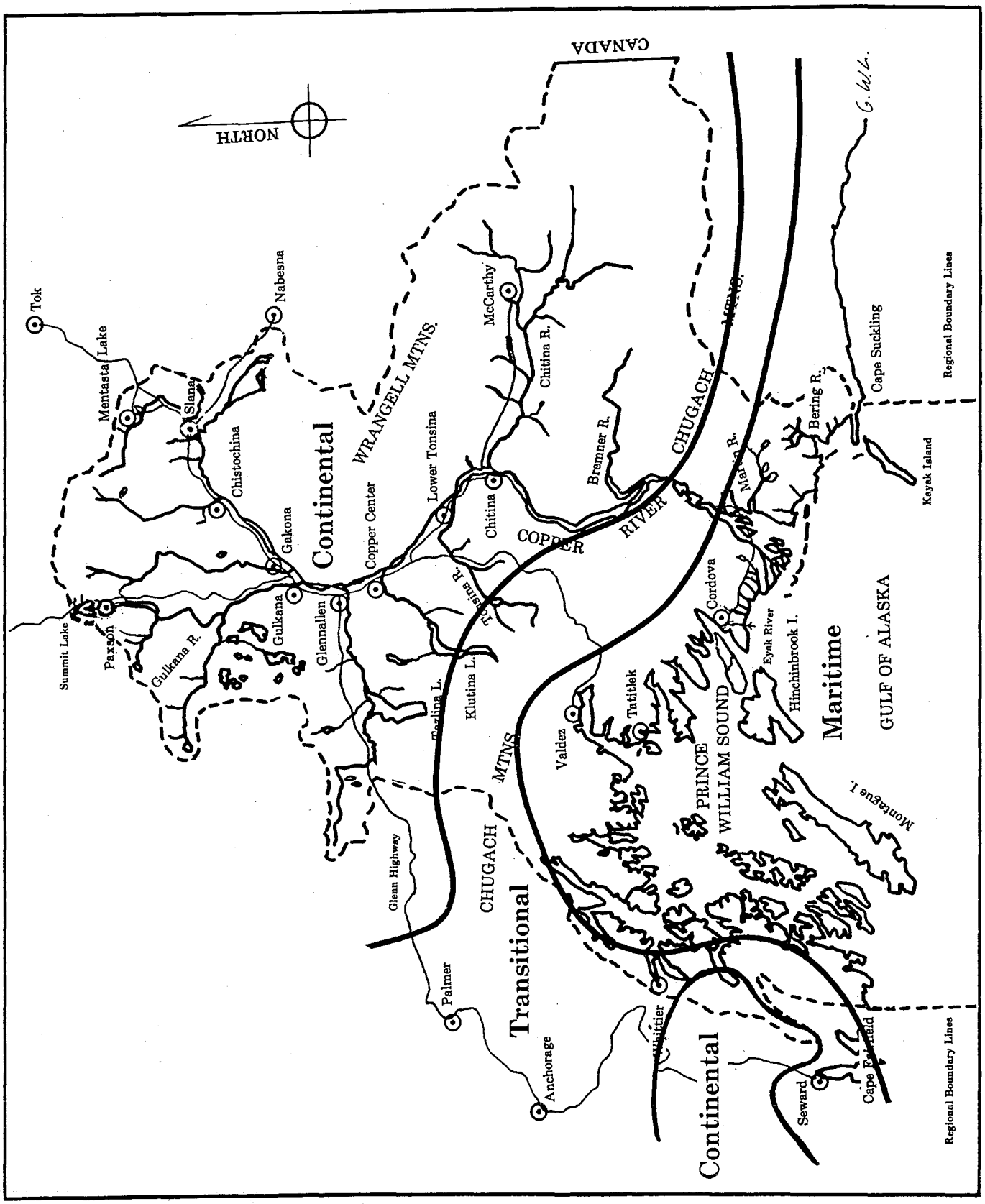


Figure 2-1. Climate zones of the Prince William Sound Region (adapted from Anonymous, 1974).

Geologic Aspects

Landforms of this diverse and complex Region have been shaped over the past several million years by the actions of ice, meltwaters, winds and earthquakes. Mountains comprize a significant portion of the land area. Mountain ranges include: the Kenai, Chugach, St. Elias, Wrangell, Mentasta and Talkeetna mountains. Twelve volcanos are located within or near the Region. One volcano, Mt. Wrangell, erupted steam in 1966. The others have probably been dormant since at least 1760.[11] The Region is heavily glaciated. Alpine, valley and piedmont glaciers and icefields are present. Many glaciers calve directly into the fiords of Prince William Sound. Water clarity of many of the lakes, streams and estuaries is affected by glacial melt. The flats around Glennallen are underlain by thin to moderately thick permafrost, the maximum depth of which is 600 ft. The coastal region is generally free of permafrost.[9]

Approximately six percent of the world's earthquakes occur along the numerous fault systems of Southcentral Alaska. The Region is located on the boundary between the Pacific plate and the North American plate. Earthquakes occur as the Pacific plate slides under the North American plate. Mountains and volcanos of the Region and the Alaska Peninsula and Aleutian Islands attest to the forces at work in this subduction zone.[12]

The majority of the earthquakes within the Region have, since 1899, been concentrated in the Valdez area. The epicenter of the Good Friday earthquake of 1964, which registered 8.5 on the Richter scale, was located near the head of College Fiord. Since 1899, a minimum of 86 earthquakes have occurred that have exceeded 6.0 on the Richter scale, 19 have exceeded 7.0 and 4 have exceeded 8.0.

The Good Friday earthquake caused areas in and around the Sound to experience both horizontal and vertical movement. Lands shifted seaward as much as 64 ft. The greatest subsidence, 8 ft., occurred in the northwest portion of the Sound. The greatest uplift, 38 ft., occurred on the southwest side of Montague Island (Figure 2-2). Salmon habitat was severely disrupted. Only a few streams in a small area across the northcentral part of the Sound were unchanged (Figure 2-2).[13]

Extensive slides occurred producing a number of highly destructive waves. Valdez and Chenega were extensively damaged by these waves. In Valdez, the docks and waterfront warehouses and fish processing plants were destroyed and the business district was inundated. The village of Chenega was partially swept away. Both townsites were abandoned. Valdez was rebuilt 4 miles from the old site, and Chenega is being rebuilt on Evans Island.

Land around Cordova and the Copper River Delta rose approximately 6 ft. This resulted in serious damage to waterfowl habitat and destruction of shellfish and their habitat.The Cordova small boat harbor required dredging to be usable. Bridges along the Copper River Highway were destroyed or badly damaged.

Major changes in the salmon spawning and rearing environment occurred. Of approximately 223 primary salmon streams in the Sound, 138 were uplifted 3 to 31 ft., 43 subsided 2 to 6 ft. and 42 remained at essentially the same level (-1 to +2ft.). The water level of Bering Lake was lowered 2 to 3 ft., and, subsequently, some shoreline spawning habitat was destroyed.[14]

A serious effect of uplift or subsidence was disruption of stream gradient. In uplifted

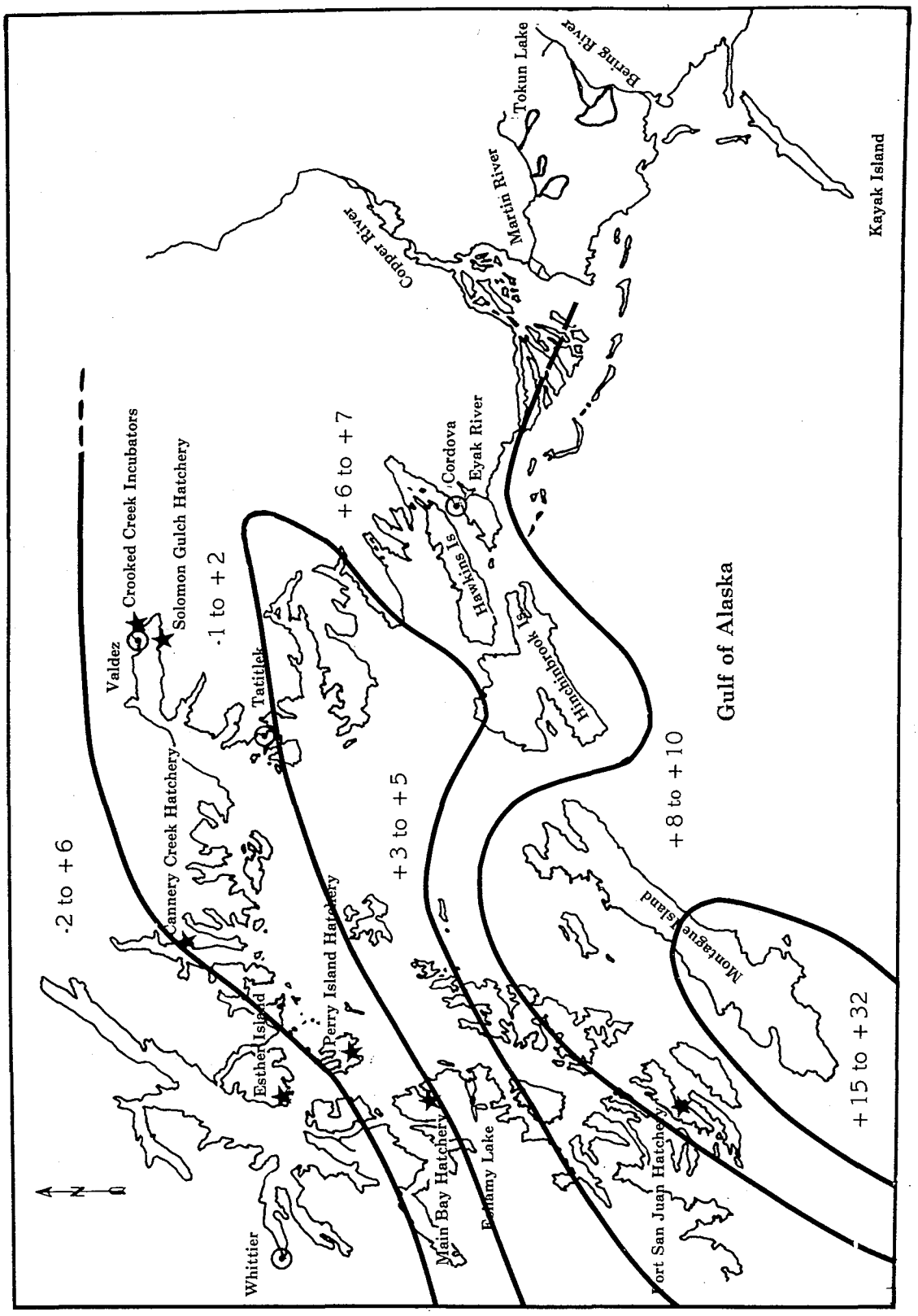


Figure 2-2. Approximate zones of uplift and subsidence (in feet) associated with the Good Friday earthquake of 1964 (adapted from Roys, 1971).

streams, soft materials of former sea floors were readily subject to scouring. The action of scouring and resultant filling of downstream areas often resulted in braided and abandoned channels. Salmon eggs and alevins were destroyed by dislodgement, mechanical shock, exposure (scouring), suffocation (filling) and dessication or freezing (abandoned channels).[15]

In a few uplifted streams, notably on the northeast part of Montague Island, water flows were insufficient to cut through exposed beach materials and these streams subsequently now flow underground prior to entering the ocean. Salmon, therefore, are prevented from utilizing these streams.[15]

Subsided streams were affected by sea water intrusion of formerly productive spawning areas and fouling and blockage of spawning areas by silt and blow down of dead trees. In some instances subsidence was beneficial. Hobo Creek, for example, was rendered accessible by the subsidence and drowning of a former barrier near the mouth.[15]

Before the earthquake, generally 70-77 percent of even-year pink salmon and 35-57 percent of odd-year pink salmon spawned in intertidal reaches of streams. After the earthquake, stocks in uplifted streams were displaced downstream into newly created, unstable reaches of streams. Stocks in subsided streams were displaced upstream.[14]

The net effect of the earthquake was to increase the amount of potential spawning area by several million square yards.[16] As streams regain equilibrium and accumulated sediments in uplifted intertidal zones are reduced, the salmon production potential of the Sound may increase. It may take many years, however, for salmon to utilize these areas.

Evidence of earlier marked changes in land elevation in the Sound have been observed. Captain George Vancouver in May and June 1794 observed at Port Chalmers, Montague Island that: "...stumps of trees, with their roots still fast in the ground, were ... found in no very advanced state of decay nearly as low down as the water of spring tides."[15,17] Thorsteinson et al. (1971) stated: "Evidence of this subsidence, or perhaps a more recent one, is shown by stumps still standing on a bare beach along Wild Creek in Port Chalmers." Similar observations were made by Grant and Higgins (1910).

The Region borders what seismologists term the "Yakutat Gap." The "Gap" spans an area between Cape Yakataga and Kayak Island. This area has been seismically inactive since 1899-1900, and the probability of a major earthquake occurring within the near future is considered high.[18,19]

Fisheries Resources

Fish have long been a source of sustenance, income and enjoyment in the Region. Natives and others have utilized fish, primarily salmon, as an important part of their diet. Commercial fisheries for numerous species have developed, prospered or waned, including: salmon, herring, razor and cockle clam, Dungeness crab, king crab, Tanner crab, shrimp, bottom fish and halibut. Commercial fishermen in 1981 received 69.2 milion dollars for their catches. Salmon contributed 84.3 percent of these revenues. Approximately 5,000 sport fishermen harvested an estimated 29,991 anadromous salmon in the Region in 1981.[20] Subsistence permits were issued to 4,162 individuals or households in 1981, and these fishermen harvested an estimated 56,101 salmon.[21]

Salmon

Five species of Pacific salmon occur within the Region. In Prince William Sound, pink salmon are dominant followed by chum, sockeye and coho salmon. The freshwater distribution of these species is depicted in Figures 2-3 through 2-7. King salmon are few in number and are not known to spawn in the streams of the Sound. Those harvested are generally immature feeding fish. Many of the 551 documented salmon spawning streams within the Sound are usable by salmon only near tide water; and, subsequently, pink and chum salmon stocks capable of successfully spawning in intertidal waters have evolved.[22]

In the Copper River and delta area, sockeye salmon are dominant, followed by coho and king salmon. Pink and chum salmon population levels are insignificant.

In the Bering River and delta area, sockeye and coho salmon are codominant. Small populations of pink and chum salmon also spawn in the area.

The causes of fluctuations in salmon catches in Figures 1-2 through 1-7 are not fully understood. Numerous factors affecting egg deposition and survival have been identified and these include: escapement magnitude, substrate freezing, redd superimposition, flooding, siltation, dewatering, salinity, low oxygen, temperatures and predation.[16] Estimates of the number of pink and chum salmon adults returning per spawner suggest that factors other than escapement have been major causes of run fluctuations. A comparison of parent escapements (index areas) and subsequent returns (catch plus index escapement) indicate that, since 1960, the number of adult pink salmon returning per spawner has varied from approximately 0.7 to 14.6 with an unweighted average of 4.8 (Figure 2-8). Since 1960, chum salmon data indicate a range in return per spawner of 0.9 to 14.3 with an unweighted average of 3.7 (Figure 2-9). In Prince William Sound, pink and chum salmon spawn commonly in short, steep streams, and these streams are particularly vulnerable to freezing, flooding, siltation and dewatering.

Commercial Salmon Fishery

The commercial salmon fishery in the Region has perhaps gone through three phases since its inception and now is in a fourth phase. During the initial phase, 1889-1915, a single cannery was operated at Eyak. Sockeye salmon were the preferred species followed by king and coho salmon. The major fishery occurred where these species were most abundant, the Copper River Delta. Prince William Sound, due to its relatively small sockeye salmon runs, was of secondary importance. Pink salmon were only taken incidentally, and chum salmon were avoided.[16]

During the second phase, 1915-1959, canneries were constructed and operated at: Port San Juan, Port Ashton, Drier Bay, Port Nellie Juan, Unakwik Inlet, Valdez, Ellamar, Shepard Point, Miles Lake and Cordova. The fishery was managed by the federal government. Pink and chum salmon fisheries developed, and the sockeye salmon fishery declined. Fish trap (floating and pile driven) and purse seine fisheries became established in the Sound. Set and drift gill net and troll fisheries also occurred. Catches of pink and chum salmon escalated to high levels and peaked between 1922 and the late 1940's (Appendix 1-1). Average annual catches of even-year and odd-year pink salmon and chum salmon were

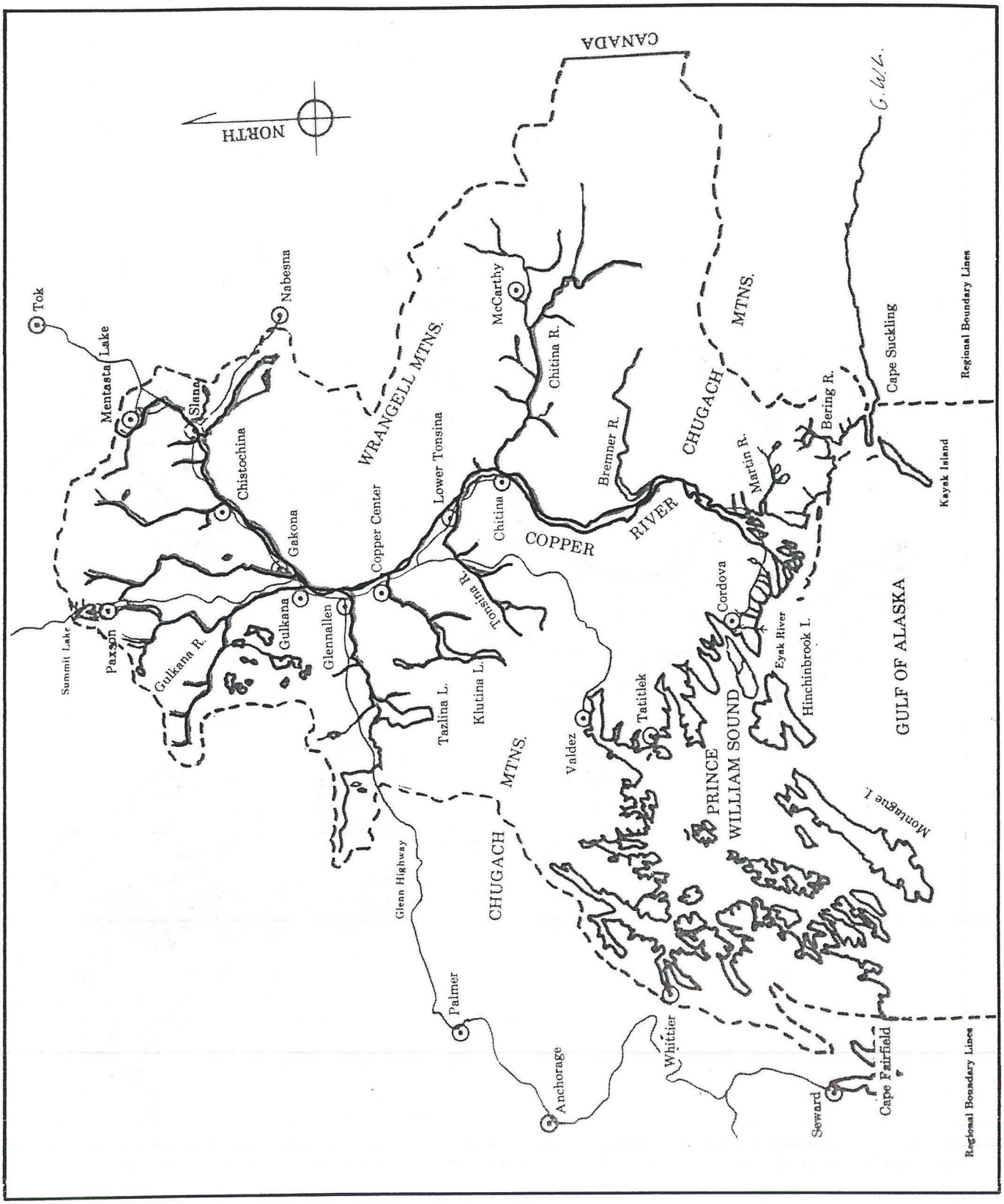


Figure 2-3. King salmon migration, spawning and/or rearing areas within the drainages of the Prince William Sound Region (adapted from Alaska Department of Fish and Game, 1982).

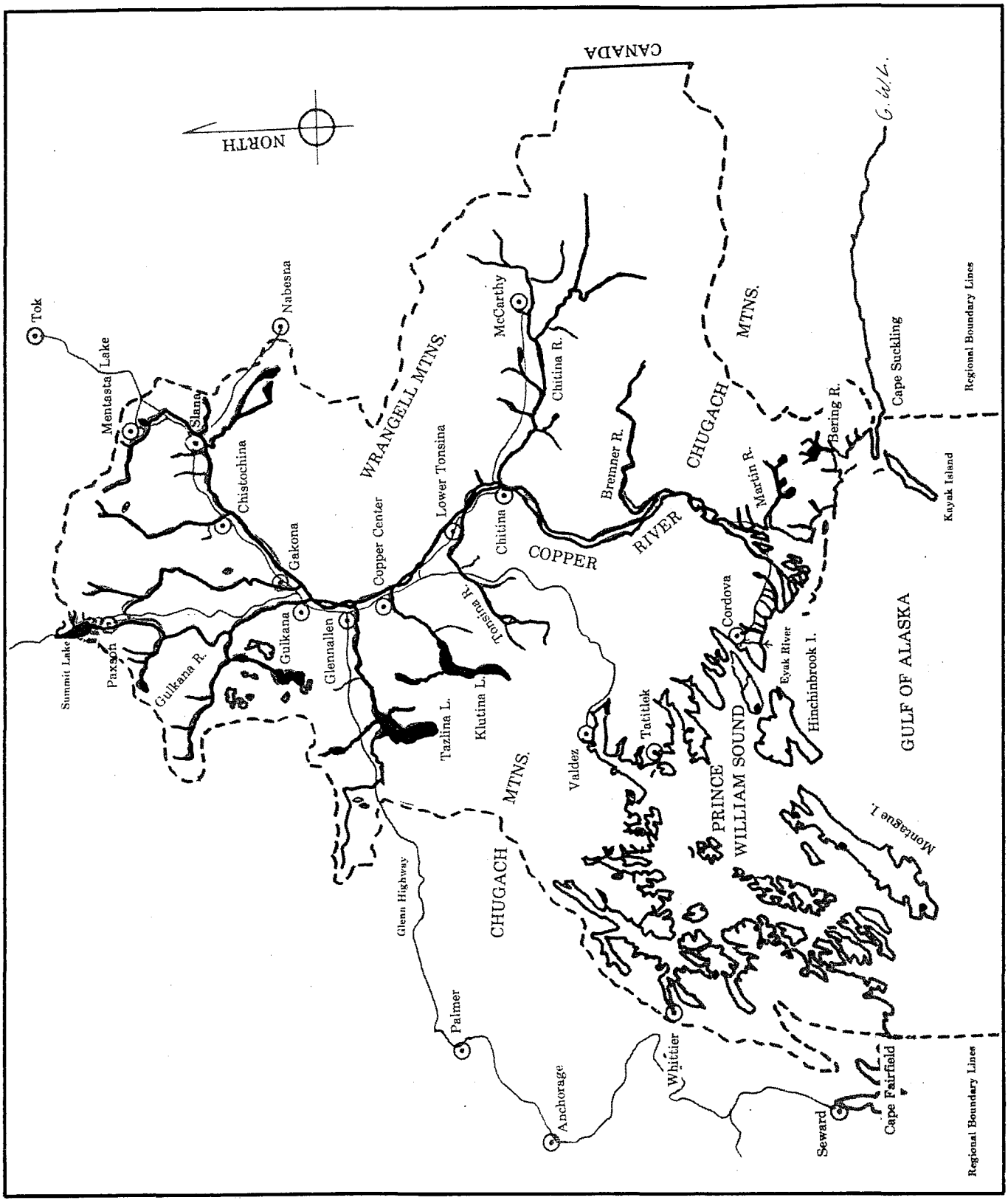


Figure 2-4. Sockeye salmon migration, spawning and/or rearing areas within the drainages of the Prince William Sound Region (adapted from Alaska Department of Fish and Game, 1982).

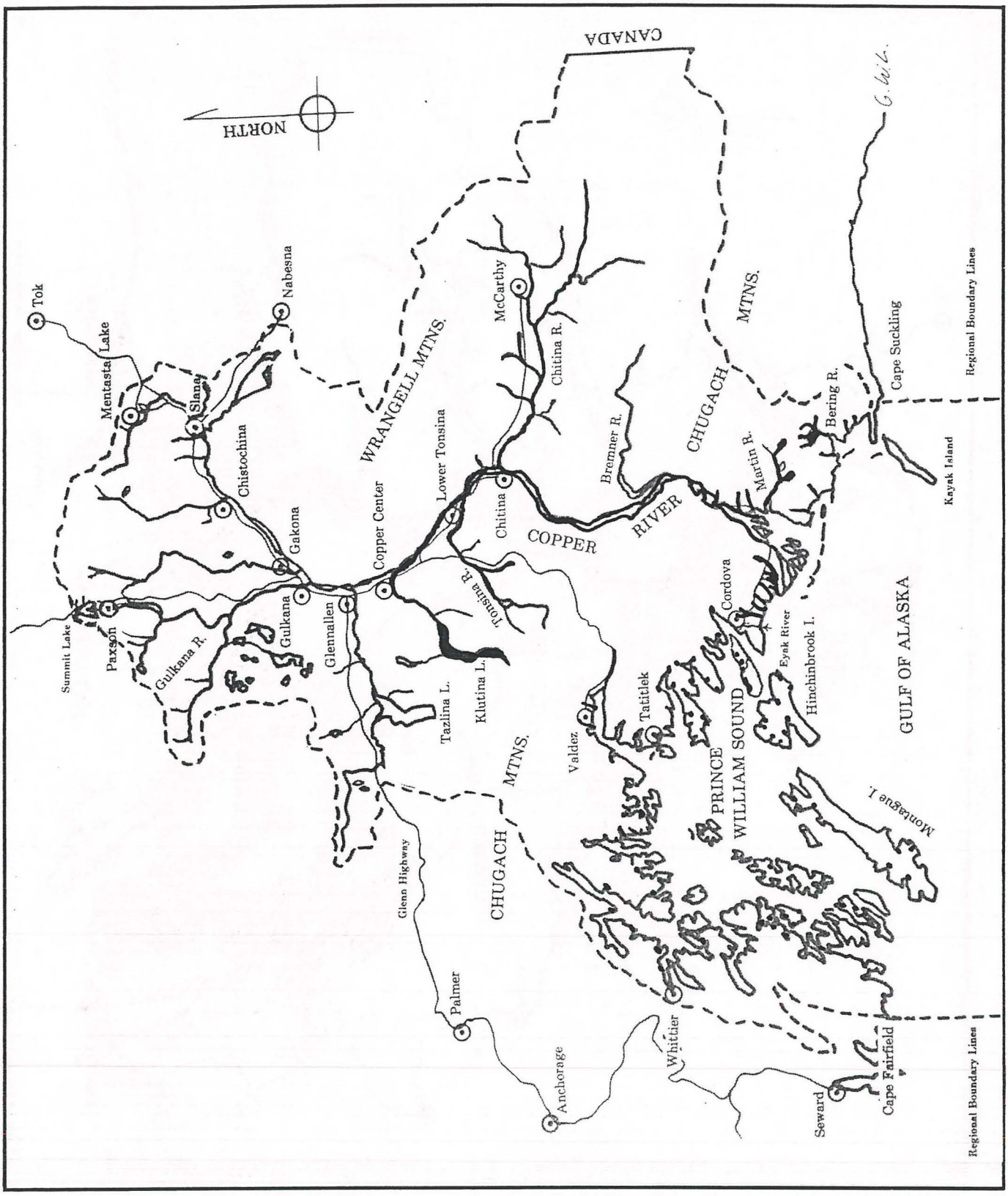


Figure 2-5. Coho salmon migration, spawning and/or rearing areas within the drainages of the Prince William Sound Region (adapted from Alaska Department of Fish and Game, 1982).

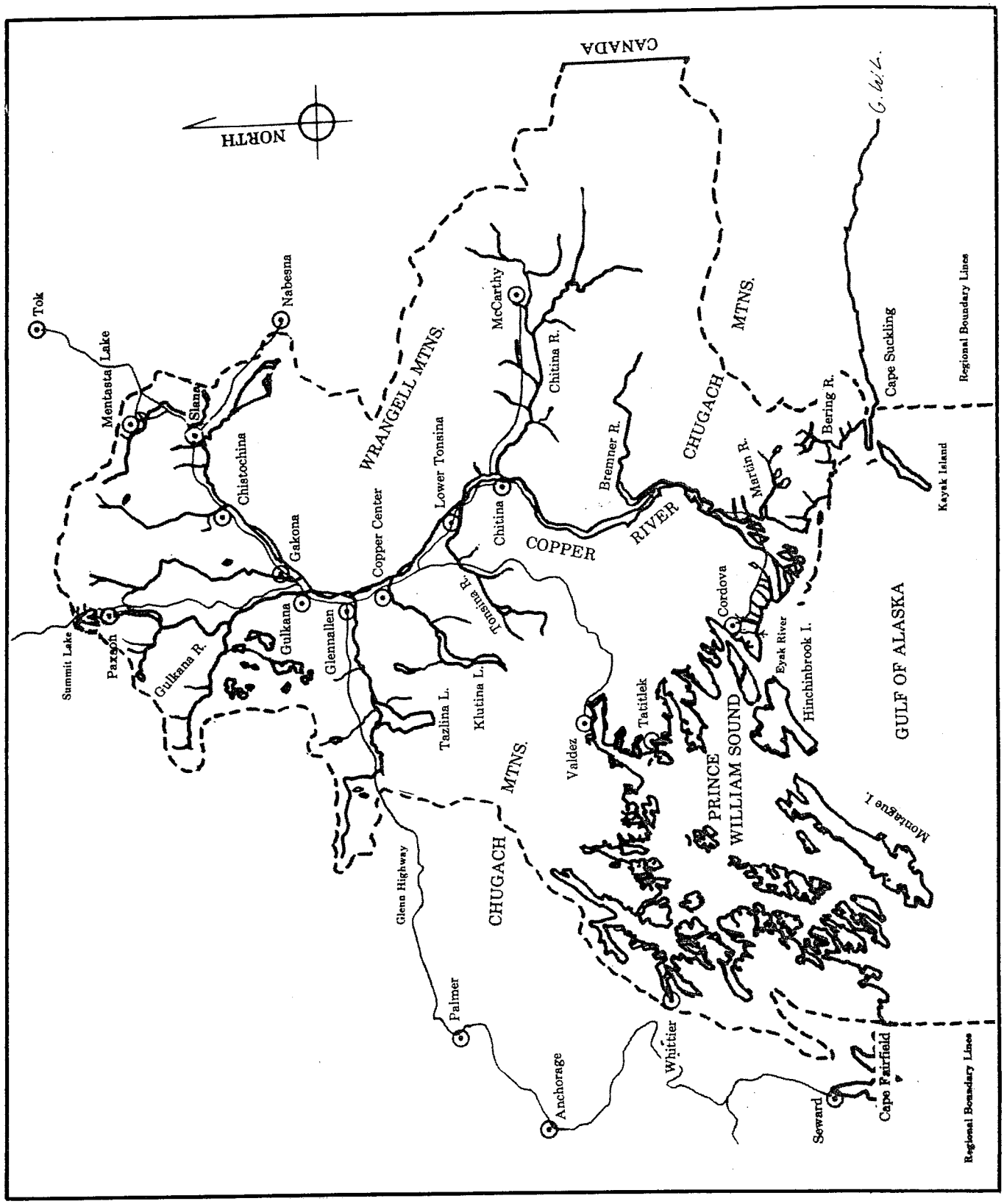


Figure 2-6. Pink salmon spawning and/or migration areas within the drainages of the Prince William Sound Region (adapted from Alaska Department of Fish and Game, 1982).

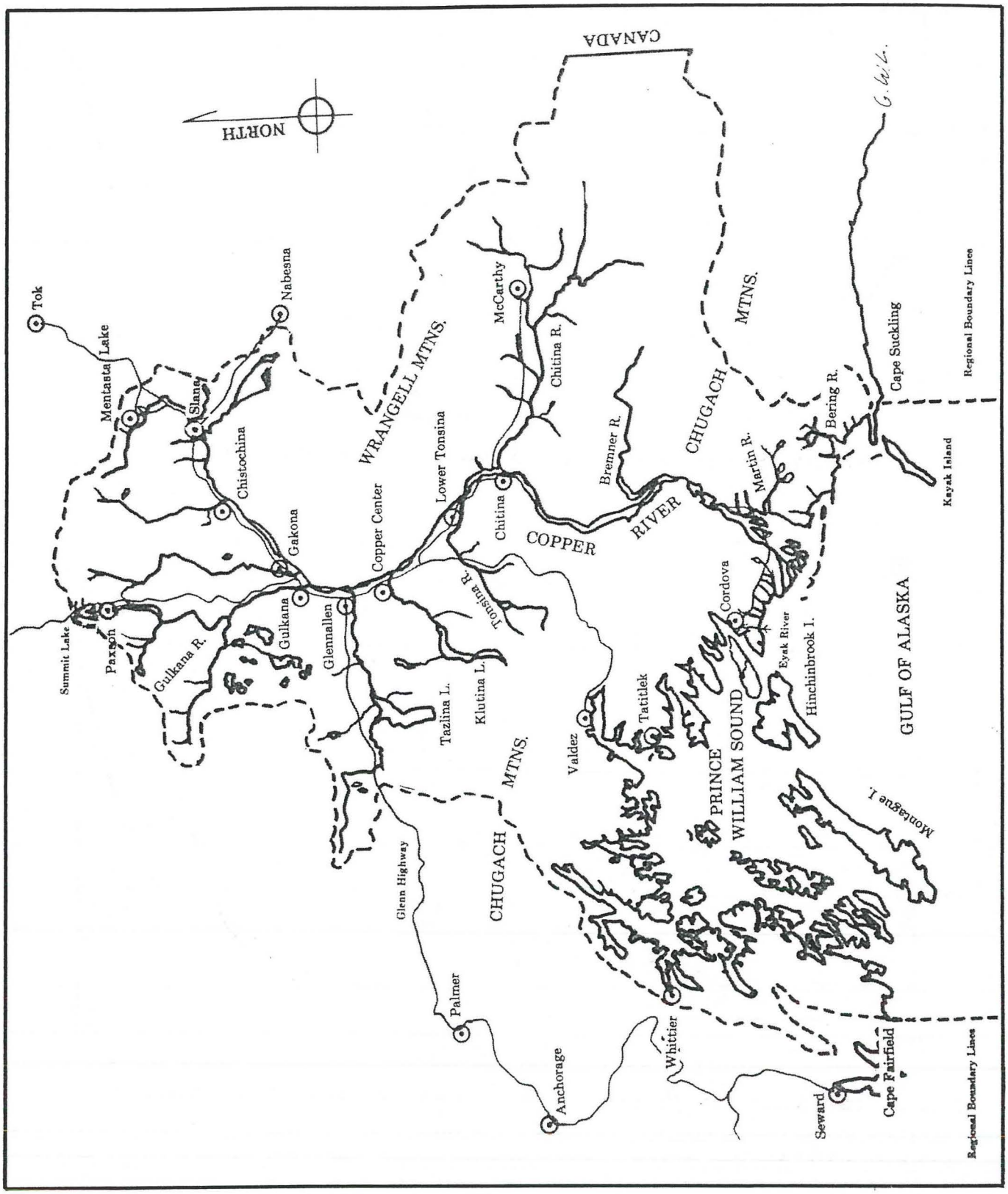


Figure 2-7. Chum salmon spawning and/or migration areas within the drainages of the Prince William Sound Region (adapted from Alaska Department of Fish and Game, 1982).

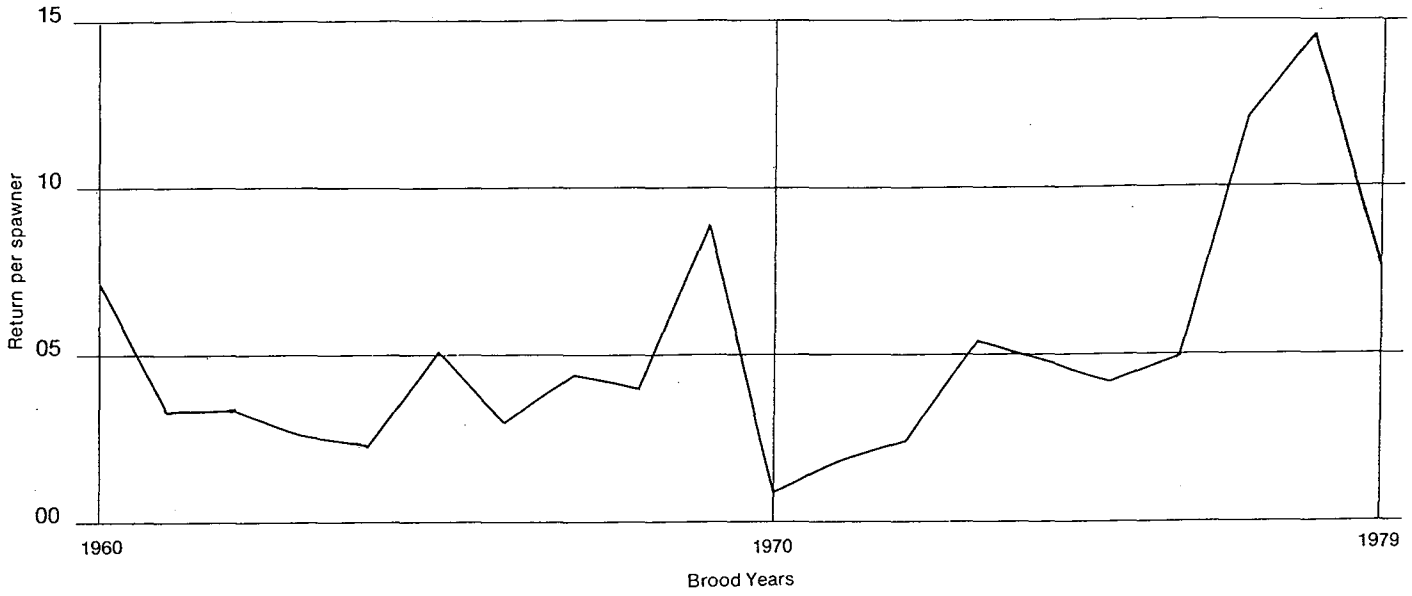


Figure 2-8. Prince William Sound pink salmon return per spawner ratios for brood years 1960-1979.

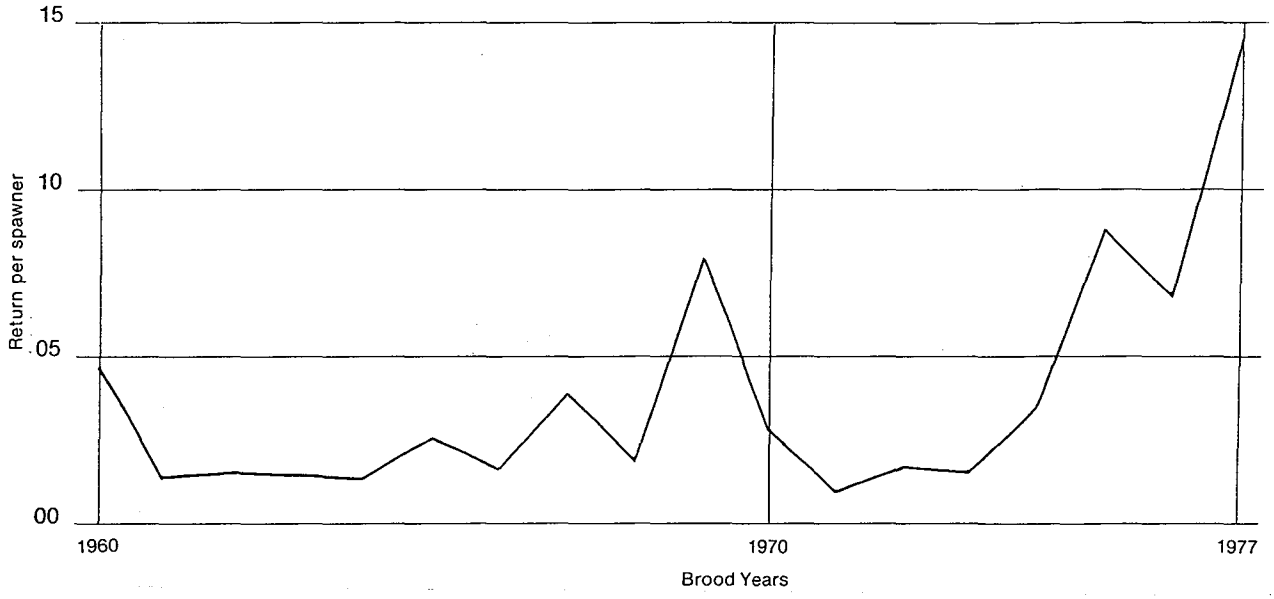


Figure 2-9. Prince William Sound chum salmon return per spawner ratios for brood years 1960-1977.[1]

1) Assuming all 4 year old fish.

approximately 8.0, 6.0 and 0.7 million fish, respectively. Catches of these stocks declined to low levels thereafter. Dwindling catches prompted the federal government to close the Prince William Sound fishery in 1954 and 1955. These closures resulted in an increase in the returns of even-year pink salmon. Odd-year pink salmon returns, however, did not increase. At the close of the era of federal management, stocks of pink and chum salmon were apparently at half of the historic high levels.[16]

The third phase of the fishery started in 1960 when the State took over management, research and enforcement responsibilities and fish traps were prohibited. With Statehood, the Commissioner of ADF&G was granted authority to adjust fishing time and open areas to fishing. Optimum escapement goals for pink and chum salmon were established and the seine fishery was managed according to these goals. Formal forecasting of pink and chum salmon returns was was initiated in 1961.

Pink (even and odd-year stocks) and chum salmon stocks upsurged temporarily during the first few years of this period. The 1964 earthquake, however, caused these stocks to once again decline.

A fourth and ongoing phase in the salmon fishery was initiated in 1971 when the Legislature initiated a large-scale salmon aquaculture program by creating the FRED Division within ADF&G. Private nonprofit salmon hatchery and limited entry legislation was enacted shortly thereafter. These significant events, coupled with legislation authorizing the establishment of regional associations, planning teams and the regional salmon planning process, set the stage for a new era in the fishery.

Unfortunately, this era began with two successive harsh winters, hampering the recovery of earthquake-impacted pink and chum salmon stocks. Complete closures of the seine fishery were implemented as a result in 1972 and 1974, and catches in 1973 were minimal. Unusually favorable survival conditions occurred in the late 1970's, however, and pink salmon catches soared to record high levels in 1979 and continued through 1981. In addition, record high chum salmon catches occurred in 1981.

Exvessel prices (the price the fishermen receive for fish) increased dramatically beginning in 1973 (Appendix 2-1). Fishermen, in response to higher fish prices, larger catches and stable competition, have commonly upgraded their boats and fishing gear. Many wooden boats have been replaced by larger fiberglass boats.

Limited entry regulations have brought about a relative stabilization of fishing gear quantity. The number of permit holders in 1982 was: 271 purse seine (259 permanent, 1 hatchery and 11 interim), 541 drift gill net (529 permanent and 12 interim) and 31 set gill net (26 permanent, 1 hatchery and 4 interim).[23] PWSAC holds, to date, the only hatchery seine permit; however, VFDA is currently applying for a hatchery seine permit. NERKA, Inc. currently has a hatchery set net permit. Hatchery permits are only usable in the special harvest areas.[24] Interim permits have been issued to fishermen whose qualification for permanent permits is being contested by the Commercial Fisheries Entry Commission. The market value of limited entry permits has increased dramatically since the inception of limited entry.

Subsistence Salmon Fishery

Subsistence salmon fishing is restricted to Alaskan residents, and permits are required to participate. Regulations restrict locations, methods and quantity of fish harvested. Subsistence salmon fishing is allowed in marine waters open to commercial salmon fishing and a 100 mile portion of the main Copper River above Wood Canyon (Figure 2-10)[25]

Marine waters have been open to subsistence fishing during open commercial fishing periods. Legal fishing gear has consisted of drift and set gill nets and purse seines. Freshwater subsistence fishing normally has been open June 1 through September 30. Restrictions occurred in 1978, 1979 and 1980 when sonar counters at Miles Lake indicated a smaller than desired run. Dip nets and fishwheels constitute the legal gear.[25]

Catches by species, gear type, area and year are presented in Appendix 2-2 through 2-4.

Sport Salmon Fishery

The sport fishery has until recent times been the least documented salmon fishery in the Region. The harvest data base initiated in 1966 for the Upper Copper River and 1977 for all waters (Appendix 2-5 and 2-6). These data indicate that sport users have harvested the least number of salmon. Favored salmon sport fishing areas have been the Gulkana River, Valdez Bay, Passage Canal and Eyak River (Appendix 2-6).

Socioeconomics

According to government censuses, the population of the Region in 1980 was 7,650 residents. Population increases occur annually with the influx of seasonal workers, fishermen (commercial, subsistence and sport), job seekers, tourists and vacationers. The largest city in the Region is Valdez (Appendix 2-7). The population of the Region has increased by over 100 percent since 1970. This has been largely due to the construction and operation of the Alyeska Pipeline Terminal at Valdez and pump stations between Valdez and Glennallen. Projections of population growth between 1980 and 2002, the target year of this plan, are presented in Appendix 2-8.

The economy of the Region centers around the Alyeska Pipeline, fishing, fisheries processing, tourism, miscellaneous services and government employment (federal, State and local).

Fish Processors

The majority of local processing has in recent years been done by five processors in Cordova and Seward Fisheries in Seward. The major Cordova processors are: Morpac, Inc.; North Pacific Processors; St. Elias Ocean Products; Chugach Alaska Fisheries, Inc. and the Copper River Fisheries Cooperative. Of the major processors, four have canning lines and all have freezers.

The daily processing capacity of the processors located within the Region, including Seward Fisheries, was estimated by ADF&G in December, 1981, to be 597,000 canned salmon and 100,000 frozen salmon.[26,27] Pink salmon constitute the majority of the fish canned in the Region. Some chum salmon are also canned. All species are frozen.

The five major processors operating at full

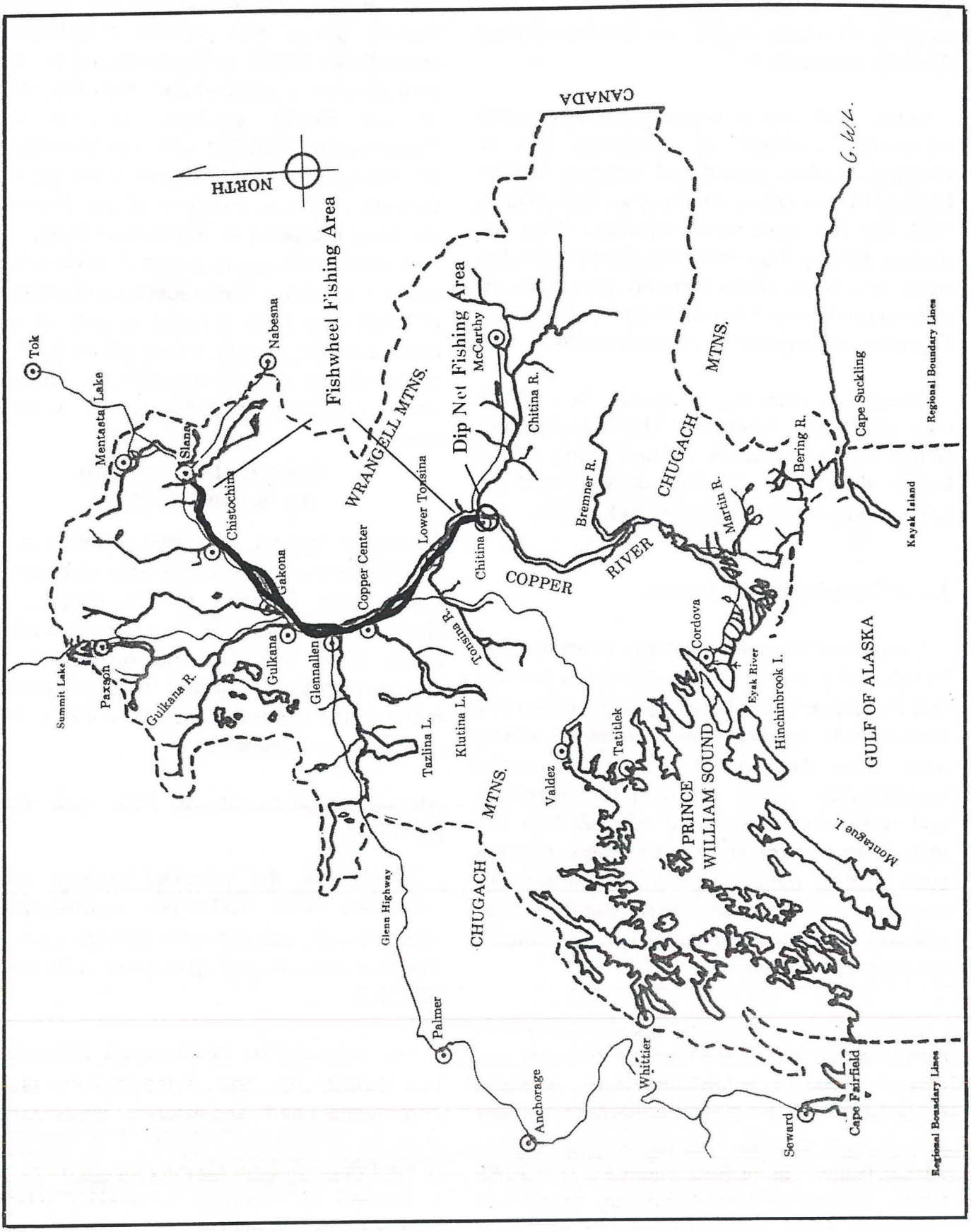


Figure 2-10. Subsistence fishing areas of the Upper Copper River.

capacity have employed approximately 800 workers, of which roughly one third have been Alaskan residents.[28]

Large local runs in recent years have been adequately handled by tendering fish to outlying Alaskan plants and freezing fish on floating freezer ships. As many as 250,000 to 500,000 fish have been exported from the Region daily by these methods. The processing capacity of these plants is largely dependent on salmon run strength in their respective regions. Capacity, subsequently, varies annually.

Processing capacity, obviously, is a major concern among fishermen. The full utilization of the salmon resources of the Region will be highly dependent on the development of adequate processing facilities and outlets.

Land Ownership and Status

Land ownership and status is of importance in fisheries planning. The policies and plans of owners and administrative agencies determine land use. Access and continued use of stream and lake-side lands are important considerations when planning for recreation and subsistence needs and rehabilitation and enhancement projects. Development projects such as coal mining and timber harvest will require coordination with the Habitat Protection Division of ADF&G to minimize or mitigate fisheries habitat losses.

Land ownership has changed dramatically in recent years. The State and the regional and village native corporations have received portions of their land entitlements under provisions of the Alaska Statehood Act and the Alaska Native Claims Settlement Act (ANSCA). Conveyance of lands is continuing. Native land selections have generally focused on areas containing valuable resources, principally timber, gravel and mineral resources and recreational lands. A large holding of federal land became a national park with the passage of the Alaska National Interest Lands Conservation Act (ANILCA). The boundaries of the Chugach National Forest were expanded through ANILCA. Portions of the Forest are currently classified as Wilderness Study Areas and other portions are under consideration for wilderness status. The wilderness classification of lands may have a major impact on major enhancement projects. It may not be feasible to construct and operate cost-effective hatcheries under guidelines established for wilderness areas.

Agencies Involved with the Salmon Fisheries

Various federal and State agencies and private organizations are directly involved with the salmon fisheries of the Region. The Regional Fisheries Planning Team serves to guide these agencies and organizations in fisheries matters through recommendations made to the Commissioner of ADF&G. These agencies are as follows.

Alaska Department of Fish and Game (ADF&G)

ADF&G is the principal agency and is involved with fisheries management, rehabilitation, enhancement and research. Five divisions deal, in varying degrees, with salmon fisheries.

The **Division of Commercial Fisheries** is responsible for the management of the commercial and subsistence fisheries and commercial fisheries research. The Area Office of the Prince William Sound Management Area is located in Cordova. A satellite office is maintained in Glennallen.

The **Division of Sport Fisheries** is responsible for the management and research of the State's sport fish species. A goal of the division is to provide maximum sport fishing opportunities while maintaining stocks at a high level of productivity.[29] The Area Office is located in Glennallen.

The **Division of Subsistence** performs research on subsistence users and needs and serves the Alaska Board of Fisheries in an advisory capacity.

The **FRED Division** has the responsibility to "(1) develop and continually maintain a comprehensive, coordinated state plan for the orderly present and long-range rehabilitation, enhancement and development of all aspects of the state's fisheries...; (2) encourage the investment by private enterprize in the technological development and economic utilization of the fisheries resources; and (3) through rehabilitation, enhancement and development programs do all things necessary to insure perpetual and increasing production and use of the food resources..."[30] Offices are located in Cordova, Glennallen and Anchorage. FRED Division operates hatcheries at Cannery Creek, Main Bay and Gulkana.

The **Cannery Creek Hatchery** is located on the east shore of Unakwik Inlet and has been operated by FRED Division since 1979 (Figure 1-1). The hatchery consists of: a 7,000 sq. ft. hatchery building, a bunkhouse, three single family residences, a power generating module, eight 10 ft. by 100 ft. outside raceways, a large lake level control dam and a stream level control weir. Cannery Creek is a short coastal stream with a watershed of 3.34 sq. mi. The creek drains a 130 surface acre lake, Cannery Lake.

The hatchery currently has sufficient incubation trays to incubate approximately 50.5 million pink salmon eggs. There exists sufficient floor space, however, to increase the capacity to 80 million eggs.[31]

During 1980 and 1981, an estimated 232,000 pink salmon returned from fry released at Cannery Creek and Hobo Creek (Appendix 2-9). It is estimated that approximately 125,000 of these fish were captured by commercial fishermen.

Several critical factors currently limit the production of salmon at this hatchery. An immediate concern is the lack of adequate adult salmon holding facilities. This reduces the efficiency of egg take operations, and as a result it is estimated that a maximum of 50 million eggs can be taken during any spawning season.[31] A captital improvement request has been submitted to improve the fish handling facilities.

The development of a large chum salmon brood stock would require use of a donor stock with an earlier run timing than that of the pink salmon in Cannery Creek. Early run fish, however, would emerge early and would require long-term feeding. The water in the hatchery raceways during spring is thought to be too cold for effective freshwater rearing.[32] Emergent chum salmon normally feed for a brief period in fresh or brackish water. This initial freshwater rearing period is apparently of major importance to the survival of chum salmon fry. Emergent pink salmon fry, conversely, do not thrive in freshwater and migrate promptly to the estuary.[33]

Short-term feeding of pink salmon fry in saltwater is not feasible due to the lack of rearing pens. It is estimated that marine survival can be enhanced approximately 2.9 fold by doubling the weight of emergent fry through short-term feeding (Appendix 3-16).

The **Gulkana Incubation Facility** consists of twenty 4 ft. by 4 ft. by 8 ft. incubation boxes situated in a spring area (Figure 1-1). Fertilized sockeye salmon eggs are placed on gravel or artificial material and spring water is fed by gravity into the bottom of each box via a system of pipes. To date, approximately 19.8 million fry have been produced (Appendix 2-10). It has not been possible to determine the number of adult salmon that have been produced. Overall survival from fry to adult has been estimated to range from one-half to one percent.[34] The capacity of the facility is presently 10.3 million sockeye salmon eggs. Currently, only about 10 percent of the water of the spring flows through the hatchery. Other springs also exist in the area, and, therefore, the potential for expansion is high. Work is progressing at this time to evaluate the feasibility of stocking nearby lakes: Paxson, Summit, Crosswind, Monsoon and Dickey.

The **Main Bay Hatchery** is located within Main Bay in the western part of the Sound (Figure 1-1). This new facility consists of 7 structures, water pipelines, a sewage treatment system and a hydroelectric plant. The water source of the hatchery is an 826 acre lake set within a 3,900 acre watershed.

The capacity of the facility currently is approximately 95 million "green" (freshly fertilized) eggs. Rearing facilities presently consist of indoor freshwater raceways. These contain sufficient space to rear 25 million chum salmon to fingerling size*. No outdoor saltwater rearing facilities exist for chum or pink salmon.

The hatchery became operational during the summer of 1982. Brood stock development started in the spring of 1981 when 2.95 million pink salmon juveniles were transported from the Port San Juan Hatchery and released at the Main Bay Hatchery site. Plans with the existing facility are to direct efforts toward chum salmon.

It is estimated that the existing hatchery at full capacity of 95 million eggs will produce approximately 808,000 adult chum salmon. It is estimated that returns could be increased by 492,000 adult chum salmon if rearing facilities for all fry were to be provided.

The **Division of Habitat Protection** is responsible for cataloging, protection and improvement of fish habitat. It oversees proposed and on-going activities in anadromous fish streams and critical habitat areas.

Alaska Board of Fisheries

This regulatory body promulgates regulations covering commercial, sport and subsistence fishing activities in State waters and seaward biological influence zones. These zones encompass areas within the 200 mile limit where finfish or shellfish indigenous to Alaska are available for harvest. The Board also sets regulations governing private non-profit hatcheries and special harvest areas.

*A fingerling is defined as juvenile salmon that is twice the weight of an emergent fry.

Alaska Commercial Fisheries Entry Commission

This commission administers the licensing of fishermen and fishing vessels and strives to limit fishing gear in distressed fisheries. In this Region, salmon and herring commercial fishing gear has been limited by the Commission.

Alaska Division of Fish and Wildlife Protection

This agency enforces State fishing, hunting and trapping regulations. Officers are stationed in Cordova, Valdez and Glennallen.

North Pacific Fishery Management Council (NPFMC)

The Council is composed of members representing Alaska, Washington, Oregon and federal fisheries agencies and is responsible for the development of management plans for all fishery resources harvested in the Fishery Conservation Zone adjacent to Alaska. The Zone encompasses marine waters 3 to 200 miles offshore. The broad representation on the Council reflects the concept that fishery resources of this Zone are commonly shared by these north Pacific states. Plans for the salmon fishery will deal primarily with the troll fishery.[29] The Board of Fisheries declared salmon trolling west of Cape Suckling to be no longer legal in 1976. Proposals have been introduced to the Board of Fisheries, however, to reinstitute trolling as legal gear in this area.

US Forest Service (USFS)

The Forest Service manages fish habitat in the Chugach National Forest and has been actively involved in fish habitat improvement projects within the Forest. Projects entail habitat inventory, fish pass installation, channel stabilization and stream clearance and improvement. The Forest Service has worked with the State on the selection of hatchery, lake stocking and lake fertilization sites. District offices are located in Cordova, Anchorage and Seward. The Forest Supervisor's office is in Anchorage.

Bureau of Land Management (BLM)

BLM administers federal lands under the multiple-use principle. The Bureau's first management priority regarding fisheries is the identification and protection of salmon spawning habitat.[35] This agency is currently involved in a cooperative study of Monsoon and Dickey lakes in the Upper Copper River drainage. These lakes are candidates for sockeye salmon fry stocking.

Prince William Sound Aquaculture Corporation (PWSAC)

PWSAC operates the Port San Juan Hatchery on Evans Island in western Prince William Sound (Figure 1-1). The hatchery is one of the largest and most successful pink salmon hatcheries in the world. The hatchery is built on the site of a cannery formerly operated by the San Juan Fishing and Packing Company. Construction and operation of the hatchery commenced in 1975. The site was chosen mainly because of low initial cost, land status and the time savings that could be achieved by utilizing the old cannery buildings, dock and water source. Following major seine fishery closures in 1972 and 1974, organizers of PWSAC were anxious to get a hatchery on line to aid the fishery and lend credibility to the program.

During 1977 through 1981, an estimated 4.5 million pink salmon returned to the hatchery and common property fishery from 73.2 million fry released (Appendix 2-11). Chum salmon brood stock build up is ongoing. To date, approximately 20,000 chum salmon adults have returned to the hatchery and common property fishery.

The permitted egg capacity of the facility is presently 150 million pink salmon eggs and 13 million chum eggs.[36] The short-term rearing capacity of the hatchery is estimated to be 100 million pink salmon fry and 10 million chum salmon fry.[37]

Members of the Cordova Aquatic Marketing Association (CAMA), a regional fishermen's association, have voted to assess their salmon catch on a voluntary basis. This self-imposed tax has served as collateral for State loans and operating funds for PWSAC. Prior to 1982, two assessment rates were utilized. Copper River and Bering River fishermen voluntarily paid 2 cents per fish sold and Prince William Sound fishermen paid 3 cents per fish sold. A higher rate was selected for the Prince William Sound fishermen because the first hatchery was located in this area. It was the intent to direct the greater cost to the users who would benefit the earliest from the PWSAC hatchery program. The assessment rate was changed to 2 cents for all fishermen in the spring of 1982. Non-CAMA fishermen have also contributed.

Processors have cooperated oftentimes by matching the amount contributed by the fishermen. One processor, North Pacific Processors, Inc., contributed the scheduled amount regardless of whether the fisherman had contributed or not.

Between 1975 and 1981, fishermen assessed themselves a total of $1,629,535.28 or 76 percent of the potential assessment associated with the total catch. Processors contributed $1,317,617.85 or 81 percent of the amount contributed by fishermen.

In addition to cash, fishermen, processors and tender operators have contributed personal services and/or surplus equipment.

Other revenues have been aquired through the harvest of salmon in the Port San Juan Special Harvest Area. Between 1975 and 1981, approximately 1,416,546 salmon were harvested (Appendix 2-11).

Fishermen have received direct benefit from the hatchery by catching returning adults in the common property fishery. Tender operators, processors and communities have subsequently benefitted from these increased catches.

Valdez Fisheries Development Association (VFDA)

VFDA, a private non-profit corporation, has operated a stream-side egg incubation box system at Crooked Creek in Valdez since 1979. VFDA has been permitted by the State to take and incubate eggs under provisions of a scientific and educational permit and a private non-profit permit. Educational research is conducted in conjunction with the Prince William Sound Community College in Valdez.

A major objective of the Crooked Creek facility has been the development of donor stocks for the new Solomon Gulch Hatchery. The new hatchery is located at the mouth of Solomon Gulch Creek, several miles from Crooked Creek. The Association is permitted

by the State to incubate at this facility 50 million pink salmon eggs, 18 million chum salmon eggs and 1 million coho salmon eggs.[35] Water for the hatchery comes from a hydroelectric plant reservoir.

Approximately 8.5 million pink salmon fry and 1.2 million chum salmon fry have been released to date (Appendix 2-12).

NERKA, Inc.

NERKA, a private non-profit corporation, has operated a small harchery on Perry Island since 1976. The facility is located 40 miles east of Whittier and consists of a residence, warehouse and water system. NERKA currently has only the capacity to incubate 300,000 eggs. The present water system becomes low during extremely cold weather and production is thereby limited. Releases amd returns to the facility have been low (Appendix 2-13). NERKA has applied for a State Fisheries Enhancement loan to upgrade the facility to incubate 20 million eggs.

Agencies Involved with Access and Campgrounds

Access routes to fishing areas and campground facilities are both of major concern to sport and subsistence fishermen. Various agencies and corporations are involved in the provision and maintenance of these recreational facilities. Some facilities are not located near salmon fishing areas.

ADF&G, Division of Habitat Protection

Reservation of lands for access routes to sport and subsistence fishing areas is a function of the Division.

ADF&G, Division of Sport Fisheries

The Division recommends access lands for reservation or purchase in an effort to preserve or provide for increased sport fishing opportunities.

Alaska Department of Natural Resources (ADNR), Division of Parks

The Division maintains 122 overnight campsites in 8 parks within the Region. No additional roadside campgrounds have been proposed; however, marine parks within Prince William Sound have been proposed. The Division has a program to procure lands for recreation purposes.

Alaska Department of Transportation and Public Facilities (DOTPF)

This agency maintains wayside rest areas, including two heavily utilized rest areas near Chitina. No overnight camp spaces are provided.

Bureau of Land Management (BLM)

BLM maintains 52 camp spaces in 4 campgrounds within the Region. The Bureau also has boat ramps and access easements across native lands.[38]

US Forest Service (USFS)

The Forest Service maintains 21 recreational cabins within the Region. Cabins must be reserved and a $10 daily fee is charged.[39] The Forest Service also maintains three boat launching sites and is developing a system of mooring buoys to enhance recreation in poor anchorage areas. The Draft Forest Plan calls for the addition of 18 recreation cabins, 18 tent

platforms and 1 campground by 1993. The Forest Service is also maintaining public easements across private land. This program is a cooperative effort with the native corporations.

AHTNA Native Corporation

This corporation is a major land owner in the Upper Copper River drainage and maintains 20 camp spaces within two campgrounds along the Gulkana River. A $10 annual fee is required to utilize AHTNA lands. The Corporation has no plans for future campground development.[40]

Eyak Corporation

Eyak Corporation maintains 17 camp spaces within two campgrounds near Cordova. User fees vary form $3 to $5 per day. The Corporation also maintains a cabin at Simpson Bay, which can be rented for $15 per day. The Corporation has no plans to develop other recreational facilities.[41]

CHAPTER 3

ANALYSIS OF THE REGION'S CURRENT AND FUTURE SALMON HARVESTS

CHAPTER 3

ANALYSIS OF THE REGION'S CURRENT AND FUTURE SALMON HARVESTS

To derive an estimate of management, rehabilitation and enhancement needs, we must first make an educated guess about probable future average catches of natural and supplemental stocks if no significant increases in management efficiency or rehabilitation and enhancement activities were to occur. These baseline data when compared with projected user demands, provide estimates of future production gaps or shortfalls. Chapter 7 will address the various management, rehabilitation and enhancement projects needed to resolve these gaps.

Without this plan, some increase in management precision will undoubtedly occur, as will increases in rehabilitation and enhancement activities. This plan sets forth an organized process which serves to guide the various agencies involved with salmon production and to provide a measure of progress.

Harvest data for natural and supplemental stocks are presented by gear type. It is assumed that over the next 20 years the proportion of natural runs caught by each user group will not significantly change despite projected increases in population and anticipated increases in sport and subsistence fishing effort. Finally, it is assumed that significant increases in catches by all user groups will only be realized after the management program is improved and after new rehabilitation, enhancement and access projects are implemented.

Harvests of Natural Stocks

Catch data for natural stocks have been compiled and analysed by gear type and user group to project probable catch magnitudes 20 years from now. Under the circumstances outlined above, it may be surmised that catches of most stocks during the next twenty years will probably be similar to catches that occurred between 1960 and 1981. The average run size will probably be similar, and runs will probably fluctuate within the ranges that occurred in the past (Figure 1-2 through 1-7). It is assumed, of course, that no major environmental changes will occur. The year 1960 was chosen as the general starting point because this was the year that fish traps were eliminated and the State took over fisheries management. Shorter time frames have been chosen for some stocks affected by various events, such as the 1964 earthquake, unusual fisheries closures or changing fishing practices. Drift and set gill net catches in the Eshamy District were combined prior to 1967, and, therefore, only data for 1967 through 1981 were employed.

Purse Seine Catches of Natural Stocks

The purse seine fishery is, by regulation, restricted to the following districts: Eastern, Northern, Unakwik, Coghill, Northwestern, Southwestern, Montague and Southeastern (Figure 3-1). Management of the purse seine fishery is based on aerial surveys of salmon abundance in the fishing districts, pink and chum salmon catch data and aerial and ground surveys of pink and chum salmon escapement.

The purse seine fishery has been opened annually by field announcement according to the early run strength of pink salmon. Fishing time has normally been divided into weekly fishing periods encompassing 6:00 am Monday to 9:00 pm Friday.[26]

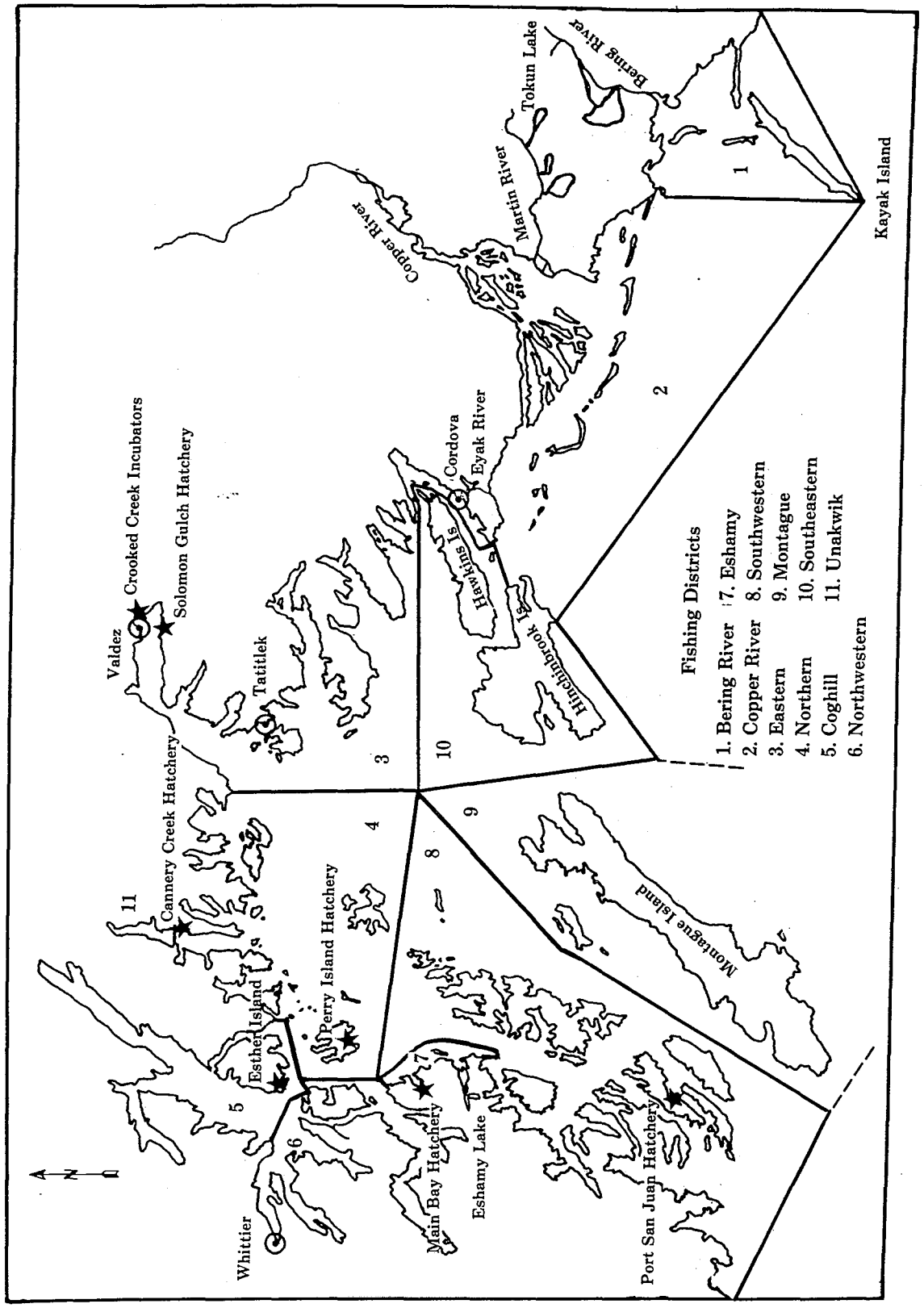


Figure 3—1. Commercial fishing districts of the Prince William Sound Region (adapted from Randall et al., 1982).

District and fishing time restrictions have been imposed when concentrations of salmon in bays and index streams were less than desirable. District escapement goals have been established for pink and chum salmon (Appendix 3-1 and 3-2). These goals are based on an overview of historic escapements in index streams. Major management efforts have centered on the dominant species, pink salmon. Only relatively minor efforts have been made to manage runs of chum and coho salmon. No efforts have been made to manage the runs of sockeye and king salmon. King salmon do not spawn in the seine districts and catches are relatively insignificant.

Escapement counts of pink and chum salmon are generally index counts based on periodic aerial and ground estimates of escapement magnitude in selected streams. Total escapement estimates are available only for Coghill Lake and Eshamy Lake. Seining is not allowed in the Eshamy District. The index stream system encompasses 196 of 522 streams that have been documented as pink salmon spawning streams in the Sound and 94 of 219 streams that have been documented as chum salmon spawning streams in the Sound.[22,42] It has been estimated that approximately 75 percent of pink and chum salmon in the Sound spawn in the index streams.[43]

Six hatcheries are located within districts open to seining: Port San Juan, Cannery Creek, Main Bay, Solomon Gulch, Crooked Creek and Perry Island. Significant returns have been realized at the Port San Juan and Cannery Creek hatcheries. Returns to these six facilities will be harvested in the seine districts and terminal areas.

During years of low natural run abundance, commercial fishery openings may largely be limited to terminal areas. Openings in these limited areas will facilitate adequate escapement of natural stocks and the desired common propery harvesting of hatchery stocks.

ADF&G prepares annually a formal forecast of natural pink and chum salmon runs returning to Prince William Sound and a management outlook of projected catches of other species in all districts. Forecasts of hatchery returns have been prepared by FRED Division and PWSAC. Forecasts and outlooks are of value to the fisheries manager, fishermen and processors in their preseaon planning activities. Various estimates of marine survival are utilized to estimate total returns. Precise verification of total returns and common property interception rates has been stymied by the lack of funds for marking and recovery sampling and by the lack of technology. Accurate forecasts are a precondition for the complete utilization of harvestable fish by fishermen. This can occur only if the processing and marketing industry is adequately informed and prepared.

King salmon

King salmon catches have been relatively minor but have undergone relatively major fluctuations (Appendix 3-4). The cause of these fluctuations is unknown. The average catch for all years since 1960 was 1,325 king salmon, and it is projected that the average catch in future years will be approximately 1,300 king salmon.

Sockeye salmon

Catches since 1960 have, with several exceptions, been relatively stable (Appendix

3-4). The fishery was restricted during 1972 and 1974, and catches have increased significantly in recent years. This recent upturn is likely due to the concentration of fishing effort that has occurred in the Southwestern District. Seine catches of mid to late-run Eshamy Lake stocks in this area have probably been higher than in previous years. Seiners have concentrated in this area to harvest the large natural pink salmon runs that have occurred since 1979. It is probable that these large natural pink salmon runs will not continue and that fishing activities in the Southwestern District will be restricted during weak natural runs. The interception of Eshamy Lake sockeye salmon would be reduced under these circumstances. The average catch during 1960 through 1981 was 47,924 sockeye salmon. It is assumed that future catches will be similar to those that have occurred since 1960 and that average catches will be approximately 47,900 sockeye salmon.

Coho salmon

Reported catches have declined markedly commencing in 1972 (Appendix 3-4). This has probably been due to a reduction in late-season fishing time, earthquake disruption of spawning and rearing areas and/or misidentification of fish. No escapement data are available, and, therefore, it is not possible to determine if these stocks have declined in abundance. The exvessel price of seine-caught coho salmon dropped below the price of chum salmon beginning in 1973, and, it is possible that significant numbers of coho salmon were sold as chum salmon by fishermen. The average reported catch during 1960 through 1981 was 15,810 coho salmon. It is projected that average catches in future years will be apporoximately 15,800 coho salmon.

Pink salmon

Catches and escapements declined briefly following the Good Friday earthquake of 1964 and rebounded to record high levels beginning in 1979 (Appendix 3-4 and 3-5). The cause of these high returns is not entirely understood. Mild winters and optimum estuarine conditions are thought to be major contributing factors. It is probable that these high catches will not continue or that they will reoccur only infrequently. The average harvest during 1960 through 1981 was 4,758,965 pink salmon. It is projected that average catches of natural stocks in future years will be approximately 4,759,000 pink salmon.

Chum salmon

Catches have followed roughly the same pattern as pink salmon catches (Appendix 3-4). Escapement data indicate marked declines beginning in 1974 of Southwestern and Southeastern district stocks and a depletion of Montague District stocks (Appendix 3-6). These decreases were caused by land upheaval and habitat destruction associated with the 1964 earthquake. Catch data for the years 1974 through 1981 are used as indicators of future harvest magnitude. The average catch during this period was 447,504 chum salmon. It is projected that average catches in future years will be approximately 447,500 chum salmon.

Drift Gill Net Catches of Natural Stocks

The drift gill net fishery has, by regulation, been conducted in the following districts: Copper River, Bering River, Coghill, Unakwik and Eshamy (Figure 3-1). The fishery has been managed according to catch data and escapement counts. Various methods have

been employed to derive escapement estimates. Sonar counters have been utilized at Miles Lake, and weirs have been utilized at Coghill and Eshamy lakes. Escapement estimates in other areas have generally consisted of index area counts. Index counts of sockeye, king and coho salmon have been "peak" counts and have only been obtainable after the majority of fish have been harvested. The peak or greatest number of salmon observed at any time in an area has been the index. No effort has been made to derive stream-life factors or to estimate total seasonal spawning populations within index areas. Escapement goals have been established for sockeye salmon but not for other species (Appendix 3-3).

Fishing seasons in all drift gill net districts are opened and closed by emergency order. The fishery in the Copper River District, where most of the drift gill net caught salmon are harvested, is normally opened in mid May. The fishery in the Bering River normally opens in mid June, and the fishery in the Coghill and Unakwik districts normally opens the third week of June. The fishing season in all districts is divided into weekly fishing periods.

Currently two hatcheries are located in districts open to drift gill netting. The Main Bay Hatchery is located in the Eshamy District and the Gulkana Hatchery is located in the headwaters of the Copper River District (Figure 3-1).

King salmon

The majority of king salmon in the Region have been caught in the Copper River District (Appendix 3-7). This species spawns in the Copper River drainage (Figure 2-3). No spawning populations are known to occur in the other districts, and king salmon harvested in these districts are generally feeding fish. King salmon catches in the Copper River District have exhibited a slight upward trend during the past 22 years. The upward trend cannot be explained and may not continue. It is estimated that during the next 20 years the average catch of king salmon in the Copper River District will be similar to the average catch that has occurred since 1960. The same time frame was also used in the projection of Bering River District catches. Shorter time frames were employed for the Coghill and Unakwik districts, reflecting an increase in effort in recent years. It is projected that the average harvest for all districts will be approximately 16,800 king salmon.

Sockeye salmon

Spawning populations of sockeye salmon occur in each drift gill net district (Figure 2-4). The Copper River produces the majority of sockeye salmon in the Region. Long-term catch averages were used to project future harvests of Copper and Bering river stocks (Appendix 3-8). These data do not indicate any upward or downward catch trends. Data for 1979 and 1980 were excluded in the determination of catch averages due to unusual fisheries closures that occurred. Short-term catch averages were used for the Coghill and Unakwik districts because of changes in fishing effort and increases in catch magnitude. It is projected that the average harvest for all gill net districts will be approximately 759,200 sockeye salmon.

Coho salmon

Coho salmon spawning populations are most abundant on the Copper and Bering river

deltas. Few spawning populations occur in other gill net districts. Catches of coho salmon, like sockeye salmon, have generally exhibited no upward or downward trend since 1960 (Appendix 3-9). It is estimated that the average drift gill net harvest for all districts will be approximately 217,900 coho salmon.

Pink salmon

Spawning populations of pink salmon in the gill net districts are most abundant in the Coghill District. Overall catches indicate a trend toward increased abundance, and, subsequently, recent catch data were used to project future harvests (Appendix 3-10). Catches in the Bering River District increased beginning in 1979 due to an increase in fishing effort on the east side of Kayak Island (Figure 1-1). Larger boats have recently entered the gill net fishery, and these boats allow fishing to occur in these rough, outside waters. It is projected that average harvests within all districts will be approximately 216,500 pink salmon.

Chum salmon

The majority of chum salmon in the gill net districts spawn in the Coghill District. Catches have displayed generally the same trends as pink salmon (Appendix 3-11). It is projected that the average harvest for all districts will be approximately 91,100 chum salmon.

Set Gill Net Catches of Natural Stocks

The set gill net fishery is, by regulation, conducted in the Eshamy District (Figure 3-1). The fishery is managed according to the sockeye salmon escapement at the Eshamy Lake weir. The escapement goal has been 20,000 to 30,000 sockeye salmon (Appendix 3-3). Sockeye salmon escapement to Eshamy Lake has often been less than desired; therefore, fishing periods have been curtailed by emergency order. The fishery has been closed 8 fishing seasons since 1967 (Appendix 3-12).

No efforts have been made to manage the set net fishery for other species. Spawning populations of pink salmon rivaling those of sockeye salmon occur within the district. Only minor numbers of coho and chum salmon have been observed.

Set net catch data for each species was combined with drift gill net data prior to 1967; therefore, the data base for projecting future harvests of each species encompasses 1967 through 1981 (Appendix 3-12). Years of fishery closure were included in the analysis of these data because it is likely that, unless corrective rehabilitation efforts are implemented, these frequent closures will continue.

During 1967 through 1981, the average harvest of each species was 6 king salmon, 8,543 sockeye salmon, 90 coho salmon, 12,728 pink salmon and 2,855 chum salmon (Appendix 3-12). It is projected that average future harvests will include approximately 8,500 sockeye salmon, 100 coho salmon, 12,700 pink salmon and 2,900 chum salmon. It is assumed that king salmon catches will be negligible.

Subsistence Catches of Natural Stocks

Subsistence catch data have been divided by area: Upper Copper River, Copper River Delta, and Prince William Sound (Appendix 2-2 through 2-4). Catch reports indicate that the

majority of subsistence-caught salmon have been harvested in the Upper Copper River area.

Upper Copper River

Fishing effort and catches increased markedly during the 1960's and stabilized between 1970 and 1981 (Appendix 2-2). The sockeye salmon subsistence fishery in the Upper Copper River is currently managed according to a management plan adopted by the Alaska Board of Fisheries.[25] This plan establishes allowable harvest levels for differing levels of projected escapement. The escapement of sockeye salmon is monitored by means of sonar counters located below Miles Lake on the Copper River. The minimum and desired escapement goals are currently 250,000 and 350,000 sockeye salmon, respectively. The plan allows for a subsistence harvest of 25,000 sockeye salmon when it is projected that the desired escapement goal will be achieved. From 1970 through 1981, the average reported subsistence catch of sockeye salmon was 27,995 fish. It is anticipated that the desired escapement goal will generally be achieved and that future harvests, assuming that the management plan will remain unchanged, will average approximately 25,000 sockeye salmon.

Management strategies for the king and coho salmon fisheries are limited due to the lack of total escapement estimates and escapement goals. The average reported catch of king and coho salmon from 1970 through 1981 was 1,731 and 348 fish, respectively (Appendix 2-2). Natural king salmon stocks may not be able to sustain a higher exploitation rate than this average level. Coho salmon stocks are not abundant, and catches may remain low even if effort increases significantly. It is projected that the average catches of king and coho salmon will be 1,700 and 400 fish, respectively.

Copper River Delta

Subsistence catches on the Copper River Delta exhibit no clear upward or downward trends (Appendix 2-3). The average catch during 1960 through 1981 was 38 king salmon, 117 sockeye salmon and 44 coho salmon. It is assumed that future harvests of king and coho salmon will be negligible and that sockeye salmon harvest will average approximately 100 fish.

Prince William Sound

Reported subsistence catches in Prince William Sound have noticeably decreased since the 1960's (Appendix 2-4). This may be due to regulations prohibiting commercial salmon net permit holders from obtaining salmon subsistence permits. The catch still occurs, but it is unreported. It is assumed that future reported harvests will be negligible.

Sport Catches of Natural Stocks

The data base for salmon sport catches is relatively brief and in this document has been organized into five areas. Upper Copper River sockeye and king salmon catches have been estimated by the Sport Fish Division of ADF&G since 1966 (Appendix 2-5). Data for other areas and all species have been derived since 1977 (Appendix 2-6). These data have been generated by means of an annual statewide harvest survey. The Gulkana River is a preferred fishing area in the Upper Copper River drainage; therefore, there is some overlap between tables.

Upper Copper River

Sockeye salmon catches in the Upper Copper River peaked in 1971 and 1973 and declined when snagging in freshwater was prohibited (Appendix 2-5). The average catch of sockeye salmon in the Upper Copper River from 1976 through 1981 was 1,916 fish. It is assumed that the snagging prohibition will be maintained and that catches will not increase beyond the 1976-1981 level. It is projected that the future average catch will be approximately 1,900 sockeye salmon.

King salmon catches in the Upper Copper River reached a relatively high level during 1979 through 1981 (Appendix 2-5). The average catch during this period was 2,255 king salmon. It is assumed that catches of this magnitude may be sustainable and that the average catch in future years will be approximately 2,300 king salmon.

Valdez Bay

Valdez Bay has, since 1977, been the preferred marine salmon fishing area in the Region (Appendix 2-6). During 1977 through 1981, catches of all species were relatively stable. The average catch during that time period was 118 king salmon, 342 sockeye salmon, 4,965 coho salmon, 11,288 pink salmon and 799 chum salmon. It is assumed that future catches will be similar and that average harvests will include approximately 100 king salmon, 300 sockeye salmon, 5,000 coho salmon, 11,300 pink salmon and 800 chum salmon.

Passage Canal (Whittier)

Fishing effort in this area increased considerably from 1978 to 1979 (Appendix 2-6). Coho salmon captured in this area are generally hatchery-produced fish reared at Ft. Richardson and planted in Passage Canal. Natural stocks harvested since 1979 include only minor numbers of king and pink salmon. The average catch of king and pink salmon was 18 and 869 fish, respectively. The fishery is limited by access and availability of boat slips. It is projected that average future catches of natural stocks in Passage Canal will include negligible numbers of king salmon and approximately 900 pink salmon.

Eyak River

The Eyak River fishery is the second most popular freshwater salmon fishery in the Region (Appendix 2-6). Effort increased substantially beginning in 1979, and the average catch from 1979 through 1981 was 3,468 coho salmon. Catches of sockeye salmon during all years of record have been relatively minor. The average catch from 1977 through 1981 was 162 sockeye salmon. Total in-season escapement estimates are lacking for both species, subsequently, these fisheries are difficult to manage. It is questionable whether it is feasible to increase the exploitation rate of coho salmon unless the commercial salmon fishery is curtailed. It is projected that the average catch in future years will be approximately 3,500 coho salmon. Regulations prohibiting snagging may preclude any increases in sockeye salmon catches, and it is assumed that average catches will be approximately 200 sockeye salmon.

Other Areas

Other popular fishing areas include: Orca Inlet, Coghill River, Eshamy Creek, Shrode

Creek, Copper River Highway streams and other freshwater and marine areas. The average catch from 1977 through 1981 was 432 king salmon, 3,943 sockeye salmon, 3,441 coho salmon, 6,446 pink salmon and 651 chum salmon (Appendix 2-6). It is projected that average harvests in these areas will be approximately 400 king salmon, 3,900 sockeye salmon, 3,400 coho salmon, 6,400 pink salmon and 700 chum salmon.

Harvests of Supplemental Stocks

The supplemental harvest data presented herein represent the projected harvest contribution of existing rehabilitation and enhancement projects when fully operational or fully utilized and when brood stocks are completely developed.

Fish Pass and Stream Improvement Projects

The US Forest Service has completed fish pass or stream improvement projects in more than 50 locations in Prince William Sound since 1962. The benefits associated with many of these projects are difficult to quantify. It is estimated that 13 of the more significant projects will annually contribute approximately 5,500 sockeye salmon to the drift gill net fishery and approximately 120,600 pink, 12,000 chum, 20,300 sockeye and 1,100 coho salmon to the purse seine fishery (Appendix 3-13 and 3-14).

Some of these projects have contributed in recent years to the seine fishery; however, the total returns are difficult to estimate. Catch data presented for natural stocks in Appendix 3-4 include some fish created as a result of these projects; however, no effort has been made to estimate the relative proportion.

Hatchery Projects

Existing facilities include seven hatcheries all of which are in various stages of completion or brood stock development (Appendix 3-15). The projected contribution of these facilities to the user groups is summarized in Appendix 3-17.

Various survival and catch rate assumptions were employed in Appendix 3-17 and 3-18. In some instances no data are available for a facility, and standard ADF&G planning assumptions have been employed (Appendix 3-16). The ADF&G assumptions are generally conservative when compared with assumptions for the Solomon Gulch Hatchery estimates of return rates experienced at Port San Juan and Cannery Creek. The actual number of fish returning to ADF&G facilities may be greater than initially anticipated. Survival and catch rate assumptions will be periodically revised as return data are compiled.

Summary

A projection of the total catches of natural and supplemental stocks for each user group is summarized in Appendix 3-18. These data will be compared with estimates of user demand in the next chapter to derive estimates of harvest shortfalls or gaps.

Assumptions

The key assumptions in projecting harvests of natural and supplemental stocks during the next 20 years are:

1) Spawning and rearing areas and conditions will remain unchanged.

2) Regulations governing methods, means and open fishing areas will remain unchanged.

3) Catches of natural stocks will be generally similar in averge magnitude and degree of fluctuation to those that occurred from 1960 through 1981.

4) Spawning and rearing habitat, including the new areas created by the 1964 earthquake, will be utilized to the same degree as in the past.

5) The proportion of natural runs caught by each user group will not change significantly despite projected increases in population and anticipated increases in sport and subsistence fishing effort.

6) Significant increases in average catch will be realized after the management program is improved and after new rehabilitation and enhancement projects are implemented.

7) Processing and market capacity will be equal to the number of fish commercially harvested annually.

CHAPTER 4

ANALYSIS OF USER DEMAND

CHAPTER 4

ANALYSIS OF USER DEMAND

The Regional Planning Team undertook an intensive public involvement effort to identify and plan for user needs. The Team drafted a 48-part questionnaire (Appendix 4-1) for distribution to sport, subsistence, commercial and nonfishermen (non-consumptive users). Provisions were made to include the input of fishermen who have never fished in the Region but would like to in the future.

The Team chose to make the questionnaire available to everyone rather than to randomly solicit participants. It was decided that a statistically accurate sampling scheme would be inordinately time consuming and difficult to implement. The foremost problem was the lack of a list of Regional sport fishermen, commercial crew members, non-permit holding subsistence fishermen and aspiring fishermen. Many of these fishermen reside outside the Region's boundaries and the development of the pools of names from which to draw would be extremely difficult.

Despite the short commings of the questionaire distributon proceses, the questionaire does provide valuable information about the general direction of long-range fisheries planning in the Region. Subsequent user-group surveys should be carefully conducted on a periodic basis to insure that the plans are aligned with user needs.

Questionnaire participants were solicited through newspaper ads, printed notices and letters and by direct contact. To reach sport fishermen, future fishermen and non-consumptive users, ads with mail-in coupons were printed four times in 13 newspapers circulated within and around the Region. Notices with mail-in coupons were placed in ADF&G offices within and around the Region as well as the offices of the Cordova Aquatic Marketing Association (CAMA), PWSAC and VFDA. Questionnaires were handed out to sport fishermen at the March meeting of the Alaska Sport Fishing Association in Anchorage and the Annual Sport Fishing Fair in Anchorage. Subsistence fishermen were contacted primarily through a list of fishermen who applied for Prince William Sound or Copper River subsistence permits in 1981. Commercial fishermen of the Region were contacted primarily through the mailing list of the *PWSAC Aquaculture News*. All commercial fishermen of the Region receive the *PWSAC News*. Questionnaires were made available at the office of CAMA and PWSAC.

Approximately 2,000 questionnaires were distributed, and 811 were returned. Of the respondents, 533 had sport fished in the Region, 471 had subsistence fished in the Region and 152 had commercial fished in the Region. Those people who have not fished for salmon in the Region but plan or hope to do so in the future included 75 sport fishermen, 31 subsistence fishermen and 5 commercial fishermen. Many respondents were members of more than one user group. Only one non-consumptive user participated.

Questionnaires were sorted by user group and gear type. Questionnaires from commercial fishermen were sorted by degree of participation (permit holder or crew member) and they were also sorted according to the Area E salmon fishery that the fisherman participated in during 1981, i.e. drift gill net only, seine only or drift and seine. This allowed for the analysis of needs and opinions of

discrete groups (such as drift-only or seine-only fishermen) and all fishermen of a given group. In this manner the true problems or needs of a group of fishermen could be defined without having to deal with the biases of a related group. Groups of fishermen were further sorted according to their history of participation and their satisfaction with the fishery of 1981:

1. Fishermen who fished in the Region in 1981.
   a. Fishermen satisfied with their 1981 salmon catch or salmon fishing income.
   b. Fishermen with no opinion about their 1981 salmon catch or salmon fishing income.
   c. Fishermen dissatisfied with their 1981 salmon catch or salmon fishing income.
2. Fishermen who have fished in the Region in the past but not in 1981.
3. Fishermen who have never fished in the Region but plan or hope to do so in the future.

These groupings provided some understanding of the reasons why some fishermen were satisfied and others were not, and it helped define levels of satisfaction and user needs.

Harvest demand of sport and subsistence fishermen was estimated by two methods:

1) Minimum demand

A measure of the minimum satisfactory catch is the average catch of satisfied 1981 fishermen. The average catch of these fishermen generally exceeded the average catch of the dissatisfied fishermen, and it may be surmised that a threshold of satisfaction does exist. The total minimum demand, the number of fish required to satisfy the majority of the fishermen, can be estimated by multiplying the average catch of the satisfied fishermen by the number of fishermen in the Region. The minimum demand for the year 2002 can be estimated by multiplying the current minimum demand by the projected increase in population of the Region.

2) High demand

The high demand is the number of salmon that fishermen stated they desire to catch. This demand is several fold greater than the minimum demand. Theoretically, the high demand is the catch required to satisfy 100 percent of the fishermen. The total high demand is the average desired catch multiplied by the number of fishermen who fish in the Region. The high demand for the year 2002 is the current high demand expanded by the projected population increase of the Region.

The minimum demand of commercial fishermen is the minimum income required to sustain his or her commercial fishing boat or set net site and provide necessary personal income. Commercial fishermen differ in one basic aspect from sport or subsistence fishermen. They are engaged in a business and, as businesspeople, desire to earn as much profit as possible. Their high demand is, subsequently, difficult if not impossible to derive or calculate.

Commercial fishermen, in addition to garnering income from fishing, also often times take home a portion of their catch for their personal use. This is done without need of a subsistence permit. Demand, therefore, is in the form of earnings and personal-use fish.

The minimum demand of commercial fishermen was estimated in various ways:

1) Permit holders and crew members were asked how much they need to gross in an average year to pay their fishing and living expenses and make a reasonable profit from their fishing investments. They were also asked what percentage of their gross income they would prefer to earn from a given fishery. The current desired gross earnings from a given fishery was derived by multiplying the desired gross income by the desired percentage from the fishery. These data provide an estimate of the desired minimum income of commercial fishermen in view of the costs that prevailed in the spring of 1982. Demand estimates for seine permit holders were adjusted to reflect anticipated upgrading of boats. Processors may require refrigeration of the catch of seiners.

2) Estimates of investments and costs made by Larson (1980) and Wiese (personal communication) were compared with the data derived above. These data provided a check of the accuracy of the desired income data (above).

3) The average 1981 earnings of permit holders and crew members for each fishery were calculated and compared with the satisfaction rate of fishermen who participated soley in a given fishery. This provided a gross indication of the adequacy of the seine and drift gill net incomes in 1981.

4) The number and species of salmon taken out of the commercial catch for personal use was calculated for each group of fishermen.

Satisfaction of commercial fishermen needs is dependent on several variables, including costs of operation, exvessel prices and quantity of fish. The questionnaire provides an estimate of income needs at a point in time, i.e. spring, 1982. These data are the basis for establishing the initial long range objectives for the commercial salmon fishery. The variables listed above, particulary exvessel prices and quantity of fish, have and will undergo annual fluctuations. It is obvious that a change in fisherman costs will result in a change in income needs and that as exvessel prices move up or down, the number of fish required to meet the minimum income needs of commercial fishermen will change. At this time we can only make general assumptions about the long range trends of these variables. Periodic reevaluation of these variables and adjustment of the objectives will be required to insure that this plan keeps pace with the needs of the fishermen.

Finally, it should be noted that user demands transcend numbers of fish caught or dollars earned. Some users rank other aspects higher than lack of fish or lack of earnings, i.e. unstable prices, overcrowded fishing areas and lack of access. Many sport and subsistence fishermen view fishing as a total outdoor experience and the number of fish caught is often of secondary importance. It may be more cost effective in some situations to promote improved campgrounds and access routes rather than increase the number of salmon.

Commercial Fishermen

Commercial salmon fishing in the Region in 1981 was conducted by means of drift gill nets and purse seines. The set gill net fishery did not open in 1981 due to lack of sockeye salmon escapement in the Eshamy District. An estimated 1,377 fishermen participated in the salmon fishery in 1981.

Purse Seine Permit Holders

Approximately 19 percent (51) of the purse seine permit holders completed a questionnaire. The vast majority of these fishermen (80 percent) were satisfied with their earnings from salmon fishing in Area E in 1981 (Appendix 4-2, Q 24). Both seine-only and seine-drift fishermen exhibited satisfaction rates approximating this magnitude. The total exvessel value of the salmon harvested by the seine fishermen in 1981 was $45.9 million. Average earnings for each of the 266 permit holders that participated in the fishery were $172,000.

The four most important problems of the salmon fisheries of the Region, as ranked by the seine-only fishermen, were: unstable prices (13), lack of processors (4), lack of enforcement (3), and too much gear (1) (Appendix 4-2, Q 44). It should be noted that the questionnaire was distributed immediately after the botulism scare occurred in 1982. Many processors were experiencing pack recalls and canned salmon sales were temporarily slowed or halted.

Seine-only fishermen when asked what they needed to gross in an average year to pay their fishing and living expenses and make a reasonable profit from their fishing expenses responded that they'd like to gross $148,000, 70 percent of which ($104,000) they'd like to make by salmon seining in Area E. Seine-drift fishermen responded that they'd like to gross $163,000, 66 percent of which ($108,000) they'd like to earn by salmon seining in Area E. Collectively, these groups desired to gross $156,000, 68 percent of which ($106,000) they desired to earn from salmon seining in Area E (Appendix 4-2, Q 30 and 33).

Estimates of the minimum revenue requirements of some seine permit holders suggest that a desired gross income of $106,000 for seine permit holders is reasonable (Appendix 4-3). The difference between the hypothetical income requirement of $121,350 and the desired income level expressed by the respondents may largely be due to lower average permit and gear payments. The majority of respondents indicated that their permits were owned free and clear (Appendix 4-2, Q 34). The desired gross income from seining of $106,000 is probably a reasonable approximation of current demand.

Minimum demands of seine permit holders, in 1981 dollars, are expected to increase during the next 20 years due to the anticipated mandatory upgrading of boats. The maintenance of existing prices and markets and the development of new markets, may depend largely on the improvement of fish quality. Heretofore, it has been common practice to carry fish in dry, unchilled fish holds for as long as 12 hours. It is probable that all boats will be required to have chilled fish holds. Chilled sea water equipment is perhaps the most practical. Many boats in the fleet cannot be converted, and these boats will have to be replaced. It has been estimated by Jack Shaw (personal communication) that a seine boat with a chilled sea water system will cost a minimum of $200,000 in 1981 dollars. This represents approximately a 100 percent increase in boat value over estimates used in the compilation of the hypothetical revenue requirements in Appendix 4-3. To increase the cost of an average seine boat in Appendix 4-3 from approximately $98,000 to $200,000 may cause annual boat, permit and gear payments to increase by 36 percent and insurance costs to roughly double. This assumes that the boat,

permit and gear are financed under the conditions set forth in Appendix 4-3. The net effect in Appendix 4-3 would be an increase in costs of approximately $18,000. This represents an overall increase in revenue requirements of approximately 15 percent. It may be reasonable to assume that if the average value of seine boats increase to $200,000, the current desired gross income of $106,000 may increase by approximately 15 percent. An estimate of future demand is therefore $122,000.

Seine-only fishermen preferred foremost to fish for pink salmon (9), followed by sockeye salmon (7), chum salmon (6) and king salmon (1) (Appendix 4-2, Q 37). Preferred districts for seining, as indicated by all seine respondents were: Southwestern (21), Southeastern (8), Northern (8) and Eastern (7) (Appendix 4-2, Q 42). Preferred districts for new enhancement and rehabilitation projects, as indicated by seine-only fishermen, included: Eastern (4), Northern (4), Coghill (4), Copper River (2), Northwestern (2) and Southwestern (2) (Appendix 4-2, Q 43).

Most of the seine permit holders (78 percent) indicated that they take a portion of their commercial catch home for personal use (Appendix 4-2, Q 38). When asked which species they preferred to take home, the seine-only fishermen responded: sockeye salmon (10), king salmon (9) and coho salmon (1) (Appendix 4-2, Q 39). The average take-home catch of seine-only fishermen in 1981 was 0.6 king salmon, 3.8 sockeye salmon, 4.5 chum salmon, 3.6 pink salmon, 3.2 coho salmon (Appendix 4-2, Q 40).

Drift Gill Net Permit Holders

In Area E there are currently 529 permanent and 12 interim salmon drift gill net permit holders. Interim permit holders include fishermen who have disputed claims for permanent permits. A total of 110 drift permit holders (20 percent) completed a questionnaire. Of these, 53 (48 percent) participated only in the drift fishery in 1981, 55 (50 percent) participated in both the drift and seine fisheries in 1981 and 2 (2 percent) did not fish for salmon in Area E in 1981 (Appendix 4-4).

When asked what are the four most important problems with the salmon fisheries of the Region, the fishermen who drift fished only in 1981 replied: lack of fish (12), management of the fisheries (10), too much gear (8) and lack of processors (5) (Appendix 4-4, Q 44).

The majority of the drift-only fishermen (62 percent) were dissatisfied with their earnings from salmon fishing in Area E in 1981. The majority (73 percent) of the drift-seine fishermen, however, were satisfied with their earnings from salmon fishing in Area E in 1981 (Appendix 4-4, Q 32). The seine fishery of 1981 encompassed record high pink and chum salmon catches.

The total exvessel value of salmon caught by drift fishermen in 1981 was approximately $12.5 million. Average earnings for each of the 541 permits were $23,037. It is currently not known how many permit holders actually participated in 1981. Peak fishing effort consisted of 409 boats. Assuming that no more than 409 permit holders fished in 1981, the average earnings of permit holders who drift gill net fished were approximately $30,600.

Dissatisified drift-only fishermen, when compared with the satisfied drift-only fishermen, had less experience in the drift fishery, and higher proportions of these fishermen were financing their permit and/or boat (Appendix 4-4, Q 26, 34 & 36).

Most of the drift-only fishermen indicated that they wished to continue participating in the fishery in the same capacity. The majority of those who wished to participate in the seine and set net fisheries were dissatisfied fishermen (Appendix 4-4, Q 27). Obviously, diversification was viewed as a solution to poor earnings experienced in 1981.

When asked, "What do you need to gross in an average year to pay your fishing and living expenses and make a reasonable profit from fishing investments?" drift-only fishermen gave an average response of $66,000. These fishermen indicated that they'd prefer to make on the average 83 percent of their gross income from salmon drift gill netting in Area E. This equates to a desire to earn approximately $55,000 from drift gill netting. Drift-seine fishermen indicated a need to gross $100,000, 45 percent of which ($45,000) they'd prefer to derive from salmon drift gill netting in Area E. Collectively, both of these groups registered a need to gross $79,000, 63 percent of which ($50,000) they'd prefer to derive from salmon drift gill netting in Area E (Appendix 4-4, Q 30 and 33). The average desired income is similar to estimated minimum revenue requirements of hypothetical drift gill net permit holders of approximately $49,150 (Appendix 4-3). Considering current costs and prices, the desired gross income of $50,000 is perhaps a reasonable estimate of current minimum demand.

The future minimum demand is difficult to estimate. Average values of boats, permits and costs may increase at a rate faster than inflation. Salmon prices may in the long run decline. At present, it is perhaps most logical to assume that these factors will remain relatively constant with regard to inflation and that the demand will be $50,000 (1981 dollars) in the year 2002. Periodic evaluation will be required to affirm this.

Drift-only fishermen indicated that they prefer foremost to fish for sockeye salmon (40) followed by king salmon (7) and coho salmon (3) (Appendix 4-4, Q 37). Preferred fishing districts for gill netting, as ranked by all drift fishermen, were: Copper River (65), Coghill (33), Bering River (9) and Eshamy (1) (Appendix 4-4, Q 41). Preferred districts for new enhancement or rehabilitation projects, as ranked by drift-only fishermen, were: Copper River (25), Coghill (11), Bering River (4) and Eshamy (3) (Appendix 4-4, Q 43).

The majority of drift-only fishermen (83 percent) indicated that they take a portion of their commercial salmon catch home for personal use. The average take, during 1981, of drift-only fishermen was: 2.7 king salmon, 16.3 sockeye salmon, 0.2 chum salmon, 0.6 pink salmon and 9.2 coho salmon (Appendix 4-4, Q 40). Sockeye salmon (24) were preferred for personal use followed by king salmon (22) and coho salmon (2) (Appendix 4-4, Q 39).

Set Gill Net Permit Holders

Of the 26 permanent and 4 interim set net permit holders in Area E, only 3 fishermen responded to the questionnaire (Appendix 4-5). These fishermen were dissatisfied with their earnings from salmon fishing in Area E in

1981 (Appendix 4-5, Q 32). The salmon set gill net fishery, which is only conducted in the Eshamy District, did not open in 1981. Insufficient sockeye salmon escaped to Eshamy Lake to allow the fishery to open.

Respondents indicated that lack of fish was the most important problem with the salmon fisheries of the Region (Appendix 4-5, Q 44).

Respondents indicated a desire to gross an average of $16,000 from the set gill net fishery (Appendix 4-5, Q 33). Estimates of the minimum revenue requirements of hypothetical set gill net permit holders suggest that a desired gross income of $16,000 is reasonable (Appendix 4-3). The desired gross income of $16,000 is therefore the estimate of current demand and future demand (1981 dollars).

Respondents indicated that they preferred to fish for sockeye salmon and that the Eshamy District was the preferred location for new rehabilitation or enhancement projects (Appendix 4-5, Q 37 & 43).

Two fishermen indicated that they take a portion of their commercial catch home for their personal use. Sockeye salmon were the preferred species for personal use (Appendix 4-5, Q 38 & 39).

Crew Members

It is estimated that approximately 851 seine crew members and possibly 170 drift gill net crew members participated in the salmon fisheries of the Region in 1981. This is predicated on an average seine crew size of 3.2 fishermen (excluding the permit holder) and an average drift crew size per permit of 0.3 fishermen (excluding the permit holder).[44] No set gill net crew members participated in that fishery in 1981 due to a complete closure of the fishery.

Respondents included 9 crew members who participated only in the seine fishery in 1981, 12 drift permit holders who were also seine crew members in 1981, 3 fishermen who participated as crew members in both the seine and drift fisheries in 1981 and one former set gill net crew member (Appendix 4-5 and 4-6).

Crew members are normally paid a percentage of the gross revenues less some expenses such as food. Crew share percentages normally range from 8 to 13 percent, with a mean of about 10 percent. Seine crew members, in 1981, probably earned an average of $17,000. Drift crew earnings for 1981 are difficult to estimate. Average earnings probably were between $2,000 and $5,000.

The majority of the seine crew members were satisfied with their earnings from salmon fishing in Area E in 1981 (Appendix 4-6). Seine crew members as a whole indicated a need to earn approximately $17,000 from salmon seining (Appendix 4-6, Q 33). The seine-crew-only fishermen considered the most important problems with the commercial salmon fisheries to have been: unstable prices (5), lack of fish (1), lack of enforcement (1), and lack of processors (1) (Appendix 4-6, Q 44)

The 3 drift-crew respondents were not satisfied with their earnings from salmon fishing in Area E in 1981. These fishermen indicated a need to earn on the average $6,000 from salmon gill netting (Appendix 4-5, Q 33). They considered lack of processors and unstable

prices to have been the most important problems of the commercial salmon fishery in 1981.

The former set gill net crew member indicated a need to gross $10,000 from salmon set gill netting in Area E (Appendix 4-8, Q 33).

Most of the seine-crew-only and drift-crew fishermen indicated that they take a portion of their commercial salmon catch home for personal use (Appendix 4-5 and 4-6, Q 40). Seine-only fishermen indicated an average take of 0.9 king salmon, 3.9 sockeye salmon, 5.4 chum salmon, 3.7 pink salmon and 3.3 coho salmon (Appendix 4-6, Q 40). Drift crew fishermen indicated an average take of 1.7 king salmon, 6.7 sockeye salmon, 5.0 chum salmon and 8.3 coho salmon (Appendix 4-5, Q 40).

Subsistence Fishermen

Respondents to the questionnaire included 445 subsistence fishermen who fished in the Region in 1981, 26 fishermen who have fished in the Region but did not do so in 1981 and 31 aspiring subsistence fishermen who have not fished in the Region but would like to do so (Appendix 4-7 and 4-8). Of the 1981 fishermen, 356 used dip nets, 58 used fishwheels, 13 used gill nets and 18 indicated that they used more than one type of gear.

Dip Net Fishermen

These fishermen are the largest group of subsistence fishermen in the Region. A total of 3,555 dip net permits were issued in 1981. Of these, 2,739 were issued to families and 816 were issued to individuals. A total of 356 dip net fishermen who fished in 1981 responded to the questionnaire. Respondents indicated that the four most important problems with the fishery in 1981 were: overcrowded fishing areas (65), restrictive regulations (51), lack of open areas (44) and lack of access (41) (Appendix 4-7, Q 23). Lack of fish was ranked fifth. The fishery is limited to the Chitina Subdistrict on the main Copper River (Figure 2-10).

Assuming that only one response was received per permit, the respondents who fished in 1981 constituted approximately 10 percent of the individiuals or families who were issued permits in 1981. Respondents tended to be more successful than the average fishermen. Respondents caught approximately 6,124 salmon or 21 percent of the reported total catch of 28,872 salmon.

The majority of respondents were dissatisfied with their catch in 1981: dissatisfied 52 percent, satisfied 44 percent and no opinion (or no answer) 4 percent (Appendix 4-7, Q 19)). Satisfied respondents caught an average of 22.8 salmon, dissatisfied respondents caught an average of 11.7 salmon and no opinion respondents caught an average of 29.7 salmon (Appendix 4-7, Q 18). It is estimated that the 3,199 non responding permit holders caught approximately 22,748 salmon or 7.1 salmon per permit holder.[21]

Satisfied respondents caught more king, sockeye and coho salmon than dissatisfied respondents (Appendix 4-7, Q 18). All dip net respondents indicated the following species preference: sockeye salmon (216), king salmon (111), silver salmon (31) and pink salmon (4) (Appendix 4-7, Q 17). These data suggest that fisherman satisfaction was related primarily to the catch of sockeye salmon and secondarily to the catch of king salmon. It is not

known, however, if these fishermen were satisfied because they caught 19.2 sockeye salmon, 19.2 sockeye salmon plus 1.6 king salmon or if they were satisfied because they caught a total of 22.8 salmon.

Satisfied respondents caught slightly more sockeye and coho salmon than no opinion respondents, fewer king salmon than no opinion respondents and fewer total salmon than no opinion respondents (Appendix 4-7, Q 18). It is not known why the no opinion respondents were not satisfied or did not answer question 19.

In view of the apparent bias in the sample of dip net fishermen and the anticipated limited rehabilitation and enhancement opportunities for king and coho salmon in the Copper River drainage, the most realistic definition of current minimum demand at this time may be the average total catch of 22.8 salmon. It is assumed that efforts to meet this demand will center on sockeye salmon. Unfortunately, no alternate or independent unbiased estimates of minimum demand are available to confirm the accuracy of the questionnaire results. Further evaluation encompassing an unbiased sample of all dip net fishermen will be required to refine these estimates.

The current minimum demand, as indicated by the number of 1981 permits issued, is estimated to be 81,100 salmon. Knapp (1982) projects that the population of the Region will increase by 43 percent between 1980 and 2002 (Appendix 2-8). The projected minimum demand in the year 2002, assuming a 43 percent increase in permits, is estimated to be 116,000 salmon.

Approximately 92 percent of the 407 respondents who have dip net fished or hope to do so in the future, completed both the sport and subsistence sections of the questionnaire. These data suggest that a portion of the high dip net demand can be met if both the minimum sport and dip net demands are satisfied. If the minimum sport demand of an average catch 12.4 salmon were to be met by the 92 percent contingent of the 3,555 dip net fishermen who were sport fishermen, approximately 40,600 salmon would be harvested. If the minimum dip net demand of an average catch of 22.8 salmon were to be met by all dip net permit holders, then approximately 81,100 salmon would be harvested. The total harvest from both sources of all dip net permit holders would thereby be 121,700 salmon. The average harvest would be 34.2 salmon. All dip net respondents when asked, "How many salmon do you and your family need per year?" responded with an average of 40 salmon (Appendix 4-7, Q 22). The difference between the number of salmon provided if both the minimum sport and dip net demands were met (34.2 salmon) and the high demand of all dip net fishermen (40 salmon) is 5.8 salmon. For 3,555 dip net permit holders, this equates to approximately 20,600 salmon. The current high demand of dip net fishermen can thereby be satisfied, disregarding species composition, if the current minimum sport demand of 62,000 salmon were to be met, the current minimum dip net demand of 81,100 salmon were to be met and an additional 20,600 salmon were to be provided.

No attempt has been made to adjust the minimum demands of dip net fishermen to account for participation by sport fishermen. It is assumed that the minimum demand of sport-subsistence fishermen is the minimum sport fish demand of an average of 12.4 salmon plus the minimum dip net demand of an average of 22.8 salmon and not some lesser number.

The high demand in the year 2002, assuming a 43 percent increase in permits and the continuation of the same degree of joint participation by sport fishermen, may be achieved if an estimated 29,500 salmon are provided in addition to fish required to meet the combined future minimum demand of sport and dip net fishermen of 204,600 salmon.

Satisfaction of the future high sport demand of 196,000 salmon would provide more than the 29,500 salmon required to meet the future high dip net demand. It is estimated that approximately 92 percent or 3,271 of the 3,555 dip net permit holders who fished in 1981 were also sport fishermen. These joint fishermen constituted approximately 65 percent of the estimated 5,000 sport fishermen who fished in 1981. Should the number of sport and dip net fishermen increase at the same rate during the next 20 years and should the high sport demand of 196,000 salmon be realized, then approximately 65 percent of these fish or 127,000 salmon would be provided to sport-dip net fishermen.

Fishwheel Fishermen

During 1981, 501 fishwheel permits were issued to families and 22 fishwheel permits were issued to individuals. A total of 58 fishwheel fishermen responded to the questionnaire (Appendix 4-7). Repondents indicated that the foremost problems with the subsistence fisheries of the Region were: lack of access (9), lack of fish (8), overcrowded fishing areas (5), restrictive regulations (5) and lack of open areas (5) (Appendix 4-7, Q 23). The fishwheel fishery is conducted in the Glennallen Subdistrict on the main Copper River (Figure 4-1).

The total catch of all fishwheel fishermen in 1981 was 26,924 salmon. Assuming no more than one response from any permit, responses were received from approximately 11 percent of the individuals or households permitted to fish in 1981.

The respondents caught 2,621 salmon or approximately 10 percent of the total 1981 fishwheel catch. Respondents caught 33 percent of the king salmon harvested, 9 percent of the sockeye salmon harvested and 100 percent of the coho salmon harvested. As with dip net respondents, fishwheel respondents caught more king and coho salmon than the average fisherman.

Fishwheel respondents demonstrated the same species preferences as the dip net respondents: sockeye salmon (39), king salmon (17) and coho salmon (2) (Appendix 4-7, Q 17).

The majority of the respondents, 62 percent were satisfied with their subsistence salmon catch in 1981. Approximately 29 percent were dissatisfied and 9 percent registered no opinion or did not answer the question (Appendix 4-7, Q 19).

Satisfied respondents caught an average of 3.5 king salmon, 39.8 sockeye salmon and 4.6 coho salmon (Appendix 4-7, Q 18). The average catch of fishwheel fishermen was higher than that of dip net fishermen because fishwheel permit holders, depending on income and family size, are allowed to harvest 15 to 500 salmon. Dip net permit holders are allowed to harvest 15 to 30 salmon. As with dip net fishermen, it is not known if fishwheel fishermen were satisfied because they caught more sockeye salmon, more sockeye and king salmon or because of their total catch.

The minimum demand is estimated to be the sum of the average catch by species of satisfied fishermen or 48 salmon. Because of the limited rehabilitation and enhancement opportunities which may prevail with king and coho salmon in the Copper River and the preference for sockeye salmon, it is assumed that most of the demand will be met with sockeye salmon. The total current minimum demand is tentatively estimated to be approximately 25,100 salmon. Assuming a 43 percent increase in permits, the minimum demand in the year 2002 is projected to be 35,900 salmon.

Approximately 62 percent of the 58 respondents who have subsistence fished with a fishwheel or hope to do so in the future, completed both the sport and subsistence sections of the questionnaire. These data suggest that a portion of the high fishwheel demand will be satisfied if the minimum sport and fishwheel demands are met. If the minimum sport demand of an average catch of 12.4 salmon were to be met by the 62 percent of the 523 fishwheel fishermen who were sport fishermen, approximately 4,000 salmon would be harvested. If the minimum fishwheel demand of an average catch of 48 salmon were to be met by all permit holders, then approximately 25,100 salmon would be harvested. Fishwheel permit holders would thereby realize a total harvest from both sources of 29,100 salmon. The average harvest would be 55.6 salmon. All fishwheel fishermen when asked, "How many salmon do you and your family need per year?" responded with an average of 111 salmon (Appendix 4-7, Q 22). The difference between the number of salmon provided if both the minimum sport and fishwheel demands were met (55.6 salmon) and the high demand of all fishwheel fishermen (111 salmon) is 55.4 salmon. For 523 fishwheel permit holders, this equates to approximately 29,000 salmon. The current high demand of fishwheel fishermen can thereby be satisfied, disregarding species composition, if the current minimum sport demand of 62,000 salmon were to be met, the current minimum fishwheel demand of 25,100 salmon were to be met and an additional 29,000 salmon were to be provided.

No attempt has been made to adjust the minimum demands of fishwheel fishermen to account for joint participation by sport fishermen. It is assumed that the minimum demand of sport-subsistence fishermen is the minimum sport fish demand plus the minimum fishwheel demand and not some lesser number.

The high demand in the year 2002, assuming a 43 percent increase in permits, may be met if the future minimum sport and fishwheel demands of 124,600 salmon are achieved and an additional 41,500 salmon are provided.

Satisfaction of the future high sport demand of 196,000 salmon would provide approximately 11,800 of the 41,500 salmon required to meet the future high fishwheel demand. It is estimated that approximately 62 percent or 324 of the 523 fishwheel permit holders were also sport fishermen. These multi-gear fishermen constituted approximately 6 percent of the estimated 5,000 sport fishermen who fished in 1981. Should the number of sport and fishwheel fishermen increase at the same rate during the next 20 years and should the high sport demand of 196,000 salmon be realized, then approximately 6 percent of these fish or 11,800 salmon would be provided to sport-fishwheel fishermen. Satisfaction of the high demands of fishwheel fishermen would thereby require that 29,700 salmon be

provided in addition to sufficient fish to meet the future minimum fishwheel demands and the future high sport demands.

Gill Net Fishermen

During 1981, 72 gill net permits were issued for the Copper River Flats and 11 were issued for Prince William Sound. Of the permitted fishermen, 29 were successful in catching salmon, 4 were unsuccessful, 25 did not fish and 25 did not return their permits.[21] A total of 13 gill net subsistence fishermen responded to the questionnaire. Of these, 11 respondents caught salmon. The respondents considered the most important problems with the subsistence fisheries of the region to have been: lack of enforcement (2), overcrowded fishing areas (2) and restrictive regulations (2) (Appendix 4-8, Q 23).

Assuming no more than one response per permit, 11 successful respondents comprised approximately 38 percent of the successful permitted individuals or households. Respondents caught approximately 310 salmon; whereas, the total reported catch in 1981 was 331 salmon.[21] As with the sport, dip net and fishwheel respondents, more successful fishermen completed and returned a questionnaire than unsuccessful fishermen.

Of the 13 respondents, 8 were satisfied with their salmon subsistence catch in 1981 (Appendix 4-8, Q 19). Satisfied respondents caught an average of 32.5 salmon, and dissatisfied respondents caught an average of 16.0 salmon. Satisfied respondents caught slightly more king salmon and considerably more sockeye and coho salmon than the dissatisfied respondents (Appendix 4-8, Q 18). King salmon were the preferred species followed by sockeye salmon (Appendix 4-8, Q 17).

In view of the apparent bias in respondents, estimates of user demand should be regarded as tentative. The apparent minimum demand, as indicated by the catch of satisfied respondents, is approximately 32.5 salmon. The current total minimum demand for the 83 permit applicants is approximately 2,700 salmon. Assuming a 43 percent increase in permits, it is estimated that the demand in the year 2002 will be approximately 3,900 salmon.

Approximately 68 percent of the 34 respondents who have subsistence fished with a gill net or hope to do so in the future, completed both the sport and subsistence sections of the questionnaire. These data suggest that a portion of the high gill net demand may be met if both the minimum sport and gill net demands are satisfied. If the minimum sport demand of an average catch of 12.4 salmon were to be achieved by 68 percent of the 83 gill net fishermen, approximately 700 salmon would be harvested. If the minimum gill net demand of an average catch of 33 salmon were to be met by all gill net permit holders, then approximately 2,700 salmon would be harvested. The total harvest from both sources would thereby be 3,400 salmon. The average harvest would be 41.0 salmon. All gill net respondents when asked, "How many salmon do you and your family need per year?" responded with an average of 42 salmon (Appendix 4-8, Q 22). The difference for all permit holders is less than 100 salmon. The current and future high demands of gill net fishermen will virtually be satisfied, therefore, if the minimum sport and gill net demands are achieved. Increases in sport harvests beyond the minimum demand level will provide the additional 100 salmon required.

Sport Fishermen

It is estimated that approximately 5,000 anglers fished for salmon in the Region in 1981 (Watsjold, personal communication), and, of these, 396 or 8 percent completed a questionnaire. Other respondents included 137 fishermen who have fished in the Region but did not do so in 1981 and 75 fishermen who have never fished in the Region but would like to (Appendix 4-9, Q 1).

According to the fishermen who fished in the Region in 1981, the four most important problems with the salmon sport fisheries of the Region were: overcrowded fishing areas (76), lack of fish (57), lack of access (56) and restrictive regulations (48) (Appendix 4-9, Q 14).

Of the fishermen who fished in the Region in 1981, approximately 45 percent were dissatisfied with their salmon catch, 43 percent were satisfied and 12 percent had no opinion or did not answer the question (Appendix 4-9, Q 10). Fishermen registering "no opinion" often indicated in the margin of the questionnaire that they did not know or were unsure if their catch was adequate. Some fishermen felt that the number of fish caught was not important.

Satisfied fishermen on the average caught more salmon of each species than dissatisfied fishermen (Appendix 4-9, Q 9). The dissatisfied fishermen regarded the food aspects of sport fishing more highly than the satisfied fishermen (Appendix 4-9, Q 6), and, as is indicated by the answers to Question 12, their desired catch was generally higher than the desired catch of the satisfied fishermen.

It should be noted that Question 9 (Appendix 4-1) erroneously did not specifically ask the questionnaire participant to record only the number of salmon caught and kept. Some fishermen noted the number kept and the number released, and the latter fish were excluded in the analysis of the data. It is assumed that the data in Appendix 4-9, question 9 encompass insignificant numbers of released fish.

The 1981 fishermen perceived differing Regional problems according to the area they selected as their favorite fishing area. The four favored areas were: the Gulkana River (119), Valdez Bay (68), the Eyak River (27) and Passage Canal (Whittier) (24) (Appendix 4-9, Q 7).

Fishermen who preferred the Gulkana River ranked the most important problems: overcrowded fishing areas (27), lack of access (18), restrictive regulations (18), management of the fisheries (12) and lack of fish (10).* The Gulkana River flows across large holdings of land owned by the AHTNA Native Corporation. A fee is required of fishermen to gain access to AHTNA land.

Fishermen who preferred Valdez Bay ranked the most important problems as: lack of fish (15), overcrowded fishing areas (11), lack of access (10) and lack of enforcement (10).* Freshwater salmon fishing is prohibited in Valdez Bay, and trolling is the principal means of harvesting salmon.

Fishermen who preferred Eyak River ranked the most important problems as: lack of enforcement (7), overcrowded fishing areas (2), lack of access (2) and inadequate campgrounds (2).* Boat traffic on this

*Data not included in Appendix 4-9.

relatively small river is heavy during the salmon run. A boat is generally required to reach the best fishing areas.

Fishermen who preferred Passage Canal (Whittier) ranked the most important problems as: lack of fish (6), lack of access (6), lack of enforcement (3), overcrowded fishing areas (3) and lack of boat slips (2). Spawning populations of preferred species are few in number. The fishery is heavily dependent on supplemental coho salmon transplants. Access is available by means of the Alaska Railroad.

Fishermen who selected these four areas were, with the exception of the Eyak River fishermen, generally dissatisfied with their salmon catch in 1981. It cannot be determined, however, if they considered the salmon fishing in their favorite area to have been unsatisfactory or if this related to fishing in the Region as a whole.

A comparison of the total 1981 harvest of the respondents and the total harvest of all fishermen indicate that questionnaire results are biased toward successful fishermen. The respondents who sport fished in the Region in 1981 comprised approximately 8 percent of the total number of anglers, and the respondents caught approximately 3,880 or 13 percent of the estimated total harvest of 29,991 anadromous salmon. Land-locked salmon are not included in this plan. Respondents caught the following percentage of the total 1981 catch: king salmon 19 percent, sockeye salmon 29 percent, coho salmon 16 percent, pink salmon 5 percent and chum salmon 28 percent.

A comparison of the average 1981 catch of the satisfied respondents (the minimum demand) and minimum acceptable catch rate data derived for Cook Inlet fishermen suggests that the aforementioned bias is of minor consequence. Fourteen years of data collected in Seward indicate that angler dissatisfaction increases sharply when catch rates fall below 0.5 coho salmon per angler day. Minimum daily catch data for other species in the Cook Inlet fishery have been defined and they are as follows: 0.2 king salmon, 0.6 sockeye salmon, 0.7 chum salmon, and 1.0 pink salmon.[45] To compare these data with the average seasonal catch of satisfied questionnaire respondents, an expansion of the minimum acceptable catch data is required. The average angler in the Prince William Sound Region fished 5.7 days for salmon in 1981.[20] By expanding the Cook Inlet data by 5.7, an estimate of the minimum acceptable seasonal catch can be obtained. A general similarity is evident between the expanded Cook Inlet data and the average seasonal catch of satisfied respondents:

A comparison of the average 1981 catch of satisfied fishermen (minimum demand) and the minimum acceptable catches (expanded) for Cook Inlet fishermen.

	King	Sockeye	Chum	Pink	Coho
Average seasonal catch of satisfied respondents (Appendix 4-9, Q 9)	1.2	3.6	1.2	2.4	4.0
Minimum acceptable catch per season (expanded Cook Inlet data)	1.1	3.4	4.0	5.7	2.8

The greatest disparity exists between estimates for chum and pink salmon. These species, according to Appendix 4-9, Q 8, were preferred least by sport fishermen of the Prince William Sound Region. Respondents as a whole ranked their favored species as: king salmon (227), silver salmon (153), sockeye salmon (140), chum salmon (1) and pink salmon (1). The average catch of the estimated 4,604 fishermen, who fished in the Region 1981 but did not complete a questionnaire, was estimated as follows: 0.4 king salmon, 0.6 sockeye salmon, 0.2 chum salmon, 3.0 pink salmon, and 1.6 coho salmon. With the exception of pink salmon, these estimates are less than the minimum acceptable catch or demand data presented above. The estimated average catch of non respondents was also generally less than the average catch of dissatisfied or no opinion fishermen in Appendix 4-9, Q 9. It may be surmised that non respondents were generally dissatisfied or had no opinion about the adequacy of their sport harvest and that satisfied anglers probably constituted a minority of the fishermen.

The current (1983) minimum demand can be estimated by multiplying the catch of the satisfied repondents by the number of fishermen who presently fish for salmon in the Region. The number of anglers residing in the Region has probably not changed significantly since 1981, and, therefore, the total number of salmon required to meet current minimum demand can be estimated as follows:

Estimates of the current minimum seasonal demand

	King	Sockeye	Chum	Pink	Coho
Average seasonal catch of satisfied respondents	1.2	3.6	1.2	2.4	4.0
Estimated number of fishermen, 1981	5,000	5,000	5,000	5,000	5,000
Current minimum seasonal demand	6,000	18,000	6,000	12,000	20,000

The minimum demand 20 years from now can be estimated by use of population projections. The minimum seasonal demand in the year 2002 is:

Estimates of the minimum seasonal demand by the year 2002

	King	Sockeye	Chum	Pink	Coho
Current minimum seasonal demand	6,000	18,000	6,000	12,000	20,000
Projected population increase, 1980-2002	43%	43%	43%	43%	43%
Projected minimum seasonal demand, 2002	8,600	25,700	8,600	17,200	28,600

It is assumed that the population did not significantly change between 1980 and 1981 and that the number of sport fishermen will increase at a rate proportionate to the population of the Region.

The current high demand can be estimated from the answer of all respondents to Question 12 (Appendix 4-1): "As a sport fisherman, how many of the following fish do you need to catch per season to feel satisfied?"

Estimates of current high demand

	King	Sockeye	Chum	Pink	Coho
Average desired seasonal catch of all respondents	3.9	10.4	1.9	2.6	8.6
Estimated number of fishermen	5,000	5,000	5,000	5,000	5,000
Current high seasonal demand	19,500	52,000	9,500	13,000	43,000

It is assumed that fishermen responded to Question 12 (Appendix 4-1) with the number of salmon they'd like to catch and keep. Approximately 63 percent of the 1981 sport fish respondents also participated in the regional subsistence fishery and, therefore, it is likely that the majority used those fish for food. Some respondents viewed Question 12 as difficult to answer and, subsequently, did not specify a desired catch. These fishermen were perhaps more interested in aesthetics as opposed to catching food.

Using the aforementioned population projections, the high demand for the year 2002 can be estimated as:

Estimates of high demand by the year 2002

	King	Sockeye	Chum	Pink	Coho
Current high seasonal demand	19,500	52,000	9,500	13,000	43,000
Projected population increase, 1980-2002	43%	43%	43%	43%	43%
Projected high seasonal demand, 2002	27,900	74,400	13,600	18,600	61,500

Assumptions

The following assumptions must be considered in the analysis of user demand:

1) The average of the catches of satisfied sport and subsistence fisherman who responded to the questionnaire is representative of minimum satisfactory catch rates.

2) Population projections are correct.

3) Desired income and cost data are representative of commercial fishermen.

4) Median household income data are representative of commercial fishermen in this Region.

5) The average values of drift gill net boats will remain relatively constant.

6) The average values of purse seine boats will increase to $200,000 (1981 dollars) by the year 2002.

CHAPTER 5

ANALYSIS OF REGIONAL GAPS

CHAPTER 5

ANALYSIS OF REGIONAL GAPS

Gaps are the shortfalls between the projected needs of the fishermen and the projected conditions that will probably exist in the year 2002. Gaps encompass both tangible items such as salmon, earnings, access roads and campgrounds and intangible items such as knowledge. Gaps in catches of salmon or earnings have been calculated and are summarized for commercial, subsistence and sport fishermen. Other gaps have also been evaluated and these are discussed collectively.

Commercial Harvest Gaps

A comparison of future natural and supplemental production estimates (Appendix 3-19) and the desired gross income levels of all permit holders, suggests that major shortfalls in earnings will soon occur among purse seine and drift gill net permit holders unless remedies are quickly implemented (Figure 5-1 and Appendix 5-1).

Purse Seine Permit Holders

It is projected that seine permit holders will experience a shortfall in earnings of $11.7 million by the year 2002. The total minimum demand is projected to be $32.9 million annually; whereas, the exvessel value of the average harvest of natural and supplemental stocks is projected to be $21.2 million. This equates to average earnings per permit holder of $79,000 annually or 65 percent of the projected minimum demand of $122,000.

Projected exvessel values are considerably less than the record high average earnings of $172,000 experienced in 1981. Recent record high returns of pink salmon have largely been due to unusually high survival of natural stocks. A comparison of parent year index escapements and the returns that occurred during 1979 through 1981 indicate an average return per spawner of 11.0 pink salmon (Appendix 3-5). During the preceding 17 years, the average return per spawner was 3.7 pink salmon. During 1979 to 1981, the Port San Juan Hatchery contributed an estimated 2.7 million pink salmon to the common property seine fishery (Appendix 2-11). The total seine catch during these three years, excluding fish harvested by PWSAC, was 48.7 million pink salmon (Appendix 3-5).

A reduction in catches from the recent high levels will probably cause permit prices to decrease and the upgrading of boats will be reduced to a minimum. Capital investments and minimum revenue requirements will probably fall to a level commensurate with the actual value of catch. This will occur at the expense of lost investments, and the frequency of bankruptcies will undoubtedly increase. Permit holders may find themselves in a financial squeeze at a time when the maintenance of existing markets or prices may be dependent on the installation of expensive chilled sea water or ice equipment on their seine boats.

Drift Gill Net Permit Holders

It is projected that drift gill net permit holders will experience a shortfall in earnings of $13.9 million by the year 2002. The total minimum demand is projected to be $27.0 million annually. The exvessel value of the average harvest of natural and supplemental stocks is projected to be $13.1 million annually. This equates to average earnings per permit holder

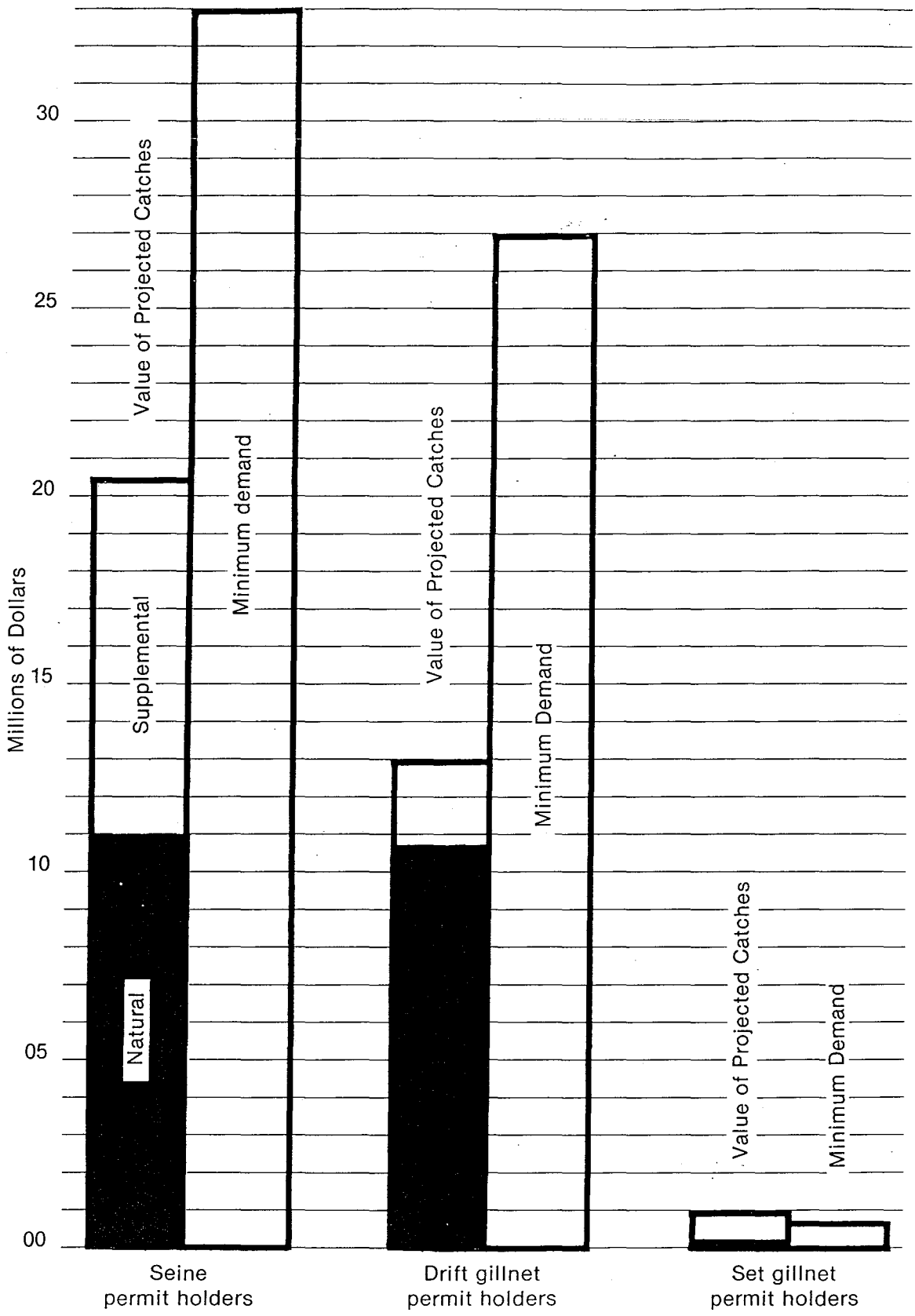


Figure 5—1. Projected catches and minimum demands of commercial fishermen.

of $24,000 annually or 48 percent of the projected minimum demand of $50,000.

Set Gill Net Permit Holders

A comparison of the minimum demand estimates based on three responses to the questionnaire and the projected commercial harvests in Appendix 5-1 suggests that no shortfall in earnings will occur in the set net fishery. The total projected minimum demand is estimated to be $480,000 annually. It is estimated that the total exvessel value of catches may be $906,000 annually. Further knowledge of the income requirements of these fishermen and the contribution of the Main Bay Hatchery will be required before a gap can be credibly defined.

Crew Members

The demands of crew members, as indicated by the questionnaires, have not been incorporated into Appendix 5-1. It is assumed that permit holders considered crew shares in their estimates of desired gross income. To meet the demands of crew members would widen the gaps in earnings in these fisheries (Appendix 5-1).

Subsistence Harvest Gaps

Major shortfalls in Upper Copper River subsistence salmon catches are projected in 20 years (Figure 5-2). These will coincide with anticipated massive shortfalls in drift gill net revenues and sport catches (Figure 5-1 and 5-3). The Gulkana Hatchery, at present capacity, will not satisfy the demand for subsistence fish.

It is projected that a minimum harvest gap of 125,900 salmon will exist for all subsistence gear types by the year 2002 (Appendix 5-2). Estimates of high demand and high gap are complicated by the large numbers of subsistence fishermen who are also sport fishermen. High subsistence demands and gaps may largely be resolved through the combined satisfaction of minimum subsistence and sport demand and high sport demands. Unfortunately, the questionnaire did not ask the joint sport-subsistence fishermen how many fish they would prefer to catch on sport gear vs. subsistence gear. It is assumed, however, that these fishermen would prefer to catch the majority of salmon on sport gear.

Sport Harvest Gaps

Major shortfalls in sport salmon catches are anticipated (Appendix 5-3). The projected total minimum and high gaps are approximately 37,000 and 142,900 salmon, respectively. Gaps in harvests of the preferred species, king, coho and sockeye salmon, are of primary importance to the sport fishermen.

Many sport fishermen have indicated that they prefer to fish in the Gulkana River, Valdez Bay, Eyak River and Passage Canal (Whittier). Fish created to resolve the gaps should, therefore, be distributed, when available, in these areas.

Knowledge Gaps

Lack of knowledge limits the management, rehabilitation and enhancement of salmon fisheries. Knowledge gaps encompass biological, environmental, technical and sociological matters. Gaps listed below are not

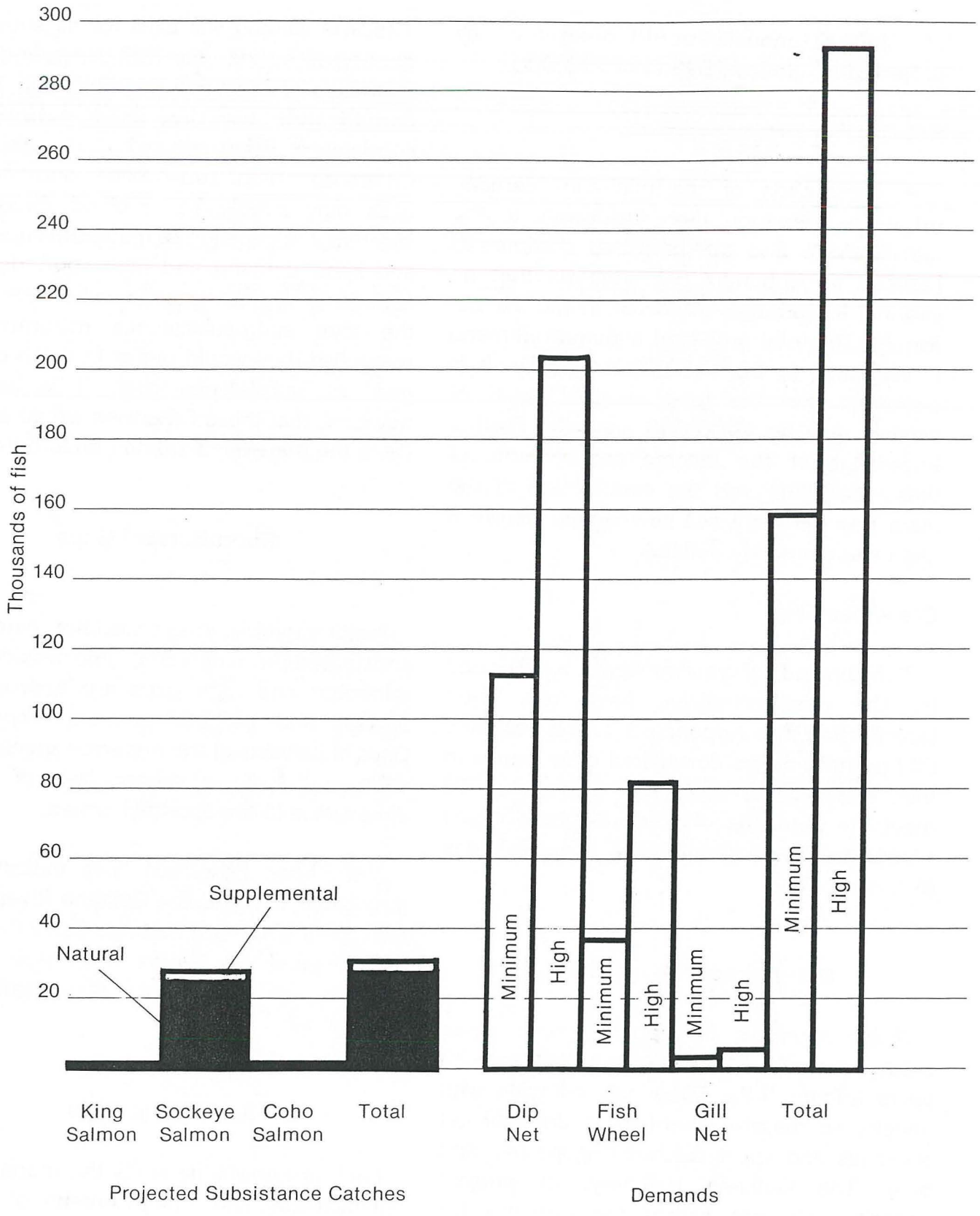


Figure 5—2. Projected catches and demands of subsistence fishermen.

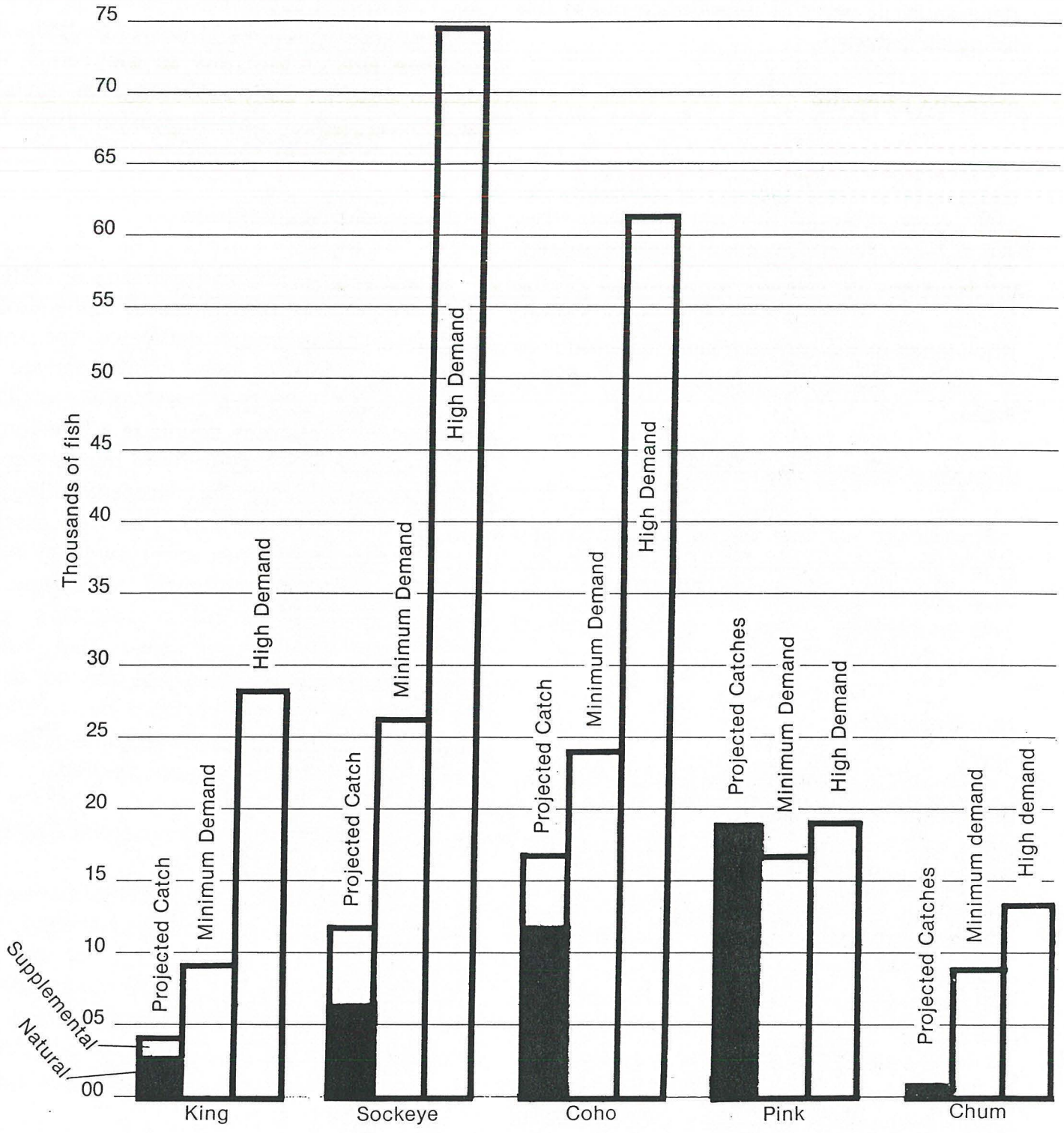


Figure 5—3. Projected catches and demands of sports fishermen.

necessarily in order of importance nor is this listing all inclusive.

Carrying Capacity

A major gap is the lack of knowledge of the carrying or stocking capacity of the freshwater and marine areas of the Region. The satisfaction of future demand will require major introductions of salmon fry in lakes of the interior and western Prince William Sound. Knowledge of the carrying capacity is required to achieve the optimum utilization of rearing areas.

Migration Routes and Milling Areas

Knowledge of the migration routes and milling areas of individual stocks, natural stocks as a whole or hatchery stocks is incomplete. This information is needed to protect natural stocks from over fishing.

Run Forecasts

Long-range run forecasting in the Region has been restricted to pink and chum salmon in the seine districts. Forecasts of runs of other species is generally not feasible due to the large number of streams and stocks. Facets lacking in the existing program are the knowledge of marine rearing conditions, time of emergence and the physical condition of fry. It is believed that knowledge of these factors combined with an increase in stream sampling would enhance the accuracy of the forecast. The planning efforts of the fishery manager, processors and fishermen would be enhanced by improved forecasts.

In-season Run Magnitude

Long-range forecasts cannot take into account rearing conditions on the high seas. A program, subsequently, is needed to define the ultimate size of the runs as they enter the fishing districts. Early knowledge of run size would enhance the implementation of appropriate harvest strategies.

Escapement Enumeration

Escapement counts provide a critical measure of the effectiveness of management practices. Escapement estimates for most stocks are presently index counts derived by aerial and ground estimation. The completeness of these counts is a function of water clarity, observer bias and percentage of the total escapement that is present during the survey. Not all spawners are necessarily present at any one time, and surveys or index counts are commonly partial estimates. In glacial drainages, index counting can commonly only occur after fish reach clearwater spawning areas. This may not occur until the majority of fish have been caught. Increased funding and improved data gathering and evaluation techniques are needed.

Stock Composition of Commercial Catches

Determination of the commerical harvest of individual natural stocks is currently not feasible. It may be feasible, however, to determine the relative harvest magnitude of individual hatchery stocks and natural stocks as a whole. This would provide a means to detect weak natural runs and implement protective measures.

Optimum Escapement

Knowledge of optimum escapement levels is required to attain the maximum harvest from each stock. Escapement goals are often based

on fragmentary information. More information is needed on the stream life of spawners and the utilization of spawning areas.

Processing Gaps

Full utilization of salmon runs will require that adequate processing facilities be available to handle the harvests of commercial fishermen and private nonprofit hatcheries. The processing capacity of shore-based plants in the Region has been estimated to be approximately 697,000 salmon per day. Additional fish have been tendered daily to outlying Alaskan plants or have been processed on freezer ships. These processing outlets, however, have not been reliable. Commercial catches in 1981 often exceeded 1.0 million salmon per day. Catches of at least the same magnitude as experienced in 1981 may be required to sustain seine permit holders in the future. Should exvessel prices decline, then even larger catches and greater processing capacity will be required.

Access and Campground Gaps

Sport and subsistence fishermen cited lack of access, crowded fishing areas and lack of campgrounds as major problems with the fisheries of the Region. These problems are directly related to each other in that lack of public access crowds anglers into readily accessable public areas that lack adequate facilities. The public land base along many water bodies is decreasing due to the State land disposals and settlement of native land entitlements. Additional campgrounds, access roads and trails leading to quality fishing areas are needed.

Assumptions

1) Limited entry legislation will remain in force and the number of permit holders will not change.

2) Estimates of the contribution of existing facilities and stream improvement projects are accurate.

3) Estimates of the production status of natural runs are accurate.

4) Projections of fish prices are accurate.

5) Variables affecting user demand will not change significantly and estimates of user demand are accurate.

CHAPTER 6

REGIONAL GOALS AND OBJECTIVES

CHAPTER 6

REGIONAL GOALS AND OBJECTIVES

Goals encompass the production of additional harvestable fish, the acquisition of data and knowledge, the development of additional access routes to sport and subsistence fishing areas and development of additional campground spaces. Objectives are goals generally stated in quantifiable and realistic terms. This Phase I Plan deals with long-term, or 20 year objectives. Phase II plans, will deal with short-term or 2 to 5 year objectives.

The overall goals of this plan are to:

1. Identify user needs, problems areas and gaps.

2. Recommend means to protect and maintain the natural runs of salmon.

3. Recommend biologically sound rehabilitation and enhancement activities and projects necessary to satisfy the needs and demands of each user group.

4. Provide as many fish as possible to each user group.

5. Promote the investment of funds.

Commercial Harvest Objectives

It is an objective to provide sufficient salmon to meet the desired income levels of commercial fishermen. Once these needs are met, it is an objective to continue increasing production and harvests to improve the profits of fishermen.

Purse Seine Fishery

It is an objective to increase the average harvests and gross income of purse seine permit holders from the base level of $21.2 million to $32.9 million by the year 2002.

Purse seine permit holders indicated that they prefer, in descending order, to fish for pink, sockeye, chum and king salmon. The greatest potential for increased production lies in pink and chum salmon. These fishermen ranked their preferred fishing districts in descending order: Southwestern, Southeastern and Northern (tied) and Eastern. Their preferred districts for new rehabilitation and enhancement projects were: Eastern, Northern and Coghill (all tied). Efforts, therefore, should be concentrated on providing the preferred species in the preferred areas.

Constraints to these objectives include mixing and overharvesting of wild stocks, prices and costs. Wild stocks may mix with hatchery stocks and overharvesting of the wild stocks may occur. Terminal harvest areas, however, may allow for the total harvest of hatchery stocks without impairing wild stocks. The exvessel prices of pink and chum salmon may decline at a rate faster than harvests can be increased. Finally, the costs of permits and boats may increase faster than revenues are enhanced.

Drift Gill Net Fishery

It is an objective to increase the average harvest and gross income of drift gill net permit holders from the base level of $13.1 million to the minimum revenue requirements of $27.0 million by the year 2002.

Drift gill net permit holders expressed a preference to fish for sockeye salmon, followed in descending order by king, coho, chum and pink salmon. The greatest potential for increased production lies in pink, chum and perhaps sockeye salmon. Efforts should be concentrated on those species that are both preferred and have the greatest potential for increased production.

Drift gill net permit holders expressed a preference to fish in the Copper River District followed, in descending order, by the Coghill, Bering River, Eshamy and Unakwik districts. These fishermen when asked which districts they would prefer to have enhanced or rehabilitated, ranked these districts in the same order. Enhancement and rehabilitation opportunities are limited in the Bering River District, and efforts should be concentrated in the other preferred districts.

Constraints to the production of these fish and the satisfaction of the minimum needs of these fishermen include rearing area, fish prices and costs. Sockeye salmon rearing area in the districts listed may not be sufficient to rear the needed salmon. Exvessel prices may drop at rate faster than additional fish can be produced. Finally, the costs of commercial gill netting may increase faster than revenues can be enhanced.

Set Gill Net Fishery

It is an objective to increase the average harvests and gross income of set gill net permit holders beyond the base levels projected in Chapter 3 of $906,000.

Set gill net fishermen indicated that they preferred to fish for sockeye salmon and that they preferred that new rehabilitation and enhancement projects be conducted in the Eshamy District. It is recommended that new rehabilitation and enhancement projects in the Eshamy District should focus on sockeye salmon.

The objective may be limited by unforeseen problems with the proposed lake fertilization and stocking projects and the interception of sockeye salmon by the seine fleet.

Subsistence Harvest Objectives

Dip Net and Fishwheel Fisheries

It is an objective to provide sufficient fish by the year 2002 to meet and surpass the high catch demands of dip net and fishwheel fishermen. It is assumed that the high catch demands of most subsistence fishermen will be met if both the high sport catch demands and the minimum subsistence catch demands are met.

The objectives are to increase dip net and fishwheel catches from a combined base level of approximately 29,900 salmon to:

1) A dip net harvest of at least 116,000 sockeye salmon by the year 2002.

2) A fishwheel harvest of at least 65,600 sockeye salmon by the year 2002.

Dip net and fishwheel fishermen indicated that they desire to subsistence fish on the Copper River. It is an objective, therefore, to provide these fish in the Copper River.

Constraints to the production or harvest of these fish are similar to those described for sport fishermen. Participation in the fishery may be limited by overcrowded fishing areas,

lack of access and lack of open areas. The Copper River Subsistence Management Plan currently limits subsistence harvests according to levels of escapement magnitude.

Gill Net Fishery

It is an objective to increase gill net harvests to a minimum of 4,000 salmon by the year 2002.

These fishermen indicated a preference for king salmon followed by sockeye and coho salmon. They indicated a desire to catch these fish primarily on the Copper River Flats and secondarily in the Coghill District. It is recommended that efforts be directed to provide the preferred species in the areas indicated.

Constraints to the production and harvest of these fish include rearing capacity of lakes and streams and escapement magnitude.

Sport Harvest Objectives

It is an objective of this plan to provide sufficient fish by the year 2002 to meet and surpass the high catch demands of sport fishermen. The objectives in order of user preference and priority are:

1) king salmon - increase the harvest from the base level of approximately 4,300 fish to a harvest of at least 27,900 fish by 2002

2) coho salmon - increase the harvest from the base level of approximately 16,900 fish to a harvest of at least 61,500 fish by 2002

3) sockeye salmon - increase the harvest from the base level of approximately 11,700 fish to a harvest of at least 74,400 fish by 2002

4) chum salmon - increase the harvest from the base level of approximately 1,400 fish to a harvest of at least 13,600 fish by 2002

No gap in pink salmon harvests is anticipated.

Efforts should be made to provide these fish in preferred areas.

Major constraints to these objectives include access, escapement magnitude and the rearing capacity of lakes and streams. Sport harvests have been limited to a large degree by access and not necessarily by lack of fish. The magnitude of future sport harvests will largely be dependent on the accessibility and size of salmon populations. In order to sustain angler interest, these salmon populations will have to be of sufficient magnitude to sustain acceptable catch rates. There may not be sufficient rearing capacity in lakes and streams to provide the catches of king, sockeye or coho salmon.

Management and Research Goals and Objectives

Lack of knowledge limits our ability to manage, plan, improve and fully utilize the salmon resources. An overall goal is to increase our knowledge of the salmon resources and user groups and improve the ability to manage the salmon resources. The following is a list of objectives that may be attainable by the year 2002.

★ Improve the accuracy of all salmon forecasts.
★ Determine run magnitude and timing by species and by hatchery stocks as salmon enter the western entrance to Prince William Sound.
★ Assess spatial and temporal distribution and

migration paths of salmon in Prince William Sound.

★Determine the harvest contribution of hatchery stocks.

★Assess the stock composition of sockeye salmon catches.

★Improve the accuracy of escapement enumeration.

★Refine estimates of optimum escapement levels for all species.

★Determine the factors that limit the abundance of adult pink and chum salmon in Prince William Sound.

★Inventory and catalog spawning and rearing habitat in conjunction with habitat protection activities, stream clearance and improvement activities, carrying capacity and productivity assessments, lake fertilization assessments and barren-lake stocking assessments.

★Explore means to encourage pink salmon to utilize new habitat made available through fish pass installation, barrier removal and stream improvement activities.

★Achieve solutions to disease problems hampering supplemental production of sockeye and king salmon.

★Achieve maximum production of hatchery produced fish.

★Evaluate any impacts that salmon hatchery production may have on local natural stocks.

★Fully utilize the productive capacity of lakes in Prince William Sound.

★Periodically reevaluate user demands.

Access and Campground Acquisition Objectives

Sport and subsistence fishermen cited the lack of access to fishing areas and the lack of adequate campgrounds to be major problems with the salmon fishery of the Region. It is an objective, therefore, to promote activities leading to the acquisition and improved maintenance of access routes and campgrounds.

Plan Revision Objectives

It is an objective to review and update major components of this Plan every five years henceforth: 1987, 1992, 1997, and 2002.

CHAPTER 7

STRATEGIES AND RECOMMENDED PROJECTS

CHAPTER 7

STRATEGIES AND RECOMMENDED PROJECTS

This chapter describes the strategies and projects which may be employed to attain the goals and objectives outlined in Chapter 6. The basic strategies involved in improving salmon production are harvest management, habitat protection, rehabilitation and enhancement. Each of these strategies is of value in improving production of salmon. The application of these strategies may vary according to the peculiarities of the species, stocks and prevailing stream or lake conditions.

Closely aligned with these strategies are research and evaluation activities. Research explores new methods and unknowns. Evaluation provides timely feedback regarding the value of our efforts or methods. Without these, progress would be inhibited.

Another aspect beyond the production of more salmon is the creation and control of access roads and campground facilities for sport and subsistence fishermen and the creation of road-side salmon viewing areas for all people, fishermen and non-fishermen alike.

Projects implemented as a result of this plan will increase, perhaps in differing proportions, the catches of the various user groups. The Planning Team, when it recommends projects to the Commissioner of ADF&G, is in a defacto sense recommending the allocation of projected increases in salmon runs to user groups. The Planning Team does not have authority to allocate resources but can only make recommendations to the Commissioner. The authority to allocate fisheries resources is vested in the Alaska Board of Fisheries by AS 16.251-255.

Harvest Management Strategies and Projects

Management strategies aim at maintaining and improving salmon runs by achieving the proper escapement for each stock and the full utilization of fish that are surplus to escapement needs. It is an essential strategy for both wild and supplementally produced fish.

Management precision is generally limited by insufficient knowledge of run size, stock composition, timing, escapement rates, behavioral characteristics and optimum escapement levels. Increased knowledge of these would increase management precision, improve the harvest and/or improve the quality or value of the catch. Unlike rehabilitation and enhancement projects, the benefits derived from management projects are difficult to quantify. The following is a descriptive list of recommended projects. The costs of most of these projects are not known at this time.

Project: Forecast improvement.
Agency: ADF&G, Division of Commercial Fisheries.
Location: Prince William Sound districts.
Objectives: To improve the accuracy of pink and chum salmon forecasts.
Narrative: Forecasts are of value to fisheries managers, fishermen, processors and government agencies in their preseason planning activities. The full utilization of large (natural and/or hatchery) runs and the protection of small natural runs require adequate preparation and planning. As hatchery returns increase in magnitude, natural

stocks will become increasingly vulnerable to overharvest. Protective strategies and measures must be developed prior to the arrival of weak natural runs in the cape fishery areas. In years of low natural run abundance, the fishing fleet may be restricted to harvest areas near hatcheries. Additional manpower, vessel charter and environmental monitoring equipment is required to improve forecasts.

Project: In-season run assessment.
Agency: ADF&G, Division of Commercial Fisheries.
Location: All districts.
Objectives: To continually assess run strength and timing of each species and major stock within the fishing districts.
Narrative: To most effectively manage the fisheries, the manager needs to constantly assess run strength and timing for each species and major stock. It would be ideal to be able to monitor the fish as they enter the fishery, as they are available for harvest and as the fish escape the fishery. Information concerning test fishing, catch magnitude, stock composition, timing, migration paths, milling areas and escapement can be computerized and a program can be developed to allow the manager to compare daily fisheries data with historic data. In this manner the ultimate size of the run can be accurately estimated early enough in the season to affect changes in fishing time and escapement rates. This would be of particular value in the Copper and Bering river districts where silty water conditions preclude run size and escapement estimates until the fish cross the sonar counters at Miles Lake on the Copper River or are visible in clearwater streams. Additional funding is needed to develop the computer program and input data.

Project: Test fishing.
Agency: ADF&G, Division of Commerical Fisheries.
Location: Ocean entrances from Cape Puget to Cape Cleare.
Objectives: To determine the magnitude of pink, chum and sockeye salmon returns immediately prior their entry into the Prince William Sound fishery and to determine the relative magnitude of natural runs and hatchery runs.
Narrative: The majority of pink, chum and sockeye salmon that spawn in Prince William Sound are believed to enter the Sound through the 21-mile wide ocean entrance between Cape Puget and Cape Cleare. It may be feasible to determine run magnitude and run composition by test fishing with a purse seine and/or gill net and by monitoring with sonar. The project would be conducted much the same as the test fishing project at Port Moller in Bristol Bay. Fishing stations would be established across the ocean entrance, and fishing would be briefly conducted at each station on a periodic basis throughout the season. Catches would be used to derive in-season estimates of total run strength. Scales would be collected for racial scale-pattern analysis, and fish would be examined for coded-wire nose tags. The tags would be implanted in a portion of juvenile salmon released from regional hatcheries. The proportion of natural and hatchery stocks migrating into the Sound may thereby be determined. Additional funding is required for vessel charter, personnel and equipment.

Project: Stock identification.
Agency: ADF&G, Division of Commercial Fisheries and FRED Division.
Location: All districts.
Objectives: To identify the origin of commercially harvested salmon and to

apportion the catch accordingly.

Narrative: The ability to identify stocks in the fishing districts and assign these fish to streams and/or lakes of origin is necessary to develop forecast relationships, assess optimum escapement and evaluate success of rehabilitation and enhancement activities. This ability has been lacking within the Region. Required projects entail the collection of scale and fish length data, tagging and tag recovery. Scales and lengths would have to be collected from fish both in the escapement and the catch. Scale pattern and length data would be analyzed by computer to determine differences between stocks of salmon. Microwire tags would be implanted in a portion of juvenile salmon produced at each hatchery and incubation site. Sensing devices would be employed to identify tagged fish. Additional funds are needed for personnel, aircraft and vessel charter, computer analysis and microwire tagging and recovery equipment.

Project: Escapement enumeration.

Agency: ADF&G, Division of Commercial Fisheries.

Location: Region wide.

Objectives: To improve the accuracy of escapement counts, to obtain counts earlier and to derive total escapement counts in more locations.

Narrative: Accurate and timely escapement information is vital to a successful management program. The present and future well-being of the resource users is dependent on the ability of the manager to estimate escapement rates and total escapement and to attain the optimum escapement level in each lake or stream. Escapement numbers are compared to fry, smolt or adults produced over a period of years to derive optimum escapement estimates. Both the escapement and catch magnitude must be known to assess forecast accuracy and improve forecasts.

Additional weirs, aerial and ground surveys, and sonar counters are needed to improve accuracy and coverage. It may be desirable to install and man weirs at Eyak Lake, Tokun Lake, Shepherd Creek at Bering Lake, and Salmon Creek at McKinley Lake and other selected sites.

Total estimates of pink and chum salmon escapement in Prince William Sound are actually index counts based on the expansion of periodic ground and aerial counts in the major spawning streams. The total of these estimates is thought in some years to equal perhaps 75 percent of the total escapement throughout the Sound. No efforts are currently made to estimate escapements in non-index streams. Periodic counts are expanded by a "stream-life" factor to derive the total escapement for a given stream. The accuracy of these estimates is limited by the number of visits to the streams and the accuracy of the stream life factor utilized. Additional personnel, aircraft and vessel charter funds will be required to improve escapement survey estimates. Stream-life studies are needed annually.

Escapement estimates of sockeye and coho salmon in the Sound and all salmon species in the Copper and Bering river districts are commonly based on the highest or peak survey count obtained during several surveys, and no efforts are made to expand these counts by stream-life factors. Total escapement counts are only available at Eshamy and Coghill lakes (weirs) and at Miles Lake (sonar counters). Peak counts are only indices of escapement because all spawners are not necessarily present in a stream or lake at one time. In any given area early fish may spawn, die and disappear before late fish appear. Additional manpower and survey funds and perhaps stream-life studies are needed to increase the accuracy of these escapement estimates. Sonar

counters may be beneficial in various turbid streams to provide early and accurate escapement counts. Suitable sites need to be explored and funding is needed to provide personnel and equipment.

Project: Optimum escapement and carrying capacity studies.
Agency: ADF&G, Division of Commercial Fisheries and FRED Division.
Location: Region wide.
Objectives: To determine optimum escapement levels and to determine the stocking capacity of selected lakes and streams
Narrative: The determination and refinement of escapement goals is required to achieve maximum production of individual stocks. Projects may entail the measurement of spawning and rearing areas, plankton sampling, water chemistry analysis, assessments of predator and competitor species and assessments of the abundance of existing stocks. Knowledge of stocking capacity is needed to optimize the returns of adult salmon resulting from fry planted in barren lakes. Funding is needed to provide personnel, aircraft and vessel charters and equipment.

Enhancement and Rehabilitation Strategies and Projects

Enhancement involves the building of stocks to production levels beyond their former capabilities. Rehabilitation entails the restoration of depressed stocks to previous high levels of abundance. Various projects may be implemented including hatchery expansion, the construction of new hatcheries, lake and stream stocking, lake fertilization, fish pass installation and stream improvement and clearance.

Project: Main Bay Hatchery short-term rearing expansion.
Agency: ADF&G, FRED Division.
Objectives: To expand facilities at Main Bay to allow for the short-term rearing of 86 million chum salmon fry.
Narrative: This facility currently has only sufficient raceway space to rear 25 million fish to fingerling size. When the hatchery is in full production, an estimated 44 million emergent fry will be released into the estuary without benefit of short-term rearing. According to FRED Directive No. 3, short-term rearing of fish to fingerling size may increase survival from an estimated 0.7 percent for unfed fry to 2.0 percent. It is estimated that an additional 492,000 chum salmon adults will be produced if the rearing facilities are provided.

Project: Cannery Creek Hatchery fish handling and short-term rearing facilities.
Agency: ADF&G, FRED Division.
Objectives: To provide adult fish handling facilities and to provide salt water rearing facilities for 68 million pink salmon fry.
Narrative: The lack of adequate fish handling facilities currently limits annual egg takes to a maximum of 50 million pink salmon eggs. The addition of needed facilities will enable hatchery personnel to take an additional 30 million eggs annually. A $550,000 captial improvement request has been submitted to provide the fish handling facilties.

The addition of salt water rearing facilities may, according to FRED Directive No. 3, result in an increase in marine survival from 0.7 percent to 2.0 percent. It is estimated that an additional 755,000 adult pink salmon will be produced if these project are implemented.

Project: Gulkana Hatchery expansion.
Agency: ADF&G, FRED Division and/or Division of Commercial Fisheries.

Location: Glennallen.
Objectives: To increase the capacity of the hatchery by an unspecified amount.
Narrative: This facility at the present capacity of 10.3 million eggs is utilizing approximately 10 percent of the available spring water at the site. The hatchery, therefore, may have potential for significant expansion. Knowledge of the stocking capacity of the numerous lakes in the Copper River drainage is incomplete at this time. Proposals for expanding the facility may be presented as data become available.

Project: Esther Lake Hatchery construction.
Agency: PWSAC.
Location: Esther Island in the Coghill District, 25 miles east of Whittier.
Design capacity: The egg capacity of the facility is tentatively 50 million early chum salmon eggs, 50 million mid-late chum salmon eggs, 200 million mid-late pink salmon eggs, 10 million sockeye salmon eggs, 1.0 million coho salmon eggs, and 1.0 million king salmon eggs.
Objectives: To increase the catches of commercial, sport and subsistence fishermen.
Narratve: The proposed hatchery site is located on State land at the outlet of Esther Lake in Lake Bay. Two lakes form the drainage system. Both are clear and barren of salmon. This site was selected because of the large, high quality water supply and because it is located in an area where both purse seine and drift gill net gear may be used. Facilities upon completion may include: a shallow and deep water intake in the lake, pipelines, a hydroelectric plant, hatchery buildings, shops and storage buildings, personnel quarters and a dock and road system.

Project: Additional hatchery construction.
Agency: To be determined.
Location: Yet to be determined (see Appendix 7-1).
Objectives: To increase the catches of commercial, sport and subsistence fishermen.
Narrative: Twenty-one potential hatchery sites have been identified in Prince William Sound (Appendix 7-1). The evaluation process has yet to be completed; therefore, it is not possible to prioritize this listing.

Project: Lake stocking.
Agency: ADF&G, FRED Division, PWSAC and/or USFS.
Location: Numerous potential stocking sites have been identified (Appendix 7-2).
Objectives: To plant juvenile salmon in barren or underutilized lakes and streams and, thereby, increase the catches of commercial, sport and subsistence fishermen.
Narrative: Underutilized or barren lakes can be stocked to establish a run of salmon or supplement existing runs. Some lakes are barren due to impassable barriers. These lakes and barriers need to be evaluated from a biological and engineering standpoint. Sockeye, coho and king salmon runs can be established by the construction of a fish pass system and the stocking of fry. Summit, Crosswind, Monsoon and Dickey lakes are currently under consideration as stocking sites for sockeye salmon fry incubated at the Gulkana Springs incubation box facility. Other lakes that may be suitable stocking candidates for sport fish enhancement are listed in Appendix 7-2.

Project: Lake enrichment.
Agency: ADF&G, FRED Division, PWSAC and/or USFS.
Location: Region wide.
Completion date: As soon as possible.
Objectives: To increase the production of sockeye salmon juveniles in selected lakes.
Narrative: Lake nutrients are a necessary

ingredient in the production of lake rearing salmon such as sockeye and coho fry. The survival of fry to adulthood has been shown to be directly related to the size of the fish when migrating to sea. This size is directly dependent on the availability of zooplankton in the lake. Many lakes when once depleted of salmon are slow to recover due to the lack of spawned-out carcasses, a major source of nutrients in some lakes. Salmon fry in these lakes grow slowly and commonly remain in the lake longer than normal. Fry hatched in following years must compete with the older fry for available food. Fertilization increases zooplankton production, and, subsequently, fry grow more quickly and outmigrate sooner. Eshamy Lake, Summit Lake and Tokun Lake (Martin River drainage) are potential fertilization candidates. Additional limnological sampling is required to ascertain feasibility, desirability and benefit-cost factors.

Project: Stream stocking.
Agency: ADF&G, FRED Division, PWSAC and/or USFS.
Location: Region wide.
Objectives: To increase sport and commercial catches of salmon.
Narrative: Streams that are barren, depleted, slow to rebuild naturally or underutilized by rearing fry can be planted to establish a run or enhance the existing run of salmon. Coho salmon smolt have been planted at Whittier Creek and Cove Creek in Passage Canal. These fish imprint in these streams, migrate to sea and return to be harvested by sport fishermen. The streams offer no rearing potential, consequently this constitutes a supplemental plant. Bear Lake near Seward has been the egg source heretofore. The Ft. Richardson incubation and rearing facility has been used to incubate the eggs and rear the fry to smolt size. The Bear Lake donor stock is no longer usable due to disease, and, therefore, alternate brood sources need to be identified and utilized. Other streams that may be suitable stocking candidates for sport fisheries enhancement are listed in Appendix 7-3.

Project: Fish pass installation.
Agency: USFS and/or ADF&G, FRED Division.
Location: Prince William Sound.
Objectives: To provide salmon access to unutilized habitat and increase the catches of commercial, sport and subsistence fishermen.
Narrative: Fish passes (fish ladders, steep passes or fish ways) allow salmon to utilize habitat upstream of falls or velocity barriers. Suggested streams for fish pass installation are listed in Appendix 7-4.

Project: Stream improvement.
Agency: USFS and/or ADF&G, FRED Division.
Location: Region wide.
Objectives: To improve and increase spawning and rearing habitat for salmon and increase commercial, sport and subsistence catches of salmon.
Narrative: Stream improvement involves the creation of spawning channels, resting pools, channel containment and flow control structures and other structures which improve the stream environment for spawning and/or rearing. Streams in which improvement efforts may be beneficial are listed in Appendix 7-5.

Project: Stream clearance.
Agency: USFS and/or ADF&G, FRED Division.
Location: Region wide.
Objectives: To clear stream of obstruction and allow salmon access to unutilized habitat and to increase the salmon catches of commercial, sport and subsistence fishermen.

Narrative: Stream clearance is often the simplest and least costly technique of rehabilitation. It is useful when removable obstructions limit access to spawning and/or rearing areas. Suggested streams for clearance are listed in Appendix 7-6.

Habitat Protection Strategies and Projects

Habitat protection is critical to the maintenance of wild salmon stocks. Spawners will not successfully reproduce if spawning or rearing areas are disrupted, polluted or destroyed. It is recognized that logging, mining, urban growth, road construction, and hydroelectric and industrial development are potentially detrimental to salmon habitat. There is a strong likelihood that these activities will increase or take place in the future. Major projects may include the construction and operation of a hydroelectric dam at Silver lake, in Galina Bay of Valdez Arm, coal mining at Bering Lake and commericial logging in numerous areas of the Sound. The transfer of large tracts of public lands into private ownership will be a major factor. We need to maintain and increase the surveillance and enforcement activities of the Habitat Protection Division of ADF&G and other agencies to keep pace with potentially destructive activities. The following habitat project is urgently needed:

Project: Habitat inventory.
Agency: ADF&G, Habitat Protection Division, the US Forest Service and/or the Bureau of Land Management.
Location: Region wide.
Objectives: To inventory and categorize fisheries habitat and to make these data available to fisheries managers, land use planners and land managers.

Access and Campground Strategies and Projects

With population growth and transfer of public lands into private ownership, pressure on the accessible resources will increase dramatically. Additional access roads, trails, campgrounds, boat ramps, mooring slips and salmon viewing areas will be required to enhance and preserve the recreational qualities of the Region.

Project: Access and campground development.
Agency: ADF&G, Divisions of Habitat Protection and Sport Fish, ADNR, Division of Parks, USFS and BLM.
Location: Region wide.
Objectives: To provide access and campgrounds to sport and subsistence fishermen.
Narrative: Sport and subsistence fishermen have cited lack of access and campgrounds to be major problems with the salmon fisheries of the Region. Additional access will diversify fishing pressure and will increase the harvest of fishermen.

Planning Strategies and Projects

Project: Plan reevaluation and update.
Agency: PWSAC and the Prince William Sound Regional Fisheries Planning Team.
Location: Cordova.
Objectives: To update this fisheries plan.
Narrative: This fisheries plan is a "living" document and as such will change as the salmon resource, environment and social and economic elements of the Region, State and world change. Periodic update will be needed to reevaluate user demands, to evaluate our progress in meeting demands and to evaluate and prioritize needed projects.

Appendices

Appendix 1-1. Historical commercial catches of salmon in numbers of fish, by species, Prince William Sound Region, 1889 — 1981.[1]

Year	King	Sockeye	Coho	Pink	Chum	Total
1889	0	242,790	0	0	0	242,790
1890	5,491	411,190	0	0	0	416,681
1891	6,185	710,740	0	0	0	716,925
1892	0	0	0	0	0	0
1893	8,674	792,690	72,000	0	0	873,364
1894	8,494	710,000	17,000	0	0	735,494
1895	10,248	507,630	142,937	0	0	660,815
1896	1,407	738,575	31,862	308,180	0	1,080,024
1897	2,044	410,756	25,605	302,290	0	740,695
1898	1,850	456,554	0	375,246	0	833,650
1899	4,682	554,194	0	212,907	0	771,783
1900	3,462	854,477	88,175	50,565	0	996,679
1901	6,558	781,438	0	313,806	0	1,101,802
1902	2,500	800,044	0	375,408	0	1,177,952
1903	4,600	814,345	0	398,926	0	1,217,871
1904	5,667	734,230	0	573,967	0	1,313,864
1905	20,000	420,000	0	0	0	440,000
1906	2,276	380,030	0	0	0	382,306
1907	869	281,249	0	252,373	0	534,491
1908	0	583,432	0	18,018	0	601,450
1909	3,067	467,100	0	0	0	470,167
1910	974	290,115	32,560	196,871	0	520,520
1911	1,358	430,689	53,944	156,349	0	642,340
1912	6,181	544,962	59,801	401,892	495	1,013,331
1913	3,310	518,845	406	425,574	70	948,205
1914	3,043	653,509	55,193	224,906	0	936,651
1915	7,338	976,453	19,013	465,250	2,175	1,470,229
1916	14,272	983,130	217,951	3,316,352	45,985	4,577,690
1917	14,615	1,305,329	249,042	2,599,408	370,309	4,538,703
1918	20,323	1,914,469	254,844	4,308,779	1,342,576	7,840,991
1919	20,268	1,621,117	203,033	1,008,312	558,522	3,411,252
1920	29,525	1,146,861	227,167	5,314,747	260,963	6,979,263
1921	11,469	783,529	9,693	12,644	3,499	820,834
1922	10,433	777,690	8,962	2,421,272	50,517	3,268,874
1923	10,955	988,286	51,612	2,447,776	111,582	3,610,201
1924	17,192	1,036,433	191,350	8,396,087	385,274	10,026,336
1925	23,130	310,056	294,802	4,085,310	780,960	5,494,258
1926	23,567	406,078	309,056	11,153,883	587,351	12,479,935
1927	45,139	459,409	669,166	6,124,911	655,159	7,953,784
1928	48,972	714,935	494,676	8,034,200	468,260	9,761,043
1929	47,690	1,232,961	249,955	9,613,500	1,282,150	12,426,256
1930	26,921	1,037,002	705,444	6.776,860	979,800	9,526,027
1931	36,095	919,570	146,999	4,860,083	560,271	6,523,018
1932	37,310	1,086,075	99,856	3,466,435	350,895	5,040,571
1933	23,386	755,,832	171,801	3,030,586	285,824	4,267,429
1934	16,858	1,135,529	100,331	6,792,072	261,479	8,306,269
1935	6,203	286,770	113,279	2,618,185	471,050	3,495,487
1936	14,564	1,065,976	43,783	9,581,539	218,550	10,924,412
1937	16,061	1,161,270	105,597	3,334,462	227,468	4,844,858
1938	12,796	883,856	52,735	7,547,696	250,224	8,747,307
1939	10,620	754,277	43,061	2,078,528	273,053	3,159,539

Appendix 1-1. Historical commercial catches of salmon in numbers of fish, by species, Prince William Sound Region, 1889 — 1981, continued.[1]

Year	King	Sockeye	Coho	Pink	Chum	Total
1940	6,516	512,160	318,561	11,542,576	532,327	12,912,140
1941	12,707	518,959	613,582	3,785,693	507,538	5,438,479
1942	26,768	658,618	773,626	7,003,688	702,472	9,165,172
1943	20,542	865,458	259,056	10,815,321	475,877	12,436,254
1944	10,618	910,554	359,826	8,346,755	1,208,587	10,836,340
1945	22,011	999,603	368,001	11,632,238	1,754,087	14,775,940
1946	26,022	661,140	442,711	8,026,032	757,173	9,913,078
1947	15,807	553,489	344,972	8,077,210	706,189	9,697,667
1948	5,981	380,846	301,723	2,460,760	457,618	3,606,928
1949	9,295	535,172	288,680	6,089,394	827,665	7,750,206
1950	18,335	875,036	220,642	1,850,770	455,947	3,420,730
1951	21,109	663,599	248,360	802,998	549,255	2,285,321
1952	29,466	1,210,640	228,512	2,167,840	550,754	4,187,212
1953	12,296	621,532	66,878	1,996,579	352,760	3,050,045
1954	15,765	1,105,878	250,341	12,286	6,344	1,390,614
1955	20,563	683,750	228,904	27,072	4,676	964,965
1956	12,341	738,348	197,582	4,526,585	507,258	5,982,114
1957	9,190	637,247	107,081	650,869	706,888	2,111,275
1958	19,078	345,110	125,367	6,298,828	687,448	7,475,831
1959	11,357	327,166	191,942	1,175	67	531,707
1960	10,325	428,733	238,744	1,842,400	382,178	2,902,380
1961	8,899	656,911	195,858	2,299,887	224,508	3,386,063
1962	16,868	804,324	262,038	6,744,196	892,395	8,719,821
1963	13,259	458,460	339,892	5,296,925	942,985	7,051,521
1964	12,858	779,991	352,343	4,207,444	539,109	5,891,745
1965	16,492	945,020	168,111	2,461,274	201,406	3,792,303
1966	12,108	1,130,278	189,873	2,700,135	426,744	4,459,138
1967	13,497	565,708	247,239	2,626,916	274,454	3,727,814
1968	11,276	721,201	309,694	2,456,710	343,412	3,842,293
1969	17,424	1,020,513	94,304	4,829,427	321,221	6,282,889
1970	20,432	1,243,403	252,641	2,810,642	231,349	4,558,467
1971	20,142	741,945	327,697	7,312,730	579,552	8,982,066
1972	23,003	976,115	124,670	57,090	46,088	1,226,966
1973	22,638	473,044	199,019	2,065,844	740,017	3,500,562
1974	20,602	741,340	76,041	458,619	89,210	1,385,812
1975	22,325	546,634	84,109	4,453,041	101,286	5,207,395
1976	32,755	1,009,035	160,495	3,022,426	370,657	4,595,368
1977	22,864	943,943	179,417	4,536,459	573,166	6,255,849
1978	30,435	505,509	312,930	2,917,494	489,771	4,256,144[2]
1979	20,078	369,583	315,774	15,638,258	349,615	16,693,303[3]
1980[4]	8,735	230,193	331,837	14,219,566	477,699	15,268,030[5]
1981[4]	21,374	795,392	382,347	19,476,807	1,884,845	22,560,765[6]

1) Includes catches by all gear types from the General purse seine, Coghill, Unakwik, Eshamy, Copper River and Bering River districts. From Pirtle (1976) and Randall et al. (1982).
2) Includes 133,648 pinks from PWSAC hatchery harvests.
3) Includes 223,761 pinks from PWSAC hatchery harvests.
4) Preliminary.
5) Includes 346,828 pinks from PWSAC harvests.
6) Includes 707,037 pink, 118 chum and 1 sockeye salmon from PWSAC hatchery harvest.

Appendix 1-2. Alaska Statute 16.10.375-380.

Sec. 16.10.375.REGIONAL SALMON PLAN. The commissioner shall designate regions of the state for the purpose of salmon production and have developed and amend as necessary a comprehensive salmon plan for each region, including provisions for both public and private nonprofit hatchery systems. Subject to plan approval by the commissioner, comprehensive salmon plans shall be developed by regional planning teams consisting of department personnel and representatives of the appropriate qualified regional associations formed under §380 of this chapter. (§2 ch 161 SLA 1976; am§ch 154 SLA 1977)

Sec. 16.10.380. REGIONAL ASSOCIATIONS. (a) The commissioner shall assist in and encourage the formation of qualified regional associations for the purpose of enhancing salmon production. A regional association is qualified if the commissioner determines that:

(1) it is comprised of associations representative of commercial fishermen in the region;
(2) it includes representatives of other user groups interested in fisheries within the region who wish to belong;
(3) it possesses a board of directors which includes no less than one representative of each user group that belongs to the association.

(b) In this section "user group" includes but is not limited to, sport fishermen, processors, commercial fishermen, subsistence fishermen, and representatives of local communities. (§ch 161 SLA 1976)

Note: Section 1, ch 161, SLA 1976, provides: "It is the intent of this Act to produce salmon for the common property fisheries of the state."

Appendix 2-1. Exvessel value of Prince William Sound Region commercial salmon harvest, in thousands of dollars, 1960-81.[1]

Year	King	Sockeye	Coho	Pink	Chum	Total
1960	64	633	272	884	260	2,113
1961	55	965	235	1,099	151	2,505
1962	105	1,216	335	3,403	663	5,722
1963	68	616	449	2,095	759	3,987
1964	78	1,168	614	1,716	402	3,978
1965	97	1,494	194	775	119	2,679
1966	73	2,001	271	1,058	305	3,708
1967	68	993	378	1,729	266	3,434
1968	81	1,380	626	1,415	371	3,873
1969	134	1,931	202	2,610	453	5,330
1970	158	2,352	606	1,303	207	4,626
1971	174	1,571	660	4,166	530	7,101
1972	273	2,176	332	44	56	2,811
1973	353	2,396	667	3,009	2,537	8,962
1974[2]						
1975[2]						
1976[2]						
1977	897	6,865	1,328	7,138	2,059	18,287
1978	1,133	4,374	3,191	3,888	1,770	14,356
1979	838	3,612	3,147	21,856	1,671	31,124
1980	337	1,356	3,308	20,429	1,911	27,077
1981	918	7,501	3,726	38,189	8,003	58,337

1) From Pirtle (1976) and Randall et al. (1982).
2) No data available.

Appendix 2-2. Upper Copper River subsistence fishery data, 1960—1981.[1]

	Catch		Permits Issued			Catch by Species			
Year	Dip Net	Fishwheel	Dip Net	Fishwheel	Total	Sockeye	King	Coho	Other
1960	1,179	5,660	32	26	53	6,739	136	25	
1961	1,777	12,419	307	59	366	15,472	388	553	
1962	3,203	11,101	435	117	552	14,543	343	331	
1963	2,124	12,395	514	110	624	14,055	464	553	
1964	4,133	7,749	794	158	952	11,915	725	103	
1965	7,215	5,813	982	115	1,097	12,760	644	52	
1966	7,452	9,183	1,132	110	1,242	16,718	555		
1967	6,146	8,360	1,166	125	1,291	14,457	419		
1968	8,040	6,071	1,235	112	1,347	14,819	644	233	
1969	18,054	6,220	1,415	113	1,528	27,604	719	224	
1970	22,700	9,886	3,220	267	3,487	36,500	427	554	
1971[2]	28,115	9,370	4,168	374[2]	4,542	37,517	1,363	363	
1972[3]	18,996	7,854	3,485	205	3,690	26,850	1,501	243[3]	
1973[4]	16,407	10,943	3,840	305	4,145	27,350	1,856	51[4]	
1974[5]	15,143	7,657	3,305	288	3,593	22,800	1,141	163[5]	
1975	7,694	5,626	2,452	350	2,802	13,320	1,705		
1976	12,130	8,321	2,512	451	2,963	20,451	2,017	17	
1977	22,612	12,751	3,526	540	4,066	35,363	2,171	454	
1978	12,569	6,638	3,313	392	3,705	19,207	2,050	633	
1979	11,887	10,251	2,730	470	3,200	22,138	2,372	705	
1980	14,661	9,716	2,804	399	3,203	21,437	2,256	636	125
1981	28,872	26,924	3,555	523	4,078	53,008	1,913	849	26
Average Years						27,995 1970-1981	1,731 1970-1981	348 1970-1981	

1) From Randall et al. (1982).
2) Last use of Dip Net / Fishwheel Combination permits.
3) First issue of permits at Chitina.
4) Last year permits were denied fishermen who failed to return their previous year permits.
5) Issue of permits at Chitina and Glennallen only.

Appendix 2-3. Copper River Delta gill net salmon subsistence catch and effort, 1960-1981.[1]

	Permits Returned					Catch			
Year	Permits Issued	Unused	Unsuccessful	Successful	Total	King	Sockeye	Coho	Total
1960	13	No Record	No Record	Unknown	No Record			158	158
1961	14	No Record	No Record	Unknown	14	60	137	99	296
1962	14	No Record	No Record	Unknown	No Record	44	135	3	182
1963	8		2	6	8	3	13	157	173
1964	5	2			3	14			14
1965	31	5	2	13	20	12	459	85	556
1966	45	10	2	19	31	47	175		222
1967	61	19	9	28	56	83	153		236
1968	17	8	1	6	15	11	36		47
1969	49	13	7	13	33	16	63	85	164
1970	32	3	1	23	27	66	179		245
1971	29	9	12	5	26	10	32	4	46
1972	104	5		75	80	149	569	53	771
1973	94			89	89	153	326	180	659
1974	9	2	2	1	5	5	4	2	11
1975	2			2	2		5		5
1976	27			14	14	1	10		11
1977	23			22	22	10	71		81
1978	34	19		9	28	37	18	12	67
1979	49	20	4	17	41	45	26	17	88
1980	39	17	6	12	35	19	27	17	63
1981	72	21	4	26	51	48	145	104	297
Average years						38 1960-1981	117 1960-1981	44 1960-1981	

1) From Randall et al. (1982).

Appendix 2-4 Prince William Sound salmon subsistence catch and effort, 1960-1981[1].

	PERMITS		CATCH						
Year	Issued	Returned	King	Sockeye	Coho	Pink	Chum	Unknown[2]	Total
1960	50			139	505	1292	75	150	2,161
1961	12	1	41	123	732	3			900
1962	9				119	214	142		475
1963	9		3		406	298	24		731
1964	15			11		900			911
1965	22	16				179	25		204
1966	3	3		3	19	20	50		92
1967	4	3			4	4			8
1968	4	3			20	156		22	198
1969	7	3			16				16
1970	1	1							
1971	3	2				46			46
1972									
1973	19	16			289				289
1974	3	1							
1975	2								
1976									
1977	4	4							
1978	3	2							
1979	15	2							
1980	26	15		7	6				13
1981	12	8		3	29		2		34

1) From Randall et al. (1982). Does not include Copper and Bering River districts.
2) Catches not reported by species.

Appendix 2-5. Sport harvest of sockeye and king salmon, Upper Copper River Drainage, 1966-81.[1]

Year	Sockeye Salmon	King Salmon
1966	300	150
1967	400	150
1968	700	300
1969	1,500	500
1970	1,800	600
1971	4,000	600
1972	2,000	750
1973	4,000	850
1974	3,000	900
1975	200	750
1976	1,000	400
1977	3,662	532
1978	1,606	641
1979	1,599	2,948
1980	2,109	2,101
1981	1,523	1,717

1) Estimates provided by Fred Williams, ADF&G.

Appendix 2-6. Annual sport harvest of salmon in five selected areas of the Prince William Sound Region, 1977-1981.

Area	Year	Sport Harvest King	Sockeye	Coho[1]	Pink	Chum	Effort[2]
Gulkana River	1977	421	1,180				4,165
	1978	606	662				6,570
	1979	2,440	545				17,323
	1980	1,688	1,248				13,752
	1981	1,469	1,447				14,430
	Average	1325	1016	0	0	0	
Valdez Bay	1977	247	557	5,277	12,020	219	19,423
	1978	58	78	3,582	7,910	1,444	12,687
	1979	88	141	6,402	13,217	845	19,068
	1980	121	568	5,545	11,606	913	18,707
	1981	`76	367	4,018	11,686	572	18,716
	Average	118	342	4,965	11,288	799	
Passage Canal (Whittier)	1977[3]						
	1978[3]						
	1979	29		761	573		4,134
	1980	26		1,541	1,343		3,756
	1981			32	691		4,875
	Average	18	0	778	869	0	
Eyak River	1977		209	1,229			3,544
	1978		127	704			2,003
	1979		362	2,633			4,653
	1980		69	4,822			6,954
	1981		43	2,948			3,910
	Average	0	162	2,467	0	0	
Other Areas	1977	292	8,228	2,592	13,405	521	47,532
	1978	70	5,314	4,965	8,390	1,541	35,936
	1979	733	4,323	4,580	4,182	682	33,690
	1980	568	4,073	3,565	3,858	112	32,587
	1981	496	1,848	1,501	2,397	400	29,761
	Average	432	3,943	3,441	6,446	651	

1) Does not include land-locked coho salmon.
2) Angler-days spent fishing for all species, salmon and non-salmon.
3) Only minor effort and catches.

Appendix 2-7. Population census of the Prince William Sound Region, 1980.[1]

Glenn Highway		
	Eureka	11
	Tazlina	31
	Glennallen	511
	Gulkana	104
	Gakona	87
	Chistochina	55
	Slana	49
	Mentasta Lake	59
Richardson Highway		
	Valdez	3,694[2]
	Ptarmigan	2
	Tonsina	135
	Copper Center	213
	Sourdough	11
	Paxson	30
Edgerton Highway		
	Chitina	42
	Lower Tonsina	40
McCarthy Road		
	McCarthy	22
Non-highway[4]		
	Cordova	2,241[3]
	Eyak	47
	Whittier	198
	Tatitlek	68
	Total	7,650

1) Except where otherwise noted, data based on U.S. Government census. Data provided by Linda Leask, University of Alaska, Institute of Social and Economic Research.
2) State census data.
3) City census data.
4) No estimates are available for other locations.

Appendix 2-8. Projected population growth estimates for the Prince William Sound Region and selected census areas of Southcentral Alaska, 1980-2002.[1]

Location	Year 1980	Year 2002	% increase
Prince William Sound Region	7,650	10,940	43%
Anchorage	179,047	247,196	38%
Fairbanks	52,145	68,044	30%
S.E. Fairbanks	5,501	6,557	19%
Matanuska/Susitna	17,249	23,063	34%
Kenai/Cook Inlet	21,148	30,394	44%
Seward	3,235	5,341	65%
Total	285,975	391,535	37%

1) Data provided by Gunnar Knapp, University of Alaska, Institute of Social and Economic Research.

Appendix 2-9. Pink and chum salmon production data, Cannery Creek Hatchery, 1978-1982[1].

Brood Year	Species	Stock	Green Egg Take	Fry Released	Estimated Total Adult Return	Estimated Fishery Harvest	Marine Survival %
1978	Pink	Cannery Cr.	4,038,974[2]	2,825,634	90,348	53,348	3.2[3]
	Chum	Wells R.	667,020[2]	21,045			
1979	Pink	Cannery Cr.	1,189,468	999,261	84,651	71,840[3]	8.5[3]
	Pink	Jonah Cr.	2,369,990	1,695,412[4]	56,677[5]		3.4[3]
	Chum	Siwash Cr.	613,299	469,124			
1980	Pink	Cannery Cr.	17,299,478	14,388,752	760,389	688,814	5.3
	Pink	Port San Juan	6,925,210[6]	6,950,000[4]	4,200[8]		
	Chum	Siwash Cr.	673,116	484,954			
	Chum	Eaglek R.	2,067,115	1,963,657			
1981	Pink	Cannery Cr.	14,544,078	13,932,987			
	Pink	Port San Juan	35,288,000[6]	33,000,000[7]			
	Chum	Siwash Cr.	953,376	866,981			

1) Data provided by Tim McDaniel, ADF&G.
2) Incubated at Port San Juan Hatchery.
3) Estimated by mark-recovery method.
4) Fry transported to and released at Hobo Creek, Port Wells.
5) Estimated 49,660 adults returned to Port San Juan and 7,017 returned to Hobo Creek.
6) Eyed eggs from Port San Juan Hatchery.
7) Fry transported to and released at Main Bay to develop brood stock for Main Bay Hatchery.
8) Adults returned to Hobo Creek.

Appendix 2-10. Sockeye salmon production data for the Gulkana Incubation Facility, 1973-82.

Year	Eggs Taken	Fry Produced	Survival Rate (%)
1973—74	225,800	179,311	79.4
1974—75	1,266,552	886,556	70.0
1975—76	1,276,570	727,607	57.0
1976—77	1,288,142	627,387	48.7
1977—78	1,361,149	581,227	42.7
1978—79	1,320,472	1,040,563	78.8
1979—80	3,563,568	2,446,056	68.6
1980—81	6,228,897	5,249,173	84.2
1981—82	9,166,596	8,033,000	87.6
		Unweighted Average	68.6

Appendix 2-11 Pink and chum salmon production data for the Port San Juan Hatchery, 1975-1982.

Brood Year	Species	Eggs taken	Eyed eggs incubated at PSJ	Fed fry released at PSJ	Unfed fry released at PSJ	Total Fry Released at PSJ	Estimated Total Adult Return	Estimated Common Property Harvest	Brood Stock[3]	Sales Fish	Marine Survival%
1975	Pink	6,254,460[1]	no estimate		1,000,000	1,000,000	44,000	4,000	40,000		4.4
1976	Pink	15,017,934[2]	11,351,110	1,304,332	9,706,245	11,010,577	154,620	0	40,432	114,188	1.4
	Chum	17,112[4]	no estimate	10,000		10,000	no estimate				
1977	Pink	23,424,000[5]	17,788,000	1,859,629	15,081,149	16,940,778	553,000	275,000	54,207	223,748	3.3
	Chum	1,445,700[6]	1,356,000	1,014,000		1,014,000	20,000	12,000	2,037	7,669	2.0
1978	Pink	28,645,626[7]	25,180,220	4,684,590	18,090,140	22,774,730	1,485,500	1,038,700	100,026	346,729	6.5
	Chum	441,192[6]	256,000	247,548		247,548	1,000[8]	600[8]		416	0.4[8]
1979	Pink	28,401,415[7]	22,749,500	21,576,000	65,757	21,641,757	2,264,700	1,358,900	198,721	707,037	10.5
	Chum	570,556[6]	407,800	395,000		395,000					
1980	Pink	94,689,000[7]	82,036,000[9]	69,662,000	124,000[10]	69,786,000					
	Chum	3,605,000[11]	943,000	745,668		745,668					
1981	Pink	143,500,000[7]	100,633,000[12]	70,495,000	4,000,000	74,495,000					
	Chum	8,593,000[11]	8,180,000	7,294,000	322,000	7,616,000					

1) From stream 603 in Ewan Bay.
2) From Millard Creek, Duck River and Larsen Creek.
3) Includes fish allowed to spawn in Larsen Creek and mortalities.
4) From Duck River.
5) From streams in Crab Bay, Hardins Bay, Port Ashton, and Port San Juan.
6) From streams 84, 85 and 87A in Port Fidalgo.
7) From Larsen Creek at Port San Juan.
8) These data only pertain to the return of 3 year old fish in 1981. The majority of chum salmon in Prince William Sound return as 4 year old fish.
9) 6,925,210 eyed eggs transported to the Cannery Creek Hatchery.
10) 2,752,000 fry released at Main Bay.
11) From stocks in stream 83 and 87 and Larsen Creek.
12) 35,288,000 eyed eggs transported to the Cannery Creek Hatchery.

Appendix 2-12 Pink and chum salmon production data for the Crooked Creek Hatchery, 1981-1982.

Species	Brood Year	Donor Source	Number Eggs	Number Released (Date)	Returns to Hatchery (Date)	Estimated C.P.[1] Harvest
Pinks (Sci/Ed)	1980	Crooked Creek	25,000	22,000 (1981)	---- (1982)	---- (1982)
(PNP)	1981	Siwash Creek	9,976,000	8,500,000 (1982)	---- (1983)	---- (1983)
	1982					
Chums (Sci/Ed)	1979	Crooked Creek	342,000	330,000 (1980)	---- (1980)	---- (1982)
					---- (1983)	---- (1984)
					---- (1984)	---- (1984)
	1980	Crooked Creek	363,000	318,000 (1981)		
	1981	Crooked Creek	188,000	160,000 (1982)		
(PNP)		Crooked Creek	506,000	430,000 (1982)		

1) Common property harvest.

Appendix 2-13 Pink salmon production data for the Perry Island Hatchery, 1976-1982

Species	Brood Year	Donor Source	No. Eggs Transplanted (Date)	No. Fry Released (Date)	Returns to Hatchery	Est. C.P.[11] Harvest
Pink	1976	Lambert Lagoon	78,000[1]	33,000[2] (1977)	4,000[3] (1978)	N.E.[4]
	1977	—[5]				
	1978	Lambert Lagoon	208,000[6]	150,000[7] (1979)	5,000[8] (1980)	N.E
	1979 (1980)	Mink Cr. (1981)	686,000	250,000	200	N.E.
	1980	Hatchery Cr. & Lambert Lagoon	307,000[9]	149,000[10] (1981)	(1982)	
	1981	Hatchery Cr.	2,250	(1982)	(1983)	

1) Approximately 46,000 green eggs planted in upstream barren areas; remainder incubated.
2) 10,000 fry emigrated from incubator —an assumed 50% emergence from egg plant.
3) Combined return from wild fish reproduction and hatchery operations — cannot be distinguished: over 20 fish entered the hatchery stream which has no natural run.
4) No estimate.
5) No odd-year pink salmon are present naturally in South Bay, Perry Island.
6) About 47,000 planted in upstream barren areas as eyed eggs.
7) 115,000 released from incubator and an estimated 35,000 downstream migrants from egg plant.
8) Combined return from wild fish reproduction and hatchery operations — cannot be distinguished; over 500 fish entered the hatchery stream which has no natural run.
9) 73,000 eyed eggs were planted in upstream barren area.
10) 113,000 released after short-term rearing — estimated 36,000 from eyed egg plant.
11) Common property harvest.

Appendix 3-1 Escapement goals and average escapement estimates for pink salmon, Prince William Sound Region, 1960-81.[1]

District / System	Escapement Goals[2]	Average Escapement[2]
Eastern	403,760—484,500	451,962
Northern	140,000—168,000	151,735
Northwestern and Coghill	262,500—315,000	332,278
Southwestern and Eshamy	112,500—135,000	126,346
Montague	106,250—127,500	142,837
Southeastern	225,000—270,000	297,557
Total	1,250,000—1,500,000	1,503,930

1) From Randall et at. (1982).
2) Index area escapement counts.

Appendix 3-2 Escapement goals and average escapement estimates for chum salmon, Prince William Sound Region, 1960-81.[1]

District / System	Escapement Goals[2]	Average Escapement[2]
Eastern	87,200—109,000	101,026
Northern	29,400—36,750	47,560
Northwestern and Coghill	48,600—60,750	48,811
Southwestern and Eshamy	3,400—4,250	2,575
Montague	11,400—14,250	10,668
Southeastern	20,000—25,000	20,138
Total	200,000—250,000	224,778

1) From Randall et al. (1982).
2) Index area escapment counts.

Appendix 3-3 Escapement goals and average escapement estimates for sockeye salmon, Prince William Sound Region.[1]

District / System	Escapement Goals[2]	Average Escapement
Copper River (main)	250,000—350,000	315,300[2]
Copper River Delta	80,000—90,000[3]	53,215[4]
Bering River	30,000—40,000[3]	30,500[5]
Eshamy	20,000—30,000[3]	16,441[6]
Coghill	40,000—60,000[3]	60,548[7]
Total	420,000—570,000	467,004

1) From Randall et al. (1982).
2) Based on sonar counts, 1978-1981.
3) Randall (personal communication).
4) Peak index counts, 1970-1981.
5) Peak index counts, 1974-1981.
6) Weir count, 1972-1981.
7) Weir count, 1974-1981.

Appendix 3-4. **Commercial purse seine catches of natural stocks by species, Prince William Sound Region, 1960-1981.[1] [2]**

Year	King	Sockeye	Coho	Pink	Chum
1960	1,584	35,176	30,722	1,841,896	381,858
1961	406	478	9,651	2,174,873	199,071
1962	1,830	16,765	27,998	6,663,730	847,154
1963	2,293	43,339	48,641	5,292,689	937,635
1964	65	38,110	30,967	4,201,106	534,553
1965	880	34,565	45,176	2,263,829	151,896
1966	620	29,552	23,157	2,610,535	402,667
1967	3,569	8,900	40,522	2,391,041	224,051
1968	1,458	45,696	11,579	2,337,992	296,863
1969	3,263	88,919	12,534	4,779,683	280,706
1970	1,031	50,676	10,848	2,692,074	211,064
1971	3,478	41,346	30,497	7,227,763	519,599
1972[3]	396	0	192	2	0
1973	2,224	25,079	1,013	1,973,930	633,891
1974[4]	1,260	4,273	570	54,272	7,720
1975	1,789	34,827	5,783	4,353,229	67,971
1976	970	50,054	6,099	2,963,028	280,977
1977	497	121,299	1,011	4,088,187	432,431
1978	390	19,068	1,431	2,728,464	383,871
1979	798	65,037	4,997	14,878,407	269,209
1980	88	153,278	2,429	12,409,899	410,696
1981	260	147,897	1,998	16,770,596	1,737,153
Average Years	1,325 1960-81	47,924 1960-81	15,810 1960-81	4,758,965 1960-81	447,504 1974-81

1) From Randall et al. (1982) and Pirtle (1976).
2) Includes relatively minor troll catches (1960-76) but does not include Port San Juan sales fish or estimates of hatchery fish intercepted by commercial fishermen.
3) Purse seine fishery closed in all districts.
4) Purse seine fishery restricted to Coghill District.

Appendix 3-5. Pink salmon runs, Prince William Sound districts, 1960-1981.[1]

	Escapements								
			Northwestern	Southwestern				Commercial	
Year	Eastern	Northern	Coghill	Eshamy	Montague	S. eastern	Total	Catch	Total Run
1960	475,073	133,653	203,575	155,788	214,987	167,747	1,350,823	1,841,896	3,192,719
61	706,790	123,900	448,180	133,990	289,290	496,830	2,198,980	2,298,218	4,497,198
62	650,300	253,490	417,190	107,950	317,360	271,720	2,018,010	6,742,316	8,760,326
63	378,050	77,760	354,230	49,760	78,750	417,190	1,355,740	5,295,378	6,651,118
64	485,470	349,010	353,030	172,800	121,220	360,150	1,841,680	4,206,896	6,048,576
1965	258,680	54,970	187,760	62,720	77,000	255,930	897,060	2,460,471	3,357,531
66	489,800	255,710	200,940	110,980	42,050	201,150	1,300,630	2,699,418	4,000,048
67	321,520	167,300	544,080	109,750	23,800	300,270	1,466,720	2,626,340	4,093,060
68	360,300	136,630	201,790	165,510	44,100	183,440	1,091,770	2,452,168	3,543,938
69	328,960	147,880	264,750	132,510	63,470	218,060	1,155,630	4,828,579	5,984,208
1970	328,730	109,240	170,130	69,260	73,190	139,640	944,190	2,809,996	3,754,186
71	529,820	161,540	614,530	104,080	337,540	373,900	2,121,410	7,310,964	9,432,374
72	317,450	91,610	66,270	27,680	28,860	75,550	607,420	54,783	662,203
73	264,850	44,840	563,510	66,030	106,340	184,340	1,229,910	2,056,878	3,206,798
74	229,370	186,130	200,520	141,750	11,800	89,170	858,740	448,773	1,307,513
1975	570,830	44,270	580,170	77,860	110,950	234,210	1,618,290	4,452,805	6,071,095
76	446,470	123,380	116,730	51,200	12,260	115,560	865,600	3,018,991	3,884,591
77	465,970	62,150	426,670	226,060	196,970	315,510	1,693,330	4,513,082	6,206,412
78	268,940	159,870	200,950	220,610	48,680	156,830	1,055,610	2,913,721[2]	3,969,331
79	782,420	223,580	241,120	264,710	323,490	1,091,970	2,927,290	15,630,068[2]	18,557,358
1980	515,380	171,410	338,100	134,860	114,170	302,190	1,576,110	14,215,694[2]	15,791,804
81	768,000	259,850	588,880	193,750	506,140	594,890	2,911,510	19,442,859[2 3]	22,354,369
Average	451,962	151,735	332,278	126,346	142,837	297,557	1,503,930	5,105,468	6,609,398

1) Adapted from Randall et al. (1982).
2) Does not include hatchery sales.
3) Preliminary.

Appendix 3-6 Chum salmon runs, Prince William Sound districts, 1960-1981.[1]

	Escapements								
			Northwestern	Southwestern				Commercial	
Year	Eastern	Northern	Coghill	Eshamy	Montague	S. eastern	Total	Catch	Total Run
1960	92,100	24,729	40,458	4,800	16,782	23,008	201,877	381,858	583,735
61	117,950	50,420	70,940	4,750	34,380	59,910	338,350	224,401	562,751
62	238,660	67,670	96,020	10,610	34,190	39,690	486,840	891,880	1,378,720
63	148,090	68,390	114,250	5,330	15,070	20,030	371,160	942,900	1,314,060
64	176,840	64,750	136,590	3,560	31,650	29,160	442,550	539,047	981,597
1965	69,180	20,980	39,690	1,840	17,500	46,480	195,670	201,043	396,713
66	85,480	39,440	42,150	3,420	32,720	20,160	223,370	426,628	649,998
67	97,420	50,930	15,290	2,360	11,060	10,700	187,760	274,234	461,994
68	99,350	31,530	37,310	5,100	1,590	21,400	196,280	342,939	539,219
69	81,140	9,770	43,390	2,170	1,710	26,310	164,490	320,977	485,467
1970	58,180	6,100	22,000	770	3,370	11,910	102,330	230,661	332,991
71	79,930	16,190	34,570	1,210	25,620	9,260	166,780	574,265	741,045
72	134,780	79,030	50,520	2,850	5,190	29,310	301,680	45,370	347,050
73	267,210	143,420	89,790	1,130	2,930	42,110	546,590	729,839	1,276,429
74	92,840	53,830	45,010	200	90	2,910	194,880	88,544	283,424
1975	28,220	7,820	7,410	580		2,760	46,790	100,479	147,269
76	17,870	26,520	38,460	90		950	83,890	370,478	454,368
77	53,200	36,360	41,640	4,480	560	8,370	144,610	572,610	717,220
78	102,290	25,410	27,650	500		6,030	161,380[3]	485,147	646,527
79	57,450	17,040	18,660	80		4,450	97,680	326,414	424,094
1980	32,160	34,250	14,460	40	280	6,230	87,420	477,664[2]	565,084
81	92,240	39,740	47,590	770	0	21,890	202,230	1,874,484[3]	2,076,714[3]
Average	101,026	41,560	48,811	2,575	10,668	20,138	224,778	473,721	698,499

1) Adapted from Randall et al. (1982).
2) Does not include hatchery sales.
3) Preliminary.

Appendix 3-7. Commercial drift gill net catches of king salmon, by district, Prince William Sound Region, 1960-1981.[1]

	District					
Year	Copper River	Bering River	Coghill	Unakwik	Eshamy	Total
1960	8,678	63	—[2]	—[2]	—[4]	8,741
1961	7,621	872		—[2]	—[5]	8,493
1962	14,792	246				15,038
1963	10,871	95			—[4]	10,966
1964	12,751	36	6[3]	—[3]	—[4]	12,793
1965	15,390	3	219[3]	—[3]	[5]	15,612
1966	11,422	36	30[3]	—[3]	—[5]	11,488
1967	9,853	20	55[3]	—[3]	—[4]	9,928
1968	9,743	10	65[3]	—[3]	—[4]	9,818
1969	14,040	44	61[3]	—[3]	3	14,148
1970	19,375	26	0[3]	—[3]	—[5]	19,401
1971	16,486	105	73		—[4]	16,664
1972	22,349	107	67	2	49	22,574
1973	19,948	285	144	1	41	20,419
1974	18,980	32	156	5	18	19,191
1975	19,644	162	525	4	—[4]	20,335
1976	31,483	228	102	4	—[4]	31,817
1977	22,089	127	124	3	22	22,365
1978	29,062	331	469	24	—[4]	29,886
1979	17,678	385	543	11	—[4]	18,617
1980	8,449		196			8,645
1981	20,782	204	148		—[4]	21,134
Average Years	16,431 1960-81	155 1960-81	231 1971-81	5 1971-81	10 1967-81	16,832

1) From Randall et al. (1982).

2) Coghill District created and first opened in 1961. Unakwik District created and first opened in 1962.

3) Coghill and Unakwik data combined until 1971.

4) Fishery closed.

5) Drift and set net data were combined; therefore, these data are not presented.

Appendix 3-8. Commercial drift gill net catches of sockeye salmon, by district, Prince William Sound Region, 1960-1981.[1]

Year	District: Copper River	Bering River	Coghill	Unakwik	Eshamy	Total
1960	360,667	32,890	—[2]	—[2]	—[4]	393,557
1961	528,223	60,116	12,961	—[2]	—[5]	601,300
1962	77,626	72,230	13,846[3]	—[3]	—[5]	769,428
1963	375,029	23,127	16,965[3]	—[3]	—[4]	415,121
1964	699,548	13,469	28,864[3]	—[3]	—[4]	741,881
1965	818,277	10,651	66,071[3]	—[3]	—[5]	898,708
1966	1,005,615	24,949	49,336[3]	—[3]	—[5]	1,084,898
1967	508,327	11,866	36,615[3]	—[3]	—[4]	556,808
1968	573,261	26,136	76,108[3]	—[3]	—[4]	675,505
1969	696,836	38,093	134,986[3]	—[3]	4,984	874,809
1970	1,115,695	23,539	36,273[3]	—[3]	1,911	1,177,418
1971	616,801	36,776	45,514	1,508	—[4]	700,599
1972	727,144	51,445	134,628	10,010	15,117	938,344
1973	332,816	15,426	74,426	8,858	7,470	441,852
1974	607,766	4,208	95,610	10,449	12,640	734,946
1975	335,384	21,637	142,864	11,922	—[4]	513,792
1976	865,354	30,908	54,334	8,421	—[4]	965,183
1977	619,140	14,445	154,342	7,912	16,916	829,191
1978	249,872	33,554	193,899	9,116	—[4]	496,332
1979	80,528[6]	139,015	75,753	9,250	—[4]	307,647
1980	18,451[6]	0[6]	54,679	1,124	661	78,043
1981	486,982	55,973	102,094	2,445	—[4]	649,240
Average Years	610,018 1960-78, 81	35,260 1960-79,81	102,558 1971-81	7,365 1971-81	3,980 1967-81	759,181

1) From Randall et al. (1982).
2) Coghill District created and first opened in 1961. Unakwik District created and first opened in 1962.
3) Coghill and Unakwik data combined until 1971.
4) Fishery closed.
5) Drift and set gill net data combined; therefore, this data was not presented.
6) Excluded in calculation of average due to unusual closures.

Appendix 3-9. Commercial drift gill net catches of coho salmon, by district, Prince William Sound Region,1960-1981.[1]

Year	District					Total
	Copper River	Bering River	Coghill	Unakwik	Eshamy	
1960	137,957	70,065	—[2]	—[2]	—[4]	208,022
1961	133,987	50,883	13	—[2]	—[5]	184,883
1962	174,628	55,502	15[3]	—[2]	—[5]	233,093
1963	202,621	88,610	20[3]	—[3]	—[5]	291,251
1964	242,666	78,708	2[3]	—[3]	—[4]	321,376
1965	70,786	52,114	18[3]	—[3]	—[5]	122,953
1966	116,147	49,818	6[3]	—[3]	—[5]	166,344
1967	160,532	46,138	45[3]	—[3]	—[4]	206,715
1968	230,867	67,134	114[3]	—[3]	—[4]	298,115
1969	77,405	4,033	121		29	81,588
1970	161,892	79,264	62[3]	—[3]	60	1,278
1971	208,915	88,231	54		—[4]	297,200
1972	103,211	19,825	296		626	123,958
1973	132,272	65,348	237		71	197,928
1974	46,625	28,615	103	3	114	75,460
1975	53,805	24,162	357		—[4]	78,324
1976	111,900	42,423	72		—[4]	154,395
1977	131,356	47,218	49	2	49	178,674
1978	220,338	91,097	64		—[4]	311,499
1979	194,885	114,046	1,837	9	—[4]	310,777
1980	219,779	108,535	1,028	3	25	329,370
1981	303,801	76,161	387		—[4]	380,349
Average	156,198	61,270	407	2	65	217,942
Years	1960-81	1960-81	1971-81	1971-81	1967-81	

1) From Randall et al. (1982).
2) Coghill District created and first opened in 1961. Unakwik District created and first opened in 1962.
3) Coghill and Unakwik data combined until 1971.
4) Fishery closed.
5) Drift and set gill net data were combined; therefore, these data are not presented.

Appendix 3-10. Commercial drift gill net catches of pink salmon by district, Prince William Sound Region, 1960-1981[1]

Year	District: Copper River	Bering River	Coghill	Unakwik	Eshamy	Total
1960	375	126	—[2]	—[2]	—[4]	501
1961	1,639	30	10,019	—[2]	—[5]	11,688
1962	1,880		2,241[3]	—[3]	—[5]	4,121
1963	1,487	60	2,689[3]	—[3]	—[4]	4,236
1964	548		5,790[3]	—[3]	—[4]	6,338
1965	803		196,092[3]	—[3]	—[5]	197,170
1966	717		52,299[3]	—[3]	—[5]	71,310
1967	573	3	35,299[3]	—[3]	[4]	235,875
1968	4,343	199	114,176[3]	—[3]	[4]	118,718
1969	847	1	23,436[3]	—[3]	3,327	27,610
1970	645	1	73,596[3]	—[3]	5,689	79,931
1971	1,762	4	68,883	14,318	—[4]	84,967
1972	2,304	3	5,961	3,445	20,362	32,075
1973	8,964	2	61,328	119	11,777	151,108
1974	9,839	7	98,149	10,911	217,141	390,315
1975	236		99,492	84	—[4]	244,967
1976	3,392	43	53,219	2,744	—[4]	124,891
1977	23,185	192	332,859	257	63,036	649,744
1978	3,512	266	49,527	2,082	—[4]	123,561
1979	1,295	6,895	259,372	2,359	—[4]	308,481
1980	3,872		357,967	3,621	2,960	525,768
1981	23,772	10,176	529,998	4,488	—[4]	587,740
Average Years	8,037 1972-81	8,536 1979-81	174,250 1971-81	4,039 1971-81	21,619 1967-81	216,481

1) From Randall et al. (1982).
2) Coghill District created and first opened in 1961. Unakwik District created and first opened in 1962.
3) Coghill and Unakwik data combined until 1971.
4) Fishery closed.
5) Drift and set gill net data were combined; therefore, these data are not presented.

Appendix 3-11. Commercial drift gill net catches of chum salmon, by district, Prince William Sound Region, 1960-1981.[1]

Year	District					
	Copper River	Bering River	Coghill	Unakwik	Eshamy	Total
1960	314	6	—[2]	—[2]	—[4]	320
1961	106	1	2,412	—[2]	—[5]	2,517
1962	513	2	4,817[3]	—[3]	—[5]	5,332
1963	85		5,265[3]	—[4]	—[5]	5,350
1964	62		4,494[3]	—[3]	—[4]	4,556
1965	331	32	48,498[3]	—[3]	—[5]	48,861
1966	115	1	16,065[3]	—[3]	—[5]	16,818
1967	218	2	50,183[3]	—[3]	—[5]	50,403
1968	473		46,076[3]	—[3]	—[4]	46,549
1969	244		32,135[3]	—[3]	1,016	33,395
1970	687	1	13,966[3]	—[3]	949	15,603
1971	5,287		52,829	1,837	—[4]	59,953
1972	717	1	18,503	859	15,663	35,743
1973	10,173	5	68,311	91	16,632	95,212
1974	664	2	51,428	500	23,488	76,082
1975	807		32,438	70	—[4]	33,315
1976	178	1	89,140	331	—[4]	89,650
1977	335	221	127,476	141	8,344	136,517
1978	2,233	2,391	100,679	597	—[4]	105,900
1979	107	23,094	56,916	289	—[4]	80,406
1980	34	1	66,221	483	130	66,869
1981	1,752	8,491	135,962	1,369	—[4]	147,574
Average Years	2,026 1971-81	11,325 1978,79,81	72,718 1971-81	597 1971-81	4,415 1967-81	91,081

1) From Randall et al. (1982).
2) Coghill District created and first opened in 1961. Unakwik District created and first opened in 1962.
3) Coghill and Unakwik data combined until 1971.
4) Fishery closed.
5) Drift and set gill net data were combined; therefore, these data are not presented.

Appendix 3-12. Commercial set gill net catches, by species, Eshamy District, Prince William Sound Region, 1967-1981.[1]

Year	King	Sockeye	Coho	Pink	Chum	Total
1967	Closed					
1968	Closed					
1969	13	56,785	182	22,133	7,120	
1970		15,309	515	38,637	4,682	59,143
1971	Closed					
1972	33	37,771	520	25,013	10,345	73,682
1973	28	8,969	78	9,724	10,914	29,713
1974	4	6,394	11	68,300	5,408	80,117
1975	Closed					
1976	Closed					
1977	9	9,889	2	24,743	4,218	38,861
1978	Closed					
1979	Closed					
1980		2,000	38	2,371	134	4,543
1981	Closed					
Average	6	8,543	90	12,728	2,855	

1) From Randall et al. (1982).

Appendix 3-13 Estimated annual fish production attributed to existing fish pass and stream improvement projects by 2002.

Stream or Number	Name	Project Type	Year Completed	Species	New Habitat	Additional Harvestable Adults
52	Control Creek	Fish pass	1974	Pink	2 acres	12,200[1]
218	Billy's Hole	Rock removal	1981	Sockeye	84 acres	4,200[2]
300	Red Creek	Fish pass	1978	Sockeye	53 acres	2,600[2]
413a-414	Harrison Lagoon Creek	Log/Gabion Diversion	1972-3	Pink Chum	30,000 sq ft 30,000 sq ft	4,200[1] 3,000[3]
417	Hobo Creek	Fish pass	1978	Pink	264,000 sq ft	37,000[1]
455	Paulson Creek	Fish pass Wood gate	1981	Pink	66,000 sq ft	9,200[1]
476	Shrode Creek	Fish pass and weir	1962-72	Pink Sockeye	228,000 237 acres	32,000[1] 12,000[2]
687	Sockeye Creek	Fish pass	1982	Sockeye Coho	55 acres	2,800[2] 300[4]
688	Otter Creek	Fish pass	1982	Pink	7380 sq ft	1,000[1]
815	Constantine Creek	Defector Dam & Channel	1967-71	Pink Chum	2 acres 2 acres	12,200[1] 9,000[3]
841-1	Boswell Bay	Fish pass	1981	Sockeye	83 acres	4,200[2]
847	Hawkins Creek	Stream grading	1969	Pink	2 acres	12,200[1]
852	Forest Service Trail Creek	Fish pass	1980	Coho Pink	83 acres 4000 sq ft	800[5] 600[1]

1) Based on 0.14 harvestable adults produced per sq ft spawning area (USFS FY 84 budget document).
2) Based on 50 harvestable adults produced per acre of lake (USFS FY 84 budget document).
3) Based on 0.10 harvestable adults produced per sq ft spawning area (USFS FY 84 budget document).
4) Based on 5 harvestable adults produced per acre of lake. (Ken Holbrook, USFS)
5) Based on 10 harvestable adults produced per acre of lake. (Ken Holbrook, USFS)

Appendix 3-14. Summary of estimated annual fish production from completed fish pass and stream improvement projects, by species, district and gear type by 2002.

District	Stream / Lake Number	Pink	Chum	Sockeye	Coho
Eastern	52	12,200			
Northern	218			4,200	
Coghill	300			2,600	
Northwestern	413a-414	4,200	3,000		
	417	37,000			
	455	9,200			
	476	32,000		12,000	
Southwestern	687			2,800	300
	688	1,000			
Southeastern	815	12,200	9,000		
	841-1			4,200	
	847	12,200			
	852	600			800
Total		120,600	12,000	25,800	1,100
Probable drift gill net Catch[1]				5,500	
Probable seine catch[2]		120,600	12,000	20,300	1,100

1) 50% of production from stream 300 and 100% of production from stream 841-1.
2) 50% of production from stream 300 and 100% of production from remaining projects except stream 841-1.

Appendix 3-15 Current design capacity and projected adult returns of existing hatcheries, Prince William Sound Region, 1982.[1]

			Projected Adult Returns					
Facility	Species	Green Eggs[2]	Fry	Smolt	Total	Common Property Fishery[3]	Brood Stock	Hatchery Sales Fish
Port San Juan	Pink	116,000,000	100,000,000[4]		5,200,000[5]	3,694,000[6]	139,000[7]	1,367,000
	Chum	12,000,000	10,000,000[4]		200,000[8]	128,000[6]	10,000[7]	62,000
Cannery Creek	Pink	80,000,000	68,800,000[4]		482,000[4]	382,000[9]	100,000[10]	0
Main Bay	Chum	95,000,000	69,000,000[4]		808,000[4]	722,000[9]	86,000[10]	0
Solomon Gulch	Pink	50,000,000	38,500,000[11]		1,155,000[12]	808,000[13]	56,000[14]	291,000
	Chum	18,000,000	13,800,000[11]		276,000[15]	193,000[13]	13,000[14]	70,000
	Coho	1,000,000		600,000[16]	30,000[17]	15,000[13]	700[14]	14,300
Perry Island	Pink	300,000[18]	260,000[4]		1,800[4]	1,200[6]	400[4]	200
Fort	Coho	160,000		100,000[4]	5,000[17]	5,000[19]	0	0
Richardson	King	160,000		100,000[4]	3,000[47]	3,000[19]	0	0
Gulkana	Sockeye	10,300,000	7,500,000[20]		52,000[4]	45,900[19]	6,100[21]	0

1) At full utilization of existing facilities and with donor stock fully developed.
2) Freshly fertilized eggs.
3) Including commercial, sport and subsistence fisheries.
4) According to FRED Directive No. 3 (Appendix 3-16).
5) Assuming marine survival of 5.2 percent. This is the unweighted average survival rate for pink salmon fry released at Port San Juan, brood years 1975 through 1980 (Appendix 2-11).
6) Assuming a fisheries exploitation rate of 68 percent for pink salmon and 64 percent for chum salmon. These data are the unweighted average eploitation rates for the the Prince William Sound districts, 1960-1981. These estimates are maximum estimates.
7) Assuming an average fecundity of 1,675 eggs for pink salmon and 2,576 eggs for chum salmon (PWSAC Draft Annual Report, 1981). It is also assumed that 50 percent of the fish are females.
8) Assuming a marine survival rate of 2 percent (Brian Allee, PWSAC).
9) Assuming that all fish surplus to brood stock needs will be harvested by commercial users.
10) Assuming 50 percent of brood fish are females and an average fecundity of 1,600 eggs for pink salmon, 2,200 eggs for chum salmon, 2,800 eggs for coho salmon, 6,500 eggs for king salmon, and 3,000 eggs for sockeye salmon (FRED Directive No. 3).
11) Assuming a green egg to fry survival of 77 percent (Paul McCollum, VFDA).
12) Assuming a marine survival of 3 percent (Paul McCollum, VFDA).
13) Assuming a fisheries exploitation rate of 70 percent for pink and chum salmon and 50 percent for coho salmon (Jason Wells, VFDA).
14) Assuming an average fecundity of 1,800 eggs for pink salmon, 2,800 eggs for chum salmon, and 3,000 eggs for coho salmon (J. Wells, VFDA). It is also assumed that 50 percent of the fish are females.
15) Assuming a marine survival of 2 percent (Paul McCollum, VFDA).
16) Assuming a green egg to smolt survival of 60 percent (Paul McCollum, VFDA).
17) Assuming a marine survival of 5 percent (Dave Watsjold,ADF&G).
18) Current capacity.
19) Assuming that all fish surplus to brood stock needs will be harvested by commercial, sport and/or subsistence users.
20) Assuming a 73 percent survival from green egg to emergent fry. This is based on the unweighted survival of brood years 1973-1975 and 1978-1980 (Appendix 2-10).
21) Assuming an average fecundity of 3,400 eggs and 50 percent of the fish females (Ken Roberson, ADF&G).

Appendix 3-16. FRED Directive No. 3, July 9, 1979.

PROCEDURE:

For your guidance in planning, budgeting and evaluating, these values are to be used.

In the hatchery

Green Egg	to	Eyed Egg	90%
Eyed Egg	to	Emergent Fry	95%
Emergent Fry	to	Fed Fry*	95%
Fed Fry	to	Fingerling**	95%
Fingerling	to	Smolt (10 gram)	80%
Smolt (10 gram)	to	Post Smolt	90%
Green Egg	to	Smolt	62%

In lake or stream

Hatchery Produced

Eyed Egg (Plant)	to	Emergent Fry	50%
Emergent Fry (King, Coho, Sockeye)	to	Smolt	7%
Fed Fry	to	Smolt	10%
Fingerling (King, Coho, Sockeye)	to	Smolt	20%
Smolt (Coho, Sockeye)	to	Adult	10%
Smolt (King)	to	Adult	3%

Lake or Stream Produced***

Emergent Fry (Pink, Chum)	to	Adult	1%
Emergent Fry (King, Coho, Sockeye)	to	Smolt	10%

Hatchery Produced Fish Planted Near or in Tidewater

Emergent Fry (Pink, Chum)	to	Adult	0.7%
Fed Fry (Pink, Chum)	to	Adult	1%
Fingerling (Pink, Chum)	to	Adult	2%
Smolt (Coho, Sockeye)	to	Adult	10%
Smolt (King)	to	Adult	3%

To calculate the expected survival of a fish lot, multiply together all treatment values. For example: Coho salmon raised to smolt and planted at a stream mouth.

Green	to	Eyed	90
Eyed	to	Emergent	95
Emergent	to	Fed Fry	95
Feeding	to	Fingerling	95
Fingerling	to	Smolt	80
Smolt	to	Adult	10

.90 × .95 × .95 × .95 × .80 × .10 = .062 or 6.2% survival from Green Egg to Adult.

Sockeye salmon planted as fed fry in a lake

Green	to	Eyed	90
Eyed	to	Emergent Fry	95
Emergent Fry	to	Fed Fry	95
Fed Fry	to	Smolt in lake	10
Smolt	to	Adult	10

.90 × .95 × .95 × .10 × .10 = .0081 or .81 = survival from Green Egg to Adult.

Fecundities by Species (fecundity values may be changed where actual observations are available).

Chum	2,200
Pink	1,600
Coho	2,800
King	6,500
Sockeye	3,000

* Definition of Fed Fry — 25% weight gain from emergent (swim-up) weight.
** Definition of Fingerling — 100% weight gain from emergent (swim-up) weight.
*** Includes fry from egg plants, stream incubation boxes, incubation channels, etc.

Appendix 3-17 Summary of estimated annual harvestable fish production and catch by species and gear type, based on full utilization of existing hatcheries.

Harvestable Fish Production

District	Facility	King	Sockeye	Coho	Pink	Chum
Southwestern	Port San Juan				3,694,000	128,000
Eshamy	Main Bay					722,000
Northern	Perry Island				—[1]	
Unakwik	Cannery Creek				382,000	
Northwestern	Ft. Richardson	3,000		5,000		
Eastern	Solomon Gulch			15,000	808,000	193,000
Copper River	Gulkana		45,900			
	Total	3,000	45,900	20,000	4,884,000	1,043,000

Probable Seine Catch

	Port San Juan				3,694,000[2]	128,000[2]
	Main Bay					
	Perry Island				—[1]	
	Cannery Creek				260,000[3]	
	Ft. Richardson			2,500[4]		
	Solomon Gulch			7,500[4]	808,000[2]	193,000[2]
	Total			10,000	4,762,000	321,000

Probable Drift Gill Net Catch

	Main Bay					542,000[5]
	Cannery Creek				122,000[3]	
	Gulkana		27,500[6]			
	Total		27,500		122,000	542,000

Probable Set Gill Net Catch

	Main Bay					180,000[7]

Probable Subsistence Catch

		2,800[8]			

Probable Sport Catch

1,500[4]	5,385[9]	5,000[10]		

1) Negligible contribution, 800 fish.
2) All fish harvested by seine fishermen.
3) Assuming a 68% exploitation.
4) Assuming a 50% exploitation.
5) Assuming a 75% exploitation.
6) Assuming a 60% exploitation.
7) Assuming a 25% exploitation.
8) Assuming a 15% exploitation rate on fish that escape the gill net fishermen.
9) Assuming a 35% exploitation rate on fish that escape the subsistence fishermen.
10) Assuming a 50% exploitation rate on fish that escape the seine fishermen.

Appedix 3-18 Summary of projected natural and supplemental catches by user group and species, Prince William Sound Region, 2002.

	King	Sockeye	Coho	Pink	Chum
Purse Seine Catches					
Natural	1,300	47,900	15,800	4,759,000	447,500
Supplemental[1]	0	20,300	11,000	4,882,600	333,000
Total	1,300	68,200	26,800	9,641,600	780,500
Drift Gill Net Catches					
Natural	16,800	759,200	217,900	216,500	91,100
Supplemental[1]	0	33,000	0	122,000	542,000
Total	16,800	792,200	217,900	338,500	633,100
Set Gill Net Catches					
Natural	0	8,500	100	12,700	2,900
Supplemental[1]	0	0	0	0	180,000
Total	0	8,500	100	12,700	182,900
Subsistence Catches					
Natural	1,700	25,100	400	0	0
Supplemental[1]	0	2,700	0	0	0
Total	1,700	27,800	400	0	0
Sport Catches					
Natural	2,800	6,300	11,900	18,600	1,500
Supplemental[1]	1,500	5,000	5,000	0	0
Total	4,300	11,300	16,900	18,600	1,500
Total Catches of Natural Stocks	22,600	847,000	246,100	5,006,800	543,000
Total Catches of Supplemental[1] Stocks	1,500	61,000	16,000	5,004,600	1,055,000
Total	24,100	908,900	262,100	10,011,400	1,598,000

1) Includes some natural stocks that will be rehabilitated by means of fish passes and stream improvement.

Appendix 4-1. Regional Planning Team Questionnaire.

QUESTIONNAIRE FOR FISHERMEN AND NON-FISHERMEN WHO USE OR MAY USE THE SALMON RESOURCES OF THE PRINCE WILLIAM SOUND COPPER — BERING RIVER REGION

Dear salmon fisherman or non-fisherman:

The Prince William Sound Regional Salmon Planning Team needs your input in the preparation of the twenty-year plan for the rehabilitation, enhancement, and management of the region's salmon resources. This region encompasses the marine waters and freshwater drainages of the Prince William Sound, Copper River and Bering River Region (see map).

This questionnaire gives you the opportunity to quickly and easily tell us your needs as a fisherman or non-fisherman. We will present the results of this survey in the Comprehensive Fisheries Plan. The twenty-year goals and objectives of the plan will be developed from your input and the input of other users, agencies, and groups.

***We need you** to fill out the questionnaire and drop it in the mail before May 31, 1982.*

Sincerely,

Mike McCurdy
Chairman,
PWS Regional Planning Team

Do you need help filling this out?
Stop by your local Alaska Dept. of Fish and Game office
or call collect 424-7511

PWS-CR and BR Regional Salmon Planning Questionnaire

1. Which categories describe your sport fishing activities in the Prince William Sound — Copper and Bering River Region?

____ (012) I have sport fished for salmon in the region.

____ (013) I plan or hope to sport fish for salmon in the region.

If you are not a sport fisherman, or do not expect to become a sport fisherman, please skip over to question number 15.

SPORT FISHERMEN

2. In which areas in this region have you sport fished for salmon?

____ (014) Valdez Bay
____ (015) Passage Canal (Whittier)
____ (016) Orca Inlet

Other marine waters (please list):

(017) _____
(018) _____
(019) _____

____ (020) Gulkana River
____ (021) Eyak River
____ (022) Coghill River
____ (023) Eshamy Creek
____ (024) Eshamy Lake
____ (025) Shrode Creek
____ (026) Shrode Lake

Other lakes and streams (please list):

(027) _____
(028) _____
(029) _____
(030) _____

3. In which areas in the region do you think your the catch of salmon per day is too low?

____ (031) Valdez Bay
____ (032) Passage Canal (Whittier)
____ (033) Orca Inlet

Other marine waters (please list):

(034) _____
(035) _____
(036) _____

____ (037) Gulkana River
____ (038) Eyak River
____ (039) Coghill River
____ (040) Eshamy Creek
____ (041) Eshamy Lake
____ (042) Shrode Creek
____ (043) Shrode Lake

Other lakes and streams (please list):

(044) _____
(045) _____
(046) _____
(047) _____

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

____ (048-9) _____ years.

5. Which four methods of salmon sport fishing do you prefer? Rank in order of preference, your first preference number "1", etc.

____ (050) Casting from a boat
____ (051) Trolling
____ (052) Drift fishing in a boat
____ (053) Fishing from shore or wading
____ (054) Ice fishing for land-locked salmon
____ (055) Snagging in marine waters

Other (specify):

(056) _____
(057) _____

Answer questions for the Prince William Sound — Copper and Bering River salmon planning region only.

PWS-CR and BR Regional Salmon Planning Questionnaire

6. Which four aspects about salmon sport fishing are most important to you? Rank in order of importance, the most important number "1", etc.

____ (058) Scenery
____ (059) Catching your limit
____ (060) Fishing by yourself
____ (061) Boating
____ (062) Peace and quiet
____ (063) Fishing with your friends
____ (064) Eating your catch
____ (065) Hooking, playing and landing the fish
Other (specify):
____ (066) _____
____ (067) _____

7. In view of your answers to question 6, rank your four favorite salmon fishing areas, your first preference number "1", etc. Do not rank those areas that you have not fished.

____ (068) Valdez Bay
____ (069) Passage Canal (Whittier)
____ (070) Orca Inlet
Other marine waters (please list):
____ (071) _____
____ (072) _____
____ (073) _____
____ (074) Gulkana River
____ (075) Eyak River
____ (076) Coghill River
____ (077) Eshamy Creek
____ (078) Eshamy Lake
____ (079) Shrode Creek
____ (080) Shrode Lake
Other lakes and streams (please list):
____ (081) _____
____ (082) _____
____ (083) _____
____ (084) No opinion

8. Which species of salmon do you prefer to fish for? Rank in order of preference, your first preference number "1", etc.

____ (085) King (chinook)
____ (086) Red (sockeye)
____ (087) Dog (chum)
____ (088) Humpback (pink)
____ (089) Silver (coho)

9. How many salmon did you catch on sport gear in 1981 in the region?

____ (090-2) King (chinook)
____ (093-5) Red (sockeye)
____ (096-8) Dog (chum)
____ (99-101) Humpback (pink)
____ (102-4) Silver (coho)
____ (105) Did not fish in the region in 1981

10. Overall, was your 1981 sport salmon catch adequate?

____ Yes
____ No
____ (106) No opinion

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

____ Yes
____ No
____ (107) No opinion

Answer questions for the Prince William Sound — Copper and Bering River salmon planning region only.

PWS-CR and BR Regional Salmon Planning Questionnaire

12. As a sport fisherman, how many of the following fish do you need to catch per season to feel satisfied?

____ (108-10) King (chinook)
____ (111-3) Red (sockeye)
____ (114-6) Dog (chum)
____ (117-9) Humpback (pink)
____ (120-22) Silver (coho)

13. What species of salmon do you think need to be enhanced?

____ (123) King (chinook)
____ (124) Red (sockeye)
____ (125) Dog (chum)
____ (126) Humpback (pink)
____ (127) Silver (coho)

14. What are the four most important problems with the salmon sport fisheries of the region? Rank them in order of importance, the most important number "1", etc.

____ (128) Lack of fish
____ (129) Management of the fisheries
____ (130) Lack of enforcement
____ (131) Overcrowded fishing areas
____ (132) Lack of access
____ (133) Lack of campgrounds
____ (134) Inadequate campgrounds
____ (135) Lack of boat slips
____ (136) Restrictive regulations
Other (specify):

____ (137) _____

15. Which categories describe your subsistence fishing activities in the Prince William Sound — Copper and Bering River Region? A subsistence user is a person who harvests salmon under the current subsistence regulations and while in posession of a current subsistence use permit.

____ (138) I have subsistence fished for salmon in this region.
____ (139) I plan or hope to subsistence fish for salmon in this region.

If you are not a subsistence fisherman in this region and/or do not expect to become a subsistence fisherman in this region, please skip over to question number 24.

SUBSISTENCE FISHERMEN

16. What type of fishing gear do you use?

____ (140) Dip net
____ (141) Fishwheel
____ (142) Drift gill net
____ (143) Set gill net
____ (144) Purse siene
____ (145) Other _____

17. Rank the species of salmon you like to eat in order of preference, your first preference number "1", etc.

____ (146) King (chinook)
____ (147) Red (sockeye)
____ (148) Dog (chum)
____ (149) Humpback (pink)
____ (150) Silver (coho)

Answer questions for the Prince William Sound — Copper and Bering River salmon planning region only.

PWS-CR and BR Regional Salmon Planning Questionnaire

18. How many subsistence salmon did you or your family catch in this region in 1981?

____ (151-3) King (chinook)
____ (154-6) Red (sockeye)
____ (157-9) Dog (chum)
____ (160-2) Humpback (pink)
____ (163-5) Silver (coho)
____ (166-8) Did not fish in 1981

19. Was this adequate?

____ Yes
____ No
____ (169) No opinion

20. Where did you fish in this region in 1981.

____ (170) Upper Copper River
____ (171) Copper River Flats
____ (172) Bering River District
____ (173) Unakwik District
____ (174) Coghill District
____ (175) Eshamy District
____ (176) Other _____

21. Where do you prefer to fish? Rank in order of preference, your first preference number "1", etc.)

____ (177) Upper Copper River
____ (178) Copper River Flats
____ (179) Bering River District
____ (180) Unakwik District
____ (181) Coghill District
____ (182) Eshamy District
____ (183) Other _____

22. How many salmon do you and your family need per year?

____ _____ (184-7) (number) salmon

23. What are four most important problems with the salmon subsistence fisheries of the region? Rank them in order of importance, the most important number "1", etc.

____ (188) Lack of fish
____ (189) Management of the fisheries
____ (190) Lack of enforcement
____ (191) Overcrowded fishing areas
____ (192) Lack of access
____ (193) Lack of campgrounds
____ (194) Inadequate campgrounds
____ (195) Too many other fishermen
____ (196) Restrictive regulations
____ (197) Lack of open areas
Other (specify):

____ (198) _____

24. Which categories describe your commercial fishing activities in Area E? Area E is the commercial salmon district in the Prince William Sound — Copper and Bering River Region; the district's eastern boundary is Cape Suckling and its western boundary is Cape Fairfield.

____ (199) I have commercial fished for salmon in this region.
____ (200) I plan or hope to commercial fish for salmon in this region.

If you are not a commercial fisherman in the region and/or do not plan to become a commercial fisherman in this region, please skip over to question number 45.

Answer questions for the Prince William Sound — Copper and Bering River salmon planning region only.

PWS-CR and BR Regional Salmon Planning Questionnaire

COMMERICAL FISHERMEN

25. If you are not now a commercial fisherman in Area E but you plan or expect to become one, indicate in which fishery and in which capacity?

____ (201) Salmon seine entry permit holder
____ (202) Salmon seine crew member
____ (203) Salmon drift net entry permit holder
____ (204) Salmon drift net crew member
____ (205) Salmon set net entry permit holder
____ (206) Salmon set net crew member

26. If you are now a commercial fisherman in Area E, indicate in which fishery and in which capacity?

____ (207) Salmon seine entry permit holder ____ (208-9) years
____ (210) Salmon seine crew member ____ (211-2) years
____ (213) Salmon drift net entry permit holder ____ (214-5) years
____ (216) Salmon drift net crew member ____ (217-8) years
____ (219) Salmon set net entry permit holder ____ (220-1) years
____ (222) Salmon set net crew member ____ (223-4) years

27. If you are now a commercial fisherman in Area E, indicate in which capacity you would like to participate in the future.

____ (225) Wish to continue in same capacity

Wish to change to the following capacity in the future:

____ (226) Salmon seine entry permit holder
____ (227) Salmon seine crew member
____ (228) Salmon drift net entry permit holder
____ (229) Salmon drift net crew member
____ (230) Salmon set net entry permit holder
____ (231) Salmon set net crew member

28. What percent of your gross 1981 income did you derive from the following sources:

Salmon seining (Area E) ____ (232-4) %
Salmon drift gillnetting (Area E) ____ (235-7) %
Salmon set gillnetting (Area E) ____ (238-40) %
Other fisheries in Area E ____ (241-3) %
Fisheries in other areas ____ (244-6) %
Non-fishing sources ____ (247-49) %
Total ____ %

29. Were you satisfied with the 1981 breakdown of your income?

____ (250) Yes
____ (251) No
____ (252) Did not fish in 1981
____ (253) No opinion

30. If not, what percent of your gross income would you prefer to come from the following sources:

Salmon seining (Area E) ____ (254-6) %
Salmon drift gillnetting (Area E) ____ (257-9) %
Salmon set gillnetting (Area E) ____ (260-2) %
Other fisheries in Area E ____ (263-5) %
Fisheries in other areas ____ (266-8) %
Non-fishing sources ____ (269-71) %
Total ____ %

31. Was your commercial catch of salmon in Area E adequate in 1981?

____ Yes
____ No
____ (272) No opinion

Answer questions for the Prince William Sound — Copper and Bering River salmon planning region only.

PWS-CR and BR Regional Salmon Planning Questionnaire

3 2 . Were you satisfied with your earnings from commercial salmon fishing in Area E in 1981?

____ Yes

____ No

____ No opinion
(273)

3 3 . What do you need to gross in an average year to pay your fishing and living expenses and make a reasonable profit from fishing investments?

$__ _____
(274-80)

3 4 . Are you paying for your permit?

____ Yes

____ No
(281)

3 5 . Do you have a boat?

____ Yes

____ No
(282)

3 6 . Is your boat financed?

____ Yes

____ No
(283)

3 7 . Which species do you prefer to fish for? Rank in order of preference, your first preference number "1", etc.

____ King (chinook)
(284)

____ Red (sockeye)
(285)

____ Dog (chum)
(286)

____ Humpback (pink)
(287)

____ Silver (coho)
(288)

3 8 . Do you take a portion of your commercial salmon catch home for personal use?

____ Yes

____ No
(289)

3 9 . Which species do you prefer to take home for personal use? Rank in order of preference, your first preference number "1", etc.

____ King (chinook)
(290)

____ Red (sockeye)
(291)

____ Dog (chum)
(292)

____ Humpback (pink)
(293)

____ Silver (coho)
(294)

4 0 . How many of the following species did you to take home for personal use during the 1981 commercial season

____ King (chinook)
(295-7)

____ Red (sockeye)
(298-30-0)

____ Dog (chum)
(301-3)

____ Humpback (pink)
(304-6)

____ Silver (coho)
(307-9)

4 1 . In which district do you prefer to gill net for salmon? Rank in order of preference, your first preference number "1", etc.

____ Bering River
(310)

____ Copper River
(311)

____ Unakwik
(312)

____ Coghill
(313)

____ Eshamy
(314)

Answer questions for the Prince William Sound — Copper and Bering River salmon planning region only.

PWS-CR and BR Regional Salmon Planning Questionnaire

42. In which district do you prefer to purse seine for salmon? Rank in order of preference, your first preference number "1", etc.

____ (315) Eastern
____ (316) Northern
____ (317) Northwestern
____ (318) Southwestern
____ (319) Montague
____ (320) Southeastern
____ (321) Unakwik
____ (322) Coghill

43. Recognizing that hatcheries are in place at Port San Juan, Cannery Creek, Main Bay, Valdez, and Perry Island, which district would you prefer to have enhanced or rehabilitated? Rank in order of preference, your first preference number "1", etc.

____ (323) Bering River
____ (324) Copper River
____ (325) Eastern
____ (326) Northern
____ (327) Northwestern
____ (328) Southwestern
____ (329) Montague
____ (340) Southeastern
____ (341) Unakwik
____ (342) Coghill
____ (343) Eshamy

44. What are the four most important problems with the commercial salmon fisheries of the region? Rank them in order of importance, the most important number "1", etc.

____ (344) Lack of fish
____ (345) Management of the fisheries
____ (346) Lack of enforcement
____ (347) Too much gear
____ (348) Unstable prices
____ (349) Lack of processors
____ (350) Lack of loans
____ (351) Restrictive regulations
Other (specify):

____ (352) _____

NON-FISHERMEN ONLY

45. What is the most important thing to you about the salmon resource of the region?

_____

_____

_____

_____

_____

_____

46. What do you think should be done to increase man's benefits from the salmon of the region?

_____

_____

_____

_____

_____

_____

_____

Answer questions for the Prince William Sound — Copper and Bering River salmon planning region only.

PWS-CR and BR Regional Salmon Planning Questionnaire

FISHERMEN AND NON-FISHERMEN

47. Enhancing and rehabilitating the salmon runs and increasing man's benefits from this resource will require various activities to take place. Please indicate if you approve, disapprove or have no opinion concerning the following activities. Circle your answer.

Approve	Disapprove (353)	No Opinion	Construct fish hatcheries
Approve	Disapprove (354)	No Opinion	Install incubation boxes in or near streams
Approve	Disapprove (355)	No Opinion	Build fish ladders
Approve	Disapprove (356)	No Opinion	Fertilize lakes
Approve	Disapprove (357)	No Opinion	Remove undesireable fish from selected lakes and restock with desirable fish.
Approve	Disapprove (358)	No Opinion	Clear streams of logs and boulders
Approve	Disapprove (359)	No Opinion	Transport fish to barren lakes
Approve	Disapprove (360)	No Opinion	Build roadside viewing areas
Approve	Disapprove (361)	No Opinion	Build access roads
Approve	Disapprove (362)	No Opinion	Install boat slips and launching ramps
Approve	Disapprove (363)	No Opinion	Other (specify)

_____

_____

48. Please write down your suggestions or comments below.

_____

_____

_____

_____

_____

_____

Answer questions for the Prince William Sound — Copper and Bering River salmon planning region only.

Appendix 4-2. Questionnaire responses of commercial salmon fishermen, seine permit holders.

	Seine Permit Only[1]			All Seine Permit Holders[2]					
	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Did not fish in 1981	Future Permit Holders	Total
24. Number of respondents:	18	4	1	40	9	1	1	0	51
26. Level of participation in Area E salmon fisheries and average years of experience:									
Seine entry permit holder(number/years)	18/3-6	4/2-5	1/8.0	40/5-7	9/7-2	1/8.0	1/4.0		51/6.0[3]
Seine crew member (number/years)	2/5-5		1/2.0	9/8.0	3/6.0	1/2.0			13/7.7[3]
Drift net permit holder (number/years)			1/2.0	26/9.8	4/17.8	1/2.0	1/5.0		32/10.4[3]
Drift net crew member (number/years)		1/4.0		1/3.0	1/4.0				2/3.5[3]
Set net entry permit holder (number/years)									
Set net crew member(number/years)									
27. Desired level of participation in the Area E salmon fisheries:									
Wish to continue in same capacity	16	3	1	34	8	1	1		44
Wish to change in the following capacity in the future:									
Salmon seine entry permit holder									
Salmon seine crew member									
Salmon drift net entry permit holder	2	3		3	3				6
Salmon drift entry crew member									
Salmon set net entry permit holder				1					1
Salmon set net crew member									
28. Percentage of gross 1981 income derived from the following sources:									
Salmon seining (Area E)	71	67	100	72	69	100			71[3]
Salmon drift gill netting (Area E)				8	17				9[3]
Salmon set gill netting (Area E)									
Other fisheries in Area E	6			9	3		100		9[3]
Fisheries in other area	1	3		1	1				1[3]
Non-fishing sources	22	30		10	10				10[3]
Total	100	100	100	100	100	100	100		100[3]
29. Number satisfied with the breakdown of their 1981 income:									
Satisfied	16	2		32	3				35
Dissatisfied	1	1		6	5				11
Did not fish in 1981							1		1
No opinion	1	1	1	2	1	1			4
30. Preferred sources of gross income (Question 28 revised):									
Salmon seining (Area E)	71	75	30	71	63	50	30		68[3]
Salmon drift gill netting (Area E)	1	8	10	12	25	25	10		14[3]
Salmon set gill netting (Area E)									
Other fisheries in Area E	10		60	9	2	25	60	9	
Fisheries in other areas	1	6		1	3				1[3]
Non-fishing sources	17	11		7	7				8[3]
Total	100	100	100	100	100		100		100[3]

1) Participated in the 1981 Area E salmon fishery as a seine permit holder only.
2) Participated in the 1981 Area E salmon fishery as a seine permit holder and in some instances a drift permit holder and drift crew member. Also included is a permit holder who did not fish in 1981.
3) Weighted mean.

Appendix 4-2. Questionnaire responses of commercial salmon fishermen, seine permit holders, continued.

Seine Permit Only			All Seine Permit Holders					
Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Did not fish in 1981	Future Permit Holders	Total

31. Was the respondent's commercial catch in 1981 adequate?:

Adequate	18			37					37
Not Adequate		2		3	7				10
No opinion		2	1		2	1	1		4

32. Number of respondents satisfied with their earnings from commercial salmon fishing in Area E in 1981:

Satisfied	18			40					40
Dissatisfied		4			9				9
No opinion			1			1	1		2

33. Average gross earnings from salmon seining needed by respondent to pay his fishing and living expenses and make a reasonable profit from fishing investments:[1]

$0—$9,999									
10,000—19,999									
20,000—29,999	2			3					3
30,000—39,999				1					1
40,000—49,999				4	1				5
50,000—59,999	2	1		3	2				5
60,000—69,999	2			3					3
70,000—79,999	1			1					1
80,000—89,999		2		1	2				3
90,000—99,999	1			1					1
100,000—109,999	1			3		1			4
110,000—119,999	1			1					1
120,000—129,999	3	1		5	2				7
130,000—139,999	1			3					3
140,000—149,999				1					1
150,000—159,999			1	2	1		1		4
160,000—169,999	1			1					1
170,000—179,999									
180,000—189,999	2			2					2
190,000—199,999									
200,000—209,999	1			2					2
210,000—219,999				1					1
220,000—229,999					1				1
250,000—259,999				1					1
Number of Respondents	18	4	1	39	9	1	1		50
Average	$105,000	86,000	150,000	106,000	102,000	100,000	150,000		106,000

Appendix 4-2. Questionnaire responses of commercial salmon fishermen, seine permit holders, continued.

	Seine Permit Only			All Seine Permit Holders					
	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Did not fish in 1981	Future Permit Holders	Total
34. Number of respondents paying for permits:									
Paying	6	3		13	5				18
Not Paying	12	1	1	27	4	1	1		33
35. Number of respondents who own a boat:									
Own a boat	17	3	1	39	8	1	1		49
Does not own boat	1	1		1	1				2
36. Number of respondents who have their boat financed:									
Boat financed	14	2	1	31	7	1	1		40
Boat not financed	4	1		9	1				10

1. Actual answered multiplied by desired seine percentage in question 30.

37. The number "1" species preferred to fish for:									
King (chinook)	1			3	1				4
Red (sockeye)	4	2	1	12	3	1	1		17
Dog (chum)	5	1		5	2				7
Humpback (pink)	8	1		17	3				20
Silver (coho)				1					1
38. Number of respondents who take home a portion of their commercial catch for their own use:	12	3	1	33	5	1	1		40
39. The number "1" preference for personal use:									
King (chinook)	6	2	1	16	4	1	1		22
Red (sockeye)	8	2		16	3				19
Dog (chum)				1					1
Humpback (pink)									
Silver (coho)	1			2					2
40. Average number of fish by species taken home for personal use during the 1981 commercial season:									
King (chinook)	0.8			2.1	1.4	2.0			1.9[1]
Red (sockeye)	4.8	0.3		8.9	6.4	10.0			8.3[1]
Dog (chum)	5.8			2.7	0.2				2.2[1]
Humpback (pink)	4.2	1.7		2.2	3.3				2.3[1]
Silver (coho)	4.0	0.6		4.0	6.7	10.0			4.5[1]

1) Weighted average.

Appendix 4-2. Questionnaire responses of commercial salmon fishermen, seine permit holders, continued.

	Seine Permit Only			All Seine Permit Holders					
	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Did not fish in 1981	Future Permit Holders	Total
42. The number "1" preferred area for salmon seining:									
Eastern	4			7					7
Northern	1		1	7		1			8
Northwestern		1		1	1				2
Southwestern	10			19	1		1		21
Montague				1					1
Southeastern	3			5	3				8
Unakwik		1			1				1
Coghill									
43. Recognizing that hatcheries are in place at Port San Juan, Cannery Creek, Main Bay, Valdez, and Perry Island, respondents ranked their number "1" preference for enhancement or rehabiliation work:									
Bering River				2					2
Copper River	1		1	13	2	1	1		17
Eastern	3	1		5	1				6
Northern	3	1		4	2				6
Northwestern	1	1		1	1				2
Southwestern	2			3					3
Montague				2					2
Southeastern									
Unakwik	1			1					1
Coghill	3	1		5	2				7
Eshamy	1			1					1
44. The number "1" problem with the commercial salmon fisheries of the region:									
Lack of fish				1	1		1	n/a	3
Management of fisheries				2					2
Lack of enforcement	3			9					9
Too much gear	1			4	2	1			7
Unstable prices	10	2	1	16	3				19
Lack of processors	4			6					6
Lack of loans									
Restrictive regulations									

Appendix 4-2. Questionnaire responses of commercial salmon fishermen, seine permit holders, continued.

47. Enhancing and rehabilitating the salmon runs and increasing man's benefits from this resource will require various activities to take place. Respondents indicated their approval (A), disapproval (D), or no opinion (N) concerning the following activities:

	Seine permit only									All seine permit holders																				
	Satisfied with 1981 earnings			Dissatisfied with 1981 earnings			No Opinion about 1981 earnings			Satisfied with 1981 earnings			Dissatisfied with 1981 earnings			No Opinion about 1981 earnings			Did not fish in 1981			Future Permit Holders			Total		
	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N
Construct fish hatcheries	15	1		3	1			1		33	2		8		1	1			1						43	2	2
Install incubation boxes in or near streams	16		1	4			1			35		2	8		1	1			1						45		3
Build fish ladders	16		1	4			1			33		4	9			1				1					44		4
Fertilize lakes	16		1	4			1			34		3	6	1	2	1			1						42	1	52
Remove undesirable fish from selected lakes and restock with desirable fish	7	2	5	4				1		17	5	12	5		1		1		1						23	6	13
Clear streams of logs and boulders	14	2	1	3		1	1			31	3	3	7		1	1			1						40	3	4
Transport fish to barren lakes	15	1	1	4			1			30	3	4	8			1			1						40	3	40
Build roadside viewing areas	6	5	6	1		3			1	10	14	12	1	4	3			1		1					11	19	16
Build access roads	3	7	6	1	3		1			5	21	9	1	7		1				1					7	29	9
Install boat slips and launching ramps	8	4	4	1	2	1			1	16	11	7	2	5	1	2	5	1		1					18	17	19

Appendix 4-3. Estimated minimum revenue requirements of hypothetical salmon purse seine, drift gill net and set gill net permit holders, Prince William Sound Region, 1981.[1]

Purse seine permit holders

Assumptions:
1. Market value of entry permit (second quarter, 1982) - $150,000
2. Market value of boat (second quarter, 1982) - $98,000[2]
3. Market value of gear (second quarter, 1982) - $34,000[3]
4. Percent of permit, boat and gear financed - 70%[4]
5. Loan terms - 14% for 10 years and equal annual payments
6. Return on investment equal to 10% of dollars invested annually[5]
7. Gross personal income requirement equal to median household income of Alaskan residents in 1980 of $25,109[6]
8. Average crew of 4.2 people including permit holder[7]
9. Average crew share of 10% per crew member[8]

Expenses:[9]	
Fuel	$2,500
Provisions	$2,700
Maintenance	$4,000
Supplies	$5,000
Transportation	$2,500
Insurance	$3,000
Moorage/storage	$1,000
Dues/licenses	$750
Vehicle	$1,000
Permit, boat and gear payments	$33,500
Subtotal	$55,950
Return on investment:	$8,500
Personal income (returns to labor and management):	$17,100[10]
Subtotal:	$81,550
Crew share:	$38,400
Assessment:	$1,400
Total:	$121,350

Drift gill net permit holders

Assumptions:
1. Market value of entry permit (second quarter, 1982) - $65,000
2. Market value of boat (second quarter, 1982) - $44,000[11]
3. Market value of gear - $15,600 (second quarter, 1982)[12]
4. Percentage of permit, boat and gear financed - 70%[4]
5. Loan terms - 14% for 10 years and equal annual payments
6. Return on investment equal to 10% of dollars invested[5]
7. Gross personal income requirement equal to median household income of Alaskan residents in 1980 of $25,109[6]
8. Average crew of 1.3 people including permit holder[7]
9. Average crew share of 10% per crew member[8]

Expenses:[9]	
Fuel	$2,000
Provisions	$2,000
Maintenance	$4,000

Appendix 4-3. Estimated minimum revenue requirements of hypothetical salmon purse seine, drift gill net and set gill net permit holders, Prince William Sound Region, 1981, continued.

Supplies	$500
Transportation	$1,600
Insurance	$1,400
Moorage/storage	$500
Dues/licenses	$250
Truck	$1,000
Permit, boat and gear payments	$14,800
Subtotal	$28,050
Return on investment:	$3,700
Personal income (returns to labor and management):	$15,800[13]
Subtotal:	$47,550
Crew share:	$1,500
Assessment:	$100[14]
Total:	$49,150

Set gill net permit holders[15]

Assumptions:

1. Market value of entry permit (second quarter, 1982) - $21,000
2. Market value of boat (estimate, no data available) - $5,000
3. Market value of gear (estimate, no data available) - $5,000
4. Market value of fishing site (estimate, no data available) - $25,000
5. Percentage of permit, boat and gear financed - 70%[4]
6. Loan terms - 14% for 10 years and equal annual payments
7. Return on investment equal to 10% of dollars invested[5]
8. Gross personal income requirement equal to median household income of Alaskan residents in 1980 of $25,109[6]
9. Average crew of 1.5 people including permit holder (estimate, no data available)
10. Average crew share of 10% per crew member[8]

Expenses:	
General operating (estimated from Cook Inlet)[7]	$4,000
Permit, boat and gear payments	$6,700
Subtotal	$10,700
Return on investment:	$1,700
Personal income (returns to labor and management):	$11,300[16]
Subtotal:	$23,700
Crew share:	$1,200
Assessment:	$50[11]
Total:	$24,950

1) Not necessarily representative of average permit holder.

2) Larson (1980) estimated the average market value of Area E purse seine boats during fall, 1979 to have been approximately $81,370. The average value was increased as per footnote 2 above without regard to the purchase of new vessels.

3) Larson (1980) estimated the average value of fishing gear to have been approximately $27,865 during fall 1979. This estimate was increased as per footnote 2.

4) Hypothetical, assuming equal payments annually.

5) To offset inflation.

6) Thomas (1982).

Appendix 4-3. Estimated minimum revenue requirements of hypothetical salmon purse seine, drift gill net and set gill net permit holders, Prince William Sound Region, 1981, continued.

7) Larson (1980).
8) Common crew share percentage.
9) Wiese (personal communication).
10) Median household income adjusted by 68%, the amount of gross income that fishermen indicated they desire to earn from salmon purse seining in Area E.
11) Larson (1980) estimated the average market value of Area E drift gill net boats during fall, 1979 to have been approximately $36,526. The Anchorage Consumer Price Index (CPI) increased 21% between January, 1980 and May, 1982. The average value was increased accordingly without regard to the purchase of new vessels.
12) Larson (1980) estimated the average value of fishing gear to have been approximately $12,905 during fall 1979. This estimate was increased by the increase in the CPI of 21%.
13) Median household income adjusted by 63%, the portion of gross income that fishermen indicated that they desire to earn from salmon drift gill netting in Area E.
14) Based on the number of fish needed to meet all of the foregoing revenue requirements and an assessment of 2¢ per fish.
15) Few data are available. Rough estimates and Cook Inlet data collected by Larson (1980) have been employed.
16) Median household income adjusted by 45%, the portion of gross income that fishermen indicated that they desire to earn from salmon set gill netting in Area E.

Appendix 4-4. Questionnaire responses of commercial salmon fishermen, drift gill net permit holders.

	Drift Gill Net Permit Only[1]			All Drift Gill Net Permit Holders[2]					
	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Did not fish in 1981	Future Permit Holders	Total
24. Number of respondents:	15	33	5	55	47	6	2	3	113
26. Level of participation in the Area E salmon fisheries and average years of experience:									
Seine entry permit holder (number/years)				26/6.7	4/13.0		1/4.0		31/7.4[3]
Seine crew member (number/years)	4/6.8	2/7.0	3/7.7	23/8.1	10/6.0	4/6.2			37/7.3[3]
Drift net entry permit holder (number/years)	13/9.9	32/6.5	5/2.6	52/8.6	45/7.4	6/2.5	2/3.0		105/7.6[3]
Drift net crew member (number/years)	1/2.0			2/2.5					2/2.5[3]
Set net entry permit holder (number/years)					2/9.0				2/9.0[3]
Set net crew member (number/years)									
27. Desired level of participation in the Area E salmon fisheries:									
Wish to continue in same capacity	12	29	4	44	38	4	2	n/a	48
Wish to change to the following capacity in the future:									
Salmon seine entry permit holder	2	6	2	12	9	2			23
Salmon seine crew member	1	4		1	6				7
Salmon drift net entry permit holder									
Salmon drift net crew member									
Salmon set net entry permit holder		1			1				1
Salmon set net crew member									
28. Percentage of gross 1981 income derived from the following sources:									
Salmon seining (Area E)				43	10	8		n/a	26[3]
Salmon drift gill netting (Area E)	90	76	67	42	64	61			52[3]
Salmon set gill netting (Area E)									
Other fisheries in Area E	2	1		9	1				5[3]
Fisheries in other areas		1	14		3	12	50		3[3]
Non-fishing sources	8	22	19	6	22	19	50		14[3]
Total	100	100	100	100	100	100	100		100[3]
29. Number satisfied with breakdown of their 1981 income:									
Satisfied	10	9	3	37	12	3		n/a	52
Dissatisfied	2	21	1	13	32	1			46
Did not fish in 1981							2		2
No opinion	3	3	1	5	3	2			10

1) Participated in the 1981 Area E salmon fishery as a drift permit holder only.
2) Participated in the 1981 Area E salmon fishery as a drift permit holder and in some instances as Area E salmon seine crewmen or seine permit holders. Also included in this category are those permit holders who didn't fish as drift permit holders in 1981 as well as aspiring fishermen who wish to enter the fishery.
3) Weighted average.

Appendix 4-4. Questionnaire responses of commercial salmon fishermen, drift gill net permit holders, continued.

	Drift Gill Net Permit Only			All Drift Gill Net Permit Holders					
	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Did not fish in 1981	Future Permit Holders	Total
30. Preferred sources of gross income (Question 28 answers revised):									
Salmon seining (Area E)		4		39	14		15		25
Salmon drift gill netting (Area E)	88	81	77	52	75	81	45	25	63
Salmon set gill netting (Area E)		5			1			12	1
Other fisheries in Area E	3	2		4	2		30	12	3
Fisheries in other areas	1	2	13		3	11		12	2
Non-fishing sources	8	6	10	5	5	8	10	39	6
Total	100	100	100	100	100	100	100	100	100
31. Number of respondents satisfied with their commercial salmon catch in Area E in 1981:									
Adequate	14	4		48	6			n/a	54
Not adequate	1	28	4	7	40	4			51
No opinion		1	1		1	2	2		5
32. Number of respondents satisfied with their earnings from commercial salmon fishing in Area E in 1981:									
Satisfied	15			55				n/a	55
Dissatisfied		33			47				47
No opinion			5			6	2		8

Appendix 4-4. Questionnaire responses of commercial salmon fishermen, drift gill net permit holders.

	Drift Gill Net Permit Only			All Drift Gill Net Permit Holders					
	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Did not fish in 1981	Future Permit Holders	Total
33. Average gross earnings from salmon drift gill netting needed by respondent to pay his fishing and living expenses and make a reasonable profit from fishing investments:[1]									
$ 0—9,999				5				n/a	5
10,000—19,999		2	1	5	2	1			8
20,000—29,999	1	2		8	5				13
30,000—39,999	3	2		8	4				12
40,000—49,999	1	2	2	4	4	2	1		11
50,000—59,999	2	8		4	12		1		17
60,000—69,999	3	6	2	5	6	3			14
70,000—79,999	3	4		5	5				10
80,000—89,999		2			2				2
90,000—99,999				1					1
100,000—109,999		3		4	4				8
110,000—119,999									
120,000—129,999									
130,000—139,999									
140,000—149,999									
150,000—159,999									
160,000—169,999									
170,000—179,999									
180,000—189,999					1				1
190,000—199,999									
200,000—209,999									
210,000—219,999									
220,000—229,999									
250,000—259,999									
Number of Respondents	13	32	5	49	45	6	2		102
Average	$53,000	57,000	47,000	43,000	57,000	49,000	49,000		50,000
34. Number of respondents paying for permits:									
Paying	4	14	4	21	18	4	1	n/a	44
Not Paying	11	19	1	34	29	1	1		65
35. Number of respondents who own a boat:									
Own a boat	15	32	5	55	45	6	2	n/a	108
Does not own boat					1				1
36. Number of respondents who have their boat financed:									
Boat financed	8	27	4	37	39	5	2	n/a	83
Boat not financed	7	5	1	18	6	1			25

1) Actual answer multiplied by desired drift gillnet percentage in question 30.

Appendix 4-4. Questionnaire responses of commercial salmon fishermen, drift gill net permit holders, continued.

	Drift Gill Net Permit Only			All Drift Gill Net Permit Holders					
	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Did not fish in 1981	Future Permit Holders	Total
37. The number "1" preferred species to fish for:									
King (chinook)	3	4		7	8			n/a	15
Red (sockeye)	11	27	2	31	33	5	2		71
Dog (chum)				2	2				4
Humpback (pink)				11	1				12
Silver (coho)		2	1	1	3	1			5
38. Number of respondents who take home a portion of their commercial catch for their own use:									
Yes	14	27	3	51	38	4	2	n/a	95
No	1	6	2	4	9	2			15
39. The number "1" preference for personal use:									
King (chinook)	6	14	2	27	21	2		n/a	50
Red (sockeye)	7	16	1	21	21	4			46
Dog (chum)				1					1
Humpback (pink)									
Silver (coho)		2		1	2				3
40. Average number of fish by species taken home for personal use during the 1981 commercial season:[1]									
King (chinook)	2.6	2.4	4.8	3.1	3.2	4.0		n/a	3.1[1]
Red (sockeye)	11.4	16.8	28.0	11.1	16.7	23.3			14.2[1]
Dog (chum)		0.3		0.3	0.5				0.4[1]
Humpback (pink)		1.0		0.2	0.7				0.4[1]
Silver (coho)	10.4	8.5	10.0	6.5	9.3	8.3			7.8[1]
41. The number "1" preferred area for salmon gill netting:									
Bering River		1		8	1			n/a	9
Copper River	8	16	2	32	28	3	2		65
Unakwik									
Coghill	7	15	1	14	16	3			33
Eshamy					1				1

1) Weighted average

Appendix 4-4. Questionnaire responses of commercial salmon fishermen, drift gill net permit holders, continued.

43. Recognizing that hatcheries are in place at Port San Juan, Cannery Creek, Main Bay, Valdez and Perry Island, respondents ranked their number "1" preference for enhancement or rehabilitation work:

	Drift Gill Net Permit Only			All Drift Gill Net Permit Holders					
	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Did not fish in 1981	Future Permit Holders	Total
Bering River		4		3	5		2	n/a	10
Copper River	10	14	1	35	21	5	1		61
Eastern		1		3	2		3		8
Northern				2			4		6
Northwestern									
Southwestern				1					1
Montague				2	1				3
Southeastern					1				1
Unakwik		1			1				1
Coghill	2	7	2	7	8				15
Eshamy		3			4				4

44. The number "1" problem with the commercial salmon fisheries of the region:

Lack of fish	3	9		7	13	2	n/a	2	24
Management of fisheries	3	6	1	7	6	1			14
Lack of enforcement	1			8	2				10
Too much gear	3	5		11	8	1			20
Unstable prices	1	2	1	11	4			15	
Lack of processors	1	3	1	6	3	1			10
Lack of loans		1			1				1
Restrictive regulations		3		1	3	1			5

47. Enhancing and rehabilitating the salmon runs and increasing man's benefits from this resource will require various activities to take place. Respondents indicated their approval (A), disapproval (D), or no opinion (N) concerning the following activities:

	Drift Gill Net Permit Only									All Drift Gill Net Permit Holders																				
	Satisfied with 1981 earnings			Dissatisfied with 1981 earnings			No Opinion about 1981 earnings			Satisfied with 1981 earnings			Dissatisfied with 1981 earnings			No Opinion about 1981 earnings			Did not fish in 1981			Future Permit Holders			Total		
	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N
Construct fish hatcheries	9	1	1	25	6	1	4			43	2	2	38	6	1	5			2			1			89	8	3
Install incubation boxes in or near streams	8		2	31		1	4			42		5	43		2	5			2			1			93		7
Build fish ladders	9		2	27		5	2		1	40		8	40		5	2		1	2			1			85		3
Fertilize lakes	10		1	26	2	4	1		2	44			36	3	6	1		2	2				1		83	3	12
Remove undesirable fish from selected lakes and restock with desirable fish	3	1	5	18	8	7			3	22	6	18	23	9	1			3	2				1		47	16	32
Clear streams of logs and boulders	8		2	27	2	3	2		1	38	3	6	40	2	3	2		1	2			1			83	5	10
Transport fish to barren lakes	7		3	26	4	2	2	1		36	3	8	38	5	2	2	1		2			1			79	9	10
Build roadside viewing areas	1	4	5	5	19	7	1	1	1	7	20	18	5	27	11	1	1	1		2			1		13	51	30
Build access roads	0	6	4	3	6	2	1	2		5	31	9	4	35	4	1	2			2		1			11	70	13
Install boat slips and launching ramps	2	6	2	10	18	3	2	1		16	21	6	14	25	5	2	1			2		1			33	49	11

Appendix 4-5. Questionnaire responses of commercial salmon fishermen, set gill net permit holders, set gill net crew members and drift gill net crew members.

	Set Gill Net		Drift Gill
	Permit Holders	Crew Members	Net Crew Members
24. Number of Respondents:	3	1	3
26. Level of participation in area E Salmon Fisheries and average years experience:			
Salmon seine entry permit holder (number/years)			
Salmon seine crew member (number/years)	1/6.0	1/10	3/5.7
Salmon drift net entry permit holder (number/years)	2/12.5		
Salmon drift net crew member (number/years)		1/2.0	3/3.4
Salmon set net entry permit holder (number/years)	23/6.7	1.20	3.43
Salmon set net crew member (number/years)		1/2.0	1/2.0
27. Desired level of participation in the Area E salmon fisheries:			
Wish to continue in the same capacity	3		1
Wish to change to the following capacity in the future:			
Salmon seine entry permit holder			
Salmon seine crew member			
Salmon drift net entry permit holder			1
Salmon drift net crew member			
Salmon set net entry permit holder			
Salmon set net crew member			
28. Respondents derived the following percentages of their gross 1981 income from the following sources:			
Salmon seining (Area E)			10
Salmon drift gill netting (Area E)	33		14
Salmon set gill netting (Area E)			
Other fisheries in Area E			5
Fisheries in other areas			5
Non-fishing sources	67		66
Total	100		100
29. Number satisfied with breakdown of their 1981 income:			
Satisfied	0	0	0
Dissatisfied	2	1	3
Did not fish in 1981	1		
No opinion			
30. Preferred sources of income: (Question 28 revised):			
Salmon seining (Area E)	10		7
Salmon drift gill netting (Area E)	20	20	25
Salmon set gill netting (Area E)	45	20	7
Other fisheries in Area E			17
Fisheries in other areas		10	2
Non-fishing sources	25	50	42
Total	100	100	100

Appendix 4-5. Questionnaire responses of commercial salmon fishermen, set gill net permit holders, set gill net crew members and drift gill net crew members, continued.

	Set Gill Net		Drift Gill
	Permit Holders	Crew Members	Net Crew Members
31. Number of respondents satisfied with their commercial catch in Area E in 1981:			
Adequate	1		
Not Adequate	2	1	3
No opinion			
32. Number of respondents satified with their earnings from commercial salmon fishing in Area E in 1981:			
Satisfied			
Dissatisfied	3	1	3
No opinion			
33. Average gross earnings from salmon seining needed by Respondent to pay his fishing and living expenses and make a reasonable profit from fishing investments:			
0-$9,999	1		2
10,000-19,000	1	1	1
20,000-29,000			
30,000-39,999	1		
40,000-49,999			
50,000-59,999			
60,000-69,999			
70,000-79,999			
80,000-89,999			
90,000-99,999			
100,000-109,999			
110,000-119,999			
120,000-129,999			
130,000-139,999			
140,000-149,999			
150,000-159,999			
160,000-169,999			
170,000-179,999			
180,000-189,999			
190,000-199,999			
200,000-209,999			
210,000-219,999			
220,000-229,999			
250,000-259,999			
Number of Respondents	3	1	3
Average	$16,000	$10,000	$6,000
34. Number of respondents paying for permit:			
Paying	1	1	1
Not Paying	2		2
35. Number of respondents who own a boat:			
Own a boat	3	1	
Does not own boat			2

Appendix 4-5. Questionnaire responses of commercial salmon fishermen, set gill net permit holders, set gill net crew members and drift gill net crew members, continued.

	Set Gill Net		Drift Gill
	Permit Holders	Crew Members	Net Crew Members
36. Number of respondents who have their boats financed:			
Boat financed	2		
Not financed	1	1	3
37. The number "1" preferred species to fish for:			
King (chinook)		1	2
Red (sockeye)		2	1
Dog (chum)			
Humpback (pink)	1		
Silver (coho)			
38. Number of respondents who take home a portion of their commercial catch for their own use:			
	2	1	3
39. The "1" preferred for personal use:			
King (chinook)			
Red (sockeye)	3		1
Dog (chum)		1	1
Humpback (pink)			1
Silver (coho)			
40. Average number of fish by species taken home for personal use during the 1981 commercial fishing season:			
King (chinook)	1.9		1.7
Red (sockeye)	14.3		6.7
Dog (chum)	0		5.0
Humpback (pink)	0		
Silver (coho)	13.3		8.3
43. Recognizing that hatcheries are in place at Port San Juan, Cannery Creek, Main Bay, Valdez, and Perry Island, which district would the respondent rank as his number "1" preference for enhancement or rehabilitation work.			
Bering River			
Copper River	1		
Eastern			
Northern			1
Northwestern			
Southwestern			
Montague			1
Southeastern			
Unakwik			
Coghill			
Eshamy	2		

Appendix 4-5. Questionnaire responses of commercial salmon fishermen, set gill net permit holders, set gill net crew members and drift gill net crew members, continued.

	Set Gill Net		Drift Gill
	Permit Holders	Crew Members	Net Crew Members

44. The number "1" problem with the commercial salmon fisheries of the region:

Lack of fish	2		
Management of the fisheries			
Lack of enforcement			
Too much gear			
Unstable prices			1
Lack of procesors		1	1
Lack of loans			
Restrictive regulations			

47. Enhancing and rehabilitating the salmon runs and increasing man's benefits from this resource will require various activities to take place. Respondents indicate approval (A), disapproval (D), or have no opinion (N) concerning the following activities.

	Set Gill Net						Drift Gill		
	Permit Holders			Crew Members			Net Crew Members		
	A	D	N	A	D	N	A	D	N
Construct fish hatcheries	3			1			3		
Install incubation boxes in or near streams	2		1	1			3		
Build fish ladders	2		1	1			3		
Fertilize lakes	3			1			3		
Remove undesirable fish from selected lakes and restock with desirable fish	2		1	1			2	1	
Clear streams of logs and boulders	3				1		2	1	
Transport fish to barren lakes	2	1		1			3		
Build roadside viewing areas			3	1			2		1
Build access roads	1	1	1		1		2	1	
Install boat slips and launching ramps	2		1	1			3		

Appendix 4-6. Questionnaire responses of commercial salmon fishermen, seine crew members.

	Seine crew Only[1]			All Seine Crew[2]					
	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Did not fish in 1981	Future Permit Holders	Total
24. Number of respondents:	7	2	0	19	9	1	0	2	31
26. Level of participation in the Area E salmon fisheries and average years of experience:									
Seine entry permit holder (number/years)				1/2.5					1/2.0
Seine crew member (number/years)	7/7.3	2/3.0		18/7.6	9/4.0	1/6.0			28/6.4[3]
Drift net entry permit holder (number/years)				12/4.3	4/3.8				16/4.2[3]
Drift net crew member (number/years)	3/4.3	1/1.0		3/4.3	4/3.5	1/6.0			8/4.1[3]
Set net entry permit holder (number/years)									
Set net crew member (number/years)					1/20				1/20[3]
27. Desired level of participation in the Area E salmon fisheries: Wish to continue in same capacity	2			10	2				12
Wish to change to the following capacity in the future.									
Salmon seine entry permit holder	4	1		11	3	1			15
Salmon seine crew member	2			2	1				3
Salmon drift net entry permit holder	4	2		4	4	1			9
Salmon drift net crew member									
Salmon set net entry permit holder						1			1
Salmon set net crew member									
28. Percentage of gross 1981 income derived from the following sources:									
Salmon seining (Area E)	54	28		54	23	30		n/a	43[3]
Salmon drift gill netting (Area E)				28	17	70			26[3]
Salmon set gill netting (Area E)									
Other fisheries in Area E	1			1	1				1[3]
Fisheries in other areas	11			4	10				6[3]
Non-fishing sources	34	72		13	49				24[3]
Total	100	100		100	100	100			100[3]
29. Number satisfied with breakdown of their 1981 income:									
Satisfied	4	1		11	3	1			15
Dissatisfied	1	1		6	6				12
Did not fish in 1981									
No opinion	1			3					3

1) Participated in the 1981 Area E salmon seine fishery as a seine crew member only.

2) Participated in the 1981 Area E salmon fishery as a seine crew member and in some instances drift permit holder or drift crew member.

3) Weighted average.

Appendix 4-6. Questionnaire responses of commercial salmon fishermen, seine crew members, continued.

	Seine crew Only			All Seine Crew Only					
	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Did not fish in 1981	Future Permit Holders	Total
30. Preferred sources of income (Question 28 revised):									
Salmon seining (Area E)	45	38		43	21	30		50	37[1]
Salmon drift gill netting (Area E)	9	25		39	36	70			36[1]
Salmon set gill netting (Area E)					2			10	1[1]
Other fisheries in Area E	4			1	7				3[1]
Fisheries in other areas	7			3	8			15	5[1]
Non-fishing sources	35	37		14	26			25	18[1]
Total	100	100		100	100			100	100[1]
31. Number of respondents satisfied with their commercial catch in Area E in 1981:									
Adequate	7	1		16	1	1		n/a	18
Not Adequate		1		3	8				11
No opinion									
32. Number of respondents satisfied with their earnings from commercial salmon fishing in Area E in 1981:									
Satisfied	7			19				n/a	19
Dissatisfied		2			9				9
No opinion						1			1
33. Average gross earnings from salmon seining needed by respondent to pay his fishing and living expenses and make a reasonable profit from fishing investments:									
$0—$9,999	1	1		2	3			n/a	5
10,000—19,999	2	1		3	2				5
20,000—29,999	1			3	2	1			6
30,000—39,999				3					3
40,000—49,999	1			2					2
50,000—59,999									
Number of Respondents	5	2		13	7	1			21
Average	$19,000	10,000		24,000	11,000	21,000			17,000
34. Number of respondents paying for permits:									
Paying				8	2	1			11
Not Paying	5	2		9	7				16
35. Number of respondents who own a boat:									
Own a boat	4			16	5	1			22
Does not own a boat	3	1		3	3				6
36. Number of respondents who have their boats financed:									
Boat financed	4			11	3	1			15
Not financed	1			6	3				9

1) Weighted average.

Appendix 4-6. Questionnaire responses of commercial salmon fishermen, seine crew members, continued.

	Seine crew Only			All Seine Crew Only					
	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Did not fish in 1981	Future Permit Holders	Total
37. The number "1" preferred species to fish for:									
King (chinook)	1			2	3				5
Red (sockeye)	1	1		10	4				14
Dog (chum)	3			3					3
Humpback (pink)	2	1		3	1	1			4
Silver (coho)				1	1	1			3
38. Number of respondents who take home a portion of their commercial catch for their own use:	6	2		18	8	1			27
39. The number "1" species preferred for personal use:									
King (chinook)	3			10	3	1			14
Red (sockeye)	3	2		8	4				12
Dog (chum)					1				1
Humpback (pink)									
Silver (coho)									
40. Average number of fish by species taken home for personal use during the 1981 commercial season:									
King (chinook)	1.1			3.4	3.0				3.5[1]
Red (sockeye)	3.4	5.5		9.1	12.0				9.7[1]
Dog (chum)	6.4	2.0		2.4	2.8				2.4[1]
Humpback (pink)	4.6	0.5		1.7	0.1				1.1[1]
Silver (coho)	3.9	1.0		8.6	5.8				7.4[1]
42. The number "1" preferred area for salmon seining:									
Eastern	1			3					3
Northern	2			6	1				7
Northwestern									
Southwestern	3			9	3				12
Montague		1			3				3
Southeastern						1			1
Unakwik									
Coghill									

1) Weighted Average

Appendix 4-6. Questionnaire responses of commercial salmon fishermen, seine crew members, continued.

Seine Crew Only			All Seine Crew					
Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Satisfied with 1981 earnings	Dissatisfied with 1981 earnings	No Opinion about 1981 earnings	Did not fish in 1981	Future Permit Holders	Total

43. Recognizing that hatcheries are in place at Port San Juan, Cannery Creek, Main Bay, Valdez, and Perry Island respondents ranked their number "1" preference for enhancement or rehabilitation work:

Bering River				1	1				2
Copper River	1			11	2	1			14
Eastern	1			1					1
Northern									1
Northwestern									
Southwestern									
Montague	2			2	2				4
Southeastern									
Unakwik									
Coghill				1					1
Eshamy									

44. The number "1" problems with the commercial salmon fisheries of the region:

Lack of fish									6
Management of the fisheries									1
Lack of enforcement									3
Too much gear									3
Unstable prices									10
Lack of processors									3
Lack of loans									
Restrictive regulations									

Appendix 4-6. Questionnaire responses of commercial salmon fishermen, seine crew members.

47. Enhancing and rehabilitating the salmon runs and increasing man's benefits from this resource will require various activities to take place. Respondents indicated their approval (A), disapproval (D), or no opinion (N) concerning the following activities:

	Seine crew only									All seine crew																
	Satisfied with 1981 earnings			Dissatisfied with 1981 earnings			No Opinion about 1981 earnings			Satisfied with 1981 earnings			Dissatisfied with 1981 earnings			No Opinion about 1981 earnings			Did not fish in 1981			Future Permit Holders			Total		
	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N
Construct fish hatcheries	7			1						18			8			1						2			19		
Install incubation boxes in or near streams	6		1	1						16		2	7		1	1						2			26		3
Build fish ladders	7			1						16		2	8			1						2			7		2
Fertilize lakes	4	1	2	1			13	1	4	7		1	1						2						26	1	5
Remove undersirable fish from selected lakes and restock with desirable fish	0	4	3	1						6	6	6	6	1	2	1						2			15	7	8
Clear streams of logs and boulders	6	1		1						16	1	1	7	1	0	1						2			26	2	1
Transport fish to barren lakes	5	2	0	1						14	2	2	8			1						2			25	2	2
Build roadside viewing areas	1	4	2	0	0	1				3	10	4	2	3	3	0	1	0				3			7	14	7
Build access roads	1	5	1	0	0	1				2	13	2	2	5	1	0	1	0				1	1	0	5	20	3
Install boat slips and launching ramps	4	2	1	1						7	7	2	5	2	0	1						1	1	0	14	10	2

Appendix 4-7. Questionnaire responses of subsistence salmon fishermen, dip net and fishwheel.

	Dip Net Fishermen				Fishwheel Fishermen				
	Satisfied with 1981 catch	No opinion about 1981 catch	Dissatisfied with 1981 catch	Total	Satisfied with 1981 catch	No opinion about 1981 catch	Dissatisfied with 1981 catch	Total	Total this page
Number of respondents:	157	15	184	356	36	5	17	58	414
16. Type of fishing gear used by respondents:									
Dip net	157	15	184	356					356
Fishwheel					36	5	17		58
17. The number "1" preference for personal use:									
King (chinook)	47	2	62	111	8	2	7	17	128
Red (sockeye)	101	12	103	216	26	2	11	39	245
Dog (chum)									0
Humpback (pink)	3		1	4					4
Silver (coho)	13		18	31		1	1	2	33
18. Average number of salmon caught by respondent and family:									
King (chinook)	1.6	5.2	0.8	1.3[1]	3.5	4.6	1.3	2.9[1]	2.2[1]
Red (sockeye)	19.2	18.5	9.8	14.3[1]	39.8	76.6	27.5	39.4[1]	17.8[1]
Dog (chum)		2.0							0.1[1]
Humpback (pink)	0.2	2.7	0.3	0.3[1]					0.3[1]
Silver (coho)	1.8	1.3	0.8	1.3[1]	4.6		0.3	2.9[1]	1.5[1]
Did not fish in 1981									
19. Was this adequate for respondents own use:									
Adequate	157			157	36			36	193
Not Adequate			184	184			17	17	201
No opinion		15		15		5		5	20
20. Area where respondent fished in 1981:									
Upper Copper River	103	13	122	238	31	5	12	48	286
Copper River Flats	27[2]		40[2]	67[2]	4[2]	1[2]	3[2]	8[2]	75[2]
21. Respondent's preferred location to fish:.									
Upper Copper River	97	12	108	217	29	5	13	47	264
Copper River Flats	27	2	41	70	2	0	2	4	74
Bering River District									
Unakwik District									
Coghill District			2	2					2
Eshamy district									
Other									
22. Number of salmon respondent and family need per year (average):	31	40[1]	47	40[1]	43	250	216	111[1]	50[1]

1) Weighted average.

2) Assumed that these people actually meant upper Copper River.

1) Weighted average.

2) Assumed that these people actually meant upper Copper River.

Appendix 4-7. Questionnaire responses of subsistence salmon fishermen, dip net and fishwheel, continued.

	Dip Net Fishermen				Fishwheel Fishermen				
	Satisfied with 1981 catch	No opinion about 1981 catch	Dissatisfied with 1981 catch	Total	Satisified with 1981 catch	No opinion about 1981 catch	Dissatisfied with 1981 catch	Total	Total this page
23. The number "1" problem with the salmon subsistence fisheries of the region:.									
Lack of fish	6	1	29	36	5	1	2	8	44
Management of the fisheries	9	1	8	18	3			3	21
Lack of enforcement	10	1	7	18	2		1	3	21
Overcrowded fishing areas	29	4	32	65	3		2	5	70
Lack of access	13	1	27	41	6	1	2	9	49
Lack of campgrounds	13	1	5	19					19
Inadequate campgrounds	6	2	6	14			2	2	16
Too many other fishermen	3	1	2	6	4			4	10
Restrictive regulations	16	3	32	51	2	1	2	5	56
Lack of open areas	28	1	15	44	3	2		5	49

47. Enhancing and rehabilitating the salmon runs and increasing man's benefits from this resource will require various activities to take place. Respondents indicated their approval (A), disapproval (D), or no opinion (N) concerning the following activities.

	Dip Net Fishermen									Fishwheel Fishermen									Total this Page		
	Satisfied with 1981 catch			No opinion about 1981 catch			Dissatisfied with 1981 catch			Satisified with 1981 catch			No opinion about 1981 catch			Dissatisfied with 1981 catch					
	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N
Construct fish hatcheries	128	6	11	9	0	1	147	14	6	30	3	2	3	0	2	12	0	1	329	23	23
Install incubation boxes in or near streams	89	9	35	7	0	3	121	6	36	27	1	3	2	2	1	9	0	3	255	18	81
Build fish ladders	104	8	28	6	1	3	132	8	25	24	3	6	4	1	0	9	0	3	279	21	66
Fertilize lakes	92	12	31	6	1	4	103	21	40	19	4	10	4	0	1	8	1	2	232	39	88
Remove undesirable fish from selected lakes and restock with desirable fish	67	47	22	4	5	2	90	42	29	22	9	4	2	1	2	5	4	2	190	107	61
Clear streams of logs and boulders	38	70	29	1	7	3	66	66	33	16	7	10	2	3	0	6	1	4	129	154	79
Transport fish to barren lakes	108	15	13	9	0	2	131	17	19	31	1	1	4	1	0	11	0	1	294	34	36
Build roadside viewing areas	63	44	33	5	4	3	78	35	46	7	12	11	2	2	1	4	5	3	156	102	97
Build access roads	85	40	15	6	3	2	119	32	14	16	14	3	2	1	2	7	2	2	235	92	38
Install boat slips and launching ramps	71	34	31	2	2	7	99	29	32	11	10	10	1	3	0	8	2	2	192	80	82

Appendix 4-8. Questionnaire responses of subsistence salmon fishermen, other and multiple gear types.

	Other Gear Types			Multiple Gear Types					
	Satisfied with 1981 catch	No opinion about 1981 catch	Dissatisfied with 1981 catch	Satisfied with 1981 catch	No Opinion about 1981 catch	Dissatisfied with 1981 catch	Have subsistence fished in the region but not in 1981	Have never subsistence fished in the region but would like to	Total
15. Number of respondents:	8	2	3	6	0	12	26	31	88
16. Type of fishing gear used by respondent:									
Dip net				5		12	22	12	51
Fishwheel				6		12	2		20
Drift gill net	6	2	3				3	10	24
Set gill net	1			1		3	2	3	10
Purse siene								1	1
17. The number "1" preference for personal use:									
King (chinook)	5	1	2	1		2	8	7	26
Red (sockeye)	3	1	1	5		7	15	13	45
Dog (chum)						1			1
Humpback (pink)									
Silver (coho)						2	2	7	11
18. Number of subsistence salmon caught by respondent or his family in this region in 1981:									
King (chinook)	4.2		3.0	6.0		3.3	n/a	n/a	
Red (sockeye)	20.2		13.3	68.7		20.3			
Dog (chum)				3.3					
Humpback (pink)						3.0			
Silver (coho)	8.1					1.6			
Did not fish in 1981									
19. Was this adequate?									
Adequate	8			6			n/a	n/a	14
Not Adequate			3			12			15
No opinion		2							2
20. Where Respondent s fished:									
Upper Copper River	1			6		9	n/a	n/a	16
Copper River Flats	5		3			2			10
Bering River District									
Unakwik District									
Coghill District	1								1
Eshamy District									
Other	1					3			4
21. Respondent's preferred fishing location:									
Upper Copper River				5		8	15	n/a	13
Copper River Flats	5	2	2			4	4		17
Bering River District									
Unakwik District							1		1
Coghill District			1				1		2
Eshamy District							1		1
Other									

Appendix 4-8. Questionnaire responses of subsistence salmon fishermen, other and multiple gear types, continued.

	Other Gear Types			Multiple Gear Types					
	Satisfied with 1981 catch	No opinion about 1981 catch	Dissatisfied with 1981 catch	Satisfied with 1981 catch	No Opinion about 1981 catch	Dissatisfied with 1981 catch	Have subsistence fished in the region but not in 1981	Have never subsistence fished in the region but would like to	Total
22. Number of salmon respondent and his family need per year (average)	46	32	40	74		126	37	50	57[1]
23. The number "1" problem with the salmon subsistence fisheries of the region:									
Lack of fish	1			1		2	3	n/a	7
Management of the fisheries	1						2		3
Lack of enforcement	2						1		3
Overcrowded fishing areas	1		1	1		2	3		8
Lack of access				1		1	2		4
Lack of campgrounds							1		1
Inadequate campgrounds	1						1		2
Too many other fishermen	1			1			1		3
Restrictive regulations	1		1			6	3		11
Lack of open areas				1			3		4

47. Enhancing and rehabilitating the salmon runs and increasing man's benefits from this resource will require various activities to take place. Respondents indicated their approval (A), disapproval (D), or no opinion (N) concerning the following activities:

	Other Gear Types									Multiple Gear Types						Have subsistence fished in the region but not in 1981			Have never subsistence fished in the region but would like to			Total this page		
	Satisfied with 1981 earnings			No Opinion with 1981 earnings			Dissatisfied about 1981 earnings			Satisfied with 1981 earnings			No Opinion about 1981 earnings			Dissatisfied with 1981 earnings									
	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N
Construct fish hatcheries	6	1	1	2			3			2	1					10		1	21	1	1	23	2	3	67	3	3
Install incubation boxes in or near streams	6		1	2			3			4						9		2	20		3	23	1	5	67		10
Build fish ladders	7		1	2			3			3						8	1	2	20		2	23	3	2	66	4	7
Fertlize lakes	6		1			2	3			5						6		5	16	1	6	21	1	6	57	2	20
Remove undersirable fish from selected lakes and restock with desirable fish	5		2	1		1	1	2		2	1					8	3		11	6	6	13	11	3	41	23	12
Clear streams of logs and boulders	7		1	1	1		3			3	1					4	4	3	12	4	4	15	8	3	45	18	11
Transport fish to barren lakes	7		1	2			3			4						10		1	21	1		27	1	1	74	2	3
Build roadside viewing areas	2	1	4		2		2	1		3		1				5	3	3	11	8	3	13	9	5	36	24	16
Build access roads	2	4	1		2		1	2		3						6	3	2	16	6	1	11	13	2	39	30	6
Install boat slips and launching ramps	3	2	2	1	1		2	1		2	1	1				9	2	0	14	5	4	16	8	3	47	20	10

1) Weighted average.

Appendix 4-9. Questionnaire responses of sport salmon fishermen.

	Sport fished in the region in 1981			Have sport fished in the region but not in 1981	Have never sport fished in the region but would like to	Total
	Satisfied with 1981 catch	No opinion about 1981 catch	Dissatisfied with 1981 catch			
1. Number of Respondents:	169	47	180	137	75	608
2. Areas in which respondents have sport fished for salmon:						
Valdez Bay	64	15	97	56		232
Passage Canal (Whittier)	32	7	37	50		126
Orca Inlet	31	5	11	14		61
Simpson Bay	9	1		2		12
Hinchinbrook Island waters	6		2	2		10
Other Marine Waters	34	11	39	13		97
Gulkana River	84	19	58	86		247
Eyak River	36	6	8	13		63
Coghill River	25	1	15	8		49
Eshamy Creek	14	4	10	10		38
Eshamy Lake	10	3	6	7		26
Shrode Creek	5	1	4	3		13
Shrode Lake	5	0	5	3		13
Klutina River	7	9	1	11		28
Little Tonsina River	5	4	2	4		15
Mendeltna Creek - Tazlina River	5	3	1	1		10
Other 42 locations						67
3. Areas in which respondents thought their daily catch of salmon to be too low:						
Valdez Bay	20	4	48	25		97
Passage Canal (Whittier)	11	3	23	16		53
Orca Inlet	6		6	5		17
Simpson Bay	1					1
Hinchinbrook Island Waters						
Other Marine Waters	1		2	1		4
Gulkana River	40	4	78	33		155
Eyak River	6		7	5		18
Coghill River	4	1	12	2		19
Eshamy Creek	6	1	6	3		16
Eshamy Lake	2		5	2		9
Shrode Creek		1	5			6
Schrode Lake			4	2		6
Kluthina River			5	1		6
Little Tonsina River			1			1
Mendeltna Creek-Tazlina River						
Other	3		5	3		11
4. Average number of years respondents have sport fished in the region.	9.0[1]	6.5[1]	8.1[1]	9.0[1]		8.5[1]

1) Weighted average.

Appendix 4-9. Questionnaire responses of sport salmon fishermen, continued.

	Sport fished in the region in 1981			Have sport fished in the region but not in 1981	Have never sport fished in the region but would like to	Total
	Satisfied with 1981 catch	No opinion about 1981 catch	Dissatisfied with 1981 catch			
5. Respondents ranked the following methods of salmon sport fishing their first perference.						
Casting from a boat	38	10	53	34	13	148
Trolling	19	5	23	24	12	83
Drift fishing in a boat	16	2	17	11	6	52
Fishing from shore or wading	84	26	80	63	22	275
Ice fishing for land-locked salmon	5	2	2	2	2	13
Snagging in marine waters	1	3	4	5	1	14
6. Respondents ranked the following aspects about salmon sport fishing as their most important aspect.						
Scenery	16	6	7	9	6	44
Catching your limit	22	3	22	18	6	71
Fishing by yourself	7	3	4	3	3	20
Boating	2	1	3	1	1	8
Peace and quiet	17	5	13	19	11	65
Fishing with your friends	35	5	19	21	6	86
Eating your catch	26	11	47	36	10	130
Hooking, playing and landing the fish	60	13	64	62	25	224
7. Respondents ranked the following areas as their favorite salmon fishing areas (in view of their answers to Question 6.)						
Valdez Bay	27		41	30	n/a	98
Passage Canal (Whittier)	7	2	15	8		32
Orca Inlet	5		3	4		12
Simpson Bay	2	10		1		13
Hinchinbrook Island waters	2	2				4
Gulkana River	47	10	62	53		172
Eyak River	24	2	1	5		32
Coghill River	8		2	2		12
Eshamy Creek	1		1	6		8
Eshamy Lake	1					1
Shrode Creek			1			1
Klutina River	2			2		4
Little Tonsina River			2			2
Mendeltna Creek-Tazlina River			1			1
No opinion	21	26	27	19		93
8. Respondents ranked the following species salmon as their number "1" preference to fish for:						
King (chinook)	71	15	103	61	27	227
Red (sockeye)	38	10	44	36	12	140
Dog (chum)	1					1
Humpback (pink)	1			1		2
Silver (coho)	58	11	29	39	16	153

Appendix 4-9. Questionnaire responses of sport salmon fishermen, continued.

	Sport fished in the region in 1981			Have sport fished in the region but not in 1981	Have never sport fished in the region but would like to	Total
	Satisfied with 1981 catch	No opinion about 1981 catch	Dissatisfied with 1981 catch			
9. Respondents in 1981 caught the following average number of salmon on sport gear in the region:						
King (chinook)	1.2	.6	0.9			1.0[1]
Red (sockeye)	3.6	1.4	2.3			2.7[1]
Dog (chum)	1.2	0	.4			.7[1]
Humpback (pink)	2.4	1.8	1.7			2.0[1]
Silver (coho)	4.0	2.2	3.2			3.4[1]
Did not fish in the region in 1981				137	75	212
10. Number of respondent who felt that their 1981 sport salmon catch in the region was adequate:						
Adquate	169					169
Not adequate			180			180
No opinion		47		137	75	259
11. Number of respondents who need to catch their daily limit to feel satisfied:						
Limit	22	2	52	16	6	98
No Limit	139	27	123	108	39	436
No opinion	8	18	5	13	30	74
12. Average catch of salmon needed by respondents to achieve satisfaction:						
King (chinook)	2.8	3.2	6.3	3.1	2.8	3.9[1]
Red (sockeye)	8.9	17.2	13.1	8.9	6.2	10.4[1]
Dog (chum)	2.0	.1	3.2	1.2	.7	1.9[1]
Humpback (pink)	3.0	1.2	2.9	2.2	2.3	2.6[1]
Silver (coho)	7.1	4.1	11.1	9.5	7.3	8.6[1]
13. Species of salmon needing enhancement:						
King (chinook)	157	14	131	87	n/a	389
Red (sockeye)	96	16	73	61		246
Dog (chum)	14	2	11	9		36
Humpback (pink)	11	1	18	9		39
Silver (coho)	96	14	91	63		264
14. The number "1" problem with the salmon sport fisheries of the region:						
Lack of fish	18	6	33	18	n/a	75
Management of the fisheries	12	3	14	10		39
Lack of enforcement	29	1	10	10		50
Overcrowded fishing areas	30	7	39	29		105
Lack of access	22	6	28	26		82
Lack of campgrounds	8	4	6	8		26
Inadequate campgrounds	4	1	5	4		14
Lack of boat slips	2		5	3		10
Restrictive regulations	17	2	29	18		66

1) Weighted average.

Appendix 4-9. Questionnaire responses of sport salmon fishermen, continued.

47. Enhancing and rehabilitating the salmon runs and increasing man's benefits from this resource will require various activities to take place. Respondents indicate approval (A), disapproval (D), or have no opinion (N) concerning the following activities:

	Sport fished in the region in 1981									Have sport fished in the region but not in 1981			Have never sport fished in the region but would like to			Total		
	Satisfied with 1981 catch			No opinion about 1981 catch			Dissatisfied with 1981 catch											
	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N
Construct fish hatcheries	130	14	10	35	4	2	150	8	9	114	8	7	52	7	8	481	37	36
Install incubation boxes in or near streams	123	7	23	34	1	5	131	3	27	94	5	29	40	5	19	422	21	103
Build fish ladders	129	12	16	36	0	5	129	11	22	108	5	15	51	3	10	453	31	68
Fertilize lakes	105	11	36	32	3	6	120	8	34	82	12	31	41	8	16	380	42	123
Remove undersirable fish from selected lakes and restock with desirable fish	81	51	23	18	12	11	94	38	29	75	28	22	34	19	12	302	148	97
Clear streams of logs and boulders	74	50	26	25	12	5	68	68	28	60	42	24	22	29	11	249	201	94
Transport fish to barren lakes	130	13	11	33	2	7	139	6	18	99	15	14	55	5	4	456	41	54
Build roadside viewing areas	68	52	32	14	9	17	84	38	36	58	32	38	30	16	18	254	147	141
Build access roads	75	6	10	21	14	16	118	35	14	71	36	19	46	16	5	331	167	54
Install boat slips and launching ramps	75	52	25	23	10	6	111	24	27	68	28	29	37	15	10	314	129	97

Appendix 5-1. Summary of projected commercial harvests of natural and supplemental stocks, minimum income demands and gaps, 2002.[1]

	King	Sockeye	Coho	Pink	Chum	Total
Seine Fishery						
Natural harvests	1,300	47,900	15,800	4,759,000	447,500	
Supplemental harvests	0	20,300	11,000	4,882,600	333,000	
Total	1,300	68,200	26,800	9,641,600	780,500	
Average wt (lbs) (1972-81)	12.7	7.4	8.2	4.0	8.7	
Average Price ($) (1981)[2]	1.65	1.40	0.44	0.44	0.5	
Total Exvessel Revenues ($)	27,242	706,552	96,694	16,969,216	3,395,175	21,194,879
Total Demand ($)						32,940,000
Gap ($)						11,745,121
Drift gill net fishery						
Natural harvests	16,800	759,200	217,900	216,500	91,100	
Supplemental harvests	0	33,000	0	122,000	542,000	
Total	16,800	792,200	217,900	338,500	633,100	
Average wt (lbs) (1972-81)	28.9	6.7	9.6	4.5	7.2	
Average Price ($) (1981)[2]	1.65	1.40	0.95	0.44	0.50	
Total Exvessel Revenues ($)	801,108	7,430,836	1,987,248	670,230	2,278,800	13,168,222
Total Demand ($)						27,050,000
Gap ($)						13,881,778
Set gill net fishery						
Natural harvest	6	8,500	100	12,700	2,900	
Supplemental harvests	0	0	0	0	180,000	
Total	6	8,500	100	12,700	182,900	
Average wt (lbs) (1972-81)	12.7	7.4	8.2	4.0	8.7	
Average Price ($) (1981)[2]	1.65	1.40	0.44	0.44	0.50	
Total Exvessel Revenues ($)	0	88,060	361	22,352	795,615	906,338
Total Demand ($)						480,000
Gap ($)						+426,388

1) These data do not include seine and drift gill net caught personal take home fish worth approximately $115,000 and $116,000, respectively.

2) It is assumed that prices will remain relatively constant in 1981 dollars.

Appendix 5-2 Summary of Subsistence demands, probable harvests and gaps, 2002.

	King	Sockeye	Coho	Total
Narural Harvests	1,700	25,100	400	
Supplemental Harvests		2,700		
Total	1,700	27,800	400	29,900
Minimum demands				
Dip net fisherman				116,000
Fishwheel fisherman				35,900
Gill net fisherman				3,900
Total				155,800
Gap				125,900

Appendix Table 5-3. Summary of sport fishery demands, probable harvests and gaps, 2002.

	King	Sockeye	Coho	Pink	Chum	Total
Minimum Demand 2002	8,600	25,700	28,600	17,200	8,600	88,700
High Demand 2002	27,900	74,400	61,500	18,600	13,600	196,000
Natural Production	2,800	6,300	11,900	18,600	1,500	41,100
Supplemental Production	1,500	5,500	5,000	0	0	12,000
Total	4,300	11,800	16,900	18,600	1,500	53,100
Gap Minimum	4,300	13,900	11,700	0	7,100	37,000
High	23,600	62,600	44,600	0	12,100	142,900

Appendix 7-1. Potential salmon hatchery sites in Prince William Sound.*

Eastern District

Stream 36 Sheep River, unnamed lakes, Sheep Bay: Eyak Corporation selection, conveyance pending.

Stream 100 Creek and lake unnamed, Boulder Bay, Tatitlek Narrows: Tatitlek Corporation selection, conveyance pending.

Northern District

Stream 202 Chuck's Creek, unnamed lake, Columbia Bay: Tatitlek Corporation selection, conveyance pending.

Stream 203 Unnamed creek and unnamed lake, Columbia Bay: Tatitlek Corporation selection, conveyance pending.

Stream 231 Unnamed creek, Island Lake, Cedar Bay: National Forest land.

Stream 285 Cascade Creek, unnamed lakes, Eaglek Bay: National Forest land. This is a high potential site and is currently under investigation.

Stream 289 Derickson Creek, unnamed lakes, Eaglek Bay: National Forest land.

Stream unnumbered and unnamed, South Bay, Perry Island: National Forest Land. Existing hatchery (NERKA).

Coghill District

Stream 311 Golden River, Davis Lake: National Forest land.

Stream 336 Esther River, Esther Lake, Esther Island: State and National Forest land. High potential hatchery site, currently in design and permitting process (PWSAC).

Northwestern District

Streams and lakes unnumbered and unnamed, east shore of McClure Bay, Port Nellie Juan: National Forest Land.

Stream 427 Unnamed creek and lake, Pirate Cove, Port Wells: National Forest land.

Stream 476 Shrode River, Jack Lake, Culross Passage: National Forest land. Lower lake in system, Shrode Lake, is serviced by a fish pass. Jack Lake, the largest lake in the system is blocked to migration by a 25 ft. waterfall a short distance above Shrode Lake.

Stream 480 Mink Creek, unnamed lake, Mink Harbor, Port Nellie Juan: National Forest land.

Stream 481 Unnamed creeek and unnaked lakes, Port Nellie Juan: National Forest land. Five lakes are contained within this watershed.

Eshamy District

Stream 501 Tiedeman Creek, unnamed lake, Foul Bay: National Forest land.

Stream 505 Hana Creek, Falls Lake, Falls Bay: National Forest land.

Southwestern District

Stream 603 Ewan Creek, Ewan Lake, Ewan Bay, Dangerous Passage: Chenega Corporation selection, conveyance pending.

Stream 617 Princeton Creek, unnamed lake, Icy Bay.

Stream 621 Totemoff Creek, unnamed lake, Chenega Island, Dangerous Passage: Chenega Corporation selection, conveyance pending.

Stream 628 Chenega Creek, unnamed lake, Chenega Island: Chenega Corporation selection, conveyance pending.

Stream and lake unnumbered and unnamed, west shore of Marsha Bay, Knight Island: National Forest land and Chugach Regional Corporation selection land, conveyance pending.

Appendix 7-2. Potential lake stocking sites.

The following is a list of lakes that are potential candidates for stocking. Several lakes are also candidates for fertilization and various outlet streams are potential candidates for fish pass construction, stream improvement and/or clearance. Some lakes have insurmountable barriers, and, subsequently, in these systems it will not be possible to establish populations capable of sustaining themselves. Fry will have to be implanted periodically. The rate of plankton regeneration will determine if stocking can be conducted annually or only every two or more years. Fertilization may be beneficial in some instances, thereby, allowing for annual fry introductions.

Eastern District

Stream 114 Turner Creek, Turner Lake, Galena Bay. Tatitlek Corporation land, conveyance pending.

Stream 115 Millard Creek, Millard Lake, Galena Bay. Tatitlek Corporation land, conveyance pending.

Northern District

Stream 202 Chuck's Creek, unnamed lake, Columbia Bay: Tatitlek Corporation land, conveyance pending. A large lake system is completely blocked to salmon by falls at the stream mouth. Ample spawning and rearing habitat for salmon is available.

*Listings in Appendix 7-1 through 7-6 have been adapted from Anonymous (1975), Nickerson (1978), Holbrook (personal communication), and Sanner (personal communication).

Stream 205 Unnamed creek, Columbia Lake, Columbia Bay: Tatitlek Corporation land, conveyance pending. A barrier falls at the lake outlet prevents salmon from utilizing this glacial lake.

Stream 219 Gravel Creek, unnamed lake, Long Bay: National Forest land.

Stream 228 Unnamed creek and lake, Cedar Bay. National Forest land.

Stream 282 and 283 Eaglek Bay: Odd year pink salmon could be enhanced with fry incubated at Cannery Creek Hatchery.

Stream 289 Derickson Creek, unnamed lakes, Derickson Bay, Eaglek Bay: National Forest land. An 11-ft. falls at tide water blocks access to an excellent upper watershed containing two lakes.

Coghill District

Stream 311 Golden River, Davis Lake, Port Wells: National Forest land. Maintenance stocking of salmon fry.

Stream 329 Pass Creek, Pass Lake, Esther Island, Port Wells: National Forest land. Maintenance stocking of salmon fry.

Stream 331 and 332 Unnamed creeks and lakes, Granite Bay, Esther Island: National Forest land.

Stream 344 Unnamed creek and lake, Shoestring Bay, Esther Island: National Forest land.

Stream 345 Unnamed creek and lake, Esther Island: National Forest land.

Northwestern District

Stream 427 Chasm Creek, unnamed lake, Pirate Cove, Port Wells: National Forest land. A major lake system is blocked by a series of falls near the tidal zone. This drainage system has a very large upper watershed and is recommended for maintenance stocking of salmon fry.

Stream 428 Unnamed creek and lake, Pirate Cove: National Forest land. Maintenance stocking of salmon fry.

Stream 436 Poe Creek, Poe Bay, Passage Canal: National Forest land. Maintenance stocking of salmon smolt.

Stream 438 Billings Creek, Passage Canal: National Forest land. Maintenance stocking of salmon smolt.

Stream 444, 445 and 446 Unnamed creeks, Shotgun Cove, Passage Canal: National Forest land. Maintenance stocking of salmon smolt.

Stream 452 and 453 Unnamed creeks, Surprise Cove lakes, Cochrane Bay: National Forest land. Maintenance stocking of salmon fry in lake at head of Stream 452. Fishpass on Stream 453 and two years of fry stocking to establish a run.

Stream 453a and 454 Unnamed creeks and lakes, Cochrane Bay: National Forest land.

Stream 459 Rainy Creek, unnamed lake, Cochrane Bay: National Forest land. A lake-fed fork of this stream is blocked to salmon by a falls.

Stream 466 Unnamed creek and lake, Cochrane Bay: National Forest land. This lake-fed system is blocked by falls near the mouth.

Stream 476 Shrode River: Shrode and Jack lakes, Culross Passage: National Forest land. A fish pass has been constructed at the downstream end of the system. Jack Lake is still blocked to salmon a short distance above Shrode Lake by a large waterfall.

Stream 478a Huckleberry Creek, Huckleberry Lake, Culross Island: National Forest land. Maintenance stocking of salmon fry in a deep, clearwater lake.

Stream 479 Culross Creek, unnamed lake, Culross Passage: National Forest land. Falls near tidewater block this system to salmon.

Stream 480 Mink Creek, unnamed lake, Mink Harbor, Port Nellie Juan: National Forest land. The lake-fed watershed upstream of a barrier may be suitable salmon habitat.

Stream 481 Unnamed creek and lakes, west of Mink Island, Port Nellie Juan: National Forest land. A chain of five lakes is blocked to salmon by small falls in the tidal zone.

Stream 491 Unnamed creek and lake, Deep Water Bay, Port Nellie Juan: National Forest land.

Stream 492 Unnamed creek and lake, McClure Bay, Port Nellie Juan: National Forest land. The stream appears to be suitable for salmon.

Stream 498 McClure Creek, unnamed lake, McClure Bay, Port Nellie Juan: National Forest land.

Stream and lake unnumbered and unnamed, south shore of Hidden Bay, Culross Island: National Forest land.

Stream and lake unnumbered and unnamed, Perry Passage, north of Hidden Bay: National Forest land.

Eshamy District

Stream 500 Unnamed creek and lake, Point Nellie Juan: National Forest land.

Stream 501 Tiedeman Creek, unnamed lake, Foul Bay: National Forest land.

Stream 505 Hanna Creek, Falls Lake, Falls Bay: National Forest land. The system has two large lakes that are completely blocked by a large series of falls at tidewater.

Stream 511 Eshamy Creek, Eshamy Lake, Eshamy Bay: Chenega Corporation land, conveyance pending. This is a lake fertilization candidate.

Southwestern District

Stream 603 Ewan Creek, Ewan Lake, Dangerous Passage: Chenega Corporation land, conveyance pending. Falls halfway to lake block more than half of the system to use by salmon. A fish pass could be erected to help establish sockeye or coho salmon runs, or water from the lake could be used to serve a salmon hatchery.

Stream 610 Kompkoff River, unnamed lake, Jackpot Bay: Chenega Corporation land, conveyance pending. Barrier falls prevent salmon from reaching most of the watershed. A small pink salmon run could be enhanced and a coho salmon run could be established.

Stream 617 Princeton Creek, unnamed lake, Icy Bay: National Forest land.

Stream 638 Unnamed creek and lake, Bainbridge Passage :National Forest land.

Stream 655 Unnamed creek and lake, Bainbridge Island: National Forest land.

Stream 687 Sockeye Creek, unnamed lake, Bay of Isles, Knight Island: National Forest land. A fish pass providing access to a 55 acre lake was completed in 1982.

Stream 688 Otter Creek, unnamed lake, Bay of Isles, Knight Island: National Forest land. A fish pass providing access to a 58 acre lake was completed in 1982.

Stream 689 Unnamed creek and lake, Louis Bay, Knight Island: National Forest land.

Stream 690 Unnamed creek, Solf Lake, Knight Island: National Forest land. This lake formerly was utilized by sockeye salmon until the outlet stream changed course and began to flow over impassable falls after the 1964 earthquake. Gabions and deflectors have been installed by USFS to divert the stream into a favorable channel. Restocking with sockeye salmon is desirable.

Stream and lake unnumbered and unnamed, west shore Marsha Bay, Knight Island: National Forest land and Chugach Regional Corporation land, conveyance pending.

Montague District

Stream 700 San Juan Creek, San Juan Lake: National Forest land. The lake in this sockeye salmon system dewatered as a result of a 32 ft. uplift caused by the 1964 earthquake. A dam with a fish pass could re-establish rearing area and create access.

Stream 759 Rocky Creek, unnamed lake, Rocky Bay: National Forest land. Falls prevent salmon from reaching an upper lake.

Southeastern District

Stream 844 Makarka Creek, Hawkins Island: National Forest land. A fish pass could allow salmon access to a lake system.

Stream 841-1 Unnamed creek and lake, Boswell Bay, Hinchinbrook Island: National Forest land. An 83 acre lake was opened to sockeye salmon with a fish pass in 1981. Stocking of sockeye salmon is desirable.

Stream 852 Forest Service Trail Creek, unnamed lake, Hawkins Island: Eyak Corporation land (?), conveyance pending. A fish pass installed in 1980 allows salmon access to an 83 acre lake. Stocking of lake with salmon may be desirable.

Stream 867 Trail Creek, unnamed lake Orca Inlet, Hawkins Island: National Forest land and Eyak Corporation land (?), conveyance pending.

Appendix 7-3. Potential stream stocking sites.

Northern District

Stream 282 and 283 Eaglek Bay: Odd year pink salmon could be enhanced with fry incubated at Cannery Creek Hatchery.

Northwestern District

Stream 436 Poe Creek, Poe Bay, Passage Canal: King salmon smolt. Maintenance stocking of king salmon smolt.

Stream 427 and 428 Pirate Cove, Port Wells: Maintenance stocking of coho salmon smolt.

Stream 438 Billings Creek, Passage Canal: Maintenance stocking of coho smolt.

Stream 444, 445 and 446 Shotgun Cove, Passage Canal: Maintenance stocking of coho salmon smolt.

Montague District

The 1964 earthquake caused numerous streams to be depleted of chum salmon. It may be feasible to reestablish chum salmon by stocking fry in the following streams:Stream 701 Trap Creek, Stream 702 Point Creek, Stream 707 McCleod Creek, Stream 710 Hanning Creek, Stream 711 Quadra Creek, Stream 739 Swamp Creek, Stream 741 Chalmers River, Stream 745 Wild Creek, Stream 746 Schuman Creek, Stream 747 Cabin Creek, Stream 770 Udall Creek, and Stream 775 Pautzke Creek.

Appendix 7-4. Potential fish pass sites.

Eastern District

Stream 38 Waterfall Stream, Sheep Bay: Eyak Corporation selection, conveyance pending. A small run of pink salmon that spawn below a falls near the high tide level could be enhanced by the installation of a fish pass and drop structures.

Stream 54 Carlsen Creek, Port Gravina: Eyak Corporation selection, conveyance pending. Small falls block most of the watershed to salmon.

Stream 119 Johnson Cove Creek, Valdez Arm: Tatitlek Corporation selection, conveyance pending.

Stream 123 Gregorioff Creek, Jack Bay: State selection and/or National Forest land. Falls are 2 to 3 ft. in height. The upstream habitat is of marginal quality.

Northern District

Stream 202 Chuck's Creek, unnamed lake, Columbia Bay: Tatitlek Corporation selection, conveyance pending. A large lake system is completely blocked to salmon by falls at the stream mouth. Ample spawning and rearing habitat for salmon could be made available.

Stream 205 Unnamed creek, Columbia Lake, Columbia Bay: Tatitlek Corporation selection, conveyance pending. A barrier falls at the lake outlet prevents salmon from utilizing this glacial lake.

Stream 219 Gravel Creek, Long Bay: National Forest land. A 6 ft. falls near tidewater prevents sockeye salmon from migrating upstreams during low water periods. This project is considered to be of marginal benefit.

Stream 231 Unnamed Creek, Cedar Bay: National Forest land. A 40 acre-lake is blocked to salmon by low falls at the lake outlet.

Stream 232 Unnamed creek, Wells Bay: National Forest land. Falls block access of pink salmon to most of the stream. Upstream habitat is of marginal quality.

Stream 239 Unnamed Creek, Unakwik Inlet: National Forest land: National Forest land. A falls at tidewater presently blocks access of pink salmon.

Stream 289 Derickson Creek, Eaglek Bay: National Forest land. An 11-ft. falls at tide water bocks access to an excellent upper watershed containing two lakes. This project is under consideration for 1986.

Stream 292 Papoose Creek, Squaw Bay: National Forest land. Low falls at stream mouth may not actually be a barrier to salmon. The habitat should be evaluated.

Northwestern District

Stream 427 Chasm Creek, Pirate Cove, Port Wells: National Forest land. A lake system is blocked by a series of falls near the tidal zone.

Stream 452 and 453 Surprise Cove, Cochrane Bay: State land. Velocity barriers at tidewater block both systems to salmon. Coho salmon in these streams would enhance the Whittier sport fishery.

Stream 478A Unnamed Creek, Huckleberry Lake, Culross Island: Chugach Natives, conveyance pending. Falls at tide water prevent salmon from gaining access to a barren, deep clearwater lake.

Stream 492 Unnamed, Port Nellie Juan: National Forest land. Kokanee 8 in. long inhabit this system. An inventory and survey is needed.

Eshamy District

Stream 500 Unnamed creek, Point Nellie Juan lakes, Point Nellie Juan: Light house reserve land. An 8 ft. falls block access to lake system.

Stream 501 Tiedeman Creek, Foul Bay: National Forest land. Falls at tidewater block this system to salmon.

Stream 510 Eleshansky Creek, Eshamy Lagoon: Chenega Corporation selection, conveyance pending. Falls near the tidal zone block most of watershed to pink salmon.

Southwestern District

Stream 603 Ewan Creek, Dangerous Passage: Chenega Corporation selection, conveyance pending. Falls halfway to lake block more than half of the system to use by salmon. A fish pass could be erected to help establish salmon runs, or water from the lake could be used for a salmon hatchery.

Stream 610 Kompkoff River, Jackpot Bay: Chenega Corporation selection, conveyance pending. Barrier falls prevent salmon from reaching most of the watershed.

Stream 667 Anderson Creek, Sawmill Bay, Evans Island: Chenega Corporation selection, conveyance pending. A fish pass could be installed at falls near upper tidal zone to allow pink salmon access.

Montague District

Stream 754 Dry Creek, Stockdale Harbor: National Forest land and/or Chugach Regional Corporation selection, conveyance pending (?). Falls near tidewater may block salmon from lake system. A survey is needed.

Stream 759 Rocky Creek, Rocky Bay: National Forest land. Falls prevent salmon from reaching an upper lake. A fish pass is tentatively going to be installed in 1983.

Southeastern District

Stream 844 Makarka Creek, Hawkins Island: National Forest land. Falls may block access to a lake system.

Stream 853 Whiskey Creek, Whiskey Cove, Hawkins Isalnd: Eyak Corporation selection, conveyance pending.

Appendix 7-5. Potential stream channelization and improvement sites

Eastern District

Stream 16 Rude River, Orca Bay: A portion of the water from a nonproductive major glacial river could be drawn off through a system of dikes and settling basins and combined with the small creeks on the south hillside to form a spawning channel for pink and chum salmon.

Stream 20 Spring Creek, East Arm, Simpson Bay: The existing moderately productive spawning channel could be made more efficient.

Stream 26 Simpson River, North Arm, Simpson Bay: Construction of dikes, a settling basin and general channel improvement to the side branch of the glacial stream would add to chum salmon production.

Stream 50 Gravina River, Port Gravina: The very muddy nonproductive main stream needs to be diked-off from the slightly productive east side overflow channel. General improvements also need to be made to the overflow channel.

Stream 51 Olsen Creek, West Fort, Olsen Bay, Port Gravina: Impassable falls block off most of the watershed. A spawning channel could be provided in the spring and marsh area east of the main channel.

Stream 83 through 87 Spring fed creek channels adjacent to Fidalgo and Sunny Rivers (glacial), Port Fidalgo: The area is used by a unique late chum population which presently has a very erratic survival pattern. Many minor improvements are needed including new channel construction, water collection, and flow control.

Stream 99 Lagoon Creek, Landlock Bay, Port Fidalgo: From time to time, this is an extremely productive pink salmon system. The previously constructed Alaska Department of Fish and Game spawning channel needs streambed resealing.

Stream 127 Naomoff River, head of Jack Bay, Valdez Arm: Salmon production could be improved by taking excess water from main glacial stream. Improvements would include: diking, constructing a settling basin and improving the northside overflow channel.

Stream 137 Canyon Slough, tributary to Lowe River, Port Valdez: The natural stock is made up of an off-year June run of pink salmon that spawn in mid-July and a late-run chum salmon stock that spawn in late August and early September. The area has large volume of year-around spring water. Construction of spawning channels for chum and pink salmon in the lower watershed would be productive. Additionally, the upper watershed could be rechannelled and improved for spawning and rearing coho salmon.

Stream 138 through 142 Spring and seepage creeks, Old Valdez townsite: Due to the abundance of seepage water, water collection facilities and spawning channels could be constructed.

Stream 143 Siwash Creek, Port Valdez: One of the best spring fed creeks in Prince William Sound. Channel clearing, widening and other improvements could increase salmon production. The watershed is, unfortunately, in a growing Valdez residential neighborhood. Early planning and zoning by the city is necessary to avoid destruction of the creek. The stream contains a unique late June - early July pink run and chum salmon. Both species would be enhanced by channel improvement.

Stream 147 Mineral Creek and Stream 148 Spring Creek, Port Valdez: Fish production in spring creek could be improved by diking and settling basin construction on the north side of the main creek to improve water flow.

Stream 152 Twin Falls Creek, Sawmill Bay, Valdez Arm: An excellent 1,000 yard long spawning channel could be made by constructing an overflow channel to cut across the oxbow on the main stream.

Northern District

Stream 214 Long Creek, East Long Bay: An excellent complex of intertidal sloughs and spring creeks that could be improved by adding water flow from the large, partially discolored and unstable main stream.

Stream 227 Granite Creek, Granite Bay: A stream with very low fish productivity due to an abnormal build-up of pure white granitic gravel in the streambed which causes the stream to overflow in an erratic manner. Construction of a channel through the center of the valley that would collect and discharge water in a stable manner would enhance fish production.

Stream 229 Cedar Creek, Cedar Bay: An excellent stream containing low barriers a short distance above the tidal flats. The barriers need to be removed.

Stream 264 Siwash Bay, Unakwik Inlet: Four natural spawning channels are located south of the main, unstable river. They are fed by overflow from the main stream and possibly by springs. The channels need to be widened and generally improved. A diversion structure on the main stream would insure a larger more stable flow. Much higher salmon production could be achieved.

Stream 276 Black Bear Creek, Eaglek Bay: A highly productive chum salmon stream that suffers from low stream flow. A high percentage of unspawned mortalities and serious bear predation have been observed. Two small adjacent creeks could be combined into one good channel at a higher elevation. This would greatly improve salmon production.

Stream 279 Canyon Creek, Eaglek Bay: An extremely unstable lower stream channel where water tends to go underground, leading to a unique inner lagoon, fed by an intertidal river. Construction of a stable spawning channel to collect and control all of the available water in one channel could greatly improve salmon production.

Coghill District

Stream 307 Village Creek, upper Esther Passage: A series of falls and log jams beginning at tide water blocks access to several productive upstream zones leading to headwater lake. Annual stream clearance is needed to improve stream productivity.

Stream 310 Golden Lagoon: Water from the adjacent Golden River which is not accessible to salmon could be piped to the streambed of the unnamed creek, possibly through an intermediate hatchery station. Enlargement of the creek to a sizeable spawning channel could also increase the natural run of pink salmon.

Stream 311 Golden River: A major lake watershed that is completely devoid of salmon due to stream blockage. Clearance is needed.

Stream 314 Avery River, Port Wells: Excellent riffles in a large hanging valley is blocked by large falls in the tidal zone. The 1964 earthquake destroyed the entire chum run by land subsidence of about 6 feet. The former chum spawning riffles below the high falls at the tidal limit are now in 0 ft. to 6 ft. tidal range which prevents chum egg survival. Placement of eight feet of sorted gravels could easily reinstate the 250,000 sq. ft. area. Approximately 80,000 cubic yards of gravel are needed. It is available from a large spit less than one-half mile away, and could easily be barged to the location.

Stream 318 through 320 Crescent and Amherst Rivers: These medium sized glacial streams are devoid of fish due to their instability. Seepage water could be collected from these non-productive watersheds and several spawning channels could be built in the large outwash plain.

Stream 321 Lafayette River: A spawning channel could be built that would enter the lower Coghill River where a shortage of good spawning grounds for chum salmon has been a problem ever since the old grounds were drowned by earthquake subsidence in 1964.

Northwestern District

Stream 414 Harrison Lagoon: One of the top ten pink salmon streams in Prince William Sound before the 1964 earthquake drowned the intertidal spawning grounds. The old intertidal zone could be rebuilt by filling or partitioning. Presently, the USFS and the ADF&G are working on a diversion project that will divert the stream to another channel.

Stream 421 Mill Creek, Bettles Bay, Port Wells: A major early run pink and chum salmon producer until the 1964 earthquake drowned the spawning grounds. A spawning channel could be constructed in the new tidal zone to increase salmon production.

Stream 424 North side of flats Hummer Bay: A good quality salmon stream until the adjacent glacial Hummer River changed its course around 1950. It is now a nearly dry channel. Water from the non-productive Hummer River could be diverted to this channel. The project would greatly increase salmon runs to Hummer Bay.

Stream 430 Meacham Creek and Stream 432 Swanson Creek, Pigot Bay, Port Wells: These streams were two of the top ten early pink salmon producers in Prince William Sound before the 1964 earthquake. A six foot subsidence drowned the heavily used intertidal spawning grounds. Large quantities of seepage water from the Pigot glacial River could be collected into man-made or improved natural spawning channels.

Southwestern District

Stream 665 Bjorn Creek, Evans Island: Water from this small creek flows under a broad gravel flat at its mouth during low water flows. As a result, hundreds of salmon get accidently stranded and die unspawned. The creek needs to be channelized across the tidal flat.

Stream 681 Hogan Bay, Knight Island: This is a high gradient stream. The lower streambed is so shallow during average summer water flow that spawners cannot enter the stream. The stream occasionally has large runs of pink salmon, however, due to the periodic occurence of optimum conditions, the streambed gravel could be regraded and channelized to stabilize fish production in this stream.

Stream 698 Mallard Creek, Mallard Bay, arm of Drier Bay, Knight Island: A lake-fed stream that flows under a talus slope for a long distance. It emerges as a spring near tidewater. The unique water supply could be put to better use if a spawning channel was constructed from the spring to the intertidal zone.

Montague District

Stream 702 through 707 MacLeod Harbor, Stream 710 Hanning River, Hanning Bay, Stream 711 Quadra Creek, Hanning Bay: A 35 foot uplifting during the 1964 earthquake is causing the streams to cut new channels. Channel cutting is a slow evolutionary process. Stabilization could be speeded up by building man-made spawning channels.

Stream 712 through 737 Central west coast of Montague Island: This location is the largest non-productive area in the inside waters of Prince William Sound. The lack of productivity is caused by the heavy surf pounding the exposed beach. This phenomenon causes stream instability and barriers at some creeks. Channelization of the creeks could create a very productive fish zone.

Stream 741 Chalmers River, Port Chalmers: This river was a major chum salmon producer before the 1964 earthquake disrupted the delicate balance between the tide levels and specific spring tributary to the lower reach of the stream. The main river channel has become highly unstable. Chum salmon production could be greatly improved by collecting the spring water into a carefully constructed chum salmon spawning channel and by developing other diversion channels out of the main river channel.

Stream 768 through 770 Zaikoff and Udall Creek complex: These are highly unstable creeks. Fish production is very erratic. Because all of these small streams are close together they could all be diverted into one stable channel. The combined channel should consistently produce large pink and chum salmon runs. Heavy spring snow runoff water, however, would have to be diverted away from the new channel.

Stream 778 Beach River, Nellie Martin: Logging is being conducted in the vicinity, and it is imperative that the stream remain clear of debris. Nellie Martin is a very large producer.

Stream 779 Patton River, Patton Bay, Montague Island: A nonproductive stream that needs a survey and investigation to determine why it is not producing salmon.

Southeastern District

Streams 810, 811, 812 and 815 Port Etches: These are unstable streams that suffer from gravel movement during floods. Channel stabilization to safeguard against floods would prevent gravel movement and greatly increase salmon production. The productive zone in these streams is potentially several miles long. Work is scheduled at Stream 815 Constantine Creek in 1984.

Streams 817, 818 and 819 Southwest Hinchinbrook Island: These streams are unstable. A stream stabilization program could significantly increase coho and pink salmon production.

Stream 831 Double Creek, Double Bay, Hinchinbrook Island: An unstable stream that meanders, changing channels frequently in the lower reach which is used by salmon. Stream stabilization in the lower creek could cure this problem.

Stream 834 and 835 Cutoff Creek, Dan Creek, Dan Bay, East Shore, Hinchinbrook Island: Lower two miles of both creeks is very unstable. The unstable zone, nevertheless, is heavily used by pink and chum salmon. Because the valley floor is very wide and there are many old abandoned stream channels, it would be easy to construct controlled flow channels. Benefits should be large in relation to the cost of construction.

Stream 847 Hawkins Creek, Hawkins Island: Work is scheduled for 1983.

Appendix 7-6. Potential stream clearance sites

Northern District

Stream 229 Cedar Creek, Cedar Bay: An excellent stream containing low barriers a short distance above the tidal flats. The barriers need to be removed.

Coghill District

Stream 307 Village Creek, upper Esther Passage: A series of falls and log jams beginning at tide water blocks access to several productive upstream zones leading to headwater lake. Annual stream clearance is needed to improve stream productivity.

Stream 311 Golden River: A major lake watershed that is completely devoid of salmon due to stream blockage. Clearance is needed.

Montague District

Stream 778 Beach River, Nellie Martin: Logging is being conducted in the vicinity. The stream may need to be rehabilitated when logging has been completed. Nellie Martin is a very large producer.

Stream 779 Patton River, Patton Bay, Montague Island: A nonproductive stream that needs a survey and investigation to determine why it is not producing salmon. Logging is being done in the vicinity and logging practices should be closely monitored to minimize blow down and clearance activities.

Lists of Footnotes and Sources.

Footnotes within the text:

1) Alaska Statute 16.10.375-550.

2) Alaska Statute 10.20.

3) Alaska Department of Fish and Game. Issue Paper No. 81-03. August 18, 1981.

4) Letter of Intent from the Legislature to the Commissioner of ADF&G dated 4/24/79 *IN* Regional Planning Team Guidelines. ADF&G. Juneau. 144 pp.

5) Alaska's Private Nonprofit Hatchery Program Information Handbook (Draft) Jan. 31, 1978. ADF&G. Juneau. 53 pp. and ADF&G policies and procedures PNP-13.2 (Policy) and PNP-14.7 (Procedure).

6) Alaska Statute 16.10.520.

7) Alaska Statute 16.10.530-540.

8) *PWSAC Aquaculture News.* Vol. 2, No. 2. April 1980.

9) Anonymous. 1973. Proposed Wrangell-St. Elias National Park, draft environmental impact statement. DES 73-90. Alaska Planning Group. US Dept. of Interior.National Park Service. 340 pp.

9a) Hanable, W. S. and K. W. Workman. 1973. Lower Copper and Chitina Rivers: an historic resource study. Office of the Statewide Cultural Programs. ADNR. 46 pp.

10) Janson, L.E. 1975. *The Copper Spike.* Alaska Northwest Publishing Co. Anchorage. Ak.

11) Anonymous. 1974. Alaska regional profiles: Southcentral Region. University of Alaska. Arctic Environmental Information and Data Center. Joint Federal-State Land Use Planning Commission for Alaska.

12) Anonymous. 1979. Draft enironmental impact statement, Alaska Petrochemical Company Refinery and Petrochemical Facility, Valdez, Alaska. U.S. Environmental Protection Agency. EPA 910/9-79-064.

13) Plafker, G., T.R. Burns and R.A. Page. 1975. Interim report on petrochemical resource potential and geologic hazards in the outer continental shelf of the Gulf of Alaska Tertiary Province. U.S. Geological Survey Open File Report 75-592.

14) Roys, R. S. 1971. Effect of tectonic deformation on pink salmon runs in Prince William Sound. *IN* The great Alaska earthquake of 1964: biology. Committee on the Alaska Earthquake of the Division of Earth Sciences, National Research Council. National Academy of Sciences NAS Publication No. 1604. Washington, D.C. p 220-237.

15) Thorsteinson, F.V., J.H. Helle and D.G. Birkholz. 1971. Salmon survival in intertidal zones of Prince William Sound streams in uplifted and subsided areas. *IN* The great Alaska earthquake of 1964: biology. Committee on the Alaska Earthquake of the Division of Earth Sciences. National Research Council. National Academy of Sciences NAS Publication No. 1604. Washington, D.C. p. 194-219.

16) Anonymous. 1975. Salmon culture progam. Prince William Sound Aquaculture Corporation. Cordova, Ak. 124 pp.

17) DeLaguna, F. 1956. Chugach prehistory: the archaeology of Prince William Sound, Alaska. Univ. of Washington Publications in Anthropology. Vol. 13 Univ. of Washington Press. Seattle.

18) Rogers, J. Project Engineer. Alaska Seismic Study. U.S. Geologic Survey. Article *IN Cordova Times* 11/12/81.

19) Anonymous. 1979. Enironmental impact statement, Alaska Petrochemical Company Refining and Petrochemical Facility, Valdez, Alaska, Appendix Volume I. U.S. Environmental Protection Agency. EPA-10-AK-Valdez-NPDES-79.

20) Mike Mills, Alaska Dept.of Fish and Game, personal communication.

21) Randall, R., F. Fridgen, M. McCurdy, and K. Roberson. 1982. Prince William Sound area annual finfish management report, 1981. Alaska Dept. of Fish and Game. Cordova. 122 pp.

22) Alaska Dept. of Fish and Game. 1982. An atlas of the catalog of waters important for spawning, rearing and migration of anadromous fishes, South Central Region 2. Rev. April, 1982. Habitat Division. Resource Assessment Unit.

23) Alaska Commercial Fisheries Entry Commission.

24) Alaska Administrative Code 5 AAC 40.035-037.

25) Alaska Administrative Code 5 AAC 01.600-647.

26) Richard Randall, Alaska Dept. of Fish and Game, personal communication.

27) Report on processing capacity presented to the Alaska Board of Fisheries, December, 1981.

28) Gendron, I., P. Hartsock, F. Orth, and P. Rogers. 1981. Prince William Sound economic impact study, regional salmon plan (unpublished). Frank Orth and Associates, Inc. prepared for Prince William Sound Aquaculture Corp. 69 pp.

29) Anonymous. 1980. Comprehensive salmon plan for Southeast Alaska, phase I. Joint Southeast Alaska Regional Planning Teams.

30) Alaska Statute 16.05.092.

31) Tim McDaniel, Alaska Dept. of Fish and Game, personal communication.

32) Paul Krasnowski, Alaska Dept. of Fish and Game, personal communication.

33) Tom Koller, Alaska Dept. of Fish and Game, personal communication.

34) Ken Roberson, Alaska Dept. of Fish and Game, personal communication.

35) Anonymous. 1980. BLM land use plan for Southcentral Alaska, a summary. U.S. Dept. of Interior. B.L.M. Anchorage District Office. 39 pp.

36) Anonymous. 1982. Annual report, 1981, Division of Fisheries Rehabilitation, Enhancement and Development (FRED). Edited by J.C. McMullen and M.W. Kissel. Alaska Dept. of Fish and Game. Juneau. 101 pp.

37) Armin Koernig, Prince William Sound Aquaculture Corp., personal communication.

38) Ziegler, W., Bureau of Land Management, personal communication.

39) Anonymous. 1980. Recreational cabins: Chugach National Forest. US Forest Service. Alaska Region Leaflet 72.

40) Lee Adler, AHTNA Native Corporation, personal communication.

41) Tom Somrak, Eyak Native Corporation, personal communication.

42) Pirtle, R.B. 1977. Historical pink and chum salmon estimated spawning escapements from Prince William Sound, Alaska streams, 1960-1975. Alaska Dept. of Fish and Game. Technical Data Report No. 35. 332 pp.

43) Mike McCurdy, Alaska Dept. of Fish and Game, personal communication.

44) Larson, D. 1980. 1979 fisherman's income survey, herring and salmon fisheries. Univ. of Alaska. Alaska Sea Grant Program Report 80-5. Fairbanks. 20 pp.

45) Sport Fish Division, Alaska Dept. of Fish and Game.

Sources cited in text and in appendix:

Alaska Dept. of Fish and Game. 1982. An atlas of the catalog of waters important for spawning, rearing and migration of anadromous fishes, South Central Region 2. Rev. April, 1982. Habitat Division. Resource Assessment Unit.

Anonymous. 1974. Alaska regional profiles: Southcentral Region. University of Alaska. Arctic Environmental Information and Data Center. Joint Federal-State Land Use Planning Commission for Alaska.

Anonymous. 1975. Salmon Culture Progam. Prince William Sound Aquaculture Corporation. Cordova, Ak. 124 pp.

Gendron, I., P. Hartsock, F. Orth, and P. Rogers. 1981. Prince William Sound economic impact study, regional salmon plan (unpublished). Frank Orth and Associates, Inc. prepared for Prince William Sound Aquaculture Corp. 69 pp.

Grant U.S. and D.F.Higgins. 1910. Reconnaisance of the geology and mineral resources of Prince William Sound, Alaska. US Geologic Survey Bull. 443. Government Printing Office. Washington. 89 pp.

Holbrook, K., US Forest Service, personal communication.

Knapp, G. 1982. "Map" model statewide and regional projections for population and employment. Univ. of Alaska. Inst. of Social and Economic Research. 36 pp.

Knapp, G., Univ. of Alaska. Inst. of Social and Economic Research, personal communication.

Leask, L., Univ. of Alaska. Inst. of Social and Economic Research, personal communication.

Larson, D. 1980. 1979 fisherman's income survey, herring and salmon fisheries. Univ. of Alaska. Alaska Sea Grant Program Report 80-5. Fairbanks. 20 pp.

McCollum, P., Valdez Fisheries Development Assn., personal communication.

Nickerson, R. B. 1978. Identification of fish hatcheries, aquaculture sites, habitat and species enhancement projects in Prince William Sound. Alaska Dept. of Fish and Game. Cordova.

Pirtle, R.B. 1976. Historical catch, escapement, and related commercial fishery statistics of fish and shell fish, Prince William Sound Area, Alaska. Data Report No. 26. Alaska Dept. of Fish and Game. Cordova. 92 pp.

Randall, R., Alaska Dept. of Fish and Game, personal communication.

Randall, R., F. Fridgen, M. McCurdy, and K. Roberson. 1982. Prince William Sound area annual finfish management report, 1981. Alaska Dept. of Fish and Game. Cordova. 122 pp.

Sanner, C., US Forest Service, personal communication.

Shaw, J., Cordova fisherman, personal communication.

Thomas, C. 1982. Preliminary housing study (in-house draft). Univ. of Alaska. Inst. of Social and Economic Research. Anchorage.

Thorsteinson, F.V., J.H. Helle and D.G. Birkholz. 1971. Salmon survival in intertidal zones of Prince William Sound streams in uplifted and subsided areas. *IN* The great Alaska earthquake of 1964: biology. Committee on the Alaska Earthquake of the Division of Earth Sciences. National Research Council. National Academy of Sciences NAS Publication No. 1604. Washington, D.C. p. 194-219.

Watsjold, D., Alaska Dept. of Fish and Game, personal communication.

Wells, J., Valdez Fisheries Development Assn., personal communication.

Wiese, C., Univ. of Alaska. Sea Grant Program, personal communication.

Williams, F., Alaska Dept. of Fish and Game, personal communication.