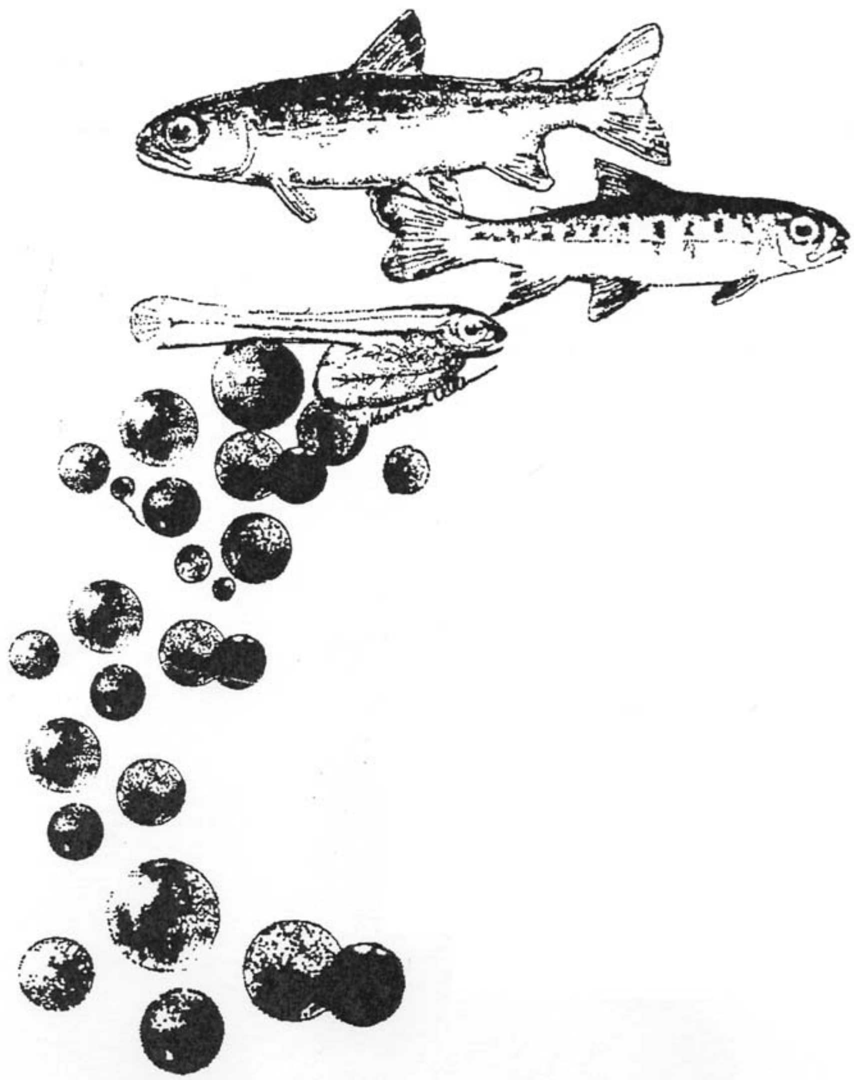
COMPREHENSIVE SALMON ENHANCEMENT PLAN FOR SOUTHEAST ALASKA: PHASE III

DEVELOPED BY
JOINT NORTHERN/SOUTHERN SOUTHEAST
REGIONAL PLANNING TEAM



Alaska Department of Fish and Game
P.O. Box 25526
Juneau, Alaska 99802-5526

Kevin C. Duffy, Commissioner
June 2004

STATE OF ALASKA

FRANK H. MURKOWSKI
GOVERNOR

DEPARTMENT OF FISH AND GAME

OFFICE OF THE COMMISSIONER

P.O. BOX 25526
JUNEAU, AK 99802-5526
PHONE: (907) 465-4100
FAX: (907) 465-2332

June 1, 2004

Mr. Garold Pryor
Chairman, Joint RPT
ADF&G, Division of Commercial Fisheries
P.O. Box 240020
Douglas, AK 99824-0020

Dear Mr. Pryor:

This letter is to officially inform you and all members of the Joint Northern/Southern Southeast Regional Planning Team (Joint RPT) of my approval of the *Comprehensive Salmon Enhancement Plan for Southeast Alaska: Phase III.*

Prior to submittal of this plan for my consideration, I understand that, in compliance with AS 16.10.375, in February 2004 the Joint RPT distributed copies of a public review draft to fishermen's organizations, agencies, universities, processors, communities, regional and nonregional PNP corporations, and other interested parties. To provide wider access to the plan throughout the region, the Joint RPT also placed the public review draft online with access through the department's home page. The divisions of Commercial Fisheries and Sport Fish jointly issued a news release to inform the public of the plan's availability and to solicit comments on proposed revisions. Furthermore, for the past two years plan development has been on the agenda of all public meetings held by the Joint RPT.

This plan culminates in the formalization of a series of guidelines to assess the viability of proposed future increments of enhanced production and/or projects and to assure continued sustainability of wild salmon stocks. This plan further provides goals and objectives for future salmon enhancement as well as a comprehensive overview of the existing fisheries enhancement program in Southeast Alaska. The plan has undergone complete technical reviews by fisheries staffs of Alaska Department of Fish and Game, Northern Southeast Regional Aquaculture Association, Southern Southeast Regional Aquaculture Association, University of Alaska Fairbanks School of Fisheries, and National Marine Fisheries Service. I am confident that the Joint RPT has been responsive to the comments and suggestions resulting from this thorough review process. Based on the efforts of the Joint RPT in preparing this plan and comments I have received on the quality of those efforts, I believe a viable and responsible document has been produced for the Southeast region; therefore, I offer my congratulations and appreciation to you and all members of the team for cooperating with the department and me in producing the *Comprehensive Salmon Enhancement Plan for Southeast Alaska: Phase III.*

Sincerely,

Kevin C. Duffy

Kevin C. Duffy
Commissioner

Comprehensive Salmon Enhancement Plan For Southeast Alaska: Phase III

Developed by
Joint Northern/Southern Southeast Regional Planning Team

Alaska Department of Fish and Game
P.O. Box 25526
Juneau, Alaska 99802-5526

EXECUTIVE SUMMARY

The commissioner of the Alaska Department of Fish and Game (ADF&G), in accordance with AS 16.10.375-470, has designated salmon production regions throughout the state. The commissioner is responsible for the development and amendment of a comprehensive salmon plan to guide enhancement activities in each region. The commissioner has delegated this responsibility to regional planning teams (RPTs) consisting of representatives from ADF&G and regional aquaculture associations.

The mission of the Joint Northern/Southern Southeast Regional Planning Team (Joint RPT) is to promote through sound biological practices programs to achieve optimal production of wild and enhanced salmon stocks on a sustained yield basis for maximal social and economic benefit to all communities and user groups in the region.

The *Comprehensive Salmon Enhancement Plan for Southeast Alaska: Phase III* is a project of the Southeast Sustainable Salmon Fisheries Fund; it was initiated by the Joint RPT in the fall of 2002 and was developed by Joint RPT members, special projects staff, state and federal agencies, and other parties involved in the enhancement program in Southeast. In April 2003, a preliminary draft was provided to Joint RPT members and invited agency reviewers. The comments/revisions received from these individuals were incorporated into a public review draft. In February 2004 that draft was made available to fishermen, processors, regional and nonregional PNP corporations, state and federal agencies, Southeast communities, and other interested parties. Comments and suggestions from the public were incorporated into this final draft, which was reviewed by the Joint RPT during its spring 2004 meeting and sent to ADF&G Commissioner Kevin Duffy with their recommendation for approval.

This phase III plan culminates in the formalization of a series of guidelines to assess the viability of proposed future increments of production and/or projects and to assure continued sustainability of wild salmon stocks. This plan further provides goals and objectives as well as a comprehensive overview of the fisheries enhancement program in Southeast Alaska.

ACKNOWLEDGMENTS

The Joint RPT respectfully acknowledges its members for their contributions to programs of ADF&G and the PNP enhancement community as well as the Southeast community at large for their contributions and efforts in drafting the phase III plan:

> **SSEPT**: Ken Duckett, gillnet, Ketchikan; Dave Otte, power troll, Ketchikan; John Peckham, seine, Ketchikan; Garold Pryor, resource development, Division of Commercial Fisheries, Douglas; Andy McGregor, management, Division of Commercial Fisheries, Douglas; Rocky Holmes, management, Division of Sport Fish, Douglas; Steve Leask, ex officio, Tamgas Hatchery, Metlakatla; Dick Aho, ex officio, Forest Service, Petersburg; and Geoff Whistler, ex officio, DCED, Juneau.
>
> **NSERPT**: Kevin McDougal, gillnet, Juneau; Alan Andersen, power troll, Sitka; Bryon Pfundt, seine, Petersburg; Andy McGregor, management, Division of Commercial Fisheries, Douglas; Rocky Holmes, management Division of Sport Fish, Douglas Garold Pryor, resource development, Division of Commercial Fisheries, Douglas; Eric Prestegard, ex officio, DIPAC, Juneau; Dick Aho, ex officio, Forest Service, Petersburg; and Geoff Whistler, ex officio, DCED, Juneau.

The Joint RPT extends its acknowledgments and appreciation for contributions to this plan to John Burke, general manager, SSRAA, Ketchikan; Steve Reifenstuhl, operations manager, NSRAA, Sitka; Bill Heard, Alex Wertheimer, and Frank Thrower, fisheries research biologists, National Marine Fisheries Service, Auke Bay Lab; Steve McGee, acting RPT chairman, PNP program manager, Division of Commercial Fisheries, Juneau; Jim Seeb, principal geneticist, Division of Commercial Fisheries, Anchorage; Dan Moore, geneticist, Division of Commercial Fisheries, Anchorage; Ted Meyers, principal pathologist, Division of Commercial Fisheries, Juneau; Scott Kelley, Southeast management coordinator, Division of Commercial Fisheries, Douglas; Kevin Monagle, former RPT chairman, Juneau area management biologist, Division of Commercial Fisheries, Douglas; Irv Brock, assistant director, Division of Sport Fish, Juneau; Bob Piorkowski, invasive species coordinator, Division of Commercial Fisheries, Juneau; Amy Carroll, Jim Craig, and Kurt Savikko, publication specialists, Division of Commercial Fisheries, Juneau; Katrina Lokke and Suzanna Girmscheid, administrative clerks, Division of Commercial Fisheries, Juneau; Dave Barto, habitat biologist, Division of Commercial Fisheries, Douglas; Lon Garrison, field projects manager, NSRAA, Sitka; Ron Josephson, program coordinator, Mark, Tag, and Age Laboratory, Division of Commercial Fisheries, Juneau; Glen Oliver, research supervisor, Division of Commercial Fisheries, Douglas; and Greg Bigsby, former NSERPT gillnet representative, Haines.

Acknowledgment and appreciation are extended to members of the special projects staff who were responsible for drafting the initial document and coordinating development of subsequent drafts: Carol Denton, fisheries biologist, Hyder; Ken Duckett, executive director, United Southeast Alaska Gillnetters, Ketchikan; and Sid Morgan, planner, Juneau.

Acknowledgments are gratefully extended to all hatchery managers and operators for their cooperation in the development of the hatchery profile section of the plan, including the following who have not been previously mentioned: Bart Watson and Karen Lechner, Port Armstrong Hatchery, Baranof Island; John Bruns, Klawock River Hatchery, Prince of Wales Island; Steve Andison and Brock Meredith, Gunnuk Creek Hatchery, Kake; Jerry Taylor, Auke Creek Hatchery, Juneau; Gene Richards, Burro Creek Hatchery, northern Lynn Canal; Jerry Guthrie, Deer Mountain Hatchery, Ketchikan; and David Harrington, Sheldon Jackson Hatchery, Sitka.

The contributions of the following reviewers of the plan are also gratefully acknowledged: William Bergmann, Petersburg area management biologist, Division of Commercial Fisheries; Kathy Hansen, executive director, Southeast Alaska Fishermen's Alliance, Juneau; Craig Farrington, hatchery program coordinator, Division of Commercial Fisheries, Juneau; Ben VanAlen, subsistence fisheries biologist, Forest Service, Juneau; Tom Brookover, regional management coordinator, Division of Sport Fish, Sitka; William Davidson, Sitka area management biologist, Division of Commercial Fisheries; Bob Chadwick, Sitka area sport fish biologist, Division of Sport Fish; Randy Ericksen, Haines area sport fish biologist, Division of Sport Fish; and Randy Bachman, Haines area management biologist, Division of Commercial Fisheries.

TABLE OF CONTENTS

LIST OF FIGURES

Figure Page

LIST OF TABLES

Table Page

INTRODUCTION

The Salmon Enhancement Program

The intent of the enhancement program in Alaska is to benefit the public by providing additional harvest opportunities to regional salmon fisheries without adversely affecting natural stocks. The methods, means, and constraints for providing these fish are addressed in Alaska statutes and in the regulations, management regimes, and policies of the Alaska Department of Fish and Game (ADF&G[1]). The regional planning teams (RPT) play a pivotal, coordinating role in the realization of this program by (1) developing regional plans that establish production/project goals, objectives, and guidelines and (2) assuming responsibility for insuring that proposed projects are in compliance with the regional plans and that they optimize public benefits without jeopardizing natural stocks.

Phase I and Phase II Enhancement Planning in Southeast

The *Comprehensive Salmon Plan for Southeast Alaska, Phase I* was completed by the Joint Northern/Southern Southeast Regional Planning Team (Joint RPT) in April 1981. It was a strategic plan to increase salmon harvests to predetermined numerical objectives over a period of 20 years. The numerical harvest objective for each salmon species was derived by determining its potential wild harvest amount and then adding an increment of enhanced production. The potential wild harvest number was defined as natural production that results when (1) sound fisheries management strategies are employed and (2) freshwater and marine habitats maintain their productive capabilities over the long term. This process resulted in a harvest objective for each salmon species that was based on historic catch records and the likelihood that the species could be successfully enhanced.

Phase II comprehensive salmon plans were developed separately by their respective RPTs: (1) northern Southeast in 1982 and a revised version in 1985 and (2) southern Southeast in 1983. These phase II plans identified and prioritized specific enhancement projects, harvest management strategies, and habitat protection measures to enable the achievement of phase I harvest objectives for each salmon species. The phase II plans were also periodically updated during much of the 20-year life of the phase I plan.

Salmon Production and Harvests During Phase I and Phase II Planning[2]

As a result of the phase I and phase II planning process, more than 300 proposed fisheries enhancement projects have been evaluated for their potential to help reach the goals and objectives set out in the phase I plan. Many of these projects were implemented; others were considered, investigated, and not pursued for various reasons. Descriptions of the majority of these projects are provided in Appendix A. Enhanced salmon have been

---

[1] In this plan, ADF&G is also referred to as the "department."
[2] Commercial fisheries harvest data: wild salmon data provided by ADF&G, Division of Commercial Fisheries harvest data base; hatchery salmon data provided by PNP hatchery annual reports.

cultured and released from more than 20 hatcheries in Southeast; fish have also been imprinted and released at about 150 additional remote release sites (Appendix B).
In recent years, annual harvests of coho, sockeye, chum, and pink salmon wild stocks have generally exceeded the potential wild harvest levels indicated in the phase I plan. The phase I harvest objective for coho salmon has been exceeded in eight of the last 13 years. Although 80% of the coho harvest has been attributable to the wild stock component since 1990, the additional enhanced component has pushed annual harvests over the phase I harvest objective of 2.65 million five times during that period (Figure 1, Appendix D). The sockeye salmon harvest has been composed of 89% wild stocks since 1990 and has met or exceeded the phase I harvest objective of 2.1 million seven times since 1990; in two of those years, the enhanced component enabled the harvest to reach that objective (Figure 2, Appendix D). For chum salmon, the phase I harvest objective of 9.7 million has been reached or exceeded in four of the past 10 years because of the enhanced component, which has averaged 71% of the commercial harvest (Figure 3, Appendix D). Wild pink salmon productivity has been high since 1989; the phase I harvest objective of 30 million has been met in all but two years and exceeded only once (1990) because of the enhanced component (Figure 4, Appendix D).

The phase I harvest objective for chinook salmon has become unattainable for three reasons: (1) constraints in the U.S./Canada Pacific Salmon Treaty, (2) enhancement of this species is expensive, and (3) it has been very difficult to get a large portion of the production into the holds of intended harvesters (Figure 5, Appendix D). The phase I potential wild harvest of chinook included historic harvests of migratory stocks that spawned in Canada and the Pacific Northwest. Since the advent of the Pacific Salmon

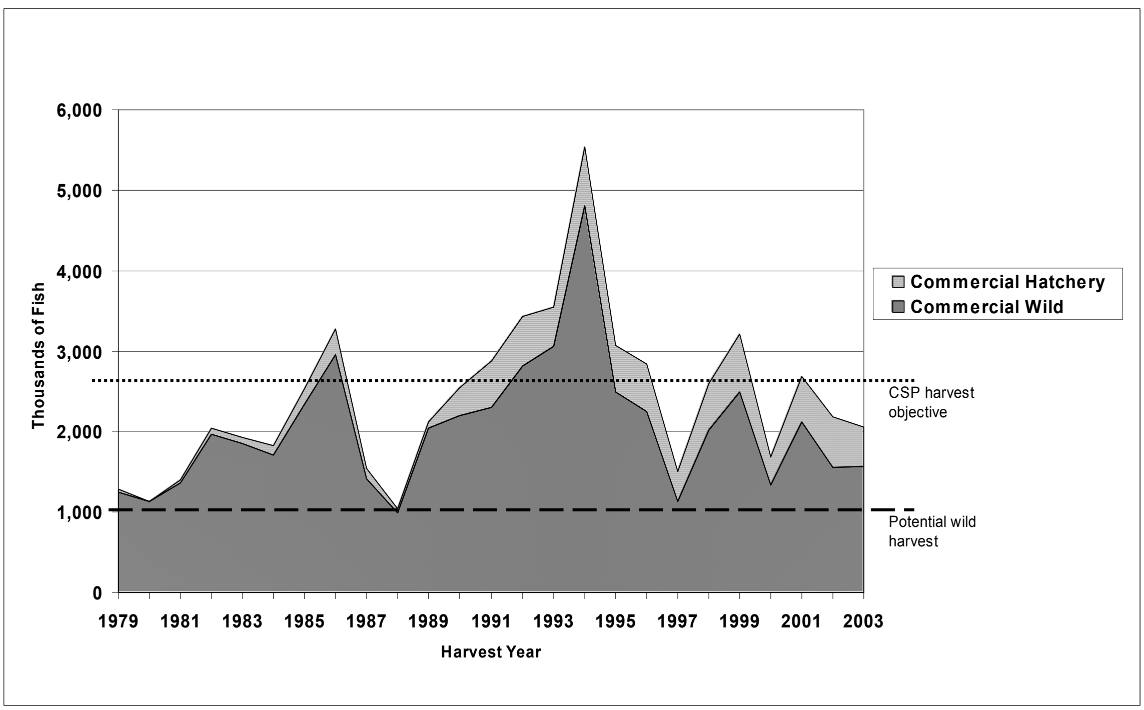


Figure 1. Number of Alaska hatchery and wild coho salmon in commercial common property harvests, relative to comprehensive salmon plan objective, 1979–2003.

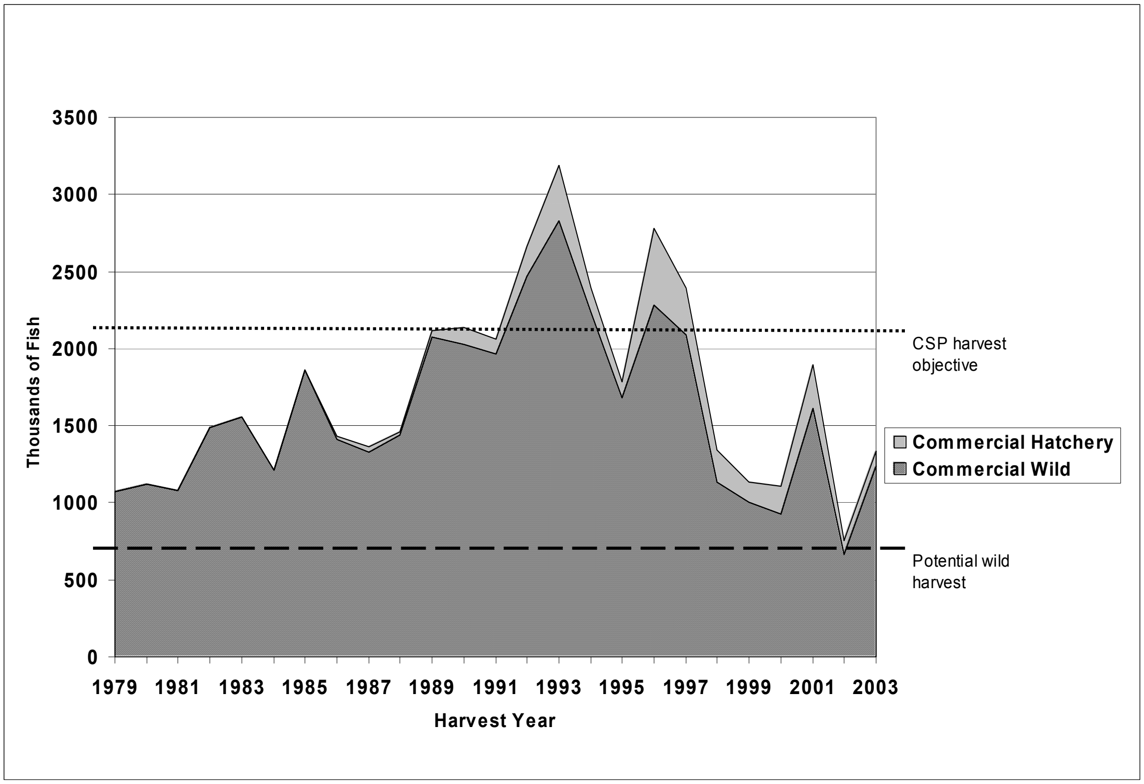


Figure 2. Number of Alaska hatchery and wild sockeye salmon in commercial common property harvests, relative to comprehensive salmon plan objective, 1979–2003.

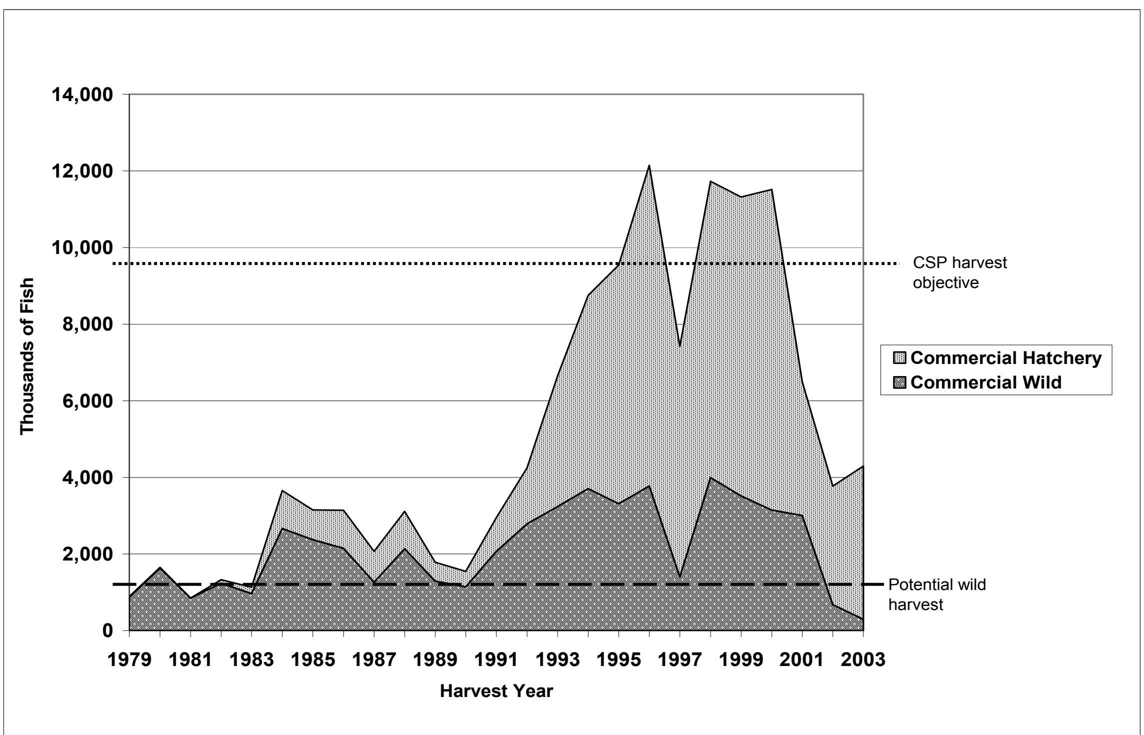


Figure 3. Number of Alaska hatchery and wild chum salmon in commercial common property harvests, relative to comprehensive salmon plan objective, 1979–2003.

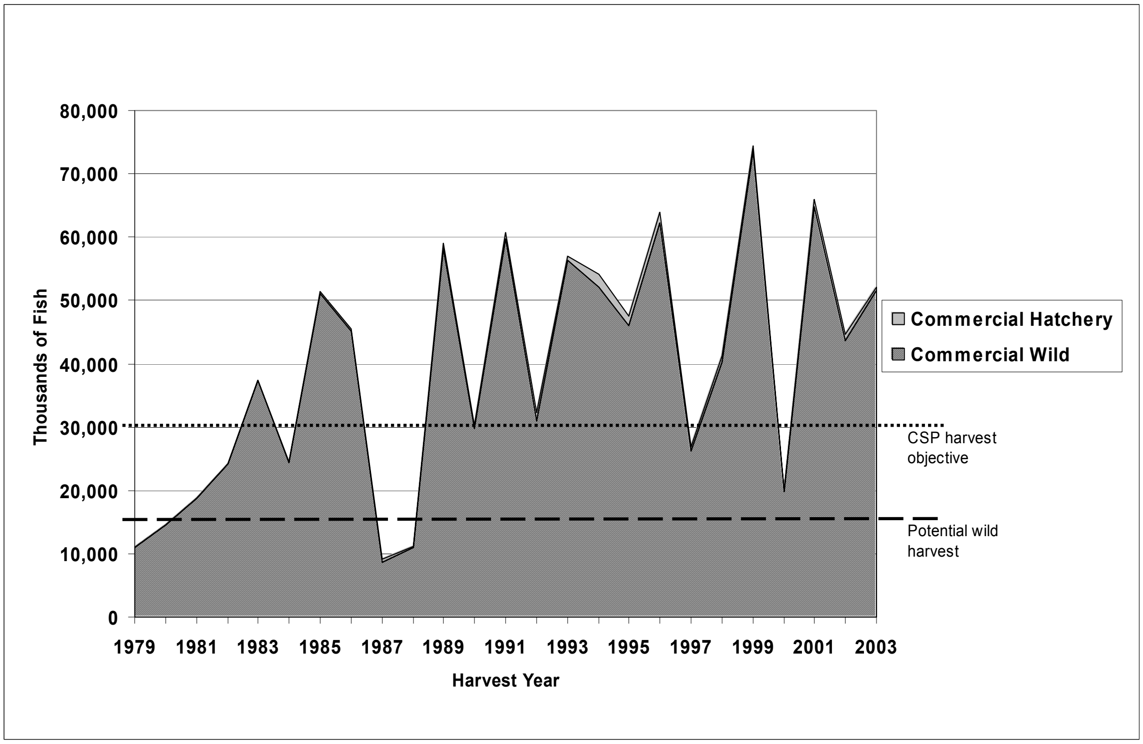


Figure 4. Number of Alaska hatchery and wild pink salmon in commercial common property harvests, relative to comprehensive salmon plan objective, 1979–2003.

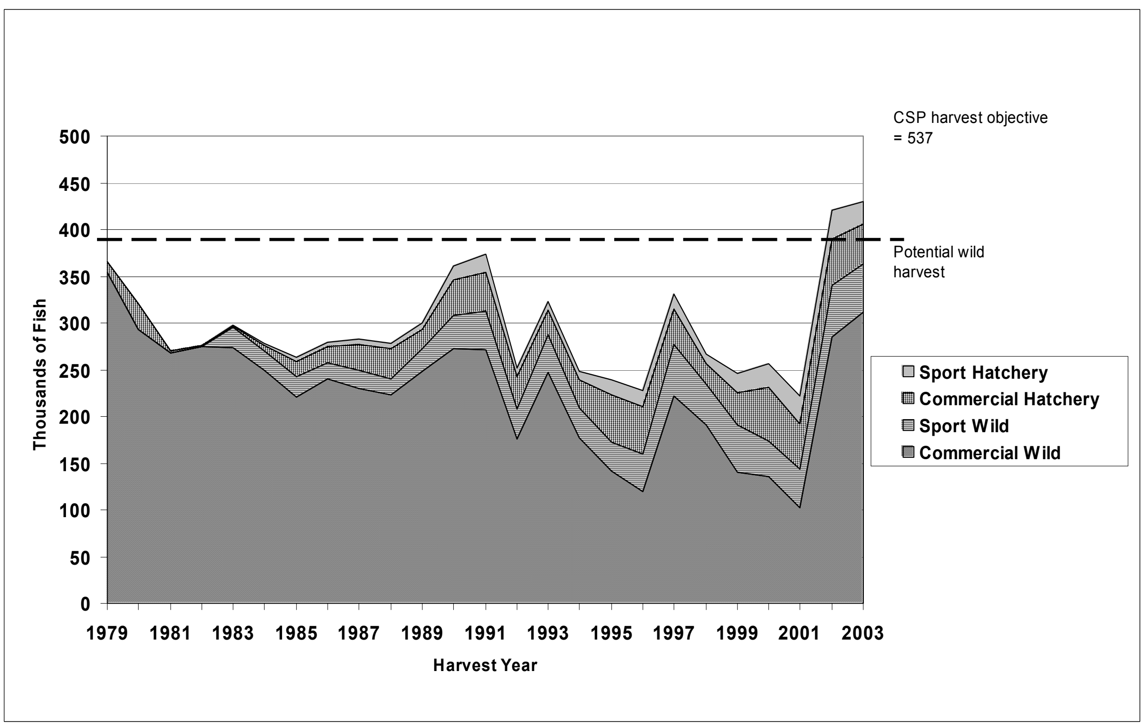


Figure 5. Number of Alaska hatchery and wild chinook salmon in common property harvests, relative to comprehensive salmon plan objective, 1979–2003.

Treaty in 1985, the harvest guidelines set by the department (i.e., ADF&G) have ensued from annual quotas established by the treaty. Commercial and sport fisheries managers recently have focused on Southeast's enhanced stocks because the majority of these fish do not count toward treaty quotas. While wild stock escapements have been generally increasing since 1990, total productivity has varied between stocks and from year to year.[3]

Phase III Strategic Elements[4]

Current biological, economic, and political realities surrounding the salmon enhancement program in Southeast call for an updating of the strategic elements presented in the phase I plan: mission statement, goals, objectives, strategies, and assumptions. Southeast Alaska's salmon enhancement program has always been dedicated to supporting maximal harvests with minimal or no impact on wild stocks; however, there has been a gradual shift in the program's focus. While phase I and phase II planning focused on increasing production, phase III planning will focus on integrating meaningful production increases and modifications as seamlessly as possible with natural production to enhance the sustainable fishery.

Mission Statement

To promote through sound biological practices programs to achieve optimal production of wild and enhanced salmon stocks on a sustained-yield basis for maximal social and economic benefit to all communities and user groups of Southeast Alaska

Goals

1. Enhance the salmon fishery in Southeast Alaska while minimizing the impact of enhancement on wild stocks.
2. Provide a substantial public benefit through consistent returns of salmon and greater stability of income to participants in the salmon industry.
3. Provide a resource that helps maintain a viable salmon industry as a key element of Southeast Alaska's economy in order to sustain community stability.
4. Help maintain the Southeast Alaska lifestyle by providing commercial, sport, and subsistence fishing opportunities.
5. Continue to adjust enhanced production to maximize economic and social benefits while meeting allocation goals.

With the maturation of the salmon enhancement program in Southeast, the first goal (i.e., *enhance the salmon fishery in Southeast Alaska while minimizing the impact of enhancement on wild stocks*) is paramount and will be given priority over the others. The remaining goals describe the enhanced salmon resource as a public benefit and an avenue toward greater economic and social stability. These goals also carry forward the intent of

---

[3] For more detail on chinook production in Southeast Alaska *see* the *Chinook Salmon Plan for Southeast Alaska* (Holland et al. 1983) and its yearly annexes, most recently Farrington et al. (2004).
[4] Phase I strategic elements are provided in Appendix C.

the goals in the phase I plan (Appendix C). Additionally, Goal No. 5 calls for the continued adjustment of production to optimize benefits in accordance with the allocation guidelines set out in the *Southeastern Alaska Area Enhanced Salmon Allocation Management Plan* (*see* page 57 of this document for additional information). Because the salmon enhancement program has been almost entirely transferred to the private sector, it is necessarily accountable to all user groups to be economically viable. This economic focus is in direct contrast to most enhancement programs in the Pacific Northwest, where wild stock rehabilitation is, by necessity, the priority.

Objectives

1. Minimize the impact of enhanced stocks on wild stocks.
2. Maintain the existing production potential for wild and enhanced stocks on a region-wide basis.
3. Assure that increases in enhanced production are consistent with region-wide goals and allocation plans.
4. Update the RPT process periodically to provide concise region-wide status reports and recommendations in a timely manner within the constraints of existing program budgets.

The objectives are expected to have a 20-year horizon. In concert with the goals, the objectives are the strategic planning criteria by which the RPT will evaluate proposed projects. The desire to increase salmon production was the driving force behind the phase I planning process; it resulted in objectives expressed as numbers of fish in the harvest. Although at the time these numerical harvest objectives served to encourage the growth and development of the enhancement program, they are now less relevant. Instead, the long-term sustainability of the fishery and the economic viability of the industry are the current forces driving the enhancement program. While the phase I objectives (Appendix C) are of interest as historical benchmarks, they will not be retained as objectives in this plan.

Strategies

1. Fishery management
2. Habitat protection or modification
3. Enhancement
    a. fishery supplementation
    b. wild stock supplementation
    c. colonization

Strategies are the methods and means by which the goals and objectives are achieved. Projects are the actions implemented to address specific components of the goals and objectives. The economic viability of the salmon industry is driven by changing market forces and varying survival rates, and these factors can shift faster than enhancement programs or harvest management strategies can be adjusted to compensate for them. Because of the fluid nature of salmon productivity and interacting social and economic values, strategies may be developed and evaluated by the RPTs annually in order to remain consistent with the goals and objectives of this plan.

The fishery management strategies that have been implemented in Southeast Alaska during the last 20 years have been the key to sustaining wildstock production. Most commercial and sport fisheries are managed for wildstock escapement,[5] while those fisheries that focus on enhanced production (e.g., in terminal harvest areas) are cooperatively managed by the department and the project operator for contributions to common property fisheries, cost recovery, and broodstock. The development of new fishery management strategies to increase terminal or near-terminal harvest efficiencies while minimizing the interception of wild stocks would benefit all user groups. Habitat protection or modification strategies include projects such as fish passes, bank stabilizations, and barrier removals. Because nearly all of these types of projects in Southeast are located on federal land, the Forest Service is the lead agency in developing and implementing them.

Enhancement strategies play an important role in supporting the economic and social fabric of Southeast Alaska's communities. Most enhanced production comes from fishery supplementation projects such as hatcheries. The *Guidelines for Enhancement Planning* section of this document (*see* page 83) describes the technical considerations for initiating each of the three types of enhancement strategies. Research and evaluation are fundamental aspects of these strategies because they help to determine whether projects are successful. Current projects supporting these strategies (*see* page 111) include those in the planning and permitting phase as well as implementation, modification, and formal evaluation phases.

Assumptions

1. The phase III plan and its goals and objectives will continue to evolve through a periodic process of review and revision to maintain its relevance to current knowledge, resources, and needs.
2. Research programs to generate the technical information needed to optimize the productivity and harvest of wild and enhanced salmon can be funded and implemented in a timely fashion.
3. Fishery management and enhancement organizations will continue to be progressive in incorporating new research, knowledge, and evaluation techniques that continue to protect salmon wild stocks.
4. Commercial, sport, personal-use, and subsistence fishing access to enhanced production will be maintained or increased.
5. Statutes and regulations governing enhanced fish production will be maintained.
6. Commercial fishing will remain economically viable.
7. Sport fishing will remain important to the lifestyle of Alaskans and visitors to Alaska.

[5] Discussion of Southeast's overall management strategies is outside the scope of this plan; commercial and sport fish management plans are available online or from the ADF&G regional office in Douglas.

8. Subsistence fishing will remain important to the lifestyle of Alaskans.
9. All entities involved in salmon production will cooperate in improving the quality of salmon products to the consumer.
10. Funding and effort to market Alaska salmon will be maintained.
11. The private nonprofit hatchery organizations will remain the primary enhanced fish producers.
12. The distribution of enhanced fish to commercial gear groups will continue to be guided by the *Southeastern Alaska Area Enhanced Salmon Allocation Management Plan*.

Sustainable Salmon Fisheries Policy and Phase III Planning

In recent years the debate over new increments of enhanced production has focused on the potential interaction of wild and enhanced fish. The decline of salmon stocks in the Pacific Northwest, especially during the 1990s, emphasized the intrinsic value of Alaska's wild stocks and the critical importance of keeping their productivity intact. To that end, under the authority of AS 16.05.251 the department and the Board of Fisheries developed the *Policy for the Management of Sustainable Salmon Fisheries*—also known as the "sustainable salmon policy" (SSP). This policy, which was incorporated into the Alaska Administrative Code (5 AAC 39.222) in 2001, states that "…while, in the aggregate, Alaska's salmon fisheries are healthy and sustainable largely because of abundant pristine habitat and the application of sound, precautionary, conservation management practices, there is a need for a comprehensive policy for the regulation and management of sustainable salmon fisheries." The following SSP sections specifically address enhancement planning:

1. Section (c)(1)(D)—"…effects and interactions of introduced or enhanced stocks on wild salmon stocks should be assessed; wild salmon stocks and fisheries on those stocks should be protected from adverse impacts from artificial propagation and enhancement efforts."

2. Section (c)(3)(J)—"…proposals for salmon fisheries development or expansion and artificial propagation and enhancement should include assessments required for sustainable management of existing salmon fisheries and wild salmon stocks."

3. Section (c)(3)(K)—"…plans and proposals for development or expansion of salmon fisheries and enhancement programs should effectively document resource assessments, potential impacts, and other information needed to assure sustainable management of wild salmon stocks."

The SSP also advocates use of a *precautionary approach* when considering plans and proposals for the development or expansion of enhancement programs. This approach was described for capture fisheries and transfer of marine organisms by the Food and Agriculture Organization of the United Nations (FAO 1996). The salient points are incorporated into section (c)(5)(A) of the SSP:

“(i) consideration of the needs of future generations and avoidance of potentially irreversible changes;
(ii) prior identification of undesirable outcomes and of measures that will avoid undesirable outcomes or correct them promptly;
(iii) initiation of any necessary corrective measure without delay and prompt achievement of the measure’s purpose…
(iv) that where the impact of the resource use is uncertain, but likely presents a measurable risk to sustained yield, priority should be given to conserving the productive capacity of the resource;
(v) appropriate placement of the burden of proof…”

The concept of “burden of proof” is an important one that should not be misused. The FAO (1996) states that the precautionary approach does *not* imply a prohibition against fishing (or by inference, enhancement activity or other activity affecting the fish resource) “until all potential impacts have been assessed and found to be negligible.” Waiting for a complete analysis of all potential impacts would constitute a reversal of the burden of proof, where an action is assumed to be harmful unless proven otherwise. Conversely, it should not be assumed that potential impacts are negligible until proven otherwise. The standard of proof for impacts “should be commensurate with the potential risk to the resource, while also taking into account the expected benefits of the activities…” (FAO 1996).

To comply with this policy, the intent of the phase III plan is to present a set of standards and technical guidelines for developing future increments of production or modifying existing projects to address biological, management, or economic concerns. The standards are the documentation of project criteria that PNP corporation staff, fisheries managers, geneticists, pathologists, and the Southeast RPTs have been using in recent years. The technical guidelines are designed to direct project development toward the standards, which comply with the goals and objectives of the phase III plan as well as the constitutional mandate to protect regional wild stocks.

It is a further intent of the phase III plan to provide a comprehensive overview of the fisheries enhancement program in Southeast. To understand why the planning process has been an effective program for 25 years in providing opportunities to harvest supplemental salmon in common property fisheries, the phase III plan will describe how it works and the checks and balances that have been incorporated into the system for explicit protection of wild stocks.

HISTORICAL PERSPECTIVE

Early Fisheries/Hatcheries

From the early days of Alaska's salmon fishery, there has been a keen interest and enthusiasm for the use of hatcheries as a means of assurance against the adverse effects of commercial fishing (Roppel 1982).

A historical perspective of Alaska's salmon fisheries is integral to understanding how Alaska got into the enhancement program. In its early manifestations, the commercial salmon fishing industry in Alaska was unrestrained. The first Alaska salmon fisheries act passed into law by Congress in 1899 prohibited barricading salmon streams or fishing in small streams; occasional closed periods were also instituted. These laws, however, were not sufficient to prevent overexploitation of salmon resources.

As a response to periodic downturns in commercial harvests, cannery operators constructed hatcheries, reasoning they would help maintain the abundance of salmon at constant levels and provide a steady supply of salmon to their operations. The first hatchery in Southeast was constructed at "Klawak Lake" on Prince of Wales Island in 1898 near where the modern Klawock Hatchery is sited today. This hatchery was soon followed by hatcheries at Redfish Bay on Baranof Island and Hetta Lake near the southern tip of Prince of Wales. All of these hatcheries were built adjacent to cannery sites and major spawning systems.

In 1901, about two years after the fisheries act had become law, it was amended to require all salmon packers to establish hatcheries as a means of replacing the fish they were harvesting each year. Not all cannery operators complied with the new law, but during the territorial period, 15 hatcheries were established in Southeast (Roppel 1982). Most of the cannery-operated facilities, however, failed because of a lack of knowledge of the underlying principles of fish biology and ecology; for example, it was a common practice for some early fish culturists to release fry directly into salt water or feed their juvenile fish ground-up beef liver (Roppel 1982).

In response to declining harvests in the early 1920s, the White Act was implemented in 1924; it required, among other things, fishing closures after the midpoint of the season to ensure adequate escapements (Cooley 1963). Unfortunately, this act had little or no scientific basis; furthermore, lack of funding prevented federal fisheries managers from developing better laws or enforcing the ones already in place. During the steady decline of salmon production in the 1940s, managers and stakeholders became aware of the need for conservation. Declining harvests also stimulated local opposition to fish traps. It wasn't until the early 1950s that fisheries managers, in conjunction with the Fisheries Research Institute of the University of Washington, began incorporating the idea of maintaining the sustained productivity of salmon through management strategies based on scientific research (Royce 1989). By then, however, fisheries in Alaska were nearing the bottom of a long period of decline.

In Southeast Alaska, that decline began in 1942, following a 1941 record-high harvest of nearly 68 million salmon (Edfelt 1973); it should be noted, however, that this record harvest might also reflect overfishing. A combination of overfishing by both domestic and international commercial fleets (e.g., Canadian and Japanese net fisheries) and lack of regulatory oversight were primary causes for the decline in salmon harvests in Southeast. The absolute bottom occurred in 1960, when the total commercial salmon harvest was 5.6 million, a mere 8% of the 1941 record (Figure 6).

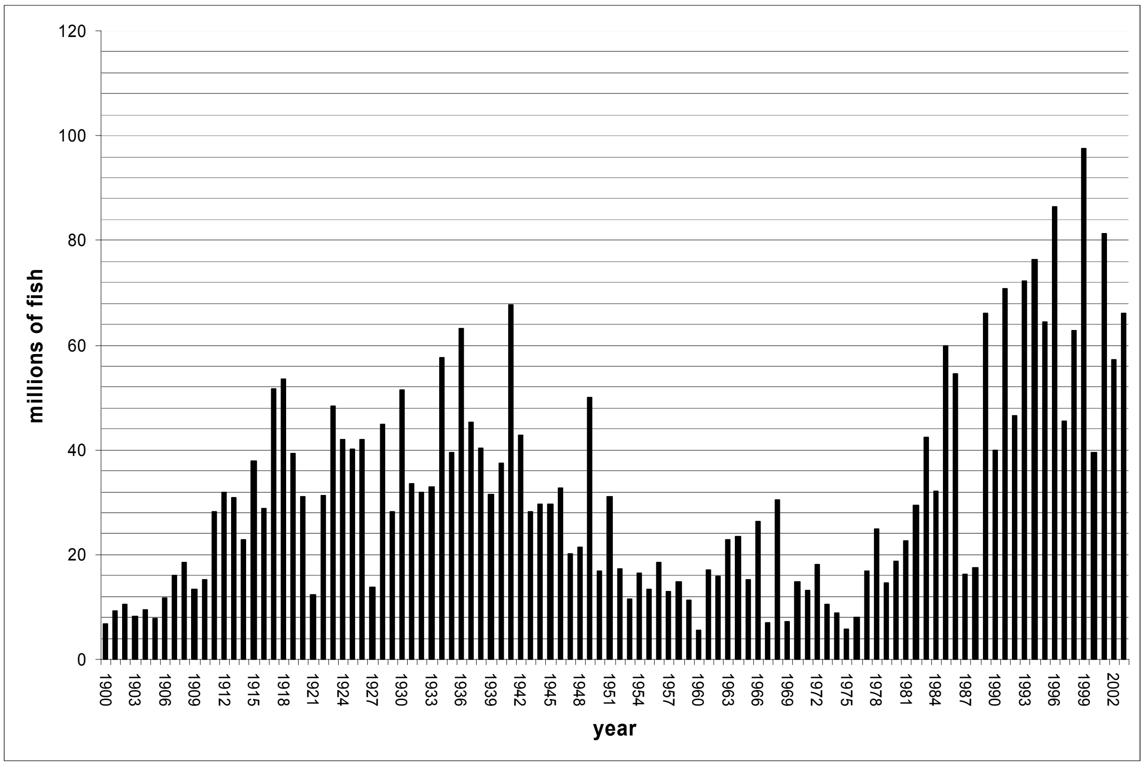


Figure 6. Historical Southeast Alaska commercial salmon harvest, 1900–2003.

In 1960 the Alaska Department of Fish and Game assumed management authority over its fisheries with a strong constitutional mandate to conserve wild stocks (i.e., Article VIII, Section 1): "Fish…and other replenishable resources belonging to the State shall be utilized, developed and maintained on the sustained yield principle, subject to preferences among beneficial uses." The Constitution of the State of Alaska further prohibited the use of fish traps for the taking of salmon for commercial purposes in all coastal waters of the state (Holmes and Burkett 1996). While ADF&G was given the responsibility to manage fisheries to maintain sustained yield, the Board of Fisheries was given the responsibility for allocating that yield to fishermen. This clear separation of conservation authority from allocation authority is one of the strengths of Alaska's fishery management system (Meacham and Clark 1994).

In his first speech to the joint assembly of the first Alaska Legislature, Governor William A. Egan noted that statewide salmon production had dropped to 25 million in 1959, its lowest level in 60 years; he noted further that "revival of the commercial fisheries is an absolute imperative" (Byerly et al. 1999). A constitutional mandate, a new fishery management regime based on scientific principles, and the Egan Administration's commitment to rebuild the salmon industry represented the beginning of the most successful salmon enhancement program in North America, one that ultimately had few similarities with the programs of the Pacific Northwest.

State Hatchery Program

The modern state hatchery program grew out of depressed fisheries and was predicated on the concept of supplementing fisheries, not restoring wild stocks. This concept dramatically differentiated Alaska's program from others, particularly those in Washington State, where habitat degradation attributed to dams, urbanization, logging, mining, agriculture, and other human activities resulted in the depression or extirpation of many of their native salmon stocks. Fisheries managers there mitigated these losses by providing hatchery stocks to replace them. Washington's approach made it difficult for fishermen or fisheries managers to distinguish the hatchery components of runs from the wild stock components in mixed-stock fisheries, sometimes resulting in the overharvest of wild stocks. In 2003, there were approximately 100 hatcheries in Puget Sound and coastal Washington largely designed to produce fish as compensation for declines in naturally spawning salmon populations. Washington hatcheries have been somewhat successful in doing that; however, they have also been identified as one of the factors responsible for the depletion of wild salmon stocks in the Pacific Northwest (Barr et al. 2002).

The policies and laws implemented in Alaska were carefully considered to meet the state's constitutional mandate. There was a concerted effort by all parties involved to collectively support fisheries and minimize impacts to wild stocks to the greatest extent possible; for example, Alaska Statute 16.10.400(f) prohibits construction or operation of a hatchery on an anadromous stream. The primary purpose of the Alaska program is to enhance fisheries, although it has become involved in the rehabilitation of some depressed stocks through spawning channel, lake fertilization, and lake stocking projects. In the late 1960s public concern over depressed fisheries was high because, prior to North Slope oil, the salmon industry was the engine that drove a significant portion of the state's economy.

In 1968 a general obligation bond authorizing $3 million for construction of state hatcheries was passed by the legislature and approved by the public. As a result of this funding, Crystal Lake Hatchery was constructed in 1969. The only other Southeast hatcheries in place at that time were two federal research facilities at Little Port Walter (1934) and Auke Creek (1950) and one state facility, Deer Mountain Hatchery (1954), which originally had been established by the City of Ketchikan to enhance its local sport fishing derbies. All of these small facilities had roles in developing new technologies for ocean ranching of salmon in Southeast. Also at the time, there was a small staff of professional fish culturists within the hatchery section of ADF&G's Division of Sport Fish who were charged with operating existing state hatcheries throughout Alaska.

In 1969 Alaska received $900 million from the sale of oil and gas leases on the North Slope, and the legislature realized the potential of future income from oil production. The state decided to spend some of that money in the development of renewable resources to provide employment and economic activity for the state. The salmon resource was a primary beneficiary for long-term investments (Eliason et al. 1992).

In the spring of 1971 the Alaska Legislature in AS 16.05.092 created the Division of Fisheries Rehabilitation, Enhancement and Development (FRED) to oversee and develop its enhancement program. The division had four main responsibilities: (1) develop and maintain a state plan for long-range fishery rehabilitation; (2) encourage private investment in the development and use of Alaska's fishery resources; (3) insure the perpetuation of Alaska's fish resources; and (4) make an annual report to the legislature.

To provide additional means of increasing economic returns to Alaska's commercial fishermen and stabilizing the level of investments in the salmon fisheries, in 1973 the legislature with a confirming vote by the public implemented limited entry (i.e., amendment to Article VIII, Section 15 of the Constitution of the State of Alaska). This amendment "does not restrict the power of the State to limit entry into any fishery for purposes of resource conservation, to prevent economic distress among fishermen and those dependent upon them for a livelihood and to promote the efficient development of aquaculture."

During the early 1970s, salmon runs for all species in Southeast continued to be weak. Fishing fleets spent weeks at a time tied to the dock during the peak period of salmon runs to assure sufficient escapements of salmon. In 1974 in response to this continuing distress in the salmon fisheries, a state-issued bond provided $10.5 million for construction of state hatchery facilities. This was timely because several new facilities were already in the planning stages.

In 1974 the United Fisherman's Association (UFA) was formed, which organized commercial fishermen statewide. Although the UFA and other fishermen's organizations[6] such as the Alaska Trollers Association (ATA) and Southeast Alaska Seiners (SEAS) became influential supporters of state hatcheries, they lobbied heavily for a private nonprofit hatchery program. With limited entry in place, legislators felt more confident in expanding the enhancement program because the economic benefits of a rehabilitated fishery would not be diluted by ever increasing numbers of fishermen (Eliason et al. 1992). Legislators were also concerned over the increasing cost of funding state hatcheries, and they were aware that operation of private hatcheries could be funded from cost recovery harvests of returning fish as well as tax assessments on fishermen benefiting from enhanced production. Legislators realized the private nonprofit hatchery program would shift the cost from the public to those who directly received the benefits—a "user-pays" philosophy.

According to Eliason et al. (1992), in 1976 the legislature estimated it would take $400 million to build up the entire fishery resource to a healthy level. Half of that amount

[6] United Southeast Alaska Gillnetters Association (USAG) was not formed until 1978.

would be for state hatcheries and would be provided by state funding. The other $200 million would be designated for development of PNP hatcheries, and the legislature anticipated that funding would come from fisheries groups, private foundations, or federal grants. In 1976, 1978, and 1980 publicly approved bond issues provided $29.2, $27.0, and $7.7 million, respectively, for capital improvements to state hatchery facilities. Between 1977 and 1979, three more state hatcheries were constructed in Southeast: Klawock, Hidden Falls, and Snettisham (Table 1, Figure 7).

Private Nonprofit Enhancement Program

In 1974 the Private Nonprofit Hatchery Act statutes (AS 16.10.375-620) authorized the FRED Division to issue hatchery permits to qualified PNP corporations. This legislation, which was developed and refined over the next several years, was designed to apply private-sector initiative to the production of salmon to make it more cost efficient and self-sustaining. The legislative intent of this act was…"to authorize the private ownership of salmon hatcheries by qualified non-profit corporations for the purpose of contributing, by artificial means, to the rehabilitation of the state's depleted and depressed salmon fisheries. The program shall be operated without adversely affecting natural stocks of fish in the state and under a policy of management which allows reasonable segregation of returning hatchery-reared salmon from naturally occurring stocks." [7] Basically, this legislation set up the method and means for establishing PNP hatcheries. Furthermore, AS 16.10.450 was soon afterward amended to allow proceeds from the sale of salmon (and eggs) by a PNP corporation to be applied to debt retirement as well as operating costs of their hatchery (Eliason et al. 1992).

The planning process for the enhancement program was established in 1976 under AS 16.10.375 of the PNP Hatchery Act statutes. It directed the commissioner to (1) designate regions in the state for the purpose of producing salmon and (2) develop comprehensive salmon plans for each region. The legislature felt that comprehensive salmon planning on a regional level would help ameliorate potential problems such as intermingling of hatchery and wild stocks by careful site selection of hatcheries (Eliason et al. 1992).

Under the authority of the commissioner, the comprehensive salmon plans were to be developed by regional planning teams consisting of department personnel and representatives of qualified regional aquaculture associations (RAA). These RAAs were to be formed (Table 2) for the purpose of enhancing salmon production according to criteria set out in AS 16.10.380: "(1) is comprised of associations representative of commercial fishermen in the region; (2) includes representatives of other user groups interested in fisheries within the region who wish to belong; and (3) possesses a board of directors that includes, but is not limited to, sport fishermen, processors, commercial fishermen, subsistence fishermen, and representatives of local communities."

As a result of this legislation the Northern Southeast and Southern Southeast Regions were established by the commissioner, their boundaries corresponding to those of

[7] Section 1 Chapter 111 Session Laws of Alaska.

Table 1. Salmon enhancement program timeline of events for Southeast Alaska.[8]

Year	Event
1934	Little Port Walter research station constructed (federal)
1950	Auke Creek Hatchery constructed (federal)
1954	Deer Mountain Hatchery constructed (territorial)
1968	$3 million bond for hatchery construction passed
1969	Crystal Lake Hatchery constructed (state)
1971	FRED Division created by legislature
1973	Enhancement projects at Starrigaven started (state)
1974	Beaver Falls Hatchery constructed (state)
	Legislature passes PNP Hatchery Act
1975	Sheldon Jackson (SJC) PNP permit issued
1976	AS 16.10.375 designated establishment of salmon production regions, regional associations, planning teams, and comprehensive salmon plans
	$29.2 million bond for hatchery construction passed
	Burnett Inlet (AAI) and Kowee Creek (DIPAC) PNP permits issued
1977	Gunnuk Creek (KNFC) PNP permit issued
	Klawock Hatchery constructed (state)
1978	Whitman Lake (SSRAA) PNP permit issued
	Hidden Falls Hatchery constructed (state)
	$27 million bond for hatchery construction passed
1979	Sheep Creek (DIPAC), Meyers Chuck, and Salmon Creek (FFI) PNP permits issued/Snettisham Hatchery constructed (state)
	$7.7 million bond for hatchery construction passed
1980	Burro Creek (BCF) PNP permit issued
	Tamgas Creek Hatchery (MIC/BIA) constructed
1981	Medvejie (NSRAA), Port Armstrong (AKI), and Salmon Creek (NSRAA) PNP permits issued and Salmon Creek (FFI) PNP permit revoked
1983	Neets Bay (SSRAA) PNP permit issued
1986	Beaver Falls (SSRAA) PNP permit issued
1987	Gastineau (DIPAC; now Macaulay) PNP permit issued
1988	Aquatic Farm Act allows contracting of hatchery operations
	Hidden Falls Hatchery contracted to NSRAA
	Salmon Creek (NSRAA) PNP permit revoked
1990	Finfish farming in Alaska prohibited
	Bell Island (AAC) PNP permit issued
1991	Beaver Falls Hatchery (state) contracted to SSRAA
1992	PNP permit issued to Haines' projects (NSRAA)
	Meyers Chuck PNP permit revoked
	FRED Division merged with Commercial Fisheries Division (CFMD)
1993	Klawock Hatchery contracted to private sector (now POWHA)
1994	Deer Mountain Hatchery contracted to Ketchikan Indian Community
	PNP permits issued to Klawock (POWHA) and Deer Mountain (KTCH)
1995	Crystal Lake Hatchery transferred from CFMD Division to Sport Fish Division
1996	Snettisham Hatchery contracted to DIPAC
1997	Beaver Falls Hatchery (state contracted to SSRAA) closed
	Burnett Inlet PNP Hatchery closed and reopened under SSRAA
2000	Crystal Lake Hatchery (state) annual professional services contract with SSRAA
2001	Kowee Creek (DIPAC) PNP permit given up

[8] Table relies extensively on timeline data provided in McNair (2001). Explanations for acronyms provided in *List of Terms* section on page 126. Gastineau Hatchery was renamed Macaulay Hatchery to honor DIPAC founder Ladd Macaulay following his untimely accidental death in April 2000.

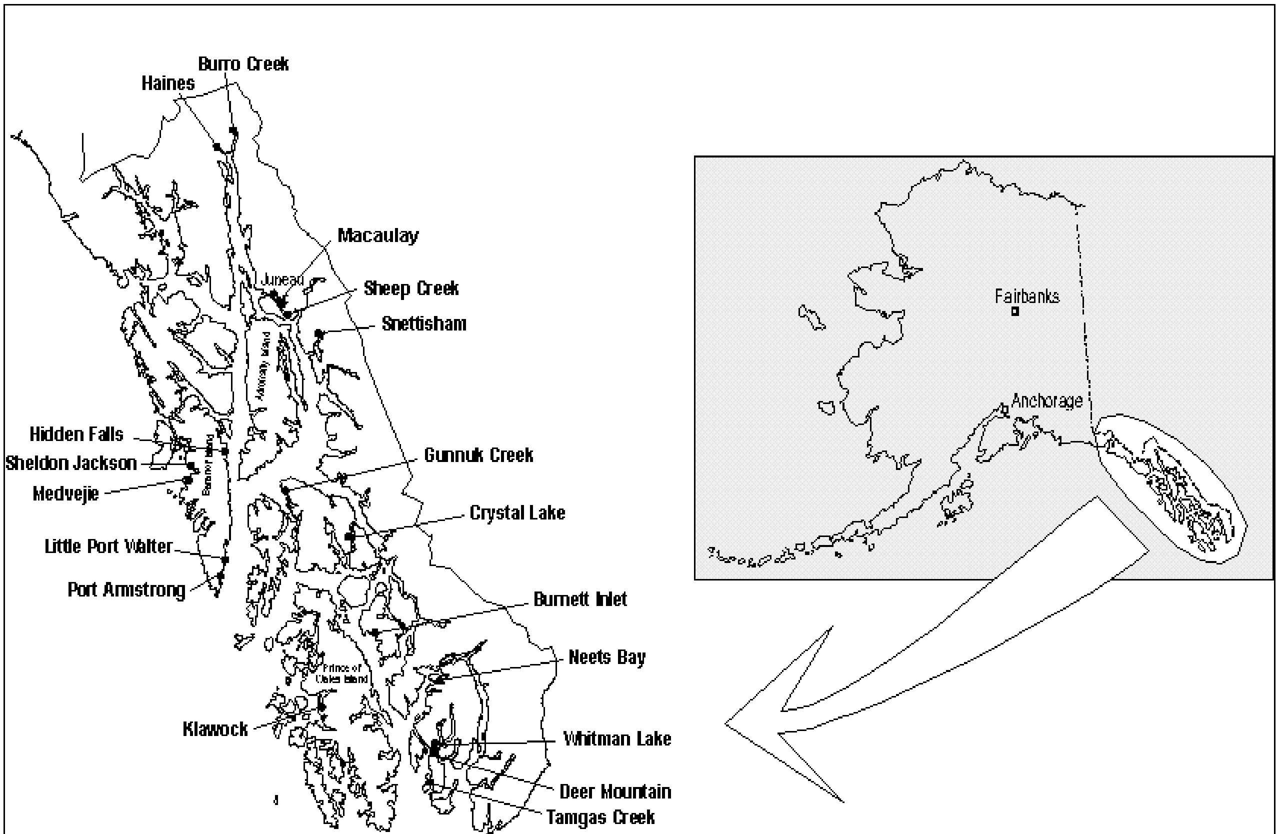


Figure 7. Locations of PNP hatcheries in Southeast Alaska.[9]

commercial fisheries management districts 1-8 and 9-16, respectively. In May 1976 the Southern Southeast Regional Aquaculture Association (SSRAA) was incorporated in Ketchikan. In March 1977 the Baranof/Chichagof Regional Aquaculture Association was incorporated in Sitka; in June 1977 that corporate name was changed to the Northern Southeast Regional Aquaculture Association (NSRAA).

Each regional aquaculture association has a board of directors weighted toward the commercial fishing interests that initially incorporated them. According to the by-laws of SSRAA, its Board of Directors “shall consist of no less than fifteen (15) nor more than twenty-one members. At least thirteen (13) directors shall be representative of bona-fide commercial fishermen, including four seiners, four power trollers, four gillnetters, and one hand troller.” Their terms of office are three years, and these terms are also staggered so that no more than four directors’ terms expire in any one year. The remaining directors are representative of other groups directly affected by the salmon industry, including subsistence fishermen, sport fishing organizations, regional or village corporations recognized under the Alaska Native Claims Settlement Act (ANCSA), municipal corporations within the region, chambers of commerce within the region, salmon processors, and the public at large. The public at large is represented by two directors; all other groups have one representative. Director candidates for the non-fishermen seats are solicited by public advertisement throughout the region and by less formal contact with

[9] Little Port Walter is a NMFS research facility; Tamgas Creek is a tribal facility operated by MIC.

Table 2. Steps in the formation of a regional aquaculture association.

Incorporators inform fisheries user groups of proposed development of RAA through advertised meetings, letters, and word of mouth.

⇩

First meeting held by incorporators to publicly discuss RAA Formation and implications

⇩

Second meeting held to develop draft Articles of Incorporation, By-laws, and regional boundaries

⇩

Incorporators solicit nominations for Board of Directors of RAA

⇩

Board of Directors organizes and conducts first meeting and adopts By-laws and Articles of Incorporation

⇩

Board of Directors files Articles of Incorporation with State Division of Banking, Securities, and Corporations

⇩

PNP Corporation submits By-laws, letters of support, other required information, and cover letter to the ADF&G commissioner

⇩

Commissioner of Alaska Department of Fish and Game authorizes RAA and designates region the concerned interest groups. Names of interested parties are submitted to the 13 commercial fishermen directors, who select a person by majority vote to fill each seat. Each of these directors serves a one-year term. All directors may succeed themselves.

According to NSRAA bylaws, the Board of Directors consists of "no less than nine, nor more than seventy-five members. At least fifty-one (51%) percent of the Board of Directors shall be bona fide commercial salmon fishermen, divided amongst seiners, trollers, and gillnetters." The remaining members of the board are solicited from other groups directly affected by the salmon industry: regional or village corporations formed under ANCSA, regional municipal corporations, sport fishing organizations, salmon processing industry, subsistence fishermen, and others having exceptional knowledge or interest in aquaculture. All directors are elected by the commercial salmon fishing fleet (i.e., those seine, troll, and gillnet fishermen with limited entry salmon permits). The term of office for any director is three years, and a director may succeed himself. Directors have staggered terms as specified by the board in such a manner that no more than one-third of the total number of directors' terms expires in any one year.

In 1976 and 1977, additional amendments (AS 16.10.500-560) created and refined a Fisheries Enhancement Revolving Loan Fund within the Department of Community and Economic Development: "It is the policy of the state…to promote the enhancement of the state's fisheries by means of grants for organizational planning purposes to regional associations…and by means of long-term, low interest loans for hatchery planning, construction, and operation and for planning and implementation of enhancement and rehabilitation activities." In order to provide collateral for these capital and operating loans, authority was given to regional aquaculture associations to assess a fisheries enhancement tax not to exceed 3% based on the sale of salmon provided that "51% of the persons holding entry permits and actively participating in a fishery to be benefited by a hatchery program…" voted for its approval (AS 16.10.540).

These amendments, in effect, created two classes of PNP corporations: (1) regional aquaculture associations permitted to carry out enhancement activities throughout entire regions designated by the commissioner and (2) nonregional corporations (sometimes referred to as "mom and pops") permitted to carry out enhancement activities in localized areas within regions. Both regional aquaculture association and nonregional PNP corporations are capitalized with state loans and grants; however, while regional aquaculture associations use revenue from cost recovery and the salmon enhancement tax, nonregional PNP corporations are primarily dependent on cost recovery fisheries and, in some instances, funding and grants from state and federal agencies for specified projects. A few nonregional corporations (e.g., Deer Mountain, DIPAC) also use other innovative means such as attracting tourist dollars by providing tours, aquariums, gift shops and other services to repay debts.

The nonregional corporations are structured differently than the regional aquaculture associations. Community groups or motivated individuals initiated their formation, and their boards generally have more community and less commercial fishing industry representation; however, user groups are also represented on those boards.

The primary legislation enabling the PNP program was made in the 1970s, including authorization for the commissioner to revoke a hatchery permit if the permit holder failed to comply with its conditions and terms (AS 16.10.430); however, lawmakers continued to fine-tune the legislation into the 1980s to further assist in the effectiveness of the program. These refinements included granting special harvest area entry permits to facilitate broodstock and cost recovery harvests by hatchery operators under AS 16.43.400-420. Moreover, when shrinking revenues and budgets compelled other alternatives to state-run facilities, in 1988 the legislature passed AS 16.10.480, which allowed the state to contract operation of its hatcheries to PNP corporations. These laws provided some closure to an emerging legislative intent to have fishermen provide the funding necessary to enhance their own fisheries. Four hatcheries built or authorized since the inception of the PNP legislation have been closed: Salmon Creek, Beaver Falls, Meyers Chuck, and Kowee Creek (Table 1). These closures illustrate that in order for PNP programs to be continued they must provide benefits to common property fisheries and be economically sustainable.

Currently there are 18 hatcheries in Southeast, 16 of which have PNP hatchery permits. Little Port Walter, a research facility, and Tamgas Creek, a tribal production facility operate under federal jurisdiction and do not have PNP hatchery permits. Hidden Falls, Snettisham, Crystal Lake, and Klawock are former state facilities operated under contract by NSRAA, DIPAC, SSRAA, and Prince of Wales Hatchery Association, respectively. The remaining 10 facilities are operated by PNP corporations: NSRAA's Medvejie and Haines Projects; SSRAA's Whitman Lake, Neets Bay, and Burnett Inlet; DIPAC's Macaulay and Sheep Creek; and the other nonregional facilities at Burro Creek, Gunnuk Creek, Sheldon Jackson, Deer Mountain, and Port Armstrong. As indicated in Table 1, after the Aquatic Farm Act was passed in 1988, the operation of five state-owned hatcheries in Southeast was gradually contracted to PNP corporations; however, while the state's Beaver Falls Hatchery was contracted to SSRAA in 1991, it was closed in 1997. An overview of all operating hatcheries in Southeast is provided in the *Hatchery Profiles* section of this plan that immediately follows this section.

Policy Development

The success of Southeast Alaska's hatchery program can also be attributed to the various policies, statutes, and regulations that were instituted by ADF&G, the legislature, and the Alaska Board of Fisheries to control hatchery development and concurrently to protect wild stocks (McGee 2003). Following legislative approval of the PNP hatchery program, ADF&G formalized its initial *Genetic Policy* in 1975 to guide the state's enhancement program and to minimize adverse impacts on wild stocks; it was revised in 1978. The current revision (Davis et al. 1985) was developed by scientists from ADF&G, PNP corporations, University of Alaska, and NMFS. This policy prohibits importation of live salmonids into Alaska and transplantation of stocks between major geographic regions of the state. It provides criteria for evaluating intraregional transplants that minimize risks of interactions between hatchery and wild stocks.

The commissioner has always placed conditions on the use of a PNP hatchery permit, including a provision that broodstock must be from an ADF&G-approved source. This action is supported by the 1981 Alaska Board of Fisheries regulations 5 AAC 41.001-41.100 governing the fish transport permit (FTP) process. These regulations stipulate that no person my transport, possess, export from the state, or release into waters of the state any live fish unless that person holds a fish transport permit issued by the commissioner and is in compliance with all conditions of the permit and provisions of all pertinent regulations. These regulations further state the commissioner will only issue an FTP if the department determines that the proposed transport, possession, or release of fish will not adversely affect the continued health and perpetuation of native, wild, or hatchery stocks of fish. All FTPs are reviewed and signed by ADF&G's principal pathologist and geneticist, regional supervisors for the fisheries divisions, and the commissioner.

The publication *Regulation Changes, Policies, and Guidelines for Fish and Shellfish Health and Disease Control* (Meyers et al. 1988) was compiled by the State Pathology Review Committee. This multi-agency group worked from 1985 through 1987 to develop changes in state regulations, new fish disease policies, and recommendations for maintaining finfish and shellfish health in Alaska. Its goal was to prevent dissemination of infectious diseases in fish and shellfish within and from outside the state without creating impractical constraints for aquaculture and other fisheries enhancement or rehabilitation projects. This document includes the department's sockeye salmon culture policy, which was updated and published separately (McDaniel et al. 1994).

The *Policy and Requirements for Fish Resource Permits* (Rosier 1994) replaced an outmoded 1983 policy for issuing ADF&G scientific collecting and educational permits. The new policy was developed by a departmental committee to provide a more detailed explanation to the public of the requirements for obtaining permits for the collection and/or transportation of live fish in any life-stage to be used for scientific, educational, propagative, or exhibition purposes.

Discussion

Collectively, PNP legislation, statutes, regulations, and policies in Alaska provided for the successful development of a hatchery program in Southeast Alaska to enhance fisheries. It is an enhancement program that represents an abrupt departure from the Pacific Northwest's program, which replaced or augmented specific stocks of wild fish by locating hatcheries adjacent to significant spawning rivers and streams accessed by wild stocks. In Southeast, hatcheries were generally built in areas where there were minimal runs of wild stocks. Usually, these hatcheries were sited in proximity to an inlet or bay that had a high-quality barriered water supply and an area large enough to accommodate a terminal fishery. Broodstock was obtained only from ADF&G-sanctioned healthy wild stocks located in neighboring systems, and the egg takes occurred over the life cycle of the particular wild stock (i.e., two to four years, depending on species). Hatchery stock was then built-up to its permitted capacity over time, generally in three to five generations. When significant numbers of fish began returning to the hatchery, eggs were taken from the returns, while cost recovery and/or common property fisheries were conducted in the terminal harvest areas once broodstock requirements had been met. It is important to recognize that, in most cases, prior to reaching the hatchery, a significant portion of the return is caught in traditional mixed-stock, common property fisheries in the vicinity of the hatchery.

During the initial development of Alaska's modern enhancement program, biologists understood that the poor natural returns of the time resulted from natural fluctuations in abundance of wild fish and the harvest of fish in the North Pacific by foreign fleets. It was not their perception that wild stocks needed rehabilitation through fish culture and stock restoration practices. The goal of the enhancement program has always been to reduce the impacts of poor natural returns and low harvests in the fisheries. The entry of enhanced fish into these fisheries has resulted in higher fish availability during years with both good and bad natural returns, thus adding value and stabilization to the industry.[10]

Smoker et al. (2000) concluded the Alaska enhancement program was developed because wild stocks could not provide adequate harvests to sustain fisheries in particular years when severe environmental factors reduced survival. Smoker et al. (2000) also noted the following: "Even in the recent era of high wild salmon production, there have been some years in some regions in which a harvest was possible only because hatchery production was available." Risks, particularly overharvest of wild stocks in mixed-stock fisheries, have been reduced by siting facilities where harvests are not heavily mixed and by using tags or thermal marks to identify hatchery-produced fish in mixed harvests so that managers can avoid overexploitation of wild stocks.

Questions have been raised as to what effect hatchery-produced salmon may be having on local and interregional wild stocks through density dependent interactions such as competition for food in the Gulf of Alaska. One indication of competition among these fish would be a decrease in growth (i.e., smaller size and weight of adult fish) accompanying an increase in abundance. This concept suggests that growth of fish may be limited when marine survival is high and large numbers of fish are competing for limited food; however, recent data for chum salmon, for example, appear to indicate the opposite occurs. When marine survival of hatchery chum salmon is high and large numbers of adults return, it appears these fish are larger (McGee 1999).

Survival of salmon in the marine environment, however, does not appear to be dependent on their density in the open ocean. Recent studies with chum salmon (Fukuwaka and Suzuki 1999) indicated 90% of salmon mortality occurred during the early marine period soon after juvenile fish entered salt water. These findings are in agreement with earlier studies (Heard 1991). Survival of hatchery-produced salmon in Alaska generally appears to mirror that of wild fish from the area surrounding the hatchery. When survival of hatchery-produced salmon is high, wild stocks from the surrounding area also survive in greater numbers; however, there is still the need to continue to investigate the concept of local and ocean-scale carrying capacity and the implications for wild and hatchery salmon productivity at regional and international scales.

---

[10] John Burke, general manager, Southern Southeast Regional Aquaculture Association. Comments on the Board of Fisheries Hatchery Committee Report. October 29, 1999

HATCHERY PROFILES[11]

Regional Hatcheries and Related Enhancement Projects

Neets Bay and Whitman Lake Hatcheries (SSRAA)

Neets Bay and Whitman Lake Hatcheries operate as extensions of one another and produce chinook, fall coho, and summer and fall chum salmon. Neets Bay Hatchery (Neets) was constructed by SSRAA with funds borrowed from the Department of Community and Economic Development (DCED).[12] This facility, located on the west side of Revillagigedo Island off west Behm Canal at the outfall of Neets Creek about 40 miles north of Ketchikan, has been in operation since 1983; the only access to the site is by water or air. The Whitman Lake Hatchery (Whitman) has been in operation since 1978; it was also built by SSRAA with funds borrowed from DCED. It is located at Herring Cove in George Inlet, approximately 10 miles south of Ketchikan, and is accessible by road.

Summer chum salmon. Carroll Inlet is the primary broodstock source for these two hatcheries. Approximately 100 million summer chum eggs are collected and eyed at Neets; of these, approximately 30 million eyed eggs are moved to Whitman to incubate until fry emergence. Emergent summer chum fry from Whitman are transported to remote release sites at Nakat Inlet (eight million) and Kendrick Bay (20 million) in the spring of each year. The fry are reared there for several months and then released. The remaining summer chums are incubated at Neets Bay. At emergence 14 million are moved to Anita Bay for short-term rearing and release while 48 million are short-term reared and released at Neets.

Fall chum salmon. Approximately 28 million fall chum of Disappearance Creek stock are also produced annually at Neets; eight million fry are transported to Nakat Inlet by vessel where they are short-term reared and released. The remaining 20 million fall chums are reared and released at Neets.

Fall coho salmon. Chickamin River is the broodstock source for coho produced at Whitman. About two million coho eyed eggs are moved to Neets for rearing to the yearling smolt stage, while the rest of the fish are reared at Whitman. Each spring about one million smolts from Whitman are moved to Neets to be released with those coho reared there—a total release of three million smolts. An additional 300,000 smolts are released at Whitman to provide broodstock, 300,000 are moved to Nakat Inlet for rearing and release, and 225,000 are moved to Anita Bay for rearing and release.

Chinook salmon. Chickamin River is the broodstock source of chinook produced at Whitman; 750,000 of these fish are retained at Whitman Lake for rearing to yearling smolt and release, while 250,000 are moved as fry to Long Lake, which drains into Neets

---

[11] Unless indicated otherwise, hatchery profiles were provided by managers or operators of these facilities.
[12] In 1999 the Department of Commerce merged with the Department of Community and Regional Affairs to become the Department of Community and Economic Development.

Bay. The fry are reared and released as presmolts into Long Lake in the fall of their first year; they volitionally move from Long Lake to salt water as smolts the following spring. The Whitman and Neets chinook releases are partially funded by Division of Sport Fish.

Returns from the Whitman Lake/Neets Bay Program. In an average year about 1.6 million summer chum return from the Neets Bay release. About 30% to 35% of these fish are harvested in common property net fisheries; the remaining fish are harvested in the Neets Bay Special Harvest Area. Trollers harvest about 200,000 of these fish, and because Neets Bay is the primary cost recovery site, SSRAA harvests the remainder for cost recovery and broodstock needs. All fish released at Nakat Inlet and Kendrick and Anita Bays are harvested by the common property net fleets.

Until 25 September the fall chums returning to Neets Bay are harvested by SSRAA for cost recovery and broodstock needs. After 25 September, a rotational gillnet and seine fishery has been conducted in Neets Bay since 2002 for fall chum and coho; these fisheries are scheduled to continue until 2005. Fall chum are also harvested at Nakat Inlet in a rotational fishery of the two net gear groups.

On average more than 70% of the return of Neets fall coho are intercepted by trollers, net fleets, and sport fishermen. This coho release has contributed as many as 100,000 fish to the troll fleet; most of that harvest occurs in the Sitka area. Recently, fewer of these coho have been caught by trollers because participation in that fishery has diminished. A significant number of these fish are harvested by gillnetters in District 106 at the northern end of Prince of Wales Island. For the last several years the Ketchikan area sport fishery has harvested close to 15,000 of these fish each season. Any remaining fish are harvested for cost recovery by Neets or harvested in the rotational net fisheries conducted in Neets Bay after 25 September. A high percentage of coho returning to Whitman, sometimes exceeding 90%, are intercepted by common property troll, net, and sport fisheries. Any remaining fish are used by the hatchery for broodstock. All of the coho returning to Nakat Inlet and Anita Bay are harvested by common property troll, net, and sport fishermen.

As many as 10,000 chinook returning to Neets and Whitman are harvested by trollers in spring hatchery access fisheries. The return to Whitman also drives the early-season “Mountain Point” sport fishery in Ketchikan. This fishery is extensively utilized by both resident and nonresident-guided anglers on charter vessels and at a minimum accounts for a harvest of several thousand of these fish annually. Broodstock is collected at Whitman. The Neets returns contribute primarily to distant troll fisheries, the Ketchikan area sport fishery, and cost recovery. Because the harvest rate on chinook returning to Neets is not nearly as high as those returning to Whitman, they represent an underutilized opportunity to common property fishermen.

Burnett Inlet Hatchery (SSRAA)

The Burnett Inlet Hatchery (Burnett) is located at the outfall of Burnett Lake on Etolin Island approximately 35 miles southeast of Wrangell. This is a remote site with access only by boat or float plane. Burnett was originally permitted to Alaska Aquaculture

Incorporated (AAI) in 1976, and construction of the hatchery facilities was initiated shortly thereafter. Production of pink and chum salmon began in 1978; production of coho salmon began in 1984 and continued through 1990; and chinook production occurred from 1987 to 1990. Alaska Aquaculture Incorporated ceased operation of Burnett in 1996. In 1997 SSRAA took over the site, did extensive remodeling and repair, and began producing fish. The current hatchery is not a large facility, but it is uniquely designed to work as a central incubation site for smaller sockeye projects. The primary production from the facility is summer coho.

Summer coho. These fish return as adults and enter lake systems in July and early August. They ripen in the lakes and spawn in the fall. Burnett produces about 2 million summer coho of Reflection Lake stock. In the spring approximately 1.7 million are moved as fry into net pens in Neck Lake on Prince of Wales Island. The fish are fed and reared until late fall or early winter; half are then released into Neck Lake as presmolts, and the other half are retained in the net pens without feed until spring. Feeding is reinitiated in the spring, and the fish are released in May to enable them to leave the lake volitionally as smolts along with the presmolts that overwintered in the lake itself. The additional production, about 300,000 fish, are reared to smolt size and released at Burnett in the spring of their second year.

Summer coho returning to the Neck Lake remote release site are primarily harvested in the gillnet fishery in District 106 at the north end of Prince of Wales Island; some are harvested by trollers near Sitka. These fish are also harvested by sport anglers along their return migration route, although the primary sport harvest of several thousand fish occurs in a terminal fishery in Whale Pass below Neck Creek. Any remaining coho are taken for cost recovery by SSRAA at Neck Creek. As much as 80% of the coho returning from the Burnett releases are harvested by the commercial fleets; those fish returning to the hatchery are used as broodstock.

Sockeye. There are several sockeye programs at Burnett. The hatchery is used as a central incubation facility to produce Hugh Smith Lake sockeye in an ongoing effort to rehabilitate that stock; 250,000 eggs are collected at Hugh Smith Lake and taken to Burnett, where they are incubated and the fish are thermally marked. Fry are returned to net pens in Hugh Smith Lake to be reared. They are released as presmolts in late July when adult sockeye first begin to enter the system. The fish overwinter in the lake and leave as smolts the following spring. This rehabilitation project, which is described in SSRAA's 2003 annual management plan, specifies a sliding egg take schedule from zero to 450,000 eggs that is dependent on escapement levels to the lake. In the summer of 2003 the sockeye escapement goal for Hugh Smith Lake was met for the first time in a number of years. Fish from this project represent a significant part of the adult return.

McDonald Lake sockeye are also produced at Burnett, although this project is still in its initial stages. For the past three years 500,000 sockeye smolts have been released from the raceway at Neck Lake. Beginning with the 2003 brood, these fish will also be reared to yearling smolt and released from Burnett; SSRAA anticipates that over 70% of the fish returning to each of these sites will be intercepted in the District 106 gillnet fishery. The fish that return to the Neck Creek remote release site will be utilized for cost recovery, while fish returning to Burnett will be used as broodstock for the long-term project. Although a few small sockeye returned to Neck Creek in the summer of 2003, a normal return of mature 3-ocean fish is expected in 2004. The first returns to Burnett Inlet will occur in 2005 or 2006. SSRAA has submitted a permit alteration request (PAR) to expand sockeye production at Burnett and provide releases of one million smolts at both Neck Creek and Burnett Inlet. In December 2003 the Southern Southeast RPT voted to allow SSRAA to increase sockeye production at Burnett from 40,000 to 250,000 smolts and to allow an aggregate smolt release at either Neck Lake or Burnett Inlet not to exceed smolts from 750,000 eggs.

Crystal Lake Hatchery (SSRAA)

Crystal Lake Hatchery (Crystal) is located at the head of Blind Slough, 18 road miles south of Petersburg. Crystal is a state-owned facility that is operated by SSRAA through a professional services contract with ADF&G Division of Sport Fish. Current funding for the facility comes from Sport Fish, SSRAA, and the Southeast Sustainable Salmon Fund. Finding appropriate funds to operate the facility has been a challenge; funding will again be in question in 2005. Crystal is the oldest continuously operated salmon enhancement program in Southeast Alaska, and it has changed very little through the years. It is primarily a chinook facility, and production is limited to its current level by its water source. Water is supplied to the hatchery through Petersburg Power and Light's Blind Slough Hydroelectric Project. Crystal produces approximately 1.4 million chinook smolts; 600,000 are released at the hatchery site, 400,000 at the SSRAA remote release site in Anita Bay, and 400,000 at Neets Bay. Crystal also produces 100,000 coho smolts as mitigation for hatchery construction on Crystal Creek and associated loss of natural production on that system.

The source of chinook broodstock used in the facility is Andrews Creek. Crystal Lake Hatchery chinook was the initial broodstock used at several other hatchery facilities. Currently, the stock is used at Macaulay (DIPAC) and Medvejie (NSRAA) Hatcheries; shortcomings in broodstock collection are often met through cooperation between these facilities. Crystal chinook are harvested in traditional troll, experimental, and terminal harvest area (THA) fisheries as they return to various release sites. A Board of Fisheries approved management plan for the Wrangell Narrows THA allows a small troll harvest in years of adequate abundance. The returns to the Anita Bay remote release site are also harvested in net-gear rotational fisheries in the terminal harvest area. The harvest in Anita Bay may be as many as 10,000 fish, which roughly equals the combined troll harvests for all Crystal releases in a good survival year. Fish returning to Neets Bay are also taken in an early season terminal net fishery, and any remaining fish are later harvested during SSRAA cost recovery activities.

Sport Anglers also harvest a significant number of these fish. On average, 80% of the chinook salmon harvested in the Petersburg area are caught in the Wrangell Narrows THA. The fishery in Blind Slough targets fish returning directly to Crystal; it is the most significant freshwater chinook "bank fishery" in Southeast, where fish are harvested by rod and reel from the shore. The Division of Sport Fish has estimated the average annual chinook and coho harvests in Wrangell Narrows and Blind Slough sport fisheries at 5,000 and 1,000 fish, respectively. This fishery has become increasingly important to Petersburg, as the local economy turns more toward tourism. The Anita Bay return can be easily accessed by sport anglers from Wrangell because some of the returning fish swim directly by the town. In a similar manner, the chinook returning to Neets Bay make up a good portion of the large adults harvested in the “north end” Ketchikan sport fishery.

Medvejie Hatchery (NSRAA)

Medvejie Hatchery (Medvejie) is located in Bear Cove in Silver Bay adjacent to Sitka Sound; it is accessible by road from Sitka. Medvejie is operated by NSRAA and produces chum, chinook, coho, and pink salmon. A temporary hatchery was built on the site in 1981, and construction of a permanent facility occurred in 1984. Funding through U.S./Canada Pacific Salmon Treaty allowed for the expansion of chinook production in 1987. Chum salmon returns have averaged 2.1 million fish annually from 1994 to 2003. Most of the fish are harvested by seiners and gillnetters in the Deep Inlet terminal harvest area located across Eastern Channel from Sitka. Trollers also harvest these chum salmon, primarily just outside the THA; from 1994 to 2003, the troll harvest has averaged 205,000 per year.

In terms of its contribution to both sport and commercial fisheries, the chinook program at Medvejie is a success. These fish are primarily harvested commercially during special May and June openings for trollers. Contribution to the troll fleet has averaged 8,060 chinook per year over the past 10 years (1994-2003). The sport catch of Medvejie chinook has averaged over 2,700 fish over this 10-year period. In some years, Medvejie chinook have represented 30% or more of chinook entered in the Sitka Salmon Derby. Medvejie began a major expansion of its chinook program in 1997. This expansion, which involves rearing fry in net pens in Green Lake, has increased the hatchery’s chinook production, which is just now being realized in terms of adult returns.

The Medvejie coho program has two components: (1) smolt releases near Sitka and (2) fry stocking at Deer Lake, which is located about 50 miles south of Sitka. The smolt releases primarily benefit the troll fishery but contribute to sport and net fisheries as well. Sitka area smolt releases occur at the hatchery (i.e., about 10,000 smolts per year) and at a remote release site at Shamrock Bay (i.e., about 230,000 smolts per year). The lake stocking project at Deer Lake generates large numbers of coho for the troll and seine fisheries, with annual harvests averaging 54,000 and 24,000 fish, respectively, from 1994 to 2003. This project also contributed and average of 2,000 coho to sport fishermen over the same 10-year period. In 1999, a record 293,000 coho returned to Deer Lake.

Green Lake chinook project. This project has doubled the production of chinook smolts released from Medvejie. Over 24,000 Green Lake adult chinook returned in 2003, and the project is expected to double the enhanced chinook returns to Sitka from between 20,000 to 40,000 fish per year to between 40,000 to 80,000 per year. These valuable fish will be caught in troll, net, and sport fisheries near Sitka. The chinook production at Medvejie has been expanded by utilizing an innovative approach that combines existing capability, experience with saltwater net-pen rearing, and some recent information on successful rearing of salmon in net pens in lakes. Hatchery smolt production capacity is limited by the fish's requirements for fresh water and space—demands that increase as the fish grow. Thus, a hatchery can produce large numbers of small fish but relatively small numbers of large fish. The key to expansion of capacity is to find other ways of growing fish that do not substantially impact the water and space demands at the hatchery.

Chinook fry are reared in freshwater net pens in Green Lake each summer and then transferred to saltwater net pens at the hatchery in early October. The chinook will spend the winter in the saltwater net pens and be released as smolts the following spring. In 1998 the first group of about 400,000 fry was introduced into the lake. The project went to full production in 1999 with 1.1 million fry going into Green Lake net pens. Adults began to return in 2001, and in 2003 full adult production for the project was achieved when Green Lake fish contributed to all major adult age classes.

Deer Lake coho project. This 977-acre barriered lake is located at 400 feet elevation on the southeastern shore of Baranof Island; it is steep sided and has a maximum depth of 870 feet. The project began in 1984 with a prestocking study. About 800,000 coho fry were planted in the lake the following year, and nearly half emigrated as smolts in the spring of 1986. No fry were planted in 1986 to allow the depleted food resources (i.e., zooplankters and aquatic insects) time to rebuild. In 1987 another 800,000 fry were planted in the lake with similar results to the 1985 plant.

In contrast to fish raised in hatchery raceways, net pens, or rearing ponds and fed prepared foods, these free-swimming juvenile coho in Deer Lake are able to utilize the lake's invertebrate food resources (e.g., zooplankters) for growth. The fish are spawned at Medvejie and raised there until the third week of June and then flown to Deer Lake and released when they are about two inches long. During the year that juvenile coho rear in the lake, they grow to about five inches long. During May and early June of the year following the fry plants, nearly all of the surviving coho migrate to salt water as smolts. Adult coho then return to the lake outlet stream in Mist Cove after another 15 months at sea. About two-thirds of the returning adults are harvested in the common property troll and seine fisheries along the Southeast coastline. The numbers of coho produced this way have been at least ten times greater than would have been possible by relying on the hatchery for the full rearing period.

In 1988 NSRAA, in cooperation with the Forest Service and ADF&G, began nutrient additions to Deer Lake. The objective was to greatly increase the yield of coho smolts. Liquid fertilizer (i.e., ammonium phosphate and ammonium nitrate) has been applied annually—usually from May through September. Fertilizer is added to greatly increase the phytoplankton (microscopic algae) population. Zooplankters then follow suit by feeding on the abundant algae. They in turn become a much larger source of food for the juvenile coho. Since initiation of fertilizer additons, coho fry have been planted in the lake each year. Currently, about 2.5 million fry are planted in late June; this results in approximately 1.5 to 1.8 million smolts the following May and June. Smolts leaving Deer

Lake for the ocean are intercepted in the outlet stream above the 230-foot-high barrier falls. An inclined-screen trap separates the smolts from most of the creek water. The fish are then sluiced around the falls in two plastic pipelines to net pens anchored in Mist Cove. The accumulated smolts are passed through an electronic counter at Mist Cove. Samples of smolts are examined for size and condition as well as for the adipose fin clip indicating a tagged fish. Usually 2% to 3% of the fish stocked in Deer Lake carry coded wire tags. Recoveries of tagged adults are used to estimate contribution to the commercial fisheries. After processing, smolts are held in other net pens in Mist Cove for one or two days and then released.

Survival in the lake from the planted fry to the emigrating smolts has ranged from 35% to 74%, with the highest values obtained in recent years. Losses are due primarily to predation by resident fish, birds, and mammals. Marine survival of the smolts released has varied widely during the life of the project, ranging from 5% to 24%. This project has contributed substantial numbers of coho to the commercial fisheries of Southeast; the annual value of these fisheries peaked at $1.2 million in 1994 and has varied between $300,000 and $1,100,000 thereafter.

Hidden Falls Hatchery (NSRAA)

Hidden Falls Hatchery (Hidden Falls) is located on Baranof Island on Chatham Strait. Built by the State of Alaska in 1978, it was operated by ADF&G's FRED Division until 1988 when the operational responsibility was transferred to NSRAA. This hatchery produces a larger chum return than any other facility in North America. Returns have averaged 2.6 million per year from 1994 to 2003, including a record return in 1996 of over four million fish. This run, which has attracted up to 240 commercial seine boats during an opening, provides fishermen with significantly greater fishing opportunities in the early portion of their seasons.

Because of a major hatchery expansion at Hidden Falls in 1987, coho and chinook returns have increased substantially in recent years. Both coho and chinook are harvested primarily by trollers and seiners. Coho returns have averaged 246,000 fish per year from 1999 to 2003, including a commercial harvest that averaged 86,000 fish per year over the same period. Chinook returns to Hidden Falls have averaged 28,000 fish per year for the five-year period 1999 to 2003, while the troll and seine harvests have averaged a respective 6,600 and 8,800 chinook per year for the same period. Peak troll harvests occur from late May through early July; seiners also harvest chinook later in June and in early July as they target on the Hidden Falls chum return. The combination of large chum, chinook, and coho returns makes this hatchery program arguably the most economically important one in Southeast.

Haines Projects (NSRAA)

The Northern Southeast Regional Aquaculture Association operates a number of enhancement projects in the Haines area, producing chum and sockeye salmon to benefit the common property fisheries of upper Lynn Canal. Sockeye enhancement at Chilkat

Lake, which is located about 20 miles north of Haines, has been accomplished using two approaches: (1) using streamside incubation boxes since 1989 and (2) planting unfed fry taken from Chilkat Lake brood but incubated by DIPAC at Snettisham. This project was designed to bring Chilkat Lake closer to its juvenile sockeye carrying capacity and thereby increase adult production.

Following a limnological review of Chilkat Lake in 1993, ADF&G concluded (1) the zooplankton population was underutilized, (2) the system was spawning limited, and (3) it could be stocked with five million unfed sockeye fry annually. A cooperative project involving NSRAA, DIPAC, and ADF&G was initiated: eggs were collected from adult sockeye in Chilkat Lake and transported to Snettisham for incubation. As fry emerged the following June, they were transported back to Chilkat Lake and released. In 1993 and 1994 NSRAA took five million eggs; in 1995 and 1996 egg takes were reduced to three million annually; and in 1997 egg takes for the cooperative project were suspended because zooplankton population levels were in rapid decline and smolt sizes significantly smaller. In 1999 a set of zooplankton population criteria was established to govern egg takes. In 2000 three million eggs were taken and 2.6 million fry planted into the lake the following June. Since that time zooplankton populations have declined below the threshold limits and the cooperative program has been suspended.

Streamside incubation boxes have been installed at various sites, but principally at Spring Pond, and NSRAA has experienced good success in producing a limited number of fry using this method. NSRAA is currently permitted to incubate up to 2.0 million green sockeye eggs in this manner, depending on Chilkat Lake's ability to support these additional fry with adequate zooplankton forage. For the past five or six years NSRAA has been faced with a reduced zooplankton population at Chilkat Lake that has, in turn, limited fry production. The streamside incubation boxes are still in place, and in 2003 about 50,000 sockeye eggs were incubated at Spring Pond. A salmon weir on the outlet stream of the lake is used during May and June to enumerate sockeye smolts leaving the lake. Scale and otolith samples are taken at this time and used to determine age composition and survival of both enhanced and wild fry.

Permitted for production of 2.6 million eggs, the Haines chum program has two components: (1) streamside incubation and (2) spawning channels. Streamside incubation boxes have been installed in tributary systems located at 17 mile, 31 mile, and at Herman Creek (30 mile) along the Haines Highway. These boxes are used to increase survival of wild chum salmon in the Chilkat/Klehini River drainage. Chum eggs are taken each October and placed in the incubators; egg-to-fry survivals have averaged 95%. The use of these streamside incubation boxes to increase egg-to-fry survival of chum in this drainage has been ongoing for the past 19 years.

Spawning channels for fall chum salmon were developed at 24 Mile along the Haines Highway and at Herman Creek, which drain into the Chilkat/Klehini Rivers. Subsurface water permeates the Chilkat River Valley, and the spawning channels were easily created by excavating riparian zones of the Chilkat River and Herman Creek. The spawning channel for Herman Creek was about 1,500 feet long, while the one at 24 Mile is about

1,200 feet long. Each year approximately 5,000 spawning chum use the Herman Creek channel, while lesser amounts (i.e., between 200 and 2,000) return to the channel excavated at 24 Mile. Overwintering juvenile coho also use the interstices of boulders lining the channel for cover. Several hundred coho adults spawn in the Herman Creek channel in mid- to late November each year. Water remains at 4°C throughout the winter.

Nonregional PNP Hatcheries and Related Enhancement Projects

Kowee Creek Hatchery (DIPAC)

The original Douglas Island Pink and Chum, Incorporated (DIPAC) hatchery was built in 1976; it was a very small facility located on the back porch of the Ladd Macaulay residence at Kowee Creek on Douglas Island. From the back porch, the hatchery was moved to the family's back yard–inside one of Joe Juneau's original gold mine adits.[13] In 1983 a small two-story building was constructed in front of the adit. This facility is no longer in use, and the permit was suspended in 2001.

Sheep Creek Hatchery (DIPAC)

After 20,000 pink salmon returned to Kowee Creek in 1979, DIPAC expanded its production in 1980 by building Sheep Creek Hatchery (Sheep Creek), four miles south of Juneau on Thane Road. The original PNP hatchery permit established capacity at a combined five million pink and summer chum eggs; permitted capacity increased to 40 million eggs. Chum production contributed to the District 111 Taku Inlet/Stephens Passage gillnet fishery, while pink production was harvested for cost recovery purposes until adequate numbers of chum returned to provide for it. In 1986 the coho annex facility was constructed at the site to develop a broodstock for what was to become the Macaulay Salmon Hatchery. When the facility lost its uplands lease for the saltwater rearing site located in Thane near the mouth of Sheep Creek in 1997, chum production was moved to Macaulay Salmon Hatchery (Macaulay); the net pen complex was reestablished at Thane in 2002. Sheep Creek is currently permitted for 10 million chum and 150,000 coho; it is used as a remote rearing facility for coho production at Macaulay.

Macaulay Salmon Hatchery (DIPAC)

Macaulay Salmon Hatchery (Macaulay), originally named Gastineau Hatchery, is located in Juneau near Salmon Creek. Construction of the facility was completed in 1989. The hatchery is currently permitted for 50 million pink, 121 million chum, 1.5 million coho, and 950,000 chinook. Its production returns began making significant contributions to the Haines and Juneau fishing fleets in 1996.

Macaulay serves as a central incubation facility for a large chum enhancement program, which releases fry from five sites in the Juneau area. Releases in Gastineau Channel occur from net pens located both at the hatchery and at the reestablished net pen complex at Thane. The 36 million fry released in Gastineau Channel provide broodstock for the entire program as well as contributions to common property fisheries, especially the Taku

[13] adit: the horizontal entrance to a mine

Inlet/Stephens Passage gillnet fishery. Another 48 million fry are released at Amalga Harbor, 25 miles north of Juneau; these fish provide cost recovery for DIPAC as well as contributions to common property fisheries, primarily the Lynn Canal gillnet fishery. The program is rounded out by additional remote releases (15 million each) at Boat Harbor (northwest of Juneau) and Limestone Inlet (southeast of Juneau). Returns from these releases contribute 100% to common property fisheries.

The chinook program is funded by the Division of Sport Fish, using sportfishing license revenues and funds from the Federal Aid to Sport Fish Restoration Program. Smolt production from 700,000 eggs is allocated to three release sites: (1) Macaulay, (2) Fish Creek on north Douglas Island, and (3) Auke Bay. A fourth release site at Thane will occur in 2004. Adult returns from these fish enhance the marine and roadside sport fisheries in the Juneau area. Beneficiaries of the popular enhancement program, which produces between 2,000 to 5,000 adult chinook annually, include local and nonresident sport anglers, charter boat operators, Territorial Sportsmen's Golden North Salmon Derby, and commercial trollers.

Under a cooperative agreement involving ADF&G and the city of Skagway, Macaulay is also involved in a chinook broodstock development program using Tahini River stock. This is a multi-phase, 15-year project designed to utilize returns from releases at Pullen Creek in Skagway to produce surplus eggs, which will eventually replace the Andrew Creek stock currently being used in the Juneau enhancement program. Returns to Skagway also contribute to common property fisheries, especially the local sport fishery.

The coho program at Macaulay, which currently releases 600,000 to 800,000 smolts annually into Gastineau Channel, provides fish for commercial, sport, and cost recovery harvests. This program is especially popular within the local Juneau sportfishing community, including roadside anglers who harvest between 2,000 and 12,000 fish annually from a public dock adjacent to the facility and the Golden North Salmon Derby that attributes 25% to 33% of its coho catch to DIPAC production.

The hatchery is home to the Ladd Macaulay Visitor Center. This attraction, which includes an aquarium, gift shop, and guided tours, has accommodated over 1.5 million visitors since 1990. Through admission, concession, and rental revenue, DIPAC's Tourism Division is able to support its own budget and contribute to the corporation's revenue stream while providing valuable educational programs to school districts statewide.

The City and Borough of Juneau installed a new sportfishing dock adjacent to the hatchery in 2001. This facility provides an urban fishing opportunity that has proved successful for Juneau residents and visitors alike. The sportfishing dock provides sport anglers direct access to salmon returning to the hatchery. Based on an on-site creel census, annual effort and harvest estimates have ranged between 16,000 and 28,000 angler-hours and 7,000 and 20,000 salmon, respectively.

<u>Boat Harbor Chum Release Site.</u> This is a cooperative project between DIPAC and NSRAA. Initiated in 1989 by DIPAC, this project was designed to benefit lower Lynn

Canal gillnetters. Initially permitted to release nine million summer chum fry originating from Macaulay production, the permitted level was increased to 24 million in 1996 to provide further flexibility for enhancement opportunities as management conditions allow; current production is set at 15 million summer chum fry.

Limestone Inlet Chum Release Site. This is a cooperative project between DIPAC and NSRAA. The Limestone Inlet remote release site was originally started by ADF&G in 1988 and designed to enhance the Taku Inlet/Stephen Passage gillnet fishery using chum salmon produced at Snettisham. The project was transferred to DIPAC in 1991 when ADF&G began conversion of the Snettisham facility to sockeye production. At this site, DIPAC is permitted to release 15 million summer chum fry originating at Macaulay.

Snettisham Hatchery (DIPAC)

Snettisham Hatchery (Snettisham) is located at the head of Port Snettisham, approximately 35 miles southeast of Juneau; it is accessible only by boat or float plane. The hatchery functions as a central incubation facility and produces sockeye salmon for a diversity of projects; sockeye are released as (1) fry in lakes in Canada as part of the U.S./Canada treaty's transboundary enhancement efforts, (2) fry in northern Southeast for enhancement or rehabilitation purposes, and (3) smolts in Port Snettisham for common property contribution and cost recovery.

The hatchery is owned by the state and has been operating since 1976. It was originally intended as a chum, coho, and chinook facility; however, since 1989 as the sockeye program evolved, other species were discontinued or elements of their production moved to other locations. The hatchery is now dedicated solely to sockeye production, and in July 1996 its operation was transferred to DIPAC under the provisions of PNP Salmon Hatchery Permit No. 39. Although the total permitted production capacity for the various sockeye projects is 33.5 million eggs, in 2003 Snettisham took 15.5 million sockeye eggs.

The current incubation area is divided into 16 modules, with an egg capacity of one to three million per module. Domestic production of the hatchery is divided into both fry and smolt rearing. Speel Lake stock is used for a fry stocking project at Sweetheart Lake, which is located in Port Snettisham, to enhance a personal-use fishery at the barrier falls of the lake. Chilkat Lake stock is used for a fry stocking project into Chilkat Lake as a cooperative project with NSRAA; the nature of that project is intermittent.

The hatchery has 12 covered raceways for smolt production; raceways are segregated to assist in controlling any potential disease outbreaks (e.g., IHN) during the freshwater rearing phase. Smolt production is currently limited to nine million sockeye, while maximum permitted capacity for smolts released at the hatchery is 12.5 million. Adult returns from smolts released at the hatchery enhance the Taku Inlet and Stephens Passage common property fisheries, particularly gillnet fisheries in District 111 and the Speel Arm terminal harvest area fishery. Cost recovery is conducted in front of the hatchery on remaining fish not necessary for broodstock to help pay for operational expenses.

Another important aspect of the sockeye program is the Canadian lake-stocking program that is part of an annex to the U.S./Canada treaty governing joint sockeye enhancement on the Stikine and Taku Rivers. Snettisham receives eyed eggs collected in Canada and is responsible for incubating the eggs and returning thermally marked fry to the appropriate lakes the following spring. Federal funding is provided for this aspect of the program.

Klawock River Hatchery (POWHA)[14]

Historically, the first Klawock Hatchery was built in 1897 at the outlet of Klawock Lake; however, because of insurmountable problems it was abandoned in 1917. In 1977 the state constructed the current hatchery; it was operated by FRED Division as a chum and coho facility with a production goal of 1 million chum and 60,000 coho. Hatchery operations were transferred to the city of Craig in 1994; in 1996 operations were transferred to the Prince of Wales Hatchery Association (POWHA). Its mission is to enhance the production of coho and sockeye in the Klawock Lake/River watershed, and its goal is to provide employment, education, and revenue to residents of Prince of Wales Island by providing coho, sockeye, and steelhead to the region's common property fisheries. The facility is currently permitted to take 5 million coho, 20 million sockeye, and 50,000 steelhead eggs.

Coho represent the majority of production at the Klawock River Hatchery; over 15 million juvenile coho were produced between 1980 and 2000 (Lewis and Zadina 2002). Under POWHA's management, a portion of the annual coho return is used in its cost recovery program, which provides funds for the facility's management and operation. Since its inception, POWHA has released over 6 million smolts into Klawock Lake and has contributed over 90,000 coho to the commercial and sport fisheries as well as an unknown number to subsistence fisheries. The return of coho in 2003 from the 2000-broodyear release of about two million smolts was about 77,000 fish; approximately 60% of these fish were harvested in the commercial and sport fisheries and the remaining 40% returned to the hatchery for broodstock and cost recovery purposes. In addition, 6,000 coho (wild as well as hatchery produced) are allowed to enter Klawock Lake to spawn naturally.

Klawock River Hatchery's sockeye program was initiated by the state in 1979 and has had varying degrees of success since POWHA assumed operations; since 1996, about 3.0 million sockeye fry have been released into Klawock Lake and its tributaries. This program is in place to provide returning adults for subsistence users on the Klawock River. At present there is no surplus sockeye to cover the cost of the program, and financial support is obtained through other sources, including grants and donations. In 2003 about 10,000 sockeye returned from a 1999-broodyear release of about 360,000 unfed fry. A thermal otolith mark has been applied to all hatchery-produced sockeye since 1999. The purpose of this marking effort is to quantify the proportion of hatchery-produced sockeye returning versus naturally produced sockeye. This information should allow a better evaluation of the success of this program in increasing sockeye returns to the system.

[14] Information in this profile relies on Lewis and Zadina (2002) and management plans for the facility.

Sheldon Jackson Hatchery (SJC)

Sheldon Jackson Hatchery is located on the campus of Sheldon Jackson College (SJC) near downtown Sitka. It was established in 1975 with a combination of public and private grants and loans. The hatchery's primary purpose is educational. Since the fisheries program was initiated in 1977, the college has graduated many students with both associate and bachelor's degrees in aquatic resources. Many of the personnel currently staffing hatcheries as fish culturists and those working in fisheries management/resource jobs for public agencies and private corporations in the state are graduates of the college who had participated in the hatchery-related curriculum.

Sheldon Jackson Hatchery's permitted production is a combined 20 million pink and chum, 150,000 coho, 100,000 chinook, and 20,000 steelhead. The hatchery's water source is the Indian River. Sheldon Jackson Hatchery makes contributions to regional common property fisheries while training students in hatchery operation, salmon culture techniques, management, and other enhancement-related disciplines. Hatchery returns contribute to commercial troll fisheries throughout Sitka Sound and seine fisheries in portions of Sitka Sound immediately adjacent to the special harvest area. The facility is dependent on pink and chum for cost recovery.

Through a grant with the Southeast Sustainable Salmon Fund, the college has recently recommitted itself to the hatchery program by improving the learning environment for students enrolled in that program. New incubators and net-pens have been purchased, along with other equipment, and permits have been obtained to improve its adult return area. Sheldon Jackson College is also in the process of improving the hatchery's water supply, establishing a water filtering and sterilizing process, and refurbishing its incubator rooms. By improving water quality, Sheldon Jackson Hatchery will be able to increase the survival of smolts and thus increase contributions to common property fisheries.

In 2002 the commissioner of ADF&G authorized an alteration to SJC's PNP Hatchery Permit to allow them (through an agreement with NSRAA) to release up to four million chum fry at NSSRA's remote release site at Deep Inlet. Staff from NSRAA will then harvest a portion of the adult chum that return to Deep Inlet for SJC's cost recovery purposes.

Gunnuk Creek Hatchery (KNFC)

The Gunnuk Creek Hatchery is located on Kupreanof Island in the City of Kake. In the 1930s a dam was constructed on Gunnuk Creek about one mile upstream from salt water to provide water for the Kake Cannery. This dam blocked the downstream migration of suitable spawning gravels to areas accessible by returning salmon, and the creek's salmon runs began to decline. In 1972 local youth began to rehabilitate Gunnuk Creek's salmon run with a small-scale hatchery project at Kake High School using an ADF&G scientific/educational permit. The first incubators were constructed from 55-gallon drums and nets.

The City of Kake recognized the importance and value of this student project and applied for a PNP hatchery permit, which was issued in 1977 to Kake Nonprofit Fisheries Corporation (KNFC). Hatchery facilities were constructed in 1982 at a location one-third mile from the intersection of Keku Road and the Gunnuk Creek Bridge. The hatchery building and the water system have undergone several modifications and improvements since then. In 1994 and 1995 the hatchery was completely rebuilt; in 1999 new saltwater net pens were purchased.

The current permitted egg-take capacity of KNFC is a combined 65 million pink and chum salmon and 250,000 coho. Although KNFC took 70.1 million chum eggs at Gunnuk Creek in 2003, 5.6 million of those were taken under the auspices of Port Armstrong's permitted chum production numbers and transported to that facility as green eggs. Additionally, KNFC released 27.7 million chum fry at Southeast Cove and 6.6 million fry into the Kake special harvest area (SHA). In 2003, KNFC produced no coho smolts because of the inadequate quantities of water provided by the temporary dam, which is currently being utilized for incubation and freshwater rearing.

Kake Nonprofit Fisheries Corporation also changed its primary production species at Gunnuk Creek (i.e., from pink to chum) to meet cost recovery goals, and this added to the length of time necessary to complete broodstock development (Jeans et al. 2003). The goals of the hatchery are to (1) remain financially solvent while minimizing the number of returns needed for cost recovery; (2) maximize the number of fish available to the common property fisheries; (3) allow local residents to gain experience in aquaculture; and (4) provide local employment opportunities.

Since 1988, Gunnuk Creek's sole remote release site has been Southeast Cove, located about eight miles southeast of Kake across Keku Strait on the northeast shore of Kuiu Island. In 2003 about 75,000 chum returned to Gunnuk Creek, while 305,000 returned to Southeast Cove. Because Gunnuk Creek does not tag or thermally mark the fish they produce, there is no means of documenting contributions to the common property fisheries; however, anecdotal evidence indicates that returning adult chum contribute to troll and net fisheries in Cross Sound, Chatham Strait, Kings Mill, and Frederick Sound.

Burro Creek Hatchery (BCF)[15]

Burro Creek Hatchery is located on Burro Creek about 1.5 miles across Taiya Inlet from Skagway. Burro Creek Farms, the nonregional PNP corporation that operated the hatchery, has an annual permitted capacity of a combined 3 million pink and chum, 100,000 coho, and 100,000 chinook eggs. Burro Creek Farms never conducted traditional cost recovery fisheries. Tourism provided major funding to operate the facility—some of that money was generated through the sale of smoked/canned salmon that were harvested on site but processed elsewhere. The sale of carcasses to dog mushers also generated funding for operational expenses. Burro Creek Hatchery is currently inactive. No fish have been released at Burro Creek since 2000. The facility is presently for sale.

[15] Information in this profile relies on Burro Creek's web site (www.upconsult.com/burrocreek) and management plans for the facility.

The stocks returning to Burro Creek and upper Lynn Canal systems entered through Cross Sound and Icy Strait and then proceeded around Point Couverden through upper Chatham Strait and lower Lynn Canal. Hatchery returns to Burro Creek passed through an intensive drift gillnet fisheries in Lynn Canal and may have been intercepted in other fisheries as well. Total exploitation in these fisheries was large because of the relatively small numbers of returning adults; however, the harvest rate on returning fish may have been fairly high. Returning coho and chinook also have contributed to local area sport fisheries. The harvest of adult returns at the facility was accomplished with dip nets, beach seines, and weirs.

Port Armstrong (AKI)

The Port Armstrong Hatchery (Port Armstrong) is a private, nonprofit facility owned and operated by Armstrong-Keta Incorporated (AKI). The hatchery is located on the outlet of Jetty Lake in Port Armstrong Bay along Chatham Strait near the southern tip of Baranof Island. Armstrong-Keta Incorporated received its PNP hatchery permit in February 1981, and its initial hatchery building was constructed that year. In 2003 AKI constructed a new incubation building to accommodate current permitted production (i.e., 85 million pink, 30 million chum, 2 million coho, and 2 million chinook). Five pipelines feed incubation, freshwater raceways, sea bags, and lenses in saltwater net pens. A shop, bunkhouse, four residences, and assorted outbuildings have been added over the years.

Initially permitted for 11 million combined pink and chum in 1982, AKI at first relied on the nearby donor streams of Sashin Creek and Lovers Creek as a source for pink broodstock. Port Armstrong's first hatchery pinks returned in 1986. Permit alterations for pink salmon occurred as follows: 12 million in 1984, 16 million in 1985, 30 million in 1988, and 110 million in 1990. The 1990 permit alteration limited pink production to 55 million eggs for release at the hatchery until a suitable remote release site for production of the other half of the eggs was identified and approved. Additional permit changes included (1) a reduction to 55 million pink eggs in 1992, disallowing the other 55 million for remote release in exchange for increased coho capacity and (2) an increase to 85 million pink eggs in 1996.

Port Armstrong initially took two million or fewer chum eggs annually during 1982 through 1985 under the combined pink and chum limit of 11 million eggs. Donor streams for chum broodstock were Elena Bay, Security Bay, and Gut Bay. Permit alterations for chum occurred as follows: four million in 1984, 10 million in 1988, and 30 million in 2003. The fall chum run did not meet AKI's goals for common property contribution and cost recovery because poor returns and dark-colored fish limited their value. Port Armstrong suspended chum production from 1994 to 2002. In 1999 ADF&G rescinded the permitted (but unutilized) fall chum capacity of 10 million eggs. In 2002 AKI formally requested the establishment a summer run of chum to avoid the problems associated with the fall chum run. This request was based on the need to diversify production at Port Armstrong for economic stability as well as the opportunity to contribute fish to the troll fishery in the lower Chatham Strait/Port Alexander area. In 2002 AKI was permitted to incubate up to 30 million summer chum eggs and to rear and release fry from the hatchery, provided that all fry were thermally marked and a sampling program initiated to document their contributions to common property fisheries.

Initially permitted for 50,000 chinook eggs in 1984, AKI did not start chinook production until 1987. Fish transport permits for Unuk River and Chickamin River stock via Little Port Walter Hatchery were approved. Port Armstrong's permitted capacity was increased to 80,000 in 1987 and to 250,000 in 1990. In 1991 ADF&G directed AKI to change its chinook brood to King Salmon River stock. The last release of Unuk River stock occurred in 1992, and chinook production was suspended from 1992 to 1996. The hatchery was permitted for 2 million chinook in 1994 with an agreement to maintain the water level in Jetty Lake within acceptable limits and to continue marking programs to determine inseason contributions to common property fisheries.

Initially permitted for 500,000 coho in 1988, AKI started its coho program at Port Armstrong with eyed eggs from Medvejie. In 1992 permitted capacity was increased to 1.5 million eggs provided AKI develop an evaluation program to determine inseason coho contributions to common property fisheries; in 1996 it was increased to two million.

Returning Port Armstrong adult pink travel north in Chatham Strait along the Kuiu Island shoreline to Kingsmill Point, where they cross Chatham Strait to Red Bluff Bay before arriving at the hatchery site. While there has never been an ADF&G tag-recovery project to quantify the contribution of Port Armstrong pinks to common property fisheries, there is strong anecdotal evidence they have made substantial contributions to the lower Chatham Strait seine fisheries in recent years.[16] Port Armstrong has begun otolith marking all of its production, which will facilitate the determining of accurate contribution rates to the area's common property fisheries.

Deer Mountain Hatchery (KTHC)

The existing hatchery building was constructed in 1954 near the site of the former Ketchikan Territorial Hatchery that was in operation from 1925 to 1931. The Alaska Department of Fish and Game operated the facility in the mid-1970s and renovated it in 1978. Hatchery water is supplied by Ketchikan Lake via Ketchikan Creek, which is also the domestic water supply for the City of Ketchikan. The Ketchikan Tribal Hatchery Corporation (KTHC) assumed operation of the hatchery in 1994. Its mission is to enhance the fishery resources of the Ketchikan area for the benefit of all user groups. The hatchery provides experiences for residents and tourists to promote understanding of local cultural, fisheries, and environmental issues through onsite educational activities. Fish culture training and experience for local residents is also provided at the facility.

The hatchery is permitted for the following production levels: 133,000 chinook eggs, 379,700 coho eggs, and 8,500 steelhead eggs. Chinook salmon production from the Unuk River ancestral stock began with the 1977 brood. Annual chinook age-1 smolt releases into Ketchikan Creek have been approximately 100,000 for most years. Coho stock from the Ketchikan Creek system was cultured there until 1982. Coho production was

[16] Bart Watson, general manager, Armstrong-Keta Incorporated, personal communication.

suspended until 1986, when the hatchery reinitiated the program using Ward Lake/ Reflection Lake summer coho stock. Coho releases occur in Ketchikan Creek (age-1 smolts) and Ward Lake (fall/winter presmolts). Deer Mountain Hatchery has entered into a cooperative agreement with SSRAA's Whitman Lake Hatchery in which Deer Mountain coho become the back-up brood source for SSRAA's Whitman Lake coho project, which was started using Deer Mountain Hatchery's Ward Lake and Ketchikan Creek coho returns. Coho broodstock from Deer Mountain are transported to the Whitman Lake facility where they are held.

The commercial fishery harvest rates of summer coho returns to Ketchikan Creek, Ward Lake, and Mountain Point have exceeded 50% in most years. Nearly half of the commercial fisheries harvests of Ketchikan Creek and Mountain Point returns come from gillnet gear in Districts 106 and 101. Most of the commercial harvest of Ward Lake stock occurs in District 106; gillnet fisheries benefit most from the Ward Lake coho return because of its early run timing. Ward Lake coho are also harvested in established local personal-use, sport, and charter-boat fisheries. All KTCH coho returns benefit roadside sport fisheries.

Federal/Tribal Hatcheries and Related Enhancement Projects

Tamgas Creek Hatchery (MIC)

From 1977 to 1980, Metlakatla Indian Community (MIC) used a temporary hatchery facility for their enhancement program. In 1980 MIC in conjunction with the Bureau of Indian Affairs completed construction of Tamgas Creek Hatchery (Tamgas), which is located seven miles south of Metlakatla in Tamgas Creek Harbor. Chinook, coho, chum, and sockeye salmon are reared and released from the hatchery. The goal of Tamgas is to enhance MIC fisheries as well as adjoining state-managed fisheries in southern Southeast. In 1985 MIC and ADF&G entered into a cooperative agreement concerning the development and conduct of MIC's aquaculture programs: ADF&G agreed to provide technical assistance, and MIC agreed to (1) inform ADF&G of plans and development schedules, (2) use Alaskan stocks for broodstock development, and (3) report incidence of fish disease or disease outbreaks at its hatcheries.

The coho program has two components: (1) 1.7 million smolts are released from the hatchery and (2) 0.7 million fed fry are planted into Tent Lake, which drains into Tamgas Harbor 0.3 mile north of hatchery. The contribution and migration patterns are the same for both sites. The annual contribution of coho to the troll fisheries has been as high as 66,000; the long-term average is 30,000. In 1995 a record 243,000 coho returned; of those, net fisheries harvested 80,000.

The chinook program has two components: (1) 500,000 yearlings are released from the hatchery and (2) 300,000 zero-age chinook are released from the hatchery. Overall marine survivals for the yearling program has averaged 4% since 1992; the survival for the 1996 brood was 6.25%; i.e., a total of 33,000 chinook. The zero-age program is still several years away from getting complete adult returns. The goals of the zero-age program are to produce 5- to 6-gram smolts by June 15 and to rear them for 5 to 10 days in saltwater net pens prior to release. Tamgas chinook returns contribute to fisheries in the southern inside waters of Southeast.

Two types of chum are produced at Tamgas: fall and summer chum. The summer chum stock is from Neets Bay. The summer chum program started in 2002 with 2.0 million Neets Bay brood; this program will continue for three more years. The fall chum program had already been established; in 1996 a record 220,000 fall chum returned. In the coming years MIC plans to significantly increase chum production: summer and fall chum releases will be capped at 8.0 and 20.0 million per year, respectively. When the anticipated production numbers are achieved, two release sites will be used. Most of the fall chum will be released at a remote release site in Chester Bay, returning adults will contribute to gillnet and seine fisheries as well as cost recovery; the remaining fall chum will be released from the hatchery, and returning adults will be used for broodstock. The majority of fall chum are harvested in the net fisheries in Districts 101, 102, and 103.

The sockeye program at Tamgas is in its fifth year; in the past four years (1999 to 2002), an annual average of 20,000 sockeye have been reared and released. Eighty-four 4-year-old adult sockeye returned to the adult holding pond in 2002, representing a 2.4% survival. In 2002, four tagged sockeye were recovered in the fisheries; however, contribution estimates are not available. Sockeye production will also increase, but those release numbers have not yet been established. Larger releases of sockeye will require a reduction in the number of yearling chinook smolts released.

Little Port Walter Hatchery (NMFS)

The National Marine Fisheries Service's (NMFS) Little Port Walter (LPW) research hatchery is located 120 miles south of Juneau, near the southeastern tip of Baranof Island. It is the oldest year-round biological research station in Alaska, and since 1934 it has been host to a wide variety of fisheries research projects. This facility is on Forest Service land in the Tongass National Forest and is accessible by boat or seaplane; it is a primary field station for the Auke Bay Laboratory and the Alaska Fisheries Science Center (AFSC). The main building at LPW, a three-story brick structure, was built in 1940 using Civilian Conservation Corps labor and materials from an abandoned fish saltery. It is used as a caretaker residence, dormitory, laboratory, and mess hall. Other buildings include two wet-laboratories; a large warehouse; wood shop; metal shop; conference room; floating wet-lab; large freshwater and saltwater rearing facility; several residences for researchers and year-round staff; and a permanent concrete fish weir on Sashin Creek.

Current research at LPW focuses on (1) interactions of hatchery and wild stocks of salmon; (2) effects of crude oil contamination on survival and homing of intertidal spawning pink salmon; (3) effects of small founder population size and freshwater sequestration on the genetic variability, size, spawn timing, fish size, and fecundity of Sashin Creek pink salmon as it relates to the productivity of the North Pacific Ocean; and (4) the development of chinook broodstocks for use in state and private Southeast fisheries enhancement programs. Other research projects conducted at LPW include cooperative programs with the University of Alaska Fairbanks and ADF&G. The facility hosts visiting scientists from other areas and agencies.

Auke Creek Hatchery (NMFS)

The Auke Creek experimental hatchery, near Juneau, Alaska, is a National Marine Fisheries Service facility located adjacent to the Auke Bay Laboratory on Auke Creek near where it enters Auke Bay. It is operated on a cooperative basis with both the University of Alaska and ADF&G. The facility is a 24- by 40- foot building that includes space for incubating, rearing, and marking fish as well as for a dry lab/office. Water is supplied by gravity flow pipeline from Auke Lake; the pipeline intake is 20 feet deep. Auke Lake, Auke Creek, and the associated drainage support anadromous runs of pink, chum, sockeye, and coho salmon as well as trout and char. These fish populations provide (1) significant contributions to the regional common property fisheries and (2) important opportunities for conducting basic research and specialized training of fisheries scientists and technicians. Because these fish occur in the midst of an urban area, they also provide educational opportunities for the general public.

The basic philosophy underlying research at Auke Creek Hatchery is to use this valuable salmon resource principally for its special research potential, educational purpose, and benefit to the general public. This philosophy also calls for maximizing natural production and maintaining instream flows to protect that resource. Operation of the hatchery is only done in an experimental, research mode with small-scale releases of fish from carefully planned, executed, and evaluated projects that are designed to have little, if any, effect on the wild salmonids in the Auke Creek system. At the present time, all hatchery-produced fish are either marked (otolith) or tagged to identify them from wild fish. Transplants to or from Auke Creek are generally discouraged. The weir is operated to provide minimal delay, injury, or stress to migrant salmon. Research projects conducted at Auke Creek Hatchery provide additional scientific benefits because the two-way fish counting weir at the hatchery site allows complete enumeration of all fish leaving and returning to Auke Creek.

PLANNING, PERMITTING, AND REPORTING STRUCTURES

Introduction

The previous sections provided a brief history of Southeast Alaska fisheries and profiles of operating hatcheries and further illustrated how weakening runs of salmon in Southeast and the inability of a hatchery system in the Pacific Northwest to prevent the decline of wild stocks combined to develop the statutory infrastructure that established the PNP program. This section will address the regulatory and policy components of a state-of-the-art enhancement program in Southeast Alaska—components that (1) were explicitly established to ensure protection of wild stocks and (2) had to be in place before the first PNP hatchery could be issued an operational permit, identify broodstocks, and begin taking eggs.

Regional Planning Teams

The hub of the enhancement program infrastructure—the mechanism that has allowed its wheels to efficiently turn—has been the regional planning teams. This key organizational element mandated by statute (AS 16.10.380) and guided by regulations (5AAC 40.300-370) represents the coming together of commercial fishermen; fisheries managers, fish culturists, and biologists from ADF&G and federal agencies; and other interested parties (e.g., sport and subsistence fishermen, communities) to develop regional plans, oversee existing projects, review new projects, and make a variety of enhancement policy-, permit-, and allocation-oriented recommendations to the commissioner. The RPT meetings in Southeast occur twice each year and are generally nonadversarial; recommendations to the commissioner are most often reached by consensus.

In the spring of 1977 the boards of directors of each regional association (i.e., NSRAA and SSRAA) appointed members representing each of the three commercial fishing gear groups to their respective RPTs (i.e., Northern Southeast RPT and Southern Southeast RPT). The commissioner appointed a representative from each of its fisheries divisions as members of both teams, and an ex officio member representing the Forest Service was appointed as a nonvoting member to each RPT. In response to recommendations of the PNP Hatchery Forum in 1996, nonregional PNP corporations were also provided with an ex officio seat to represent their interests on each RPT. The primary responsibility of the RPT is to initiate and continue an orderly process that examines the full potential of the region's enhanced salmon production capacity (Figure 8). The RPT is the only statutorily created planning group with legally mandated department and private-sector participation. The underlying premise of regional planning is to provide the means whereby representatives of commercial fisheries gear groups and department fisheries managers and other interested parties may establish and maintain a cooperative working relationship.

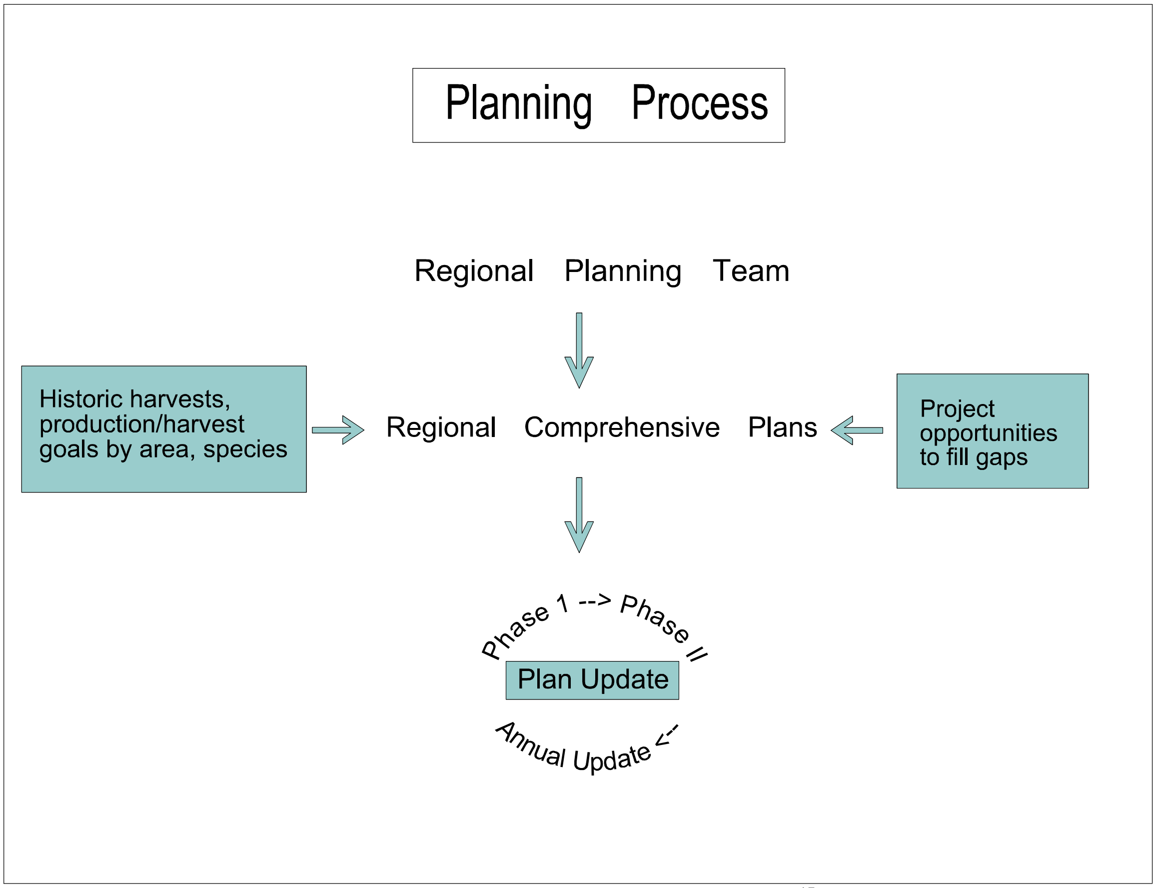


Figure 8. Schematic of the planning process of the regional planning team.[17]

The statutory duties of the RPT are as follows: (1) develop and amend the comprehensive salmon plans; (2) review PNP hatchery permit applications and make recommendations to the commissioner on whether or not they should be approved; and (3) review and comment on proposed PNP hatchery permit suspensions or revocations by the commissioner. According to the *Regional Planning Team Charter* (Pennoyer 1985), the RPT also (1) reviews annual management plans, annual reports, and proposed alterations of existing permits for each hatchery operating in the region, (2) periodically reviews and updates regional comprehensive salmon plans; (3) reviews hatchery performance; and (4) provides a forum to facilitate public comment on project approval and new project proposals. Each RPT develops criteria for its review, comment, performance evaluation, and analysis of enhancement projects. The charter further recognizes that the comprehensive salmon plan must not be considered fixed or static; rather, it should be considered as "constantly evolving" and that it be "responsive to new knowledge and changing conditions."

In 1995, in accordance with the Southeastern Alaska Area Enhanced Salmon Allocation Management Plan (5 AAC 40.345), the Joint RPT was directed to make annual recommendations to the commissioner on special harvest area management adjustments,

[17] from *Hatchery Program and Protection of Wild Salmon in Alaska: Policies and Regulations* (McGee 1995).

new enhanced salmon production, and modifications to production of existing enhancement projects in order to reach compliance with the enhanced salmon allocation guidelines (i.e., percentage goals). The role of the Joint RPT in making recommendations relative to allocation poses a unique situation for the three ADF&G representatives. These department fisheries managers and their staff provide technical input and participate in RPT discussions, but only the six gear-group representatives have voted on allocative proposals or recommendations submitted to the Board of Fisheries or ADF&G commissioner (Monagle 2003).

Regulation of the Enhancement Program

Alaska Statute 16.10.400 allows the commissioner of ADF&G to issue a permit, subject to restrictions imposed by statute or regulation, to a nonprofit hatchery corporation for the construction and operation of a salmon hatchery after the permit application has been reviewed by the RPT. The potential impacts of a hatchery to surrounding ecosystems are very complex and some may be detrimental, so there are a lot of complicated issues inherent to the permitting process (Figure 9).

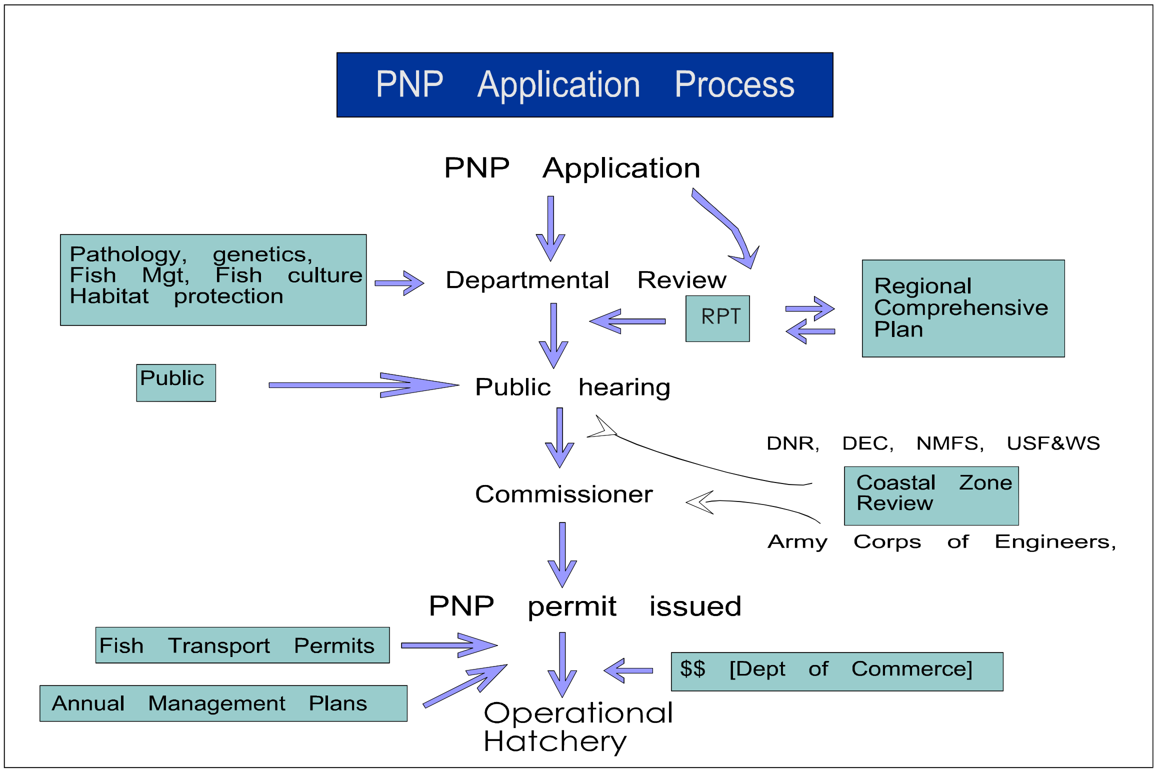
From start to finish, the minimal amount of time the regulations provide for this permitting process is 4.5 months; however, a permit has never yet been issued in that length of time. It usually takes two years to complete because all potential ramifications must be examined and addressed beforehand, and it is normal for additional information (per 5 AAC 40.180) to be requested during the process.[18] Based on the best professional/ scientific knowledge available, it must be determined that a proposed hatchery can be operated without adversely affecting wild stocks in nearby areas and under a policy of management that allows reasonable segregation of returning hatchery-reared salmon from naturally occurring stocks. Even after a permit is in place, everything is reexamined again through mandatory annual management plans (5 AAC 40.840) to assure everything is in order. The formalities inherent to the permitting process are set out in Article 4, Permit Application Procedures (5 AAC 40.110 to 5AAC 40.240) in ADF&G regulations.

Overview of the PNP Permitting Process

An applicant for a PNP permit may request assistance from the PNP coordinator or area management biologist(s) in preparing the application. This service will be provided to the extent practicable. The department will also assist an applicant by preparing a management feasibility analysis that includes (1) hatchery location, (2) species, (3) run timing by species, (4) desired incubation and rearing levels by species, (5) an estimate of contributions to common property fisheries, (6) potential size and location of special harvest area, (7) potential broodstock sources, (8) assessment of production potential for each species, and (9) additional relevant factors. The permit application must be submitted to the PNP coordinator, and it must include the management feasibility analysis. The applicant shall also provide detailed statements for operational goals,

---

[18] Steve McGee, PNP program manager, Division of Commercial Fisheries, personal communication.



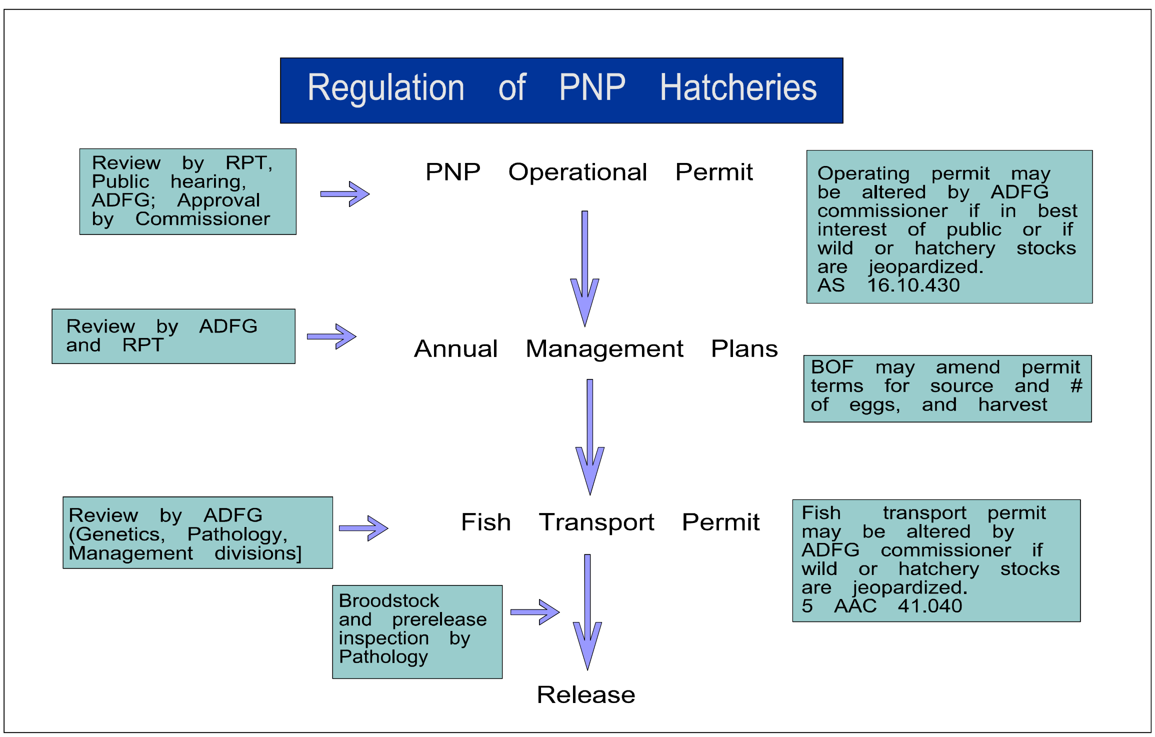


Figure 9. Schematics of PNP permitting process and regulation of PNP hatcheries.[19]

[19] from *Hatchery Program and Protection of Wild Salmon in Alaska: Policies and Regulations* (McGee 1995); the Basic Management Plan is included in the PNP Operational Permit.

objectives, and plans. The applicant is also responsible for obtaining water rights; ADF&G reviews applications to ensure that instream flow requirements for resident and anadromous fish are maintained. The PNP coordinator reviews application for completeness; if it is determined to be incomplete, the PNP coordinator requests in writing the necessary information needed to complete it. When the application is formally accepted by the PNP coordinator, a 60-day time period for processing an application will begin.

The regional planning team reviews each application (5 AAC 40.170) to determine if the proposed hatchery is compatible with the comprehensive salmon plan based on the following criteria: (1) provisions for protecting naturally occurring stocks from adverse effects; (2) compatibility of hatchery with goals and objectives of salmon plan; (3) the contribution the hatchery would make to the common property fishery; and (4) whether a hatchery would make the best use of the site's potential to benefit the fishery. An applicant may also review the RPT's determination and comment by letter to the commissioner. After an application has been accepted and if the PNP coordinator determines more information is necessary to evaluate the biological, management, and economic feasibility of the hatchery, that information will be requested from the applicant in writing. If the information is not received within 90 days of the date of the written request, the application will be rejected.

The regulatory time frame for processing a PNP hatchery permit application is 135 days (i.e., 4.5 months). The process is broken down into two phases: (1) hatchery permit application review (i.e., "Schedule A") and (2) consistency, approval, and issuance of the PNP hatchery permit (i.e., "Schedule B").

The "Schedule A" timeframe (60 days) involves the following procedures: (1) applicant submits application; (2) PNP coordinator reviews it for completeness; (3) Division of Commercial Fisheries technical staffs (i.e., geneticist, pathologist, fish culturist) review it and either submit comments to the PNP coordinator or request additional information; (4) department management and regional staffs review the application and either submit comments to PNP coordinator or request additional information; (5) RPT reviews it and sends recommendation to the commissioner; (6) Basic Management Plan (BMP) is drafted by department area staff, the applicant, and the coordinator; and (7) the public hearing is scheduled. All requests from ADF&G technical, management, and regional staffs for additional information must be directed to the PNP coordinator.

The "Schedule B" time frame (75 days) involves following procedures: (1) 30-day notice is published for public hearing on completed application and BMP; (2) public hearing is held—process concludes 10 days after oral hearing to allow department to respond to specific objections; (3) BMP is finalized; (4) consistency finding is made by Division of Governmental Coordination (DGC); and (5) permit is either issued or denied by the commissioner.

When a hatchery becomes operational, under the authority of 5 AAC 40.840, an annual management plan (AMP) is developed for each year of operation (*see* Figure 9). Specific plans for egg takes, cost recovery harvests, fry and smolt releases, marking and recovery, and any other operations are included and approved in this plan. These AMPs are developed by the department and hatchery operator and reviewed by the fisheries management divisions and regional planning team before commissioner approval.

Regulation of Broodstock

The department is required by statute to provide assistance before and after a PNP permit is issued; moreover, AS 16.10.445 reinforces ADF&G approval over the source and number of salmon eggs permitted to hatcheries. Broodstock are examined for disease prior to use in a hatchery. Salmon eggs must first be taken from stocks native to the area in which the hatchery is located. The sale of salmon and salmon eggs by hatchery operators is addressed in AS 16.10.450. After a PNP hatchery operator uses funds from these sales for reasonable operating costs, including debt service, facilities expansion, and salmon rehabilitation or research projects, remaining funds must be expended on other fisheries activities of the qualified regional association for the area in which the hatchery is located. In accordance with AS 16.05.730, the Board of Fisheries may direct ADF&G fisheries managers to achieve an adequate return of fish to enhancement projects for broodstock in a manner consistent with sustained yield of wild fish stocks.

Regulation of the Harvest of Enhanced Fish

Fish released by hatchery staff are available for common use in the same manner as natural stocks until they return to SHAs established by the department under the authority of AS 16.43.400-440. According to AS 16.10.440, after a PNP permit has been issued, the Board of Fisheries may amend by regulation the terms of the permit relating to the source and number of eggs, the harvest by hatchery operators for cost recovery and broodstock, and the SHAs designated by the department for harvest by hatchery operators. Additionally, AS 16.05.730 requires fisheries to be managed in a manner consistent with that of sustained yield of wild salmon stocks. Wildstock fisheries may also be managed for sustained yield of enhanced fish stocks, provided managers have the approval of the Board of Fisheries. In accordance with sustained yield mandates, the conservation of wild stocks is given the highest priority among competing uses in the Board of Fisheries' policy for the management of mixed-stock fisheries (McGee 1995).

Under the provisions set out in AS 16.10.450 (b), fish returning to hatcheries that are sold for human consumption must be of comparable quality to fish harvested by commercial fishermen in the region and the prices received commensurate with the local market. An annual report must also be filed with the department by December 15 of each year (AS 16.10.470). This report must contain information on hatchery returns, number of eggs taken, and numbers of fry or smolt released (McGee 1995).

Performance Review of Hatcheries

Under the authority of AS 16.10.460, the department may inspect a hatchery facility at any time the facility is operating. Each facility is subject to inspection at least every other year. Based on department internal review, the PNP coordinator will notify the commissioner if a hatchery operator's performance is inadequate, according to the conditions under which the PNP permit was granted. In accordance with AS 16.10.430, the commissioner will determine whether a (1) permit alteration, (2) suspension, or (3) revocation is necessary. If the commissioner decides to consider these alternatives, the PNP coordinator will notify the appropriate RPT who may make a written recommendation to the commissioner on the proposed alternative.

The RPT uses the following performance standards in their review, evaluation, and recommendation to the commissioner: (1) survivals in the hatchery meet the minimum standards (Table 3); (2) transport of broodstock from wild sources does not continue for longer than one life cycle without reevaluation; (3) the hatchery contributes to common property fishery; (4) the hatchery does not adversely impact wild stocks; (5) the hatchery fulfills specific production objectives described in the PNP permit; and (6) any mitigating circumstances beyond control of hatchery operator.

Table 3. Minimum hatchery survival standards per 5 AAC 40.860(c).

	Survival for This Stage	Cumulative Survival
For captured broodstock to egg take	70%	
Green egg to eyed egg	80%	80%
Eyed egg to emergent fry	85%	68%
Emergent to fed fry[a]	90%	61%
Fed fry to fingerling[b]	90%	55%
Fingerling to smolt	75%	41%

[a] Fry achieving up to 25% weight gain from swim-up.
[b] Fry achieving substantially more than 25% weight gain from swim-up.

If an event occurs at a hatchery that results in fish or egg mortalities above the minimum hatchery survival standards, the operator must inform the PNP coordinator immediately and submit an incident report that includes the following information: (1) description of incident, (2) cause of incident, (3) time of incident, (4) effect on stocks, (5) corrective action taken and proposed measures to prevent future problems, and (6) assessment of impact to the program. This mortality incident report must be submitted to the PNP coordinator within 15 days after the incident occurs to be in compliance with 5 AAC 40.870(b).

Fish Transport Permit

Under the authority of 5 AAC 41.005, no person may transport, possess, export from the state, or release into the waters of the state any live fish unless the person holds a fish transport permit issued by the commissioner or his authorized designee and is in compliance with all of its conditions. A fish transport permit authorizes only the "operation" (i.e., project) specified; any change of species, broodstock, or location requires a new permit. The permit can be suspended by the commissioner if a permitted activity will adversely affect wild stocks or the permittee fails to comply with its terms.

Under the application procedures set out in 5 AAC 41.010, an applicant for a fish transport permit is required to submit the following information to the department: (1) identification of each species and location of stock; (2) destination of transported fish and release site; (3) number of fish, life history, and age; (4) history of any previous transport; (5) statement of health or condition of fish, including disease history and treatments; (6) isolation measures planned to control disease during transport; (7) description of egg take methods; (8) source of water for rearing and proposed effluent discharge location; (9) identification and status of native stocks in area of site, including expected interactions with other stocks; (10) method of transport or release and date of release; (11) purpose and benefits of transport and release; and (12) an evaluation plan. A completed application must be submitted to the ADF&G regional office. If the commissioner or his designee finds the application to be incomplete, it will be returned to the applicant with a description of its deficient information. The commissioner or his designee will approve, condition, or deny a permit within 45 days after a completed application has been received.

The permit will be issued if the department determines that the proposed transport, possession, or release of fish will not adversely affect the continued health and perpetuation of native, wild, or hatchery stocks of fish. The permit will also be issued with terms and conditions attached if the department determines they are necessary to protect the continued health and perpetuation of native, wild, or hatchery stocks of fish. The permit will be denied in writing if the applicant's proposed plans, methods, or specifications are not adequate on the basis of fish disease, genetics, competition, predation, or other biological considerations to assure the continued health and perpetuation of native, wild, or hatchery stocks of fish. A permittee may also request an amendment to the permit, and the commissioner will make a determination pursuant to 5 AAC 41.030 (a) or (b) within 30 days of receiving the request.

Enhancement Project Development and Approval

The RPT has not formalized a process for soliciting new fishery enhancement projects because each project involves unique opportunities, circumstances, and its own development timeline. Developing a project proposal is the responsibility of qualified organizations and agencies interested in implementing a project; however, it is very important that those entities consult with ADF&G fishery management biologists and the PNP hatchery program manager early in the process. These people will (1) assist the applicant in identifying the permits needed for the project and (2) discuss strategies for meeting the standards listed in the *Guidelines for Enhancement Planning* section of this plan (*see* page 83). Applicants will need to obtain information from ADF&G fishery biologists when developing plans for project evaluation. Other agencies, groups, or individuals affected by a project also should be notified or consulted.

The ADF&G principle geneticist, who is responsible for enforcing the Alaskas' genetics policy, has a primary roll in final approval of the stock to be used for each enhancement project. Similarly, the ADF&G principle pathologist has oversight of all aspects of a project that impact fish health; he also has the authority to enforce the department's disease control policies. Before committing a significant amount of time and money to the development of a new project, it would be advisable for the applicant to informally discuss the project with the appropriate RPT to get their direction and advice.

When project details are well defined, applications for proposed projects are submitted to the PNP hatchery program manager, who initiates a review by members of the RPT and other agency staff. A sound financial plan for project operation should be developed and submitted along with the project proposal. It is not cost effective for PNP corporations, the RPT, or ADF&G to spend significant amounts of time and effort planning, reviewing, and implementing projects that do not have a solid fiscal basis for continuing operation. In developing the financial plan, the use of outside sources of funding, especially those associated with corollary activities such as education or economic development, need to be carefully scrutinized. Outside funding sources might pay for project development but usually will not support ongoing operational expenses.

Ultimately, the applicant will be required to formally present the proposed project to the RPT at a regularly scheduled meeting. These meetings are open to the public, are subject to public notice requirements, and provide an opportunity for any interested person, group, or agency to comment on a proposed project. The RPT considers and takes action on proposed projects in the form of recommendations (i.e., either for or against project approval) to the commissioner of ADF&G. Most new projects require an alteration to an existing hatchery permit, issuance of a new hatchery permit, or some other specific action to be taken under the authority of the commissioner.

During phase III of the comprehensive salmon enhancement planning process, the RPTs will use two main criteria as the basis for a recommendation of project approval: (1) the project must be consistent with Southeast Alaska's phase III goals and (2) the project must meet the technical standards for the appropriate type of project (e.g., fishery supplementation, wildstock supplementation, or colonization).

Enhancement Program Policies

Numerous department policies formed the scientific framework for constructing the enhancement program, and these policies continue to guide hatchery development and operations and provide safeguards for the maintenance of wild stocks. All new projects should have an approved evaluation plan that describes (1) how to assess potential impacts to wild stocks and (2) compliance with policies designed to protect them. The following sections provide an overview of these policies and their relevance to the enhancement program.

Genetic Policy

The genetic policy was created by ADF&G to provide guidelines for developing an enhancement program while concurrently minimizing the potential for genetic impacts on wild stocks to an acceptable level (Davis and Burkett 1989). An initial genetic policy was developed in 1975; this policy was revised in 1978 and again 1985 (Davis et al. 1985) to further refine the application of genetic principles to the development and management of broodstock for enhancement purposes. Protection of genetic integrity of wild stocks has always remained the principal objective of the policy (Davis and Burkett 1989). The maintenance of genetic variability also ensures that enhanced stocks will be able to adapt to changing environmental conditions. Davis and Burkett (1989) also pointed out that although genetic impacts to wild indigenous fish stocks become possible when fish are produced in a hatchery and/or transported to another location for remote release, it is important to recognize that these activities do not automatically imply that genetic impacts on wild stocks will follow.

The 1985 edition of the genetic policy was developed by a review team consisting of scientists from ADF&G, PNP corporations, University of Alaska, and National Marine Fisheries Service. That team reviewed and updated the genetic guidelines established with the initial policy and provided guidelines in three primary areas; (1) stock transport, (2) protection of wild stocks, and (3) maintenance of genetic variance. Protection of wild stocks remained the principal objective.

Stock Transport. Live salmon, including gametes, are prohibited from being imported from sources outside the state; although exceptions may be allowed for transboundary rivers (e.g., Taku and Stikine Rivers where only eggs are kept during incubation and returned to Canadian waters as newly hatched fry). Stocks are also prohibited from being transported between major geographic areas within the state. The acceptability of transporting stocks within regions will be determined on the following criteria: (1) phenotypic characteristics of donor stocks must be appropriate for the proposed region and goals set in the management plan and (2) because it's recognized that occurring over greater distances may result in increased straying and reduced likelihood of success, transplants with a high probability of failure will be denied.

Protection of Wild Stocks. The gene flow from hatchery fish straying and interbreeding with wild stocks may have significant detrimental effects on wild stocks. The first priority will be given to protection of wild stocks from possible harmful interactions with introduced stocks. The influx of new genetic material through straying is a natural process in the development and expansion of salmon populations. If adaptation of the natural population is very specific and selection is intense, then selection will favor and maintain the genetic complex of the wild populations. If adaptation is less specific and less intensive, then the genetic impacts from gene flow are insignificant. The magnitude of straying relative to the size of the wild run is the most important criterion.

Stocks cannot be introduced to sites where the potential for significant interaction or impact on significant or unique wild stocks can occur. The genetics policy suggests that local groups, such as RPTs, define criteria to be used to determine significant[20] stocks in a region. A watershed with significant wild stocks can only be stocked with progeny from those indigenous stocks. These gametes may be removed, placed in a hatchery, and returned to the donor system as eyed egg, fry, or fingerling; however stocking of progeny of no more than one generation of separation from the donor system will be allowed.

[20] The concept of significance is more fully explored in Appendix E of this plan.

Drainages should be established as wild stock sanctuaries where no enhancement activity is permitted except for gamete removal for broodstock development. In Southeast, enhancement activities are generally prohibited in all Forest Service lands/drainages classified as "wilderness," although such activities may be possible provided a strong need has been identified. In most respects, these areas are essentially de facto sanctuaries. Releases of fish at sites where there are no interactions or impacts on significant or unique stocks obviously will not produce a detrimental genetic effect; such releases need not be restricted by genetic concerns.

Maintenance of Genetic Variation. Diversity tends to buffer biological systems against natural or human-made disasters. There is also a consensus among geneticists that fitness is enhanced by genetic variability. To maintain genetic diversity among hatcheries, a single donor stock cannot be used to establish or contribute to more than three hatchery stocks. Remote releases for terminal harvest, rather than for development or enhancement of a stock, need not be restricted if such releases do not impact significant or unique stocks, wild stock sanctuaries, or other hatchery stocks. To maintain genetic diversity within hatcheries and from donor stocks, a minimum effective population (N_e)[21] of 400 should be used for broodstock development; however, small population sizes may be unavoidable with chinook and steelhead. To ensure all segments of the run have the opportunity to spawn, egg takes for donor stock transplants cannot allocate more than 90% of any segment of the run for broodstock (Davis et al. 1985).

Pathology Policy

The pathology policy is used by recognized authorities and user groups (e.g., hatchery operators) for maintaining adequate fish health within Alaska. The policy includes criteria for regulating and permitting protocols, diagnostic procedures, prophylactic measures, and treatments of infectious diseases of salmon. The policy has been established for the purpose of regulating interstate and intrastate movements of fish or their gametes for planting in natural waters, research/educational purposes, and other interests. The long-range goal of the policy is to prevent dissemination of infectious fish diseases within or outside Alaska without introducing impractical constraints for the enhancement program (SPRC 1988).

Alaska has very stringent disease policies that are explicitly designed to protect wild stocks. The prevalence of disease between wild and hatchery stocks are not significantly different.[22] The disease agents found in hatchery fish originate from the wild stocks because (1) there are often wild resident fish in the hatchery water supplies and (2) the hatchery stocks originated from wild fish stocks. Using a 21-year study (1978 to 1998) of different infectious hemapoetic necrosis (IHN) isolates from hatchery, wild, juvenile, and adult fish, ADF&G Pathology Section staff was able to determine that the pathogens are genetically the same for all samples as when the enhancement program was started

[21] Effective population is defined as the size of an idealized population that would lose genetic variability at the same rate as the sample population.
[22] Ted Meyers, principal pathologist, ADF&G, Division of Commercial Fisheries, personal communication.

(Meyers and Burton 2002). There are no known exotic pathogens in Alaska salmon; the same thing cannot be said about salmon in the Pacific Northwest.[23]

The pathology policy seeks to ensure that pathogens are not introduced into watersheds where they don't naturally occur. With respect to fish diseases, Alaska's geographic isolation and colder water temperatures minimize the amount of pathogens that occur; however, it has within its boundaries large areas of separated watersheds supporting wild stocks that have never been examined for disease. Therefore, there is a risk of unknowingly transporting diseases from one major geographic area to another that may not be detected at the 5% level per 60 adult fish examined prior to transport (60 fish is the state's required disease screening sample size for any fish transport). To minimize this risk, ADF&G prohibits the transplant of wild fish stocks between major geographic zones: Southeast, Kodiak Island, Prince William Sound, Cook Inlet, Bristol Bay, Alaska Yukon/Kuskokwim, and the Interior. This policy includes hatchery stocks as well, although exceptions may be considered on a case-by-case basis under stringent constraints.

One standard enhancement-related requirement is the practice of egg disinfection on all eggs coming into a hatchery, regardless of their origin. Within 24 hours of taking and fertilizing live fish eggs or transporting live fish eggs between watersheds, all eggs must be treated for at least 10 minutes with iodine solution in order to destroy any pathogens. There are four finfish disease categories: (1) disease of critical concern, (2) endemic disease of concern, (3) nuisance diseases, and (4) uncategorized diseases. These categories reflect current understandings of disease problems and concerns, and the reporting of their occurrence in hatchery fish to the principal pathologist is also required.

The most stringent disease control techniques were established for sockeye salmon culture because enhanced production of this species is seriously limited by IHN—the bubonic plague of sockeye salmon. This disease, which occurs naturally in wild stocks, has caused catastrophic mortalities of sockeye salmon in the state. Although IHN is caused by a rhabdovirus endemic to sockeye, it can also infect other salmon species. Hatcheries that culture sockeye will normally have some of the virus latent in fish within the facility. Adverse environmental conditions such as excessive stress may precipitate a change from the carrier state to the disease state, resulting in mass mortalities. Factors that precipitate stress include poor incubator performance, marginal water quality, excessive handling, grading, or marking. Consequently, extremely careful monitoring and isolation enhancement practices have been developed in Alaska to prevent the virus from horizontally infecting other stocks (SPRC 1988). Virus free water is required, and no other known susceptible species are allowed in the same facility unless it is determined that physical barriers included in the design of the hatchery operation precludes transmission of the virus.

<u>Atlantic salmon issues.</u>[24] The farming of Pacific salmon in the Pacific Northwest began in the 1970s. In the late 1970s NMFS provided aquatic farmers with Atlantic salmon smolts

[23] Ted Meyers, principal pathologist, ADF&G, Division of Commercial Fisheries, personal communication.

for conducting suitability tests. Finding Atlantic salmon more suitable for farming, aquatic farmers in British Columbia and Washington State began importing broodstock from eastern Canada and Europe in the late 1980s. The descendents of these fish are raised to adult size in floating saltwater net pens located in protected nearshore waters. Annually, it is estimated that tens, if not hundreds, of thousands of these nonindigenous fish of all life stages are released into the North Pacific through accidents (e.g., breaches in the net caused by storms, currents, marine mammals, transport losses) as well as the deliberate releases of small or slow-growing fish that escape during net-changing operations (i.e., nothing is done to prevent those “escapes”). These releases pose a potentially serious threat to wild Pacific salmon.

Introductions of non-native species can result in catastrophic consequences through habitat destruction, disease or parasites introduction, hybridization, reproductive proliferation, predation, and competition. Examples of this include the well-known introductions of rabbits into Australia, zebra mussels into the Midwest, and sea lampreys into the Great Lakes. Sexually mature Atlantic salmon are captured in both fresh and salt water throughout the Pacific Northwest and to a lesser degree in Southeast Alaska. Successful spawning by escaped adults has occurred in several British Columbia streams; it may also be occurring in one Washington stream. British Columbia’s lifting of the fish farming moratorium and the industry’s plan to triple farm production heightens the threat of successful west coast Atlantic salmon colonization.

Possibly the most significant impact Atlantic salmon farming has had and will have on wild Pacific salmon fisheries is indirect. By delivering a quality product consistently, cheaply, and in ever increasing quantities, Atlantic salmon farmers significantly reduce the value of the wild salmon in the seafood fishing industry. If a devaluation of this important sector of the Alaska economy continues, one cannot overstate the importance of vigilance to insure that wild salmon and the habitats on which they depend be protected for future generations.

Salmon Escapement Goal Policy

According to 5 AAC 39.223, the purpose of this policy is to establish the concepts, criteria, and procedures for establishing and modifying salmon escapement goals and to establish a process that facilitates public review of allocative issues associated with them. According to 5 AAC 39.222(f)(38) sustainable yield is defined as “an average annual yield that results from a level of salmon escapement that can be maintained on a continuing basis; a wide range of average annual yield levels is sustainable; a wide range of annual escapement levels can produce sustained yields.”

Because of a constitutional mandate to manage fisheries on a sustained yield basis, ADF&G has the authority to establish the annual escapement levels for spawning salmon stocks necessary to maintain sustainable harvests. Generally, sustained yield can be achieved with typical conservative management practices (e.g., catch quotas, limited

---

[24] Information regarding Atlantic salmon issues relies on Bob Piorkowski, invasive species program coordinator, ADF&G, Division of Commercial Fisheries, personal communication, and Gaudet (2002).

fishing periods, etc.). For fisheries with expanding levels of fishing effort, the number of salmon that spawn annually needs to be assessed and more conservative management strategies implemented to achieve sustainability. Department biologists have also developed methods for estimating carrying capacities of freshwater rearing environments for many stocks. These data enable them to obtain a better scientific understanding of the relationship between spawning stock levels and levels of return. The department aggressively pursues development of escapement enumeration programs, inseason fishery management programs, and scientific methods to determine the escapement levels necessary to assure sustained yield.

Maximum sustainable yield (MSY) is the greatest average annual yield from a stock; however, it is achievable only when a constant level of escapement is maintained annually, regardless of run strength. It requires a high degree of management precision and scientific data regarding the relationship between escapement and subsequent return. Biological escapement goal (BEG) is the (1) escapement level that provides the greatest potential for maximum sustained yield and (2) specific management range for the escapement of a specific stock. It is developed from the best biological data, and it is scientifically defensible on the basis of available biological information. The optimal escapement goal (OEG) is a specific management objective for escapement that considers both biological and allocative factors. This goal is determined by the Board of Fisheries; it may or may not be equal to the BEG, but it is sustainable.

Existing escapement goals for Southeast Alaska's salmon stocks are documented in reports (Geiger et al. 2003, Zadina et al. 2003, Shaul et al. 2003, Heinl et al. 2003, McPherson et al. 2003) that are available to the public. Escapement goals are reviewed and updated on an ongoing basis; they are summarized and reported every three years for consideration by the Board of Fisheries at regularly scheduled meetings. The salmon escapement goal policy also sets out guidelines for establishing and modifying the BEGs. A summary of those guidelines follows: (1) goals should be established for stocks for which escapement levels can be indexed or estimated; (2) goals may be a single escapement level or a range of levels; (3) to establish a goal or modify an existing one the department must prepare a scientific analysis and include supporting data; and (4) the department will determine whether there is a substantive allocation impact resulting from management actions taken to achieve a BEG. When such a determination is made, it will be presented to the Board of Fisheries.

Fish Resource Permit Policy

This policy was approved in 1994 to replace an outmoded policy related to the collection, scientific, and educational permitting process implemented in 1983. The new fish resource policy provides a more detailed explanation of the types of permits required for collection and/or transportation of live fish of any life stage used for scientific, educational, vocational,[25] propagative, or exhibition purposes. There are three permit classifications: (1) collection, (2) holding, and (3) propagation. Permit requirements are

[25] For purposes of the fish resource policy, *educational* refers to teaching fish biology/ecology in a classroom setting while *vocational* refers to undergoing fish culture training in a hatchery setting.

scaled by egg numbers; i.e., the more eggs taken, the greater risk to wild stocks, and therefore the more constraints added to permits (McGee 1995). These permits are issued under the authority of the commissioner. Applicants for all fish resource permits must be involved in legitimate research or educational activities.

Applications for collection or holding permits are reviewed by the Division of Commercial Fisheries for salt water and Division of Sport Fish for fresh water. The reasons for capturing and/or collecting fish include (1) impact analysis for a proposed activity in a system; (2) habitat manipulation for improving fish productivity; and (3) fish resource data collection for academic research. The reasons for holding fish include (1) exhibit live saltwater or freshwater fish (2) export live specimens from the state, and (3) conduct nonpropagative research that requires maintaining live specimens for some amount of time after capture. Release of these fish into waters of the state is prohibited, and disposition of carcasses must be approved by the department.

Applications for propagation permits fall into four categories: (1) mariculture site suitability, (2) scientific/educational, (3) vocational, and (4) propagative. Permit applications are reviewed and processed by the divisions of Commercial Fisheries and Sport Fish to determine suitability. If the applicant is a school, the school will be considered the primary employer, not the school district, and the classroom instructor will be considered the applicant.

Mariculture site suitability. This permit requires approval of the ADF&G pathologist, and that approval will fulfill fish transport permit criteria specified under 5 AAC 41.005. The following conditions apply to this permit: (1) limited to one year with no renewals, (2) limited to 10,000 organisms with no release, (3) has no commercial use, and (4) does not establish any proprietary interest in the site.

Scientific/educational. This permit is primarily used for classroom projects, and they allow the transporting and holding of live fish. Approval of this permit will fulfill fish transport permit criteria specified under 5 AAC 41.005. Approval of the department's fish pathologist may also be required. Only wild coho, pink, and chum salmon or any species obtained from an Alaska hatchery (other than sockeye salmon) will be allowed for classroom projects. There are two subcategories with separate requirements for this type of permit: (1) no release of fish or effluent into waters of the state requires less than or equal to 500 eggs or one spawning pair and use of wild stock or hatchery eggs and (2) small number releases of fish requires (a) progeny from less than or equal to 500 eggs or one spawning pair, (b) fish release only at place of origin or approved landlocked lake and effluent release either disinfected or discharged into a sewage treatment facility, (c) cumulative impacts will be carefully assessed, (d) project for educational purposes only and any adult returns are considered common property, and (e) releases of fish must be timed to natural timing of donor stock, plankton bloom, or a time appropriate to maximize survival.

Vocational. This permit, which is used primarily for large vocational fish culture projects (e.g., small central incubation facility), allows the use of up to 50,000 eggs or equivalent in spawning pairs (other than sockeye salmon). Inspection by the department pathologist and geneticist may be required. Additional constraints may be required for management or conservation needs. Review by the RPT is required, and cumulative impacts from projects in the area may be carefully assessed. A fish transport permit for broodstock selection is required. The project must be for educational purposes only, and any adult returns from project are considered common property.

Propagative. These permits allow no more than 500,000 pink or chum salmon eggs or 100,000 coho, sockeye, or chinook eggs or the equivalent in spawning pairs and are available in two subcategories: (1) research and bioenhancement projects by accredited institutions of higher learning (i.e., colleges and universities) and cooperative government agencies and (2) site suitability project as a precursor to the application process for a PNP hatchery permit.

For research and bioenhancement permits, inspection by the department pathologist and geneticist may be required; facility plans, diagram, and water source information must be furnished; and a fish transport permit for broodstock selection obtained. A site suitability permit must meet those requirements too; however, those applicants must also adhere to the following conditions: (1) provision of management feasibility analysis, (2) RPT review, (3) department/public review, (4) timed releases to natural timing of donor stock, (5) explanatory report for substantial egg mortalities, and (6) common property consideration for all returns.

The commissioner will approve, condition, or deny all fish resource permits within 30 days after a complete application containing all of the applicable information has been received by the department. The commissioner will deny a fish resource permit in writing if the proposed activities will adversely affect wild or propagated stocks or their habitat or if the specifications of the proposed study plan are inadequate.

ALLOCATION OF ENHANCED FISH

Development of the Enhanced Salmon Allocation Management Plan[26]

In March 1991 the Board of Fisheries asked NSRAA and SSRAA to coordinate development of a Southeast-wide commercial fisheries allocation plan for all enhanced salmon produced by the region's public and private nonprofit hatcheries. This plan was deemed necessary because of the emergence of a divisive issue: the amount of enhanced fish (i.e., benefits) received by each of three commercial gear groups (purse seine, power and hand troll, drift gillnet) in each region, relative to the 3% Salmon Enhancement Tax (SET) that all commercial fishermen paid.

The Boards of Directors of NSRAA and SSRAA formed the Southeast Allocation Task Force (SATF). It was composed of six voting members: three each from NSRAA and SSRAA who represented their respective commercial gear groups. One nonvoting member was also appointed from the former FRED Division and DIPAC, a nonregional PNP corporation. All decisions were determined by consensus, and no meetings were held without all six voting members present. One staff member from each regional aquaculture association and the nonvoting members acted in advisory capacities to provide technical information to the voting members. Representatives from National Marine Fisheries Service (NMFS) and Commercial Fisheries Entry Commission (CFEC) also provided technical information. A total of five SATF meetings were held between March 1991 and March 1994. Before every SATF meeting, advertisements in newspapers and on the radio throughout Southeast encouraged public attendance and participation.

Prior to 1985, the contribution of enhanced fish to the common property fisheries in Southeast was not considered significant because most facilities were just beginning production. Accordingly, allocation guidelines were based on the average catch and value data by gear group for the years 1985 to 1990. Estimates of future production were factored in based on permitted capacities and planned increases in capacities that had not yet been permitted or implemented.

Catch and value data from all of Southeast Alaska (fishing districts 1–15) were considered. Commercial catch statistics were compiled by SATF and reviewed by scientists at the NMFS Auke Bay Laboratory. The fish produced by Forest Service habitat enhancement activities, NMFS research programs, or Metlakatla Indian Community's (MIC) Tamgas Creek Hatchery were not included in the catch and value data. Because fish produced by the Forest Service were not usually marked, their contribution to the harvest could not be verified. Although MIC production was significant, the catch and value data were not included because neither harvest nor production is managed by the state. The production by NMFS was small and experimental. CFEC provided data on the value of fish by species and gear group for each year (1985 to 1990).

---

[26] From Findings of the Alaska Board of Fisheries, Southeastern Alaska Area Enhanced Salmon Allocation Management Plan (No. 94-02-FB). Information in this section is summarized; it is not taken verbatim from the text.

The Southeastern Alaska Area Enhanced Salmon Allocation Management Plan was based only on harvests and values in commercial purse seine, drift gillnet, and troll fisheries; it did not include data from commercial set net, sport, sport charter, subsistence, or personal use fisheries, and no allocation was suggested for these groups. The SATF concluded that an allocation of enhanced fish for these fisheries would be unnecessary. The commercial set gillnet fishery occurs only in the Yakutat area where no hatchery programs have been implemented, and the latter four fisheries are smaller in nature and their harvests restricted by bag limits.

In May 1994 the Board of Fisheries enacted the allocation management plan as a regulation: 5 AAC 33.364. The recommended allocation percentage goals (expressed as ranges of annual catch value) for each gear group were established as follows:

Seine	44% to 49%
Hand and power troll	27% to 32%
Drift gillnet	24% to 29%

The status of these allocation percentage goals is based on a 5-year moving average. If a gear group falls outside its allocation percentage goal for three consecutive years (i.e., consecutive 5-year averages), corrective measures may be implemented.

Utilization of the Allocation Management Plan

The Southern Southeast and Northern Southeast Regional Planning Teams use the allocation management plan when evaluating permit requests and proposed production changes. The commissioner of ADF&G considers the plan when evaluating permits or establishing special harvest areas. The commissioner of DCED considers the plan when determining salmon enhancement loans for changes in production. The Board of Fisheries uses the plan when making decisions concerning gear group disagreements involving enhanced fish production. The allocation percentage goals for each gear group are considered realistic and achievable; however, they remain flexible to changes in management, U.S./Canada Treaty, statutes, or regulations.

Guiding Principles

In addition to the allocation percentage goals, SATF developed 13 guiding principles for implementation of the allocation management plan. These principles are included in Board of Fisheries Finding # 94-02-FB. The following is a summary of those principles.

1. The enhancement program will provide additional fishing opportunities and revenue to traditional common property fisheries. The NSRAA and SSRAA programs over time should provide a 70% contribution (after broodstock) to all common property fisheries; nonregional PNP hatcheries, 60%. Although these contributions to the common property fisheries will vary from year to year depending on run strength, survival rates, and management decisions, the long-term benefit of enhancement programs must go to the common property fisheries.

No penalty for failure is suggested; however, operators of hatcheries will use these performance goals in designing annual management plans submitted to RPTs for review prior to approval by the commissioner. If performance goals are not achieved over time, it is the intent of the Board of Fisheries that management changes in hatchery terminal areas be implemented to assure attainment of those goals.

2. Management of traditional wildstock fisheries is not to be restricted by cost recovery needs (i.e., economic escapement) of hatcheries.

3. Restrictions on the conduct of wildstock fisheries to meet broodstock needs should be absolutely minimal. If it occurs, it must be documented to clearly show why it was necessary. Protection of broodstock should only occur in close proximity to terminal areas.

4. Enhancement projects should include coded wire tagging or otolith marking of fish to determine the contribution of enhanced fish in various fisheries. As fish-marking technology evolves, the most reliable and cost-effective method will be used.

5. The State of Alaska should commit to an adequate mark–recovery program for all enhanced salmon to provide harvest and production data. The allocation management plan will not work unless the state commits to a mark–recovery program that is designed to provide an equal level of confidence in enhanced salmon contributions to each gear group.

6. Fish will not be counted in those remote habitat, enhancement, and restoration projects where marking is not feasible. Fish will be counted in those remote projects where marking is feasible and economically acceptable.

7. The allocation percentage goals will be used to provide a fixed target for enhanced production. Whenever fish are released and returning adults harvested, an allocation is made. It is desirable that new or revised production contributes to achieving the allocation balance. If such production creates an imbalance in the distribution of enhanced salmon but is otherwise considered desirable, the RPT will evaluate the enhancement program to determine what adjustments may be necessary to bring distribution into compliance with the recommended allocation percentage goal. Accordingly, the RPT will then make recommendations to the commissioner

8. The SATF does not expect the allocation percentage goals to be attained each year; however, they are expected to be realized in the long term. Survival rates can vary considerably within and among enhancement projects. Also, variations in management of common property fisheries influence the harvest rates. Since any change in production takes two to five years to impact a fishery, the

allocation percentage goals are based on a minimum 5-year harvest-value increment.

9. Overall contribution of revenue from salmon enhancement projects should be evaluated using the most recent 5-year average. Adjustments should be implemented only when a consistent discrepancy exists in the 5-year average for three consecutive years.

10. The Joint RPT will evaluate current enhanced salmon production and the distribution of harvest revenues and update this data on an annual basis. The Joint RPT will recommend to the commissioner adjustments to a facility's annual operating plans as necessary to comply with the guidelines for allocation between gear groups and for the distribution of fish between cost recovery and common property fisheries. Under the authority of the commissioner, the Joint RPT is responsible for establishing and maintaining the comprehensive salmon plan and recommending changes in hatchery production to the commissioner.

11. Achieving the allocation percentage goal for each gear group should not result in any modifications in time or area to traditional wildstock fisheries. The harvest of enhanced salmon in a targeted wildstock fishery is considered incidental. This should not, however, preclude special fisheries that would not adversely impact wild stocks; examples of these are experimental fisheries, test fisheries, or establishment of fisheries in new special harvest areas in order to access enhanced fish.

12. There should be no inseason changes in management of enhanced salmon in or out of the SHAs to achieve the allocation percentage goals. These are *long-term* goals.

13. When adjustments are deemed necessary to the distribution of the harvest to meet allocation percentage goals, the following tools should be used: (1) SHA management adjustments; (2) new enhanced salmon production; and (3) modification of enhancement projects production, including remote releases. Adjustments in SHA management can be used in the short term to help modify any imbalances that occur. New enhanced production and modification of enhanced production are long-term changes that will take five to ten years to have an impact. The SATF intends these adjustments to be reviewed by the Joint RPT, who would then recommend to the commissioner the most appropriate action to achieve allocation percentage goals. Short-term adjustments should be used only until long-term adjustments can be implemented and their effects realized.

Status of the Allocation of Enhanced Fish

Year-to-year allocations of enhanced fish were dynamic from 1986 to 1995. During the time SATF was active (1991 to 1994), annual allocation percentage goals fluctuated considerably; however, the 5-year moving averages hovered around the target ranges

(Figures 10–12).[27] Because the allocation balance is relational, a relatively small fluctuation in dollar value of the troll catch, for example, may result in a large shift in allocation percentages if there is a value fluctuation in the opposite direction for the seine catch (Figures 13 and 14). Although the gillnet allocation remained fairly stable and within its target range (Figure 14) and the troll and seine allocations fluctuated in and out of their target ranges, the balance of benefits to the gear groups was maintained over time until the late 1990s.

Following the 1997 harvest, it became apparent that an imbalance in allocation was developing; seiners were receiving an increased share of the enhanced harvest, while trollers were receiving a decreased share. By 1997 the 5-year moving averages for seiners and trollers had been substantially out of the allocation range for two consecutive years, and the Joint RPT believed the imbalance was likely to continue. Rather than wait until the mandated trigger point for taking corrective measures, the Joint RPT held a workshop early in 1998 to explore ideas and proposals to alleviate the imbalance. The workshop helped to clarify the applicability, strengths, weaknesses, and limits of the allocation regulation. Following lengthy debates on a variety of topics, the following conclusions were drawn:

- The current method used by CFEC to compute the price per pound value of enhanced fish, while resulting in imperfect data, is the best method available.

- Changes in marine survival and exvessel price of fish, benefiting some species and harming others, had dramatically changed the distribution of benefits.

- For chinook salmon, the troll fleet's primary target, significant decreases in marine survival rate, number released, and price per pound resulted in decreased benefit to the troll fleet.

- For chum salmon, the seine fleet's primary target, increased hatchery releases, amplified by an extraordinary increase in marine survival rate, overrode a decline in price per pound to provide the increased benefit to the seine fleet.

- Marine survival and price of fish are factors outside the control of the enhanced fish producers, ADF&G, and the Board of Fisheries.

- Remedies should focus on improving the troll harvest. The troll representatives on the RPT expressed the opinion they were catching as many fish as they could, given U.S./Canada treaty restrictions, and were not interested in taking fish away from other gear groups. The distribution of the coho and chinook catch between gear types has remained relatively constant.

[27] Figures provided by McNair (2002b); 2002 and 2003 calculations provided by Farrington (2003, 2004); calculations for 1985 were not available.

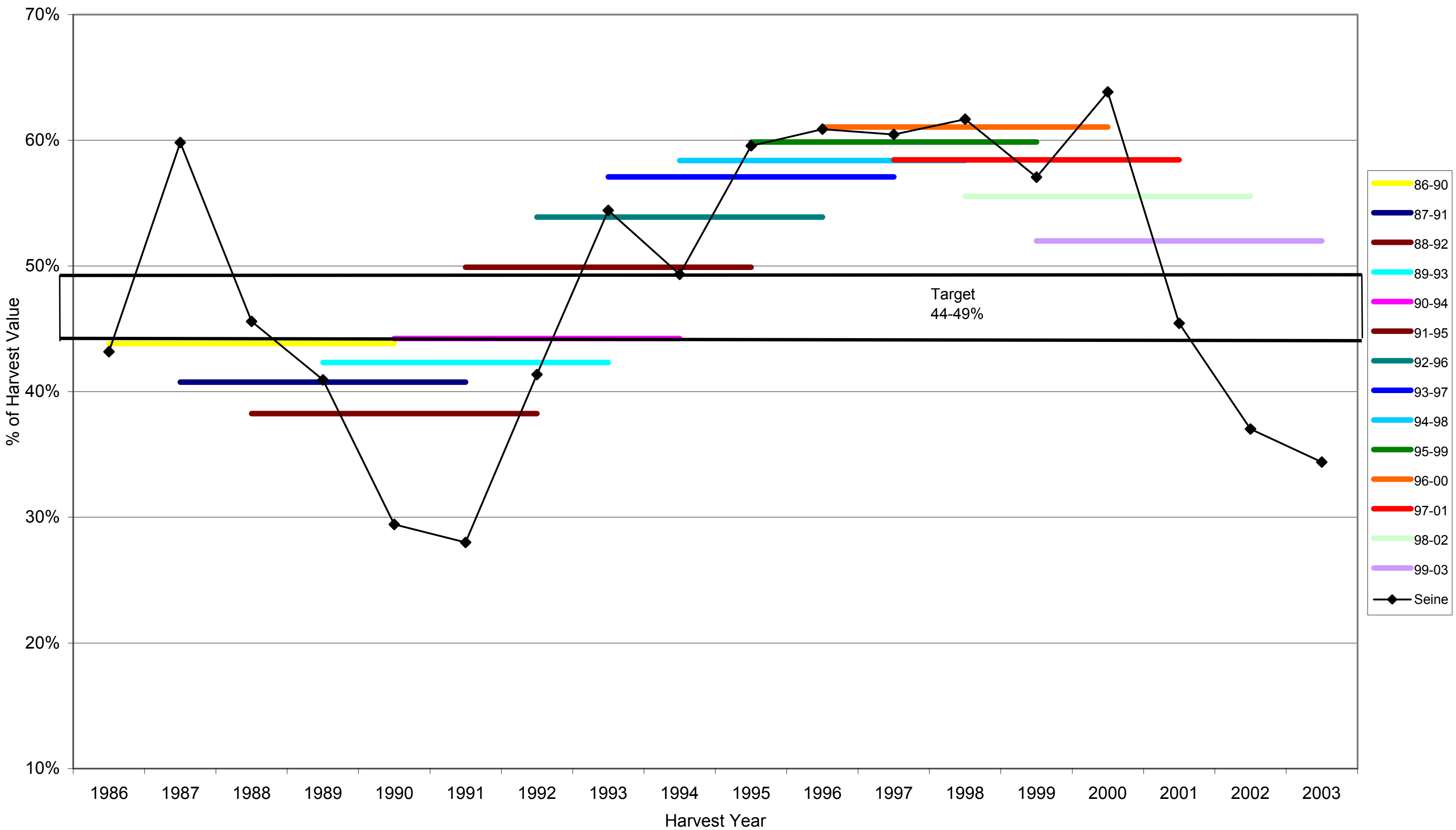


Figure 10. Seine allocation of enhanced fish and consecutive 5-year averages, 1986–2003.

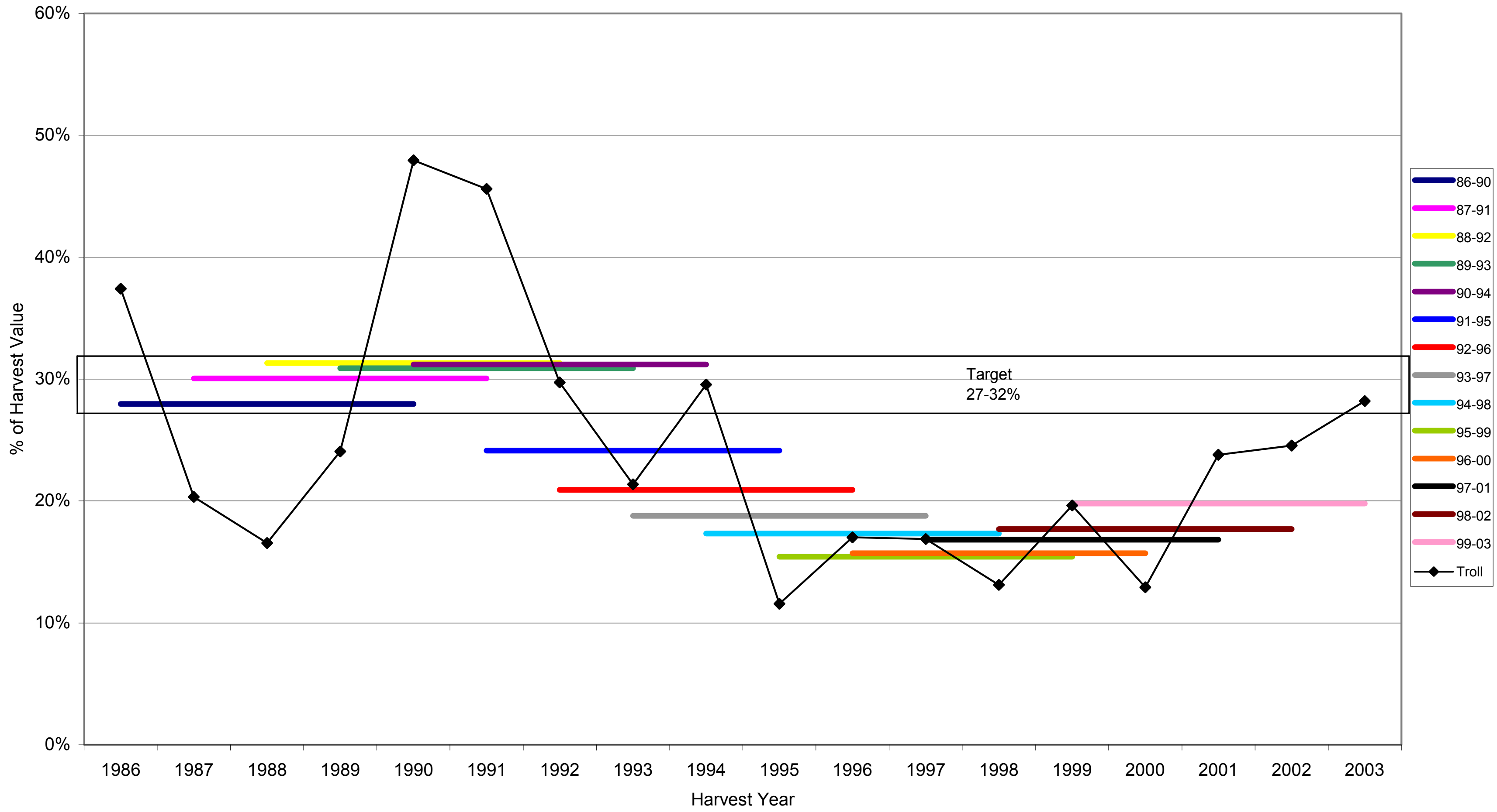


Figure 11. Troll allocation of enhanced fish and consecutive 5-year averages, 1986–2003.

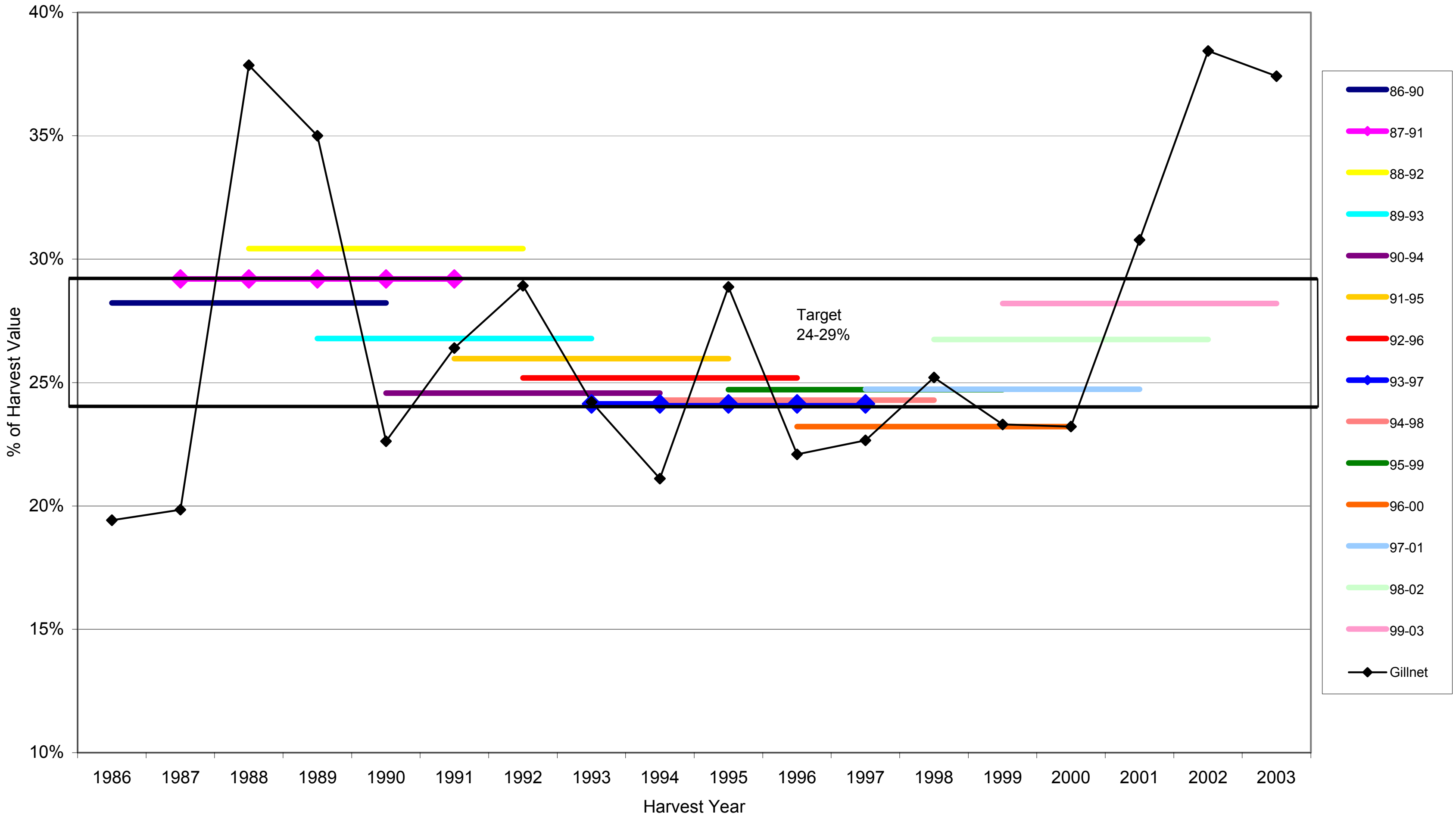


Figure 12. Gillnet allocation of enhanced fish and consecutive5-year averages, 1986–2003.

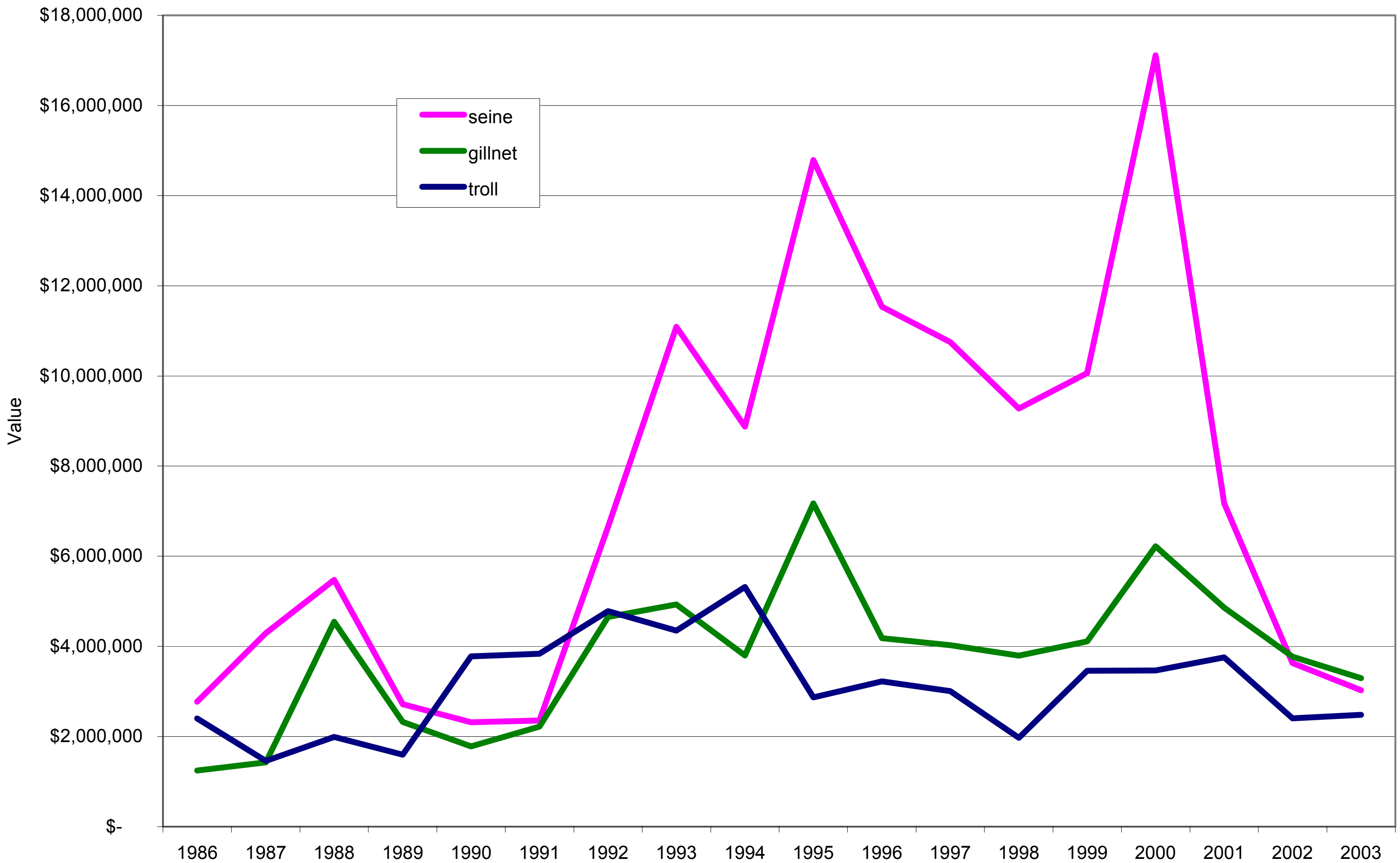


Figure 13. Dollar value of enhanced harvest by commercial gear group, all species, 1986–2003.

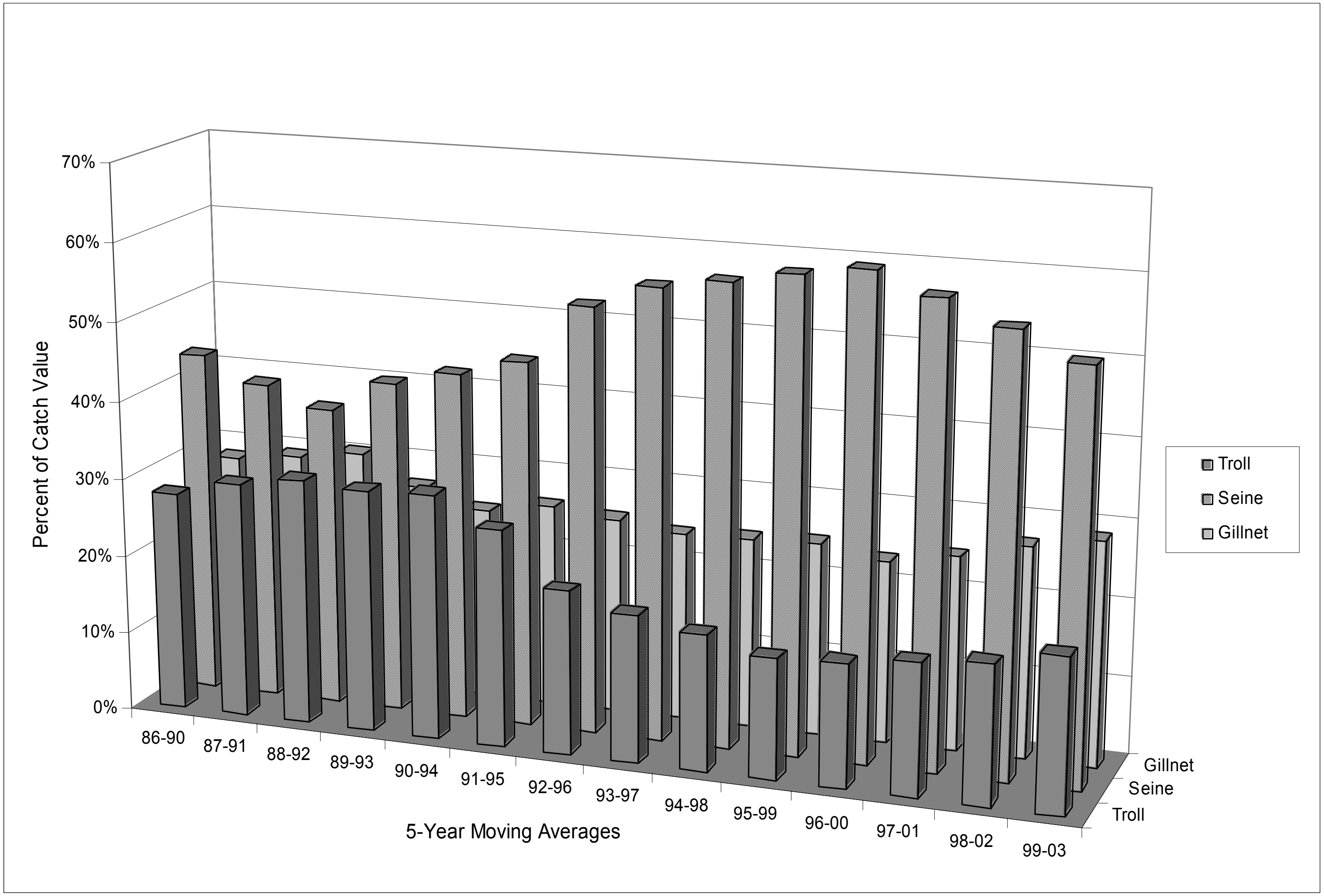


Figure 14. Allocation of enhanced Southeast harvest by commercial gear group, all species (percentage goals = troll 27-32%, seine 44–49%, gillnet 24–29%).

- Arbitrarily reducing the chum salmon harvest by seine gear or reducing chum salmon production would not be wise or necessary. A decrease in marine survival to more "normal" levels was considered highly likely.

The Joint RPT workshop recommended that hatcheries emphasize coho and chinook projects where possible for the time being. The Joint RPT continued to monitor the status of allocation; and following another out-of-balance harvest year, they submitted to the Board of Fisheries two proposals for regulatory changes to increase harvest opportunity for trollers; these proposals were adopted. In 2001 and 2003, the Joint RPT also made recommendations regarding other enhancement-related proposals submitted by the public. The Joint RPT's recommendations were based on the current status of enhanced allocation and on the guiding principles included in the Board of Fisheries finding No.94-02-FB. Most of these recommendations were adopted by the Board of Fisheries. Members of the commercial gear groups later submitted other proposals considered during the workshop; most of the proposals aimed at restoring balance to the allocations were approved by the Board of Fisheries and implemented during the 2000 salmon season.

In light of the changes that have occurred in the fisheries during the past 10 years, in the spring of 2002 the Joint RPT recommended that the Southeast Alaska Allocation Task Force be reconstituted to consider the way value should be calculated for determining the value of enhanced salmon to each gear group. This occurred and the SATF had its first meeting in January 2003; as of June 2004 (i.e., the date of publication for this plan), it has met three times and has scheduled another meeting in December 2004 to consider various issues surrounding the computation of that value.

Computer modeling by ADF&G staff showed that if marine survivals for each species were to stabilize at their long-term average[28], even if prices and production numbers remained at 1999 levels, the allocation would be balanced within a few years. Meanwhile, the allocation regulation continues to be used in production and harvest planning for enhanced salmon.

[28] Survival ranges used as standard assumptions for hatchery production planning.

PUBLIC BENEFIT AND HATCHERY FUNDING

Public Benefit

Determining a value for the enhanced portion of Southeast Alaska's salmon fisheries has not been without controversy. While the value of the PNP enhancement program may appear substantial to those who benefit from the additional harvests they provide, there are those who question whether the program actually provides statutorily mandated "substantial public benefits" (AS 16.10.400 [g]). The magnitude of this controversy has increased during the past several years as the value of salmon fisheries based on the harvest of naturally produced fish has significantly diminished because of competition in the marketplace with farmed salmon from Norway, Chile, United Kingdom, and Canada. At the same time, the value of hatchery-produced chum salmon in Southeast has increased (Burke 2002).

From 1988 to 2000, all state-operated enhancement facilities and projects in Southeast Alaska were conveyed to either the regional aquaculture associations or nonregional PNP corporations. Other than Division of Sport Fish's participation in three cooperative agreements with SSRAA, NSRAA,[29] and DIPAC to help maintain chinook sport fishing opportunities for the communities of Ketchikan, Petersburg, Sitka, and Juneau, the department has withdrawn all funding support for operation of salmon production facilities in Southeast Alaska. The most significant consequence of that withdrawal is that these former state facilities have to be run as businesses, despite the mandatory requirements to provide substantial public benefits.

Although releases of fish in Southeast have been constant in recent years, there has been variation in the relative number and value of enhanced fish in the commercial harvest (Burke 2002). Historically, the public benefit of the enhancement program has most often been considered as numbers of fish harvested in common property fisheries or the exvessel value of the commercial harvest (i.e., the price paid to fishermen by processors); however, public benefit must also include the number of fish and economic value the enhancement program provides to the region's sport fisheries. Salmon produced by PNP corporations play an important role in Southeast's sport fisheries, where anglers target primarily coho and chinook. From 1990 to 2000, sport anglers harvested 330,000 and 78,000 Southeast Alaska hatchery-produced coho and chinook, respectively (McDowell 2001). In 2002 and 2003 sport anglers harvested a reported 92,000 and 88,000 Southeast Alaska hatchery-produced salmon of all species, respectively (Farrington 2003, 2004).

In the late 1990s the hatchery committee of the Board of Fisheries indicated an interest in examining the contribution of enhanced fish to common property fisheries and determining whether the hatchery program was meeting its statutory obligations of providing "substantial public benefits." In a "Hatchery Committee Report" issued in October 1999, the board concluded that throughout Alaska some enhancement projects "undoubtedly confer a substantial public benefit."

---

[29] NSRAA's agreement with Division of Sport Fish was for a one-time only project at Green Lake.

In 1994 the standards for determining public benefit were set out in the *Report of the Southeast Alaska Allocation Task Force for Enhanced Salmon.*[30] In that report the Board of Fisheries emphasized that enhancement programs were instituted primarily for the benefit of the common property fisheries and not for private or state concerns (i.e., hatcheries). To maintain that emphasis, the Board of Fisheries also provided recommended contribution rates to the common property fisheries (70% for regional aquaculture association hatcheries and 60% for nonregional hatcheries). Most hatchery managers at the time had already established contribution goals ranging from 50% to 70% (*see* preceding *Allocation of Enhanced Fish* section, page 57).

For the 5-year period from 1995 to 1999, the average contribution to only the commercial portion of the common property fisheries by all hatcheries in Southeast for all species was 64% (McGee 1999); the most recent 5-year (1999 to 2003) and 10-year (1994 to 2003) average commercial contributions were 55% and 60%, respectively (McNair 2002; Farrington 2004; Table 4). If the harvest data from sport and personal-use fisheries had been included in that data, the average contributions to all common property fisheries would have been higher. For some facilities and projects, the contributions to common property harvests have not been adequately documented because of less than comprehensive mark–recovery programs; therefore, some contributions may have been underestimated or overestimated. Region-wide harvest summaries from 1980 to 2003 are provided in Appendix D.

According to McDowell (2001), from 1990 to 2000 commercial fishermen in Southeast harvested a total of 582 million pounds of enhanced salmon that had an exvessel value of $200 million. The average annual harvest was 53 million pounds of enhanced production valued at $18 million. The 2000 harvest of enhanced salmon was 85 million pounds. The exvessel value for these fish was a record $32 million, which generated economic values of $42 million, including $11 million in earned income and 400 annual equivalent jobs. For the 10-year period 1994 to 2003 the contributions (i.e., expressed as percentage of total harvest) of enhanced fish to the commercial common property harvests in Southeast ranged from low of 7.2% in 2001 to a high of 26.5% in 2000 and averaged 13.6% (Figure 15; Appendix D). During that same 10-year period the percentage of enhanced chum salmon in the commercial common property harvests averaged 71.0% (Figure 16; Appendix D).

Jeans et al. (2004) noted that from 1981 to 2003 NSRAA and SSRAA generated total incomes of $57.2 and $68.4 million from operator reported revenues and salmon enhancement taxes, respectively, while DIPAC reported revenues of $34.9 million; the remaining PNP facilities in Southeast accounted for reported revenues of $15.9 million. Total income from all reported revenues during that period was $176.4 million.

McDowell (2001) also investigated the impact of PNP corporations to the regional economy. The three largest organizations (NSRAA, SSRAA, and DIPAC) contributed up

[30] In Findings of the Alaska Board of Fisheries, Southeastern Alaska Area Enhanced Salmon Allocation Management Plan (5AAC 33.364), Finding #94-02-FB.

Table 4. Southeast Alaska commercial common property and hatchery cost recovery harvests of enhanced fish, 1994–2003.[31]

PNP Corp	Data	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Grand Total
AAI	**sum of commercial**	**565,357**	**350,727**	**828,008**	**61,870**	**0**	**560,303**	**13,627**				**2,379,892**
	sum of cost recovery	**183,200**	**51,758**	**119,755**	**677,175**	**147,629**	**222,350**	**0**				**1,401,867**
	% cost recovery	**24%**	**13%**	**13%**	**92%**	**100%**	**28%**	**0%**				**37%**
	% commercial	**76%**	**87%**	**87%**	**8%**	**0%**	**72%**	**100%**				**63%**
AKI	**sum of commercial**	**503,083**	**829,343**	**557,203**	**612,277**	**804,042**	**817,386**	**107,151**	**1,174,532**	**945,398**	**501,075**	**6,851,490**
	sum of cost recovery	**1,127,800**	**419,380**	**604,395**	**1,087,920**	**1,260,989**	**3,169,782**	**55,252**	**1,267,230**	**1,072,758**	**405,298**	**10,470,804**
	% cost recovery	**69%**	**34%**	**52%**	**64%**	**61%**	**79%**	**34%**	**52%**	**53%**	**45%**	**60%**
	% commercial	**31%**	**66%**	**48%**	**36%**	**39%**	**21%**	**66%**	**48%**	**47%**	**55%**	**40%**
BCF	**sum of commercial**	**2,517**	**1,248**	**664**	**675**	**703**	**1,345**		**31**			**7,183**
	sum of cost recovery	**0**	**0**	**0**	**0**	**0**	**0**		**91**			**91**
	% cost recovery	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**		**74%**			**1%**
	% commercial	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**		**26%**			**99%**
DIPAC	**sum of commercial**	**1,110,122**	**586,142**	**709,802**	**647,078**	**512,722**	**775,269**	**1,374,945**	**732,838**	**931,222**	**728,271**	**8,108,411**
	sum of cost recovery	**2,938,842**	**597,368**	**1,002,082**	**994,701**	**817,045**	**952,788**	**1,947,051**	**715,913**	**1,299,326**	**2,056,146**	**13,321,262**
	% cost recovery	**73%**	**50%**	**59%**	**61%**	**61%**	**55%**	**59%**	**49%**	**58%**	**26%**	**62%**
	% commercial	**27%**	**50%**	**41%**	**39%**	**39%**	**45%**	**41%**	**51%**	**42%**	**74%**	**38%**
KNFC	**sum of commercial**	**165,938**	**18,300**	**16,290**	**29,210**	**65,626**	**119,572**	**185,325**	**35,852**	**75,939**	**147,644**	**859,696**
	sum of cost recovery	**78,619**	**31,749**	**132,180**	**319,149**	**204,626**	**229,210**	**429,053**	**249,519**	**241,830**	**1,220,592**	**3,136,527**
	% cost recovery	**32%**	**63%**	**89%**	**92%**	**76%**	**66%**	**70%**	**87%**	**76%**	**89%**	**78%**
	% commercial	**68%**	**37%**	**11%**	**8%**	**24%**	**34%**	**30%**	**13%**	**24%**	**11%**	**22%**
NSRRA	**sum of commercial**	**4,106,357**	**4,579,961**	**6,009,205**	**3,772,739**	**4,677,316**	**5,956,186**	**6,075,016**	**2,177,029**	**1,977,401**	**2,286,107**	**41,617,317**
	sum of cost recovery	**647,592**	**551,884**	**878,947**	**616,613**	**749,780**	**862,508**	**717,623**	**594,418**	**840,960**	**1,077,781**	**7,538,106**
	% cost recovery	**14%**	**11%**	**13%**	**14%**	**14%**	**13%**	**11%**	**21%**	**30%**	**32%**	**15%**
	% commercial	**86%**	**89%**	**87%**	**86%**	**86%**	**87%**	**89%**	**79%**	**70%**	**68%**	**85%**
KTHC	**sum of commercial**	**5,324**	**3,407**	**14,006**	**4,585**	**5,609**	**6,106**	**3,977**	**4,450**	**3,109**	**2,903**	**53,476**
	sum of cost recovery	**0**	**41**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**310**	**351**
	% cost recovery	**0%**	**1%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**11%**	**1%**
	% commercial	**100%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**89%**	**99%**
POWHA	**sum of commercial**	**36,632**	**1,312**	**15,158**	**48,136**	**9,358**	**22,225**	**33,152**	**18,958**	**12,148**	**39,446**	**236,525**
	sum of cost recovery	**1,683**	**0**	**2,974**	**2,178**	**144**	**4,992**	**27,364**	**14,187**	**23,621**	**17,543**	**94,686**
	% cost recovery	**4%**	**0%**	**16%**	**4%**	**2%**	**18%**	**45%**	**43%**	**66%**	**31%**	**29%**
	% commercial	**96%**	**100%**	**84%**	**96%**	**98%**	**82%**	**55%**	**57%**	**34%**	**69%**	**71%**
SJC	**sum of commercial**	**148,682**	**5,165**	**172,764**	**128,963**	**77,189**	**21,546**	**88,313**	**52,897**	**44,608**	**11,100**	**751,227**
	sum of cost recovery	**82,323**	**400**	**19,512**	**16,518**	**122,785**	**107,453**	**124,814**	**6,124**	**0**	**0**	**479,929**
	% cost recovery	**36%**	**7%**	**10%**	**11%**	**61%**	**83%**	**59%**	**10%**	**0%**	**0%**	**39%**
	% commercial	**64%**	**93%**	**90%**	**89%**	**39%**	**17%**	**41%**	**90%**	**100%**	**100%**	**61%**
SSRAA	**sum of commercial**	**1,064,735**	**1,208,588**	**1,958,217**	**2,025,277**	**3,166,308**	**1,150,804**	**1,206,733**	**1,278,677**	**732,037**	**1,415,920**	**15,207,296**
	sum of cost recovery	**983,526**	**982,450**	**1,759,081**	**2,143,867**	**2,162,365**	**1,659,223**	**1,681,485**	**1,069,540**	**836,743**	**1,405,072**	**14,683,352**
	% cost recovery	**48%**	**45%**	**47%**	**51%**	**41%**	**59%**	**58%**	**46%**	**53%**	**50%**	**49%**
	% commercial	**52%**	**55%**	**53%**	**49%**	**59%**	**41%**	**42%**	**54%**	**47%**	**50%**	**51%**
Southeast Sum of Commercial		**7,708,747**	**7,584,193**	**10,281,317**	**7,330,810**	**9,318,873**	**9,430,742**	**9,088,239**	**5,475,264**	**4,721,862**	**5,132,466**	**76,072,513**
Southeast Sum of Cost Recovery		**6,043,585**	**2,635,030**	**4,518,926**	**5,858,121**	**5,465,363**	**7,208,306**	**4,982,642**	**3,917,022**	**4,315,238**	**6,182,742**	**51,126,975**
Southeast % Cost Recovery		**44%**	**26%**	**31%**	**44%**	**37%**	**43%**	**35%**	**42%**	**48%**	**55%**	**40%**
Southeast % Commercial		**56%**	**74%**	**69%**	**56%**	**63%**	**57%**	**65%**	**58%**	**52%**	**45%**	**60%**

[31] The PNP permit for Burnett Inlet, formally operated by AAI, was transferred to SSRAA in 1997; so commercial common property and cost-recovery harvest data after 2000 are included under SSRAA. Burro Creek Farms (BCF) has suspended its operation. Harvest data for Tamgas Creek Hatchery (MIC) and Little Port Walter (NMFS) are not included in this table. Commercial common property and cost recovery harvest data for enhanced fish are based on PNP hatchery annual reports.

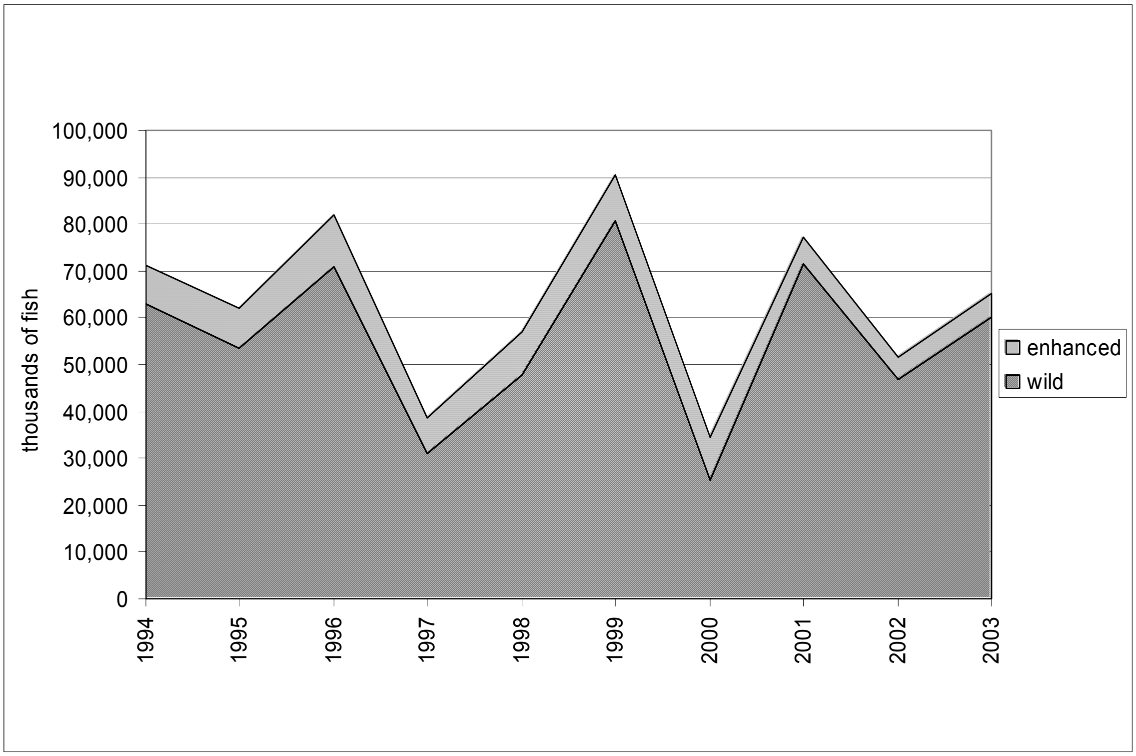


Figure 15. Relative contribution of enhanced salmon to the commercial common property harvests in Southeast Alaska, 1994–2003.

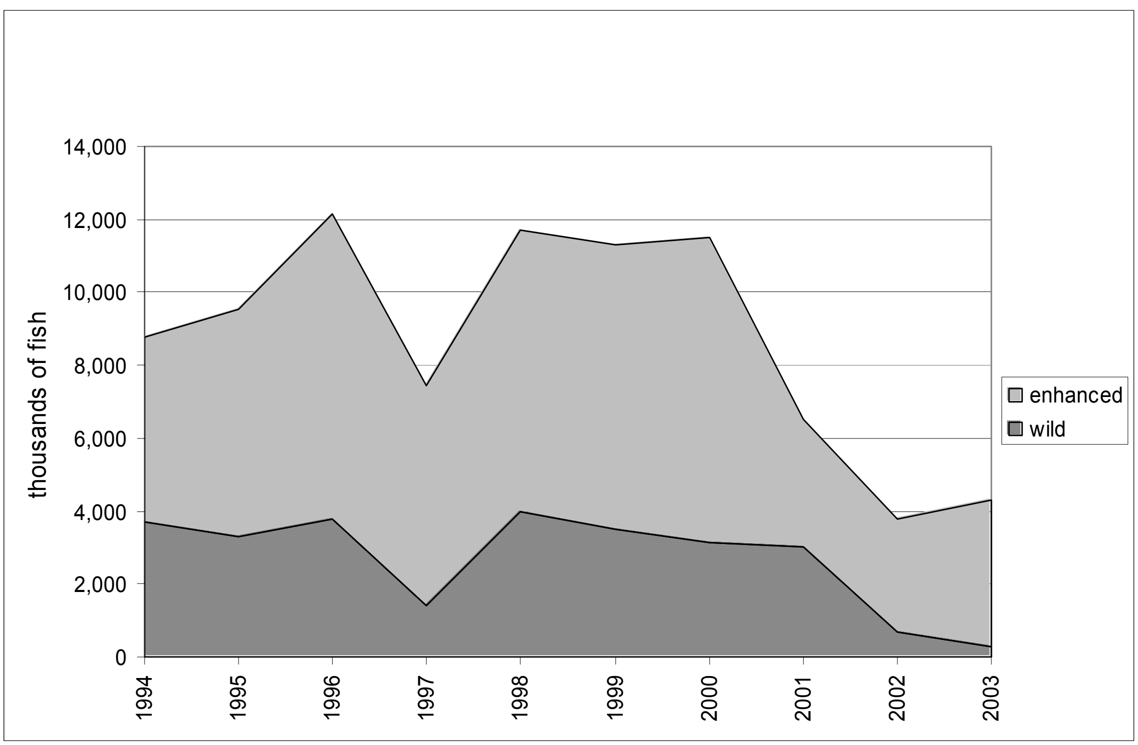


Figure 16. Relative contribution of enhanced chum salmon to the commercial common property harvests in Southeast Alaska, 1994–2003.

to 132 annual equivalent jobs to the economy and an approximate payroll of $4 million annually. The total direct and indirect economic impact from PNP employment and expenses to the Southeast economy in 2000 was $10 million in total output, including 150 annual equivalent jobs and $4.5 million in payroll. Public benefits were also measured by ADF&G through benefit-cost analyses of the PNP enhancement program in the mid-1980s (Hartman and Rawson 1984; Lindaur and Hartman 1984; Hartman 1986). Depending on the particular facility or series of assumptions used for future production and harvest of enhanced fish, these analyses showed benefit-cost ratios ranging from approximately 1.4:1 to 3:1, which the authors considered good for most government-sponsored programs. According to Reifenstuhl and Blair (1999), NSRAA's benefit-cost ratio was 4:1.

These collective benefits are significant in a region whose economy has been adversely impacted by the closures of two large pulp mills in Sitka and Ketchikan and corresponding declines in timber harvests. Throughout Southeast, enhanced salmon production attracts both commercial and sport fishing effort, resulting in direct economic benefits. Specific cases of the positive impacts of hatchery programs (e.g., commercial and sport harvests in terminal areas, fish processing facilities, charter boat operators, subsistence and personal-use harvests, etc.) to local economies can be found in every community in Southeast Alaska.

Hatchery Funding

Large-scale fisheries enhancement programs are expensive to build and operate. To varying degrees both regional aquaculture associations and nonregional PNP corporations sought public funding to provide initial capital and operating expenses, but it was the intent of the legislators who designed the program that funding for enhancement of the state's fisheries would come from those who benefited from that production; that is, a user-pays fiscal policy (Burke 2002). In order to provide organizational funds and collateral for capital and operating loans for the regional associations, fishermen were granted the right to tax themselves based on the exvessel value of their individual harvests: the salmon enhancement tax. As debt loads decreased these enhancement taxes together with cost recovery revenue were designed to allow these facilities to become self-sustaining. For the nonregional PNP corporations, achievement of debt-free self-sufficiency in their operations depends primarily on cost recovery; although some PNP corporations have attracted tourist dollars by restructuring their facilities to provide lectures, tours, aquariums, gift shops and other services. Additional financial support includes short-term federal grants (e.g., SSSF, NMFS, & USFS) and ADF&G Division of Sport Fish funding for specific enhancement projects.

Fisheries Enhancement Revolving Loan Fund

In AS 16.10.500–16.10.560, the Alaska State Legislature created the Fisheries Enhancement Revolving Loan Fund (FERLF) within the Department of Community and Economic Development as a means of promoting the enhancement of the state's fisheries through long-term, low-interest loans for hatchery planning, construction, and operation as well as for implementing other enhancement and rehabilitation activities such as lake fertilization and habitat improvement. Under the policies set out under these statutes, regional aquaculture associations and nonregional PNP corporations were eligible for loans; all payments on principal and interest were to be paid back into the fund. Most regional and nonregional PNP organizations used these FERLF monies for start-up and operation of their hatcheries until other sources of revenue had been developed.

From 1980 to 2003, a total of $61.1 million has been loaned for capital projects and hatchery operations to active PNP hatcheries in Southeast and a total of $36 million repaid (Jeans et al. 2004). The regional aquaculture associations have been considerably more successful than nonregional PNP corporations in shifting to other sources of funding other than FERLF. Because regional aquaculture associations receive salmon enhancement taxes, SSRAA and NSRAA have additional resources to repay loans at a more rapid pace than nonregional PNPs (Fig. 17). Although the NSRAA and SSRAA loans represent only 31% of the total FERLF amount loaned, their repayments represent 72% of the total payments received. In 2000 NSRAA paid off its debt to FERLF, and SSRAA will soon retire its FERLF debt.[32]

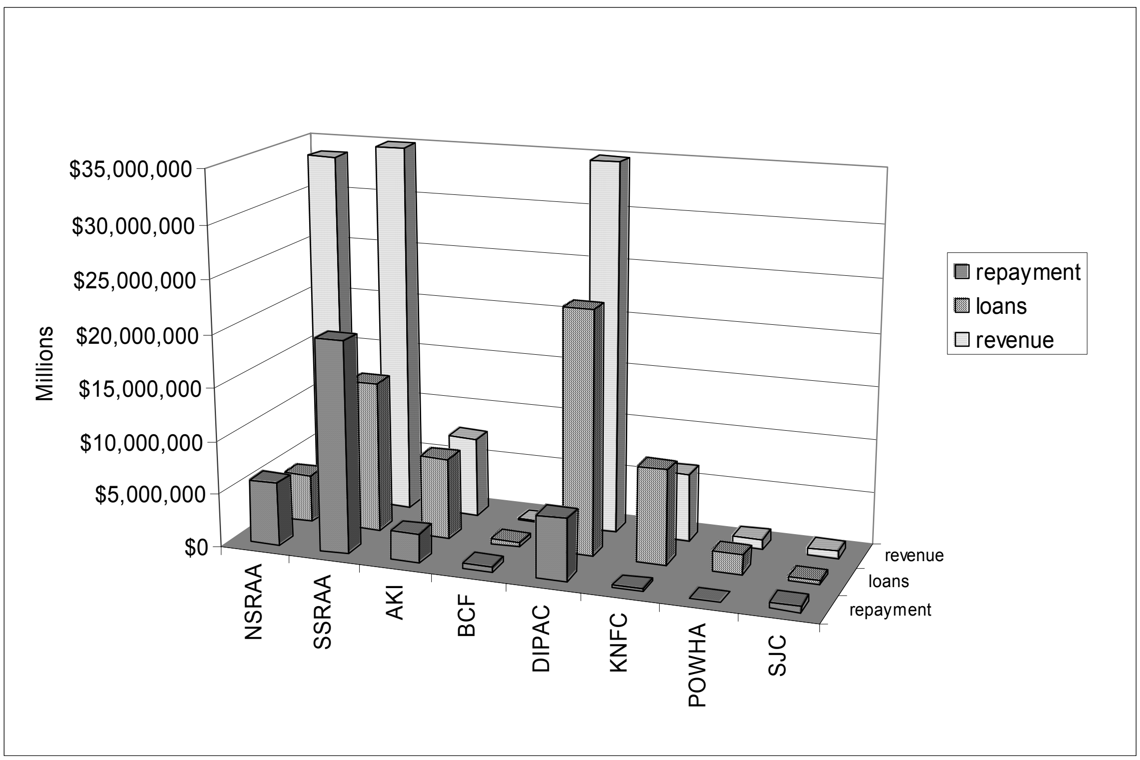


Figure 17. Total FERLF loans, repayments, and revenues for PNP enhancement corporations in Southeast Alaska through 2003.

Enhancement Tax

When the private nonprofit salmon enhancement program was initiated in the early 1970s, it was the intent of legislators that commercial fishermen would ultimately fund

[32] Steve McGee, PNP program manager, Division of Commercial Fisheries, personal communication.

enhancement of their fisheries (Burke 2001). While legislators were in the process of developing its statutory and regulatory infrastructure, Orth (1977) completed a feasibility analysis that identified and evaluated public policy issues of the program. He concluded that (1) PNP hatcheries were economically feasible, "assuming that a continuous assessment program is supported by benefiting fishermen" and (2) assessments were "economically justified because the fishermen will receive positive net benefits as a result of the productive activity of the hatchery."

In 1980 as hatcheries in Southeast began reaching their permitted capacities and production levels, the legislature adopted the Salmon Enhancement Act. This legislation established statutes (AS 43.76.010–43.76.030) authorizing either a 2% or 3% tax upon election by commercial fishermen within an established aquaculture region (DOR 2002). In accordance with the provisions of those statutes, a 3% enhancement tax for Southeast was implemented in 1981 by a vote of all Southeast limited entry permit holders.

This elective salmon enhancement tax is levied on the exvessel value of salmon sold in or exported from the region; however, salmon harvested under a special harvest area permit (i.e., hatchery cost recovery harvests) are exempt from this tax (DOR 2002). Fishermen pay these taxes to processors at the time of sale, or they pay them directly to the Alaska Department of Revenue (DOR) if they export salmon from the region (e.g., a seiner running his boat from Southeast to Seattle to sell his last load of salmon). Processors remit the collected taxes to DOR. These tax revenues are deposited in the General Fund, whereupon, the legislature may then make commensurate appropriations to regional associations for collateral, operational, or capital needs. From 1981 to 2003, $55.2 million was generated and routed to the regional aquaculture associations: $31.8 million to SSRAA and $23.4 million to NSRAA (Jeans et al. 2004).

Marketing Tax

In 1993 an additional salmon marketing tax was collected from fishermen at the rate of 1% of the exvessel value of all commercially caught salmon sold in or exported from Alaska (AS 43.76.110–43.76.130). These revenues are placed in the General Fund. The legislature then makes commensurate appropriations to the Alaska Seafood Marketing Institute (ASMI) for the purpose of developing new markets and expanding existing markets for all Alaskan salmon products. Salmon harvested under a special harvest area permit (i.e., hatchery cost recovery harvests) are exempt from the tax.

Cost Recovery Strategies

Fish production by regional aquaculture associations and nonregional PNP hatchery corporations in Southeast is funded, in part, by cost recovery. When the PNP enhancement program was established by the legislature in 1974, the harvest and sale of returning fish by hatchery operators was one of the primary funding mechanisms of the program. It was also the mechanism that would allow hatcheries to become self-sustaining. Generally, this involves harvesting and selling some of the fish they have produced, and even though the contribution of hatchery-produced fish to common property fisheries is set out in Board of Fisheries Finding #94-02-FBL (i.e., 70% for NSRAA and SSRAA and 60% for nonregional PNP hatchery corporations), the concept of cost recovery is not well understood and often misinterpreted by the general public.

In accordance with AS 16.43.400–16.43.440, special harvest area permits are issued by the Commercial Fisheries Entry Commission to holders of PNP hatchery permits; these SHAs are managed jointly by ADF&G managers and PNP operators. The cost recovery harvests are conducted by PNP operators in the SHAs; i.e., either by hatchery staff or private parties/vessels contracted by hatchery managers. Under emergency order authority, area managers from ADF&G Division of Commercial Fisheries may change the boundaries of SHAs for fisheries management considerations.

The intent of cost recovery is to harvest a portion of returning salmon and thereby provide the income necessary to support programs and maintain and operate enhancement facilities. For the 5-year period from 1999 to 2003 NSRAA and SSRAA harvested an average of 31% of their returning fish for cost recovery; nonregional PNP corporations harvested about 62% (McNair 2002a; Farrington 2004). Because nonregional PNP corporations do not receive the enhancement tax revenue that regional aquaculture associations are statutorily entitled to, they generally harvest a higher percentage of returning fish to meet their financial obligations; however, as their debt load decreases, their need for cost recovery fish will decrease as well.

From 1980 to 2003 approximately $123.7 million in cost recovery revenue has been generated by the PNP enhancement program in Southeast.[33] Table 5 summarizes hatchery funding for active facilities and the value component of PNP harvested enhanced fish for all facilities. The value of enhanced contributions to commercial common property and cost recovery harvests in Southeast from 1994 to 2003 is provided in Figure 18.[34]

Table 5. Hatchery FERLF loans, payments, and value[35] of hatchery fish, 1980–2003.

Southeast Alaska	Regional Assoc.	Nonregional PNPs	Total
FERLF Loans	$18,726,070	$42,395,345	$61,121,415
Loan Payments	$25,940,529	$10,066,619	$36,007,148
Enhancement Tax	$55,184,402	N/A	$55,184,402
Reported Revenues	$70,348,766	$50,778,944	$121,127,710
Value of Enhanced Fish	$176,312,112		

Depending on the conditions and limitations inherent in each SHA permit, hatchery operators utilize several strategies for setting and realizing cost recovery goals: (1) harvesting a fixed percentage of fish, (2) harvesting a sufficient number of fish to meet a fixed monetary amount, (3) conducting cost recovery operations at one release site and providing additional sites for exclusive use of common property fisheries, (4) harvesting

[33] Cost recovery harvest data are based on PNP hatchery annual reports.
[34] Value data for commercial common property harvests are based on annual Southeast enhanced salmon allocation reports.
[35] Value includes enhancement tax, cost recovery, and other revenues reported by PNP hatchery operators.

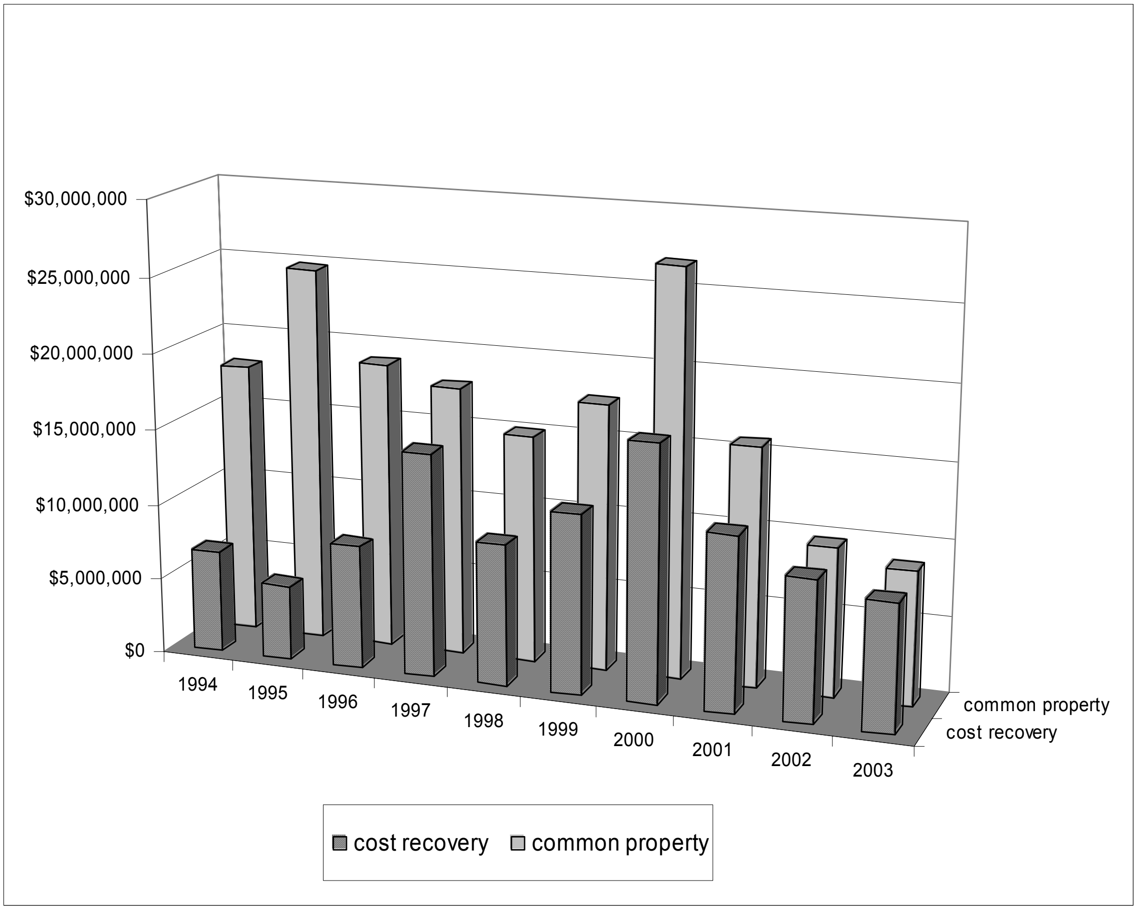


Figure 18. Value of enhanced contributions to commercial common property and cost recovery harvests in Southeast Alaska, 1994–2003.[36]

one species for cost recovery in order to support production of another species, and (5) combining two or more of the foregoing strategies. Private nonprofit hatchery corporations work with the ADF&G fishery managers to determine the manner in which terminal harvest areas will be accessed by commercial fishermen and hatchery staff.

Some Southeast hatcheries rely, in part, on mechanisms other than cost recovery to generate revenue. Tourism is a significant contributor to operations at DIPAC's Macaulay Hatchery and Ketchikan Indian Community's Deer Mountain Hatchery. Voluntary contributions to some hatchery facilities by charter boat operators provide direct user compensation from the sport fishing community. Money from the sale of sport fish licenses as well as federal fish and wildlife restoration funding also help support chinook production at four Southeast facilities (Crystal Lake, Macaulay, Whitman Lake, and Neets Bay). Additional support for enhanced salmon production includes project-oriented funding through cooperative agreements with federal entities such as NMFS, USFS, and the SSSF.

---

[36] Data for (1) common property fisheries contributions from enhancement program annual reports, (2) terminal harvest area roe from ADF&G Region I commercial fisheries salmon harvest database, and (3) salmon and roe values from Commercial Fisheries Entry Commission.

The boards of directors of all PNP corporations make decisions on the specifics of cost recovery operations; however, only the regional aquaculture associations are bound by statute to include at least one representative from each user group that belongs to the association on those boards (i.e., including, "…but not limited to, sport fishermen, processors, commercial fishermen, subsistence fishermen, and representatives of local communities" [AS 16.10.380]). Southeast's two regional aquaculture associations, NSRAA and SSRAA, differ in their approaches to cost recovery harvests; however, they face the same two risks that all hatcheries must deal with effectively if they are to continue producing fish for the common property fisheries: (1) uncertain numbers of fish returning and (2) volatile and uncertain markets.

Regional aquaculture association biologists have refined their methods for forecasting the number of fish returning to terminal areas over the past 20-plus years. Although the methods differ somewhat for the two organizations, estimates have been relatively accurate in recent years. Southeast's two RAA boards have adopted different approaches to dealing with market uncertainties, and these approaches involve varying degrees of risk to the associations and stakeholders.

The approach NSRAA uses is to lock in the selling price for cost recovery fish prior to the beginning of the fishery. This allows them to know in advance how many fish are needed to meet their budget. Barring a catastrophic run failure, they are assured of revenue for the next year's operation. Although NSRAA cannot take advantage of improvements in the market after the cost recovery price is set, they are not hurt by declines in the market. This method may result in a differential in price per pound between common property fish and cost recovery fish harvested in the same area.

The approach SSRAA uses is to market their own cost recovery fish to the extent they own the fish until the final product is sold to the consumer or to a retail business. The final product may be fish frozen whole or processed to add value; SSRAA contracts for processing services and makes a considerable investment in processing, transporting, and sometimes storing the product before revenues are realized. In this approach, SSRAA assumes all the risk of a fluctuating market; however it removes any potential for the cost recovery price to have any affect on the inseason price paid to fishermen. In setting cost recovery harvest goals prior to the season, the association can only speculate on the condition of the market when their fish are to be eventually sold and then set harvest goals accordingly.

INDUSTRY STATUS AND CHALLENGES

In Southeast Alaska, the 2002 and 2003 fishing seasons experienced all-time lows in the average exvessel prices/pound for all species of salmon, dramatically lower than those experienced in 2001 (Table 6). Although net fishermen generally received less for coho and chinook than trollers received, prices for both gear groups increased proportionately later in the season. Many processors placed seiners and gillnetters on limits, not because plants had difficulty processing the volume of fish, but because the inventory of canned pink salmon at the beginning of the season had already represented 1.5 years of future consumption. Processors were having difficulty in finding markets for their product; and despite low prices offered to fishermen for pink salmon, many processors complained they were losing money on every can of pink salmon.

Table 6. Average exvessel salmon prices/pound by species in Southeast.[37]

Year	Chinook	Chum	Coho	Pink	Sockeye
1984	$2.71	$0.45	$1.32	$0.25	$1.11
1985	$2.19	$0.42	$1.06	$0.24	$1.34
1986	$1.99	$0.38	$1.07	$0.26	$1.51
1987	$2.94	$0.63	$1.76	$0.44	$1.77
1988	$3.63	$1.03	$2.68	$0.84	$3.08
1989	$1.95	$0.49	$0.96	$0.42	$1.63
1990	$2.11	$0.50	$1.23	$0.33	$1.59
1991	$2.10	$0.34	$0.99	$0.15	$0.95
1992	$1.97	$0.48	$1.17	$0.22	$1.69
1993	$1.67	$0.48	$1.06	$0.18	$0.93
1994	$1.93	$0.25	$1.06	$0.20	$1.39
1995	$1.53	$0.37	$0.72	$0.21	$1.21
1996	$1.40	$0.17	$0.68	$0.10	$1.13
1997	$1.64	$0.25	$0.99	$0.16	$1.21
1998	$1.15	$0.18	$0.67	$0.18	$1.36
1999	$1.65	$0.21	$0.97	$0.17	$1.13
2000	$1.97	$0.29	$0.78	$0.18	$0.90
2001	$1.69	$0.39	$0.63	$0.14	$0.85
2002	$1.13	$0.22	$0.42	$0.09	$0.74
2003	$1.12	$0.19	$0.65	$0.06	$0.85

In the spring of 2002, several processors reduced the number of contracts entered into with purse seine permit holders. Without processor contracts some seiners were unable to locate markets for their fish. The 2003 prices for salmon represented a continuation of a downward trend that had begun in the early 1990s. Because of a further decline in prices for pinks, 42% of purse seine permit holders did not fish in 2003, compared with the recent 10-year (1994–2003) average of 17% not fished. Of those permit holders that

[37] 1984-2003 data from commercial operator's annual reports; 2003 data is preliminary.

fished, a significant number did so for only a portion of the season. Of 477 drift gillnet permits issued in 2003, 377 (79%) fished, which represents a 12% reduction since 2001 when 91% fished and a 10% reduction from most recent 10-year average of 89%. Of the 963 power troll permits issued in 2003, 78% fished; although this represents an increase of 9% over those permits fished in 2002, participation in the fishery has steadily declined from 86% permits fished in 1995 to 69% in 2002. Table 7 provides a historical perspective on the number of permits issued and fished and the percentage fished annually by the primary commercial gear groups from 1988 to 2003.

Table 7. Number of active limited entry permits issued and fished in Southeast Alaska, 1988–2003.[38]

	Number of Permits											
	Purse Seine			Drift Gillnet			Hand Troll			Power Troll		
Year	Issued	Fished	%Fished	Issued	Fished	%Fished	Issued	Fished	%Fished	Issued	Fished	%Fished
1988	420	395	94%	485	471	97%	1,870	778	42%	956	829	88%
1989	420	366	87%	485	467	96%	1,817	695	38%	955	831	87%
1990	420	365	87%	487	471	97%	1,782	700	39%	956	840	88%
1991	420	388	92%	485	470	97%	1,741	701	40%	958	852	89%
1992	420	358	85%	485	470	97%	1,688	647	38%	957	842	88%
1993	419	385	92%	482	462	96%	1,633	601	37%	956	842	88%
1994	418	404	97%	482	455	94%	1,579	549	35%	954	809	85%
1995	418	383	92%	483	459	95%	1,540	461	30%	954	818	86%
1996	417	361	87%	483	441	91%	1,501	414	28%	965	738	77%
1997	416	358	86%	482	428	89%	1,459	387	27%	967	747	77%
1998	416	381	92%	479	428	89%	1,409	305	22%	967	736	76%
1999	416	364	88%	481	435	90%	1,370	336	25%	965	723	75%
2000	416	358	86%	480	427	89%	1,329	318	24%	963	715	74%
2001	415	348	84%	482	438	91%	1,295	312	24%	965	706	73%
2002	415	275	66%	482	395	82%	1,249	251	20%	965	665	69%
2003	416	239	58%	477	377	79%	1,196	259	22%	963	749	78%
10-yr avg	416	347	83%	481	428	89%	1,393	359	26%	962	741	77%

This downward trend in the participation in and value of the salmon fishery has an inverse relationship with the rise in the volume of farmed salmon being produced in Norway, Scotland, British Columbia, and Chile and marketed around the world but primarily in Japan and the U.S. According to Knapp (2001), farmed salmon accounted for 58% of world salmon production in 2000. In 2001 salmon farmers produced more than three times as much salmon as Alaska. The average wholesale value of salmon processed in Alaska during the first half of the 1990s was about $1 billion annually. In 2002 it was $600 million; 40% of the wholesale value evaporated in six years. In 1980 farmed salmon accounted for less than 1% of world salmon production; by 1990 it represented 25%, and in 2002 it accounted for almost 60%.[39]

A classic business cycle is at work: high prices in the late 1980s led to increased farmed salmon production in the 1990s that, in turn, led to an over supply of product that could

[38] Permit issue data provided by Commercial Fisheries Entry Commission; fishing data provided by ADF&G (Kallenberger and Timothy 2004); 2003 data is preliminary.
[39] Gunnar Knapp, economist, University of Alaska Institute of Social and Economic Research *in* Sea of Change: the crisis in Alaska's Salmon Industry. 2002. A video production of KAKM. Public Television, Anchorage.

only be sold by reducing wholesale prices. This continuing overproduction has led to the extremely low prices experienced in 2002 and 2003. If the trend continues, this business cycle will culminate in either (1) loss of business of the weakest or most inefficient operations or (2) a reduction in salmon production to a point where supply is more in alignment with demand. Potential effects of the declining value of the salmon fisheries in Southeast could be an increase its market share through efficiencies in the fisheries and industry, improved quality of fish, and aggressive marketing techniques.

Another effect of the declining value of the fisheries occurred in the fall of 2002 when Wards Cove Packing Company, the largest salmon processor in Southeast Alaska, closed its doors and put all of its facilities up for sale; moreover, in December 2003, NorQuest Seafoods of Petersburg announced it would be discontinuing future canning operations for pink salmon. This market crisis affects not only the Alaska industry; it has affected salmon farmers as well, and many of them have been forced to sell salmon well below their costs of production (Knapp 2001). As a response to low prices, some salmon farmers are reducing their production.

Because of the turmoil in the salmon industry, the Alaska State Legislature formed a task force composed of key legislators and industry personnel to conduct a review of the entire infrastructure. The task force is in the process of reviewing regulations, tax structures, and programs that influence operations in hopes of identifying changes that could make the industry more efficient. Given the magnitude and severity of the problems and opportunities yet to be considered, this process will continue for the next several years.

One reason why Alaska needs to pay serious attention to the salmon industry's crisis is because "seafood is the state's number one private sector employer…the salmon industry is the largest segment of the seafood industry for employment by far."[40] Jon Hird (commercial troller from British Columbia) noted the difference in intrinsic value between wild salmon from Alaska and British Columbia and farmed salmon from BC and elsewhere: "wild fish is like being in the steak and lobster business…farmed fish is like being in the hot dog and hamburger business."[41]

The enhancement program was initiated in the early 1970s because the price and demand for salmon was high; concurrently, wild stocks were at the bottom of their abundance cycle primarily because of conditions in the marine environment. As a result of the low returns during this period, commercial fishing periods were significantly reduced to allow for sufficient escapements. In recent years wild stocks have reached high levels of abundance because of generally favorable marine conditions and continued effective fisheries management practices. With a surplus of salmon now available on the world market, stakeholders in Southeast's enhancement program need to address whether it

---

[40] Bob Thorstenson, president, United Fishermen of Alaska *in Sea of Change: the crisis in Alaska's Salmon Industry*. 2002. A video production of KAKM. Public Television, Anchorage.
[41] *in Sea of Change: the crisis in Alaska's Salmon Industry*. 2002. A video production of KAKM. Public Television, Anchorage.

should produce more enhanced fish or maintain the existing production levels already in place.

One significant disadvantage of marketing wild salmon is the annual variability of the volume of production. When low returns occur, the industry may not be able to supply the product to markets developed during periods of high returns, while salmon farmers can accurately control production and guarantee supply. Also most wild harvests of salmon occur during a few months in the summer, while farmed production can occur year round. Because of this competition, if previously secured wild salmon markets were unable to consistently obtain the desired fresh wild product, those markets might resort to the available farmed product. Hatchery production in Alaska does not eliminate this scenario from occurring, but it potentially has the capability of moderating the severity of low production cycles in wild salmon by making hatchery fish available to that market.

More recently, fishermen in Southeast have benefited from increases in enhanced production of chum salmon that started coming on line in the early 1990s. From 1994 to 2003, enhanced chums have contributed an average 71% to the common property harvest (Figure 19).[42] Net fishermen have targeted these fish, which has helped make up for lost income resulting from reduced values of all salmon. Because of lower marine survivals from Japanese hatchery operations in recent years and a consistent demand for roe, these fish have maintained their value better than most other species.

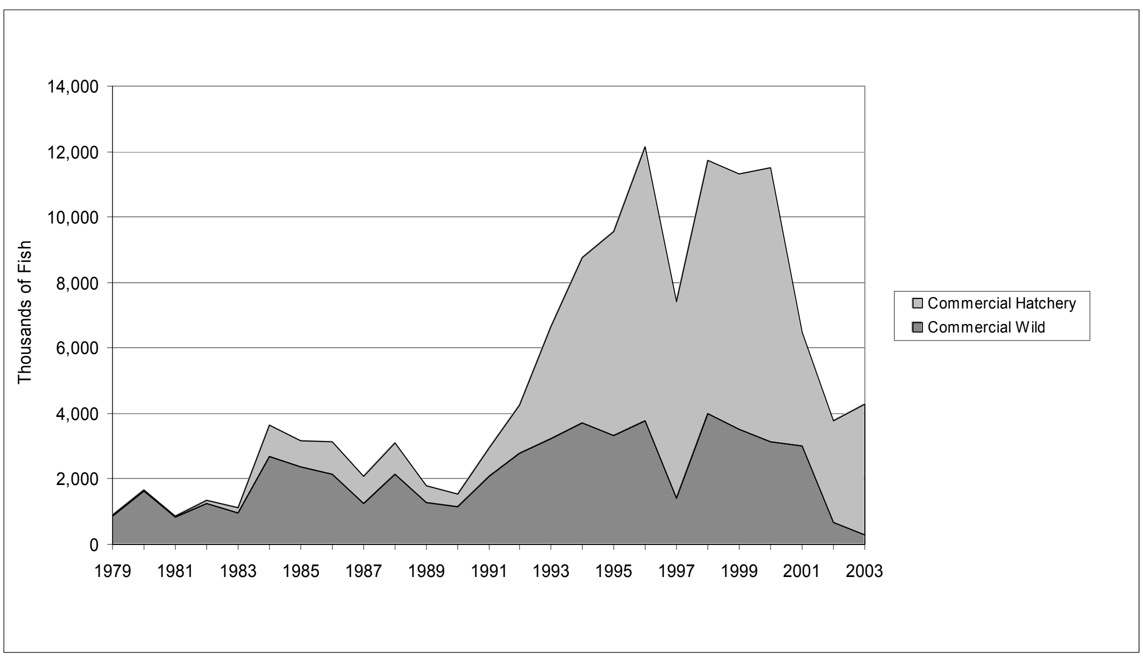


Figure 19. Relative contribution enhanced chum salmon to common property commercial harvests in Southeast Alaska, 1979–2003.

[42] Data in Figure 19 provided by PNP hatchery annual reports and ADF&G Division of Commercial Fisheries harvest data base.

Historically, low salmon returns to Alaska resulted in increased exvessel prices because of competition for limited supply to meet market demands. Because suppliers can now substitute farmed salmon to meet market demand, lower production levels do not result in compensatory increases in exvessel value. Thus, a reduction in the volume of enhanced salmon will not necessarily increase the exvessel price for remaining available fish because their increment of production is not high enough. Two examples will illustrate this point: (1) when sockeye returns to Bristol Bay declined from 1998 to 2002, the price either remained the same or decreased, and the Japanese markets replaced that production with farmed coho salmon from Chile and farmed Atlantic salmon from Norway; and (2) the common property harvests of chum salmon in Southeast for 2000, 2001, 2002, and 2003 were 11.5, 6.5, 3.8, and 4.3 million fish, respectively; the exvessel price for these fish was lower in 2003 ($0.19/lb) than it was in 2000 ($0.29/lb), 2001 ($0.39/lb), and 2002 ($0.22).

"From a fisherman's perspective, the only thing worse than low prices and good returns of salmon are low prices and poor returns of salmon."[43] Neither one is desirable, but fishermen can survive several seasons of low prices and good returns but will be bankrupt with several seasons of low prices and poor returns. In many seasons since 1993, enhanced production has provided for the good returns. Again, as nearshore and open marine conditions cause detrimental effects to both wild and enhanced salmon, enhanced production will be able to moderate the severity of low production cycles in wild salmon.

[43] Ken Duckett, executive director USAG, SSRAA Board member, personal communication.

GUIDELINES FOR ENHANCEMENT PLANNING

Southeast Alaska's hatchery corporations work with ADF&G to develop new projects that benefit fishermen and minimally impact wild salmon resources. The standards for successful projects, which form the basis for decisions to approve them, are already used in an informal process. Documenting these standards and offering guidelines for project development will provide a systematic approach to the decision-making process and be helpful to all those involved in future salmon enhancement activities.

Technical Guidelines

Many elements must be considered in developing a project. The following technical guidelines address elements that have implications for the sustainability of the wild salmon resource as well as those that relate to a project's "fit" into the Southeast Alaska ecosystem and economy. Elements related specifically to fish culture practices and project logistics, while important for maximizing fish survivals and adult returns, are outside the scope of this salmon enhancement plan.

In this section, the project elements are listed and discussed and a "*Best practice*" is given for each element. Based on the history of fisheries enhancement practices in Alaska and related available literature, these best practices represent a general consensus among fish biologists and fish culturists from regional and nonregional PNP hatchery corporations, ADF&G, NMFS, and the Forest Service. References in the literature are included for some of the guidelines. In other cases, ad hoc research or the collective wisdom of approximately 30 years of enhancement experience is used to demonstrate that some strategies are more effective than others. With additional knowledge, the guidelines are expected to change over time and should be reflected in future annexes to this plan.

Recognizing a best practice does not mean that other strategies cannot be used. It is not possible or prudent to use the same strategies for all projects; each project presents a unique set of circumstances and is addressed with a unique solution. In Southeast Alaska, a number of alternate strategies have been used very successfully. A functional project is the result of a specific blend of logistics, fish culture practices, and strategies to protect wild salmon resources. In the following sections, standards and best practice guidelines are provided for projects designed to supplement fisheries, supplement wild stocks, and colonize new areas.

I. Fishery Supplementation[44]

The majority of enhancement projects in Alaska are fishery supplementation projects that are designed to provide increased numbers of fish to be harvested. Four standards must be addressed and documented in developing a fishery supplementation project: (A) the release site has an adequate freshwater supply and is not in close proximity to significant wild stocks; (B) fish are adequately imprinted to the release site; (C) enhanced fish are

---

[44] The letters and numbers preceding headings in the guidelines section correlate to Tables 8, 9, and 10 beginning on page 107.

marked and identifiable in traditional fisheries and contribute to the harvest without jeopardizing the sustainability of wild stocks; and (D) the terminal area design and management plan enable harvest or containment of all returning adults.

The following best practices are suggested to meet the standards:

A. Release site selection

1. Characteristics of release site fresh water supply:
Look for a release site where the freshwater influence is consistent and strong. Solazzi and others (1991) found that straying of adult coho increased as releases occurred at increasing distances from a consistent freshwater source–notably, a 4.1% straying rate for coho released 2 km up a river; 6.1% straying rate for a release 19 km offshore in the river's plume, and 21% from 19 km offshore outside of the river's plume.

Best practice: Choose an imprint/release site with a strong and consistent supply of fresh water.

2. Location of release site relative to rearing site:
The generally accepted theory of sequential imprinting (discussed in section *I. B. Imprinting to the release site*) includes the corollary that a homing adult salmon will reverse the sequence of their outmigration as juveniles by following olfactory clues. Transport to a remote release site could break this sequence; however, if the fish can detect water from an earlier rearing site at the release site, it could interfere with homing precision to the release site (Labelle 1992).

Some studies have strongly indicated that a genetic component may influence the homing behavior of transplanted chinook (McIsaac and Quinn 1988), pink (Bams 1976), and coho salmon (Labelle 1992). In each of these studies, the exact type(s) of inherited responses has not been defined, but possibilities include (1) an innate preference for non-site-specific physical criteria such as water temperature, flow, or substrate characteristics that resemble the stock's native stream, (2) "preprogramming" to swim for a distance or period of time after entering fresh water, or (3) an innate response to population-specific pheromones previously demonstrated for coho (Quinn and Tolson 1986) and sockeye (Groot and others 1986). These three types of responses would not pose problems for a fishery supplementation project where adult fish return to a terminal harvest area, provided that the stock's native stream is not in close proximity. There is evidence that genetic factors–though not clearly defined–could influence the homing response and therefore should be considered when selecting a stock for a transplant project.

ADF&G's genetic policy recognizes that "…transplants occurring over greater distances may result in increased straying…."[45] Selection of the best stock for a project involves incorporating the use of a local stock with a release site that will not offer any cues that could confuse the homing response. Clearly, effective imprinting is crucial to project success.

---

[45] Sec. I.C.2

Best practice: Choose a remote release site that is unaffected by water from the rearing site but still shares general characteristics of the stock's native stream.

3. Proximity of significant wild stocks:
It is generally accepted that gene flow between conspecific salmon populations is a natural occurrence. It is also generally accepted that a decrease in population productivity can occur when there is introgression of genetic material from introduced fish at rates above the natural rate, depending on the genetic relationship of the donor and recipient populations. The extent of the decreased productivity and its persistence in the population are the subject of ongoing research and debate.

The stock appraisal tool (Appendix E) will be used as a guideline by the regional planning team and ADF&G biologists when charged with evaluating the biological significance of naturally occurring stocks near the proposed release site. The stock appraisal tool is a qualitative method that identifies the criteria to be considered when defining significance: (1) wildness, (2) uniqueness, (3) isolation, (4) population size, (5) population trend, and (6) fishery support. Because of the general lack of quantitative data to measure these criteria for most stocks, the stock appraisal tool will provide a foundation upon which to make professional judgments about the significance of a stock. The stock appraisal criteria will be applied to stocks along the assumed adult migration route, if it is reasonable to think those wild stocks could be impacted. Proximity to a significant wild stock becomes more important if the project includes practices that do not maximize the imprinting of fish prior to release.

Best practice: Choose a release site that is not proximal to the natal streams of any highly significant wild stocks of the same species or other species with similar run timing and habitat utilization characteristics.

4. Early marine interactions and cumulative effects of multiple interactions:
Predation and other sources of mortality during the early marine, near-shore phase of the salmon life cycle can significantly affect their survival rates.[46] Also, the potential for competitive interaction between hatchery-reared and wild smolts must be considered on a case-by-case basis. Flagg et al. (2000) refer to 17 studies of intraspecific competition between wild and hatchery chinook salmon or wild and hatchery steelhead trout and conclude with a "gut feeling" that intraspecific competition in the estuarine environment was minor when good hatchery rearing and release protocols were used. Some fishery supplementation projects in Southeast Alaska have modified the timing of hatchery releases to minimize early marine interaction with wild coho and pink salmon fry (i.e., Neets Bay coho, Klawock Lake coho). When planning any new production, the potential for undesirable inter- and intraspecific interactions and possible cumulative effects of multiple interactions should be anticipated. Project strategies should be designed to avoid negative impacts of hatchery-reared smolts on wild populations, based on the contemporary best data and understanding of these topics.

[46] *see* discussions of early marine mortality, by species, in Groot and Margolis (1991)

Best practice: Choose a site location and release timing that minimizes potential near-shore interaction with wild stocks.

5. Land use designation:
Most of Southeast Alaska is part of the Tongass National Forest (TNF). If the proposed project is within or adjacent to the TNF, the Land Use Designation (LUD) and existing land uses must be considered prior to project approval. Local Forest Service staff and that agency's ex officio member of the regional planning team should be contacted. Fisheries enhancement activities are compatible with the management prescriptions of many LUDs.[47] Siting an enhancement project in or near a development LUD would be the least restrictive situation. Development LUDs include the following categories: scenic viewshed, modified landscape, timber production, minerals, and transportation and utility system. These non-wilderness, non-national monument sites should be considered first for enhancement projects.[48] Enhancement projects could be allowed in lands designated LUD II; however, the forest plan goal calls for maintaining the wildland character and roadless condition of LUD II areas. Resource manipulation is least compatible with and is most closely regulated in the natural setting LUDs. The three most restrictive natural setting LUDs, with respect to enhancement projects, are wilderness, wilderness national monument, and non-wilderness national monument. These three designated areas also most closely approximate the "sanctuaries for salmon" described by Lichatowich (2000).

Additional restrictions and safeguards might be applied to projects proposed in natural setting LUDs: (1) congressionally designated LUD II; (2) old growth habitat area; (3) research natural area; (4) remote and semi-remote recreation; (5) wild, scenic, and recreational rivers; (6) special interest area; (7) experimental forest; and (8) municipal watershed. For a project in or near a natural setting LUD, it is important to consider the potential impact on the ecosystem, including increased human use. Impacts should be balanced with the need to provide well distributed fisheries that support sport and commercial fisheries, subsistence activities, and community stability.

Best practice: Consider the upland management intent adjacent to a proposed project site and minimize potential conflict or move the project elsewhere if that is not possible.

B. Imprinting to the release site

The factors that affect the quality of the freshwater imprint in salmon are complex and intertwined. Although the imprinting process is not completely understood, both research and experience suggest strategies that will most likely produce strongly imprinted smolts. There is general agreement that the most positive imprint occurs when salmon are reared in and released from the same freshwater source. The process of outmigration from a rearing site into salt water may further optimize the imprint (Dittman and others 1996; Heard 1996). This mimics the natural situation. Salmon living in the wild experience a

---

[47] For complete management prescriptions and other information on management of resources within the Tongass National Forest, *see* USDA Forest Service (1997).

[48] Forest Service Manual, Chapter 2300 (Recreation, Wilderness, and Related Management), Alaska Region Supplement No. 23020-99-3. The manual is available at any Forest Service office.

sequence of olfactory imprint events during rearing and outmigration. When returning adults reach the nearshore environment, reversing the sequence leads the salmon to suitable spawning areas, with some of them actually homing to the reach within the stream where they emerged from the gravel (reviewed in Quinn 1993). Transport to and release from a remote release site have resulted in successful fishery supplementation projects in Southeast Alaska (e.g., Deep Inlet chums, Ward Lake summer coho). The idea is to break the imprinting sequence from the natal site and imprint the fish effectively to the release site. Not all remote release projects have produced adults that demonstrate accurate homing. Clearly, a combination of factors is involved in effective imprinting. As with all other guidelines, continued research will result in continued refinement of the following best practices.

1. Transport timing:
Transporting salmon to a remote release site very early in the rearing process allows the maximum opportunity for imprinting. Given the apparent learned responses associated with the process, transporting during the fry stage is ideal. Operationally, this is not always possible and in actual practice has not proven necessary. Transport at the end of the freshwater rearing phase (smolt stage) also can result in a strong imprint when release-site characteristics and imprint strategies are adequate; however, when imprinting is inadequate, experienced professionals in the Alaska hatchery program have generally confirmed that unacceptable levels of adult straying will occur.[49]

Existing evidence points to the importance of thyroid-produced hormones in olfactory imprinting (Dittman et al. 1994; Grau et al. 1985; Lin et al. 1985). It is now generally accepted that olfactory learning is greatly facilitated in the presence of elevated thyroxine levels and the most significant thyroxine surge occurs during the parr-smolt transformation process (Dittman et al. 1996). Surges may also occur at other times during freshwater rearing; they have been linked to environmental cues such as temperature changes, a new water source, and changes in food intake or flow rates. During freshwater rearing, a salmon is likely to experience cues like these that trigger olfactory imprint events.

Researchers have found wide variation in surges of plasma T4, the most commonly used measure of thyroid function, in hatchery fish undergoing the smolt transformation (reviewed in Dittman et al. 1994). It does appear, however, that all salmonids approaching the parr-smolt transformation become primed by hormonal or other factors to imprint. When the imprint/release site is in salt water, transferring fish as early as they can tolerate the ambient salinity is the best strategy to assure a strong imprint.

Best practice: Transfer fish to the imprint/release site as early as possible during juvenile rearing.

2. Saltwater entry:
Allowing natural volitional arrival at the site of saltwater entry is likely the best strategy to assure a strong imprint. Dittman et al. (1996) noted that "... results suggest that while

[49] Jim Seeb, principal geneticist, ADF&G, Division of Commercial Fisheries, personal communication.

migration may not be absolutely required for olfactory imprinting, the combination of stimuli associated with migration and physiological changes involved in smolting may be important for optimal imprinting and homing." This also suggests that if juveniles are transported between watersheds, they should be released as high in the new watershed as is reasonable for a timely and safe migration to salt water. Heard (1996) summarized evidence that sequential imprinting by hatchery-reared salmon during downstream migration results in more accurate adult homing than simply releasing fish at the mouth of a stream.

There are numerous successful hatchery projects where downstream migration does not occur. It would pose obvious logistical problems for projects where fish are reared or acclimated in saltwater net pens. Clearly, a combination of factors is involved in effective imprinting. Where operationally feasible, downstream migration is recommended to increase the likelihood of a strong imprint.

Best practice: Allow smolts to migrate downstream volitionally from their freshwater rearing site to salt water.

3. Length of exposure to release-site fresh water:
The "three-week rule" for imprinting salmon smolts in net pens is a strategy that has withstood the test of time in Southeast Alaska. The origin of the rule is unknown. There have been no known scientific studies to support this length of time as optimal for Pacific salmon. It is possible that imprinting occurs in a much shorter period of time, but the use of a three-week window encompasses the actual imprinting *in most cases,* provided juveniles are transported when they begin smolting. Given the success of projects that imprint for three weeks or longer, there is no logical reason to change the rule.

Some evidence to support the three-week rule comes from research with Atlantic salmon (*Salmo salar*). Morin et al. (1989) found that the optimal period for long-term olfactory learning, which coincided with the peak level of thyroid activity, occurred 21 to 28 days after the beginning of the parr-smolt transformation. If the timing is similar for Pacific salmon, the three-week rule would result in an effective imprint. A reasonable corollary to the rule would be to contain the fish at the imprint site until all outward signs indicate they are fully smolted.

Perhaps just as important as causing a strong imprint, the three-week rule also provides protection for fish as they acclimate to the saltwater environment and takes them through any disorientation period that might occur. Evidence from one Alaskan project indicates that the consequence of *not* holding fish in pens at the release site was decreased survival rather than straying.[50]

Best practice: Immerse smolts in the imprint fresh water for a minimum of three weeks and release the fish only when they are fully smolted.

[50] John Burke, general manager, SSRAA, personal communication.

C. Harvest contribution

1. Identification in the fisheries:
All releases of enhanced fish must be adequately marked. Marking provides the only valid quantitative means of evaluating the success of enhancement programs. Fishery managers must be comfortable that they can distinguish between wild and enhanced stocks in traditional, mixed stock fisheries because management decisions must be based on the strength of wild stocks. If a mark–recovery program is not in place for significant interception fisheries, there should be a reasonable expectation that such a program will be implemented by the time the first enhanced adults return.[51]

Best practice: Adequately mark all groups of fish and, where needed for effective management of traditional fisheries, plan to implement a mark–recovery program to assist resource managers.

2. Effect on traditional and near-terminal fisheries:
The release-site location will affect the route that returning adults take through the traditional fisheries. Before the project is implemented, this route can only be assumed; however, fisheries management biologists will want to evaluate the potential impact of enhanced fish on management capability. This will be especially important if any stocks of concern are harvested in fisheries where more intense effort may be focused on the enhanced fish. The department has the authority to stop a harvest in a traditional or near-terminal fishery if unacceptable detrimental impacts to wild stocks are occurring.

Best practice: Do not intensively harvest groups of fish where the overharvest of wild stocks will occur.

3. Cumulative effect of multiple enhancement projects on traditional fisheries:
Currently, there are a few fisheries in Southeast Alaska where the cumulative numbers of enhanced fish from several projects have reached a level that could make determination of the prevalence of wild stocks fairly difficult (e.g., fall run coho in some southern Southeast management districts). When uncertainty as to stock origin occurs, fisheries are managed conservatively; therefore, new enhanced production that would contribute to management uncertainty should be carefully considered before being approved. In some situations, increased marking and mark recovery will help alleviate the problem. The added costs need to be weighed against the increased benefit.

Best practice: Do not allow the harvest of new production to pose management challenges in traditional fisheries that cannot be reasonably addressed by managers.

[51] *See* Project Evaluation: *Marking* and *Mark Recovery* sections of this plan on pages 99 and 100, respectively.

D. Terminal area function

1. Configuration of terminal area:
Certain attributes are desirable for terminal areas where mop-up harvests by net gear are conducted. If the terminal area is a well defined shoreline indentation such as a bay, it will provide a natural containment area. It is also desirable to have bottom substrate contours that allow an efficient net harvest. In some cases, it is desirable to block the fish from entering fresh water with a barrier seine or weir. The physical ability to effectively harvest returning fish should be a consideration in site selection.

Best practice: Delineate a terminal area that both confines returning adults and facilitates their harvest.

2. Containment of fish:
From a biological perspective, the best passive strategy to avoid straying of returning adults is to allow them access to their home stream. It has been observed that if returning adults are unable to enter the fresh water to which they were imprinted they will move instead to another stream. Furthermore, unless prevented from doing so, the crowding of returning adults in a home stream may prompt some of them to back out, which increases the likelihood that they will enter another stream. A more active strategy to prevent straying is to harvest all adults while they are still in salt water or as they first enter the fresh water of their home stream.

Best practice: Allow returning adults clear access to adequate freshwater habitat in their home stream or quickly harvest them in salt water immediately adjacent to their home stream.

3. Harvest management strategy:
Whether returning adults are in salt water or fresh water, allowing them to hold in the terminal area for any length of time is not a good strategy for maximizing the economic yield to the fisheries. One objective of terminal-area harvests is to capture the maximum number of fish in the best possible condition. This means conducting the harvest as early as possible when fish arrive in the area and while flesh quality is at a premium. A quick harvest also minimizes the possibility of a build-up of fish that exceeds the harvesting capacity of the fleet or the available fish-processing capacity. Harvest methods should be employed that will contain adults in the terminal area, but if it is especially important to prevent straying to a nearby stream, then harvests should be conducted quickly and efficiently to prevent fish from dispersing. A management plan for each terminal harvest area must be in place before there are significant adult returns from a fishery supplementation project.

Best practice: Design a terminal harvest area management plan that effectively maximizes the quality of fish harvested while minimizing any potential undesirable outcomes.

4. Incidental harvest of wild stocks:
Siting a project near a wild stock may result in an increased harvest of that stock in the terminal area. Differences in run timing and migration pattern can serve to separate the enhanced and wild returns.

Best practice: Implement a terminal harvest plan that will not affect the sustainability of incidentally harvested wild stocks.

5. Broodstock management:
Each generation of terminal area returns carries the full diversity of genetic material that has survived the specific culture and marine environments for that stock. Maintaining the diversity in each brood will enable the stock to survive the variability in environmental conditions they will face. All diversity of fish in the terminal return should be carried forward into the next generation by taking gametes from all significant segments of the run; ideally, gametes should be taken in proportion to the magnitude of each segment. The environmental conditions unique to the life history of the stock will again act on this next generation to carry it further toward adaptation to those unique conditions. Adaptation is a continual process and a moderation of diversity. Allowing adaptation to proceed with a minimum of human interaction (i.e., no selection of characteristics) will avoid errors that may result in a decreased return. Allowing a stock to adjust to its environment, whether natural or artificial, is likely to result in the best survival and return.

Best practice: Collect gametes from all significant segments of the run.

II. Wildstock Supplementation

For the most part, the health of freshwater habitat and effectiveness of fisheries management strategies in Southeast make supplementation of wild stocks unnecessary. Under certain uncommon circumstances, it may be desirable to supplement a wild stock with hatchery production because the numbers of returning adults have declined to levels consistently below the established escapement goal. For example, natural events such as earthquakes and landslides or anthropogenic impacts from timber harvest, mining, or urbanization may degrade habitat and result in reduced productive capacity. Unintended harvest pressure may result in overexploitation of a stock. In rare instances it is possible that the sustainability of a stock may be jeopardized. Wildstock supplementation, habitat modification, and fishery management changes are three possible tools that can be included in an action plan to restore productivity. When appropriate, action plans are developed by ADF&G in conjunction with hatchery corporations and other agencies to direct the activities of all participating entities.

The following standards must be addressed and documented during development of a wildstock supplementation project: (A) project objective relative to the wild stock is clearly defined, (B) wildstock characteristics are preserved as much as possible in the supplemental production, (C) imprinting strategy for the supplemental production mimics the process in the wild as much as possible, (D) enhanced/wild juvenile interactions are anticipated and impacts on wild fish are minimized as much as possible, and (E) hatchery-incubated fish are marked and identifiable in the fisheries and in the freshwater spawning habitat.

A. Project objective

The possible objectives of wildstock supplementation projects fall into two categories: (1) a jump-start the recovery of a population that has declined for correctible reasons or (2) perpetually enhance the productivity of a population in order to (a) restore and maintain it at historical productive levels or (b) circumvent bottlenecks in the productive capacity of a natural system. If the intent is to continually enhance the productivity of a population and therefore increase its yield to the fisheries, active habitat manipulation (such as lake fertilization) should be considered as well as planting hatchery-incubated fish from the same stock back into the system.

When the intent is to jump-start stock recovery, the project should have a predetermined end point defined by ADF&G. Examples of end points include consistently achieving for a period of three years a biological escapement goal (BEG), an optimal escapement goal (OEG), or a sustainable escapement goal (SEG). Before a project starts, there must be agreement on the significance of enhanced adults: will they count toward the escapement goal (an OEG) or will only wild-spawned fish (including F_1 progeny of enhanced fish) count toward the goal (a BEG or SEG)? It may also be desirable to define the criteria for inseason determination of whether or not to proceed with egg takes in any given year.

Best practice: Clearly define the project objectives relative to the wild stock, including (if appropriate) the project end point and annual decision criteria.

B. Preservation of wildstock characteristics

1. Separation of populations:
Spawning populations are groups of adults that have some degree of separation from each other (i.e., geographic, temporal, or behavioral separation). Without sophisticated research, it would be impossible to tell the amount of genetic interchange between groups of fish that spawn in different specific locations at different specific times. It would be difficult or impossible to discern the existence or extent of local adaptation in a spawning population. It is assumed these differences equate to the amount of specific adaptation that separates each group. The precautionary assumption is that these differences exist and could potentially have consequences (however small) on maximizing production.

Best practice: Target only one discrete spawning population for each egg take.

2. Broodstock composition:
It is important to include enough adults in the broodstock to be reasonably assured that the allele frequency in the supplemental production mimics that of the spawning population. Although some "numbers of spawners" tables have been published, none of them are appropriate for all situations. The genetics section of ADF&G must be consulted

for each individual project. Gametes should be taken from all significant segments of the run and in proportion to the run timing to mimic the genetic variation of the wild population in the enhanced segment.

Best practice: Time egg takes and utilize adequate broodstock numbers to assure that the genetic composition of the supplemental production mimics the wild stock.

C. Effective imprinting

If the greatest chance for breeding success in the supplemental fish occurs within their population of origin (Tallman and Healey 1994), then releasing them where they will imprint on the stream of origin is likely to result in the greatest benefit (in terms of numbers of fish produced) from the supplementation project.

Best practice: Rear and release juvenile fish in fresh water in their stream of origin.

D. Minimizing enhanced/wild impacts

1. Percentage of enhanced juveniles:
The objective of each project is to supplement, not replace, wild fry production; therefore, any strategy that minimizes competition between enhanced and wild fish should be considered first. A guideline of $\leq$50% enhanced juveniles mixed with a wild stock has been used for projects in Southeast for many years, and unless future research shows this to be incorrect, it should remain in effect. Extenuating circumstances, such as saving a stock from extirpation, may call for exceeding the 50% guideline.

Best practice: Keep the number of enhanced fry less than the number of wild fry from the same spawning population.

2. Release strategy:
According to McMichael et al. (2000) in their work with steelhead trout, the impact of supplemental fish on wild fish can be minimized by releasing actively migrating smolts. Minimizing this impact must be balanced with the probability of effectively imprinting juveniles when they are released as smolts. Also, enhanced fish should be released into a wild population when they are no larger than their wild counterparts–a difficult standard to achieve for enhanced fish reared to smolt stage off-site. McMichael's work also suggests that steelhead interactions with wild fish are decreased when water temperatures are below 8^{o}C; therefore, he recommends planting fish during times of low water temperature. The extent to which these observations and recommendations for steelhead trout can be applied to other salmonids is unknown; they are presented here to spark interest in research and to encourage discussion.

Best practice: Take all wild/enhanced fish interactions into account before determining the time and size of release of enhanced fish in order to minimize potential adverse impacts on wild fish.

E. Identifying supplemental production

Wildstock supplementation is the most closely monitored type of enhancement project because of its clearly defined objectives and intentional integration with wild stocks. Supplemental fish cultured in a hatchery should be marked according to the recommendation for that species before release into the wild. Project planners should consider mass marking chinook and coho for wildstock supplementation in addition to coded wire tagging because it may be important to distinguish wild from enhanced individuals in fresh water and early marine environments.

Best practice: Mass mark all hatchery fish and additionally coded-wire-tag the recommended proportion of chinook and coho.

III. Colonization

Colonization by salmon occurs under natural conditions as new habitat opens up (e.g., glaciers recede, beaver dams wash out, and geological processes reshape the landscape). Anadromous fish that colonize new habitat are usually pioneers from the same stream below the former barrier or strays from stocks in the immediate vicinity. Full colonization, which is defined as equilibrium with the new habitat and resident species, occurs over a long span of time when it proceeds under natural conditions.

Instead of waiting for natural colonization to occur, resource agencies have opted to plant juvenile salmon in the new accessible habitat above many of Southeast Alaska's fish passes (*see* list and descriptions in Appendix A and Appendix Table A-1). These projects have the potential to greatly decrease the length of time to full colonization. The following standards must be considered and documented during the development of a colonization project: (A) need for project and potential for success are clearly defined, (B) colonization strategy mimics the natural process as closely as possible, (C) adequate evaluation of ecological impacts will occur, and (D) hatchery-incubated fish are marked and identifiable in the fisheries and in freshwater spawning habitat.

A. Project need and potential for success

Colonization projects are unique in that they introduce a stock into a habitat where it is absent, with the intent that it will be self-sustaining after the initial life cycle. If the stock had been historically present but extirpated from the area, then the desirability of reintroduction and the potential for success may be high. The introduction of an anadromous stock into an area not known to be previously accessible is an ecosystem modification that should be discussed with all concerned agencies and interested members of the public. In Southeast, the Forest Service has been the lead agency in nearly all barrier modification projects. Their scoping and review process for these projects should include proposals for colonization. Also, before a barrier to anadromous fish is intentionally modified, a thorough survey of the upstream habitat and biota should be conducted to evaluate the probability of colonization success.

A careful analysis of 31 fish pass projects in Southeast showed that 17 (55%) were moderately or fully successful in producing the expected number of new fish.[52] The same analysis noted that for fish passes built for coho (the most commonly targeted species for fish pass projects), the presence of substantial upstream habitat was the most common predictor of colonization success.

Best practice: Evaluate project need during project planning. In addition, plan projects in streams with substantial upstream habitat without ecological conditions that might jeopardize project success.

B. Colonization strategy

As with wild stock supplementation projects, the assumption is made that the greatest chance of colonization project success with the least amount of biological risk comes with simulating the natural process. Using fish from the same stream or a nearby stream assumes the best possible preadaptation to the area. Moving fry or adults from below the barrier should be considered as a first priority, utilizing no more than 50% of the available fish of that life stage. In some cases in Southeast Alaska, eggs have been taken below the barrier or from a nearby stream, incubation has occurred at a hatchery, and the progeny have been planted above the newly constructed fish pass.

Allowing colonization to proceed without intervention could be the preferable method when a sizeable salmon population is already using the stream below the barrier. Accordingly, the total cost of the project would be considerably less; however, project objectives normally anticipate full production sooner than it would take a totally passive strategy to achieve it.

Best practice: Colonize unused salmon habitat with the stock that occurs naturally in that system using the least intrusive means that will accomplish the project objectives.

C. Evaluation of impacts

Colonization projects have occurred in locations that are typical of the broader ecosystem and absent of unique elements that would be compromised by the introduction of anadromous species. Thorough investigations of potential spawning and rearing habitat and any resident fish species are conducted before barriers are modified.

Rigorous follow-up assessments have been conducted for two colonization projects in Southeast Alaska at Slippery Lake (Wright et al. 1997) and Margaret Creek (Bryant and McCurdy 1995). No significant detrimental impacts to resident species (i.e., cutthroat trout and Dolly Varden char) were found during the evaluation period at either site. Having intensively evaluated these colonization projects, the decision to conduct a follow-up evaluation of ecological impacts for any future project will be made on a case-by-case basis.

[52] Richard Aho, fish biologist, U.S. Forest Service, Tongass National Forest, personal communication.

Best practice: Conduct a precolonization assessment of the habitat to be colonized and consider a postcolonization assessment of the impacts of anadromous fish to the habitat and biota.

D. Identification of hatchery-produced fish

Juveniles produced in a hatchery for colonization should be marked according to the recommendation for the species. For chinook and coho, otolith marking in addition to coded wire tagging is recommended if any evaluation of their freshwater phase is planned; e.g., relative abundance of hatchery and naturally produced fry. For subsequent generations produced in the wild, a subset of these projects should be intensively monitored to determine the long-term success of colonization. In conjunction with these evaluation studies, fish may be marked.

Best practice: Mass mark all hatchery-produced fish and additionally coded-wire-tag the recommended proportion of chinook and coho.

Benefits and Goals of Enhancement Projects

Fisheries enhancement projects have the potential to provide a number of benefits for common property resource users. Because numerous benefits are possible, each project generally will not result in all the possible benefits. In this section, some of the possible benefits are listed and a generalized goal is given for each benefit. A specific set of project goals will be developed for each proposed project.

I. Fishery Supplementation

The central goal of fishery supplementation is to increase the overall harvest and value of the harvest. Projects that meet this goal can provide significant benefits to Southeast Alaska. A carefully planned enhancement project (i.e., stock selection, site selection, culture techniques, etc.) may provide benefits in addition to increased harvests. Potential benefits and corresponding goals include, but are not limited to, the following:

A. Benefit: provide additional fish for harvest by one or more user groups.

Goal: provide the projected number of harvestable fish to the intended user groups in traditional fisheries or in new fisheries over an extended period of years.

B. Benefit: create a new harvest opportunity that will deflect fishing effort from traditional fisheries.

Goal: effectively and consistently attract commercial, sport, and/or personal-use fishing effort away from vulnerable wild stocks.

C. Benefit: mitigate for lost fishing opportunity related to the Pacific Salmon Treaty or other international or internal political agreement.

This potential benefit is related to the preceding benefit (i.e., I. B.). Both benefits describe the redistribution of fishing effort away from areas where it may have undesirable biological or political consequences and redirection of effort toward enhanced stocks.

Goal: allow no net loss to common property harvesters in a specific fishery as a result of the Pacific Salmon Treaty or other political agreement.

D. Benefit: provide balance for the allocation of enhanced fish between traditional harvest gear groups.

The Joint RPT has the authority to review the status of allocation of enhanced fish and make recommendations regarding production changes to the commissioner. The Joint RPT has historically chosen *NOT* to recommend production cuts to reduce harvest value for the advantaged gear group. Rather, it has chosen to look at proposed new production and recommend projects that would have a balancing effect by providing more harvest opportunity for the disadvantaged gear group.

Goal: increase the total harvest value for a disadvantaged gear group without taking existing resources from other gear groups.

E. Benefit: add value to the overall commercial fishery in Southeast Alaska

As the value of Southeast Alaska's fisheries is diminished in the competition with farmed fish, enhancement projects can compensate by selectively increasing production of species that have retained market value.

Goal: increase the overall value of the region's fisheries by a projected amount.

II. Wildstock Supplementation

Under the recently enacted policy for the management of sustainable salmon fisheries (ACC 39.222), a chain of events and decisions will precede the decision to begin any new wild stock supplementation project. Although each project will be directed at achieving a specific goal, other benefits may accrue. Potential benefits and goals follow:

A. Benefit: an increase in wildstock productivity as measured by an increase in the number of adults in the total return.

Goal: increase the number of adult fish produced by the stock to a predetermined level within a reasonable period of time and then discontinue supplementation if required by the project plan.

B. Benefit: harvest adjustments allow for increased harvest of other more plentiful stocks as well as the supplemented stock.

If harvest restrictions have been enacted because of reduced productivity of a stock, the supplementation project may result in lifting or liberalizing those restrictions.

Goal: increase the number of adults from the supplemented stock to a level where harvest restrictions are lifted, resulting in a net increase in fishing opportunity.

III. Colonization

A colonization project would potentially provide some combination of the benefits associated with fishery supplementation and/or wildstock supplementation.

Collateral Benefits

Collateral benefits are not reasons for implementing an enhancement project; rather, they are desirable consequences of such a project. Examples of collateral benefits resulting from enhancement projects follow:

A. Increased overall freshwater ecosystem productivity.

Collateral benefits may accrue whenever enhanced fish are introduced to freshwater habitat for fishery supplementation (e.g., coho lake stocking), wildstock supplementation, or colonization. One broad impact might be an increased infusion of organic nutrients into the freshwater habitat as a result of increased number of adults in the escapement. It has been shown that an increase in marine nutrients carried into freshwater habitat by escaping adult salmon can boost ecosystem productivity (Reimchen and others 2003).

B. Increased size or numbers of resident or other anadromous salmonids that prey on the supplemented stock in fresh water.

It is assumed that an increase in the supplemented species would lead to a revised equilibrium where an increase in the predator species also occurs. For example, a cutthroat trout population may increase in both numbers and size of individuals following sockeye fry plants. Improvements in the size or quantity of desirable predator species could have the beneficial outcome of providing improved sport fishing opportunity. While it is highly unlikely that a planning document for a proposed project would include this benefit as a goal, it certainly could be a desirable outcome.

C. A terminal harvest or other activity that yields a cost recovery product whose value is high enough to cover project expenses.

A collateral benefit of some fishery supplementation projects is the harvest of a portion of the adult returns to cover project expenses. Generating revenue is not a valid reason for developing a fisheries project, but financial planning to cover project expenses is a necessary part of project planning. In some cases, depending on the value of the species in the cost recovery harvest and the number of fish returning to the special harvest area, cost recovery revenue from one project may be used to pay expenses for another.

Project Evaluation

All projects will have an approved evaluation plan to assess impacts and measure success. This plan will describe how the project benefits will be measured and include a method for detecting negative or unintended impacts. An evaluation plan includes (A) fish identification (marking) method to be used; (B) mark–recovery plan for common property and terminal site harvests; (C) identification of potential ecological and genetic impacts that might warrant evaluation, a strategy to detect them, and criteria to determine when measured impacts would warrant project modification; (D) description of how impacts to fishery management will be evaluated; and (E) plan for dispersing information about the project. Proposals for new projects should document all evaluation agreements between the hatchery corporation or agency and the department, including any agreements for funding evaluation activities.

A. Marking

Most hatcheries in Southeast Alaska either have the capability to thermally mark fish or are moving ahead with plans to provide that capability. Thermal marking imposes a permanent specific pattern of bands on the otoliths of a fish before it emerges from the incubator. For species harvested primarily in net fisheries, this type of mass mark has become the standard in Southeast.

The evaluation of enhanced chinook and coho production is integrated into a coastwide stock assessment program based on coded wire tags; the need to coded-wire-tag a representative portion of releases of these species is not expected to change in the foreseeable future. The default tagging rate for chinook is 10%, with a minimum of 20,000 tags per release group. For coho projects, the tagging rate has ranged from 2% to 10%, with a minimum of 20,000 tags per group. The tagging rate for each coho project will be determined by a number of considerations, including the projected marine survival rate, intensity of tag-recovery programs along the interception route, and the desired precision of harvest estimates.

In recent years the percentage of enhanced coho in some traditional fisheries has approached 25%. At this level the current ability to assess the strength of wild returns is limited; therefore, the estimate of the wildstock component may not be precise enough for effective fishery management, resulting in more conservative approach to managing a fishery. The problem could be alleviated by (1) increasing the tagging fraction of all coho releases that contribute to the harvest, (2) thermal marking all coho releases found in the harvest, (3) reducing the number of enhanced coho that contribute to the harvest, or (4) increasing the evaluation of wild coho populations in areas of concern. The thermal marking alternative would require an expanded mark–recovery program.

There is considerable merit to mass marking all enhanced fish released from hatcheries. In addition to allowing better precision in harvest management, thermal marking is presently the best known means of identifying all individual enhanced fish in marine or freshwater environments. Tracking stock movements in the open ocean and evaluating homing precision are two examples of endeavors that would be greatly facilitated by 100% marking. Increased knowledge of enhanced fish will only lead to better decisions regarding enhancement programs. Applying an otolith mark to *all* enhanced fish produced in Southeast Alaska is a strategy worth considering for implementation.

The evaluation of naturally occurring fish production resulting from colonization or wildstock supplementation projects poses a challenge. Coded wire tagging or visible implant tagging are the only types of reliable, persistent marks available for juveniles in their natural habitat. The choice depends on data requirements and mark–recovery options. A wildstock marking procedure that causes minimal disruption to the fish and no dislocation from their home range should be used, even if it is not the most convenient method for fisheries staff. If it is desirable to evaluate adult parameters such as stream life or spawning location, a wider range of visible marking techniques is available (e.g., anchor tag or fin punch). Again, marks must be applied with minimal delay and disruption of fish movement.

Best practice: Beginning in 2004, mass mark all hatchery-produced chum, pink, and sockeye. Continue to coded-wire-tag chinook and coho in the recommended ratios; additionally, mass mark all of these fish when used for wildstock supplementation or colonization.

B. Mark Recovery

Mark recovery is the primary means for evaluating all project benefits associated with adult returns. This information is also essential in the forecasting of future returns of enhanced fish. Therefore, it is critically important that available resources for this activity are used as effectively as possible.

Oversight of the mark–recovery program has been provided by ADF&G since the program's inception in the 1970s. At the present time ADF&G continues to conduct structured catch-sampling programs in commercial and sport fisheries. Sampling in terminal harvest areas and hatchery escapements has sometimes been the responsibility of hatchery operators, with varying degrees of oversight by ADF&G.

An evaluation plan should include an assessment of ADF&G's port-sampling efforts in fisheries where enhanced fish are intercepted, including terminal and near-terminal fisheries where enhanced fish comprise most of the harvest. Hatchery corporations may need to augment ADF&G's sampling program or provide funding for increased ADF&G sampling. In order to make future run projections for species with multiple age classes, marks should be recovered from clean-up or cost recovery harvests to assess the relative strengths of those classes. Mark recovery in terminal areas will indicate whether significant numbers of naturally reproduced fish were taken in the harvest. An evaluation plan should specify where marks will be read and how data will be shared.

The region-wide transition to a more extensive use of thermal marks must include a region-wide plan for mark recovery and data management. The largest hatchery organizations in Southeast have been proactive in setting up and operating otolith reading labs and, in some cases, sampling fisheries where an indication of run strength helps them plan the management of their terminal area activities. The department stands to gain much from the increased use of thermal marks; i.e., increased precision of fishery management and increased ability to exercise effective oversight of enhancement activities. It is incumbent on ADF&G, as the lead public agency for management of the fish resource, to maintain oversight of all mark–recovery and data management activities and to participate as fully and effectively as possible in harvest sampling, especially where common property harvest decisions could be affected. Department oversight of mark recovery during cost recovery and clean-up operations in terminal harvest areas is a lesser priority; however, when private organizations conduct mark–recovery activities, they need to adhere to the same sampling standards that ADF&G employs so that results can be used to meaningfully expand that agency's ability to manage the resource. As sampling and data management become more complex, additional funding will be needed to enable ADF&G to maintain its oversight responsibilities.

Best practice: ADF&G will provide oversight for all mark–recovery activities related to common property harvest management. Mark–recovery activities conducted by entities other than ADF&G will yield data that is complementary to data collected directly by ADF&G.

C. Ecological and Genetic Impacts

One of the objectives of the technical guidelines is to suggest strategies that will minimize the impacts of enhanced fish on other freshwater and saltwater biota. For each project, the combination of technical elements should indicate the likelihood of an unintended impact occurring. If warranted, a strategy for detecting a specific impact should be included in the evaluation plan. The intensity of the evaluation program should be commensurate with the seriousness of the potential consequences; i.e., if a wild stock near an enhancement project is considered "significant" then it will be of increased importance to know if any interaction is taking place. On the other hand, it may be less important to dedicate time and money for evaluating a possible impact when there is little perceived concern for serious consequences. When it is advisable to evaluate the possibility that a project will have an ecological or genetic impact, an evaluation plan should include responses to the following questions:

- What change will be used as an indicator of impacts?
- What pre-project baseline data are needed?
- What constitutes an impact and what is an unacceptable level of impact?
- What changes to the project will be proposed in response to an unacceptable level of impact?
- Who will be responsible for data collection and who will analyze it?

1. Ecological impacts:
Projects that include a freshwater phase are begun with the understanding that freshwater ecosystems will change because they are complex, dynamic, and continually adjusting to achieve balance. Fish from enhancement projects have the potential to impact other freshwater species in both positive and negative ways (Pearsons and Hopley 1999).

The evaluation of ecological impacts of introduced salmon in freshwater habitats has been the subject of intensive research projects in Southeast at Slippery Creek (Wright and others 1997) and Margaret Lake (Bryant and others 1994, 1995, and 1999). Initial evaluations, which spanned several years after fish pass installation and fish stocking, indicated some increased complexity in food webs and changes in resident population characteristics but no broad-scale displacement or replacement by introduced species. Investigation of the long-term effects continues for the Slippery Creek project. Thorough evaluations such as these can increase the cost of a colonization project by 5 to 10 times; and considering the low level of adverse impacts detected, Forest Service staff believe that most future projects could be less rigorously evaluated.[53] It may be adequate to intensively evaluate only a sample of the colonization projects, depending on the ecological importance of the water body.

Releases of large numbers of juvenile salmon in fresh water or salt water have the potential to impact the environment in the vicinity of the release site. There are numerous theories and opinions on the types of impacts and whether or not they might affect other species or the ecosystem in lasting and significant ways. Research to determine the causes of the decline of the Taku River fall chum population is currently underway, and early marine competition with hatchery chums is considered a possible contributing factor. This type of research is especially important where there are indications that possible long-term consequences to a wild stock may be occurring. By and large, few documented early marine ecological impacts have been attributed to enhancement projects in Southeast Alaska, quite possibly because of a very healthy marine ecosystem that can adjust and rebalance when relatively minor impacts occur.

Allegations of the harmful cumulative impact of *all* Southeast Alaska enhanced fish on the Bering Sea or North Pacific Ocean ecosystems are not well supported. Current research by NMFS will expand understanding of these areas. Evaluating the impact of a new project on a faraway ecosystem is well beyond the means of any hatchery corporation; however, if 100% of enhanced fish were otolith marked, it would help all research efforts along their migratory path.

Best practice: Evaluate the ecological impact of a fisheries supplemental project if the department and the regional planning team believe supplementation is threatening a significant wild stock or an important ecosystem function in a specific place and time.

2. Genetic impacts:
Colonization projects essentially seed habitat with a stock that will be left alone for "shaping" by the environment into a naturally reproducing stock. If the new spawning

[53] Forest Service staff comments on preliminary draft of the phase III plan, personal communication.

habitat is attractive to adult salmon, straying rates will be within normal limits and the risk of adverse genetic impacts to neighboring stocks will be therefore low. Excessive straying would call for reevaluation of the accessibility and characteristics of the colonized habitat.

In wildstock supplementation projects, the F_1 offspring of wild fish are reintroduced so that they will interbreed with the rest of the wild population. There is some speculation–but no data–that incubation in an artificial environment exerts selective pressure on salmon eggs and alevins and results in genetic differentiation from the parent population. Limiting reintroduction to the F_1 generation is the precautionary strategy for minimizing any possible genetic effect of artificial propagation.

The primary impact of concern in fishery supplementation projects is the introgression of genetic material from straying enhanced fish into wild populations. All species of salmon have been observed to stray to some degree. Straying rates of wild salmon vary both between species and for different stocks of the same species. For example, Tallman and Healey (1994) found straying rates in three populations of chum salmon in the same inlet in British Columbia to range from 0% to 54%. Straying rates of wild pink salmon tagged in six different streams ranged from 9% to 53% (Sharp et al. 1994); in Southeast Alaska, straying rates have been observed from 1.5% to 9.2% (Mortensen et al. 2002; Thedinga et al. 2002). From an evolutionary standpoint, straying is necessary to help maintain genetic diversity and to colonize new habitat. It is assumed that the straying rate in the wild is in balance with each stock's ability to integrate new genetic material and either incorporate it when advantageous or discard it when it is not. More realistically, most wild salmon populations if left undisturbed over time would likely be examples of the metapopulation model of population dynamics: occasional extinction of a local population followed by recolonization of the vacant habitat by pioneers from other sites (Hanski and Gilpin 1991).

It is reasonable to expect that properly imprinted hatchery fish will home as precisely and "pioneer" as frequently as their wild conspecifics. Quinn (1993) concludes that "evidence is limited and equivocal on whether hatchery rearing per se increases the tendency of salmon to stray." The more important question, with regard to enhancement project impacts, is what percent of a neighboring wild stock's genetic material comes from enhanced fish each year? If exogenous genetic material is introduced into a wild stock at a rate in excess of its ability to deal with it, a decrease in productivity could result over time. Scientists generally agree that the decrease can be reversed if the rate of influx of genes is slowed or stopped.

True strays are most likely to be found within a few miles of the release site (Heard 1996; Labelle 1992). Survey data from prespawning fish may include a number of strays that have wandered into a stream but, if left alone, would back out and go elsewhere. “Wandering” behavior has been well documented for coho salmon. Labelle (1992) reports "back-out" rates of 16.8%, 4.1%, and 3.3% in consecutive years for coho salmon at the Trent River weir on Vancouver Island, where the escapement was a mixture of wild and enhanced fish. At Margaret Lake in southern Southeast Alaska, some of the adult coho that had been marked with visible tags at the top of a 7-meter vertical-rise fish pass, 1.5 km from salt water, were subsequently recovered at Neets Bay Hatchery, 25 kilometers to the north. One of these marked adults was recovered in a commercial fishery a month later and 80 kilometers away (Bryant and Frenette 1992, Frenette and Bryant 1993). When CWTs were recovered from eight adipose-clipped cohos at the top of the fish pass, six were from Margaret Lake smolts and two were from Neets Bay Hatchery (Bryant and others 1994). No inference about straying rates can be drawn from these data since killing the fish to recover CWTs eliminated the possibility of knowing where any of these fish would have spawned. Where this behavior has been quantified, wandering adult salmon are a relatively small proportion of the tagged fish observed. Therefore, recovery of prespawning tagged fish is roughly indicative of potential spawning by those tagged groups in a watershed.

Survey data should clearly document whether strays are sympatric with wild spawners, because strays recovered either temporally or spatially isolated from the wild spawning population would have low potential for genetic interaction. Similarly, a stray found in habitat where it cannot successfully reproduce poses no genetic threat, although it is exhibiting straying behavior.

Surveys of actively spawning or postspawning fish provide more accurate data on straying rates than counts of prespawners; however, finding postspawners in wild systems is not easy in many cases, and sample numbers might be small. For either prespawners or postspawners, straying rates cannot be evaluated with any reasonable degree of precision unless the enhanced fish are 100% marked.

Distinguishing enhanced and wild fish by scale pattern analysis or by a visual difference in freshwater scale patterns is a possible tool for long-rearing species. Coho released as smolt into Klawock River can be distinguished from wild returns to that system with reasonably good reliability. For enhanced fish released as fry, the method has been successfully applied; however, it is labor-intensive because it requires a tremendous amount of scale collection and analysis before and during project implementation in order to detect differences (Baer and Honnold 2002).

Recent projects in Southeast Alaska where straying has been evaluated have used a 2% incidence of prespawning strays in a neighboring wild stock as the “trigger point” for concern and for consideration of project modification to reduce straying. The “2% rule” is based on the theoretical rate of loss of alleles in a wild population described by Withler (1997). At a 1.5% influx of genes in each generation, the replacement of 50% of alleles in a wild population could occur in 25 generations. It is assumed that the replacement of alleles would result in a decrease of fitness and a consequent decrease in productivity of the wild population. Withler’s numbers assume there is no selection pressure acting to slow the rate of allele replacement. Tallman and Healey (1994) compared the incidence of enhanced chum carcasses in three wild populations with the electrophoretic evidence of gene flow. They found that gene flow was an order of magnitude less than the observed rate of straying (as much as 46% of the population composed of strays but less than 5% gene flow). For whatever reason (e.g., mate selection, dropout of hybrids, etc.), actual allele replacement did not correlate with the incidence of strays in the population. On the other hand, a native-stray hybrid that fails to thrive and reproduce in the wild population constitutes an increment of reduced productivity.

The potential for straying adults from a supplementation project is greatly reduced by adhering as closely as possible to the best practice guidelines, which maximize juvenile imprinting to the release site. According to the *Stock Appraisal Tool* (Appendix E), the requirement to assess straying for any project should be appropriate to the (1) potential for straying based on the project strategies and (2) significance and proximity of local conspecific wild populations. While no population is insignificant, use of the assessment parameters in the *Stock Appraisal Tool* recognizes that a possible small, reversible decrease in productivity is a more acceptable trade-off for populations that do not meet certain criteria. An acceptable rate of straying for a proposed project will be defined in relation to specific neighboring wild stocks. Setting the acceptable rate will depend on many factors, including (but not limited to) the likelihood of temporal overlap on the spawning grounds, significance of the wild stock, and how closely the two stocks are related.

The stray survey protocol recommended for a project could range in intensity from counting marks among prespawners (low intensity) to a series of thorough and systematic surveys of the entire spawning area to count marks in postspawners (high intensity). The intensity of the stray survey protocol must be adequate to detect the trigger point for corrective action or project modification. The evaluation plan will include the predetermined acceptable percentage of strays in a specific wild stock and what action will be taken if strays in excess of that percentage are observed.

Best practice: If considered necessary by the department and regional planning team, develop a plan to evaluate the genetic impact of a proposed project. The intensity of the evaluation will be appropriate to the likelihood of straying and the potential for a significant impact on a specific wild stock.

D. Fishery Management Impacts

An evaluation of the impact of new enhanced production on fishery management should occur when the project reaches full production and all age classes of adults are represented in the harvest. The project evaluation plan should indicate the year when a report of management impacts will be compiled and by whom; this report should address how well the project has measured up to the stated goals for fishery management and include answers to the following questions:

- Has the project provided the intended harvest opportunities?
- Are there unintended mixed-stock fishery impacts?

For fishery supplementation projects the report should also address the following questions:

- Has the terminal area proven appropriate to accommodate the fishing effort?
- Has the primary harvest in the terminal area been comprised of enhanced fish?
- Are the terminal harvest fish in adequate condition for the intended economic benefit?

Best practice: Define the questions and issues a project may have for managers, how those questions and issues will be resolved as the project evolves, and who will be responsible for this process.

E. Reporting

Project reports draw together all the information about a project at scheduled times. Having all the relevant information in one place is not just a convenience—it is conducive to making good decisions on project modification, if necessary. The *Policy for the Management of Sustainable Salmon Fisheries* advocates the "initiation of any necessary corrective measure without delay and prompt achievement of the measure's purpose…" as part of the precautionary approach to artificial propagation.[54] Reports should be distributed to the RPT and made available to any other interested persons.

Project reports should contain information on how closely the project plan is being followed. In some cases the original strategies proposed for a project may prove impossible or not advisable in actual practice. If deviations have occurred, the report should explain the new strategies and how they address the standards. Actual project benefits should be compared to the original goals to determine if the project is meeting expectations. If it is not, operational adjustments may be made that would help or perhaps the original goals are unrealistic in light of current biological or economic conditions. The project report should also describe collateral and unanticipated benefits as well as summarize all impact assessment activities that have been conducted. Enough detail should be presented to allow informed decisions on corrective measures, if necessary.

More than one organization or agency may be involved with implementing and evaluating a project, but the responsibility for reporting should be clearly assigned to one person or position. The evaluation plan should establish the reporting schedule and responsibility before the project begins.

Best practice: Before a project begins, designate the person or position responsible for reporting as well as the persons or positions who will receive the reports; also develop a schedule for reporting.

Tables 8, 9, and 10 schematically summarize the technical guidelines, provide examples of benefits and goals, and describe the process of project evaluation.

[54] ACC 39.222(c)(5)(A)(iii)

Table 8. Technical guidelines.

I. Fishery Supplementation

Standards	Elements	Best Practice
A. The release site has an adequate freshwater supply and is not in close proximity to significant wild stocks	A. Release site selection	
	1. Characteristics of release site freshwater supply	Choose an imprint/release site with a strong and consistent supply of fresh water.
	2. Location of release site relative to rearing site	Choose a remote release site that is unaffected by water from the rearing site but still shares general characteristics of the stock's native stream.
	3. Proximity of significant wild stocks	Choose a release site that is not proximal to the natal streams of any highly significant wild stocks of the same species or other species with similar run timing and habitat utilization characteristics.
	4. Early marine interactions and cumulative effects of multiple interactions	Choose a site location and release timing that minimizes potential nearshore interaction with local wild stocks.
	5. Land use designation	Consider the upland management intent adjacent to a proposed project site and minimize potential conflict or move the project elsewhere if that is not possible.
B. Fish are adequately imprinted to the release site	B. Imprinting to the release site	
	1. Transport timing	Transfer fish to the imprint/release site as early as possible during juvenile rearing.
	2. Saltwater entry	Allow smolts to migrate downstream volitionally from their freshwater rearing site to salt water.
	3. Length of exposure to release-site fresh water	Immerse smolts in the imprint fresh water for a minimum of three weeks and release the fish only when they are fully smolted.
C. Enhanced fish are marked and identifiable in traditional fisheries and contribute to the harvest without jeopardizing the sustainability of wild stocks	C. Harvest contribution	
	1. Identification in the fisheries	Adequately mark all groups of fish and, where needed for effective management of traditional fisheries, plan to implement a mark–recovery program to assist resource managers.
	2. Effect on traditional and near-terminal fisheries	Do not intensively harvest groups of enhanced fish where the overharvest of wild stocks will occur.
	3. Cumulative effect of multiple enhancement projects on traditional fisheries	Do not pose management challenges in traditional fisheries that cannot be reasonably addressed by managers because of the harvest of new production.
D. The terminal area design and management plan enable harvest or containment of all returning adults	D. Terminal area function	
	1. Configuration of terminal area	Delineate a terminal area that both confines returning adults and facilitates their harvest.
	2. Containment of fish	Allow returning adults clear access to adequate freshwater habitat in their home stream or quickly harvest them in salt water immediately adjacent to their home stream.
	3. Harvest management strategy	Design a terminal harvest area management plan that effectively maximizes the quality of fish harvested while minimizing any potential undesirable outcomes.
	4. Incidental harvest of wild stocks	Implement a terminal harvest plan that will not affect the sustainability of incidentally harvested wild stocks.
	5. Broodstock management	Collect gametes from all significant segments of the run.

II. Wildstock Supplementation

Standards	Elements		Best Practice
A. Project objective relative to the wild stock is clearly defined	A. Project objective		Clearly define the project objectives relative to the wild stock, including (if appropriate) the project end point and annual decision criteria.
B. Wildstock characteristics are preserved as much as possible in the supplemental production	B. Preservation of wild stock characteristics		
		1. Separation of populations	Target only one discrete spawning population for each egg take.
		2. Broodstock composition	Time egg takes and utilize adequate broodstock numbers to assure that the genetic composition of the supplemental production mimics the wild stock.
C. Imprinting strategy for the supplemental production mimics the process in the wild as much as possible	C. Effective imprinting		Rear and release juvenile fish in fresh water in their stream of origin.
D. Enhanced/wild juvenile interactions are anticipated and impacts on wild fish are minimized as much as possible	D. Minimizing enhanced/wild impacts		
		1. Percentage of enhanced juveniles	Keep the number of enhanced fry less than the number of wild fry from the same spawning population.
		2. Release strategy	Take all wild/enhanced fish interactions into account before determining the time and size of release of enhanced fish in order to minimize potential adverse impacts on wild fish.
E. Hatchery-incubated fish are marked and identifiable in the fisheries and in the freshwater spawning habitat	E. Identifying supplemental production		Mass mark all hatchery fish and additionally coded-wire-tag the recommended proportion of chinook and coho.

III. Colonization

Standards	Elements	Best Practice
A. Need for the project and the potential for success are clearly defined	A. Project need and potential for success	Evaluate project need during project planning. In addition, plan projects in streams with substantial upstream habitat without ecological conditions that might jeopardize project success.
B. Colonization strategy mimics the natural process as closely as possible	B. Colonization strategy	Colonize unused salmon habitat with the stock that occurs naturally in that system using the least intrusive means that will accomplish the the project objectives.
C. Adequate evaluation of ecological impacts will occur	C. Evaluation of impacts	Conduct a precolonization assessment of the habitat to be colonized and consider a postcolonization assessment of the impacts of anadromous fish to the habitat and biota.
D. Hatchery-incubated fish are marked and identifiable in the fisheries and in freshwater spawning habitat	D. Identification of hatchery-produced fish	Mass mark all hatchery-produced fish and additionally coded-wire-tag the recommended proportion of chinook and coho.

Table 9. Benefits and goals: examples.

I. Fishery Supplementation

Benefit	Goal
A. Provide additional fish for harvest by one or more user groups	Provide the projected number of harvestable fish to the intended user groups in traditional fisheries or in new fisheries over an extended period of years.
B. Create a new harvest opportunity that will deflect fishing effort from traditional fisheries	Effectively and consistently attract commercial, sport, and/or personal-use fishing effort away from vulnerable wild stocks
C. Mitigate for lost fishing opportunity related to the Pacific Salmon Treaty or other international or internal political agreement	Allow no net loss to common property harvesters in a specific fishery as a result of the Pacific Salmon Treaty or other political agreement.
D. Provide balance for the allocation of enhanced fish between traditional harvest gear groups	Increase the total harvest value for a disadvantaged gear group without taking existing resources from other gear groups.
E. Add value to the overall commercial fishery in Southeast Alaska	Increase the overall value of the region's fisheries by a projected amount.

II. Wild Stock Supplementation

Benefit	Goal
A. An increase in wild stock productivity as measured by an increase in the number of adults in the total return	Increase the number of adult fish produced by the stock to a predetermined level within a reasonable period of time and then discontinue supplementation if required by the project plan.
B. Harvest adjustments allow for increased harvest of other more plentiful stocks as well as the supplemented stock	Increase the number of adults from the supplemented stock to a level where harvest restrictions are lifted, resulting in a net increase in fishing opportunity.

III. Colonization

A colonization project would potentially provide some combination of the benefits associated with fishery supplementation and/or wildstock supplementation.

<u>Collateral Benefits: Wild Stock Supplementation and Colonization</u>

A. Increased overall freshwater ecosystem productivity
B. Increased size or numbers of resident or other anadromous salmonids that prey on the supplemented stock in fresh water
C. A terminal harvest or other activity that yields a cost recovery product whose value is high enough to cover project expenses

Table 10. Project evaluation.

The Evaluation Plan Includes:	Elements	Best Practice
A. Fish identification (marking) method to be used	A. Marking	Beginning in 2004, mass mark all hatchery-produced chum, pink, and sockeye. Continue to coded-wire-tag chinook and coho in the recommended ratios; additionally, mass mark all of these fish when used for wildstock supplementation or colonization.
B. Mark–recovery plan for common property and terminal site harvests	B. Mark Recovery	ADF&G will provide oversight for all mark–recovery activities related to common property harvest management. Mark–recovery activities conducted by entities other than ADF&G will yield data that is complementary to data collected directly by ADF&G.
C. Identification of potential ecological and genetic impacts that might warrant evaluation, a strategy to detect them, and criteria to determine when measured impacts would warrant project modification	C. Ecological and Genetic Impacts	
	1. Ecological Impacts	Evaluate the ecological impact of a fisheries supplemental project if the department and the regional planning team believe supplementation is threatening a significant wild stock or an important ecosystem function in a specific place and time.
	2. Genetic Impacts	If considered necessary by the department and regional planning team, develop a plan to evaluate the genetic impact of a proposed project. The intensity of the evaluation will be appropriate to the likelihood of straying and the potential for a significant impact on a specific wild stock.
D. Description of how impacts to fishery management will be evaluated	D. Fishery Management Impacts	Define the questions and issues a project may have for managers, how those questions and issues will be resolved as the project evolves, and who will be responsible for this process.
E. Plan for dispersing information about the project	E. Reporting	Before a project begins, designate the person or position responsible for reporting as well as the persons or positions who will receive the reports; also develop a schedule for reporting.

NEW PROJECTS

The following are potential projects that are either being considered for implementation during phase III or already in the early stages of development. The project list does not include hatchery upgrades or production increases aimed at reaching currently permitted capacities.

Cathedral Falls Creek
Type of Project: Colonization
Organization: USFS

The project is to provide fish passage at a 50-foot waterfall 0.75 miles upstream from salt water. The stream (109-42-09) is located 10 miles southeast of Kake. The City of Kake requested this project in 2000. Based on the 11 miles of good upstream habitat, it is estimated 4,000 to 6,000 adult coho could be produced annually. These coho would benefit the commercial fleet while in salt water and local subsistence and sport fishermen when they return to the stream. The upper watershed could be stocked with fry from lower Cathedral Falls Creek. A potential source of financial support is from wetland mitigation funding for a federal highway project near Kake. In 2002 this funding appeared to be unavailable, and the fish pass project was suspended. Fish pass construction would detract from the visual quality of the currently used recreation site. The Organized Village of Kake, Alaska Resource and Economic Development, Inc (ARED), and the Forest Service have considered using the upper watershed as a demonstration of ARED's misting incubation and egg planting technology.

Hiller Creek
Type of Project: Colonization
Organization: USFS

The project will provide fish access beyond a 25-foot waterfall 2.6 miles upstream from salt water. The stream (105-32-69) is located in Three-Mile Arm on east Kuiu Island. A partial barrier on a tributary to Hiller Creek would also be modified to improve passage. This project would make 7.5 miles of stream and a 120-acre lake available to anadromous fish. The target species is coho, and the enhanced production of approximately 1,000 adults would mostly benefit the commercial fleet. Coho fry could be stocked in the upper watershed from a remote egg take from lower Hiller Creek. The environmental analysis was completed in 2003, and the project is not currently recommended for construction. The reasons for this decision are as follows: (1) a lack of public interest in the additional coho that could be produced, (2) poorer quality fish habitat upstream of the barrier falls than originally reported, and (3) identification of resident cutthroat above the barrier falls with a unique allele that has not been detected in any of 20 anadromous cutthroat populations sampled in Southeast.

Snow Pass Creek
Type of Project: Colonization
Organization: USFS

The project will provide fish access beyond two waterfalls within one mile of salt water. This creek (106-30-93) is located on the west side of Zarembo Island. This project would make approximately 10 miles of stream habitat available to anadromous fish. The target species is coho that would be harvested by the commercial troll and gillnet fleets and by charter boat operators. Methods of stocking the upper watershed have not been discussed. The environmental analysis will be completed in 2004.

Wild-Hatchery Interaction
Type of Project: Research
Organizations: UAF/NMFS/ADF&G

The Taku River fall chum salmon stock has been depressed since the early 1980s. One possible contributing factor is competition with hatchery chum smolts during early marine rearing. Initiated in 2004, this project will investigate time/space overlap of hatchery and wild chums in the Taku River vicinity.

New Sockeye Release Site
Type of Project: Fishery Supplementation
Organization: DIPAC

There are many potential problems associated with locating new remote release sites for sockeye smolts in District 11; however, release sites for unfed fry are needed to bring Snettisham Hatchery to full production for sockeye. Some potential release sites outside of Speel Arm will be investigated.

Redistribution of Northern Inside Chum Releases
Type of Project: Fishery Supplementation
Organization: DIPAC

Enhanced chum salmon in the northern inside area of Southeast Alaska may provide increased benefit to the gillnet fisheries if they are distributed differently among existing release sites or adjusted to include a new release site. Several possibilities will be explored.

Pelican Rearing and Release Site
Type of Project: Fishery Supplementation
Organization: NSRAA

Enhanced fish releases near the town of Pelican will benefit the troll fleet as well as local employment for harvesting and processing salmon. The Pelican cold storage facility potentially could be used for incubation, and a rearing and release site located in or near Pelican. The most likely initial species will be chum salmon, because water availability for incubation is limited; however, incorporating water-reuse capability into the facility design would maximize future potential for other species. Local broodstock would be used.

Petersburg Area Release Site
Type of Project: Fishery Supplementation
Organization: NSRAA

Investigations are underway to identify new chum salmon incubation and release sites in the Petersburg vicinity. The project would be shaped to benefit all commercial gear groups and the community of Petersburg. Two sites are being considered: Port Camden and Thomas Bay. Further investigations will evaluate water temperatures and potential broodstocks.

Coho Presmolt Enhancement Research
Type of Project: Fishery Supplementation
Organization: SSRAA

The goal of this project is to identify a suitable lake in southern Southeast Alaska to produce enhanced coho for selected common property fisheries. The first research task is to analyze enhanced coho harvest data to define optimal times and areas where additional enhanced cohos could be harvested without complicating fishery management. Based on a combination of this data and known coho migratory patterns, a specific geographic area will be defined. The characteristics of lakes in that area will also be investigated to determine their suitability for the project.

Southern Southeast Sockeye Smolt Production
Type of Project: Fishery Supplementation
Organization: SSRAA

Sockeye smolt releases from the Neck Creek raceway(s) could be increased to 2 million within the next few years, if adult returns from a small pilot program are encouraging. An additional release of 2 million smolts from Burnett Inlet Hatchery would be implemented to provide broodstock. The two releases would be expected to contribute 96,000 sockeye annually to the common property fisheries, primarily the southern Southeast gillnet fishery in District 6.

Coffman Cove Chinook Release
Type of Project: Fishery Supplementation
Organization: POWHA

The annual release of 250,000 chinook salmon smolts from a raceway adjacent to Coffman Creek is being planned. Staff from POWHA and officials from Coffman Cove are cooperating to develop this project, which will provide benefits to the sport and commercial fisheries on the northeast side of Prince of Wales Island and to the community of Coffman Cove.

Port St. Nicholas Chinook Release
Type of Project: Fishery Supplementation
Organizations: POWHA/City of Craig

Enhanced chinook salmon released from the west side of Prince of Wales Island near the City of Craig would provide focused sport and commercial fishing opportunities. An additional objective is to draw fishing effort away from migrating Canadian and Pacific Northwest stocks more commonly found farther offshore. In April 2004, the Joint RPT recommended to the commissioner of ADF&G that he approve the hatchery permit application for Port St. Nicholas Hatchery. On June 1, 2004, a public hearing was conducted at the City of Craig municipal office to address the matter of the PNP hatchery permit for the Port St. Nicholas Hatchery.

RESEARCH NEEDS

There has been ample research conducted in the Pacific Northwest documenting genetic and ecological impacts resulting from hatchery programs and practices that were not well thought out. The Alaska enhancement program is designed to minimize impacts on wild stocks and on the environment. There have been few indications of adverse impacts from enhancement programs in Southeast Alaska, but when they have occurred measures have been taken to correct them. It would be an error to assume that all impacts to wild stocks or ecosystems can be assimilated through natural processes.

A current cooperative research project between UAF, ADF&G, and NMFS[55] is investigating the potential time/space overlap of DIPAC hatchery chums and Taku River fall chums during early marine rearing. This is an excellent example of a project designed to answer a specific question related to an impact on a wild stock. Funding for research is usually in short supply, so research projects must be relevant and carefully planned to yield the maximum usable information for future enhancement strategies.

New projects in Southeast Alaska will continue to carry requirements for evaluating ecological and genetic impacts. In one sense, all new enhancement projects are involved in research activities that may provide data relevant to other enhancement projects. Where there exists a likely possibility for an undesirable impact, it is especially important that the evaluation plan be carefully developed to provide the desired information.

Applying thermal marks to all enhanced chum, pink, and sockeye salmon released in Southeast Alaska will greatly aid any future research involving these species. In addition to the coded wire tags required for Pacific Salmon Treaty data collection, thermal marking of enhanced chinook and coho will be necessary for projects where impact assessment is required.

Genetic data has been collected from some of Southeast's wild and hatchery salmon stocks. Baseline genetic data for wild and hatchery chinook have been compiled (Gharrett et al. 1987; Crane et al. 1996). Chum salmon data (Davis and Olito 1982; Kondzela et al. 1994), preliminary work on sockeye salmon (Guthrie et al. 1994), and some pink salmon data (McGregor 1983) have been published.

Specific areas where continued formal research is recommended include the following genetic impacts:

- Introgression of genetic material from enhanced stocks into neighboring wild stocks, relative to (1) proportion of strays in the wild population and (2) size of the wild population.

- Genetic changes in hatchery stocks over time, relative to (1) numbers of fish spawned each generation, (2) number of generations, and (3) hatchery practices.

---

[55] S*ee* New Projects section, Wild-Hatchery Interaction, page 112.

- Impact of supplemental production on wild stocks, including changes in (1) physical characteristics and (2) life history characteristics.

- Continued collection of genetic data on wild and hatchery salmon stocks.

- Refinement of fish culture and fish transport techniques to maximize imprinting to release site, including optimum (1) transport environment (fresh or salt water?), (2) rearing time at remote release site to minimize straying, and (3) rearing conditions at remote release site (salinity?).

Research is also recommended for such ecological impacts as (1) habitat overlapping of enhanced and wild salmon during early marine rearing and (2) interception fisheries on other stocks where enhanced fish are targeted.

REFERENCES

Alaska Department of Fish and Game, Division of Commercial Fisheries 1999. Report to the Alaska Board of Fisheries on the status of private nonprofit salmon hatcheries. Juneau.

Alaska Department of Revenue 2002. Annual report of Tax Division operations July 1, 2001–June 30, 2002: overview of program. Juneau. 63p.

Alexandersdottir M, Mathisen O. 1982. Changes in Southeast Alaska pink salmon (Oncorhynchus gorbuscha) populations, 1914–1960. Seattle: Fisheries Research Institute, University of Washington. 55p.

Baer R, Honnold S. 2002. A straying assessment of an introduced sockeye salmon stock on northern Afognak Island as determined by two methods of stock identification. RIR 4K02-56, Division of Commercial Fisheries, Alaska Department of Fish & Game, Kodiak. 22p.

Baker T, Wertheimer A, Burkett R, Dunlap R, Eggers D, Fritts E, Gharrett A, Holmes R, Wilmot R. 1996. Status of Pacific salmon and steelhead escapements in southeastern Alaska. Fisheries 21(10):6–18.

Bams R. 1976. Survival and propensity for homing as affected by presence or absence of locally adapted paternal genes in two transplanted populations of pink salmon (Oncorhynchus gorbuscha). J. Fish. Res. Board Can. 33:2716–2725.

Barr J, Blankenship L, Campton D, Evelyn T, Mahnken C, Mobrand L, Seeb L, Seidel P, Smoker W. 2002. Hatchery Scientific Review Group, Puget Sound and Coastal Washington Hatchery Reform Project: a scientific and systematic redesign of hatcheries programs to help recover wild salmon and support sustainable fisheries: http://www.lltk.org/hatcheryreform.html.

Bryant M, Frenette B. 1992. Assessment of the resident cutthroat trout, Dolly Varden char, and introduced anadromous salmonids in Margaret Lake, Southeast Alaska: Progress report for 1992. USDA–PNW Research Station, Forestry Sciences Laboratory, Juneau.

Bryant M, McCurdy S, Frenette B. 1994. The Margaret Lake monitoring program: assessment of the resident cutthroat trout, Dolly Varden char, and introduced anadromous salmonids, Progress report for 1994. USDA–PNW Research Station, Forestry Sciences Laboratory, Juneau.

Bryant M, McCurdy S. 1995. The Margaret Lake monitoring program: assessment of the resident cutthroat trout, Dolly Varden char, and introduced anadromous salmonids, Progress report for 1995. USDA–PNW Research Station, Forestry Sciences Laboratory, Juneau.

Byrant M, Frenette B, McCurdy S. 1999. Colonization of a watershed by anadromous salmonids following the installation of a fish ladder in Margaret Creek, Southeast Alaska. No. Amer. Journ. Fish. Manage. 19(4):1129–1136.

Burke J. 2002. Economic benefits of a user pays program to enhance Alaska salmon fisheries: unpublished paper prepared for salmon enhancement symposium in Kobe, Japan. 2003.

Byerly B, Brooks B, Simonson B, Savikko H, Geiger H. 1999. Alaska commercial salmon catches, 1878–1997. Regional Information Report No. 5J99-05. ADF&G, Division of Commercial Fisheries. Juneau. 66p.

Cooley R. 1963. Politics and conservation: the decline of the Alaska salmon. Harper and Row, NY. In: Royce WF. 1989. Managing Alaska's salmon fisheries for a prosperous future. Fisheries 14(2):8–13.

Crane P, Templin W, Seeb L. 1996. Genetic stock identification of Alaska chinook salmon. Regional Information Report No. 5J96-17. ADF&G, Division of Commercial Fisheries. Anchorage.

Davis B, Allee B, Amend D, Bachen B, Davidson B, Gharrett T, Marshall S, Wertheimer A. 1985. Genetic Policy Review Team: Alaska Department of Fish and Game genetic policy. FRED Special Report. Juneau.

Davis B, Burkett B. 1989. Background of the genetic policy of the Alaska Department of Fish and Game. FRED Report No. 95. ADF&G, FRED Division. Juneau. 13 p.

Davis B, Olito C. 1982. Genetic variation in Alaskan chum salmon (Oncorhynchus keta). Informational Leaflet No. 200. ADF&G, Division of Commercial Fisheries. Juneau. 14p.

Dittman A, Quinn T, Dickhoff W, Larsen D. 1994. Interactions between novel water, thyroxine and olfactory imprinting in underyearling coho salmon (Oncorhynchus kisutch, Walbaum). Aquacult. Fish. Manage. 25(Suppl.2):157–169.

Dittman A, Quinn T, Nevitt G. 1996. Timing of imprinting to natural and artificial odors by coho salmon (Oncorhynchus kisutch). Can. J. Fish. Aquat. Sci. 53:434–442.

Edfelt L. 1973. Statistical history of Alaska salmon catches. ADF&G, Division of Commercial Fisheries.

Eliason D, Cotton S, Hoffman L, Zharoff F, Jones L, Taylor R. 1992. Legislative review of the Alaska salmon enhancement program: Final Report. Alaska State Senate Special Committee on Domestic & International Commercial Fisheries. 3 vol.

Farrington C. 2003. Alaska salmon enhancement program 2002 annual report. Regional Information Report No. 5J03-05. Alaska Department of Fish and Game, Division of Commercial Fisheries. Juneau. 39 p.

Farrington C. 2004. Alaska salmon enhancement program 2003 annual report. Regional Information Report No. 5J04-02. Alaska Department of Fish and Game, Division of Commercial Fisheries. Juneau. 40 p.

Farrington C, McGee S, Reifenstuhl S, Freitag G, Holmes R, Thrower F, Josephson R. 2004. 2003 Annex chinook salmon plan for Southeast Alaska. Regional Information Report No. 5J04-03. ADF&G, Division of Commercial Fisheries. Douglas.

Flagg T, Berejikian B, Colt J, Dickhoff W. 2000. Ecological and behavioral impacts of artificial production strategies on the abundance of wild salmon populations—a review of practices in the Pacific Northwest. NOAA Tech. Memo. NMFS–NWFSC-4. Northwest Science Center, Seattle, WA.

Food and Agriculture Organization of the United Nations. 1996. Precautionary approach to capture fisheries and species introductions. Elaborated by the Technical Consultation on the Precautionary Approach to Capture Fisheries (Including Species Introductions). Lysekil, Sweden, 6–13 June 1995. FAO Technical Guidelines for Responsible Fisheries No. 2. Rome, FAO. 54p. (download at ftp://ftp.fao.org/fi/document/techguid/fishpre2.pdf).

Frenette B, Bryant M. 1993. The Margaret Lake monitoring program: assessment of the resident cutthroat trout, Dolly Varden char, and introduced anadromous salmonids, Progress report for 1994. USDA–PNW Research Station, Forestry Sciences Laboratory, Juneau.

Fukuwaka M, Suzuki T. 1999. Density-dependence in the Japan Sea coastal waters for chum salmon. Subarctic Fisheries Resources Division, Hokkaido National Fisheries Research Institute and Research Division, National Salmon Resources Center *in* The North Pacific Anadromous Fish Commission International Symposium: Recent changes in ocean production of Pacific salmon. November 1–2, 1999. Juneau, Alaska, USA.

Gaudet D. 2002. Atlantic salmon: a white paper. Alaska Department of Fish and Game, Office of the Commissioner, Pacific Salmon Commission. Juneau. 12 p.

Geiger H, Cartwright M, Clark J, Conitz J, Heinl S, Jensen K, Lewis B, McGregor A, Riffe R, Woods G, Zadina T. 2003. Sockeye salmon stock status and escapement goals in Southeast Alaska. Regional Information Report No. 1J03-04. Alaska Department of Fish and Game, Division of Commercial Fisheries. Juneau.

Gharrett A, Shirley S, Tromble G. 1987. Genetic relationships among populations of Alaskan chinook salmon (Oncorhynchus tshawytscha). Canadian Journal of Fisheries Aquatic Science 44(4):765–774.

Grau E, Fast A, Nishioka R, Bern H. 1985. The effects of transfer to novel conditions on blood thyroxine in coho salmon. Aquaculture 45:377.

Groot C, Margolis L. eds. 1991. Pacific salmon: life histories. University of British Columbia. Vancouver, B.C.

Groot C, Quinn T, Hara T. 1986. Responses of migrating adult sockeye salmon (Oncorhynchus nerka) to population-specific odours. Can. J. Zool. 64:926–932.

Guthrie C, Helle J, Aebersold G. 1994. Preliminary report on the genetic diversity of sockeye salmon populations from Southeast Alaska and northern British Columbia. Proc. Rep. 94-03. Juneau, AK: National Marine Fisheries Service, Auke Bay Fisheries Laboratory, Alaska Fisheries Science Center.

Halupka K, Bryant M, Willson M, Everest F. 2000. Biological characteristics and population status of anadromous salmon in Southeast Alaska. Gen. Service, Pacific Northwest Research Station. 225p. (download at http://www.fs.fed.us/pnw/pubs/gtr468/pdf)

Hanski I, Gilpin M. 1991. Metapopulation dynamics: brief history and conceptual domain. Biol. Journ. Of Linnean Society 42:3–16.

Hard J. 1995. Genetic monitoring of life-history characters in salmon supplementation: problems and opportunities. American Fisheries Symposium 15:212–225.

Hartman J, Rawson K. 1984. Hatchery broodstock development and facility benefit-cost models for public fisheries enhancement. FRED Report Series No. 25. Alaska Department of Fish and Game, Division of Fisheries Rehabilitation, Enhancement and Development.

Hartman J. 1986. An analysis of the net benefits of existing and proposed enhancement projects for the state of Alaska. FRED Report Series No. 64. Alaska Department of Fish and Game, Division of Fisheries Rehabilitation, Enhancement and Development.

Hartman J. 1994. A preliminary estimate of income and employment impacts from private nonprofit enhancement projects for harvest years 1989 to 1993. Unpublished. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development.

Heath D, Heath J, Bryden C, Johnson R, Fox C. 2003. Rapid evolution of egg size in captive salmon. Science 299:1738–1740.

Heard W. 1991. Life history of pink salmon. In: Pacific Salmon Life Histories. C. Groot and Margolis, editors. UBC Press. Vancouver, B.C.

Heard W. 1996. Sequential imprinting in Chinook salmon: is it essential for homing fidelity? Bull. Natl. Res. Inst. Aquacult., Suppl. 2: 59–64

Heinl S, Zadina, T, McGregor A, Geiger, H. 2003. Chum salmon stock status and escapement goals in Southeast Alaska. Regional Information Report No. 1J03-08. Alaska Department of Fish and Game, Division of Commercial Fisheries. Juneau.

Hofmeister K. 1987. King and coho smolt predation on pink and chum salmon in nearshore saltwater nursery areas of southern Southeast Alaska. *in* Proceedings of the 1987 Northeast Pacific Pink and Chum Salmon Workshop, Anchorage, AK. February 18–20, 1987. ADF&G.

Holland J, Bachen B, Freitag G, Kissner P, Wertheimer A. 1983. Chinook salmon plan for Southeast Alaska: a species specific adjunct to the S.E. regional comprehensive salmon plan per provisions of AS 16.10.375. NMFS, NSRAA, USFS, SSRAA, ADF&G.

Holmes R, Burkett R. 1996. Salmon stewardship: Alaska's perspective. Special issue on Southeastern Alaska and British Columbia salmonid stocks at risk. Fisheries 21(10)36–38.

Jeans C, Whistler G, Palmateer B, Mickle M, Peterson K. 2003. Fisheries enhancement revolving loan fund: program overview. 4th ed. Alaska Department of Community and Economic Development, Division of Investments, Edgar Blatchford, Commissioner, Greg R. Winegar, Director. Juneau.

Jeans C, Whistler G, Mickle M, Macaulay A. 2004. Fisheries enhancement revolving loan fund: program overview. 4th ed. Alaska Department of Community and Economic Development, Division of Investments, Edgar Blatchford, Commissioner, Greg R. Winegar, Director. Juneau.

Kallenberger M, Timothy G. 2004. Report to the Board of Fisheries: summary of the 2002 Southeast Alaska/Yakutat commercial, personal use, and subsistence salmon fisheries. Regional Information Report No. 1J04-01. ADF&G, Division of Commercial Fisheries, Douglas. 28p.

Kondzela C, Guthrie C, Hawkins, S. 1994. Genetic relationships among chum salmon populations in Southeast Alaska and northern British Columbia. Can. Journ. Fish. Aquat. Sci. 51(Suppl. 1):50–64.

Knapp G. 2001. Challenges and strategies for the Alaska salmon industry. Institute of Social and Economic Research, University of Alaska, Anchorage. 26p.

Labelle M. 1992. Straying patterns of coho salmon (Oncorhynchus kisutch) stocks from southeast Vancouver Island, British Columbia. Can. J. Fish. Aquat. Sci. 49: 1843–1855.

Lewis, B, Zadina T. 2002. The history of subsistence and commercial fisheries, stock assessment and enhancement activities, and watershed disturbances in the Klawock Lake drainage on Prince of Wales Island. 2000 Annual Report. Regional Information Report No. 1J01-39 REVISED. A final project report to the U.S. Forest Service fulfills obligations for Sikes Act Contract No. 43-0109-0-0111 Study No. FIS00-043. ADF&G, Division of Commercial Fisheries. Juneau.

Lichatowich J, Rahr III G, Whidden S, Steward C. 2000. Sanctuaries for Pacific salmon. Pages 675-686 *in* E. E. Knudsen et al., editors. Sustainable fisheries management: Pacific salmon. CRC Press. Boca Raton.

Lin R, Rivas E, Grau E, Nishioka R, Bern H. 1985, Changes in plasma thyroxine following transfer of young coho salmon (Oncorhynchus kisutch) from fresh water to salt water. Aquaculture 45:381–382.

Lindauer S, Hartman J. 1984. An analysis of net benefits from proposed capital improvement investments in state salmon hatcheries. FRED Report Series No. 24. Alaska Department of Fish and Game, Division of Fisheries Rehabilitation, Enhancement and Development.

McDaniel T, Pratt K, Meyers T, Ellison T, Follett J, Burke J. 1994. Alaska sockeye salmon culture manual. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Special Publication No. 6. Juneau.

McDowell Group. 2001. Economic impacts of the private nonprofit aquaculture associations of Southeast Alaska. Prepared for DIPAC, Juneau; NSRAA, Sitka: SSRAA, Ketchikan.

McGee A. 1995. The hatchery program and protection of wild salmon in Alaska: policies and regulations. ADF&G, Commercial Fisheries Management and Development Division. January.

McGee S. 1999. Report to the Alaska Board of Fisheries on the status of private nonprofit salmon hatcheries. ADF&G, Division of Commercial Fisheries. November.

McGee S. 2003. Salmon hatcheries in Alaska: plans, permits, and policies that provide protection for wild stocks. Contribution PP-236 ADF&G, Division of Commercial Fisheries. Juneau. 23p.

McGregor A. 1983. A biochemical genetic analysis of pink salmon (Oncorhynchus gorbuscha) from selected streams in northern Southeast Alaska. ADF&G, Division of Commercial Fisheries, Informational Leaflet No. 213.

McIsaac D, Quinn T. 1988. Evidence for a hereditary component in homing behavior of chinook salmon (Oncorhynchus tshawytscha). Can. J. Fish. Aquat. Sci. 45:2201–2205.

McMichael G, Pearsons T, Leider S. 2000. Minimizing ecological impacts of hatchery-reared juvenile steelhead trout on wild salmonids in a Yakima Basin watershed in Knudsen, E. E. and others, editors. Sustainable fisheries management: Pacific salmon, 365–380.

McNair M. 2001. Alaska salmon enhancement program 2000 annual report. Regional Information Report No. 5J01-01. Alaska Department of Fish and Game, Division of Commercial Fisheries. Juneau. 35 p.

McNair M. 2002a. Alaska salmon enhancement program 2001 annual report. Regional Information Report No. 5J02-04. Alaska Department of Fish and Game, Division of Commercial Fisheries. Juneau. 36 p.

McNair M. 2002b. Annual report to the Joint Northern/Southern Southeast Regional Planning Team. Unpublished report.

McPherson S, Bernard D, Clark J, Pahlke K, Jones E, Der Hovanisian J, Weller J, Ericksen R. 2003. Stock status and escapement goals for chinook salmon stocks in Southeast Alaska. Special Publication 03-01. Alaska Department of Fish and Game, Division of Sport Fish.

Meacham C, Clark J. 1994. Pacific salmon management—the view from Alaska. Alaska Fisheries Research Bulletin. 1(1):76–80.

Meyers T, Burton T. 2002. Perspective on hatchery disease and wildstocks. Alaska Chapter American Fisheries Society presentation. Girdwood. October.

Monagle K. 2003. Report to the Board of Fisheries, status of the allocation of enhanced fish, Southeast region. Regional Information Report No. IJ03-09. ADF&G, Division of Commercial Fisheries. Douglas. February. 19p.

Morin P, Dodson J, Dore F. 1989. Thyroid activity concomitant with olfactory learning and heart rate changes in Atlantic salmon, Salmo salar, during smolitification. Can. J. Fish. Aquat. Sci. 46:131–136.

Mortensen D, Wertheimer A, Maselko J, Taylor S. 2002. Survival and straying of Uke Creek, Alaska, pink salmon marked with coded wire tags and thermally induced otolith marks. Trans. Amer. Fish. Soc. 131:14–26.

Orth D. 1971. Dictionary of Alaska place names. Geological Survey Professional Paper No. 567. U.S. Dept. of the Interior. Geological Survey. United States Government Printing Office, Washington. 1084 p.

Orth F. 1977. The economic feasibility of private nonprofit salmon hatcheries. Alaska Sea Grant Program, Report 77-4, University of Alaska, School of Management, Fairbanks. Grant #04-7-158-44006, NOAA Office of Sea Grant, Department of Commerce. 99p.

Pearsons T, Hopley C. 1999. A practical approach for assessing ecological risks associated with fish stocking programs. Fisheries 24(9):16–23.

Pennoyer S. 1985. Regional planning team charter comprehensive salmon planning. ADF&G, Division of Fisheries Rehabilitation, Enhancement and Development. Juneau. Approved 1/8/85. 8 p.

Quinn T. 1993. A review of homing and straying of wild and hatchery-produced salmon. Fisheries Research Bulletin 18:29–44.

Quinn T, Tolson G. 1986. Evidence of chemically mediated population recognition in coho salmon (Oncorhynchus kisutch) Can. J. Zool. 64:84–87.

Reifenstuhl S, Blair C. 1999. Northern Southeast Aquaculture Association cost-benefit analysis: prepared for NSSRA Board of Directors meeting November 1999. Updated February 2003. 11p.

Reimchen T, Mathewson D, Hocking M, Moran J, Harris D. 2003. Isotopic evidence for enrichment of salmon-derived nutrients in vegetation, soil, and insects in riparian zones in coastal British Columbia. Pages 59–69 *in* J.G. Stockner, editor. Nutrients in salmonid ecosystems: sustaining production and biodiversity. American Fisheries Society, Symposium 34, Bethesda, Maryland.

Ricker W. 1962. Regulation of the abundance of pink salmon populations. In: N. Willimovsky, editor. Symposium on pink salmon. H.R. MacMillan lectures in fisheries. Vancouver, B.C.: University of British Columbia: 155–202.

Ricker W. 1972. Hereditary and environmental factors affecting certain salmonid populations. Pages 19–160 *in* R.C. Simon and P.A. Larkin, editors. The stock concept in Pacific salmon. University of British Columbia, Vancouver.

Roppel P. 1982. Alaska's salmon hatcheries 1891–1959. Alaska Historical Commission Studies in History No. 20. National Marine Fisheries Service. ADF&G, FRED Division. Juneau. 299p.

Rosier C. 1994. Policy and requirements for fish resource permits. Alaska Department of Fish and Game, Commissioner's Office. Juneau.

Royce W. 1989. Managing Alaska's salmon fisheries for a prosperous future. Fisheries 14(2):8–13.

Sharp D, Sharr S, Peckham C. 1994. Homing and straying patterns of coded wire tagged pink salmon in Prince William Sound. Proceedings of the 16th Northeast Pacific Pink and Chum Salmon Workshop. Alaska Sea Grant Rep. 94-02:77–82.

Shaul L, McPherson, Jones E, Crabtree K. 2003. Stock status and escapement goals for coho salmon stocks in Southeast Alaska. Special Publication No. 03-02. Alaska Department of Fish and Game, Southeast Region.

Smoker W, Bachen B, Freitag G, Geiger H, Linley T. 2000. Alaska ocean ranching contributions to sustainable salmon fisheries. Pages 407–420 *in* E. Knudsen, C. Steward, D. MacDonald, J. Williams, and D. Reiser, editors. Sustainable Fisheries Management Pacific Salmon. USGS, NOAA, Pacific Salmon Foundation, Fisheries and Oceans Canada. CRC Press LLC. Boca Raton.

Solazzi M, Nickelson T, Johnson S. 1991. Survival, contribution, and return of hatchery coho salmon (Oncorhynchus kisutch) released into freshwater, estuarine, and marine environments. Can. J. Fish. Aquat. Sci. 48:248–253.

State Pathology Review Committee: Meyers T, Krasnowski P, Amend D, Bachen, B, Cochran J, Hauck K, Rawson K, Saft R. 1988. Regulation changes, policies and guidelines for Alaska fish and shellfish health and disease control. ADF&G, CFMD Division. 76 p.

Tallman R, Healy M. 1994. Homing, straying, and gene flow among seasonally separated populations of chum salmon (Oncorhynchus keta). Can. J. Fish. Aquat. Sci. 51:577–588.

Thedinga J, Wertheimer A, Heintz R, Maselko J, Rice S. 2000. Effects of stock, coded-wire tagging, and transplant on straying of pink salmon (Oncorhynchus gorbuscha) in southeastern Alaska. Can.Journ. Fish Aquat. Sci. 57(10):2076–2085.

USDA Forest Service. 1997. Tongass National Forest Land and Resource Management Plan.

Van Alen B. 2000. Status and stewardship of salmon stocks in Southeast Alaska. Pages 161–194 *in* E.E. Knudsen, C.R. Steward, D.D. McDonald, J.E. Williams, D.W. Reiser, editors. Sustainable fisheries management: Pacific salmon. CRC Press. Boca Raton.

Wipfli M, Hudson J, Caouette J. 1998. Influence of salmon carcasses on stream productivity: response of biofilm and benthic macroinvertebrates in southeastern Alaska, U.S.A. Can. J. Fish. Aquat. Sci. 55:1503–1511.

Withler R. 1997. Conclusions of panel *In*: Grant, W.S., editor. Genetic effects of straying of non-native hatchery fish into natural populations: proceedings of the workshop. U.S. Dep. Commer., NOAA Tech Memo. NMFS-NWFSC-30,130 p.

Wright B, Bryant M, Porter P, Frennette B. 1997. Assessment of introduction of coho salmon in to the Slippery Lake drainage, 1988 through 1991. UDDAFS, PNW Research Station, Juneau.

Zadina T, Heinl S, McGregor A, Geiger H. 2003. Pink salmon stock status and escapement goals in Southeast Alaska and Yakutat. Regional Information Report No. 1J03-06. Alaska Department of Fish and Game, Division of Commercial Fisheries. Juneau.

LIST OF TERMS

ADF&G—Alaska Department of Fish and Game—agency of the state responsible for management of fish and wildlife resources.

AKI—Armstrong-Keta, Inc., PNP operator of Port Armstrong Hatchery.

allocation—the granting of specific harvest privileges, usually by regulation, among or between user groups (i.e., commercial, sport, personal use, or subsistence fishermen) by Board of Fisheries). Allocation includes quotas, time periods, area restrictions, percentage sharing of stocks, and other management measures providing or limiting harvest opportunities.

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

allele—one member of a pair or series of genes that occupy a specific position on a specific chromosome.

aquaculture—culture or husbandry of salmon or other aquatic fauna/flora.

anadromous—fish such as salmon that are born in fresh water, migrate and feed in a marine environment, and return to natal freshwater systems to spawn.

biological escapement goal (BEG)—escapement of salmon that provides the greatest potential for maximum sustained yield.

Board of Fisheries—this body is composed of seven members appointed by the governor and confirmed by the legislature. Its main role is to conserve and develop the fishery resources of the state and allocate resources among competing users, which involves setting seasons, bag limits, methods and means for the state's commercial, sport, guided sport, subsistence, and personal use fisheries, and policies and direction for the management of the state's fishery resources.

broodstock—salmon contributing eggs and milt for supplemental culture purposes.

BCF—Burro Creek Farms, PNP operator of Burro Creek Hatchery.

coded wire tag—magnetically detectable pinhead-sized tag implanted in the nose of juvenile salmon for the purpose of identifying these fish as adults.

commissioner—principal executive officer of ADF&G.

commissioner approval—formal acceptance of a comprehensive salmon plan or other regional planning team products by the commissioner.

comprehensive salmon plan—statutorily mandated strategic plan for a specific region to supplement natural production and rehabilitate natural stocks over a specified period of time.

criteria—accepted means for evaluating programs, project proposals, and operations.

depressed stock—a unique population of salmon that is currently producing at levels far below its historical levels.

DIPAC—Douglas Island Pink and Chum, Inc., PNP operator of Sheep Creek, Macaulay, and Snettisham hatcheries.

diversity—in a biological context it means the range of variation exhibited within any level of organization, such as among genotypes within a salmon population, among populations within a salmon stock, among salmon stocks within a species, among salmon species within a community, or among communities within an ecosystem.

enhancement—strategies designed to (1) supplement the harvest of naturally produced salmon species by using artificial or semi-artificial production systems (2) increase the amount of production in a natural habitat through physical or chemical changes or (3) apply procedures to a salmon stock to supplement the numbers of harvestable fish to a level beyond what could be naturally produced.

escapement—salmon that successfully pass through various fisheries and return to fresh water to spawn (i.e., spawning ground or hatchery raceway).

exvessel value—first buyer price paid to the commercial fishermen for their harvest.

eyed egg—stage of development in salmon when pigmentation of the eyes of the embryo becomes visible.

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

fingerling—stage in development of salmon between fry and smolt.

fish pass—fish ladder to enable salmon to get past a barrier (e.g., waterfall) to reach spawning grounds.

FRED—former Division of Fisheries Rehabilitation, Enhancement and Development within the Alaska Department of Fish and Game.

fry—stage in development of salmon beginning with emergence from gravel and ending when it doubles its weight.

genotypic—those characteristics of an individual or group of salmon that are expressed genetically, such as allele frequencies or other genetic markers.

goals—broad statements of what the regional planning team anticipates accomplishing within specified period of the comprehensive salmon plan.

gillnet (drift)—a commercial fishing method with a net consisting of a single sheet of webbing hung between cork line and lead line designed (1) to catch fish by entanglement in the mesh, (2) to be fished from the surface of the water by a vessel, and (3) to not be staked, anchored, or otherwise fixed.

green egg—stage in development of salmon from ovulation until the eye becomes visible in the egg (i.e., eyed egg).

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

instream incubator—a device located adjacent to a stream that collects water from the stream for the purpose of incubating and hatching salmon or trout eggs.

KNFC—Kake Nonprofit Fisheries Corporation, PNP operators of Gunnuk Creek Hatchery.

KTHC—Ketchikan Tribal Hatchery Corporation, PNP operators of Deer Mountain Hatchery.

limnology—scientific study of physical, chemical, meteorlogical, and biological conditions in fresh water.

MIC—Metlakatla Indian Community, Tribal/BIA operators of Tamgas Creek Hatchery.

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

natural production—salmon that spawn, hatch, and rear without human intervention (i.e., in natural freshwater and marine environments).

NMFS—National Marine Fisheries Service, federal operators of Auke Bay and Little Port Walter Hatcheries (experimental/educational facilities).

NSRAA—Northern Southeast Regional Aquaculture Association, PNP operators of Medvejie Creek, Hidden Falls Hatcheries and Haines Projects.

otolith—calcified ear bones of salmon (and other fish). Ear bones may be used to determine the age of a fish and can be imprinted with characteristic markings (i.e., rings) by modulating water temperature during culture for later use in identifying fish from a particular hatchery.

otolith marking—manipulation of water temperature in a hatchery environment can produce distinctive otolith banding patterns in juvenile salmon, and these patterns can be used to identify specific stocks of enhanced fish or to differentiate these specific stocks between other enhanced stocks or wild stocks.

Pacific salmon:

chinook (king)—*Oncorhynchus tshawytscha*
chum (dog)—*Oncorhynchus keta*
coho (silver)—*Oncorhynchus kisutch*
pink (humpy or humpback)—*Oncorhynchus gorbuscha*
*s*ockeye (red)—*Oncorhynchus nerka*

personal-use fishing—harvesting, fishing for, or possessing finfish, shellfish, or other fish resources using gill or dip net, seine, fish wheel, long line, or other means defined by the Board of Fisheries by Alaska residents for personal use (but not for sale or barter).

phenotypic—observable physical or biochemical characteristics of an organism as determined by both genetic makeup and environmental influence.

plan development and maintenance—composing, drafting, revising, finalizing, reviewing, and updating the comprehensive salmon plan.

PNP hatchery permit application—request presented by a private nonprofit corporation to ADF&G for authorization to operate a private nonprofit hatchery.

POWHA—Prince of Wales Hatchery Association, PNP operators of Klawock Hatchery.

private nonprofit (PNP)—operational status of a private-sector corporation without profit motives.

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

recruitment—upcoming generation of salmon.

regional aquaculture association (RAA)—statutorily-based (AS 16.10.380) nonprofit corporation composed of representatives of fisheries user groups organized for the purpose of producing salmon.

regional planning team (RPT)—statutorily-mandated planning group composed of ADF&G staff and regional aquaculture association representatives organized for the purpose of developing a comprehensive salmon plan and making annual recommendations to the commissioner on production changes to salmon enhancement projects to comply with allocation plans.

rehabilitation—strategy directed towards restoring depressed natural stocks to previous (i.e., historical) levels of production using management, habitat protection, enhancement, and rehabilitation strategies.

return—total number of salmon in a stock from a single brood (spawning) year surviving to adulthood; the total return includes mature salmon from a single brood year, including harvest and escapement.

roe—salmon eggs.

run—total number of salmon in a stock surviving to adulthood and returning in a calendar year to vicinity of natal stream; it is composed of both harvest and escapement.

salmon stock—a locally interbreeding group of salmon that is distinguished by a distinct combination of genetic, phenotypic, life history, and habitat characteristics or an aggregation of two or more interbreeding groups which occur within the same geographic area and is managed as a unit.

seine (purse)—a commercial fishing method using a net designed to surround salmon and then close at the bottom by means of a free-running line through one or more rings attached to a lead line.

SJC—Sheldon Jackson College, PNP operators of Sheldon Jackson Hatchery.

smolt—salmon (also trout and charr) that have passed through the physiological process of becoming ready to migrate to salt water.

spawn—(verb) to produce or deposit eggs—(noun) a mass of spawned eggs.

spawning channel—engineered addition to natural salmon spawning habitat in which water flow, substrate, sedimentation, and predation are controlled to increase egg-to-fry survivals.

sport fishery—taking or attempting to take for personal use (and not for sale or barter) any freshwater, marine, or anadromous fish by hook and line held in the hand or by hook and line attached to a pole or rod that is held in the hand or closely attended or by other means defined by the Board of Fisheries.

SSRAA—Southern Southeast Regional Aquaculture Association, PNP operators of Whitman Lake, Neets Bay, Burnett Inlet, and Crystal Lake Hatcheries.

stock of concern—a stock of salmon for which there is a yield, management, or conservation concern.

subsistence fishery—taking of, fishing for, or possession of fish, shellfish, or other fish resources by a resident domiciled in a rural area of the state for subsistence uses with a gillnet, seine, fish wheel, longline, or other means defined by the Board of Fisheries.

supplemental production—salmon produced by methods other than natural spawning; for example, enhancement and/or rehabilitation techniques.

terminal fisheries—those fisheries conducted in a (1) special harvest area (SHA) where hatchery managers harvest returning enhanced salmon for cost recovery or (2) terminal harvest area (THA) where commercial fishermen harvest returning enhanced salmon.

thermal mark (TM)—discrete complex of rings on otolith resulting from temperature manipulations to identify a specific broodstock or group of fish.

troll—a commercial fishing method consisting of a line or lines with lures or baited hooks that are drawn through the water from a vessel and retrieved by hand power or hand-powered crank (hand troll) or drawn and retrieved by electrical, hydraulic, mechanical or other assisting devices or attachments (power troll).

user group—identification by method and/or reason for harvesting salmon (commercial, sport, personal-use, or subsistence).

weir—fence, dam, or other device placed in a stream or river to regulate the upstream movement of returning salmon for enumerating or holding purposes.

wild stock—any stock of salmon that spawns naturally in a natural environment and is not subject to human intervention pertaining to egg deposition, incubation, or rearing.

zooplankton—free-swimming, drifting, or floating organisms, mostly microscopic in size, that are found primarily in open water and are an important source of food for juvenile salmon.

APPENDIX A

The following past projects are listed in the phase I and phase II comprehensive salmon plans or in the periodic updates of those documents; they have passed preliminary screening by their respective regional planning teams and have been recommended for implementation. This listing has been organized on a regional basis and contains projects that have been implemented as well as those that have been dropped from consideration. Although information on some of the discarded projects is limited, an attempt has been made to describe them in order to provide a historic record as well as a reference for future potential implementation. The projects that have been relegated to the region-wide list deal with general issues of concern related to wildstock assessment and management, habitat quality, and enhancement.

Phase I and Phase II Projects Located in Southern Southeast[56]

1. Stock separation, mainland systems

Originally proposed for just the Behm Canal systems, coded wire tagging was initiated on Chickamin (1983 to 1988) and Unuk wild stock chinook (1983 to 1988, and 1993 to 2000). A NOAA-funded study began in 1995; the goal was to genetically define chinook stocks statewide through the allozyme electrophoresis technique. Samples have been collected from the following Southeast mainland systems: Chickamin River (and two derivative hatchery stocks), Unuk River (and one derivative hatchery stock), Farragut River, and Chilkat River (four tributaries). The final project report is in Crane et al. (1996).

2. Nakat Inlet hatchery production

Nakat Inlet is located on the mainland in the southern portion of Misty Fiords National Monument Wilderness about 60 miles southeast of Ketchikan; it lies adjacent to the U.S./Canada border on Pearse Canal. Staff from SSRAA have released coho there since 1986, and fall chum since 1983. Initially Nakat Inlet was considered for a hatchery site; however, a suitable water source and the remoteness of the site were problems that were not surmounted.

3. Hidden Inlet hatchery production

Hidden Inlet is located on the mainland in the southern portion of Misty Fiords National Monument Wilderness about 60 miles southeast of Ketchikan; it lies adjacent to the U.S./Canada border on Pearse Canal. This project was not pursued because of problems associated with the site's remoteness as well as its lack of a suitable water source. There was also the potential of Canadian fishermen intercepting returning adults.

4. Marx Creek Enhancement

Marx Creek is located adjacent to Fish Creek in the Salmon River system near Hyder at the head of Portland Canal. This project enhances the spawning and rearing habitat for coho by utilizing a spawning channel originally constructed for chums and modifying a small tributary of Marx Creek extending north of the spawning channel to improve access to additional rearing habitat. As of June 2004 this project had not been implemented.

5. Marx Creek spawning channel

Marx Creek is located on the mainland near Hyder; it flows into the Salmon River, which drains into Portland Canal. In 1985 Forest Service staff developed Marx Creek and then extended it to its present length of 1.8 km in 1989. From 1986 to 1989, in order to decrease the time necessary for full colonization, ADF&G captured adult chum salmon from adjacent Fish Creek and placed them in the spawning channel. In 1996 ADF&G completed a 4-year study that correlated the escapement of adult chum salmon with subsequent fry production. The data suggest that incubation survivals of approximately

---

[56] Although representative of the majority of phase I and phase II projects located in the southern Southeast region, the list of projects presented here is not comprehensive; some may have been inadvertently excluded.

30% can be expected over a wide range of spawner densities; the highest density was 0.78 female/m^2.

6. Bryce Creek

Bryce Creek is a tributary to the Salmon River, which is located on the mainland near Hyder. In 1987 it was proposed as a site for a spawning channel to increase chum production; however, further analysis indicated chum spawning habitat to be abundant and the system rearing-limited for coho production. In 1992 the Forest Service excavated a channel from adjacent Fish Creek into sloughs and ponds of the Salmon River valley to provide access to 29,200 m^2 of coho rearing habitat. To evaluate migration patterns and contributions to fisheries, ADF&G coded-wire-tagged coho juveniles from 1993 to 1995. The Forest Service then modified the lower end of Bryce Creek in 1995 to allow easier smolt migration. Maintenance occurs at this site on an as-needed basis.

7. Hall Cove

Hall Cove is located on the south end of Duke Island, which lies a few miles south of Annette Island. This system, about 20 miles south of Metlakatla, has been identified as a potential site for filling a portion of the coho production objectives set out in the phase I comprehensive salmon plan by planting fish there. In phase II of the comprehensive salmon plan, it was recommended as a site for examining the feasibility of this technique; however, this project has not been prioritized.

8. Feasibility of hatchery production in Boca de Quadra

Boca de Quadra is a 35-mile inlet east of Revillagigedo Channel and south of East Behm Canal; it runs northeast into the Misty Fiords National Monument Wilderness. It is considered the only feasible area for large-scale chinook production in the inside waters of southern Southeast. Based on coho tag recovery data from other facilities in the southern end of the region, coho released from this site would be expected to add to the harvest in the common property fisheries in all six units of the southern Southeast region.

9. Stock separation, Boca de Quadra

Boca de Quadra is a 35-mile inlet east of Revillagigedo Channel and south of Behm Canal; it runs northeast into the Misty Fiords National Monument Wilderness. It became apparent that a tagging program in this system would be difficult & expensive because of the need for helicopter support.

10. Red River

Red River is located on the mainland about 50 miles southeast of Ketchikan; it drains into the headwater of Marten Arm, which flows into Boca de Quadra in the Misty Fiords National Monument Wilderness. A proposal to construct fish passes around two barrier falls (i.e. 18 to 20 feet high and 12 to 15 feet high) is included in the phase II regional comprehensive salmon plan. The project would provide access to 56 acres of stream habitat; potentially 9,200 coho and 900 chinook could be produced annually. A feasibility study was in progress in 1985 and 1986; although it was given low priority in the 1987 annual update to the forest plan and rescheduled for 1993, the project was not pursued because of the system's wilderness status.

11. Keta River broodstock development
The Keta River is located on the mainland about 50 miles west of Ketchikan; it drains into Boca de Quadra. It is considered one of the minor chinook producing systems in Behm Canal. The proposed broodstock development in this system was not pursued.

12 Marten River
Located 40 miles east-southeast of Ketchikan on the mainland, the Marten River flows into Marten Arm in Boca De Quadra. A partial barrier falls in this system that blocked access for chinook, coho, and steelhead was modified with explosives in 1987 at a cost of $250,000. Based on a 1992 snorkeling survey of species above the falls, the system appeared to be fully passable. Upstream surveys in 1995 indicated utilization by chinook, coho, and steelhead, although no numbers are available. The system is no longer being monitored. The Marten River chinook stock was considered for broodstock development in 1983, but the idea was not pursued.

13. Hugh Smith weir
Hugh Smith Lake is located on the mainland approximately 55 miles south of Ketchikan. Since the late 1970s, lake fertilization and, more recently, sockeye fry plants (1.5 million annually) have been conducted there. The weir has been a long-term project used by management staff for index counts for coho. Since 1982 both coho and sockeye smolts and adults have been counted, and in some years coho smolts have been coded-wire-tagged. Otolith marking of all planted sockeye fry has been initiated to identify that contribution to the total sockeye production of the lake.

14. Whitman Lake Hatchery sockeye program
Whitman Lake Hatchery is located on Revillagigedo Island and is accessible by road. It is approximately 10 miles from downtown Ketchikan. The Whitman Lake system drains into Herring Bay next to George Inlet. Its initial PNP hatchery permit included production of 2.5 million sockeye, and SSRAA tested experimental groups for disease and cultural feasibility in 1985 and 1986. Positive results led to initiation of a PNP hatchery permit application for a sockeye program at SSRAA's Beaver Falls facility.

15. Stock separation, Bradfield Canal
The Bradfield Canal is located off the mainland east of the southern portion of Wrangell Island and off Blake channel; it's about 30 miles southeast of Wrangell. A stock separation study was proposed for chinook in 1983, but stock levels were too low in 1984 to effectively determine migration routes by coded wire tag studies. In 1989, 11,000 chums were tagged in the Harding River to identify the location of the harvest; tags were recovered only in the District 7 purse seine fishery in 1993. Harding River chinook from the 1989 and 1990 brood years that were cultured at Burnett Inlet Hatchery and released back into the Harding River were intercepted in the commercial troll, seine, and gillnet fisheries and the sport fishery. All of the troll recoveries were from inside waters, which indicates the stock may be ideal for producing Alaska harvests. Troll harvests on the chinook releases occurred through 1995. Tags were recovered from sport fisheries in Districts 2, 7, and 11; gillnet fisheries in Districts 6 and 8; and the seine fishery in District 7.

16. Lucky Cove Creek
Located 15 miles southeast of Ketchikan, Lucky Cove Creek is situated on the southern end of Revillagigedo Island between Thorne Arm and East Behm Canal. A bedrock falls barrier exists 0.8 miles from salt water that blocks access by chum and pink salmon; it is also a flow-dependant barrier to coho. The system contains approximately six miles of stream and 270 acres of lake habitat, of which stream surveys confirmed minimal escapement and underutilization. A stocking project was proposed in conjunction with a proposed fish pass project. In the mid-1980s the endemic stock was also considered as a brood stock source for development of a summer coho program at Deer Mountain Hatchery. A fish pass was designed in 1985. This project was considered a high priority in the 1986 annual update of the forest plan, but it was removed from the project schedule in the 1987 update. The fish pass was shelved, and as of June 2004 no enhancement activity had occurred there.

17. Beaver Falls Hatchery sockeye program
The Beaver Falls Hatchery is located on the Ketchikan road system east of Silvis Lake. Its sockeye program was begun by ADF&G in 1985; in 1990 the operations and programs were transferred to SSRAA, who had operated an additional sockeye program in another building at Beaver Falls since 1987. In 1997 SSRAA moved the entire sockeye program to Burnett Inlet Hatchery. During its 12-year existence, the total Beaver Falls program provided 33.4 million fry to McDonald, Virginia, Hugh Smith, Badger/ Bakewell, Salmon (Karta R), Heckman, Patching, Margaret, and Old Franks Lakes.

18. Painted Creek
Located 14 miles east of Ketchikan, Painted Creek empties into Shoal Cove in Carroll Inlet. Excavation of a bedrock cascade to create jump pools and resting areas would provide access to about seven acres of upstream habitat and result in an estimated production potential of 40,000 harvestable salmon annually. The barrier is passable to some degree by coho and steelhead, although habitat utilization is unknown. Rearing habitat enhancement was also proposed. In 2004 status of the project was inactive.

19. Swan Lake hatchery production
Swan Lake is located on Revillagigedo Island about 30 miles north northeast of Ketchikan; this system drains into the northern part of Carroll Inlet. Releases there would increase production in inside waters of southern Southeast, although they could potentially conflict with natural runs of salmon from the Carroll River. Water allocation associated with a hydroelectric plant would need to be resolved.

20. Ketchikan creel census for coho
This project was deemed necessary in 1984 because of an increasing sport catch and increased supplemental production in the region. It was implemented in 1985, and remains a continuing project. Creel census data help define catch, effort, and location.

21. Salt Creek
Located 15 miles northeast of Ketchikan, Salt Creek flows into Salt Lagoon at the head of George Inlet. A partial barrier exists 0.2 miles upstream of Salt Lagoon. First identified

as a potential enhancement opportunity in 1980, assessment of habitat, fish populations, and project feasibility began in 1982. In 1984 the Forest Service determined that (1) coho were fully using the available rearing habitat and (2) spawning habitat was not a limiting factor. The proposed barrier modification would primarily target sockeye and allow fish to access a 109-acre lake as well as upstream spawning habitat. The modification would secondarily give complete access to coho and provide partial access to pink and chum. The project was in its final design phase in 1985 and 1986, but it was removed from the schedule in 1987. The project has been idle through 2004; however, basin-wide habitat surveys were completed in the early 1990s

22. Gem Cove

Gem Cove is located on Revillagigedo Island about 15 miles northeast of Ketchikan adjacent to George Inlet. This system has been identified as a potential site for filling a portion of the coho production objectives set out in the phase I comprehensive salmon plan by planting fish there. In phase II of the comprehensive salmon plan, it was recommended as a site for examining the feasibility of this technique; however, this project has not been prioritized.

23. Carroll River

Located 20 miles northeast of Ketchikan, Carroll River flows into the head of Carroll Inlet. The main enhancement goals were focused on chinook salmon. From 1961 until 1966, it was stocked with chinook originating from Soos Creek, Washington that had been cultured at Deer Mountain Hatchery. By the early 1980s, recorded escapement counts were only in the teens and twenties. SSRAA planted Chickamin River fry in the river in 1982. Releases from a terminal site in Carroll Inlet of Chickamin and Unuk stocks from 1986 to1995 contributed to foot survey escapement counts as high as 552 in the 1990s. The Forest Service determined in 1983 that fish passage over the multiple barriers was "beyond any feasibility" and enhancement effort should be focused on fry planting to utilize rearing habitat above the falls. The idea of fish enhancement was moved from high to low priority in 1987. The project was then sidelined and no work has been done there since that time.

24. Government Creek

Government Creek is located at the south end of the Ketchikan Airport runway. Government Creek has been identified as a potential site for filling a portion of the coho production objectives set out in the phase I comprehensive salmon plan by planting fish there. In phase II of the comprehensive salmon plan, it was recommended as a site for examining the feasibility of this technique; however, surveys conducted in the early 1990s indicated good juvenile production, and the coho stocking project was not pursued.

25. Ward Creek

Ward Creek is located about 8 miles northwest of Ketchikan and drains into Ward Cove. In the late 1980s logs were added to Ward Creek and its tributaries to provide better rearing habitat for coho and cutthroat; however, the project met with limited success because of inadequate analysis of the channel type; i.e., it was incapable of retaining large wood structures.

26. Carroll Inlet chinook release site

Carroll Inlet extends about 30 miles south from the center of Revillagigedo Island to Revillagigedo Channel six miles southeast of Ketchikan. Age-zero and yearling chinook smolts (brood years 1984 to 1991) incubated and reared at Whitman Lake Hatchery were imprinted in saltwater net pens and released there. The project was expected to result in 60,000 harvestable adult chinook. Imprinting in net pens in Swan Lake (above Carroll Inlet) was considered during project development; however, the hydroelectric facility at the lake outlet posed too many logistical problems.

27. Ella Lake Creek

Ella Lake Creek is located about eight miles south of Manzanita Lake on Revillagigedo Island and drains into Ella Bay off Behm Canal; it lies within the Misty Fjords National Monument Wilderness. The RPT approved development of a fish pass over a 10-foot lower falls and 25-foot vertical falls at the lake outlet; however, sockeye salmon stock development would be needed. When fully seeded, the lake system could produce approximately 2,000 coho and 95,000 sockeye for annual harvest. This project was tabled because its wilderness designation requires that enhancement activities be implemented outside of wilderness if at all possible.

28. Wilson-Blossom River broodstock development

The Wilson and Blossom Rivers flow into Wilson Arm, which flows into Smeaton Bay off East Behm Canal. The system is about 10 miles north-northwest of the Keta River estuary; these rivers are minor chinook producing systems, and their average annual run strength was about 540 fish. Proposed broodstock development in these systems was not pursued.

29. Badger/Bakewell Lakes

Located 35 miles east of Ketchikan, Bakewell Creek flows into Bakewell Arm. A fish pass was originally constructed in 1958 by the Alaska territorial government; however, it was not maintained and became inoperable. In 1979 the fish pass was remodeled and reopened by the Forest Service; it remains operational, although additional maintenance is required. A total of 4.5 million sockeye fry were planted there from 1985 to 1995. A coho run, originating from Hugh Smith Lake broods in 1955 and 1967 to 1970, is self-sustaining. The commercial interception rate of sockeye has been high (i.e., >90%) and is suspected to have prevented the establishment of a self-sustaining run. The sockeye enhancement effort was dropped because the brood source (Hugh Smith) does not reliably produce the needed broodstock each year. Limnological evaluation was conducted from 1985 to 1996, and the evaluation reports have been completed by ADF&G. In 2002, the Forest Service installed a video fish counter and documented an escapement of 630 coho and 150 sockeye. Video monitoring continued in 2003.

30. Behm Canal log salvage evaluation

Behm Canal runs from Point Alava on the southeast corner of Revillagigedo Island north along the mainland adjacent to Misty Fiords (i.e., East Behm Canal), west along Burroughs Bay, Bell Island, and Hassler Island, and then south along the Cleveland Peninsula to the southwest corner of Revillagigedo Island at Point Higgins (i.e., where it intersects Tongass Narrows). The impetus for this project was the RPT's concern over potential loss of chinook and coho rearing habitat from the lower navigable reaches of the Unuk and Chickamin rivers. A log salvage operation had been permitted there; however, conditions (i.e., fish habitat protection measures) placed on the permit in 1985 by ADF&G were determined to be unacceptable by the salvage operator and litigation was initiated. From 1985 to 1987, Sport Fish Division staff conducted on-site studies of habitat utilization.

31. Chickamin River broodstock development

The Chickamin River is located on the mainland about 50 miles northeast of Ketchikan; it drains into Behm Canal. The Chickamin River chinook stock has been cultured continuously at Little Port Walter since 1976. Releases of this stock have occurred regularly at Whitman Lake Hatchery (since the 1983 brood) and Neets Bay Hatchery (since 1991). Since the 1989 brood, the Chickamin stock has been the second-most-utilized stock for enhancement purposes (i.e.,numbers of smolts released) in southern Southeast

32. Manzanita Lake Creek

Manzanita Lake Creek is on the east coast of Revillagigedo Island about 30 miles northeast of Ketchikan; it drains into Manzanita Bay that lies within the Misty Fjords National Monument Wilderness. The RPT approved construction of a fish pass over a 25-foot barrier falls. If this access is provided, the lake system would need to be jump-started with a sockeye stock-development project; and when fully seeded, it could produce approximately 75,000 to 150,000 sockeye and 6,000 coho adults annually. This project, however, was tabled because its wilderness designation requires that enhancement activities be implemented outside of wilderness if at all possible.

33. Herman Creek

Herman Creek is within Misty Fiords National Monument Wilderness and flows into Burroughs Bay. This system has been identified as a potential site for the rebuilding and establishing natural chinook runs through the technique of planting fish there. In the phase II comprehensive salmon plan, it was recommended as a site for examining the feasibility of this technique; however, this project has not been prioritized. Because of the land-use designation, similar projects for this species in nonwilderness areas would be considered first.

34. Grant Creek

Grant Creek is within Misty Fiords National Monument Wilderness, and flows into Burroughs Bay. This system has been identified as a potential site for the rebuilding and establishing natural chinook runs through the technique of planting fish there. In the phase II comprehensive salmon plan, it was recommended as a site for examining the feasibility of this technique; however, this project has not been prioritized. Because of the land-use designation, similar projects for this species in nonwilderness areas would be considered first.

35. Unuk River broodstock development
The Unuk River is located on the mainland about 60 miles southeast of Wrangell; it drains into Burroughs Bay. The Unuk River chinook stock has been cultured continuously at Little Port Walter since 1976, and at Deer Mountain Hatchery since 1977. Unuk stock was also released at Whitman Lake Hatchery (1980–1988) and Neets Bay (1983–1990), but it has been replaced by Chickamin River stock in both of these locations. The Unuk stock was the second-most-utilized broodstock in southern Southeast through the 1988 brood.

36. Orchard Lake
Orchard Lake is located on northwestern Revillagigedo Island about 30 miles north of Ketchikan; it drains into Shrimp Bay. In 1988 the Forest Service proposed constructing a fish pass and planting sockeye there as an Environmental Impact Statement (EIS) alternative to SSRAA's proposed sockeye hatchery. The Forest Service also proposed to monitor the resident cutthroat population before and after fish pass construction and sockeye plants. The project was viewed by the Forest Service as a multi-use alternative to SSRAA's proposal; however, it did not proceed to the NEPA analysis phase.

37. Klu Creek (Shrimp Bay Creek
Located 30 miles north of Ketchikan, Klu Creek empties into Klu Bay inside Shrimp Bay. This fish pass project that targeted all anadromous species was not scheduled for implementation in the annual updates of the regional comprehensive salmon plan from 1985 to 1987. Its status changed from low to high priority in 1987; however, the project has been sidelined and no further progress has been made.

38. Orchard Lake hatchery
Orchard Lake is located on the eastern side of Revillagigedo Island about 35 miles north of Ketchikan; the system drains into Shrimp Bay adjacent to Gedney Pass. This site has a good water source, but it was originally considered a low priority site because of potential conflicts with local Behm Canal wild stocks. Its potential as a sockeye nursery site was pursued from 1988 to 1994, but IHN sampling detected no virus in resident kokanee, thus making the lake off-limits for sockeye introduction or fish pass construction. Because the lake is virus-free, it retains its potential as a hatchery water source. Age-zero sockeye smolts were released by SSRAA in 1988, 1989, and from 1991 to 1994 into Shrimp Bay at the outlet of Orchard Creek.

39. Woodpecker Lake Creek
Located 33 miles north of Ketchikan, Woodpecker Lake Creek is a tributary of Wolverine Creek, which drains McDonald Lake on the southeastern side of Yes Bay. In 1994 the Forest Service used explosives to modify two barrier falls in this system, resulting in jump pools. The modifications provided access by anadromous fish to 161 acres of lake habitat and 2.6 miles of stream habitat. In 1994 and 1995, ADF&G planted a total of 18,810 coho fry from Hatchery Creek (McDonald Lake) into Woodpecker Lake. Coho young-of-the-year and age 1+ juveniles were trapped near the inlet stream in Woodpecker Lake in 1999, indicating successful adult passage. Physical measurements

and some snorkeling surveys of the alterations were done in 2000; no additional follow-up has been done since then.

40. McDonald Lake
McDonald Lake is located on the Cleveland Peninsula about 45 miles north of Ketchikan; it drains into Yes Bay by way of Wolverine Creek. It is the site of an ongoing lake fertilization project that was begun as a cooperative effort by the department and the Forest Service in 1982; it was transferred to SSRAA in 1997. The McDonald Lake project annually contributes 100,000 to 400,000 sockeye to the commercial harvest and approximately 10,000 sockeye to a personal-use fishery, the largest such fishery in Southeast Alaska.

41. Reflection Lake
Reflection Lake is located on the mainland on the upper part of the Cleveland Peninsula; it drains into Short Bay adjacent to Bell Arm. This system's summer coho stock was enhanced by fingerling, presmolt, and smolt plants from Deer Mountain Hatchery from 1988 to1993. Reflection Lake stock became the summer coho hatchery stock for releases in Ketchikan Creek, Ward Lake, Margaret Lake, Bold Island Lakes, Bell Island, Burnett Inlet, and Neck Lake.

42. Neets Bay hatchery production
The Neets Bay Hatchery is located just off Behm Canal on the west coast of Revillagigedo Island about 30 miles north of Ketchikan. The Neets Bay PNP permit was issued in 1983, and the facility has released chinook salmon each year since 1984, with the exception of 1995.

43. Margaret Lake
Located 20 miles North of Ketchikan, Margaret Lake empties into Traitors Cove. A 23-foot waterfall located two miles from salt water blocked anadromous fish passage. A fish pass completed in 1989 allowed access to a 145-acre lake and 24 acres of stream habitat capable of producing an estimated 4,000 coho and 7,500 sockeye. A 9-foot cascade above the waterfall is a flow-dependent barrier to coho and sockeye. Staff at the USFS Forest Science Lab (FSL) intensively monitored the effects of introducing anadromous species on resident trout. A total of 1.8 million sockeye salmon fry were released into the lake from 1988 to 1994. A small sockeye population has colonized the habitat also, but because of high predator populations in the lake, the original sockeye production estimate was too high. One group of summer coho was planted in 1991. Coho escapement is still cyclic, varying from 150 to 700 per year. Coho have fully colonized the habitat above the fish pass. The FSL has produced detailed annual reports on the project as well as two Master of Science theses. Escapements of pink salmon consistently exceed 40,000 each year. The weir was last monitored in 2001. Video escapement monitoring is a possibility in the future when the technology becomes more refined.

44. Naha River
Located 13 miles north of Ketchikan on Revillagigedo Island, Naha River flows into Naha Bay on West Behm Canal. The construction of a fish pass on the 12-foot falls at the

outlet of Patching Lake and at the 30-foot falls located 0.5 mile farther downstream was proposed. This project would provide access to 730 acres of lake and 16 acres of stream habitat and a production potential of 36,000 sockeye and 9,600 coho annually. Although it was listed in the 1986 annual update of the regional comprehensive salmon plan as a high priority and then dropped to a low priority in 1987, it was scheduled for development as recently as 1993. The fish pass was then dropped from consideration; reasons cited included concern about negative impacts to resident stocks if access were allowed. A U.S./Canada enhancement project was initiated in 1987 to boost sockeye production in the Naha drainage. A total of 2.8 million sockeye fry were planted in Patching (2.4 million) and Heckman (0.4 million) Lakes in 1988. Limnological sampling was accomplished at Heckman and Patching Lakes from 1987 to 1990 by ADF&G. (*see* Heckman Lake, project No. 45). Although this fish pass project is inactive, it is still considered a potential enhancement opportunity to be evaluated under future conditions.

45. Heckman Lake
Located 13 miles north of Ketchikan, Naha River flows into Naha Bay on west Behm Canal; Heckman Lake is part of the Naha River drainage. A lake fertilization project has been proposed for this lake. Limnological studies were conducted there in the late 1980s; however, the project was put on hold pending results of the McDonald Lake and Hugh Smith Lake fertilization programs.

46. Smugglers Creek
Located 19 miles northwest of Ketchikan on the eastern side of the Cleveland Peninsula, Smugglers Creek flows into Smugglers Cove at the southern end of West Behm Canal. A 30-foot-plus barrier falls is located near salt water; a feasibility study for a fish pass project was planned but not completed. A barrier modification for this system was listed in annual updates of the regional comprehensive salmon plan as a high priority 1985 and 1986; although it was listed as a low priority in 1987, it was still scheduled for implementation in 1992. No additional information is known on this project, and no work has been done since that time.

47. Rearing habitat improvement
The use of instream structures and other methods have the potential of improving salmon habitat and increasing smolt production in many of Southeast streams. The Forest Service has continued to use this strategy as time and funding have allowed. They had either planned or completed work on the following systems by 2002: Rio Roberts Creek (Thorne River); Chum Creek (Coffman Cove); Coffman Creek (Coffman Cove); Staney Creek; No local name (#106-30-10660-2004 in anadromous stream catalogue); 142F Creek (Kasaan Bay); Ohmer Creek (Mitkof Island); and Falls Creek (Thorne River).

The following projects were part of the department's Prince of Wales Island Stream Rehabilitation Program in 1990, 1991, and 1992: (1) creation of pool habitat and removal of barriers in a washed-out reach of Bennett Creek (103-60-10430); (2) debris dam removal and installation of 2 log weirs to realign flow back into the original channel, and also bank stabilization by tree revetments and revegetation at Dog Salmon Creek (103-

60-10590); and (3) mapping habitat utilization by sockeye and coho to begin wild stock rehabilitation in Klawock Lake tributaries. There was also a project proposed to provide passage for coho and steelhead in Steelhead Creek (103-60-10290); however, it was tabled when the benefit-cost ratio was determined to be unfavorable.

48. Kendrick Bay release site
Kendrick Bay is located on the east side of Prince of Wales Island, opposite Clarence Strait. A floating net-pen and barge-camp facility became fully operational in Kendrick Bay in 1994. The site is permitted for a release of 9 million chum fry annually. It is also a terminal harvest area for seiners.

49. Kegan Lake
Kegan Lake is located on the east side of Prince of Wales Island about 30 miles southwest of Metlakatla; the system drains into Moira Sound. From 1979 to 1983, it was evaluated for its lake fertilization potential; however, it is designated in the phase II plan as a "second priority" project for sockeye production.

50. High quality habitat designation for Disappearance Creek
Disappearance Creek is located in southeastern Prince of Wales Island; it drains into the South Arm of Cholmondeley Sound. It was the source of SSRAA's fall chum stock. In 1984 the regional planning team recommended that the Disappearance Creek drainage be considered a critical habitat.

51. Disappearance Creek weir
Disappearance Creek is located in southeastern Prince of Wales Island; it drains into the South Arm of Cholmondeley Sound. A weir was operated from 1974 to 1984 to provide hatchery broodstock for fall chum programs at Beaver Falls and Klawock hatcheries. It was also useful for management purposes, providing escapement data for a stock that was highly important to the seine fishery. As hatchery stocks became self-supporting, operation of the weir for management purposes was discontinued because of a lack of funding.

52. Sunny Creek
Sunny Creek is located about 40 miles southeast of Klawock on Prince of Wales Island; it flows into West Arm/Cholmondeley Sound. In 1984 a fish pass was constructed in Sunny Creek to remove a partial barrier for pink and chum; the total cost was $70,000. It has been fully operative since then; escapement counts have been conducted there since 1985, indicating that upstream habitat has been well utilized. An estimated 40,000 harvestable pink are produced in this system annually. The Forest Service plans to construct a debris deflector in 2003 to help reduce required annual maintenance.

53. Monie Lake
Monie Lake is located on the eastern side of Prince of Wales Island and drains into Clarence Strait about 25 miles west southwest of Ketchikan. Modification of a barrier falls by creating a series of excavated jump pools and concrete weirs would provide coho access to 0.75 acre of stream and 1.0 acre of lake habitat. Completion of the project

would result in the production of 290 coho and 4,600 pink salmon annually. In 1986 a benefit-cost analysis indicated benefits of this project would likely not justify construction, stocking, and maintenance costs. The project was dropped.

54. Dog Salmon Creek
Accessible by road, Dog Salmon Creek is located about 30 miles southeast of Klawock on Prince of Wales Island; it drains into Polk Inlet. A fish pass was constructed there in 1989 and modified in 1991 for a total cost of $186,000. Although fully operational, the fish pass still represents a partial barrier to pink and chum. No bioenhancement activities were undertaken. The first 5-year evaluation cycle has been completed. The project has contributed an estimated 30,000 pink annually to the common property fisheries in the area. As funding allows, the Forest Service may return to monitor utilization. Use of the habitat above the fish pass has been very high; ADF&G conducts aerial surveys of this system annually.

55. Old Franks Creek
Old Franks Creek is located on Prince of Wales Island about 25 miles southeast of Klawock. In 1992 two fish passes were constructed there by the Forest Service and various partners. They are fully operational, allowing access to 530 acres of spawning and rearing habitat. A total of 458,000 coho fingerlings (Karta River stock) were planted from the 1993 to 1995 brood years (U.S./Canada funding). Habitat has been colonized and remains productive. Percent of enhanced coho in the escapement declined over the evaluation period, indicating that some natural colonization occurred. All coho returning in 1999 were from natural spawning. The estimated harvest that year was 4,000; the escapement was approximately 8,500. One group of 227,000 sockeye fry was planted in Old Franks Lake in 1992, and a small run has been established.

56. Salmon Lake, Karta River system
The Salmon Lake/Karta River system is located on Prince of Wales Island about 10 miles north of Hollis. Limnological studies were initially conducted from 1981 to 1985 by SSRAA for prefertilization enhancement analysis. SSRAA used the Karta River stock for a zero-check sockeye smolt program at Beaver Falls and Shrimp Bay from 1986 to 1990. During this time SSRAA also planted 1.5 million fry back to Salmon Lake to replace gametes lost to the zero-check program. Limnological studies were reinitiated in 1990 by ADF&G for rehabilitation of the sockeye stock. A cooperative lake stocking enhancement/rehabilitation program by ADF&G and SSRAA was initiated in 1991. A total of 3.7 million sockeye were planted in Salmon Lake from 1992 to 1997; subsequently, the project was tabled until further adult returns had been evaluated.

57. North Thorne River
The Thorne River system is located on Prince of Wales Island about 25 miles northeast of Klawock; it drains into Thorne Bay. Extensive logging has occurred in this area. A barrier in this system was removed by the Forest Service in 1983. Coho have been consistently observed accessing the system beyond the barrier site.

58. Rio Roberts Creek
This creek is the middle tributary to the Thorne River, which flows into Thorne Bay on the east coast of Prince of Wales Island. At a cost of $145,000, a fish pass was constructed on Rio Roberts Creek in 1989 to allow passage for coho over a 12-foot barrier passable only during optimal flow conditions. The fish pass provides access to approximately 13.5 acres of stream and pond habitat. This amount of habitat has a production potential of 2,200 harvestable adults annually. Smolt emigration monitoring and adult escapement counts were conducted for a five-year evaluation period ending in 1995. Monitoring results indicated an average annual smolt production of only 2,200, and the Forest Service has determined this project has not been producing at the level originally anticipated. Additional future monitoring is warranted.

59. Hunter Creek
Hunter Creek is located on the west coast of Prince of Wales Island and drains into Hunter Bay; the lower one-third of this large watershed is within the South Prince of Wales Wilderness area. The phase II comprehensive salmon plan listed the status of this system as “currently not scheduled” for enhancement projects. In 1995, the creek was walked from the intertidal zone up to the lake. Juvenile coho were found to be well distributed and abundant. No potential enhancement projects were identified at that time.

60. Klakas Lake
Klakas Lake is located on the southwest side of Prince of Wales Island about 25 miles southeast of Hydaburg; it drains into Klakas Inlet. From 1979 to 1983, the system was evaluated for its fertilization potential, which appeared favorable. It is designated in the phase II plan as a “second priority” project for sockeye production.

61. Kassa Creek
Kassa Creek is on the west side of Prince of Wales Island about 20 miles south southeast of Hydaburg; it drains into Kassa Inlet. A 12- to 15-foot waterfall blocks access by anadromous fish to 1.5 miles of upstream habitat. Although a fish pass would provide that access, the RPT has concerns about negative impacts on resident stocks as well as an unfavorable benefit-cost ratio.

62. Kasook Inlet Creek
Kasook Inlet Creek is located on the southern end of Sukkwan Island about 15 miles south of Hydaburg. The project at Kasook Inlet Creek was designed to divert the outlet of Kasook Lake from its present channel to an old overflow channel in order to provide access for anadromous fish. A site reconnaissance in 1992 indicated that extensive excavation would be required to shift the flow to the old channel. It was further determined that extensive excavation would be required to provide fish access through the old channel; accordingly, the project was dropped.

63. Waterfall Bay
Waterfall Bay is located on the west coast of Dall Island; a 30-foot elevation drop in a 50-foot run acts as a total barrier to anadromous fish, preventing access to upstream spawning and rearing habitat. Modification of the barrier would provide passage for coho

and sockeye, although a stocking program would be required to establish a run of either species. Because a 1992 benefit-cost analysis showed projected costs would be double the projected benefits over the 25-year project life, the project was tabled.

64. Hetta Lake
Hetta Lake is located about 12 miles west of Hydaburg on Prince of Wales Island; it drains into Hetta Inlet. From 1979 to 1983, this lake system was evaluated for its fertilization potential and was determined to have a low priority for sockeye production because of its low natural populations of returning sockeye. It was further determined that its location in the southern portion of the region would cause its production to be intercepted in Canadian fisheries.

65. Klawock Lake limnology investigation
Klawock Lake is located near the city of Klawock on Prince of Wales Island. Limnological studies were conducted there from 1986 to 1989 to evaluate lake productivity in conjunction with fry releases from the adjacent Klawock Hatchery. These studies indicated the lake is not considered a good candidate for fertilization because of a high flushing rate.

66. Klawock Hatchery chinook production
This project was originally proposed in 1983; however, it was dropped from consideration until the mid-1990s. Increasing restrictions in chinook fisheries related to the interception of non-Alaskan stocks have provided impetus to reexamine this project. Modifying the existing hatchery for chinook production would be possible, and a remote release site would be necessary to minimize the interaction with IHN-carrying wild sockeye stocks. West coast releases would likely benefit only Unit 1, 2, and outside Unit 3 fisheries; harvests would need to focus on near-terminal and terminal areas to avoid high interception of non-Alaskan stocks. In 1999, a permit alteration was granted to Klawock Hatchery for incubation and early rearing of chinook salmon, with long-term rearing and release at Coffman Cove. Project development continues. An additional rearing/release site is under consideration at Port St. Nicholas.

67. Klawock Hatchery sockeye program
An isolation incubation module was added to the Klawock Hatchery, and sockeye have been cultured there almost every brood year since 1986. Only Klawock Lake stock has been used; all sockeye have been planted back into the lake or tributaries as fry or presmolts.

68. Cable Creek
Located about 15 miles southeast of Craig on Prince of Wales Island, Cable Creek drains into Trocadero Bay. A series of jump-pool weirs were constructed in 1986 to enable passage of coho salmon over a 20-foot falls. A smaller velocity barrier upstream was modified in 1994 by blasting to provide access to approximately 56 acres of coho rearing habitat capable of producing 9,000 harvestable coho adults annually. The Forest Service is still monitoring the effectiveness of barrier modification. Five brood years of endemic coho fry (BY 87-91) were incubated at Klawock Hatchery and planted above the barrier

for imprinting. Return of adult coho above the barrier has been low; the limiting passage factor may have been the exit-pool orientation. To help solve that problem, the fish pass was modified in 2001.

69. Tunga Inlet

Tunga Inlet Creek is located on the northwest coast of Prince of Wales Island between El Capital Passage to the north and Salt Water Lagoon to the south about 30 miles north of Klawock. The Forest Service constructed a series of jump-pool weirs in 1986 at a cost of $18,000, opening approximately 300 acres of lake habitat. Coho juveniles were planted for six years (1986-1989 and 1991-1992), and the potential harvest production for this system was estimated at 15,000 coho per year. Although the return to the commercial fishery from planted coho was good, the system lacks spawning habitat and will not be self-sustaining. The lake retains its potential as a nursery lake.

70. North Staney Creek

North Staney Creek flows west five miles to Lester River on the west coast of Prince of Wales Island. This proposed project involves excavation of three or four jump pools to provide fish passage at low water flows over the upper 18 feet of a 38-foot barrier falls. Successful implementation of the project would open 11.5 acres of habitat above the falls. The estimated annual fish production would be 1,900 coho and 70,000 pinks. The project was dropped from consideration because of concerns over impacts on resident fish stocks as well as an unfavorable benefit-cost ratio. No known progress has been made on this project.

71. Water flow control

To minimize losses of anadromous fish during dry periods, a project/technique could be developed to tap lakes in order to maintain adequate water flow and temperature required for fish production; however by June 2004 no known progress had been made. The following streams were recommended by the RPT for feasibility studies: (1) Bear Harbor (105-10-10240), (2) Shipley Creek (105-43-10020), (3) Navy Creek (106-22-10160), (4) Snake Creek (107-30-10700), (5) Falls Creek (106-21-10040), and (6) Margaret Creek (101-90-10390).

72. Irish Creek

Irish Creek is located on the west side of Kupreanof Island and drains into Rocky Pass. The fish pass there was constructed in1984; over 4 million coho fry from Crystal Lake Hatchery were planted in the upper watershed over a four-year period. The estimated commercial harvests in 1991 and 1992 were 32,000 and 13,500 respectively. Major repairs were completed in 1991 because of damage occurring during high flows. Coho, pink, chum, and steelhead are using the fish pass. Sport fishermen are now targeting coho and steelhead there.

73. Hole-in-the-Wall

Hole-in-the-Wall is located on the northwest coast of Prince of Wales, south of Point Baker off Sumner Strait. In 1988 log weirs were used to create jump pools in Hole-in-the-Wall Creek to provide access for pink salmon over a small partial barrier. The creek appears to provide full access, and low numbers of pink salmon have been observed above the barrier in subsequent years.

74. Shipley Lake Creek
Shipley Lake Creek is located on the west side of Kosciusko Island in Shipley Bay; its headwaters are Shipley Lake. Removal of boulder, rock, and log debris at the outlet of the lake would provide a channel passable to fish at low water levels, and insure unrestricted sockeye passage to 480 acres of habitat. In 1983, the RPT proposed this system as a likely candidate for a fertilization project. No known progress has been made on this project.

75. Shipley Bay Lake
Shipley Lake is located on the west side of Kosciusko Island and is the headwaters for Shipley Lake Creek, which flows into Shipley Bay. Fertilization of the lake to enhance sockeye production was a high-priority proposal in the phase II plan, but that status was removed in 1984, pending results of the McDonald and Hugh Smith Lake fertilization programs. No limnological studies were initiated at Shipley Bay Lake.

76. Survey Creek
Survey Creek is located on the south end of Koscuisko Island and drains into Survey Cove. In 1974 a fish pass was installed there; its status was listed as “currently not functioning” in the phase II plan; that status was verified several times in the 1990s. Additional habitat surveys above the fish pass have indicated a lack of spawning habitat and an absence of anadromous fish. Because of these findings, the Forest Service discontinued funding for repair of the fish pass and further evaluation of the system. The fish pass was removed in 2000.

77. Big Lake, Ratz Creek
On the east side of Prince of Wales Island, Big Lake drains into Ratz Creek, which drains into Ratz Harbor. A total barrier falls was modified by blasting in 1963 or 1964, resulting in a partial barrier to coho. Additional work in 1986 continued to improve fish access. A fish pass was constructed by the Forest Service in 1991, and approximately 210 acres of spawning and lake habitat were opened. Potentially, 10,000 harvestable sockeye and coho could be produced annually. No bioenhancement activities were undertaken. Returns of coho salmon have been as high as 1,500 (1994). The average peak sockeye escapement above the falls during surveys over the last five years (1998–2002) has been just below 1,000 fish. A five-year evaluation project, which was completed in 1995, indicated an average annual harvest of approximately 1,000 coho.

78. Hatchery Creek
Hatchery Creek is located on the east side of Prince of Wales Island; it drains into Sweetwater Lake, which subsequently drains into Whale Pass. Gabions were installed and removed prior to 1985. A significant partial barrier exists, but because a subsistence sockeye fishery developed below the barrier, the Forest Service constructed a boardwalk trail to the site in 2001 and 2002. Increased access to this site has required a restriction on personal-use harvests to prevent overfishing.

79. Mabel Creek
Mabel Creek is located on the east side of Prince of Wales Island and drains into the southern end of Whale Pass about 45 miles southwest of Wrangell. A proposal for constructing a fish pass to provide access around an 8-foot barrier falls was included in the regional comprehensive salmon plan. This project would open up additional spawning and rearing habitats above the barrier; however, RPT members were not in agreement on this, and it was given a low priority in the 1987 annual update of the plan but also tentatively scheduled for construction in 1991. The project was later tabled when a benefit-cost analysis was not favorable.

80. Neck Lake hatchery development
Neck Lake is located on the east side of Prince of Wales Island and drains into the northern portion of Whale Pass. Initially in the phase II plan, it was designated a low-priority site for hatchery development. It has a good water supply but lacks a suitable terminal harvest area in salt water. The feasibility of constructing fish passes on barrier falls to allow access to the lake was considered in the early 1990s, but both ideas were abandoned. The lake has been used for a coho rearing project since 1996 and has become SSRAA's coho release site/cost recovery area to fund the operation of Burnett Inlet Hatchery. Summer coho (Reflection Lake stock) are reared in net pens in Neck Lake, and released into the lake as presmolts. Adults returning to the outlet stream are harvested for cost recovery in a streamside raceway. Since 1999 the project has provided substantial coho returns to District 106 commercial and sport fisheries. Beginning in 2001, sockeye smolts have been reared and released from the streamside raceway.

81. Cavern Lake
The Cavern Lake system is on the east side of Prince of Wales Island and is drained by 108 Creek, which empties into the northern end of whale Pass. Construction of a fish pass to access Cavern and Twin Island Lakes was proposed in 1986, although earlier dive records (i.e., 1971) indicated that fish passage was not blocked. Supplementary stocking of the upper watershed would be necessary to colonize the five acres of stream habitat and 349 acres of lake habitat that is capable of producing an estimated 4,000 coho and 7,500 sockeye annually. This project has not been scheduled for implementation.

82. Big Creek (108 Creek)
Big Creek is located on the eastern side of Prince of Wales Island and drains into the northern portion of Whale Passage. In 1983, the regional planning team identified it as the site for a potential creek stocking project. Although the endemic summer coho stock was used as broodstock for Burnett Inlet Hatchery and subsequent releases in Burnett Inlet (i.e., 1984 to 1986), none were released back into Big Creek. Since 1998, Big Creek has been monitored for strays from the Neck Lake project (Reflection Lake stock).

83. Snow Pass Creek
Snow Pass Creek is located on the southwest side of Zarembo Island and drains into Snow Pass. Approximately two acres of spawning habitat and five acres of rearing habitat are available above two barrier falls, approximately 0.25 and 1.0 miles above salt water. The lower and upper falls block pink and coho, respectively. Although documentation of

the project via the National Environmental Policy Act (NEPA) process and final designs has not been completed, it appears to have potential. The Forest Service has tentative plans to begin modifying (i.e., blasting) these waterfalls in 2004.

84. Stream #14 Whale Passage
Whale Passage is located on the east coast of Prince of Wales Island opposite Thorne Island. This system has been identified as a potential site for filling a portion of the coho production objectives set out in the phase I comprehensive salmon plan by planting fish there. In phase II of the comprehensive salmon plan, it was recommended as a site for examining the feasibility of this technique; however, this project has not been prioritized.

85. Salmon Bay Lake
This lake is located on the northeast tip of Prince of Wales Island and drains into Snow Pass. From 1979 to 1983 it was evaluated for lake fertilization potential and appeared to be a good candidate lake. It was designated in the phase II plan as a "highest priority" project for sockeye production.

86. West Douglas Creek
West Douglas Creek is located at the southern tip of Kupreanof Island and drains into Douglas Bay. This fish pass project would provide access for coho through a series of 4- to 12-foot barriers to approximately three acres of rearing habitat. The project was reevaluated in 1990. Because of the multiple barriers and relatively small amount of habitat that would be made available, the project was determined not to be cost effective and all planning has been discontinued.

87. St. Johns Creek
St. Johns Creek is located about 25 miles west of Wrangell on the northwest tip of Zarembo Island; it drains into Sumner Strait. A fish pass was constructed there in 1986 to provide access to 56 acres of rearing habitat above an 11-foot barrier falls. The fish pass was designed for coho, but steelhead are also using the upper watershed. A cooperative coho-stocking program (SSRAA, NSRAA, FRED, USFS) employed wild fry plants: (1) St. Johns stock egg takes incubated at Crystal Lake Hatchery and (2) Crystal Lake Hatchery stock eggs fertilized with St Johns coho milt. In early years, few fish from this project were harvested in the commercial fisheries. Coho fry were well distributed in 1991, 1992, and 1993. In 1997, an estimated 16,700 coho smolts left the upper watershed.

88. Kah Sheets Creek
Kah Sheets Creek is located on the southeast tip of Kupreanof Island near the mouth of Duncan Canal. A fish pass was installed there in 1967 to improve sockeye access to Kah Sheets Lake over a partial barrier; however, it was torn out by spring ice flows shortly thereafter. A new design was prepared for improving passage, but further analysis by the Forest Service indicated that a sufficient number of sockeye passed the barrier each year. Accordingly, they decided placement of a fish pass was an unnecessary risk, because there is always the potential for the project to fail and all passage could be blocked.

89. Duncan Creek
Duncan Creek is located on the west side of the Lindenberg Peninsula portion of Kupreanof Island and drains into Duncan Canal. The fish pass was constructed in 1998. Beginning in 1998, a wild coho egg take below the fish pass occurred for three successive years. The eggs were incubated at Gunnuk Creek Hatchery and resulting fry were planted above the fish pass. A second potential barrier upstream from the fish pass proved to be a substantial obstacle to returning coho, and it was reshaped with explosives in 2001. A maximum estimate of 775 coho could be produced above the fish pass annually for the commercial and sport fisheries. It is expected sport fishermen will travel from Petersburg and fish either from skiffs in the intertidal reach or from the logging road. Other coho fishing streams in the Duncan Canal area have experienced increased sport fishing pressure.

90. Mitchell Creek
Mitchell Creek/Slough is about 15 miles southwest of Petersburg and drains into Duncan Canal. A fish pass approximately two miles from salt water was completed in 1992, providing access to 20 acres of spawning and rearing habitat. Two smaller falls farther upstream had been previously reshaped with explosives in 1991 to provide fish access. Coho eggs taken from the indigenous run were incubated at Crystal Lake Hatchery; fry releases above the fish pass occurred from 1993 through 1996. From 1995 through 1999, wild coho fry were sampled in index sections above the fish pass. Results indicate fry are well distributed throughout the watershed and their numbers are increasing.

91. Remote releases of Crystal Lake Hatchery production
Crystal Lake Hatchery is located on Mitkof Island about 18 miles south of Petersburg. The facility's goal is to produce chinook and coho that migrate through traditional common property fisheries in the area as well as a terminal fishery at the site. Chinook smolts from Crystal Lake Hatchery were released in Ohmer Creek in 1984, 1986, 1989, and 1990; returns were evaluated. Releases of Crystal Lake chinook in Earl West Cove (formerly called Square Cove) occurred annually from 1986 to 2001, along with chums from SSRAA hatcheries and coho releases from Whitman Lake Hatchery (1983, 1986–2000). After releases in 2000, all Earl West Cove production was shifted to Anita Bay. Coho produced at Crystal Lake Hatchery were released into Sumner Creek in 1983 and 1984.

92. Vixen Inlet fish pass
Vixen and Hofstad Creeks flow into Vixen Inlet in Ernest Sound, which is located 27 miles northwest of Ketchikan. Extensive feasibility studies were conducted there in 1984 and again in the early 1990s to determine whether it was a suitable site for a fish pass. Results indicated a very low benefit-cost ratio. Vixen Falls is formidable, and the stream channel offers very little pool and resting area throughout its length both below and above the falls. The proposed project was determined to be nonviable in 1993 for the above reasons, and its status is still inactive.

93. Frosty Creek fish pass

Frosty Creek is located on the west side of the Cleveland Peninsula and drains into Ernest Sound. Three barrier falls, ranging from eight to 20 feet high, are within 0.5 mile of salt water. Approximately 26 acres of lake habitat and six acres of stream habitat are available above the falls. A proposed Forest Service fish pass project could benefit coho and steelhead; however, difficulty in finding a suitable donor coho stock and a weak benefit-cost ratio caused the project to be tabled. No final designs for fish pass structures were developed.

94. Menefee Inlet release site

Menefee Inlet is located on the eastern side of Etolin Island off of Ernest Sound. For the purpose of developing a broodstock for its hatchery program, the Burnett Inlet Hatchery permit was altered in 1989 to allow release of Harding River chinook smolts at this site; however no hatchery releases ever occurred there.

95. Bradfield systems

The Bradfield systems are located on the mainland, and all systems drain into Bradfield Canal, which then intersects Ernest Sound. Chinook habitat surveys were proposed to identify the need for rehabilitation projects. Tom Creek (107-40-10470) is fairly small and has much more potential for pinks than for chinook. The Harding River (107-40-10490) has a waterfall that is long and steep and has very high flows; the installation of a fish pass there would provide chinook access to miles of upstream habitat above the lake. An attempt to restore fish passage through the Harding River gorge is described in project No. 99. The river is a partially glacial system, and chinook peak escapement counts have been between 20 and 150 fish annually from 1993 to 2002; however, those counts are significantly below the total run because aerial surveys do not count the entire run; they usually document from 20% to 40% of the run. Both forks of the Bradfield River (107-40-10530) are relatively new systems that are still undergoing a tremendous amount of change to their channels. These forks, although not totally glacial, are more glacial than the Harding River.

96. Bradfield Canal stocks

The Bradfield Canal is located off the mainland east of the southern portion of Wrangell Island and off Blake Channel; it's about 30 miles southeast of Wrangell. Broodstock development was attempted with only the Harding River chinook stock in Bradfield Canal. Burnett Inlet Hatchery cultured and released Harding River chinook from the 1989 and 1990 broods. The project was discontinued when problems were encountered with hatchery operations, although the stock appeared to perform adequately in culture. The average Harding River run is about 300 fish (*see* project No. 99 for information on additional Harding River projects).

97. Virginia Lake

Draining into Eastern Passage, Virginia Lake is located on the mainland about 5 miles east of Wrangell. A fish pass was completed in 1988, which provided fish access to the lake. A total of 8.9 million sockeye fry from the McDonald Lake stock were incubated at Beaver Falls Hatchery and planted in the lake from 1989 through 1996. A lake fertilization program was initiated in 1991 to boost lake productivity after problems associated with lake stocking occurred in 1989 and 1990. Fertilization ended in 1996 for the sockeye colonization project, but it was reinitiated in 1998 as a resident fish enhancement project. An annual run varying from 10,000 to 20,000 sockeye was initially established from the original colonization program. Catch plus escapement was estimated to be 17,300 (34% interception in the common property fishery) in 1996; however, the escapement was 6,600 in 1997 and 1,500 in 1998. Annual reports by ADF&G have been published since 1989. Since 1997, the escapement appears to be declining. Beginning in 2002, the Forest Service (with funding from the Office of Subsistence Management) is trying to determine the cause.

98. Virginia Lake hatchery production

Virginia Lake was considered as the site for a hatchery; the goal was to help meet harvest and production needs in Unit 3. It was considered a high priority in the phase II plan because of the abundant water source, the potential large terminal harvest area, and its close proximity to Earl West Cove, where hatchery chinook, coho, and chum had been released for the purpose of obtaining migration, survival, and broodstock development information needed for the proposed hatchery. A preliminary hatchery permit application was filed with ADF&G by SSRAA in 1984, but it was not pursued because of IHN concerns with the endemic Virginia Lake sockeye population.

99. Harding River

Harding River is located on the mainland near the head of Bradfield Canal. Since the early 1980s, the Forest Service has considered attempting to improve fish passage there in an 800-foot barrier canyon. Coho were the only known anadromous species to access fish habitat beyond the barrier. Studies were initiated by ADF&G to help determine benefits of this potentially expensive project. Chinook were planted above the barrier to utilize the habitat and to determine if fish imprinted to the upper watershed would pass the barrier like the coho. Full utilization of the six miles of upstream spawning and rearing habitat would produce up to 3,000 additional chinook to the common property fisheries. Egg takes for chinook enhancement (via Crystal Lake Hatchery) occurred 1986, 1989, 1990, 1991, and 1992. The eggs of the 1992 brood year had to be destroyed when four females tested positive for IHNV. In 1993 severe flooding destroyed streamside incubation boxes used in 1993; this flood also modified the barrier and created a total barrier to all species.

After the flooding event, the focus for the project shifted to maintaining the unique run of early run coho that had spawned above the barrier. Coho at the base of the barrier were captured and air-lifted upstream from 1996 to 1999. The Forest Service continues to assess the situation and in 1997 and 1998 used blasting to attempt to remove the barrier. Numerous coho fry were captured in the upper watershed in 1999, which indicated that at least partial access had been restored for coho in 1998. One radio tagged adult coho passed the barrier during fall of 1999, again indicating partial access for coho. Radio tagging and movement of adult coho over the barrier continued through 2002. To provide an index of previous adult passage, in 2003 an attempt will be made to capture coho smolts migrating from the upper watershed. In other related Harding River activities, 18,000 wild chum fry were coded-wire-tagged in 1988 and 89 to determine their contribution to the fisheries. In 1989 and 1990 Harding River chinook eggs were taken to Burnett Inlet Hatchery for broodstock development, but the project failed.

100. Bradfield River
The Bradfield River is on the mainland at the head of Bradfield Canal. Extensive logging in the Bradfield River floodplain during the 1970s has impacted salmon production. Feasibility studies for riparian habitat rehabilitation activities occurred in the early 1990s. The Forest Service and ADF&G verified present species and life stage use of stream habitat and quantified and described lost habitat. One hundred ninety-eight acres of riparian second growth was thinned to accelerate growth of large conifers. In 1997, large woody debris in the channel were cabled together to help retain it in the river system. By 2002, most of the harvested riparian second growth had been treated and monitoring of the earliest thinning indicates that growth rate of spruce and cottonwood accelerated.

101. Tyee Lake hatchery
Tyee Lake is located on the mainland at the head of Bradfield Canal about 40 miles southeast of Wrangell. This site was considered a low priority in the phase II plan because of water temperature concerns and water allocation problems associated with hydroelectric development.

102. Salamander Creek
Salamander Creek is located on the northeast side of Wrangell Island about 10 miles southeast of the City of Wrangell; it drains into Eastern Passage. Two partial barriers at 0.25 and 0.5 miles above salt water were blasted to create access to 2.5 miles of spawning habitat for chum, which were surplus to the Earl West Cove terminal fishery. Coho had been able to pass without difficulty. Escapement surveys have confirmed that the project is successful in allowing the fish to disperse upstream.

103. Pat Creek
Pat Creek is located on Wrangell Island about 10 miles south of Wrangell. This system has been identified as a potential site for filling a portion of the coho production objectives set out in the phase I comprehensive salmon plan by planting fish into the system. In the phase II plan, it was recommended as a site for examining the feasibility of that technique; however, this project has not been prioritized.

104. Meter Bight Creek
On the east side of Zarembo Island, Meter Bight Creek drains into Stikine Strait. It is the northernmost of three streams in the area. A cluster of four small 5-foot falls and a larger 15-foot cascade blocked pink access. Coho passage was variable from year to year. Passage was improved in 1993, allowing pink and coho access to approximately 30 acres of spawning habitat in the upper watershed. Green pink eggs from below the barriers were planted in the upper watershed. Peak pink counts during occasional surveys above the upper barrier include 2,000 in 1993, 6,700 in 1997, and 400 in 2002. Maintenance and monitoring are ongoing.

105. Stikine River escapement monitoring-sonar
In 1984 the use of a sonar installation to count fish was proposed as a management tool. It was not pursued because of lack of funding.

106. Stikine River/Andrews Creek broodstock development
Andrews Creek, which is on the U.S. side of the border, is the largest chinook system on the Stikine River, which is located just a few miles northeast of Wrangell. The chinook stock from that system has been cultured continuously at Crystal Lake Hatchery since 1976; that stock has also been cultured at NSRAA facilities (Medvejie and Hidden Falls Hatcheries) continuously since the early 1980s. Andrews Creek chinook has been the most utilized stock for enhancement purposes (i.e., numbers of smolts released) in southern Southeast since 1987.

107. Gengen Lake Stocking
Gengen Lake is part of the Ohmer Creek system (No. 108-40-10500 in the anadromous stream catalogue). It's located on Mitkof Island about 20 miles southeast of Petersburg and is accessible by road. This system is a chinook release site for Crystal Lake Hatchery.

108. Crystal Lake Hatchery ozonation
Crystal Lake Hatchery is located on Mitkof Island about 18 miles south of Petersburg. This project provided funding to install water depuration equipment to control the incidence of bacterial kidney disease (BKD). The source of the pathogen was traced to fish residing in the lake that supplied water to the hatchery. The ozone system reduced, if not completely eliminated, the incidence of BKD. Installation of the ozonation system was completed in 1993 at a cost of $175,000. The system is capable of treating 500 gallons per minute of the water used for incubation and rearing.

109. Muddy River
Muddy River is located on the mainland about five miles northwest of Petersburg. A spring that is located at a fairly low elevation in the watershed has been proposed as a site for placement of an incubation box for chum or chinook; however, the spring was monitored for several years and it was determined the flow was too low for more than a single box. So, that portion of the project was dropped. Additionally, the Muddy River has been considered as a site for chinook fry plants from Crystal Lake Hatchery.

110. Tahltan Lake
Tahltan Lake is located in Canada; this system is a tributary to the Stikine River. It has a water control structure that was installed in 1959 to facilitate fish passage through the outlet stream into the lake during low flows. Fry plants began there in 1989, and it is an ongoing cooperative U.S./Canada project identified in the Pacific Salmon Treaty. From 1993 to 2002 the number of enhanced sockeye returning there has averaged about 15,000 annually. The Tahltan Lake sockeye return is the broodstock source for fry planted in Tahltan and Tuya lakes; incubation occurs at Snettisham Hatchery (*see* project No. 42 on page 171).

111. Tuya River/Tuya Lake
The Tuya River is a major system of the Stikine River and drains Tuya Lake in Canada, which is the largest lake draining into Southeast Alaska. The Tuya River is about 100 miles long; however, access for anadromous fish is blocked by a barrier near its mouth. Sockeye fry have been planted into the lake from egg takes that occurred at Tahltan Lake (system that also contributes to the Stikine River). The eggs were incubated at Snettisham Hatchery and then flown to Tuya Lake for planting (*see* project No. 42 on page 171). Fry plants began there in 1991 and continued through 1999; planting occurred again in 2003. Studies of ways to surmount the barrier have been conducted, although no action has been taken. Adult sockeye returning from the plants have been radio tagged and then manually moved over the barrier to varying distances up the river and released; these fish have had difficulty accessing the lake. From 1996 to 2002, the average number of adults returning from Tuya Lake releases was 41,000. This is an ongoing cooperative U.S./Canada project identified in the Pacific Salmon Treaty.

112. Surveillance of unmonitored escapements/sockeye escapement studies
In some years and as funding allows, weirs have been placed in large systems that are important to commercial fisheries: e.g., Karta River, Naha River, and Salmon Bay Lake. Additional systems suggested for monitoring include Sarkar, Hetta, and Kegan Lakes.

113. Cottonwood Creek
Cottonwood Creek is a tributary of Staney Creek, which is located on northwestern Prince of Wales Island and flows into Tuxekan Passage. This project proposal concerns modification of a barrier falls in Cottonwood Creek. The creation of jump pools would allow coho access to approximately 10 acres of upstream habitat; however, no progress has been made on this project.

Appendix Table A-1. List of Phase I and Phase II Projects Located in Southern Southeast

Key to Project Types

Management	M
Habitat Repair/Improvement	H
Fish Passage	F
Lake/stream Stocking	S
Research	R
Lake Fertilization	LF
Broodstock Development	B
Capital Construction/Improvement	C
Enhanced Production	E

Key to Agencies

AK Dept. Fish & Game	AK
Northern SE Regional Aquaculture	NS
Southern SE Regional Aquaculture	SS
U.S. Forest Service	FS
(Ranger District)	
Craig	c
Ketchikan-Misty Fiords	k-m
Thorne Bay	tb
Petersburg	p
Wrangell	w
Sitka	s
Juneau	j
National Marine Fisheries Service	NM
Douglas Isl. Pink & Chum	D
Armstrong-Keta, Inc.	A

Key to Species

Chinook	K
Chum	Ch
Coho	Co
Pink	P
Sockeye	S
Steelhead or rainbow trout	St

Target Species	Project Type	Proj. No.	Name	Location	Production Basis	Year Proposed	Years Implemented [1]	Years Evaluated [1]	Lead Agenc(ies)
K	M	1	Stock separation, mainland systems	101, 110, 115		1983			AK
K,Co	E	2	Nakat Inlet hatchery production	101-11		1983			AK
K,Co,Ch	E	3	Hidden Inlet hatchery production	101-11		1983			AK
Co	H	4	Marx Creek Enhancement	101-15-10500-2006		1987			FS(k-m)
Ch	H,S	5	Marx Creek Spawning Channel	101-15-10500-2006	1.8 km	1984	1986-1989	1988-1996	FS(k-m),AK
Co	H,FP	6	Bryce Creek	101-15-10500-2023		1987	1992	1991-1998	FS(k-m),AK
Co	S	7	Hall Cove	101-21		1983			
K,Co,Ch	E	8	Feasibility of hatchery production in Boca de Quadra	101-30		1983			AK
K	M	9	Stock separation, Boca de Quadra	101-30		1984			AK
All	FP	10	Red River	101-30-10300	56 A str	1983	dropped, wilderness		FS(k-m)
K	B	11	Keta River broodstock development	101-30-10300		1983			
K	FP,S,B	12	Marten River	101-30-10600		1983	1987	1992, 1995	FS(k-m)
Co,S	M	13	Hugh Smith weir	101-30-10750		1984	1982-c		AK
S	E	14	Whitman Lake Hatchery sockeye program	101-40	2.5 M eggs	1984	1985, 1986		SS
K	M	15	Stock separation, Bradfield Canal	101-40		1983			AK
Co	FP,S	16	Lucky Cove Creek	101-41-10250	6 Mi st, 270 A lk	1983	dropped 1987		FS(k-m),AK
S	E	17	Beaver Falls Hatchery sockeye program	101-44	9.5 M eggs	1984	1985-1997	1985-2001	SS
P,Ch	FP	18	Painted Creek	101-45	6.4 A	1986			FS
K,Co,Ch	E	19	Swan Lake hatchery production	101-45		1983			AK
Co	M	20	Ketchikan creel census for coho	101-45, 47, 90		1984	1985-c		AK
S,P,Ch	FP	21	Salt Creek	101-45-10380	109 Ac lk	1983	dropped 1987		FS(k-m)
Co	S	22	Gem Cove	101-45-10530		1983			AK
All	FP,S	23	Carroll River	101-45-10780		1983	dropped 1987		FS(k-m),AK,SS
Co	S	24	Government Creek	101-47-10040		1983			AK
Co	H	25	Ward Creek	101-47-10150		1987	late 1980s	late 1980s	FS(k-m)
K	E	26	Carroll Inlet chinook release site	101-48	1.2 M fry; 60 K adults	1985	1986-1995	1986-1999	SS
S,Co	FP,S	27	Ella Lake Creek	101-51-10900	2K Co,95K S adults	1986	dropped; wilderness		FS(k-m)

Target Species	Project Type	Proj. No.	Name	Location	Production Basis	Year Proposed	Years Implemented [1]	Years Evaluated [1]	Lead Agenc(ies)
K	B	28	Wilson-Blossom R	101-55-10200;10400		1983			
S,Co	FP,S	29	Badger/Bakewell Lakes	101-55-10730			1958	1985-96,2002	FS(k-m), AK
K,Co	H	30	Behm Canal log salvage evaluation	101-71,101-75		1984			AK
K	B	31	Chickamin River broodstock development	101-71-10040		1983	1970s-c		AK,NS,SS,NM
S,Co	FP,S	32	Manzanita Lake Creek	101-71-10430	75K S, 6K Co adults	1986	dropped 1987; wilderness		FS(k-m)
K	S	33	Herman Creek	101-75-10050		1983			AK
K	S	34	Grant Creek	101-75-10100		1983			AK
K	B	35	Unuk River broodstock development	101-75-10300		1983	1970s-c		AK,SS,NM
Co,S,P,Ch,St	FP	36	Orchard Lake	101-80		1988	dropped		FS(k-m)
All	FP	37	Klu Creek (Shrimp Bay Creek)	101-80-10200		1984			FS(k-m)
K,Co,S	E	38	Orchard Lake hatchery	101-80-10230		1983			AK,SS
Co	FP,S	39	Woodpecker Lake Creek	101-80-10680	161 A lk, 2.6 Mi st	1993	1994	1995-1998	FS(k-m)
S	LF,S	40	McDonald Lake	101-80-10680-0010			1982-c	c	AK,FS,SS
Co	S	41	Reflection Lake	101-80-10840		1983	1988-1993		AK
K	E	42	Neets Bay hatchery production	101-90		1983	1983	1986-c	SS
S,Co	FP,S	43	Margaret Lake	101-90-10390	145 A lk and 24 A st	1986	1989	1987-2001	FS(k-m)
All	FP	44	Naha River	101-90-10500	730 A lk, 16 A str	1984	fish pass dropped		FS(k-m), AK
S	LF	45	Heckman Lake	101-90-10500		1983			AK
All	FP	46	Smugglers Creek	101-90-10750		1983			FS(k-m)
Co,S	H	47	Rearing habitat improvement	102, 106, 108		1985	1990-1999		FS©,AK
Ch	E	48	Kendrick Bay release site	102-10	9 M fry	1989		x- c	SS
S	LF	49	Kegan Lake	102-30-10670		1983			AK
Ch	H	50	High quality habitat designation for Disappearance Creek	102-40-10430		1984			FS©,AK
Ch	M	51	Disappearance Creek weir	102-40-10430		1984			AK
P,Ch	FP	52	Sunny Creek	102-40-10870	2 Mi st	1983	1984	1985-c	FS©
Co,P	FP	53	Monie Lake	102-50-10280	.75 A str, 1 A lk	1986	dropped 1986		FS©
P,Ch,S	FP	54	Dog Salmon Creek	102-60-10380	5 Mi st, 107 A lk	1983	1989		FS©
Co,S	FP,S	55	Old Franks Creek	102-60-10440	530 A	1983	1992	1992-1999	FS©,AK
S	LF,S	56	Salmon Lake, Karta River system	102-60-10870		1983			AK,SS
Co	FP	57	North Thorne River	102-70-10580		1983	1983	1983-c	FS(tb)
Co	FP,S	58	Rio Roberts Creek	102-70-10580-2031	13.5 A str & pond	1986	1989	1991-1995	FS(tb),AK
All	FP	59	Hunter Creek	103-11-10170		1983	Dropped 1995		FS©
S	LF	60	Klakas Lake	103-15-10330		1983			AK
Co	FP	61	Kassa Creek	103-21-10340	1.5 mi stream	1987			FS©
Co	FP	62	Kasook Inlet Creek	103-40-10580	90 A	1987	dropped 1992		FS©
Co,S	FP,S	63	Waterfall Bay	103-50-10290		1987	dropped 1992		FS©
S	LF	64	Hetta Lake	103-50-10470		1983			AK
S	LF,S	65	Klawock Lake limnology investigation	103-60-10470		1983			AK
K	E	66	Klawock Hatchery chinook production	103-60-10470		1983			AK
S	E	67	Klawock Hatchery sockeye program	103-60-10470	5 M fry	1984	1986-c	1989-c	AK
Co	FP,S	68	Cable Creek	103-60-10770-2004	56 A st	1985	1986, 1994	1988-1998	FS©,AK
Co,S,P,Ch	FP,S	69	Tunga Inlet	103-90-10090	300 A lk	1985	1986	1988-1994	FS(tb),AK
Co,P	FP	70	North Staney Creek	103-90-10310	11.5 A	1986	dropped		FS(tb)
All	H	71	Water flow control	105, 106, 107, 101		1983			FS
Co	FP,S	72	Irish Creek	105-32-10120	50 miles	1983	1984	1991, 92	FS(p),AK
P	FP	73	Hole-In-The-Wall	105-41-10040		1988	1988	1988-1992	FS(tb)
S	FP,LF	74	Shipley Lake Creek	105-43-10020	480 A	1986			FS(tb)
S	LF	75	Shipley Bay Lake	105-43-10020		1983			AK
P	FP	76	Survey Creek	105-50-10570			1974	Fishpass removed 2000	FS(tb)

Target Species	Project Type	Proj. No.	Name	Location	Production Basis	Year Proposed	Years Implemented [1]	Years Evaluated [1]	Lead Agenc(ies)
S,Co,P	FP	77	Big Lake, Ratz Creek	106-10-10100	210 A	1985	1991	1991-1995	FS(tb)
Co	FP	78	Hatchery Creek	106-30-10510			pre-1985		FS(tb)
P,Ch,Co	FP	79	Mabel Creek	106-30-10720		1986	dropped		FS(tb)
Co	E	80	Neck Lake hatchery development	106-30-10750		1983	1995	1998-c	AK,SS
Co,S,P	FP,S	81	Cavern Lake	106-30-10800	5A str, 349A lk	1986			FS(tb)
Co	S	82	Big Creek (108 Creek), Whale Pass	106-30-10800		1983			AK
P,Co	FP	83	Snow Pass	106-30-10930	7 A st	1989			FS(w)
Co	S	84	Stream #14, Whale Passage	106-30-xx		1983			AK
S	LF	85	Salmon Bay Lake	106-41-10150-2003					
Co	FP	86	West Douglas Creek	106-41-10650	3 A	1986	dropped 1990		FS(p)
Co	FP,S	87	St. Johns Creek	106-42-10030	56 A	1985	1986	1991-1993, 1997	FS(w),AK,NS,SS
S	FP	88	Kah Sheets Creek	106-42-10100		1983	dropped 1990s		FS(p)
Co	FP,S	89	Duncan Creek	106-43-10750	17 mi	1997	1998	1999-c	FS(p),Gunnuk
Co	FP,S	90	Mitchell Creek	106-43-10800	20 A	1983	1992	1993-c	FS(p)
K,Co,Ch	E	91	Remote releases of Crystal Lake Hatchery production	107, 108		1983			AK
All	FP	92	Vixen Inlet fish pass	107-10-10200		1984	dropped 1993		FS(w)
Co, St	FP	93	Frosty Creek fish pass	107-20-10050	6A lk, 6A str	1989	dropped 1994		FS(w)
K	E	94	Menefee Inlet release site	107-20-10300		1989			
K,Co	H	95	Bradfield systems	107-40		1984			FS(w),AK
K,Co	B	96	Bradfield Canal stocks	107-40		1983	1986, 1989-1991		AK
S	FP,S,LF	97	Virginia Lake	107-40-10070	625 A lk		1988-2002	1988-2002	FS(w),AK,SS
K,Co,Ch	E	98	Virginia Lake hatchery production	107-40-10070		1983			AK,SS
K,Co,Ch	FP,E	99	Harding River	107-40-10490	24 mi stream, 120 A lake	1985	1986	1985-c	FS(w),AK
K,Co	H	100	Bradfield River	107-40-10530-2003	1084 riparian acres	1983	1997-98, 2002	1997-c	FS(w)
K,Co,Ch	E	101	Tyee Lake hatchery	107-40-10538		1983			AK
Ch	FP	102	Salamander Creek	107-40-10820	2.5 mi str		1993	1993-1996	FS(w)
Co	S	103	Pat Creek	108-10-10050		1983			AK
P	FP	104	Meter Bight Creek	108-20-10060	30 A	1989	1993	1993, 1997	FS(w)
All	M	105	Stikine R escapement monitoring- sonar	108-40-10150		1984			AK
K	B	106	Stikine R, Andrew Cr broodstock development	108-40-10200		1983	1970s-c		AK,NS
K	S	107	Gengen Lake stocking	108-40-10500-0010			1984	86-90	AK
K	C	108	Crystal Lake Hatchery ozonation	108-45		1994			AK
K	S	109	Muddy River	108-80-10030					AK, FS(p)
S	S	110	Tahltan Lake	108-80-11100		1989			AK
S	S,LF	111	Tuya River/Tuya Lake	108-80-11300		1983	89-c	89-c	AK
S	R,M	112	Surveillance of unmonitored escapements/sockeye escapement studies	SSE various		1984			AK
Co	FP	113	Cottonwood Creek	103-90-10310	10A str.	1987			FS

[1] – "c" following year indicates a continuing project

Phase I and Phase II Projects Located in Northern Southeast[57]

1. Expansion of coho lake rearing
In 1985 this coho lake rearing project proposed expansion of NSRAA's lake rearing program by planting coho fry in barriered lakes (i.e., Banner, Elfendahl, and Rostislaf lakes) on Baranof and Chichagof islands on a three-year rotation schedule. In actuality, coho juveniles were planted in Banner Lake 1983 and 1989, in Elfendahl Lake in 1984, and in Rostislaf Lake in 1985 and 1989.

2. South Baranof Island lake stocking: Cliff and Lords Pocket Lakes
Lords Pocket Lake drains into Chatham Strait west of Patterson Bay and is located in the South Baranof Wilderness area; Cliff Lake is located near the head of Deep Cove about eight miles southwest of Lords Pocket Lake. An environmental assessment for the south Baranof Island lake-stocking project was completed in the spring of 1988. These two barriered lakes were included as stocking candidates. Deer Lake, located a few miles south of Cliff Lake, was also considered, although no further actions were taken there. In 1988 Cliff Lake was stocked with coho fry that had been reared at Medvejie Hatchery. According to the follow-up plan, 1.1 million and 1.9 million coho fry were to be planted into these barren lakes during odd and even years, respectively. Also, smolt migrations and adult contributions were to be monitored. As of June 2004 this plan had not been put into effect, although detailed lake surveys have been completed on Cliff and Lords Pocket lakes.

3. Rostislaf Lake coho rearing
Rostislaf Lake is located on southeast Baranof Island south of Patterson Bay. As part of NSRAA's barren lakes stocking program, fry were planted in Rostislaf Lake in 1985 and 1989. The poor survival to smolt stage of those two transplants caused NSRAA to discontinue coho stocking efforts in this system.

4. Osprey Lake chinook hatchery
The Southeast Chinook Technical Planning Team received a proposal from NMFS to construct a major production hatchery at the Osprey Lake outlet in Big Port Walter, which is located on the southeastern side of Baranof Island opposite Chatham Strait. The facility would produce 100,000 harvestable chinook annually using a combination of freshwater and marine net-pen rearing facilities. Construction costs were estimated at $9.3 million. This 1985 hatchery project was never implemented.

5. Lake Osprey rearing research
Lake Osprey is located on the lower southeast coast of Baranof Island; the system drains into Port Walter opposite Chatham Strait. In 1984 Little Port Walter Hatchery staff planted 50,000 chinook (2g fry) into the lake. Serious problems with a parasite transmitted through copepods were encountered; very few fish survived to smolt and only about 30 adults were produced. This chinook stocking project was discontinued.

---

[57] Although representative of the majority of the phase I and phase II projects located in the northern Southeast region, the list of projects presented here is not comprehensive; some may have been inadvertently excluded.

6. Deer Lake coho rearing
Deer Lake is a 977-acre lake located on southeast Baranof Island at the entrance to Patterson Bay. Deer Lake was stocked with approximately 850,000 coho salmon in 1985 and 1987 as part of NSRAA's barren lakes stocking program. In 1988, NSRAA had 700,000 coho salmon in excess of lake rearing capacity. Rather than destroy the fish or stock the lakes too densely, Deer Lake was stocked with the 470,000 coho, and a fertilization program was started to increase primary and secondary productivity. In addition, fertilization allowed annual stockings due to the elevated zooplankton biomass. Commercial fertilizers have been applied annually from July through mid-September to (1) sustain zooplankton levels adequate for fish to grow to smolt stage in one year and (2) maintain nutrient levels to ensure good recruitment for next summers zooplankton crop. Annual stocking and fertilization has continued, with the exception of 2000 when the number of juvenile coho from previous plantings had exhausted the lakes food supply and held over to the following year. From 1990 to 1999, Deer Lake's annual production of returning adults ranged from 77,000 to 287,000 coho.

7. Banner Lake coho rearing
Banner Lake is located along the west side of Patterson Bay on southeast Baranof Island. Juvenile coho were planted there in 1983 and 1989 for broodstock development for NSRAA's lake rearing program. Coho were again planted into this lake in 2000 in order to continue the lake stocking program during a year when Deer Lake had not been stocked.

8. Port Armstrong Hatchery expansion
Port Armstrong is located on the east side of Baranof Island near its southern tip. In 1986 Armstrong-Keta Incorporated proposed an expansion of Port Armstrong Hatchery to produce 30,000 harvestable chinook. In 1992 ADF&G selected Port Armstrong Hatchery as the facility to conduct the Southeast Baranof Chinook Project. Using a U.S./Canada funding grant, an expansion project to rear chinook was initiated at the hatchery site. Construction began in the fall of 1992; it included installation of new water pipelines, new raceway and raceway support structures, and expansion of the hydroelectric facilities. The project was completed in 1995; however, no chinook eggs from an approved broodstock were available. Coho production was expanded in 1995 to fill unutilized rearing space until sufficient chinook broodstock became available. Chinook production was suspended in 1994 to provide a break in returns between Unuk River/Andrew Creek stocks and King Salmon River (KSR) stock. The KSR stock never became available to Port Armstrong, and that broodstock development program was dropped in 1998. In 2001 chinook production resumed with 125,000 Unuk River chinook eggs from Little Port Walter. The first adult returns of Unuk stock are expected in 2005.

9. Falls Lake fish pass
This 234-acre lake is located in a wilderness area on the east side of Baranof Island directly south of Red Bluff Bay off Chatham Strait about 30 miles southeast of Sitka; it is located within the South Baranof Wilderness. A partial barrier at the lake outlet has caused significant mortalities to returning spawners, especially coho that returned when water levels were low. Falls Lake supports runs of sockeye, coho, and pink salmon as well as Dolly Varden char. The Forest Service constructed a fish pass there in 1986. The

environmental assessment for this project was administratively appealed; the subsequent appeal decision by the chief of the Forest Service directed changes in agency policy in the Alaska region for fish enhancement in wilderness areas. During a 5-year monitoring period that occurred prior to construction of the fish pass, 15% of returning adult salmon died at the falls. Mortality at the falls declined to 3% during a 3-year monitoring period following construction of the fish pass; as many as 5,000 sockeye have been counted above the fish pass. Since 2001 sockeye returns to Falls Lake and its associated subsistence fishery have been monitored through a cooperative project between ADF&G and Office of Subsistence Management.

10. Falls Lake fertilization

This 234-acre lake is located on the east side of Baranof Island opposite Chatham Strait about 30 miles southeast of Sitka. Included in the 1985 phase II revision as "operational," the potential production of this limnology project was estimated at 23,400 sockeye to the common property fishery.

11. Eliza Lake fry stocking and evaluation

Eliza Lake is a small barriered lake on the southern tip of Admiralty Island. An environmental analysis focused on the effects (1) introduced chinook salmon would have on native species and (2) stocking would have on wilderness values. In 1986 the Department planted 130,000 chinook fry there. The only adult chinook returning from that release were those recovered in 1991 in the troll fishery in District 10.

12. Slo Duc Creek fish pass

Slo Duc Creek is on the northwest side of Kupreanof Island about five miles southeast of Kake. In 1986 biologic and economic analyses were completed by the Forest Service as a precursor to conceptually designing the fish pass. In 1989 the land in the area was conveyed to the local Native corporation in Kake and the project was put on hold.

13. Kadake & Saginaw watersheds, large woody debris replacement

Saginaw Creek drains into Saginaw Bay on northern Kuiu Island and Kadake Creek drains into Kadake Bay on northeastern Kuiu next to Port Camden. Riparian second growth was thinned in 1995 and 1996 to accelerate growth of conifers for future sources of large woody debris in riparian areas that had been previously logged. This project involved cutting and girdling alder trees to release spruce and hemlock. The amount of pool-forming large woody debris in the streams had been reduced, compared with streams where no logging had occurred. Cutting alders increased sunlight to the smaller conifers, but girdling failed to kill the trees.

14. Port Camden incubation boxes

Port Camden is located on northeastern Kuiu Island; its entrance is west of Kadake Bay off Keku Strait, and its headwaters are about 25 miles south of Kake. In 1985 PNP Hatchery Permit No. 23 was issued to NSRAA to construct and operate an instream incubation facility there on two unnamed streams (i.e., Nos. 109-43-006 and 109-43-008 in the anadromous stream catalogue), providing that no more than 10 million chum salmon eggs were to be taken in any one year. The primary goal of this project was to provide additional fall chum to the common property fishery; the secondary goal was to rehabilitate the naturally spawning fall chum stocks in Port Camden. It was a cooperative project with participation by the department, Forest Service, and NSRAA. The project was cancelled in December 2000.

15. Slippery Creek fish pass

Slippery Creek is located on northeast Kuiu Island and drains into Port Camden, which is located about 15 miles south of Kake. In 1988, the fish pass was built and the upper watershed was stocked with coho fry from Crystal Lake Hatchery. Slippery Lake coho have been intercepted in a wide range of commercial seine, gillnet, and troll fisheries from District 1 to District 16. The dominant areas where enhanced coho from Slippery Lake were harvested are the District 9 purse seine fishery and the District 9 and 13 troll fisheries. Pink, chum, steelhead, and Dolly Varden char also use the fish pass. The department also uses Slippery Creek as a coho index system; it operated a weir there above the fish pass in 1998, 2000, 2001, and 2002. The respective coho escapements for those years were 632, 411, 2,674, and 5,341.

16. Port Camden spawning channel

Port Camden is located on the east side of Kuiu Island about 20 miles south of Kake. The Forest Service completed construction of an intertidal spawning channel for chum salmon in west Port Camden in 1989. The channel is designed to take advantage of available groundwater by developing an area not previously used by chum salmon spawners. Chum salmon have used the channel to access the upwelling spring water further upstream, but little actual spawning has occurred there. Additionally, NSRAA has used this channel as an egg take site; the fertilized chum salmon eggs are placed in instream incubation boxes.

17. Dean Creek fish pass

This system is located on northern Kuiu Island between Saginaw and Security Bays. In 1983 a fish pass was installed 0.25 mile above salt water. Natural colonization by coho has been slow because of low numbers in the downstream population and limited fry transplants from adjacent streams. The fish pass was modified in 1994 to allow access to pink. Annual coho fry index counts through 1998 indicate low colonization. Potential problems include lack of coho spawning habitat as well as access to rearing habitat because of extensive beaver dams and ponds.

18. Browns Creek fish pass

Browns Creek is located at the head of Rowan Bay on Kuiu Island. A 28-foot falls located 2.6 miles upstream blocks access to approximately 17 acres of spawning and rearing habitat. A preliminary design has been developed for a fish pass; however, NEPA documentation and a final design will be required before project implementation. Substantial populations of pink, coho, and steelhead are present in the lower creek. Coho from the lower portion of the creek could be used to stock the upper watershed. Average annual peak escapement of pink from 1993 to 2002 is 29,000. Although some pink may use the fish pass, little spawning habitat exists above the falls. Construction costs have been estimated at $200,000. A logging road access is available to within 1 mile of the proposed fish pass. Emphasis on this project has been reduced because of a low benefit-cost ratio.

19. Kwatahein Creek fish pass
Kwatahein Creek is the main pink producer in the Bay of Pillars on west Kuiu Island. In 1989 a 60-foot fish pass was built to allow pink and chum access to spawning and rearing habitat above a 13-foot barrier; the fish pass was successful. From 1993 to 2002 the average annual peak escapement of pink above the fish pass was 41,000, compared with an annual average peak escapement of 1,700 during the ten years preceding its construction (i.e., 1979-1988).

20. Wolf Creek fish pass
Wolf Creek is located on Kuiu Island at the head of Thetis Bay, which is one of the southern arms of Tebenkof Bay about 20 miles west of Little Port Walter. There is a barrier to pink and chum about one eighth of a mile above the intertidal zone. Coho are able to pass over the barrier. In 1982 the Forest Service designed a fish pass to provide access to pink and chum; however, the project was put on hold pending completion of a study comparing aquaculture projects in wilderness areas versus those in nonwilderness areas. There appears to be little interest in the project, and there are no current plans to move forward.

21. Thomas Bay coho lake rearing
Thomas Bay is located on the mainland about 13 miles north of Petersburg. In conjunction with a proposed hatchery development in Thomas Bay, lakes in the area may offer opportunities for coho rearing.

22. Thomas Bay hatchery feasibility
Thomas Bay is located on the mainland about 15 miles north of Petersburg in Frederick Sound; it is considered an excellent potential terminal harvest area. There are two water sources for a hatchery: Scenery Lake and Swan Lake. The more probable water source would be the Swan Lake outlet stream just above a falls near salt water. Hydroelectric development is also possible. This proposed hatchery was identified in phase II planning as a 20-year project.

23. Rehabilitate/enhance small mainland chinook stocks in the Farragut River
The Farragut River is a partially glacial system on the mainland that empties into Farragut Bay, which connects with Frederick Sound. The local chinook stock was enhanced in 1992, 1993, and 1994 by planting fry into Farragut Lake, which is located at the headwaters of the river about three miles above a barrier that blocks access to returning fish. The annual goal of the project was to collect 250,000 eggs from 40 females, incubate them, rear them for a short time at Crystal Lake Hatchery, and release fry into the lake. Based on preliminary studies conducted from 1983 to 1985, 2,000 to 4,000 adults could be generated from the river from a 250,000-egg project. Funding for this project was dropped after the 1994 releases, and no adults from the 1992 to 1994 releases were recovered. Construction of a fish pass at the barrier located 10 miles from salt water has been considered to provide fish access to two 1,000-acre lakes above the barrier.

24. Cat Creek fish pass
Cat Creek is located on the mainland and drains into Frederick Sound about 25 miles northwest of Petersburg. A feasibility analysis conducted by the Forest Service concluded that modification (blasting) of three small bedrock waterfalls would allow pink access to spawning and rearing habitat above the barriers. Coho, however, are able to negotiate the existing falls. The project was not carried forward in the 1980s and 1990s because of the abundance and low value of pink salmon.

25. Portage Creek fish pass
Portage Creek is located on northern Kupreanof Island and drains into Portage Bay, which opens into Frederick Sound. Two fish passes, located 1.5 and 2.0 miles above tidewater, were constructed to provide access to approximately 40 acres of spawning and rearing habitat. From 1992 to 1995 coho enhancement activities were conducted there. Eggs were taken from native stock below the barriers; they were incubated at Gunnuk Creek Hatchery and fry were short-term reared there before being planted above the fish passes. At full utilization, this system could produce an estimated 1,200 to 6,850 adult coho and 95,000 adult pink annually. Steelhead, chum, and pink are expected to colonize volitionally. Estimated commercial harvest of coho was 113 in 1995, 260 in 1996, and 402 in 1997. Determining peak escapement is difficult because of the system's tannin-colored water; escapement counts between the two fish passes have varied from 400 to 5,000 pink. Coho escapement counts have not been conducted.

26. Roberts Island Creek fish pass
Roberts Island Creek is located on the mainland on the south shore of Port Houghton about 33 miles northeast of Kake. Pink and chum are most common resident anadromous species there. Good spawning and rearing habitat are available in the first mile, but a large log barrier diminishes upstream habitat. Stream surveys conducted by the Forest Service for a 1995 Port Houghton/Cape Fanshaw timber sale project did not identify this system as having enhancement potential.

27. Lauras Creek fish pass
Lauras Creek is located on the mainland and drains into inner Hobart Bay, which is adjacent to Stephens Passage about 55 miles north of Petersburg. A series of small falls that begin at Goldbelt Corporation's property line and proceed upstream provide a partial barrier to anadromous fish. The upstream spawning and rearing habitat appears suitable for coho. Blasting is the preferred method for creating access, because physical characteristics of the gorge would make construction alternatives difficult. In 1990 the Forest Service surveyed the stream and found juvenile coho above the barrier, indicating some access during high-water flows. This information coupled with the high cost of the project led the Forest Service to drop this project from its five-year plan.

28. Chuck River/North Arm Lake (Port Houghton enhancement potential)
The Chuck River is located on the mainland; it drains into Windham Bay, which borders on Stephens Passage. It has a very small run of chinook and is a major producer of pink. A gorge with small cascades and velocity chutes sometimes prevents the majority of the pink run from reaching five miles of excellent spawning habitat. It may be feasible to

provide access by constructing a fish pass at the site of the barrier. North Arm Lake is drained by the Rusty River into the Port Houghton Salt Chuck. Port Houghton is a large mainland bay that borders on southern Stephens Passage. There is a steep narrow gorge that prevents fish access to North Arm Lake nearly all the time. Steelhead and coho reside in the lake; sockeye have not been observed in the lake, so they may be spawning in the river and either rearing there or in the salt chuck. Rusty River is often the largest pink producer in District 10; from 1993 to 2002 it had an average peak escapement of 150,000 fish. Various enhancement techniques for these systems have been discussed, including constructing a fish pass, planting fry above the barriers, fertilizing the lakes, or installing instream incubation boxes. Habitat protection of the Chuck River watershed from potential effects of logging or mineral extraction would be fundamental to these efforts.

29. Walter Island Creek habitat improvement

Walter Island Creek is located on the mainland on the southern shore of Port Houghton about 35 miles north of Petersburg. Pink and chum production from this 4.5 mile system is poor, partly because the 3% gradient causes poor gravel supply. The installation of wire gabions would be a potential means of holding spawning gravels in place and thereby enhancing local salmon stocks; however, the Forest Service does not consider this project a priority. Further investigations will not take place unless this agency’s priorities change.

30. Negro Creek fish pass

Negro Creek is a small watershed on the mainland that drains into Port Houghton at the southern portion of Stephens Passage about 40 miles north of Petersburg. A vertical waterfall one mile from salt water is a total barrier to anadromous fish. In 1988 the Forest Service blasted a slot and resting pool, which allowed coho and steelhead to access about one acre of excellent spawning and rearing habitat. Subsequent monitoring revealed no evidence of fish using the fish pass. Additional blasting and enhancement activities may be attempted when road access becomes available.

31. Surprise Creek fish pass

Surprise Creek is located on the mainland on the south side of Windham Bay, which is adjacent to Stephens Passage about 50 miles southeast of Juneau. This creek has a partial barrier approximately one-half mile from the estuary, but it has the qualities necessary to be a good producer: (1) the gradient is slight, (2) the riparian slopes steep, and (3) there is little debris. From 1993 to 2002 the average annual peak escapement of pink salmon above the barrier was 11,000 fish. The project was dropped because it was considered to be economically unfeasible.

32. Juneau area recreational fishery enhancement

Division of Commercial Fisheries staff began releasing chinook reared at Snettisham Hatchery at several locations on the Juneau road system in an attempt to bolster the Juneau marine recreational fishery. The Sport Fish Division assumed funding for this project in 1991; in 1993 the project, including Sport Fish funding, was transferred to DIPAC's Macaulay Hatchery.

33. King Salmon River broodstock development
The King Salmon River is located on northeastern Admiralty Island; it drains into King Salmon Bay in Seymour Canal. Beginning with the 1979 brood, King Salmon River (KSR) chinook salmon were cultured at Snettisham Hatchery. The intent was to replace Snettisham releases of Andrew Creek stock; however, because of low returns and high interception rates around Snettisham, a portion of the KSR stock was moved to Little Port Walter in 1988 to speed-up its development. The Chinook Planning Team (CPT) recommended use of KSR stock for culture at DIPAC's Gastineau (Macaulay) Hatchery and Port Armstrong Hatchery. In 1998, however, the CPT recommended dropping KSR chinook as a hatchery broodstock because there were (1) indications that the stock did not respond well to domestication, (2) genetic concerns for developing a broodstock with characteristics differing substantially from all other Southeast chinook stocks, and (3) the risk of detrimental effects to other stocks if cross breeding occurred in the wild.

34. Taku River system rehabilitation/enhancement potential
The Taku River is located on the mainland 20 miles southeast of Juneau; it drains into Taku Inlet, which is adjacent to Stephens Passage. In 1982 a proposed project sought Canadian cooperation to (1) allow the evaluation of spawning and rearing habitat above barriers present on Nakina River, Dudidontu River, and Tseta Creek, and (2) determine feasibility of stocking chinook fry above those barriers. This project was never implemented.

35. Taku River coho rearing habitat improvement
The Taku River is located on the mainland about 20 miles southeast of Juneau. This system drains into Taku Inlet, which is adjacent to Stephens Passage. Creation of access to slough and pond areas on the lower Taku River could expand natural coho production. The Forest Service and the department have identified several sites that were included in the phase II planning process; however, the project was dropped in 1996.

36. Taku River mark/recapture/escapement
The Taku River heads in British Columbia and flows southwest 54 miles to Taku inlet, about 20 miles southeast of Juneau; ADF&G operates the Canyon Island fish wheel on that system that is used to gauge the run timing and strength of the various species of salmon going into that system. The data acquired are used for management purposes. The fish wheel also provides the opportunity for Division of Sport Fish personnel to mark chinook for determining population estimates.

37. Taku River (Fish Creek) habitat improvement
The Taku River is a major transboundary system located about 20 miles southeast of Juneau; Fish Creek enters the river a few miles south of the U.S./Canada border opposite Canyon Island. This project entails removal of a 6-feet-high-by-400-feet-wide beaver dam that is a total barrier to fish passage. The recommended procedure of the Forest Service is to blast and remove 150 feet of the dam. Annual adult coho production from this system has been estimated at 2,000 to 5,000; total production failure could result if the dam remains in place.

38. Davidson Creek fish pass
Davidson Creek drains into the east side of the Taku Inlet just north of Turner Lake. A reconnaissance survey was conducted in 1963 to assess the suitability for modifying a waterfall barrier and planting coho. In 1964 and 1965 coho were planted in the stream. Davidson Creek was again surveyed in 1988, and a detailed fish pass feasibility assessment was recommended. The extent and quality of upstream habitat makes Davidson Creek an excellent enhancement opportunity. Project scoping/feasibility studies and an environmental analysis were conducted in 1990. The fish pass was completed by the Forest Service in 1991. A new enhancement effort involving a coho egg-take from the Taku River near Canyon Island was conducted for two years after the completion of the project. Monitoring has indicated that coho have spawned above the barrier, probably in small numbers. Fry densities and the radio-tracking of adults trying to negotiate the barrier, indicate that the barrier is still blocking most upstream access. In order to improve passage, additional blasting at the barrier is scheduled for 2003. Monitoring of this system will follow.

39. Turner Lake fish pass/limnological studies
Turner Lake is located opposite the eastern shore of Taku Inlet about 20 miles east of Juneau; two department projects have been proposed for this system: (1) development of a fish pass to provide fish access to the lake and its tributaries and (2) use of the lake for sockeye enhancement by planting fry there. Both projects were set-aside in 1989 as the result of an environmental analysis, which concluded it would be necessary to complete an environmental impact statement (EIS) in order to make a decision on both proposals. Because of the controversies over potential impacts of planted sockeye to resident cutthroat trout and the related sport fishery at the lake, the department dropped the proposal.

40. Turner Lake stocking
Turner Lake is located on the mainland about 20 miles west of Juneau on the east side of Taku Inlet. It has the potential to produce an estimated 50,000 adult sockeye annually. In 1989 Forest Service and department staff jointly prepared an environmental analysis; however, seven people objected to the project during an appeal process. Preparation of an EIS and any further plans for implementing the project stopped when department biologists were unable find Infectious Hemapoetic Necrosis (IHN) virus in resident kokanee. Any sockeye fry planted in the lake could potentially introduce IHN to the system; therefore, the ADF&G pathology policy prohibits such plants.

41. Sockeye central incubation facility (Snettisham)
Snettisham Hatchery is located on the mainland in Port Snettisham, near the northern end of Speel Arm, about 30 miles southeast of Juneau. Following its construction in 1979 it produced mostly chum and had initiated a small chinook program. Both of these programs were unsuccessful; the water was too cold for chinook and survivals were low, and not enough returning chum were getting through the fisheries to meet broodstock needs. The conversion of Snettisham Hatchery to a central incubation facility for sockeye was originally proposed in 1987 and accomplished in 1993. The new facility has ten separate incubation modules designed to service a diverse program of sockeye lake enhancement in northern Southeast Alaska. The new program also expanded the sockeye

smolt project, which is intended to provide for cost recovery potential. The facility incorporates new systems that provide better water quality and more efficient operation. ADF&G staff believes that Snettisham has the best potential of any Southeast Alaska hatchery to produce sockeye and further advance this technology. The Snettisham program melds several important projects at one facility: (1) TBR stocking projects at Tahltan and Tuya Lakes; (2) Chilkat Lake sockeye enhancement; (3) Speel and Crescent Lakes stocking; (4) Port Snettisham sockeye smolt releases; and (5) Sweetheart Lake stocking. In 1996 the operation of Snettisham Hatchery was transferred by ADF&G to DIPAC.

42. TBR stocking projects: Tahltan, Tuya, Tatsamenie, and Trapper lakes

When the United States and Canada entered into the Pacific Salmon Treaty governing harvest of salmon stocks of joint concern, they also committed to jointly undertake enhancement efforts designed to benefit both countries. In Alaska the major joint enhancement projects were for sockeye lake stocking on the TBRs (i.e., Taku and Stikine rivers). Limnological studies indicated these Canadian lakes could support additional production. Eggs were taken from Tastsamenie and Tahltan lakes in 1993, incubated at Snettisham Hatchery, and resulting fry planted into Trapper, Tahltan, and Tatsamenie lakes in 1994. These lake stocking projects continued in 1995. During the 1996 fry plants, Tuya Lake was substituted for Trapper Lake, and 2000 was the last year fry were planted into Tuya Lake (*see* project No. 110 on page 157). Fry plants into Tahltan and Tatsamenie lakes are ongoing projects; Snettisham has dedicated four modules for this program.

43. Port Snettisham sockeye smolt releases

Snettisham Hatchery produces sockeye smolts for release at two saltwater sites: (1) at the hatchery and (2) Gilbert Bay. This program, which began in 1997, is expected to generate between 300,000 and 450,000 adult sockeyes per year at full production; cost recovery is expected to cover project costs.

44. Indian Lake large woody debris introduction

Indian Lake empties into Speel Arm in Port Snettisham about 30 miles southeast of Juneau. In 1985, 88 trees were felled and cabled to the lakeshore to provide additional coho rearing habitat. In 1989 coho fry were observed using this rearing habitat.

45. Indian Lake incubation facility

Indian Lake is located about 25 miles southeast of Juneau near the terminus of Speel Arm; it is a few miles north of Snettisham Hatchery. Construction of a remote central incubation facility there was proposed by the department and the Forest Service to enhance sockeye production in the lake. Streamside incubation was tested at this site in 1987; it was seeded with 500,000 sockeye eggs. Although the water source provided adequate flow through the winter, low pH caused aluminum toxicity and the eggs did not survive.

46. Speel and Crescent lakes stocking

Speel and Crescent Lakes are located on the mainland and drain respectively into the Speel and Whiting Rivers, which flow into Port Snettisham about 30 miles southeast of Juneau. These lakes are an integral part of the operations at Snettisham Hatchery that provide the sockeye brood source for this portion of the program. These lakes have each been stocked one year to maintain and enhance production.

47. Speel Lake weir
Speel Lake is located at the headwaters of Speel Arm off Port Snettisham about 30 miles southeast of Juneau and 6 miles up the Long River from Snettisham Hatchery. Speel Lake is the designated sockeye broodstock for releases at the hatchery. To provide estimates of the escapements, a weir has been installed at the outlet; weir operation occurs from mid-July to about mid-September. The weir project is accomplished cooperatively with DIPAC and the department. If the natural spawning is less than 5,000 sockeye, fry or pre-smolts are planted back into the lake to safeguard the natural spawning population.

48. Crescent Lake prefertilization studies
This 5.3-mile^2 shallow lake (i.e., 82 feet) drains into Port Snettisham and Stephens Passage by way of the Whiting River and has a moderate glacial influence. Sockeye and coho spawn and rear in the lake. Because little is known of the production potential of fertilized glacial lakes, limnological, physical, and zooplankton data were collected and analyzed in 1988, 1989, and 1990. The fertilization project was not implemented.

49. Crescent Lake escapement survey
Crescent Lake is located about 48 miles southeast of Juneau. During sockeye spawning runs in 1977 and 1978 and from 1983 to 1992, ADF&G maintained a large weir at the outlet of the lake to conduct annual escapement surveys; however the data was suspect because the weir had not been consistently fish tight. In a 2002 Crescent Lake survey, DIPAC and ADF&G installed a fixed-location, split-beam hydroacoustic system (sonar) to estimate the escapement of sockeye. A location near the historic weir site downstream of the mouth of Crescent Lake was considered suitable for the sonar installment. This was the first attempt to assess the spawning run of sockeye there using sonar. The primary objective of this survey was to provide ADF&G fisheries managers with an inseason relative abundance tool to help in their decision-making process.

50. Sweetheart Lake stocking
Sockeye fry are stocked in Sweetheart Lake, which is a barriered system in Port Snettisham about 30 miles southeast of Juneau. The outlet creek cascades down a 500-foot fall before entering salt water. Investigations completed in 1993 indicated that 60% of sockeye smolts leaving the lake survived this drop, which is an acceptable mortality in terms of the applicable enhancement technique (i.e., fry planting). The first adults returned in 1993. Further sockeye fry plants are scheduled to continue at Sweetheart Lake. This project could produce an additional return to Gilbert Bay of between 20,000 and 60,000 adult sockeye per year. As the five million smolt level is reached, adult production should double; however, additional evaluation is needed to meet full production, and it is likely that lake fertilization would be needed.

51. Macaulay Hatchery broodstock development
Andrew Creek chinook stock was cultured at Macaulay Hatchery to begin their chinook program in 1989; however, release of this central Southeast stock in a northern "sensitive"

zone was considered temporary; i.e., until the King Salmon River stock was adequately developed (*see* project No. 33 on page 169). In 1998 the Chinook Planning Team reconsidered broodstock "assignments" and recommended development of (1) Tahini River stock for Macaulay Hatchery and (2) additional release sites in Lynn Canal for that stock.

52. Herbert andEagle rivers rearing pond complex

The Eagle and Herbert rivers are glacially turbid systems sharing a common drainage and are located about 25 miles north of Juneau. The Forest Service has determined these systems have limited potential to produce coho salmon. Although these systems have an abundance of suitable spawning habitat, rearing habitat along downstream reaches are limited. In 1988 and 1989, the Forest Service constructed a channel connecting two ponds. This new rearing habitat also connects to the Herbert River. The scope of the project was reduced from its initial proposal because of potential impacts from materials removal. The final project includes two small ponds and 600 feet of channel. The Forest Service monitored fish use of the new habitat for three years. Groundwater levels allow the new habitat to connect with the main Herbert River channel during the summer months. The habitat is used by up to 1,500 juvenile coho salmon. About 90% of the fish that move into the habitat throughout the summer overwinter in the ponds. During the years it was monitored, overwintering mortalities were very low. Potential exists to expand this project. Due to the strong natural runs of coho salmon, no expansions are planned.

53. Dredge Lakes fish pass/stocking

Dredge Lake is located on the Juneau road system a few miles from the Mendenhall Glacier. Between 1985 and 1989 the Forest Service and ADF&G cooperatively conducted a coho stocking project there: (1) in 1985, 20,000 smolts were planted, and (2) in 1989, 80,000 were planted. The goal of the project was to improve local fishing and provide a new roadside fishery with an estimated yearly escapement of 6,000 adults. In 1985 a concrete culvert was installed at the outlet of the system to allow for smolt outmigration. Stocking efforts are no longer needed because a self-sustaining run (i.e., annual average of 500 adults) has been established.

54. Limestone Inlet chum releases

Limestone Inlet is located on the mainland about 25 miles southeast of Juneau on the eastern side of Stephens Passage. Snettisham Hatchery began releasing chum salmon at Limestone Inlet in 1988. This project was transferred to Macaulay Hatchery in 1992, and DIPAC and NSRAA have continued to release chums there.

55. Baranof Warm Springs rearing and release investigations

Baranof Warm Springs is located in Warm Springs Bay on the northeast side of Baranof Island opposite Chatham Strait. In 1987, when Tahini River chinook stock had been under development at Hidden Falls for a few years, the Chinook Planning Team recommended that smolt releases be moved off-site from Hidden Falls to avoid interception in the chum fishery and reduce problems and costs associated with chinook stock separation for spawning. Warm Springs Bay was considered by NSRAA and ADF&G as a potential site for a cooperative NSRAA/ADF&G chum salmon rearing project. ADF&G also considered it as a potential site for construction of a state hatchery. No fish were released there in 1987 because of insufficient time for obtaining proper permits and negative public input into the decision-making process. In 1989 the idea was abandoned altogether, along with plans for a state chinook hatchery because of insufficient funding and public opposition by property owners at Baranof Warm Springs.

56. Baranof Warm Springs hatchery
Chinook releases from this site were expected to draw harvest effort to the lower Chatham Strait/Frederick Sound area. Federal mitigation funds were earmarked for this project, and preliminary costs for construction of this facility were estimated at between $15 and $18 million. In 1989 ADF&G decided not to dedicate any further U.S./Canada planning efforts toward this proposed project because by then they had begun transferring operation of state facilities to the PNP sector; furthermore, there was opposition to this project by property owners in Baranof Warm Springs.

57. Whiterock Creek fish pass
Whiterock Creek is located on southeastern Chichagof Island. Cascading waterfalls form a partial barrier to coho and a complete barrier to pink and chum. Step pools were blasted into a rock plateau adjacent to the barrier falls, and large woody debris structures were placed in the main channel in 1992. Annual monitoring indicates upstream habitat has been fully utilized by juvenile coho since completion of the project. All large wood debris structures are still in place, providing additional instream rearing habitat. Between 1993 and 1994, the sill walls on two blasted pools of the fish pass failed because of poor rock quality. In 1995 two concrete walls were constructed to replace the failed sills and improve passage, particularly for pink and chum. Monitoring and evaluation of this fish pass continues.

58. Wheeler Creek (Game Cove) fish pass/stocking
Wheeler Creek is located on west Admiralty Island within a designated wilderness national monument. There is a barrier located about five miles from salt water; this 45-foot vertical falls blocks all anadromous fish access to upstream spawning and rearing habitat. This system has been investigated as a potential site for reintroduction of chinook. A habitat and juvenile population inventory of the watershed was completed in 1992 to determine the number of chinook in the system. A thorough habitat survey was conducted in 1993 by the Forest Service. Because of the relative high cost of a fish pass, the Forest Service did not pursue enhancement activities; however, if priorities change, further project investigations may be initiated.

59. Ward Creek fish pass/stocking
Ward Creek is a large west Admiralty Island system with a partial barrier one mile above salt water. Although coho salmon have been documented above the barrier, access is impeded during low- and high-flow periods. This project was considered as a mitigation opportunity for Shee Atika logging operations, but because the barrier does not completely obstruct fish access and most of the watershed is in a designated wilderness national monument, the Forest Service has not pursued enhancement activities on this system. If priorities change, further project investigations may be initiated

60. Florence Lake/Florence Creek fish pass/stocking
This system is located on the west side of Admiralty Island about 20 miles east of Tenakee Springs. Most of this system, including the 840-acre lake and most of the upper watershed, is on land owned by Shee Atika Inc., a regional Native corporation headquartered in Sitka. There is a vertical falls barrier in this system located about one mile from salt water. This system was considered a potential study site to determine the effects of sockeye introduction on resident cutthroat trout. Shee Atika Inc. has expressed an interest in participating in this enhancement project. In 1994 the Forest Service decided not to proceed with further evaluation because of high costs and concerns for the resident cutthroat trout population.

61. Fishery Creek fish pass
Fishery Creek is a major coho and pink system on the west side of Admiralty Island that flows directly into Chatham Strait. A large vertical waterfall barrier occurs approximately 1.5 miles above salt water. The barrier prevents access by coho and pink to an additional 17 miles of spawning and rearing habitat. The Forest Service in the mid-1990s conducted a complete habitat survey. This survey found that the stream above the barrier contained good spawning habitat but only limited off-channel coho rearing habitat. This system also contains a unique resident cutthroat trout stock. Because of the limited coho rearing habitat above the barrier and the potential impact to the resident cutthroat trout, the Forest Service has not pursued this enhancement project. If priorities change, further project investigations may be initiated.

62. Hidden Falls hatchery expansion/smolt rearing facilities
Hidden Falls Hatchery is located on east Baranof Island about 20 miles northeast of Sitka; the system drains into Kasnyku Bay and Chatham Strait. Expansion of the smolt rearing facilities for chinook and coho was proposed when the hatchery was transferred from ADF&G to NSRAA in 1988, and this expansion was completed in 1991. In 1992 a summer chum enhancement project, funded by the U.S./Canada Pacific Salmon Treaty Enhancement Program for Southeast Alaska, enabled NSRAA to increase its chum production by 35 million eggs. Existing floor space in the hatchery was available for the increased stacks of incubators. Funding was used to purchase incubators, holding ponds, net pens and floats, a feed storage barge, fish grinder, monitoring equipment for the water pipeline, skiff and motor, computer, pallet jack, and water piping. To ensure that the local habitat had the carrying capacity to support additional chums, NSRAA determined that incremental smolt releases were warranted.

63. Indian River fish pass/stocking
The Indian River is located on west Chichagof Island near Tenakee Springs. A waterfall 1.5 miles from tidewater prevented fish access to 34 miles of upstream spawning and rearing habitat as well as a 10-acre pond. In 1986 and 1988 chinook fry were cooperatively planted above the barrier by the Forest Service and the department. The estimated fry to adult survival was 0.5%. In 1993, 120,000 chinook fry were planted above the barrier. An environmental assessment was conducted to analyze and disclose the effects of a proposed fish pass. A decision was made to build the fish pass but to discontinue chinook stocking. The focus of enhancement was redirected towards coho.

Permits were obtained to capture native coho fry from the lower river and to plant them into habitat above the falls. Recent returns of coho have been low; however, only 1,000 coho fry were planted there in 1999. The system is currently being stocked with fry from Kadashan River. A vertical slot concrete fish pass was completed in 1999. An 8-foot waterfall further upstream was also modified by blasting step pools to provide fish access. An estimated 3,000 adult cohos could potentially be produced from this system annually for sport, commercial, and subsistence users and particularly for nearby residents of Tenakee Springs.

64. Upper Corner Bay fish pass

Corner Bay Creek flows into Tenakee Inlet about 7 miles southeast of Tenakee Springs. Two fish passes were constructed in 1981 and 1983 to provide access for pink and chum to 5.5 miles of upstream habitat. The waterfalls had been only partial barriers to coho. Repairs have occurred in 1992, 1997, and 2002. Pink and chum from the downstream population volunteered through the fish passes and have successfully established in the upper watershed at approximately the expected levels. Several thousand adults are counted annually between the ladders, and less than 1,000 adults are annually counted above the upstream ladders.

65. Kadashan River weir

The Kadashan River is located about five miles south across Tenakee Inlet from Tenakee on Chichagof Island; it drains into Kadashan Bay. The weir was put in place by ADF&G in the late 1970s early 1980s to monitor the system's chum prior to utilizing that endemic stock as a source for the Hidden Falls Hatchery's chum brood. The Forest Service in an earlier project also wanted to take coho from the Kadashan River and use those fish as broodstock for rehabilitation of the Indian River.

66. Pavlov River upper fish pass

The Pavlov River is located about six miles northeast of Tenakee on Chichagof Island; it drains into Pavlov Lake and then into Pavlov Harbor at the southern end of Freshwater Bay. Two fish passes have been installed in the Pavlof River system: (1) in 1935 a concrete stair was constructed by the Works Progress Administration (WPA) at a partial waterfall barrier located at salt water (2) in 1987 an aluminum fish pass was installed at an upper cascade barrier to provide pink and chum with access to high-quality upstream spawning habitat. Previous to modification, the barriers were passable to coho and sockeye. Since construction, maintenance has included cleaning rock and organic debris from the outlet as well as use of explosives to create and deepen an exit channel immediately upstream of the fish exit. In 1995 a relatively large coho escapement (i.e., 1,840 upstream of the upper fish pass) occurred when the outlet of the fish pass had been partially blocked by organic debris from a washed-out beaver dam. In 2003 the Forest Service conducted further studies to determine how many fish this project contributes to the area's common property fisheries.

67. Pavlov River and Pavlov Creek fish habitat monitoring

These systems are located on east side of Chichagof Island about eight miles north of Tenakee. As of June 2004 no known progress has been made on this project, which was proposed in 1989.

68. Kennel Creek large woody debris insertion
Located on Chichagof Island about six miles north of Tenakee Springs, Kennel Creek drains into Freshwater Bay. Large woody debris was added to this system in 1992 to create rearing habitat for anadromous and resident fish. An evaluation by the Forestry Sciences Lab was conducted to determine the effectiveness of the habitat restoration work; the project was determined to be ineffective and has been discontinued.

69. Bay Head Creek barrier modification
Bay Head Creek is located on the east side of Chichagof Island about 14 miles north of Tenakee Springs; it drains into the head of Freshwater Bay near the northern part of Chatham Strait. In 1992 three barriers in this system were modified by blasting. In 1992, walk-through surveys to determine coho escapement in 1992 failed to detect any coho upstream of the barrier modifications. Although blasting in 1993 and 1995 created larger step pools at the lower end of the middle barrier cascade, it also contributed more rock deposits in the middle cascade. The middle cascade also developed into a 9-foot falls that lacked adequate jump pools. Future work ought to be concentrated there to reduce any impacts on the lower cascade. No known coho are currently passing beyond these barriers.

70. Howard Bay fish pass
Howard Bay is located on the western shore of Lynn Canal about seven miles north of Point Couverden and 25 miles west of Juneau. There is a barrier on this system located near tidewater; however, pink and chum are present. Project scoping and feasibility studies were conducted in 1992 by the Forest Service; the project was determined to be nonfeasible.

71. Greens Creek fish pass evaluation
This system is located on the northeastern end of the Glass Peninsula on Admiralty Island and drains into Stephens Passage. The environmental impact statement for the nearby Greens Creek mine specified that fish access would be provided past a barrier in the system to mitigate impacts to fish habitat. In 1989 that barrier was modified by blasting a series of steps to provide that access. Use of this fish pass by pink and significant numbers of chum and coho has been documented. As a result of monitoring, the Forest Service determined that the mining company had met its obligations in providing coho access above the barrier.

72. Admiralty Island barriered systems: Hasselborg, Thayer, and Salt lakes
These Admiralty Island systems have as yet undetermined potentials to produce significant numbers of coho. In 1986 the Division of Sport Fish considered initiating a project to capture, enumerate, and tag out-migrant coho smolts to learn more about their distribution and contribution to the fisheries as well as the reasons for low run strength. In 1994 Division of Sport Fish determined it could not initiate this project because of lack of funding. As of 2003, Salt Lake and lower Hasselborg Creek have healthy natural runs of sockeye and coho that spawn below a partial barrier falls. Helicopter surveys need to be conducted to index annual escapements of those fish to confirm that stocks are maintained at healthy levels while the area is managed for increased sport and subsistence effort. Introduction of salmon into Hasselborg or Thayer lakes by any means is not warranted because of potential adverse impacts to resident species; furthermore,

wild coho runs throughout the region have been at historical high levels, providing ample harvest opportunities to the common property fisheries, and escapements have exceeded management goals.

73. Watershed restoration
Using a variety of rehabilitation and enhancement strategies, it is the intention of the Forest Service to restore function to logged watersheds in the Sitka and Hoonah ranger districts.

74. Lake Ekaterina enhancement/hatchery site
Lake Ekaterina, a nonanadromous lake above Crawfish Inlet and Shamrock Bay in the South Baranof Wilderness area, was considered a good candidate for a hatchery water supply in 1985. The lack of flat ground to facilitate construction of a hatchery building led to consideration of a floating hatchery at that site. The lake was also considered as an optimal site for planting coho fry; however, NSRAA's releases of coho smolts in Shamrock Bay beginning in 1993 have been the only enhancement activity in the area.

75. Shamrock Bay coho smolt release
Shamrock Bay is located in southwestern Baranof Island just off West Crawfish Inlet; NSRAA added it as a coho release site in 1993 to provide trollers further opportunities to fish on hatchery returns in the Sitka area. Smolts were transported from Medvejie Hatchery to Shamrock Bay by boat, held in net pens for three weeks, and released. Annual releases there have occurred since 1993.

76. Benzeman Lake investigation
Benzeman Lake is located on the west side of Baranof Island at the northern end of Necker Bay about 25 miles south of Sitka; it contains a unique run of small sockeye, ranging from 2.5 to 3.5 lb. These lower weights are probably the result of natural selection to allow adults to pass through the underground outflow of the lake and over the top of the barrier during high water overflows. Fertilization of the lake would allow for an increase in the number of fish rearing there; however, their small size makes the project questionable from a harvest value standpoint.

77. Medvejie coho smolt releases
Coho releases from Medvejie central incubation facility are minimized to avoid wildstock interactions. Ideally, just enough fish are released to provide adequate adult returns to meet egg take goals. In 1992 and 1993, about 3,000 smolts were released each year from the hatchery; however, from 1994 to 1996, 5,000 smolts were released each year to better insure adequate broodstock. In 1993 inadequate hatchery returns forced utilization of fish returning to Deep Inlet and Sheldon Jackson to meet the egg take goals. Since 2000, NSRAA has been releasing 10,000 coho smolts there annually.

78. Medvejie Hatchery expansion
This facility is located at Silver Bay on west Baranof Island and is accessible by road from downtown Sitka. With U.S./Canada treaty funds, in 1985 and 1986 NSRAA expanded its chinook production facilities at Medvejie from an egg capacity of 250,000 to 3.1 million. The plan was to release approximately 1.7 million 30-gram chinook per

year with an expected annual return of 50,000 adults. Presmolts were transferred to net pens in the fall to overwinter in salt water. Capital costs were approximately $2 million.

79. Deep Inlet coho smolt releases

Deep Inlet is located on the west coast of Baranof Island about 10 miles south of Sitka. NSRAA released coho smolts there from 1990 to 1995; the number released has ranged from 49,970 (16.7 g) in 1994 to 136,000 (20.5 g) in 1993. This project has expanded commercial and sport fishing opportunities for cohos in the Sitka area, and the total harvest rates have been high (e.g., 91.7% of the 8,003 cohos returning in 1995). The original donor stock of coho eggs came from Sheldon Jackson Hatchery (Indian River stock); however, the later brood source was from the return to the Medvejie Hatchery in Silver Bay. Releases of the Medvejie origin coho ceased at Deep Inlet in 1996 because of conflicts with wildstock coho exploitation. In 2001 and 2002 NSRAA conducted an egg take of Plotnikof Lake/Whale Bay coho in order to develop a local broodstock. No eggs were taken in 2003 because of BKD problems with this summer stock and the high costs associated with broodstock development.

80. Swan Lake cooperative fish stocking

Swan Lake is located near downtown Sitka and drains through a culvert into Crescent Bay. This ongoing project is an extension of the Lake Sukoi (located at the southern tip of Chichagof Island opposite Sergus Narrows) project, in which the Division of Sport Fish places 300 catchable-sized rainbows from Lake Sukoi into Swan Lake prior to the annual children's fishing derby.

81. Lava Falls Creek fish passes

Lava Falls Creek flows into the southwest corner of Port Krestof in northern Sitka Sound. A waterfall at tidewater blocked access to about five miles of coho spawning and rearing habitat. In 1996 and 1997 two fish passes were constructed to provide that access. Three years (1993–1995) before construction began, coho salmon fry from nearby Eagle River (Kruzof Island) were planted above the barrier; between 5,000 and 7,500 juvenile coho were coded-wire-tagged each year. In 1996 returns from those transplants contributed (based on tag recovery data) 141 adult coho to the commercial and sport fisheries of Sitka, Hoonah, Pelican, Juneau, and Craig. In 1996 adult pink were also observed above the fish passes. Monitoring will continue with stream counts of adult and juvenile coho.

82. Kizhuchia Creek fish pass

Kizhuchia Creek is located on Baranof Island approximately eight miles south of Sitka. Two fish passes were constructed in 1980 and 1981 to provide access for pink and chum to 6.5 miles of upstream habitat, and alterations/repairs were made to both of them in 1982. In 2003 the fish passes were inspected; the rock-filled gabion baskets need to be replaced. Additionally, four small falls downstream from the fish passes should be blasted to further improve access. Pink and chum access both ladders. Although approximately 1,800 were counted upstream in 1982 and 1983, the habitat has not been fully utilized. Escapement above the fish passes has declined since 1985.

83. Redoubt Lake fertilization
Redoubt Lake is located on the west side of Baranof Island about 15 miles south of Sitka in the southern portion of Sitka Sound. The lake reportedly once supported commercial harvests of about 60,000 sockeye and escapements of 100,000. Fertilization of the lake from 1984 to 1987 and from 1990 to 1995 boosted average annual escapements from 8,000 to 49,000; however, sockeye populations have been too low to take full advantage of the increased forage. Without this enhancement project, a return to historical escapement levels would not occur in the short term. Follow-up evaluations of the long-term impacts of fertilization continued through 2001.

84. Redoubt Lake incubation research
This experimental sockeye project was conducted in concert with the Redoubt Lake fertilization project. In-lake incubation boxes with varying numbers of eggs were placed in Redoubt Lake from 1986 through 1991 to develop a fry delivery system that would accelerate the sockeye population to a level that would take full advantage of the additional forage produced by fertilization. The project was abandoned because of high sockeye mortalities. In 1986, 0.9 million chinook fry were planted into Redoubt Lake; these fry plants were not continued because of adverse impacts on plankton levels.

85. Redoubt Lake rearing
Redoubt Lake is located on the western shore of Baranof Island about 15 miles south of Sitka; the system drains into Redoubt Bay. The lake and inlet stream have runs of sockeye, pink, chum, and coho. The lake was initially fertilized from 1984 to 1987, resulting in significant increases in age-1 and age-2 smolt production; however, the sockeye fry population was too low to take full advantage of available forage and return that population to its historically high levels, so fertilization was dropped until a sockeye stocking/rearing program could be developed. When no fry delivery system was developed, fertilization resumed in 1989 and continued through 1995.

86. Rodman Bay habitat restoration
Rodman Bay is located on the northeastern tip of Baranof Island adjacent to Peril Strait. This watershed was logged in the 1960s, and several restoration/rehabilitation activities were planned in the late 1980s: (1) removing old bridges and culverts, (2) reinserting large woody debris or installing gabions to create pool habitat and stabilize the channel, and (3) opening up of streamside canopy dominated by alder. As of 2003, some work has been completed, but the Forest Service is devoting restoration funding to other, more cost-effective watersheds.

87. Appleton Creek fish pass
Appleton Creek is located on north Baranof Island and drains into Appleton Cove near the mouth of Rodman Bay. It has two waterfalls one mile above salt water that prevent access to upstream spawning and rearing habitat. The Forest Service designed fish passes for each barrier. Construction began in 2002, and the blasting component of the project was completed. Concrete work was completed in 2003. To facilitate ready use of the new habitat, coho fry from below the barriers will be captured and planted upstream.

88. Sealion Cove lake fertilization research

Sealion Cove is located near Point Kruzof on the northwestern coast of Kruzof Island about 40 miles northwest of Sitka. In 1981 NSRAA's basic management plan for Medvejie Hatchery identified the Sealion Cove's stream and lake system as a potential provider of coho donor stock for development of their broodstock program. Sealion Cove was also designated by NSRAA as remote release and cost recovery site. In conjunction with this project, Sealion Cove's lake system was to be fertilized and stocked with coho. A portion of the coho releases at Sealion Cove was to be coded-wire-tagged; tag recovery data were to be used to evaluate the contribution to the common property fishery and to evaluate the success of the lake-stocking program.

89. Eagle River fish pass

Eagle River is located on the north end of Kruzof Island. In 1985 an aluminum fish pass was constructed to provide passage for pink and chum over a waterfall. Coho and steelhead already had access to the 3.5 miles of upstream habitat. Repairs were made in 1993 and in 2000. Pink and chum from the downstream population volunteered through the fish pass and have successfully established in the upper watershed at the approximate level originally anticipated. An escapement count of pink above the fish pass yielded over 22,000 fish in 1997.

90. Waterfall Cove fish pass

Waterfall Cove Creek is a small but productive system located in the southern part of Slocum Arm on west Chichagof Island. The proposed project involves blasting step pools to provide easier access to coho and pink through a constriction in the channel. For several years the project was on hold by the Forest Service, pending completion of an aquaculture in wilderness/non-wilderness comparison study. The project was dropped in 1993 because it was not considered economically feasible.

91. Flat Cove Creek cooperative fish stocking

This system is located on southwestern Chichagof Island near the end of Slocum Arm in the West Chichagof Wilderness area. A chinook stocking project had been planned for that system; however, because it was not endorsed by NSERPT, it was never implemented.

92. Goon Dip River fish pass/stocking

Goon Dip River is located on the western shore of Chichagof Island and drains into Portlock Harbor; it has a 25-foot waterfall that is a total barrier to migrating salmon. Stream and lake surveys have been completed, but no NEPA analysis or engineering study has occurred. As of June 2004, the Forest Service does not plan to pursue this relatively large fish pass/fish stocking project because it is in the West Chichagof Wilderness area.

93. Goulding Lakes fish pass/stocking

This is a major lake/stream system, including a chain of four large lakes, on the west coast of Chichagof Island in the West Chichagof Yakobi Wilderness area; it drains into Goulding Harbor. It has a large but correctible barrier. This system has been identified as having exceptional potential as a nursery lake for sockeye fry. The scope of the lake project would be to establish baseline information on limnology and the cutthroat trout population during the first two years. Fry plants would begin in the third year; limnology and fisheries data collection would continue through one sockeye life cycle (6 years). Potential adult production would be 200,000 to 300,000 sockeye, based on ADF&G's euphotic volume model. Preliminary limnology and fishery investigations were conducted in 1994, but the project was not taken beyond the planning stage.

94. Elfendahl Lake coho rearing
Elfendahl Lake is located on West Chichagof Island south of Lisianski Strait in the West Chichafoff/Yakobi Wilderness area. As part of NSRAA's barren lakes stocking program, fry were planted in Elfendahl Lake in 1984. Because of a high incidence of tape worm larvae in juvenile coho, NSRAA discontinued its stocking efforts in this system.

95. Mud Bay River large woody debris insertion
The Mud Bay River is located on the north end of Chichagof Island about 55 miles west southwest of Juneau; it drains into Mud Bay opposite Icy Strait. In 1986 the Forest Service experimented with blasting the roots and tipping large conifer trees into the river. The objective was to enhance rearing habitat of natural channels by introducing additional large woody debris with attached root wads. Costs and benefits were tracked, and the Forest Service recommended that the woody debris insertion be discontinued.

96. West Swanson River fish pass
This moderately-sized system is located on the mainland southeast of Excursion Inlet; it has a cascade falls partial barrier approximately 2.5 miles above salt water. Coho can negotiate the barrier at moderately high flows. The Forest Service decided not to pursue the project because it was only a partial barrier and the need for additional pink and chum in the area was not a high priority.

97. Suntaheen Creek fish pass
Suntaheen Creek is located on Chichagof Island about 15 miles east of Hoonah; it is accessible by road and drains into Whitestone Harbor off Icy Strait. The Forest Service has modified a rock barrier, installed two fish passes at waterfalls, coded-wire-tagged native coho stock, and released them upstream of the barriers where excellent spawning and rearing habitats exist. From 1990 to 1993 coho eggs were also collected at nearby Game Creek and incubated at Medvejie Hatchery; the resulting fry were coded-wire-tagged and planted above the barriers. Between 1992 and 1996 this project contributed an annual average of 680 coho to the troll fishery. Few if any adult coho are able to pass both fish passes, and the Forest Service has made modifications to improve passage. Coho fry from below the fish passes are transported and released above them.

98. Game Creek habitat improvement and fish pass
Game Creek is a major watershed on Chichagof Island that drains into Port Frederick near the City of Hoonah. A cascade falls occurs on one of its main tributaries, blocking access to about two miles of excellent rearing habitat. A monitoring program was initiated in 1992 to determine the effectiveness of jump pools and large woody debris installation. This study indicated that construction of a fish pass would not be cost effective; therefore, no further

work is planned. No analysis of the effects of the fish pass upon resident fish populations has been conducted.

99. Neka River habitat improvement and enhancement
The Neka River is located on the Port Frederick side of northwestern Chichagof Island; it drains into Neka Bay. The following projects have been proposed for this system: (1) installation of two incubation boxes to increase anadromous fish production from underutilized habitat and (2) development of a rock pit/rearing pond to create additional habitat for anadromous and resident fish. The department's escapement data indicate a declining chum run there. Additional feasibility investigations and NEPA documentation are required prior to implementation of this project, but further enhancement efforts are considered unlikely in the near future.

100. Fish barrier removal
The proposed project is on a nameless stream (#114-80-40 in the anadromous stream catalogue) in the vicinity of Excursion Inlet at the southeast end of Glacier Bay. An unidentified barrier preventing access to anadromous salmon exists on this system; however, as of June 2004 no action had been initiated on this project.

101. Hatchery/release sites
This project consists of a list of potential summer chum remote release sites. These sites have not been investigated for technical or economic feasibility: Taiya Inlet in northern Lynn Canal near Skagway; Sawmill Creek/Echo Cove on the mainland near Berners Bay; Sullivan Island in northern Lynn Canal south of the Chilkat Peninsula near Haines; William Henry Bay on west side of Lynn Canal about 10 miles south of the southern tip of Sullivan Island; and St. James Bay on the west side of Lynn Canal about 20 miles south of Sullivan Island.

102. Boat Harbor chum releases
Boat Harbor is located on the west side of Lynn Canal a few miles north of St. James Bay. This ongoing NSRAA and DIPAC cooperative project was initiated in 1988 for the rearing and release of Macaulay Hatchery chums at Boat Harbor.

103. Berners River bank stability
Berners River is located about 50 miles north of Juneau; it drains into Berners Bay, which lies adjacent to Lynn Canal. Adjoining the river is a 6-mile-long side slough that had not been infiltrated by the cold, glacially turbid water of the main stem of the river; however, in the late 1980s the main stem of the river undercut the bank near the inlet to the side slough, and the turbid glacial water began flowing into the slough, bringing silt and lower water temperatures that adversely affect rearing coho. The goal of this project centered on diverting river water away from the side slough and back into the main stem of the river. Options considered were (1) installing current deflectors or (2) constructing an overflow channel. The estimated cost of this project in 1990 was about $10,000; however, as the project was delayed, costs increased. The Forest Service estimated that the reclaimed rearing habitat would produce 19,858 pounds of adult coho annually. In 1991 ADF&G and Forest Service staffs jointly decided the project should not be implemented because (1) shifting of

channels is a natural process; (2) it would be expensive and difficult to remedy; and (3) a nearby abandoned channel would soon provide quality rearing habitat.

104. Sullivan Island enhancement investigations
Sullivan Island is located in Lynn Canal about 15 miles south of Haines. The department, NSRAA, and DIPAC have jointly investigated remote release sites for chum from Skagway to the southern end of Admiralty Island. Sullivan Island is one of the locations investigated; however, open-water net-pen technology would be necessary at that site.

105. Upper Lynn Canal CIF/enhancement/rehabilitation development
Upper Lynn Canal encompasses the anandromous systems near Skagway and Haines. NSRAA wanted to develop a central incubation facility in the Haines area to use for remote outstocking and rehabilitation projects. This project is no longer being considered.

106. Boulder Creek habitat restoration/stocking
Boulder Creek is a tributary of the Chilkat River; it's located about 30 miles northwest of Haines and it adjacent to the Haines Highway, where it was impacted by a road construction project in 1982. ADF&G studied the creek to determine availability of chinook habitat and needed restoration activities. Several methods were used to enhance spawning habitat there, including placing boulder clusters, cabling large woody debris to the streambed, and creating a boulder step dam to hold spawning gravel in place. Chinook escapements were thought to be substantially below established goals; in 1992 an incubation box was placed alongside the creek and seeded with eggs from returning chinook through 1995. Since then the incubation boxes have been inactive. The volume of water available during winter flows may no longer be adequate for egg incubation. Escapement into Big Boulder Creek has improved substantially in recent years.

107. Chilkat River spawning channel creation and improvement
The Chilkat River is located in northern Lynn Canal near the community of Haines. To mitigate for road construction impacts to chum spawning habitat, several sites on this system have been identified as good locations for spawning channel development. Subsequently two sites were developed: Mile 24 of the Haines Highway and Herman Creek.

108. Chilkat River rearing habitat protection and improvement (ponds)
The Chilkat River is located on the mainland near Haines; it drains into northern Lynn Canal. In the early 1990s, timber harvests were expected to occur on major portions of lands adjacent to the Chilkat and Chilkoot Rivers and their tributaries. Mining and road construction would also have major impacts on these areas, and protection of rearing habitat is vital to maintaining valuable coho stocks. From 1980 to 1982 Department staff and Haines residents connected nine landlocked ponds to the Chilkat River to create new coho rearing areas. A subsequent evaluation of the work determined that benefit would be derived by connecting additional ponds to the main river. An additional 21 ponds have been located, but the project has been inactive since the initial work in the early 1980s.

109. Chilkat River escapement enumeration
Escapement enumeration is difficult in this glacial system. Escapement has been monitored annually through mark–recovery studies for chinook since 1991 and sockeye since 1994. Fish wheels have operated in the lower Chilkat River since 1993 to serve as a marking platform and to assess relative run strength.

110. Alternative rehabilitation and enhancement technologies
Improved harvest management and habitat restoration were named as the preferred methods for rehabilitation of wild chinook stocks. It was recommended that the success of these strategies be evaluated relative to the Chilkat and Taku Rivers, and the potential for fry stocking and/or on-site incubation of chinook stocks be investigated.

111. Sockeye run timing and magnitude indexing
The relative abundance of sockeye stocks from the Chilkat and Taku Rivers could be determined by test fishing. Separate stocks could also be identified by scale pattern analysis to determine contribution to the fisheries by time and area. This information would greatly aid in efficient management of these stocks.

112. Smolt index forecasting for Chilkat and Chilkoot rivers
Develop preseason forecasts for these sockeye runs to allow more effective management of the early portions of the Lynn Canal gillnet fishery, rather than waiting for inseason harvest data to make management decisions.

113. Chilkat Lake sockeye enhancement
This was a cooperative project by NSRAA, DIPAC, and ADF&G that was initiated in 1993. Eggs were collected from adult sockeyes in Chilkat Lake and transported to Snettisham for incubation. As the fry emerged the following June, they were transported back to Chilkat Lake and released. After the initial stocking, however, zooplankton populations crashed and subsequent smolt sizes were reduced. As a result of these effects, the project was suspended in 2001.

114. Chilkat Lake streamside incubation boxes
Chilkat Lake is located about 20 miles northwest of Haines; this system flows into the Chilkat River. Streamside incubation boxes began production on a tributary (i.e., Spring Pond) of Chilkat Lake in 1989. Streamside incubation boxes were also placed at additional sites; in 1998, when the project was suspended, the permitted capacity for sockeye eggs was two million and only native stock had been used. Fry volitionally emigrated the following spring into the lake, and incubation survivals were 90%. A limited egg take was conducted a Spring Pond in 2003.

115. Chilkat Lake limnology studies
Chilkat Lake is located on the mainland approximately 20 miles northwest of Haines; it drains into the Chilkat River. Detailed limnology studies were conducted at this lake from 1987 to 1991 and from 1994 to 1997. Reduced water nutrient sampling was conducted there from 1997 to 2001; however, physical parameters and zooplankton sampling remained on the frequency of detailed sampling. Some limnology and smolt outmigration studies

occurred in 2002 and 2003. Sockeye were planted into this system from 1994 through 1997 and again in 2001.

116. Herman Creek spawning channel
In 1989, NSRAA constructed a spawning channel for fall chum at Herman Creek, a tributary of the Klehini River, which is located about 30 miles northwest of Haines. Subsurface water permeates the Chilkat River Valley, and NSRAA evacuated a 1,500-foot-long channel that spills into Herman Creek, providing additional high-quality spawning habitat. Each year some 5,000 spawners use the channel; it also provides shelter for overwintering juvenile coho salmon. The water remains at near $4^{o}C$ throughout the winter.

117. Porcupine Creek habitat restoration/stocking
Porcupine Creek is a tributary to the Chilkat River about 30 miles northwest of Haines. Mining activities occurred near this chinook system in 1982. The phase II plan recommended that it be investigated to determine whether sufficient impacts had occurred to warrant implementation of a habitat restoration project.

118. Tahini River broodstock development
The Tahini River is a tributary of the Chilkat River. It originates in icefields located in British Columbia and flows southeast 11 miles to the Chilkat River. The confluence is located at the northern boundary of the Alaska Chilkat Bald Eagle Preserve about 15 miles north of Klukwak. The department collected chinook eggs from the Tahini River from 1983 through 1987 and again in 1989 and 1990 for hatchery broodstock development. During four of those years, resulting fry were returned to the Tahini River to compensate for the removal of eggs from the system. Because chinook escapements were thought to be below the escapement goal, in 1991 eggs were collected from the Tahini River, incubated at Jerry Myers vocational hatchery, and returned to the river to boost egg-fry survival. The Tahini River broodstock was originally developed for the Hidden Falls Hatchery and later for Jerry Meyers vocational hatchery and Burro Creek Hatchery near Skagway. When NSRAA took over the Hidden Falls facility, they decided to discontinue the Tahini broodstock and maintain only the Andrew Creek broodstock. ADF&G agreed to let them discontinue the Tahini stock with the understanding that NSRAA would continue to collect eggs from Tahini brood returns to the hatchery and rear the resulting smolt for imprinting and release in northern Lynn Canal.

119. Tahini River stocking research
Five brood years of Tahini River chinook stock (1988-1992) were reared at Hidden Falls Hatchery and imprinted and released in either Lutak or Taiya inlets in northern Lynn Canal to enhance the sport fishery there and to develop broodstock for continued use at Burro Creek Hatchery and Jerry Meyers vocational hatchery. Interest in the Tahini broodstock diminished until DIPAC decided to develop this broodstock to replace its Andrew Creek stock. As a result, in 1998 a cooperative program was initiated between ADF&G, DIPAC, Burro Creek Hatchery, and the City of Skagway to collect eggs from Tahini brood chinook returning to Burro Creek and Jerry Meyers hatcheries for incubation and rearing at Macaulay Hatchery. Smolt are transported back to Pullen Creek near Skagway for imprinting and release. Returning adults will be available for (1) harvest in the local

recreational fisheries and (2) continuation of Tahini River broodstock development. Tahini River brood hatchery returns to the Skagway area will eventually be used as broodstock for all of DIPAC's chinook releases, thereby replacing its Andrew Creek stock.

120. Chilkoot Lake limnology studies
Chilkoot Lake is located on the mainland approximately 15 miles northwest of Haines and is accessible by road; it drains into Lutak Inlet. Detailed limnology studies were conducted there from 1987 to 1991. Since 1996 zooplankton samples and physical profile data have been collected. These studies were listed as high priority in the phase II plan so that the carrying capacity and optimal escapement goals could be determined.

121. Surveillance of sockeye systems
Very little information exists on small-scale, naturally producing sockeye systems in northern Southeast Alaska. Monitoring surveys need to be introduced to identify enhancement potentials and optimal harvest strategies at Crab Bay Lake, Neka Lake, Pavlof Lake, Lisianski Lake, Game Creek Estuary, Hoktaheen Lake, Surge Lake, and Takanis Lake. Pavlof Lake has been identified as the system with the highest priority. In 2002, sockeye stock assessment projects at Pavlov, Hoktaheen, Neva, Tumakoff, Salmon, Klag, Falls, Sitkoh, and Kanalku Lakes and Gut Bay were initiated in conjunction with the federal subsistence program.

122. Water flow control structures
Moderating extremes of water flow through placement of instream structures has the potential for improving incubation and rearing survivals of anadromous fish. This technique can also aid adult spawning success. Flow control for appropriate systems in northern Southeast should therefore be explored.

123. Summer chum investigations
These investigations focus on escapement data collection, primarily in areas that could be managed for chum salmon; e.g., Port Frederick and Tannic Inlet. The project's goal is to (1) assess the potential for regulating harvests on the basis of spatial or temporal stock separation, (2) improve escapement enumeration on major systems, and (3) determine optimal escapement goals. Escapement goals are needed for Pybus Bay, Perio Strait, Dry Bay, Gedney Harbor, Hood/Chaik Bays, Murder Cove, Kelp Bay, Tebenkof Bay, Hobart Bay, Limestone Inlet, and Pt. Malmesbury. An additional project goal is to assess chum brood source potential in the following systems: Excursion Inlet, Little Pybus Bay, Port Camden, Chaik Bay, Security Bay, Lynn Canal, and Taku/Snettisham.

124. Rehabilitation of depleted streams using central incubation facility (CIF)
Medvejie (NSRAA), Gunnuk Creek (KNFC), and Sheep Creek (DIPAC) as well as the Forest Service/ADF&G cooperative projects are a few examples of rehabilitation efforts using CIFs in Southeast. Normally, ladders are placed into the system to provided access to upstream spawning and rearing areas, and either local or nearby wild stocks are used to "jump start" these systems. Eggs are taken, incubated at a hatchery facility, and then planted back into these systems.

Appendix Table A-2. List of Phase I and Phase II Projects Located in Northern Southeast

Key to Project Types

Management	M
Habitat Repair/Improvement	H
Fish Passage	F
Lake/stream Stocking	S
Research	R
Lake Fertilization	LF
Broodstock Development	B
Capital Construction/Improvement	C
Enhanced Production	E

Key to Agencies

AK Dept. Fish & Game	AK
Northern SE Regional Aquaculture	NS
Southern SE Regional Aquaculture	SS
U.S. Forest Service	FS
(Ranger District)	
Craig	c
Ketchikan-Misty Fiords	k-m
Thorne Bay	tb
Petersburg	p
Wrangell	w
Sitka	s
Juneau	j
Admirality Monument	ad
Yakutat	y
National Marine Fisheries Service	NM
Douglas Isl. Pink & Chum	D
Armstrong-Keta, Inc.	A

Key to Species

Chinook	K
Chum	Ch
Coho	Co
Pink	P
Sockeye	S
Steelhead or rainbow trout	St

Target Species	Project Type	Narrative #	Name	Location	Production Basis	Year Proposed	Years Implemented [1]	Years Evaluated [1]	Lead Agenc(ies)
Co	S	1	Expansion of coho lake rearing	109, 113		1985			NS
Co	S	2	South Baranof Island lake stocking: Cliff and Lords Pocket Lakes	109-10	1151 A & 2441 A	1988	1988		NS
Co	S	3	Rostislaf Lake coho rearing	109-10		1985	1985		NS
K	C	4	Osprey Lake chinook hatchery	109-10-10130	100 K adults	1986			NM
K	R	5	Lake Osprey rearing research	109-10-10130	270 A	1983	1984	86-90	NM,FS,FS,AK
Co	S	6	Deer Lake coho rearing	109-10-10185	977 A	1988	88-c	90-c	NS
Co	S	7	Banner Lake coho rearing	109-10-10240	162 A	1985	83,89	84-90	NS
K	C	8	Port Armstrong Hatchery expansion	109-11		1986			AK
S,Co	FP	9	Falls Lake fish pass	109-20-10130	234 A	1985	1986	1982-88	FS(s)
S	LF	10	Falls Lake fertilization	109-20-10130		1982	83-86		AK,FS
K	S	11	Eliza Lake fry stocking and evaluation	109-30-10060	130,000 fry	1986	1986	88-92	AK,FS(ad)
Co	FP	12	Slo Duck Creek fish pass	109-42-10070		1986	dropped 1989		FS(p)
Co	H	13	Kadake & Saginaw watersheds, large woody debris replacement	109-42-10300; 109-44-10390	2 A	1989	1995, 96	1995-c	FS(p)
Ch	E	14	Port Camden Incubation boxes	109-43-	10 M eggs	1985	1985	c	NS,FS
Co	FP,S	15	Slippery Creek fish pass	109-43-10030	3,300 adults	1985	1988	92, 98, 00-c	FS(p), AK
Ch	E	16	Port Camden spawning channel	109-43-10080		1985	1989	1989-95	FS(p)
Co	FP,S	17	Dean Creek fish pass	109-50-10700	2.4 mi	1983	1983	86 & 91-98	FS(p)
Co	FP	18	Browns Creek fish pass	109-52-10080	17 A	1989	dropped		FS(p)
P	FP	19	Kwatahein Creek fish pass	109-52-10550	5.2 A	1982	1989	1991-93	FS(p)
P	FP	20	Wolf Creek fish pass	109-62-10290	3 A	1982	dropped		FS(p)
Co	S	21	Thomas Bay coho lake rearing	110-12		1985			NS
K,Co	C	22	Thomas Bay hatchery feasibility	110-12		1982			AK

Target Species	Project Type	Narrative #	Name	Location	Production Basis	Year Proposed	Years Implemented [1]	Years Evaluated [1]	Lead Agenc(ies)
K	E	23	Rehabilitate/enhance small mainland stocks in the Farragut River	110-14-10070	3.5 mi; 200 A lks	1982	84-86;90;92-94	96-00	AK
Ch,P	FP	24	Cat Creek fish pass	110-15-10030		1986	dropped		FS(p)
Co	FP,S	25	Portage Creek fish pass	110-16-10020	40 Ac st	1993	1994-1995	95-c	FS(p), Gunnuk
P,Ch	FP	26	Roberts Island Creek fish pass	110-31-10040	13 mi	1985	dropped 1995		FS(j)
Co	FP	27	Lauras Creek fish pass	110-33-10130		1989	dropped		FS(j)
K,S	E	28	Chuck River/North Arm Lake (Port Houghton enhancement potential)	110-34-10090; 110-34-	Lk=1200 A	1982			AK
Co	H	29	Walter Island Creek habitat improvement	110-34-10100	4.5 mi	1985	dropped 2003		FS(j)
Co	FP	30	Negro Creek fish pass	110-34-10140	1 A	1986	1988	early 1990s	FS(j)
Co	FP	31	Surprise Creek fish pass	110-34-10140	11.5 Mi	1989	dropped		FS(j)
K	E	32	Juneau area recreational fishery enhancement	111-		1986	1986	88-91	AK
K	B	33	King Salmon River broodstock development	111-17-10100		1988	1979-1998		AK,NM,D
K,S	R	34	Taku River system rehabilitation/enhancement potential	111-32-10320		1982			AK
Co	H	35	Taku River coho rearing habitat improvement	111-32-10320		1982	dropped 1996		FS(j),AK
All	M	36	Taku River mark/recapture/escapement	111-32-10320		1984	1985		AK
Co	H	37	Taku River (Fish Creek) habitat improvement	111-32-10320-2052		1986			AK
Co	FP,S	38	Davidson Creek fish pass	111-32-10780		1989	1991	1990-c	FS(j)
S	FP,LF	39	Turner Lake fish pass/ limnological studies	111-32-10800-0010		1985	dropped 1989		AK,FS(j)
S	S	40	Turner Lake stocking	111-32-10800-0010	50 K adults	1986	dropped		AK,FS(j)
S	C	41	Sockeye central incubation facility (Snettisham)	111-33		1987			AK
S	S	42	Transboundary river (TBR) stocking projects: Tahltan, Tuya, Tatsamenie, and Trapper Lakes	111-33: 108-40-10150; 11-32-10320		1989	1993-c		AK,D
S	E	43	Port Snettisham sockeye smolt releases	111-33	300K-450K adults	1996	1995-c		AK,D
Co	H	44	Indian Lakes large woody debris introduction	111-33			1985	1989	FS(j)
Co,S	E	45	Indian Lakes incubation facility	111-33	500 K eggs	1986	1987		AK,FS(s)
S	S	46	Speel and Crescent Lakes stocking	111-33-10300-0010;111-35-10050-2035-0010		1993			AK,D
S	M	47	Speel Lake weir	111-33-10300-2014		1984			AK
S	LF	48	Crescent Lake prefertilization studies	111-35-10050-2035	3.3 km^2	1982			AK
S	M	49	Crescent Lake escapement survey	111-35-10050-2035-0010		1984			AK
S	S	50	Sweetheart Lake stocking	111-35-10200	20-60 K adults	1993			AK,D
K,Co	BS	51	Macaulay Hatchery broodstock development	111-43		1988	1988		D
Co	H	52	Herbert/Eagle River rearing pond complex	111-50-10060; 111-40-10920		1986	1988-89	1988-90	FS(j)
Co	FP,S	53	Dredge Lakes fish pass/stocking	111-50-10500	5A		1985-1989	1985-c	FS,AK
Ch	E	54	Limestone Inlet chum releases	111-90		1990	1996-c		D,NS
K	R,E	55	Baranof Warm Springs rearing and release investigations	112-11		1988			AK,NS
K	C	56	Baranof Warm Springs hatchery	112-11		1982			AK
P,Ch	FP	57	Whiterock Cr fish pass	112-12-10500	5 A	1986	1992-95	1993-c	FS(s)
K	FP,S	58	Wheeler Creek (Game Cove) fish pass/ stocking	112-16-10300		1986	dropped		FS(ad)
K	FP,S	59	Ward Creek fish pass/ stocking	112-17-10160		1986	dropped		FS(ad)
K,S	FP,S	60	Florence Lk/Florence Creek fish pass/stocking	112-17-10250	840 A	1985	dropped		FS(ad),AK
K,Co,P	FP	61	Fishery Creek fish pass	112-17-10300	17 mi	1986	dropped		FS(ad)
K	C	62	Hidden Falls Hatchery expansion/smolt rearing facilities	112-22		1986			AK,NS
K,Co	FP,S	63	Indian River fish pass/ stocking	112-42-10080	34 mi; 50,000 fry	1989	1999		FS(s)
P,Ch	FP	64	Upper Corner Bay fish pass	112-42-10160	5.5 mi	1982	19,811,983	1981-c	FS(s)
P,Ch	M	65	Kadashan weir	112-42-10250		1984			AK
Co	FP	66	Pavlov River upper fish pass	112-50-10100		1986	1987	1988-1996	FS(h)
Co	H	67	Fish habitat monitoring of Pavlov River and Pavlov Creek	112-50-10100		1989			FS
Co	H	68	Kennel Creek large woody debris insertion	112-50-10200	0.6 A	1986	1992	1993-1994	FS(s)
Co	FP	69	Bay Head Creek barrier modification	112-50-10320		1996	1992-1995	92-96	FS(h)
P,Ch	FP	70	Howard Bay fish pass	112-61-10120		1988	dropped 1992		FS(j)

Target Species	Project Type	Narrative #	Name	Location	Production Basis	Year Proposed	Years Implemented [1]	Years Evaluated [1]	Lead Agenc(ies)
Co	FP	71	Greens Creek fish pass evaluation	112-65-10240		1991	1998		FS(ad)
Co,S	R	72	Admiralty Island barriered systems: Hasselborg, Thayer, and Salt Lakes	112-67-10350; 112-17-10500	3500 A & 3000 A	1986			AK
All	H	73	Watershed restoration	113, 114	multiple streams	1991	multiple years		FS(s),(h)
Co	C,E	74	Lake Ekaterina enhancement/ hatchery site	113-32		1985			NS
Co	E	75	Shamrock Bay coho smolt release	113-32		1993	1993-1996	1994-1997	NS
S	LF	76	Benzeman Lake investigation	113-34-10050-0010	1600 A	1985			AK
Co	E	77	Medvejie coho smolt releases	113-37		1993	1992-c	1993-c	NS
K	C	78	Medvejie Hatchery expansion	113-37		1986			NS
Co	E	79	Deep Inlet coho smolt releases	113-38	136 K smolts	1989	96		NS
St	S	80	Swan Lake cooperative fish stocking	113-41					FS(s)
Co	FP	81	Lava Falls Creek fish passes	113-41-10120	5 mi	1989	1993-1995	1993-c	FS(s)
P,Ch	FP	82	Kizhuchia Creek fish pass	113-41-10420	1.3 A		1980-81	1980-c	FS(s)
S	LF	83	Redoubt Lake fertilization	113-41-10430-0010	3200 A	1982	84-87 & 90-95	1984-c	AK,FS(s)
S	R,E	84	Redoubt Lake incubation research	113-41-10430-0010	50,000 eggs	1982			AK
K	S	85	Redoubt Lake rearing	113-41-10430-0010	1,000,000 eggs		1986	88-92	AK
Co	H	86	Rodman Bay habitat restoration	113-54		1986	late 1980s		FS(s)
Co	S	87	Appleton Creek fish pass	113-54-10050	15 A	1999	2002-03		FS(s)
Co	LF	88	Sealion Cove lake fertilization research	113-61-10060	19 A	1983	1986		NS,FS,AK
P,Ch	FP	89	Eagle River fish pass	113-62-10500	3.5 mi	1982	1985	1985-c	FS(s)
Co,P	FP	90	Waterfall Cove fish pass	113-73-10060		1982	dropped 1993		FS(s)
K	S	91	Flat Cove Creek cooperative fish stocking	113-73-10080		1985			FS(s)
K	FP,S	92	Goon Dip River fish pass/stocking	113-81	6 mi; 195 A	1985	dropped/wilderness		FS(s)
S	S	93	Goulding Lakes fish pass/stocking	113-81-10030	200-300K adults	1993			NS,FS
Co	S	94	Elfendahl Lake coho rearing	113-91		1985	1984	1985	NS
Co	H	95	Mud Bay River large woody debris insertion	114-23-10700		1986	1986	1986	FS
Co	FP	96	West Swanson River fish pass	114-25-10350		1986	dropped		FS(j)
Co	FP	97	Suntaheen Creek fish pass	114-27-10150		1988	1990-1991	1990-c	FS(h),AK
Co	FP,H	98	Game Creek habitat improvement and fish pass	114-31-10130	2 mi	1983	1992	1992	FS(s)
Co	H	99	Neka River habitat improvement and enhancement	114-33-10230		1989			FS(h)
All	FP	100	Fish barrier removal	114-80-10400		1987	dropped 2003		FS(j)
Ch	C,E	101	Hatchery/release sites	115-		1985			AK,D
Ch	E	102	Boat Harbor chum releases	115-10		1988	1996-c		D,NS,AK
Co	H	103	Berners River bank stability	115-20-10100		1989	dropped 1991		FS(j)
Ch	R	104	Sullivan Island enhancement investigations	115-31		1988			NS,AK
S	C	105	Upper Lynn Canal CIF/enhancement/rehabilitation development	115-32 to 115-35		1988			AK
K	H,S	106	Boulder Creek habitat restoration/ stocking	115-32-10250	4 mi	1982	92-96	94-02	AK
Ch	E	107	Chilkat River spawning channel creation and improvement	115-32-10250	7.5 M eggs	1982	83-86	86-c	NS
Co	H	108	Chilkat River rearing habitat protection and improvement (ponds)	115-32-10250	103 A	1982	1981	1986	AK
S,K,Co	M	109	Chilkat River escapement enumeration	115-32-10250		1985	1994-1995	96c	NS,AK
K	R,E	110	Alternative rehabilitation and enhancement technologies	115-32-10250; 111-32-10320		1982			AK,NS
S	M	111	Run timing and magnitude indexing	115-32-10250; 111-32-10320		1985			AK
S	M	112	Smolt index forecasting for Chilkat and Chilkoot Rivers	115-32-10250;115-33-10300		1985			AK
S	E	113	Chilkat Lake sockeye enhancement	115-32-10250-0010		1996	1993-c	1994-c	NS,AK,D
S	E	114	Chilkat Lake streamside incubation boxes	115-32-10250-0010		1994			NS
S	LF	115	Limnology studies, Chilkat Lake	115-32-10250-0010		1982			AK
Ch	E	116	Herman Creek spawning channel	115-32-10250-2077-3061		1988			NS
K	H,S	117	Porcupine Creek habitat restoration/ stocking	115-32-10250-2077-3111		1982			AK?
K	B	118	Tahini River broodstock development/stocking investigation	115-32-10250-2175		1988	1990-1992;1998-	1990-c	AK,NS,D
K	R	119	Tahini River stocking research	115-32-10250-2176	4.0 mi		85-86;90-92	87-98	AK,NS

Target Species	Project Type	Narrative #	Name	Location	Production Basis	Year Proposed	Years Implemented [1]	Years Evaluated [1]	Lead Agenc(ies)
S	LF	120	Limnology studies, Chilkoot Lake	115-33-10200-0010		1982			AK
S	M	121	Surveillance of sockeye systems	NSE various		1985	2002-c		FS,AK
All	H	122	Water flow control structures	NSE various		1986			AK,FS
Ch	M	123	Summer chum investigations	NSE various		1982			AK
All	S	124	Rehabilitation of depleted stream using central incubation facility (CIF)	NSE various					

[1] "-c" following year indicates a continuing project

Southeast Region-Wide Phase I and Phase II Issues and Projects[58]

1. Coastwide data base development
Recognized as a priority need in the early 1980s, the Pacific States Marine Fisheries Commission developed and maintains a database for coded wire tagging and recoveries as well as other types of marks.

2. Culture techniques to reduce IHNV disease problems
Successful enhancement of sockeye was long hampered by IHNV disease. During the 1980s, techniques to reduce the risk of virus transmission were developed with modest numbers of fry and then expanded to production numbers. ADF&G published the *Alaska Sockeye Salmon Culture Manual* in 1994.

3. Documentation of feeding and nursery areas
Documenting areas where there is a high abundance of undersized chinook would enable fisheries managers to alter release location strategies and avoid that phenomenon. Information on feeding and nursery areas for immature chinook could be gathered during an inseason tag/recovery program. Limited troll observer programs and analyses of fish tickets and logbooks could be used to document times and areas with a high abundance of undersized chinook. The NMFS Auke Bay Lab has conducted studies targeting immature chinook and coho.

4. Effect of logging on fish habitat: baseline studies in unlogged areas
This project is a component of the broad effort to monitor the effectiveness of the Tongass Forest Plan standards and guidelines to protect fish habitat and fish populations. Dolly Varden char and cutthroat trout are management indicator species identified in the forest plan. The design for the project includes several years of monitoring in 20 watersheds before timber harvests have occurred and additional monitoring following timber harvests to see if measurable effects occur. Additional watersheds with no planned logging are being monitored to serve as controls. By 2004, five years of prelogging data had been collected.

5. Effectiveness monitoring of best management practices
Monitoring for the Tongass Forest Plan includes effectiveness of the BMPs. The Forest Service has implemented three studies in the Tongass planning process to protect salmon habitat: (1) channel condition assessments, (2) buffer effectiveness, and (3) fish passage at culverts. The results of these studies are reported in an annual monitoring and evaluation report.

6. Enhanced coho predation on pink and chum fry
Because of proposed large-scale releases of coho smolts produced by enhancement and rehabilitation projects, the question of possible detrimental effects of predation on pink and chum smolts by coho smolts is frequently asked. Knowledge gained from this research may significantly affect achievement of the goals and objectives of the comprehensive salmon enhancement plan. In 1984 a research team was formed to study this issue; Hofmeister (1987) concluded that if releases of enhanced coho were delayed until early to mid-June, local predation on pink and chum would be highly reduced. He felt that this practice would present few

[58] Although representative of the majority of region-wide projects and issues during phase I and phase II, the list presented here is not comprehensive; some may have been inadvertently excluded.

problems to hatchery operators. Delaying large releases of enhanced coho until June 1 is now a standard practice in southern Southeast.

7. Escapement enumeration/refinement of escapement goals
Studies were proposed to identify an effective, affordable way to enumerate escapement, especially for coho. Before optimal escapement goals and effective harvest management can be employed, research is needed to determine carrying capacities of stream habitat, spawner-recruitment ratios, and escapement levels necessary to assure sustained yield. This is a continuing area of emphasis for both sport and commercial fisheries divisions.

8. Fall chum salmon forecast
This project recommended development of a fall chum salmon forecast that is based on overwinter survivals. Selected side sloughs would be monitored as an index of overall survivals. Forecasts would aid management during early portions of the chum run, and data could also be used to improve escapement goals.

9. Fish pass evaluation
Generally, fish pass construction in some systems in Southeast has occurred without an adequate understanding of biological and physical limitations of salmon access as well as a comprehensive follow-up evaluation. Some areas that need further study are (1) effects of improving existing access versus creating new access, (2) interactions of introduced and resident species, and (3) rate of natural colonization.

10. Forecasting through index stream evaluation
This program was implemented prior to the phase I comprehensive salmon plan; during phase I and phase II it was expanded and refined. The strategy involves identifying suitable streams to monitor, placing weirs there, monitoring escapements, and conducting smolt tagging and migration studies to assist with fisheries management for those stocks.

11. Gillnet selectivity research
This was a priority management project listed in the phase II plan involving the selection of various gillnet mesh sizes to regulate chinook escapements; i.e., harvesting chinook of a specified size, while allowing smaller fish to escape the net. These types of projects were initiated in the mid-1980s to increase wild production of chinook whose populations were depressed.

12. Habitat protection/improvement
Because coho systems (i.e., spawning/rearing habitat) are generally more numerous than those of other salmon species, they have been more vulnerable to impacts from development. One potential mitigation measure to counteract the effects of development would be the placement of structures in these systems to increase rearing habitat. Significant, cumulative increases in coho production could occur if these types of projects were to be implemented.

13. Identify, inventory, and catalog all anadromous streams in Southeast
This is an ongoing project that is sometimes implemented through observations made while in the field working on other projects. This project is also accomplished by using aerial photographs and statistical subsampling. This project was initiated in 1985 and is conducted out of the Petersburg ADF&G office. The Forest Service routinely updates the geographic

information system (GIS) for Southeast and often nominates streams for inclusion in the anadromous stream catalogue.

14. Improved inseason management/improved forecast accuracy
Two projects offer improved inseason management precision: (1) stock separation mark–recovery studies can provide better migration and timing information for stock specific management outside of the terminal harvest areas and (2) inseason assessment of run size to optimize harvest of good-quality fish before they reach their natal streams; test fishing and/or limited seine openings can be used to get this data, and troll catch of pink offer an index to abundance that was not widely utilized in the early 1980s. The ADF&G Mark, Tag, and Age Laboratory plays a key role in providing timely, detailed information about Alaska salmon to fishery managers to help them set harvest levels and times. This information also allows hatchery operators to measure performance of their releases. The laboratory tracks salmon populations by deciphering thermal marks induced in fish otoliths, a low-cost technique of mass marking that they have been instrumental in developing/pioneering (i.e., many of its aspects). This facility is also the centralized resource for tracking Alaska releases and recoveries of coded wire tagged salmon. The lab's detailed database, which is integrated into the PSMFC coastwide database, is used to quantify survival of fish, timing of runs through fisheries, compliance with treaty restrictions, and various biological parameters.

15. Increase pathology research and diagnosis (especially IHN)
In 1988 the state's pathology review committee developed a fish pathology manual titled *Regulation Changes, Policies and Guidelines for Alaska Fish and Shellfish Health and Disease Control*. This publication includes criteria for regulating and permitting protocols, diagnostic procedures, prophylactic measures, and treatments of infectious diseases of salmon. The goal of the overall policy is to prevent dissemination of infectious fish diseases within or outside Alaska. Increased research and diagnosis capability specifically for IHN virus was implemented in conjunction with the development and publication of the *Alaska Sockeye Salmon Culture Manual* in 1994.

16. Interagency chinook workshops
One- or two-day meetings were implemented in the early 1980s; they occurred in most years until the demise of FRED Division. The workshops were attended by representatives of all agencies concerned with the chinook resource. The purpose of the workshops was to informally share information and research results.

A chinook plan for Southeast was developed in 1983 by a chinook planning team, whose members represented chinook producers, fisheries harvest managers, NMFS researchers, and ADF&G planning and permitting staff. The initial intent of the plan was to increase chinook production to help provide for the phase II harvest goal of 537,000 fish annually; however, in 1985 the Pacific Salmon Treaty was signed and the U.S. and Canada agreed to begin a coast-wide wild chinook stock-rebuilding program. Since then harvest limits have been imposed on Alaska's harvest of chinook not of Alaska hatchery origin. The planning team meets regularly and the chinook plan is updated annually.

17. Land-use effects on coho habitat
In 2003 the Forestry Sciences Laboratory began a long-term project to develop a plan to monitor juvenile coho for the effects of land management. The project is part of the management indicator species monitoring requirements from the Tongass land and resource management plan.

18. Maximize production at existing hatcheries.
Specifically proposed for chinook in 1983, this is a continuing goal of all hatchery operators in Southeast.

19. Optimal release timing/nearshore marine conditions
The study of nearshore marine conditions should become an integral part of all fishery supplementation projects. Timing of releases is crucial to the success of hatchery projects, and timing, water temperature, and zooplankton studies should be conducted by all facilities releasing salmonids in Southeast.

20. Pink and chum freshwater/marine survival studies
These types of studies are regularly initiated by hatchery staff through their mark–recovery programs and analysis of release, return, and harvest information.

21. Protection of chinook habitat/standardize method for fish habitat protection
Maintaining a productive rearing environment as well as science-based management practices is essential for increased chinook escapements. The coordination of state and federal agencies in using standardized methods to protect habitat would benefit all anadromous species. Since 1997 fish habitat within the Tongass National Forest has been further protected according to the standards and guidelines set out in the Forest Service's forest plan.

22. Reestablish Title 16 authority/provide funding
Current legal interpretation suggests that ADF&G's permitting authority may not extend to uncatalogued tributaries of anadromous streams, although many are important to coho production. Title 16 permitting authority must be reestablished for all portions of anadromous fish streams. Funding is needed for increased surveillance during land-use activities and subsequent evaluations.

23. Seasonal surveillance of land use
As of June 2004, no known progress has been made on this project that was proposed in 1982. Since the revised forest plan was finalized in 1997, stream habitat and resident fish populations in numerous streams are being monitored to measure potential effects of logging. Results of these monitoring studies are published in an annual monitoring and evaluation report.

24. Shallow lake enhancement techniques
Shallow lakes were believed to have potential for positive response to fertilization; however, problems with residence time of nutrients, carrying capacities, and temperature regimes need to be overcome.

25. Southeast fry digs
In the early 1980s some limited fry digs were conducted at Hugh Smith and McDonald Lakes to determine overwinter sockeye survival estimates. In the mid-1980s the method was expanded to a set of index streams to ascertain preseason projections of pink run strength. The theory was that the density of alevins in the gravel surviving until spring would provide some indication of subsequent adult returns. Essentially, fish and dead eggs were flushed from the gravel into a net using a pump and then counted. These types of projects were discontinued because the process was cumbersome, costly, and inefficient and researchers decided that early marine abundance was a better predictor of adult returns than alevin density. The method was replaced with early marine sampling.

26. Stock distribution in Southeast fisheries
This project proposal recommended additional marking of wild chinook stocks to determine migration and run timing. In the event these stocks were used as broodstock in an enhancement program, this knowledge would allow fisheries managers to develop harvest strategies that would avoid these stocks while they were rebuilding.

27. Stock separation/timing/distribution
Stock separation studies using tags and test fisheries were proposed in the northern Southeast phase II plan: "Determining the degree of spatial or temporal segregation among wild stocks (managed on a CPUE basis) and ultimately between wild and enhanced stocks would more clearly define the risks to wild stocks in a given fishery and the extent to which a fishery can be directed toward specific stocks within a specific area or period of time." The original proposal was aimed at separation of wild and enhanced chum stocks, but the practical application of stock separation was judged to be "very limited" in the phase II plan. Also, net fishery management based on pink abundance and the relatively low value of chum in the 1990s made stock separation studies a low priority. Another stock separation project begun in 1983 sought to identify the interception and migration patterns of chinook. This project is an ongoing effort closely associated with the U.S./Canada treaty negotiations.

28. Streamside vegetation planting
Planting of black cottonwood or willow cuttings can be used to replace streamside cover lost through natural causes or resource development activities. Further evaluation of this riparian management technique was sought to determine its feasibility as a rehabilitation and enhancement tool. In the 1990s, cottonwood, willow, and spruce were planted along harvested sections of Steelhead, Ellen, and Sal creeks. Initial monitoring indicated variable survival of the planted cuttings.

29. Strengthen laws protecting fish habitat
Although Alaska statutes provide enforcement agencies with jurisdiction over those portions of streams noted as important to spawning, rearing, or migration of anadromous fish (*see* AS 16.05.870), it leaves many small rearing streams as well as tributaries to listed streams outside that jurisdiction. Strengthening the law to allow for enforcement authority in any system utilized by fish resources was considered a high priority in 1983.

30. Summer chum salmon investigations
Based on declining summer chum runs in the early 1980s, the project proposed to (1) investigate the potential for regulating harvests on the basis of spatial or temporal species separation, (2)

enumerate escapement on the major known spawning streams, and (3) determine optimal escapement levels for each system based on spawning area availability and spawner-recruit data curves. All of this information assists fisheries managers in regulating harvests. In northern Southeast, investigations were specifically proposed for Port Frederick, Tannic Inlet, Pybus Bay, Peril Strait, Dry Bay, Gedney Harbor, Hood Bay, Chaik Bay, Murder Cove, Kelp Bay, Tebenkof Bay, Hobart Bay, Limestone Inlet, and Point Malmesbury. An additional benefit of this project would be increased knowledge of potential broodstock sources in the following systems: Excursion Inlet, Little Pybus Bay, Port Camden, Chaik Bay, Security Bay, Lynn Canal, Taku River, and Port Snettisham. Chum stocks have rebounded since the mid-1980s, and the limited resources have been shifted to other, more critical investigations.

31. Survey logged watersheds and compare with unlogged
As of 2003 no known progress has been made on this project that was proposed in 1982. Since the revised forest plan was finalized in 1997, stream habitat and resident fish populations in numerous streams are being monitored to measure potential effects of logging. Results of these monitoring studies are published in the annual monitoring and evaluation report.

32. Tag recovery studies
The program has been refined over the years and remains active, with a goal of sampling 20% of the chinook catch commonly achieved by ADF&G's port sampling program. Also, wildstock tagging studies have been conducted on several wild chinook and coho populations to help define migration routes and allow for better management and stock separation during the harvest. Representative portions of several brood years of chinook have been coded-wire-tagged on the Unuk and Chickamin Rivers; recovered tag data provide information on run timing through the fisheries.

33. Timely tag return information
This project emphasized the need for rapid decoding of tag information to enable effective inseason management of fisheries predicated on protection of wild stocks. Impetus for the proposal was the need to identify the hatchery portion of the coho catch in Districts 106 and 108.

34. Total escapement investigation
By 1984 the department had computerized escapement survey data since 1960. The highest single fish count during the season was used as an indication of total stream escapement for the year, but this count was often not taken at the peak of the run or in an adequate number of streams. This project proposed to develop an improved method of estimating total pink and chum salmon escapement, based on studies of stream life conducted by ADF&G in the early 1980s. A large project funded under the U.S./Canada Salmon Treaty was implemented in 1986.

35. Wild stock studies
It was recognized that in addition to increased tagging studies, habitat studies, and improved escapement monitoring are necessary to (1) get a comprehensive overview of a particular wild stock and (2) determine if anything should be done to improve it.

Appendix Table A-3. List of Phase I and Phase II Region-Wide Projects in Southeast.

Key to Project Types

Management	M
Habitat Repair/Improvement	H
Fish Passage	F
Lake/stream Stocking	S̄
Research	R
Lake Fertilization	LF
Broodstock Development	B
Capital Construction/Improvement	C
Enhanced Production	E

Key to Agencies

AK Dept. Fish & Game	AK
Northern SE Regional Aquaculture	NS
Southern SE Regional Aquaculture	SS
U.S. Forest Service	FS
(Ranger District)	
Craig	c
Ketchikan-Misty Fiords	k-m
Thorne Bay	tb
Petersburg	p
Wrangell	w
Sitka	s
Juneau	j
Admirality Monument	ad
Yakutat	y
National Marine Fisheries Service	NM
Douglas Isl. Pink & Chum	D
Armstrong-Keta, Inc.	A

Key to Species

Chinook	K
Chum	Ch
Coho	Co
Pink	P
Sockeye	S
Steelhead or rainbow trout	St

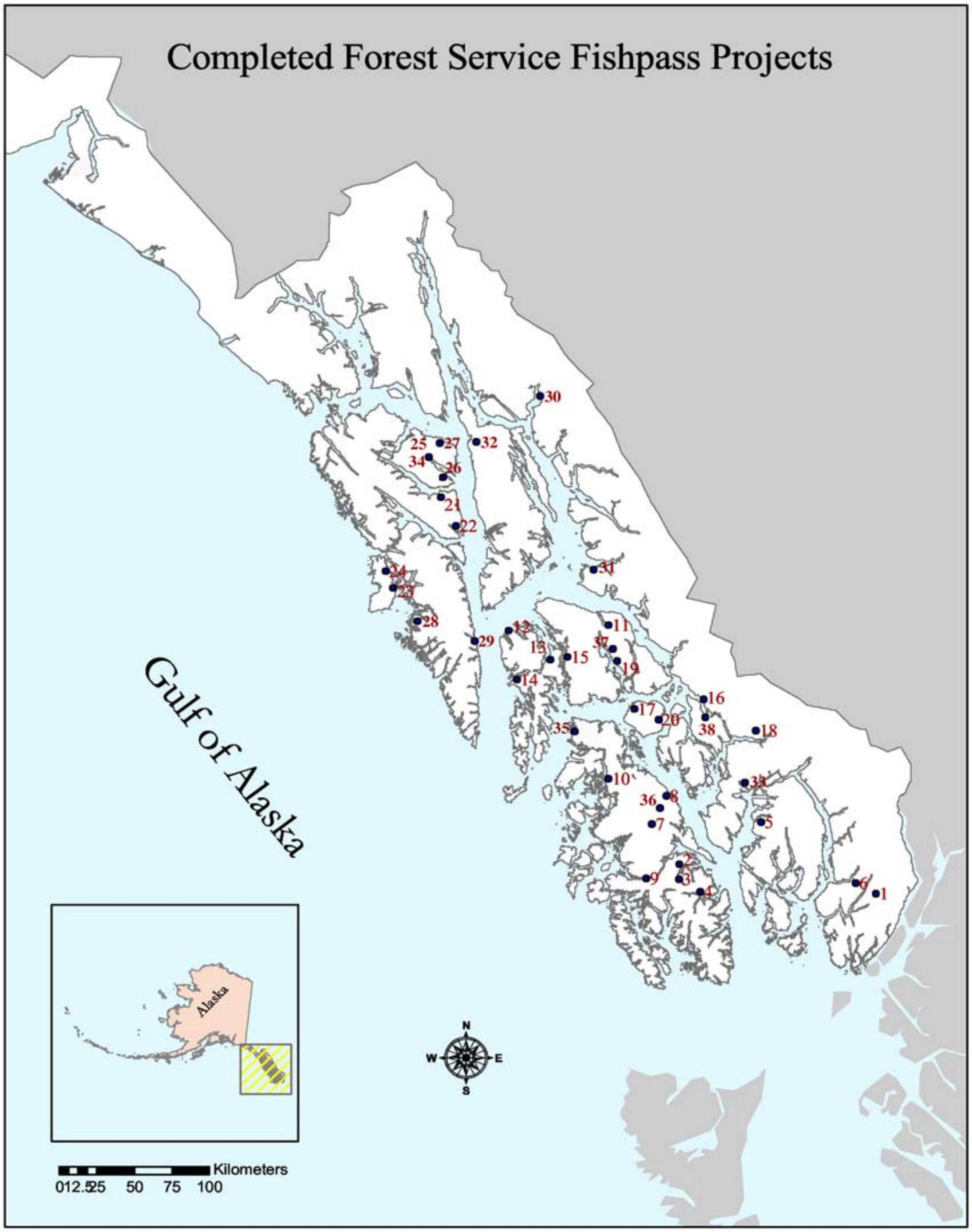
Target Species	Project Type	Narrative #	Name	Year Proposed	Lead Agenc(ies)
All	M	1	Coastwide data base development	1984	AK
S	R	2	Culture techniques to reduce IHNV disease problems	1983	AK
K	R	3	Documentation of feeding and nursery areas	1984	AK,NM
All	H	4	Effect of logging on fish habitat; baseline studies in unlogged areas	1983	FS,AK
All	R	5	Effectiveness monitoring of best management practices	1982	FS
Co	R	6	Enhanced coho predation on pink and chum fry	1984	AK
All	M	7	Escapement enumeration/refinement of escapement goals	1984	AK
Ch	M	8	Fall chum salmon forecast	1985	AK
All	FP	9	Fish pass evaluation	1989	FS
Co	M	10	Forecasting through index stream evaluation	1983	AK
All	M,R	11	Gillnet selectivity research	1984	AK
Co	H	12	Habitat protection/improvement	1982	FS, AK
All	R	13	Identify, inventory, and catalog all anadromous streams in Southeast	1985	FS
All	M	14	Improved inseason management/improved forecast accuracy	1986	AK
All	R	15	Increase pathology research and diagnosis (especially IHN)	1982	AK
K	M	16	Interagency chinook workshops	1982	
Co	M	17	Land use effects on coho habitat	1983	FS
K	E	18	Maximize production at existing hatcheries	1983	AK
All	R,E	19	Optimal release timing/nearshore marine conditions	1990	AK
P,Ch	R	20	Pink and chum freshwater/marine survival studies		
All	H	21	Protection of chinook habitat/ standardize methods for fish habitat protection	1983	FS,AK
All	M	22	Reestablish Title 16 authority/provide funding	1985	AK
All	M	23	Seasonal surveillance of land use	1982	FS,AK
S	R	24	Shallow lake enhancement techniques	1983	AK
P,Ch	M	25	Southeast fry digs	1984	AK
K	M	26	Stock distribution in Southeast fisheries	1984	AK
All	M	27	Stock separation/timing/distribution	1983	AK
All	H	28	Streamside vegetation planting	1984	FS
All	H	29	Strengthen laws protecting fish habitat	1983	AK
Ch	M	30	Summer chum salmon investigations	1983	AK
All	H	31	Survey logged watersheds and compare with unlogged		

Target Species	Project Type	Narrative #	Name	Year Proposed	Lead Agenc(ies)
K,Co	M	32	Tag recovery studies	1983	AK
Co	M	33	Timely tag return information	1983	AK
P,Ch	M	34	Total escapement investigation	1983	AK
K	R,M	35	Wild stock studies	1984	AK

Appendix Table A-4. Key for map of fish pass locations in Southeast Alaska.

Map Number	Project Number[59]	Project Location
1	S -12	Marten River
2	S -55	Old Franks Creek
3	S -54	Dog salmon Creek
4	S -52	Sunny Creek
5	S -43	Margaret Lake
6	S -29	Badger/Bakewell Lake
7	S -58	Rio Roberts Creek
8	S -77	Big Lake
9	S -68	Cable Creek
10	S -69	Tunga Inlet Creek
11	N -25	Portage Creek
12	N -17	Dean Creek
13	N -15	Slippery Creek
14	N -19	Kwatahein Creek
15	S -72	Irish Creek
16	S -97	Virginia Lake
17	S -87	St. Johns Creek
18	S -99	Harding River
19	S -90	Mitchell Creek
20	S -104	Meter Bight Creek
21	N -64	Upper Corner Creek
22	N -57	White Rock Creek
23	N -81	Lava Falls Creek
24	N -89	Eagle River
25	N -69	Bay Head Creek
26	N -66	Pavlof River Upper
27	N -97	Suntaheen Creek
28	N -82	Kizhuchia Creek
29	N -9	Falls Lake
30	N -38	Davidson Creek
31	N -30	Negro Creek
32	N -71	Greens Creek
33	S -39	Woodpecker Lake
34	N -63	Indian River
35	S -73	Hole-In-The-Wall
36	S -57	North Thorne River
37	S -89	Duncan Creek
38	S -102	Salamander Creek

[59] N = Northern Southeast regional projects, S = Southern Southeast regional projects.



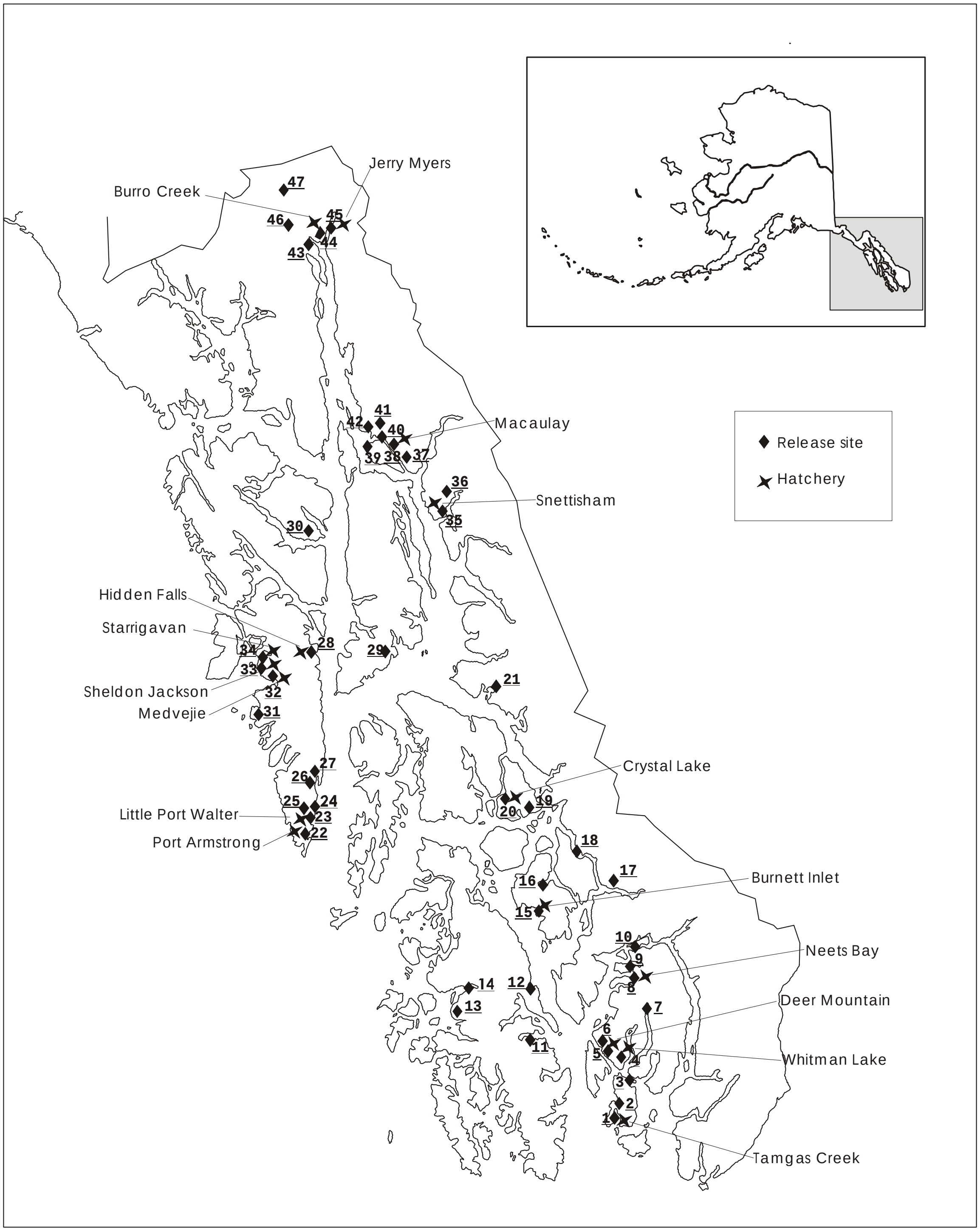
Appendix Figure A-1. Completed Forest Service fish pass projects in Southeast.

APPENDIX B

Release Maps and Keys

Appendix Table B-1a. Key for map of chinook salmon release sites in Southeast Alaska.

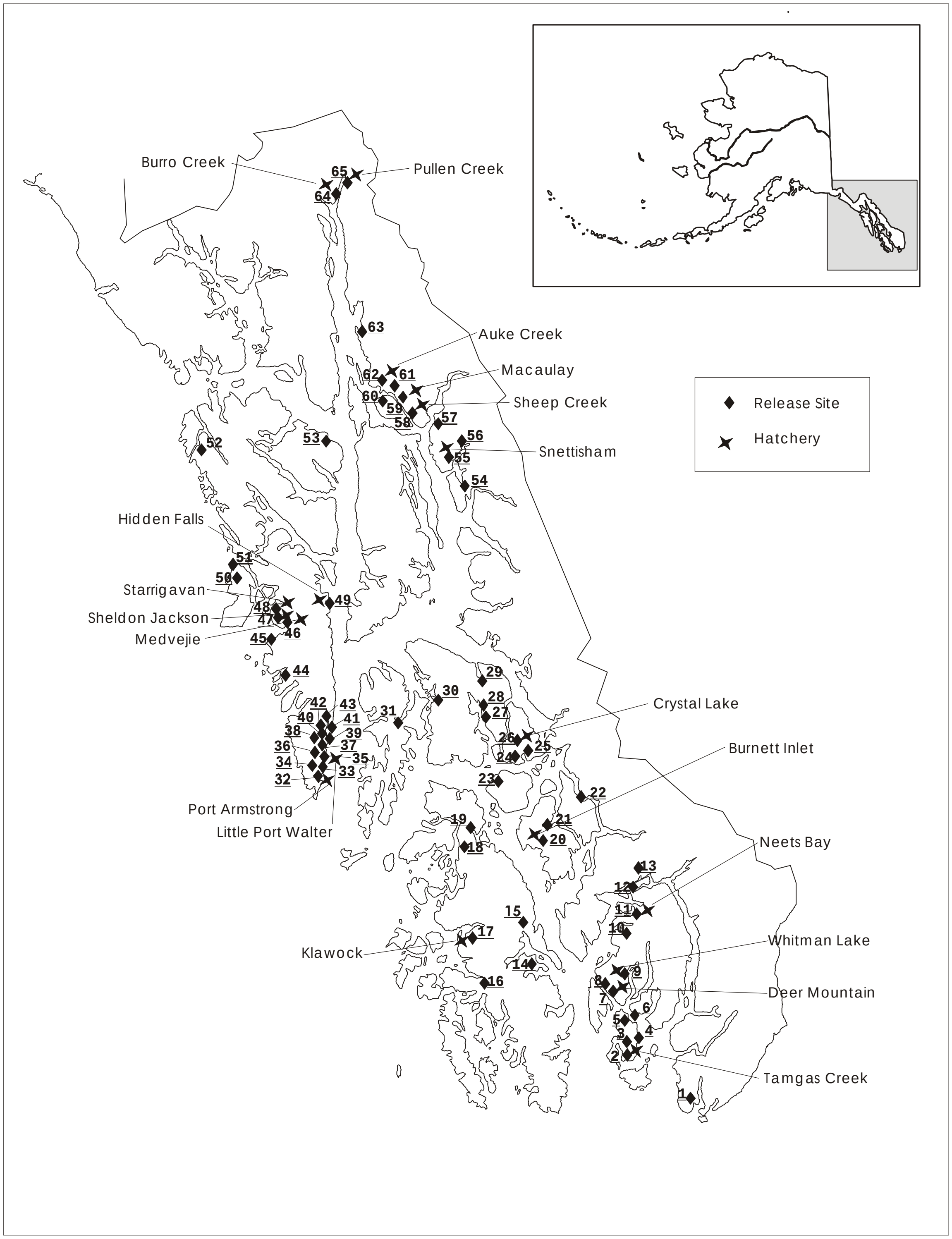
Map #	Release site
1	Tamgas Creek/ Tamgas Creek Hatchery
2	Tent Creek
3	Bold Island Lake
4	Herring Cove/ Whitman Lake Hatchery
5	Ketchikan Creek & Thomas Basin/ Deer Mountain Hatchery
6	Ward Cove
7	Carroll River & Carroll Inlet
8	Neets Bay/ Neets Bay Hatchery
9	Long Lake
10	Bell Island
11	Brennan Lake
12	Thorne Bay
13	Crab Bay
14	Big Salt
15	Burnett Inlet/ Burnett Inlet Hatchery
16	Anita Bay
17	Harding River
18	Earl West Cove
19	Ohmer Creek & Gengen Lake
20	Crystal Creek/ Crystal Lake Hatchery
21	Farragut Lake & Farragut River
22	Jetty Creek/ Port Armstrong Hatchery
23	Little Port Walter/ Little Port Walter Hatchery
24	Tranquil Lake
25	Osprey Lake
26	Banner Lake
27	Larry Lake
28	Kasnyku Bay/ Hidden Falls Hatchery
29	Eliza Lake
30	Indian River
31	Redoubt Lake
32	Bear Cove/ Medvejie Hatchery
33	Crescent Bay/ Sheldon Jackson Hatchery
34	Starrigavan Bay/ Starrigavan Hatchery
35	Speel Arm/ Snettisham Hatchery
36	Indian Lake
37	Sheep Creek
38	Gastineau Channel/ Macaulay Hatchery
39	Fritz Cove & Fish Creek
40	Montana Creek
41	Mendenhall River & Dredge Lake
42	Auke Bay
43	Lutak Inlet
44	Taiya Inlet & Burro Creek/ Burro Creek Hatchery
45	Pullen Creek/ Jerry Myers Hatchery
46	Big Boulder Creek
47	Tahini River



Appendix Figure B-1. Chinook salmon release sites in Southeast Alaska.

Appendix Table B-2a. Key for map of coho salmon releases in Southeast Alaska.

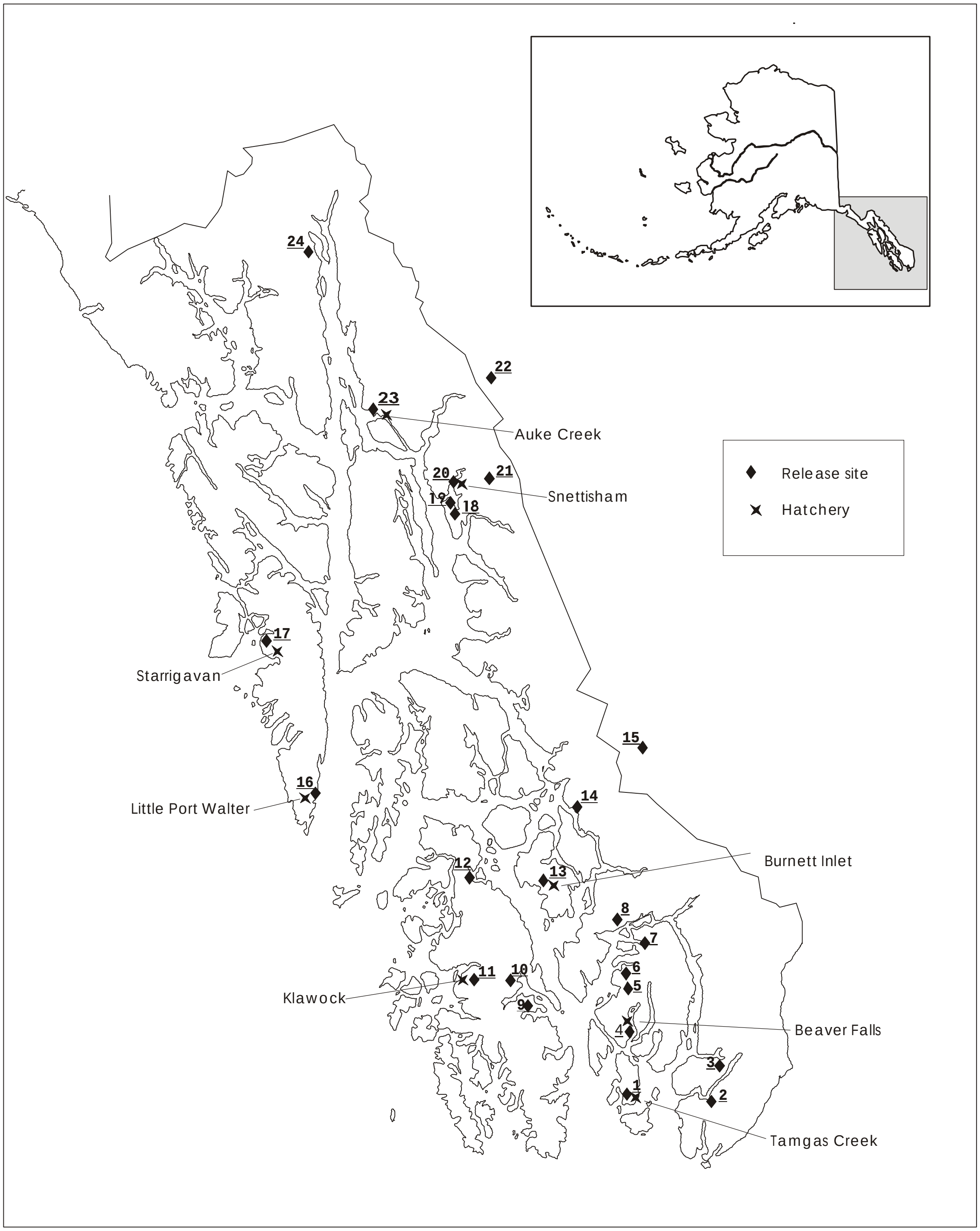
Map #	Release Site
1	Nakat Inlet
2	Tamgas Creek/ Tamgas Creek Hatchery
3	Tent Lake
4	Triangle Lake
5	Annette Bay Creek
6	Bold Island Lake
7	Ketchikan Creek/ Deer Mountain Hatchery
8	Ward Lake
9	Herring Cove/Whitman Lake Hatchery
10	Margaret Lake
11	Neets Bay/ Neets Bay Hatchery
12	Bell Island
13	Reflection Lake
14	Old Franks Lake
15	Rio Roberts Creek
16	Cable Creek
17	Klawock River/ Klawock Hatchery
18	Tunga Lake
19	Neck Lake
20	Burnett Inlet/ Burnett Inlet Hatchery
21	Anita Bay
22	Earl West Cove
23	St. John Creek
24	Sumner Creek
25	Ohmer Creek
26	Crystal Creek/ Crystal Lake Hatchery
27	Mitchell Creek
28	Duncan Creek
29	Portage Creek
30	Irish Creek
31	Slippery Creek
32	Jetty Lake/ Port Armstrong
33	Toledo Harbor
34	Ludvik Lake
35	Little Port Walter/ Little Port Walter Hatchery
36	Osprey Lake
37	L. Rostislaf Lake
38	Deer Lake
39	Cliff Lake
40	Banner Lake
41	Fiddle Lake
42	Finger Lake
43	Blanchard Lake
44	Shamrock Bay
45	Deep Inlet
46	Bear Cove/ Medvejie Hatchery
47	Crescent Bay, Indian River/ Sheldon Jackson Hatchery
48	Starrigavan Bay/ Starrigavan Hatchery
49	Kasnyku Bay/ Hidden Falls Hatchery
50	Sea Lion Cove Lake
51	Surprise Lake
52	Elfendahl Lake
53	Suntaheen Creek
54	Sweetheart Lake
55	Speel Arm/ Snettisham Hatchery
56	First Lake & Indian Lake
57	Davidson Creek
58	Sheep Creek
59	Gastineau Channel/ Macaulay Hatchery
60	Fish Creek
61	Dredge Creek, Salmon Creek, & Mendenhall River
62	Auke Creek
63	Berner's River
64	Taiya Inlet & Burro Creek/ Burro Creek Hatchery
65	Pullen Creek/Jerry Myers Hatchery



Appendix Figure B-2. Coho salmon release sites in Southeast Alaska.

Appendix Table B-3a. Key for map of sockeye salmon release sites in Southeast Alaska.

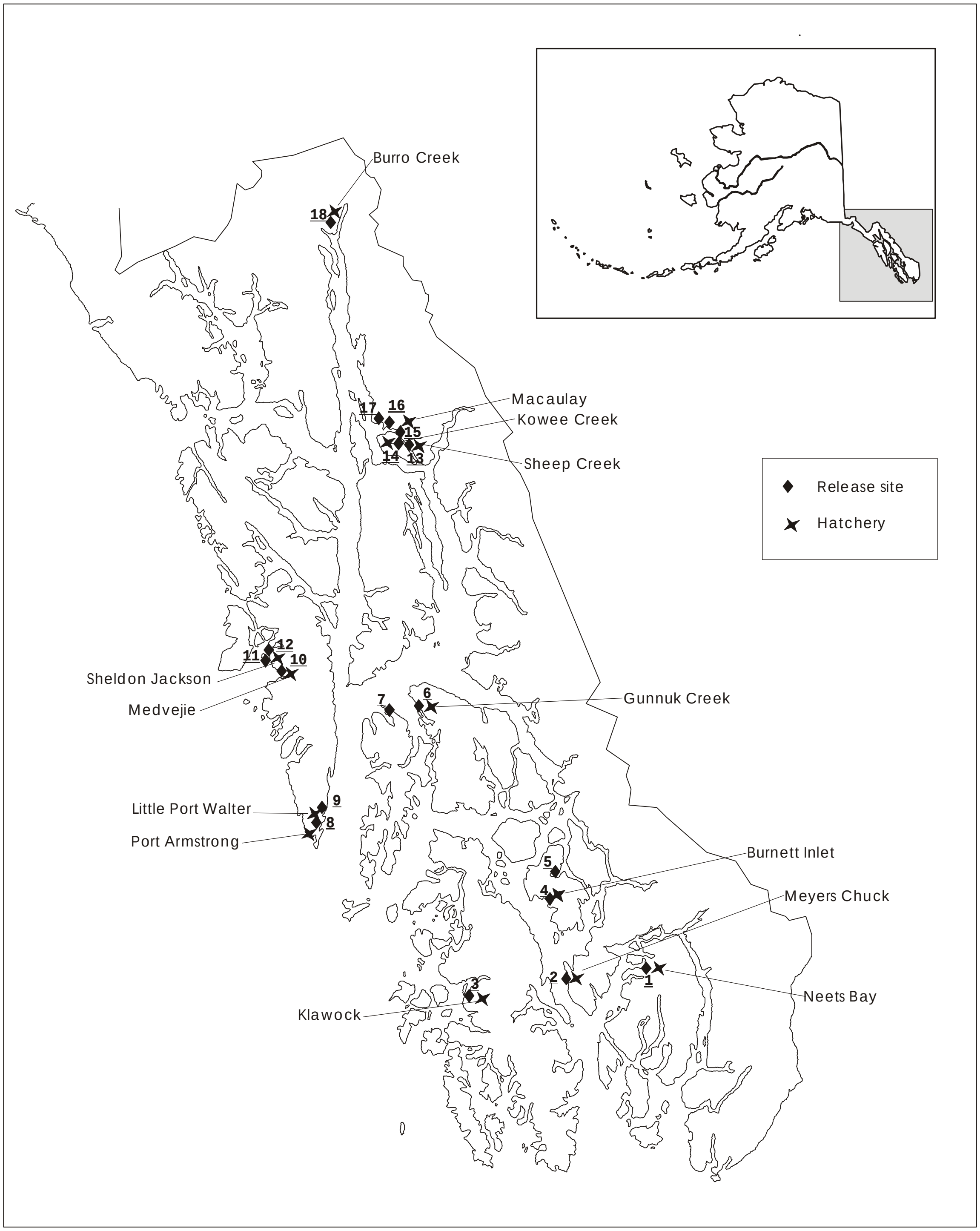
Map #	Release site
1	Tamgas Creek/ Tamgas Creek Hatchery
2	Hugh Smith Lake
3	Bakewell Lake & Badger Lake
4	George Inlet/ Beaver Falls Hatchery
5	Heckman Lake & Patching Lake
6	Margaret Lake
7	Shrimp Bay
8	McDonald Lake
9	Old Franks Lake
10	Salmon Lake
11	Klawock Lake/ Klawock Hatchery
12	Neck Lake Creek
13	Burnett Inlet/ Burnett Inlet Hatchery
14	Virginia Lake
15	Tuya Lake &Tahltan Lake
16	Litle Port Walter/ Little Port Walter Hatchery
17	Starrigavan Bay/ Starrigavan Hatchery
18	Sweetheart Lake
19	Gilbert Bay
20	Speel Lake/ Speel Arm/ Snettisham Hatchery
21	Crescent Lake
22	Tatsamenie Lake & Trapper Lake
23	Auke Creek & Auke Lake & Auke Bay/ Auke Creek Hatchery
24	Spring Pond & Chilkat Lake



Appendix Figure B-3. Sockeye salmon release sites in Southeast Alaska.

Appendix Table B-4a. Key for map of pink salmon release sites in Southeast Alaska.

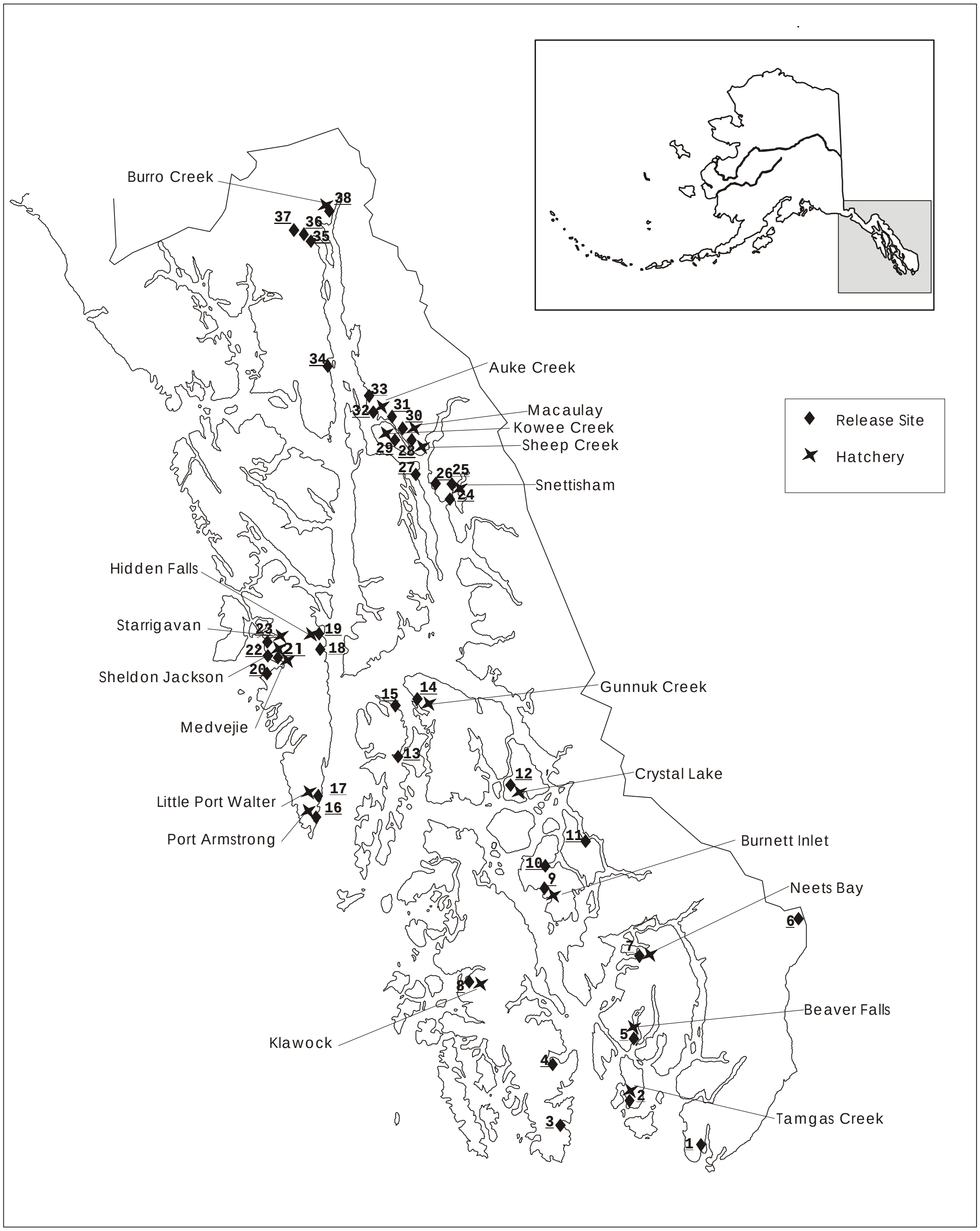
Map #	Release site
1	Neets Bay/ Neets Bay Hatchery
2	Meyers Stream/ Meyers Chuck Hatchery
3	Klawock River/ Klawock Hatchery
4	Burnett Inlet/ Burnett Inlet Hatchery
5	Anita Bay
6	Portage Bay & Gunnuk Creek/ Gunnuk Creek Hatchery
7	Southeast Cove
8	Jetty Creek/ Port Armstrong Hatchery
9	Little Port Walter/ Little Port Walter Hatchery
10	Bear Cove/ Medvejie Hatchery
11	Crescent Bay/ Sheldon Jackson Hatchery
12	Starrigavan River & Starrigavan Bay/ Starrigavan Hatchery
13	Sheep Creek/ Sheep Creek Hatchery
14	Kowee Creek
15	Gastineau Channel/ Macaulay Hatchery
16	Salmon Creek
17	Auke Creek/ Auke Creek Hatchery
18	Taiya Inlet & Burro Creek/ Burro Creek Hatchery



Appendix Figure B-4. Pink salmon release sites in Southeast Alaska.

Appendix Table B-5a. Key for map of chum salmon release sites in Southeast Alaska.

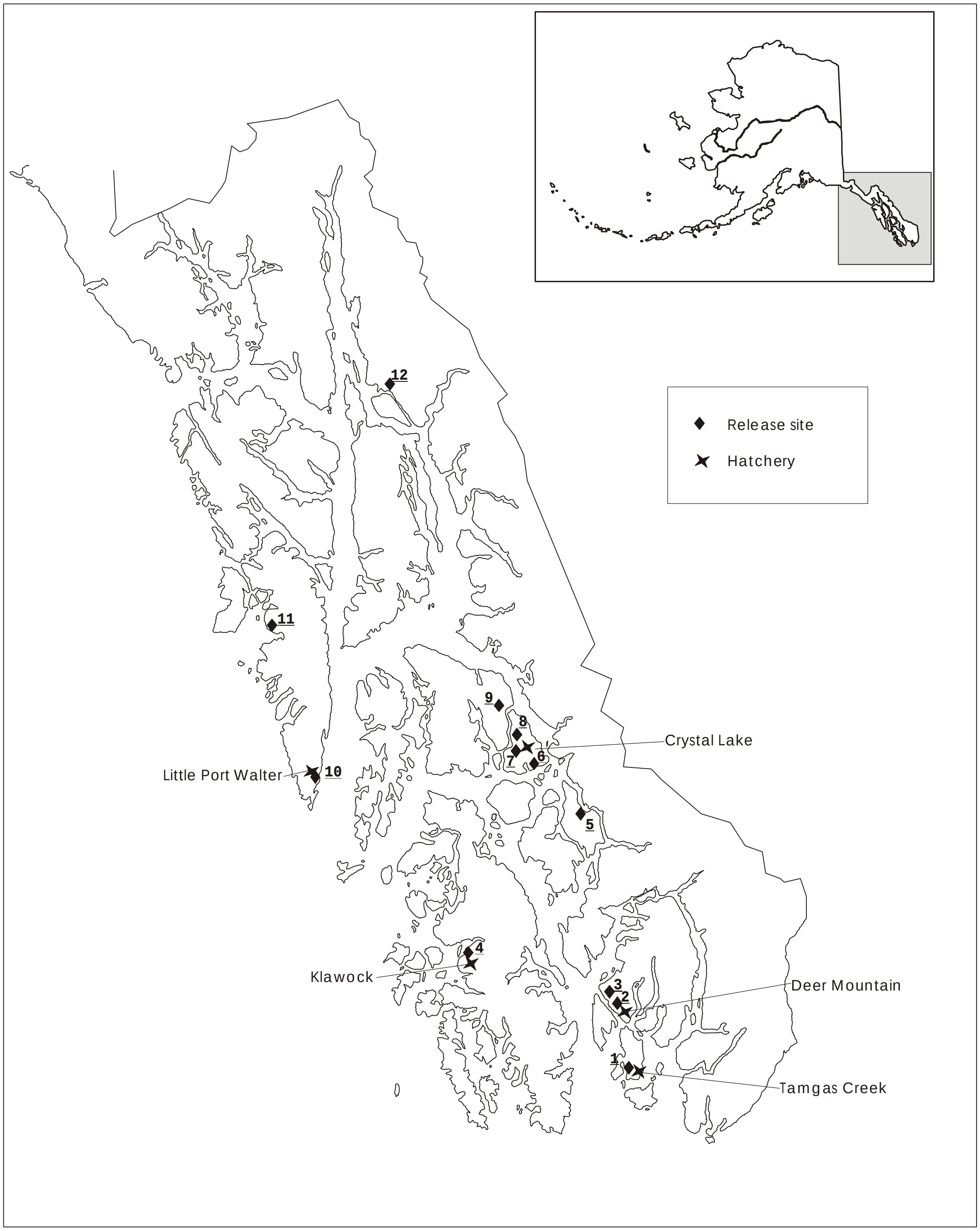
Map #	Release site
1	Nakat Inlet
2	Tamgas Creek/ Tamgas Creek Hatchery
3	Kendrick Bay
4	Disappearance Creek
5	George Inlet/ Beaver Falls Hatchery
6	Marx Creek
7	Neets Bay/ Neets Bay Hatchery
8	Klawock Inlet & Klawock River/ Klawock Hatchery
9	Burnett Inlet/ Burnett Inlet Hatchery
10	Anita Bay
11	Earl West Cove
12	Crystal Creek/ Crystal Lake Hatchery
13	East Port Camden & West Port Camden
14	Portage Bay& Gunnuk Creek/ Gunnuk Creek Hatchery
15	Southeast Cove
16	Jetty Creek/ Port Armstrong Hatchery
17	Little Port Walter/ Little Port Walter Hatchery
18	Takatz Bay
19	Kasnyku Bay/ Hidden Falls Hatchery
20	Deep Inlet
21	Bear Cove & Silver Bay/ Medvejie Hatchery
22	Crescent Bay/ Sheldon Jackson Hatchery
23	Starrigavan River/ Starrigavan Hatchery
24	Mist Island
25	Speel Arm/ Snettisham Hatchery
26	Limestone Inlet
27	Doty Cove
28	Sheep Creek/ Sheep Creek Hatchery
29	Kowee Creek/ Kowee Creek Hatchery
30	Gastineau Channel/ Macaulay Hatchery
31	Salmon Creek
32	Auke Creek/ Auke Creek Hatchery
33	Amalga Harbor
34	Boat Harbor
35	17 Mile (Chilkat River)
36	Herman Creek
37	31 Mile (Klehini River)
38	Burro Creek/ Burro Creek Hatchery



Appendix Figure B-5. Chum salmon release sites in Southeast Alaska.

Appendix Table B-6a. Key for map of steelhead release sites in Southeast Alaska.

Map #	Release Site
1	Tamgas Creek/ Tamgas Creek Hatchery
2	Ketchikan Creek & Thomas Basin/ Deer Mountain Hatchery
3	Ward Lake & Talbot Lake
4	Klawock Lake & Klawock River/ Klawock hatchery
5	Willie Lowe (Shane) Creek
6	Ohmer Creek
7	Crystal Creek/ Crystal Lake Hatchery
8	Falls Creek
9	Petersburg Creek
10	Little Port Walter/ Little Port Walter Hatchery
11	Indian River
12	Montana Creek



Appendix Figure B-6. Steelhead release sites in Southeast Alaska.

Appendix Table B-1b. Releases of chinook salmon in Southeast Alaska.

				Release Year									
Age	Ancestral Stock	Facility	Release Site	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
0	TAMGAS CREEK MIX	TAMGAS CREEK	TAMGAS CR										
0	UNUK R	TAMGAS CREEK	TAMGAS CR										
0	UNUK R - D	TAMGAS CREEK	TAMGAS CR										
0	TAMGAS CREEK MIX	TAMGAS CREEK	TENT CR										
0	UNUK R - D	DEER MOUNTAIN	BOLD IS LK										
0	CHICKAMIN R	WHITMAN LAKE	HERRING COVE										
0	CHICKAMIN R	WHITMAN LAKE	CARROLL R										78,322
0	UNUK R - D	DEER MOUNTAIN	WARD COVE										
0	UNUK R - D	DEER MOUNTAIN	THOMAS BASIN										
0	CHICKAMIN R	WHITMAN LAKE	CARROLL INLET										
0	CHICKAMIN R - D	WHITMAN LAKE	CARROLL INLET										
0	UNUK R - D	WHITMAN LAKE	CARROLL INLET										
0	CHICKAMIN R - D[1]	NEETS BAY	LONG LK										
0	UNUK R - D	NEETS BAY	NEETS BAY										
0	UNUK R - D	WHITMAN LAKE	NEETS BAY										
0	UNUK R - D	BEAVER FALLS	BRENNAN LK										
0	UNUK R - D	DEER MOUNTAIN	BRENNAN LK										
0	UNUK R - D	DEER MOUNTAIN	THORNE BAY										
0	UNUK R - D	DEER MOUNTAIN	CRAB BAY										
0	UNUK R - D	DEER MOUNTAIN	CRAB BAY										
0	ANDREW CR	CRYSTAL LAKE	CRYSTAL CR					166,030	56,102	14,634	13,676		
0	ANDREW CR - D	CRYSTAL LAKE	CRYSTAL CR										59,127
0	CHICKAMIN R	CRYSTAL LAKE	CRYSTAL CR				8,500						
0	CHIGNIK R	CRYSTAL LAKE	CRYSTAL CR	1,140									
0	KING SALMON R	CRYSTAL LAKE	CRYSTAL CR					3,099					
0	NAKINA R	CRYSTAL LAKE	CRYSTAL CR				4,100						
0	SHIP CR	CRYSTAL LAKE	CRYSTAL CR			62,101							
0	HARDING R	CRYSTAL LAKE	HARDING R										
0	CRYSTAL LAKE MIX	CRYSTAL LAKE	GENGEN LK OHMER CR										
0	CHICKAMIN R	LITTLE PORT WALTER	L PORT WALTER					5,054					
0	SITUK R	LITTLE PORT WALTER	L PORT WALTER							8,584			
0	UNUK R	LITTLE PORT WALTER	L PORT WALTER						105,996	17,781			
0	CHICKAMIN R	LITTLE PORT WALTER	LARRY LK										15,506
0	UNUK R	LITTLE PORT WALTER	OSPREY LK										
0	CHICKAMIN R	LITTLE PORT WALTER	TRANQUIL LK										6,599
0	UNUK R	LITTLE PORT WALTER	BANNER LK										
0	UNUK R - D	PORT ARMSTRONG	JETTY CR										
0	ANDREW CR - D	HIDDEN FALLS	ELIZA LK										
0	FARRAGUT R	CRYSTAL LAKE	FARRAGUT LK										
0	FARRAGUT R	HIDDEN FALLS	FARRAGUT LK										
0	ANDREW CR - D	SNETTISHAM	INDIAN LK										
0	ANDREW CR - D	SNETTISHAM	INDIAN R										
0	SHIP CR	FISH CREEK	FRITZ COVE					88,607					

				Release Year									
Age	Ancestral Stock	Facility	Release Site	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
0	ANDREW CR - D	HIDDEN FALLS	INDIAN R										
0	ANDREW CR - D	MEDVEJIE	BEAR COVE										
0	CROOKED CR	STARRIGAVAN	STARRIGAVAN B					182,124					
0	SHIP CR	STARRIGAVAN	STARRIGAVAN B			2,063							
0	ANDREW CR - D	SNETTISHAM	REDOUBT LK										
0	TAHINI R	CRYSTAL LAKE	TAHINI R										
0	TAHINI R	MACAULAY	TAHINI R										
0	TAHINI R	JERRY MYERS	TAHINI R										
0	BIG BOULDER CR	BIG BOULDER INSTREAM	BIG BOULDER CR										
0	BIG BOULDER CR	MACAULAY	BIG BOULDER CR										
			Age 0 Region Total	1,140	0	64,164	12,600	444,914	162,098	40,999	13,676	0	159,554
1	TAMGAS CREEK MIX	TAMGAS CREEK	TAMGAS CR										
1	UNUK R	TAMGAS CREEK	TAMGAS CR										
1	UNUK R - D	TAMGAS CREEK	TAMGAS CR										
1	CHICKAMIN R	WHITMAN LAKE	HERRING COVE										
1	CHICKAMIN R - D	CRYSTAL LAKE	HERRING COVE										
1	CHICKAMIN R - D	WHITMAN LAKE	HERRING COVE										
1	UNUK R	WHITMAN LAKE	HERRING COVE										145,564
1	UNUK R - D	WHITMAN LAKE	HERRING COVE										
1	UNUK R	DEER MOUNTAIN	KETCHIKAN CR							18,122	72,064	65,743	118,848
1	UNUK R - D	DEER MOUNTAIN	KETCHIKAN CR										
1	UNUK R - D	DEER MOUNTAIN	THOMAS BASIN										
1	CHICKAMIN R	WHITMAN LAKE	CARROLL INLET										
1	CHICKAMIN R - D	WHITMAN LAKE	CARROLL INLET										
1	UNUK R - D	WHITMAN LAKE	CARROLL INLET										
1	UNUK R - D	BELL ISLAND NET PENS	BELL ISLAND										
1	ANDREW CR - D	CRYSTAL LAKE	NEETS BAY										
1	CHICKAMIN R - D	CRYSTAL LAKE	NEETS BAY										
1	CHICKAMIN R - D	NEETS BAY	NEETS BAY										
1	UNUK R	WHITMAN LAKE	NEETS BAY										
1	UNUK R - D	CRYSTAL LAKE	NEETS BAY										
1	UNUK R - D	NEETS BAY	NEETS BAY										
1	UNUK R - D	WHITMAN LAKE	NEETS BAY										
1	UNUK R - D	DEER MOUNTAIN	THORNE BAY										
1	UNUK R - D	DEER MOUNTAIN	BIG SALT										
1	ANDREW CR	BURNETT INLET	BURNETT INLET										
1	ANDREW CR - D	BURNETT INLET	BURNETT INLET										
1	HARDING R	BURNETT INLET	BURNETT INLET										
1	ANDREW CR	CRYSTAL LAKE	CRYSTAL CR									42,197	
1	ANDREW CR - D	CRYSTAL LAKE	CRYSTAL CR										273,849
1	WA CARSON #2	CRYSTAL LAKE	CRYSTAL CR		134,391								
1	ANDREW CR - D	CRYSTAL LAKE	ANITA BAY										
1	ANDREW CR - D	CRYSTAL LAKE	EARL WEST COVE										
1	ANDREW CR - D	CRYSTAL LAKE	OHMER CR										
1	CHICKAMIN R	LITTLE PORT WALTER	L PORT WALTER						13,451				
1	CHICKAMIN R - D	LITTLE PORT WALTER	L PORT WALTER										
1	KING SALMON R	LITTLE PORT WALTER	L PORT WALTER										
1	KING SALMON R - D	LITTLE PORT WALTER	L PORT WALTER										
1	UNUK R	LITTLE PORT WALTER	L PORT WALTER						22,599		169,287	30,621	20,267

Age	Ancestral Stock	Facility	Release Site	Release Year 1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
1	UNUK R - D	LITTLE PORT WALTER	L PORT WALTER										
1	WA CARSON #2	LITTLE PORT WALTER	L PORT WALTER	7,261									
1	UNUK R - D	PORT ARMSTRONG	JETTY CR										
1	ANDREW CR - D	SNETTISHAM	PORT ARMSTRONG										
1	UNUK R - D	SNETTISHAM	PORT ARMSTRONG										
1	ANDREW CR	SNETTISHAM	SPEEL ARM							11,577			
1	ANDREW CR - D	SNETTISHAM	SPEEL ARM										
1	KING SALMON R	SNETTISHAM	SPEEL ARM									26,746	
1	SNETTISHAM MIX	SNETTISHAM	SPEEL ARM										
1	SITUK R	SNETTISHAM	SPEEL ARM							7,372			39,200
1	ANDREW CR - D	SNETTISHAM	SHEEP CR										
1	KING SALMON R - D	MACAULAY	SHEEP CR										
1	ANDREW CR - D	MACAULAY	GASTINEAU CH										
1	KING SALMON R - D	MACAULAY	GASTINEAU CH										
1	ANDREW CR - D	SNETTISHAM	GASTINEAU CH										
1	ANDREW CR - D	MACAULAY	AUKE BAY										
1	ANDREW CR	SNETTISHAM	AUKE BAY CR										
1	ANDREW CR - D	MACAULAY	AUKE BAY CR										
1	ANDREW CR - D	SNETTISHAM	AUKE BAY CR										
1	KING SALMON R - D	MACAULAY	AUKE BAY CR										
1	WA CARSON #2	CRYSTAL LAKE	DREDGE LK		44,227								
1	ANDREW CR	SNETTISHAM	MONTANA CR										
1	ANDREW CR - D	SNETTISHAM	MONTANA CR										
1	ANDREW CR	SNETTISHAM	FISH CR										
1	ANDREW CR - D	MACAULAY	FISH CR										
1	ANDREW CR - D	SNETTISHAM	FISH CR										
1	KING SALMON R - D	MACAULAY	FISH CR										
1	ANDREW CR	HIDDEN FALLS	KASNYKU BAY										
1	ANDREW CR - D	HIDDEN FALLS	KASNYKU BAY										
1	TAHINI R	HIDDEN FALLS	KASNYKU BAY										
1	TAHINI R - D	HIDDEN FALLS	KASNYKU BAY										
1	ANDREW CR	MEDVEJIE	BEAR COVE										
1	ANDREW CR - D	MEDVEJIE	BEAR COVE										
1	CHICKAMIN R - D	MEDVEJIE	BEAR COVE										
1	ANDREW CR - D	SHELDON JACKSON	CRESCENT BAY										
1	ANDREW CR	SHELDON JACKSON	CRESCENT BAY										
1	ANDREW CR - D	SHELDON JACKSON	CRESCENT BAY										
1	WIND R CARSON N	STARRIGAVAN	STARRIGAVAN B	9,826	62,233								
1	WA CARSON #2	CRYSTAL LAKE	MENDENHALL R		25,430								
1	TAHINI R	HIDDEN FALLS	LUTAK INLET										
1	TAHINI R - D	MACAULAY	PULLEN CR										
1	TAHINI R	JERRY MYERS	TAIYA INLET										
1	TAHINI R - D	HIDDEN FALLS	TAIYA INLET										
1	TAHINI R - D	JERRY MYERS	TAIYA INLET										
1	TAHINI R - D	BURRO CREEK	BURRO CR										
			Age 1 Region Total	17,087	266,281	0	0	0	36,050	37,071	241,351	165,307	597,728
2	KING SALMON R	LITTLE PORT WALTER	L PORT WALTER										
2	ANDREW CR - D	SNETTISHAM	SHEEP CR										

Age	Ancestral Stock	Facility	Release Site	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
				Release Year									
2	ANDREW CR - D	SNETTISHAM	AUKE BAY CR										
2	ANDREW CR - D	SNETTISHAM	FISH CR										
			Age 2 Region Total	0	0	0	0	0	0	0	0	0	0
			Region Total	18,227	266,281	64,164	12,600	444,914	198,148	78,070	255,027	165,307	757,282

Age	Ancestral Stock	Facility	Release Site	Release Year 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
0	TAMGAS CREEK MIX	TAMGAS CREEK	TAMGAS CR				555,400					770,647	178,999
0	UNUK R	TAMGAS CREEK	TAMGAS CR						1,756,300				
0	UNUK R - D	TAMGAS CREEK	TAMGAS CR		391,248	150,000		164,400					
0	TAMGAS CREEK MIX	TAMGAS CREEK	TENT CR										
0	UNUK R - D	DEER MOUNTAIN	BOLD IS LK			27,900							
0	CHICKAMIN R	WHITMAN LAKE	HERRING COVE			12,600							
0	CHICKAMIN R	WHITMAN LAKE	CARROLL R										
0	UNUK R - D	DEER MOUNTAIN	WARD COVE					171,000					
0	UNUK R - D	DEER MOUNTAIN	THOMAS BASIN	20,633	304,858	227,000	284,000						
0	CHICKAMIN R	WHITMAN LAKE	CARROLL INLET				44,960						
0	CHICKAMIN R - D	WHITMAN LAKE	CARROLL INLET								27,274		
0	UNUK R - D	WHITMAN LAKE	CARROLL INLET				236,040	435,000					
0	CHICKAMIN R - D[1]	NEETS BAY	LONG LK										
0	UNUK R - D	NEETS BAY	NEETS BAY		152,109	407,199	2,299,739	2,733,000	8,529			29,500	
0	UNUK R - D	WHITMAN LAKE	NEETS BAY		100,228								
0	UNUK R - D	BEAVER FALLS	BRENNAN LK		109,329								
0	UNUK R - D	DEER MOUNTAIN	BRENNAN LK			225,700							
0	UNUK R - D	DEER MOUNTAIN	THORNE BAY				68,000	83,000					
0	UNUK R - D	DEER MOUNTAIN	CRAB BAY				71,000	48,000					
0	UNUK R - D	DEER MOUNTAIN	CRAB BAY				71,000	48,000					
0	ANDREW CR	CRYSTAL LAKE	CRYSTAL CR										
0	ANDREW CR - D	CRYSTAL LAKE	CRYSTAL CR										
0	CHICKAMIN R	CRYSTAL LAKE	CRYSTAL CR										
0	CHIGNIK R	CRYSTAL LAKE	CRYSTAL CR										
0	KING SALMON R	CRYSTAL LAKE	CRYSTAL CR										
0	NAKINA R	CRYSTAL LAKE	CRYSTAL CR										
0	SHIP CR	CRYSTAL LAKE	CRYSTAL CR										
0	HARDING R	CRYSTAL LAKE	HARDING R					30,523			31,208		41,769
0	CRYSTAL LAKE MIX	CRYSTAL LAKE	GENGEN LK OHMER CR		13,379								
0	CHICKAMIN R	LITTLE PORT WALTER	L PORT WALTER					26,575	4,249				
0	SITUK R	LITTLE PORT WALTER	L PORT WALTER										
0	UNUK R	LITTLE PORT WALTER	L PORT WALTER				102,407	12,021					
0	CHICKAMIN R	LITTLE PORT WALTER	LARRY LK										
0	UNUK R	LITTLE PORT WALTER	OSPREY LK		141,949								
0	CHICKAMIN R	LITTLE PORT WALTER	TRANQUIL LK										
0	UNUK R	LITTLE PORT WALTER	BANNER LK			96,100							
0	UNUK R - D	PORT ARMSTRONG	JETTY CR					75,602					
0	ANDREW CR - D	HIDDEN FALLS	ELIZA LK				130,000						
0	FARRAGUT R	CRYSTAL LAKE	FARRAGUT LK		22,764	45,308	12,040						66,456
0	FARRAGUT R	HIDDEN FALLS	FARRAGUT LK								29,402		
0	ANDREW CR - D	SNETTISHAM	INDIAN LK										
0	ANDREW CR - D	SNETTISHAM	INDIAN R						269,000				
0	SHIP CR	FISH CREEK	FRITZ COVE										
0	ANDREW CR - D	HIDDEN FALLS	INDIAN R				51,020						
0	ANDREW CR - D	MEDVEJIE	BEAR COVE										
0	CROOKED CR	STARRIGAVAN	STARRIGAVAN B										

Age	Ancestral Stock	Facility	Release Site	Release Year 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
0	SHIP CR	STARRIGAVAN	STARRIGAVAN B										
0	ANDREW CR - D	SNETTISHAM	REDOUBT LK				911,000						
0	TAHINI R	CRYSTAL LAKE	TAHINI R			42,961	34,068						
0	TAHINI R	MACAULAY	TAHINI R										62,579
0	TAHINI R	JERRY MYERS	TAHINI R								30,146	36,316	
0	BIG BOULDER CR	BIG BOULDER INSTREAM	BIG BOULDER CR										
0	BIG BOULDER CR	MACAULAY	BIG BOULDER CR										44,820
			Age 0 Region Total	20,633	1,235,864	1,234,768	4,870,674	3,827,121	2,038,078	0	118,030	836,463	394,623
1	TAMGAS CREEK MIX	TAMGAS CREEK	TAMGAS CR					2,445,700				671,038	527,187
1	UNUK R	TAMGAS CREEK	TAMGAS CR				424,000						
1	UNUK R - D	TAMGAS CREEK	TAMGAS CR		48,000	70,000				888,092			
1	CHICKAMIN R	WHITMAN LAKE	HERRING COVE			27,200	119,100	98,000	151,000				
1	CHICKAMIN R - D	CRYSTAL LAKE	HERRING COVE										
1	CHICKAMIN R - D	WHITMAN LAKE	HERRING COVE							54,980		73,670	106,170
1	UNUK R	WHITMAN LAKE	HERRING COVE										
1	UNUK R - D	WHITMAN LAKE	HERRING COVE								75,400		
1	UNUK R	DEER MOUNTAIN	KETCHIKAN CR										
1	UNUK R - D	DEER MOUNTAIN	KETCHIKAN CR				46,374	42,000	70,000	166,784	85,553	79,064	127,819
1	UNUK R - D	DEER MOUNTAIN	THOMAS BASIN	18,664							30,625	19,172	
1	CHICKAMIN R	WHITMAN LAKE	CARROLL INLET				51,290						
1	CHICKAMIN R - D	WHITMAN LAKE	CARROLL INLET							702,500	1,004,750	1,100,000	1,217,800
1	UNUK R - D	WHITMAN LAKE	CARROLL INLET					816,600	892,300				
1	UNUK R - D	BELL ISLAND NET PENS	BELL ISLAND									5,853	5,308
1	ANDREW CR - D	CRYSTAL LAKE	NEETS BAY										
1	CHICKAMIN R - D	CRYSTAL LAKE	NEETS BAY										
1	CHICKAMIN R - D	NEETS BAY	NEETS BAY										
1	UNUK R	WHITMAN LAKE	NEETS BAY										
1	UNUK R - D	CRYSTAL LAKE	NEETS BAY										
1	UNUK R - D	NEETS BAY	NEETS BAY			131,704	930,072	731,177	708,200	691,060	1,608,000	388,150	728,470
1	UNUK R - D	WHITMAN LAKE	NEETS BAY		144,196	53,880							
1	UNUK R - D	DEER MOUNTAIN	THORNE BAY							24,304	35,451	24,400	
1	UNUK R - D	DEER MOUNTAIN	BIG SALT						51000			25041	
1	ANDREW CR	BURNETT INLET	BURNETT INLET										25,230
1	ANDREW CR - D	BURNETT INLET	BURNETT INLET							100,000	192,364	70,000	
1	HARDING R	BURNETT INLET	BURNETT INLET									30,160	28,945
1	ANDREW CR	CRYSTAL LAKE	CRYSTAL CR		416,000								
1	ANDREW CR - D	CRYSTAL LAKE	CRYSTAL CR		150,000	135,000	351,000	432,544	550,000	479,381	542,258	434,114	520,353
1	WA CARSON #2	CRYSTAL LAKE	CRYSTAL CR										
1	ANDREW CR - D	CRYSTAL LAKE	ANITA BAY										
1	ANDREW CR - D	CRYSTAL LAKE	EARL WEST COVE				98,000	251,866	482,700	394,200	486,500	399,600	368,100
1	ANDREW CR - D	CRYSTAL LAKE	OHMER CR		100,000		201,000			228,569	342,493		
1	CHICKAMIN R	LITTLE PORT WALTER	L PORT WALTER	25,858	44,814				162,575	82,896	71,638		11,444
1	CHICKAMIN R - D	LITTLE PORT WALTER	L PORT WALTER										
1	KING SALMON R	LITTLE PORT WALTER	L PORT WALTER								51,951	84,203	

Age	Ancestral Stock	Facility	Release Site	Release Year 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	KING SALMON R - D	LITTLE PORT WALTER	L PORT WALTER										104,720
1	UNUK R	LITTLE PORT WALTER	L PORT WALTER	94,366	130,502	215,074	207,030	212,233	176,180	59,191	37,480	102,583	159,368
1	UNUK R - D	LITTLE PORT WALTER	L PORT WALTER										
1	WA CARSON #2	LITTLE PORT WALTER	L PORT WALTER										
1	UNUK R - D	PORT ARMSTRONG	JETTY CR					69,949		89,942	144,323	62,176	110,030
1	ANDREW CR - D	SNETTISHAM	PORT ARMSTRONG										217,574
1	UNUK R - D	SNETTISHAM	PORT ARMSTRONG										91,188
1	ANDREW CR	SNETTISHAM	SPEEL ARM		221,000								
1	ANDREW CR - D	SNETTISHAM	SPEEL ARM				49,782	746,422	111,000	804,000	1,056,042		
1	KING SALMON R	SNETTISHAM	SPEEL ARM	7,471	65,240	104,187	142,911	86,000	70,421	72,004	19,724		
1	SNETTISHAM MIX	SNETTISHAM	SPEEL ARM										
1	SITUK R	SNETTISHAM	SPEEL ARM										
1	ANDREW CR - D	SNETTISHAM	SHEEP CR				30,280	31,112	31,556	120,000	122,155		
1	KING SALMON R - D	MACAULAY	SHEEP CR										
1	ANDREW CR - D	MACAULAY	GASTINEAU CH									43,595	191,765
1	KING SALMON R - D	MACAULAY	GASTINEAU CH										
1	ANDREW CR - D	SNETTISHAM	GASTINEAU CH							11,000	101,462		
1	ANDREW CR - D	MACAULAY	AUKE BAY										
1	ANDREW CR	SNETTISHAM	AUKE BAY CR					90,532					
1	ANDREW CR - D	MACAULAY	AUKE BAY CR										
1	ANDREW CR - D	SNETTISHAM	AUKE BAY CR				85,636		92,000	117,000	175,341	45,952	
1	KING SALMON R - D	MACAULAY	AUKE BAY CR										
1	WA CARSON #2	CRYSTAL LAKE	DREDGE LK										
1	ANDREW CR	SNETTISHAM	MONTANA CR					30,703					
1	ANDREW CR - D	SNETTISHAM	MONTANA CR				28,335		52,000	33,000			
1	ANDREW CR	SNETTISHAM	FISH CR					62,684					
1	ANDREW CR - D	MACAULAY	FISH CR										
1	ANDREW CR - D	SNETTISHAM	FISH CR				60,272		74,000	67,000	149,472	45,200	285,719
1	KING SALMON R - D	MACAULAY	FISH CR										
1	ANDREW CR	HIDDEN FALLS	KASNYKU BAY	80,460	70,002	50,211	45,583	46,137					
1	ANDREW CR - D	HIDDEN FALLS	KASNYKU BAY						101,571	99,621	222,573	169,379	1,133,506
1	TAHINI R	HIDDEN FALLS	KASNYKU BAY			46,750	46,518	51,847	57,460	53,768		14,750	
1	TAHINI R - D	HIDDEN FALLS	KASNYKU BAY							184,511			
1	ANDREW CR	MEDVEJIE	BEAR COVE		26,572	21,883							
1	ANDREW CR - D	MEDVEJIE	BEAR COVE				108,041	227,536	174,577	743,511	589,593	529,831	
1	CHICKAMIN R - D	MEDVEJIE	BEAR COVE								9,681	337,008	1,144,688
1	ANDREW CR - D	SHELDON JACKSON	CRESCENT BAY				54,164	45,649	32,278	96,692	100,482	50,596	103,133
1	ANDREW CR	SHELDON JACKSON	CRESCENT BAY					45,649					
1	ANDREW CR - D	SHELDON JACKSON	CRESCENT BAY				54,164		32,278	96,692	100,482	50,596	103,133
1	WIND R CARSON N	STARRIGAVAN	STARRIGAVAN B										
1	WA CARSON #2	CRYSTAL LAKE	MENDENHALL R										
1	TAHINI R	HIDDEN FALLS	LUTAK INLET								38,660		
1	TAHINI R - D	MACAULAY	PULLEN CR										
1	TAHINI R	JERRY MYERS	TAIYA INLET					6,060	4,659	1,730	6,431	7,152	11,905
1	TAHINI R - D	HIDDEN FALLS	TAIYA INLET										30,223
1	TAHINI R - D	JERRY MYERS	TAIYA INLET										

Age	Ancestral Stock	Facility	Release Site	Release Year 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	TAHINI R - D	BURRO CREEK	BURRO CR										7,094
			Age 1 Region Total	854,398	1,416,326	855,889	3,133,552	6,570,400	6,025,055	6,462,428	8,634,661	4,863,283	7,360,872
2	KING SALMON R	LITTLE PORT WALTER	L PORT WALTER										
2	ANDREW CR - D	SNETTISHAM	SHEEP CR									100,543	
2	ANDREW CR - D	SNETTISHAM	AUKE BAY CR									101,103	
2	ANDREW CR - D	SNETTISHAM	FISH CR									105,046	
			Age 2 Region Total	0	0	0	0	0	0	0	0	306,692	0
			Region Total	875,031	2,652,190	2,090,657	8,004,226	10,397,521	8,063,133	6,462,428	8,752,691	6,006,438	7,755,495

				Release Year										
Age	Ancestral Stock	Facility	Release Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
0	TAMGAS CREEK MIX	TAMGAS CREEK	TAMGAS CR	968,000	996,400	411,088	964,000	197,079			102,199	35,055	236,000	272,102
0	UNUK R	TAMGAS CREEK	TAMGAS CR											
0	UNUK R - D	TAMGAS CREEK	TAMGAS CR											
0	TAMGAS CREEK MIX	TAMGAS CREEK	TENT CR									152,500		
0	UNUK R - D	DEER MOUNTAIN	BOLD IS LK											
0	CHICKAMIN R	WHITMAN LAKE	HERRING COVE											
0	CHICKAMIN R	WHITMAN LAKE	CARROLL R											
0	UNUK R - D	DEER MOUNTAIN	WARD COVE											
0	UNUK R - D	DEER MOUNTAIN	THOMAS BASIN											
0	CHICKAMIN R	WHITMAN LAKE	CARROLL INLET											
0	CHICKAMIN R - D	WHITMAN LAKE	CARROLL INLET											
0	UNUK R - D	WHITMAN LAKE	CARROLL INLET											
0	CHICKAMIN R - D[1]	NEETS BAY	LONG LK						29,827	273,613	248,698	300,221	257,589	257,689
0	UNUK R - D	NEETS BAY	NEETS BAY											
0	UNUK R - D	WHITMAN LAKE	NEETS BAY											
0	UNUK R - D	BEAVER FALLS	BRENNAN LK											
0	UNUK R - D	DEER MOUNTAIN	BRENNAN LK											
0	UNUK R - D	DEER MOUNTAIN	THORNE BAY											
0	UNUK R - D	DEER MOUNTAIN	CRAB BAY											
0	UNUK R - D	DEER MOUNTAIN	CRAB BAY											
0	ANDREW CR	CRYSTAL LAKE	CRYSTAL CR											
0	ANDREW CR - D	CRYSTAL LAKE	CRYSTAL CR											
0	CHICKAMIN R	CRYSTAL LAKE	CRYSTAL CR											
0	CHIGNIK R	CRYSTAL LAKE	CRYSTAL CR											
0	KING SALMON R	CRYSTAL LAKE	CRYSTAL CR											
0	NAKINA R	CRYSTAL LAKE	CRYSTAL CR											
0	SHIP CR	CRYSTAL LAKE	CRYSTAL CR											
0	HARDING R	CRYSTAL LAKE	HARDING R											
0	CRYSTAL LAKE MIX	CRYSTAL LAKE	GENGEN LK OHMER CR											
0	CHICKAMIN R	LITTLE PORT WALTER	L PORT WALTER											
0	SITUK R	LITTLE PORT WALTER	L PORT WALTER											
0	UNUK R	LITTLE PORT WALTER	L PORT WALTER											
0	CHICKAMIN R	LITTLE PORT WALTER	LARRY LK											
0	UNUK R	LITTLE PORT WALTER	OSPREY LK											
0	CHICKAMIN R	LITTLE PORT WALTER	TRANQUIL LK											
0	UNUK R	LITTLE PORT WALTER	BANNER LK											
0	UNUK R - D	PORT ARMSTRONG	JETTY CR											
0	ANDREW CR - D	HIDDEN FALLS	ELIZA LK											
0	FARRAGUT R	CRYSTAL LAKE	FARRAGUT LK	95,798	125,120									
0	FARRAGUT R	HIDDEN FALLS	FARRAGUT LK											
0	ANDREW CR - D	SNETTISHAM	INDIAN LK		283,000									
0	ANDREW CR - D	SNETTISHAM	INDIAN R											
0	SHIP CR	FISH CREEK	FRITZ COVE											246,895
0	ANDREW CR - D	HIDDEN FALLS	INDIAN R	122,075										

Age	Ancestral Stock	Facility	Release Site	Release Year 1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
0	ANDREW CR - D	MEDVEJIE	BEAR COVE								205,623	309,500		
0	CROOKED CR	STARRIGAVAN	STARRIGAVAN B											
0	SHIP CR	STARRIGAVAN	STARRIGAVAN B											
0	ANDREW CR - D	SNETTISHAM	REDOUBT LK											
0	TAHINI R	CRYSTAL LAKE	TAHINI R											
0	TAHINI R	MACAULAY	TAHINI R											
0	TAHINI R	JERRY MYERS	TAHINI R											
0	BIG BOULDER CR	BIG BOULDER INSTREAM	BIG BOULDER CR		24,324	45,060	62,014							
0	BIG BOULDER CR	MACAULAY	BIG BOULDER CR	23,389	28,062									
			Age 0 Region Total	1,209,262	1,456,906	456,148	1,026,014	197,079	29,827	273,613	556,520	797,276	257,589	776,686
1	TAMGAS CREEK MIX	TAMGAS CREEK	TAMGAS CR	338,600	284,000	142,160	167,157	381,719	523,250	501,171	485,583	369,382	840,000	340,400
1	UNUK R	TAMGAS CREEK	TAMGAS CR											
1	UNUK R - D	TAMGAS CREEK	TAMGAS CR											
1	CHICKAMIN R	WHITMAN LAKE	HERRING COVE											
1	CHICKAMIN R - D	CRYSTAL LAKE	HERRING COVE						404,278					
1	CHICKAMIN R - D	WHITMAN LAKE	HERRING COVE	109,000	123,164	233,623	238,981	697,171	713,331	741,929	779,750	782,650	689,634	702,430
1	UNUK R	WHITMAN LAKE	HERRING COVE											
1	UNUK R - D	WHITMAN LAKE	HERRING COVE											
1	UNUK R	DEER MOUNTAIN	KETCHIKAN CR											
1	UNUK R - D	DEER MOUNTAIN	KETCHIKAN CR	71,293	85,066	98,665	80,761	97,903	101,316	51,411	90,258	89,488	96,026	97,534
1	UNUK R - D	DEER MOUNTAIN	THOMAS BASIN											
1	CHICKAMIN R	WHITMAN LAKE	CARROLL INLET											
1	CHICKAMIN R - D	WHITMAN LAKE	CARROLL INLET	1,062,700	1,147,876	513,323								
1	UNUK R - D	WHITMAN LAKE	CARROLL INLET											
1	UNUK R - D	BELL ISLAND NET PENS	BELL ISLAND	5,659	5,263									
1	ANDREW CR - D	CRYSTAL LAKE	NEETS BAY								421,803			
1	CHICKAMIN R - D	CRYSTAL LAKE	NEETS BAY						404,278	347,334		416,329	452,644	520,466
1	CHICKAMIN R - D	NEETS BAY	NEETS BAY	377,374	214,980		556,809	991	138,110	194,133				
1	UNUK R	WHITMAN LAKE	NEETS BAY											
1	UNUK R - D	CRYSTAL LAKE	NEETS BAY					338,767						
1	UNUK R - D	NEETS BAY	NEETS BAY											
1	UNUK R - D	WHITMAN LAKE	NEETS BAY											
1	UNUK R - D	DEER MOUNTAIN	THORNE BAY											
1	UNUK R - D	DEER MOUNTAIN	BIG SALT											
1	ANDREW CR	BURNETT INLET	BURNETT INLET											
1	ANDREW CR - D	BURNETT INLET	BURNETT INLET											
1	HARDING R	BURNETT INLET	BURNETT INLET											
1	ANDREW CR	CRYSTAL LAKE	CRYSTAL CR											262,870
1	ANDREW CR - D	CRYSTAL LAKE	CRYSTAL CR	462,989	443,392	451,898	501,282	539,965	610,090	670,915	713,569	595,728	565,240	464,687
1	WA CARSON #2	CRYSTAL LAKE	CRYSTAL CR											
1	ANDREW CR - D	CRYSTAL LAKE	ANITA BAY									369,647		406,806
1	ANDREW CR - D	CRYSTAL LAKE	EARL WEST COVE	436,600	316,100	203,572	241,606	396,829	386,426	364,405	441,038			
1	ANDREW CR - D	CRYSTAL LAKE	OHMER CR											
1	CHICKAMIN R	LITTLE PORT WALTER	L PORT WALTER	166,508	75,569	80,297	56,564	49,533			66758	53498		

Age	Ancestral Stock	Facility	Release Site	Release Year 1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	CHICKAMIN R - D	LITTLE PORT WALTER	L PORT WALTER						77,907	51,209				164,955
1	KING SALMON R	LITTLE PORT WALTER	L PORT WALTER		27,616									
1	KING SALMON R - D	LITTLE PORT WALTER	L PORT WALTER	4,307		79,098	42,720	47,288						
1	UNUK R	LITTLE PORT WALTER	L PORT WALTER	44,534	47,228	49,004	48,375	105,415			67338	55328		
1	UNUK R - D	LITTLE PORT WALTER	L PORT WALTER						29,802	55,311				28,639
1	WA CARSON #2	LITTLE PORT WALTER	L PORT WALTER											
1	UNUK R - D	PORT ARMSTRONG	JETTY CR											
1	ANDREW CR - D	SNETTISHAM	PORT ARMSTRONG	1,070,038										
1	UNUK R - D	SNETTISHAM	PORT ARMSTRONG	194,392										
1	UNIK R - D	LITTLE PORT WALTER	PORT ARMSTRON											106,756
1	ANDREW CR	SNETTISHAM	SPEEL ARM											
1	ANDREW CR - D	SNETTISHAM	SPEEL ARM											
1	KING SALMON R	SNETTISHAM	SPEEL ARM											
1	SNETTISHAM MIX	SNETTISHAM	SPEEL ARM											
1	SITUK R	SNETTISHAM	SPEEL ARM											
1	ANDREW CR - D	SNETTISHAM	SHEEP CR											
1	KING SALMON R - D	MACAULAY	SHEEP CR			28,458	35,423	44,664						
1	ANDREW CR - D	MACAULAY	GASTINEAU CH	207,536	241,366				112,676	221,443	208,586	213,232	213,276	120,891
1	KING SALMON R - D	MACAULAY	GASTINEAU CH			158,681	64,360	171,908	112,676					
1	ANDREW CR - D	SNETTISHAM	GASTINEAU CH											
1	ANDREW CR - D	MACAULAY	AUKE BAY						348,460	173,207		157,393	85,040	
1	ANDREW CR	SNETTISHAM	AUKE BAY CR											
1	ANDREW CR - D	MACAULAY	AUKE BAY CR			193,464		176,193						
1	ANDREW CR - D	SNETTISHAM	AUKE BAY CR	100,517	141,000									
1	KING SALMON R - D	MACAULAY	AUKE BAY CR				106,256							
1	WA CARSON #2	CRYSTAL LAKE	DREDGE LK											
1	ANDREW CR	SNETTISHAM	MONTANA CR											
1	ANDREW CR - D	SNETTISHAM	MONTANA CR											
1	ANDREW CR	SNETTISHAM	FISH CR		71,000									
1	ANDREW CR - D	MACAULAY	FISH CR			196,549		179,164	358,118	183,701	223,585	183,252	178,745	121,670
1	ANDREW CR - D	SNETTISHAM	FISH CR	105,696	72,000									
1	KING SALMON R - D	MACAULAY	FISH CR				109,274							
1	ANDREW CR	HIDDEN FALLS	KASNYKU BAY											
1	ANDREW CR - D	HIDDEN FALLS	KASNYKU BAY	1,754,956	1,053,038	923,506	888,538	944,457	1,070,885	1,104,403	1232716	1214625	1,145,835	1,248,290
1	TAHINI R	HIDDEN FALLS	KASNYKU BAY											
1	TAHINI R - D	HIDDEN FALLS	KASNYKU BAY											
1	ANDREW CR	MEDVEJIE	BEAR COVE											
1	ANDREW CR - D	MEDVEJIE	BEAR COVE	762,369	1,083,432	1,130,236	1,004,878	1,052,995	1,119,512	1,640,506	2,043,105	1,872,609	1,953,356	1,502,186
1	CHICKAMIN R - D	MEDVEJIE	BEAR COVE											
1	ANDREW CR - D	SHELDON JACKSON	CRESCENT BAY	89,443	103,391	78,358	57,792	79,070	82,646	11,376	88,124	53,170		
1	ANDREW CR	SHELDON JACKSON	CRESCENT BAY											
1	ANDREW CR - D	SHELDON JACKSON	CRESCENT BAY											
1	WIND RIVER CARSON N	STARRIGAVAN	STARRIGAVAN B											
1	WA CARSON #2	CRYSTAL LAKE	MENDENHALL R											
1	TAHINI R	HIDDEN FALLS	LUTAK INLET											

				Release Year										
Age	Ancestral Stock	Facility	Release Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	TAHINI R - D	MACAULAY	PULLEN CR								91,618	32,123	95,386	58,793
1	TAHINI R	JERRY MYERS	TAIYA INLET											
1	TAHINI R - D	HIDDEN FALLS	TAIYA INLET	56,415	38,789									
1	TAHINI R - D	JERRY MYERS	TAIYA INLET	12,859	1,650	5,595	1,507		8,631	1,856				
1	TAHINI R - D	BURRO CREEK	BURRO CR	8,572	8,749	1,903	34,895	12,815	15,956					
			Age 1 Region Total	7,442,357	5,584,669	4,568,390	4,237,178	5,316,847	6,618,348	6,314,310	6,953,831	6,458,454	6,315,182	6,147,373
2	KING SALMON R	LITTLE PORT WALTER	L PORT WALTER		12,476									
2	ANDREW CR - D	SNETTISHAM	SHEEP CR											
2	ANDREW CR - D	SNETTISHAM	AUKE BAY CR	50,147										
2	ANDREW CR - D	SNETTISHAM	FISH CR	59,302										
			Age 2 Region Total	109,449	12,476	0	0	0	0	0	0	0	0	0
			Region Total	8,761,068	7,054,051	5,024,538	5,263,192	5,513,926	6,648,175	6,587,923	7,510,351	7,255,730	6,572,771	6,924,059

[1] "-D" after a stock name means it is a broodstock derived from that ancestral stock. A derived stock consists of returns to a release site. Derived stocks are F_1 and subsequent generations of stock taken from the wild.

Appendix Table B-1c. Ancestral stocks and release sites of Southeast Alaska hatchery chinook salmon.

ANCESTRY					RELEASE SITE					
Name	District	Sub-Dist	Stream	Site	Name	District	Sub-Dist	Stream	Site	Comment
CHICKAMIN R	101	71	10040	2018	CARROLL R	101	45	10780		
					HERRING COVE	101	40			THA
					CARROLL INLET	101	48			THA
					LONG LK	101	95			barriered[2], THA
					NEETS BAY	101	95			THA
					CRYSTAL CR	106	44	10310		THA
					L PORT WALTER	109	10			hatchery
					LARRY LK	109	10			barriered
					TRANQUIL LK	109	10			barriered
					BEAR COVE	113	41			THA
UNUK R	101	75	10300	2030	TAMGAS CR	101	26	Annette Is.		hatchery
					BOLD IS LK	101	41	10070		
					HERRING COVE	101	40			THA
					KETCHIKAN CR	101	47	10250		hatchery
					THOMAS BASIN	101	47			mouth of stream #10250
					WARD COVE	101	47			Murphys Landing
					CARROLL INLET	101	48			THA
					BELL ISLAND	101	80			mouth of stream #10990
					NEETS BAY	101	95			THA
					BRENNAN LK	102	40	10280	0010	
					THORNE BAY	102	70			
					BIG SALT	103	60			
					CRAB BAY	103	60			mouth of stream #10500
					BANNER LK	109	10	10240		barriered
					L PORT WALTER	109	10			hatchery
					OSPREY LK	109	10			barriered
					JETTY CR	109	11			THA
					PORT ARMSTRONG	109	11			THA
HARDING R	107	40	10490		BURNETT INLET	106	25			THA
					HARDING R	107	40	10490		
ANDREW CR	108	40	10150	2008	NEETS BAY	101	95			THA[1]

ANCESTRY						RELEASE SITE						
Name	District	Sub-Dist	Stream	Site		Name	District	Sub-Dist	Stream	Site		Comment
						BURNETT INLET	106	25				THA
						CRYSTAL CR	106	44	10310			hatchery
						ANITA BAY	107	35				THA
						EARL WEST COVE	107	45				THA
						OHMER CR	108	40	10500			
						PORT ARMSTRONG	109	11				THA
						ELIZA LK	109	30	10060	0010		
						INDIAN LK	111	33	10300			
						SPEEL ARM	111	33				hatchery
						SHEEP CR	111	40	10280			hatchery
						GASTINEAU CH	111	43				THA
						AUKE BAY CR	111	50	10420			hatchery
						MONTANA CR	111	50	10520	##		
						FISH CR	111	50				mouth of stream #10690
						AUKE BAY	111	50				mouth of stream #10420
						KASNYKU BAY	112	22				THA
						INDIAN R	112	42	10080			
						BEAR COVE	113	35				THA
						CRESCENT BAY	113	36				THA
						REDOUBT LK	113	41	10430	0010		
FARRAGUT R	110	14	10070			FARRAGUT LK	110	14	10070			
KING SALMON R	111	17	10100			CRYSTAL CR	106	44	10310			hatchery
						L PORT WALTER	109	10				hatchery
						SPEEL ARM	111	33				hatchery
						SHEEP CR	111	40	10280			hatchery
						GASTINEAU CH	111	43				THA
						AUKE BAY CR	111	50	10420			hatchery
						FISH CR	111	50				mouth of stream #10690
BIG BOULDER CR	115	32	10250	2077	3098	BIG BOULDER CR	115	32	10250	##	3098	
TAHINI R	115	32	10250	2175		KASNYKU BAY	112	22				THA
						BURRO CR	115	35				THA
						LUTAK INLET	115	33				
						PULLEN CR	115	34				hatchery
						TAHINI R	115	32	10250			

ANCESTRY					RELEASE SITE					
Name	District	Sub-Dist	Stream	Site	Name	District	Sub-Dist	Stream	Site	Comment
					TAIYA INLET	115	35			
SITUK R	182	70	10100		L PORT WALTER	109	10			hatchery
					SPEEL ARM	111	33			hatchery
SHIP CR	247	50	10060		CRYSTAL CR	106	44	10310		hatchery
					STARRIGAVAN B	113	41			mouth of stream #10150; hatchery
					FRITZ COVE	111	50			
CHIGNIK R					CRYSTAL CR	106	44	10310		hatchery
NAKINA R					CRYSTAL CR	106	44	10310		hatchery
WA CARSON #2					L PORT WALTER	109	10			hatchery
CROOKED CR					STARRIGAVAN B	113	41			mouth of stream #10150; hatchery
WIND R					STARRIGAVAN B	113	41			mouth of stream #10150; hatchery
WA CARSON #2					MENDENHALL R	111	50	10570		
WA CARSON #3					DREDGE LK	111	50	10500	0010	fish pass
HATCHERY MIXES										
TAMGAS CREEK MIX										
CHICKAMIN R	101	71	10040	2018	TAMGAS CR	101	26			hatchery
UNUK R	101	75	10300	2030	TENT CR	101	26			barriered
CRYSTAL LAKE MIX										
FARRAGUT R	110	14	10070		GENGEN LK OHMER CR	108	40	10500	0010	
TAHINI R	115	32	10250	2175						
SNETTISHAM MIX										
ANDREW CR	108	40	10150	2008	SPEEL ARM	111	33			hatchery
KING SALMON R	111	17	10100							
SITUK R	182	70	10100							

[1] THA = Terminal Harvest Area
[2] barriered = returning adults will be unable to access spawning habitat.

Appendix Table B-2b. Releases of coho salmon in Southeast Alaska, in thousands of fish.

				Release Year											
Age	Ancestral Stock	Facility	Release Site	79	80	81	82	83	84	85	86	87	88	89	90
0	TC MIX	TAMGAS CREEK	TAMGAS CR				530								
0	TX MIX	TAMGAS CREEK	TENT LK						2,500			3,344	2,987		2,025
0	INDIAN CR - D	WHITMAN LAKE	HERRING COVE						152						
0	REFLECTION LK	DEER MOUNTAIN	BOLD ISLAND LK												39
0	REFLECTION LK - D	DEER MOUNTAIN	BOLD ISLAND LK												
0	KETCHIKAN CR	DEER MOUNTAIN	WARD LK			53	100	81							
0	REFLECTION LK	DEER MOUNTAIN	WARD LK									21	56	54	38
0	REFLECTION LK - D[1]	DEER MOUNTAIN	WARD LK												
0	REFLECTION LK	DEER MOUNTAIN	REFLECTION LK										108	85	
0	INDIAN CR - D	NEETS BAY	NEETS BAY						754						
0	SALMON LK	KLAWOCK	OLD FRANKS LKS												
0	SALMON LK	WHITMAN LAKE	OLD FRANKS LKS												
0	RIO ROBERTS CR	KLAWOCK	RIO ROBERTS											10	
0	THORNE R	KLAWOCK	RIO ROBERTS												25
0	KARTA R	KLAWOCK	KLAWOCK R												
0	KLAWOCK R	KLAWOCK	KLAWOCK R					21							
0	KLAWOCK R	KLAWOCK	KLAWOCK LK						766	1,183	926	1,005		1,163	1,242
0	CABLE CR	KLAWOCK	CABLE CR									7	20	47	70
0	KLAWOCK R	KLAWOCK	TUNGA LK								147	199	222	175	
0	RIO ROBERTS CR	KLAWOCK	TUNGA LK											2	
0	CLH MIX	CRYSTAL LAKE	IRISH CR					1,500	777						
0	REFLECTION LK - D	WHITMAN LAKE	NECK LK												
0	CLH MIX X ST JOHN CR	CRYSTAL LAKE	ST JOHN CR											77	37
0	ST JOHN CR	CRYSTAL LAKE	ST JOHN CR									15			
0	DUNCAN CR	GUNNUK CREEK	DUNCAN CR												
0	MITCHELL CR	CRYSTAL LAKE	MITCHELL CR												
0	CLH MIX	CRYSTAL LAKE	CRYSTAL CR					246	318						
0	BLIND SLOUGH	CRYSTAL LAKE	CRYSTAL CR		57										
0	DUNCAN SALT CHUCK	CRYSTAL LAKE	CRYSTAL CR	117	15										
0	CLH MIX	CRYSTAL LAKE	SUMNER CR					250	147						
0	CLH MIX	CRYSTAL LAKE	OHMER CR						147						
0	SASHIN CR	L PORT WALTER	L PORT WALTER			3									
0	SASHIN CR	MEDVEJIE CIF	CLIFF LK										50		
0	DEEP COVE	MEDVEJIE CIF	DEER LK											1,444	
0	SASHIN CR	MEDVEJIE CIF	DEER LK							781		843	475		1,742
0	CLH MIX	CRYSTAL LAKE	SLIPPERY CR												46
0	SLIPPERY CR	CRYSTAL LAKE	SLIPPERY CR									64			
0	PORTAGE CR	CRYSTAL LAKE	PORTAGE CR												
0	PORTAGE CR	GUNNUK CREEK	PORTAGE CR												
0	SPEEL - D	SNETTISHAM	INDIAN LK							68		104			202
0	SPEEL LK	SNETTISHAM	INDIAN LK				1								
0	SPEEL LK	SNETTISHAM	FIRST LK	9											
0	AUKE CR	AUKE CREEK	AUKE LK	3											

Age	Ancestral Stock	Facility	Release Site	Release Year 79	80	81	82	83	84	85	86	87	88	89	90
0	MONTANA CR	MACAULAY	DREDGE + MOOSE											101	
0	KADASHAN R	MEDVEJIE CIF	INDIAN R												
0	FISH CR	SHEEP CREEK	DAVIDSON CR												
0	INDIAN R - D	MEDVEJIE CIF	WRINKLENECK CR												
0	SEALION COVE S END	MEDVEJIE CIF	SEALION CV LK				10								
0	GAME CR	MEDVEJIE CIF	SUNTAHEEN CR												
			Age 0 Region Total	129	72	56	641	2,098	5,561	2,032	1,073	5,602	3,918	3,158	5,466
1	INDIAN CR - D	WHITMAN LAKE	NAKAT INLET								99	108	90	101	100
1	TC MIX	TAMGAS CREEK	TRIANGLE LK												
1	COLUMBIA R #2 (WA)	TAMGAS CREEK	TAMGAS CR			216									
1	KETCHIKAN CR	TAMGAS CREEK	TAMGAS CR				269								
1	NADZAHEEN CR	TAMGAS CREEK	TAMGAS CR		47	22									
1	TC MIX	TAMGAS CREEK	TAMGAS CR				71				3,505	2,949	7,646	3,953	3,227
1	TC MIX	TAMGAS CREEK	TAMGAS CR + DAVIS						467						
1	TC MIX	TAMGAS CREEK	TENT CR												
1	INDIAN CR	WHITMAN LAKE	HERRING COVE		196	224	219								
1	INDIAN CR - D	WHITMAN LAKE	HERRING COVE					208	309	857	234	119	172	301	301
1	TC MIX	TAMGAS CREEK	ANNETTE BAY CR							2,258					
1	REFLECTION LK - D	DEER MOUNTAIN	WARD LK												
1	KETCHIKAN CR	DEER MOUNTAIN	KETCHIKAN CR	103	56	68	165								
1	REFLECTION LK	DEER MOUNTAIN	KETCHIKAN CR										8	73	43
1	REFLECTION LK - D	DEER MOUNTAIN	KETCHIKAN CR												
1	REFLECTION LK	DEER MOUNTAIN	REFLECTION LK												
1	REFLECTION LK	BELL ISLAND	BELL ISLAND												
1	REFLECTION LK - D	BELL ISLAND	BELL ISLAND												
1	REFLECTION LK	DEER MOUNTAIN	MARGARET LK												
1	INDIAN CR - D	NEETS BAY	NEETS BAY					645	958	2,153	2,356	2,485	1,430	2,141	2,204
1	INDIAN CR	WHITMAN LAKE	NEETS BAY		278	563	340								
1	INDIAN CR - D	WHITMAN LAKE	NEETS BAY					338							
1	KLAWOCK R	KLAWOCK	KLAWOCK R		13	37	66								
1	KLAWOCK R	KLAWOCK	KLAWOCK LK					101	855					1,158	
1	CLH MIX	CRYSTAL LAKE	PETERSBURG AREA								121				
1	BIG CR	BURNETT INLET	BURNETT INLET								13	9	5		
1	BIG CR - D	BURNETT INLET	BURNETT INLET											30	58
1	REFLECTION LK - D	BURNETT INLET	BURNETT INLET												
1	REFLECTION LK - D	WHITMAN LAKE	NECK LK												
1	CLH MIX	CRYSTAL LAKE	CRYSTAL CR					197	251	200		362	90	108	96
1	BLIND SLOUGH	CRYSTAL LAKE	CRYSTAL CR			477	63								
1	DUNCAN SALT CHUCK	CRYSTAL LAKE	CRYSTAL CR		11	22									
1	INDIAN CR - D	WHITMAN LAKE	ANITA BAY												
1	INDIAN CR - D	WHITMAN LAKE	EARL WEST COVE					95			100	227	174	278	223
1	CLH MIX	CRYSTAL LAKE	OHMER CR					201	251	503					
1	BLIND SLOUGH	CRYSTAL LAKE	OHMER CR			70									
1	SASHIN - D	MEDVEJIE CIF	FIDDLE LK								3				
1	AUKE CR	AUKE CREEK	L PORT WALTER				9	13							

Age	Ancestral Stock	Facility	Release Site	Release Year											
				79	80	81	82	83	84	85	86	87	88	89	90
1	SASHIN CR	L PORT WALTER	L PORT WALTER	6		13	41	16							
1	SASHIN - D	MEDVEJIE CIF	L ROSTISLAF LK											84	
1	SASHIN CR	MEDVEJIE CIF	L ROSTISLAF LK							108					
1	SASHIN CR	L PORT WALTER	LUDVIK LK		59										
1	SASHIN CR	L PORT WALTER	TOLEDO HARBOR	21	4										
1	SASHIN - D	HIDDEN FALLS	BANNER LK												
1	DEEP COVE	MEDVEJIE CIF	BANNER LK					67							
1	SASHIN - D	MEDVEJIE CIF	BANNER LK											48	
1	SASHIN - D	MEDVEJIE CIF	FINGER LK								1				
1	DEEP COVE	MEDVEJIE CIF	BLANCHARD LK									35			
1	SASHIN - D	MEDVEJIE CIF	BLANCHARD LK								18				
1	SASHIN - D	MEDVEJIE CIF	BLANCHARD LK								18			50	
1	SASHIN - D	PORT	JETTY CR												122
1	SASHIN - D	PORT	JETTY CR												
1	SASHIN - D	PORT	PORT ARMSTRONG												
1	DEEP COVE	MEDVEJIE CIF	DEER LK												
1	CLH MIX	CRYSTAL LAKE	SLIPPERY CR												
1	KING SALMON R	SNETTISHAM	SPEEL ARM									44			
1	MONTANA CR	SNETTISHAM	SPEEL ARM									86			
1	SPEEL - D	SNETTISHAM	SPEEL ARM					295	234	214	171	572	99		
1	SPEEL LK	SNETTISHAM	SPEEL ARM		156	99	15								
1	SPEEL - D	SNETTISHAM	INDIAN LK					290							
1	SPEEL - D	SNETTISHAM	SWEETHEART LK										23		
1	AUKE CR	AUKE CREEK	SALMON CR					74							
1	BERNERS R	SALMON CREEK	SALMON CR					48							
1	MONTANA CR	SALMON CREEK	SALMON CR					42	23						
1	SPEEL - D	SNETTISHAM	SALMON CR								20	101			
1	PAVLOF R	AUKE CREEK	SHEEP CR												
1	MONTANA - D	MACAULAY	SHEEP CR												533
1	STEEP - D	MACAULAY	SHEEP CR												
1	DEEP COVE, MONTANA CR, INDIAN	MACAULAY	SHEEP CR												
1	MONTANA CR	SHEEP CREEK	SHEEP CR									39			
1	PAVLOF R	SHEEP CREEK	SHEEP CR												
1	SPEEL - D	SNETTISHAM	SHEEP CR										100		
1	MONTANA - D	MACAULAY	GASTINEAU CH											37	546
1	STEEP - D	MACAULAY	GASTINEAU CH												
1	STEEP CR	SHEEP CREEK	GASTINEAU CH										50		
1	MONTANA CR	SHEEP CREEK	GASTINEAU CH												
1	STEEP CR	SHEEP CREEK	AUKE BAY										19		
1	AUKE CR	AUKE CREEK	AUKE CR		1	1	5	1	5	9	5				
1	SASHIN CR	L PORT WALTER	AUKE CR				5	2	7						
1	SPEEL - D	SNETTISHAM	DREDGE LK							20		53	50		
1	DEEP COVE	HIDDEN FALLS	KASNYKU BAY												63
1	SASHIN - D	HIDDEN FALLS	KASNYKU BAY												
1	IINDIAN R	MEDVEJIE	SHAMROCK BAY												
1	INDIAN R - D	MEDVEJIE	SHAMROCK BAY												

				Release Year											
Age	Ancestral Stock	Facility	Release Site	79	80	81	82	83	84	85	86	87	88	89	90
1	INDIAN R	MEDVEJIE	BEAR COVE												
1	INIDIAN R - D	MEDVEJIE	BEAR COVE												
1	IINDIAN R	SHELDON	CRESCENT BAY			3	9			7	86	111	98	81	44
1	INDIAN R - D	SHELDON	CRESCENT BAY						55						
1	INDIAN R	MEDVEJIE	DEEP INLET												120
1	INDIAN R - D	MEDVEJIE	DEEP INLET												
1	SASHIN CR	STARRIGAVAN	STARRIGAVAN BAY	15											
1	STARRIGAVAN MIX	STARRIGAVAN	STARRIGAVAN BAY	63											
1	INDIAN R	SHELDON	INDIAN R	3	12			3							
1	SEALION COVE N	MEDVEJIE CIF	SEALION CV LK					12			19				
1	SEALION COVE N	MEDVEJIE CIF	SURPRISE LK								23				
1	FALLS CR	MEDVEJIE CIF	ELFENDAHL LK						8						
1	SPEEL - D	SNETTISHAM	FISH CR									53	50		
1	MONTANA CR	JERRY MYERS	TAIYA INLET												12
1	PULLEN CR	JERRY MYERS	TAIYA INLET								9	1		9	
1	BURRO CR MIX	BURRO CREEK	BURRO CR												
1	MONTANA - D	BURRO CREEK	BURRO CR												11
1	TAIYA R	TAIYA R	BURRO CR										5		
			Age 1 Region Total	211	833	1,815	1,277	2,648	3,423	6,329	6,801	7,354	10,109	8,452	7,703
2	SASHIN CR	L PORT WALTER	TOLEDO HARBOR			4									
2	CLH MIX	CRYSTAL LAKE	SLIPPERY CR											0.3	7
2	SPEEL - D	SNETTISHAM	SPEEL ARM										72	71	
2	SPEEL - D	SNETTISHAM	SHEEP CR											45	
2	AUKE CR	AUKE CREEK	AUKE CR							1					
2	SASHIN CR	AUKE CREEK	AUKE CR							1					
2	SPEEL - D	SNETTISHAM	DREDGE LK											37	26
2	PAVLOF R	SNETTISHAM	FISH CR												27
2	SPEEL - D	SNETTISHAM	FISH CR											42	20
2	BURRO CR MIX	BURRO CREEK	TAIYA INLET												
2	PULLEN + TAIYA	BURRO CREEK	BURRO CR												
			Age 2 Region Total	-	-	4	-	-	-	2	-	-	72	195	80
3	SPEEL - D	SNETTISHAM	TWIN LKS										5	3	
			Region Total	340	905	1,875	1,918	4,746	8,984	8,363	7,874	12,956	14,104	11,808	13,249

				Release Year												
Age	Ancestral Stock	Facility	Release Site	91	92	93	94	95	96	97	98	99	00	01	02	03
0	TCMIX	TAMGASCREEK	TAMGASCR													
0	TXMIX	TAMGASCREEK	TENTLK	1,700	1,799	1,180	1,413	1,900	2,142	1,991	1,300					
0	INDIANCR-D	WHITMANLAKE	HERRINGCOVE													
0	REFLECTIONLK	DEERMOUNTAIN	BOLDISLANDLK													
0	REFLECTIONLK-D	DEERMOUNTAIN	BOLDISLANDLK		42											
0	KETCHIKANCR	DEERMOUNTAIN	WARDLK													
0	REFLECTIONLK	DEERMOUNTAIN	WARDLK	51	62											
0	REFLECTIONLK-D[1]	DEERMOUNTAIN	WARDLK			51	76	63	74	75	64				53	
0	REFLECTIONLK	DEERMOUNTAIN	REFLECTIONLK		42											
0	INDIANCR-D	NEETSBAY	NEETSBAY													
0	SALMONLK	KLAWOCK	OLDFRANKSLKS				97	218								
0	SALMONLK	WHITMANLAKE	OLDFRANKSLKS						143							
0	RIOROBERTSCR	KLAWOCK	RIOROBERTS													
0	THORNER	KLAWOCK	RIOROBERTS	20	39											
0	KARTAR	KLAWOCK	KLAWOCKR					10								
0	KLAWOCKR	KLAWOCK	KLAWOCKR													
0	KLAWOCKR	KLAWOCK	KLAWOCKLK	831	641											
0	CABLECR	KLAWOCK	CABLECR	40	67											
0	KLAWOCKR	KLAWOCK	TUNGALK													
0	RIOROBERTSCR	KLAWOCK	TUNGALK													
0	CLHMIX	CRYSTALLAKE	IRISHCR													
0	REFLECTIONLK-D	WHITMANLAKE	NECKLK						609	1250	1,320	1,638	1695	1942	853	
0	CLHMIXXSTJOHNCR	CRYSTALLAKE	STJOHNCR													
0	STJOHNCR	CRYSTALLAKE	STJOHNCR													
0	DUNCANCR	GUNNUKCREEK	DUNCANCR									13	33		60	
0	MITCHELLCR	CRYSTALLAKE	MITCHELLCR			4	33	34	26							
0	CLHMIX	CRYSTALLAKE	CRYSTALCR								110					
0	BLINDSLOUGH	CRYSTALLAKE	CRYSTALCR													
0	DUNCANSALTCHUCK	CRYSTALLAKE	CRYSTALCR													
0	CLHMIX	CRYSTALLAKE	SUMNERCR													
0	CLHMIX	CRYSTALLAKE	OHMERCR													
0	SASHINCR	LPORTWALTER	LPORTWALTER													
0	SASHINCR	MEDVEJIECIF	CLIFFLK													
0	DEEPCOVE	MEDVEJIECIF	DEERLK											2409	951	
0	SASHINCR	MEDVEJIECIF	DEERLK	1,875	2,055	2,330	2,075	2,425	2,392	2715	2,829					
0	CLHMIX	CRYSTALLAKE	SLIPPERYCR													
0	SLIPPERYCR	CRYSTALLAKE	SLIPPERYCR													
0	PORTAGECR	CRYSTALLAKE	PORTAGECR			65										
0	PORTAGECR	GUNNUKCREEK	PORTAGECR					34	35							
0	SPEEL-D	SNETTISHAM	INDIANLK													
0	SPEELLK	SNETTISHAM	INDIANLK													
0	SPEELLK	SNETTISHAM	FIRSTLK													
0	AUKECR	AUKECREEK	AUKELK													
0	MONTANACR	MACAULAY	DREDGE+MOOSE													

Age	Ancestral Stock	Facility	Release Site	Release Year 91	92	93	94	95	96	97	98	99	00	01	02	03
0	KADASHANR	MEDVEJIECIF	INDIANR											18		
0	FISHCR	SHEEPCREEK	DAVIDSONCR			49	126									
0	INDIANR-D	MEDVEJIECIF	WRINKLENECKCR		5	2	2	2	2	2		2				
0	SEALIONCOVESEND	MEDVEJIECIF	SEALIONCVLK													
0	GAMECR	MEDVEJIECIF	SUNTAHEENCR	57	72	61										
			Age0RegionTotal	4,574	4,824	3,742	3,822	4,686	5,423	6,033	5,623	1,653	1695	4402	1917	
1	INDIANCR-D	WHITMANLAKE	NAKATINLET	100	115	92	95	199	204	210	199	201	233	302	298	306
1	TCMIX	TAMGASCREEK	TRIANGLELK										443			
1	COLUMBIAR#2(WA)	TAMGASCREEK	TAMGASCR													
1	KETCHIKANCR	TAMGASCREEK	TAMGASCR													
1	NADZAHEENCR	TAMGASCREEK	TAMGASCR													
1	TCMIX	TAMGASCREEK	TAMGASCR	5,330	4,462	1,800	2,028	2,072	2,076	1,697	1,526	1,759	1,798	1805	1604	1,288
1	TCMIX	TAMGASCREEK	TAMGASCR+DAVISC													
1	TCMIX	TAMGASCREEK	TENTCR									1,329	1162	1357	484	717
1	INDIANCR	WHITMANLAKE	HERRINGCOVE												314	
1	INDIANCR-D	WHITMANLAKE	HERRINGCOVE	304	304	300	301	302	283	540	300	305	344	301		320
1	TCMIX	TAMGASCREEK	ANNETTEBAYCR													
1	REFLECTIONLK-D	DEERMOUNTAIN	WARDLK										78	58	53	
1	KETCHIKANCR	DEERMOUNTAIN	KETCHIKANCR													
1	REFLECTIONLK	DEERMOUNTAIN	KETCHIKANCR	29		80										
1	REFLECTIONLK-D	DEERMOUNTAIN	KETCHIKANCR		68		59	66	61	69	75	63	79	58	60	52
1	REFLECTIONLK	DEERMOUNTAIN	REFLECTIONLK	29	52											
1	REFLECTIONLK	BELLISLAND	BELLISLAND	5		5										
1	REFLECTIONLK-D	BELLISLAND	BELLISLAND				5									
1	REFLECTIONLK	DEERMOUNTAIN	MARGARETLK	25												
1	INDIANCR-D	NEETSBAY	NEETSBAY	2,216	2,303	2,677	2,315	2,672	2,994	3,380	2,414	2,751	3,100	2798	3,065	3,027
1	INDIANCR	WHITMANLAKE	NEETSBAY													
1	INDIANCR-D	WHITMANLAKE	NEETSBAY													
1	KLAWOCKR	KLAWOCK	KLAWOCKR	70			260	354	1,324		622	1,330	436	1596	2066	2,908
1	KLAWOCKR	KLAWOCK	KLAWOCKLK													
1	CLHMIX	CRYSTALLAKE	PETERSBURGAREA													
1	BIGCR	BURNETTINLET	BURNETTINLET													
1	BIGCR-D	BURNETTINLET	BURNETTINLET	57	17											
1	REFLECTIONLK-D	BURNETTINLET	BURNETTINLET								164	179	164	167	237	251
1	REFLECTIONLK-D	WHITMANLAKE	NECKLK												4	848
1	CLHMIX	CRYSTALLAKE	CRYSTALCR	79	83	108	72	174	106	91	92	92	149	178	178	179
1	BLINDSLOUGH	CRYSTALLAKE	CRYSTALCR													
1	DUNCANSALTCHUCK	CRYSTALLAKE	CRYSTALCR													
1	INDIANCR-D	WHITMANLAKE	ANITABAY											200	215	222
1	INDIANCR-D	WHITMANLAKE	EARLWESTCOVE	214	227	204	190	202	206	230	196	225	245			
1	CLHMIX	CRYSTALLAKE	OHMERCR													
1	BLINDSLOUGH	CRYSTALLAKE	OHMERCR													
1	SASHIN-D	MEDVEJIECIF	FIDDLELK													
1	AUKECR	AUKECREEK	LPORTWALTER													
1	SASHINCR	LPORTWALTER	LPORTWALTER													

				Release Year												
Age	Ancestral Stock	Facility	Release Site	91	92	93	94	95	96	97	98	99	00	01	02	03
1	SASHIN-D	MEDVEJIECIF	LROSTISLAFLK													
1	SASHINCR	MEDVEJIECIF	LROSTISLAFLK													
1	SASHINCR	LPORTWALTER	LUDVIKLK													
1	SASHINCR	LPORTWALTER	TOLEDOHARBOR													
1	SASHIN-D	HIDDENFALLS	BANNERLK											210		
1	DEEPCOVE	MEDVEJIECIF	BANNERLK													
1	SASHIN-D	MEDVEJIECIF	BANNERLK													
1	SASHIN-D	MEDVEJIECIF	FINGERLK													
1	DEEPCOVE	MEDVEJIECIF	BLANCHARDLK													
1	SASHIN-D	MEDVEJIECIF	BLANCHARDLK													
1	SASHIN-D	MEDVEJIECIF	BLANCHARDLK													
1	SASHIN-D	PORTARMSTRON	JETTYCR													
1	SASHIN-D	PORTARMSTRON	JETTYCR	207	165	82										
1	SASHIN-D	PORTARMSTRON	PORTARMSTRONG				828	642	1,385	952	124	625	1358	977	1,469	1,331
1	DEEPCOVE	MEDVEJIECIF	DEERLK									1,518	409			
1	CLHMIX	CRYSTALLAKE	SLIPPERYCR	16												
1	KINGSALMONR	SNETTISHAM	SPEELARM													
1	MONTANACR	SNETTISHAM	SPEELARM													
1	SPEEL-D	SNETTISHAM	SPEELARM													
1	SPEELLK	SNETTISHAM	SPEELARM													
1	SPEEL-D	SNETTISHAM	INDIANLK													
1	SPEEL-D	SNETTISHAM	SWEETHEARTLK													
1	AUKECR	AUKECREEK	SALMONCR													
1	BERNERSR	SALMONCREEK	SALMONCR													
1	MONTANACR	SALMONCREEK	SALMONCR													
1	SPEEL-D	SNETTISHAM	SALMONCR													
1	PAVLOFR	AUKECREEK	SHEEPCR					10								
1	MONTANA-D	MACAULAY	SHEEPCR		583	562		611	511					156		
1	STEEP-D	MACAULAY	SHEEPCR	505			564			576						
1	DEEPCOVE,MONTANACR,INDIANR[2]	MACAULAY	SHEEPCR									54	91		96	
1	MONTANACR	SHEEPCREEK	SHEEPCR													
1	PAVLOFR	SHEEPCREEK	SHEEPCR						7							
1	SPEEL-D	SNETTISHAM	SHEEPCR													
1	MONTANA-D	MACAULAY	GASTINEAUCH		393	478	380	422	348	426	824	592		615	813	784
1	STEEP-D	MACAULAY	GASTINEAUCH	508									806			
1	STEEPCR	SHEEPCREEK	GASTINEAUCH													
1	MONTANACR	SHEEPCREEK	GASTINEAUCH									192				
1	STEEPCR	SHEEPCREEK	AUKEBAY													
1	AUKECR	AUKECREEK	AUKECR									2	0.4			
1	SASHINCR	LPORTWALTER	AUKECR													
1	SPEEL-D	SNETTISHAM	DREDGELK													
1	DEEPCOVE	HIDDENFALLS	KASNYKUBAY													
1	SASHIN-D	HIDDENFALLS	KASNYKUBAY	64	169	404	1,651	1,459	1,554	1501	1,490	1,658	1,599	1,759	1,954	2,024
1	IINDIANR	MEDVEJIE	SHAMROCKBAY			57							199	227		
1	INDIANR-D	MEDVEJIE	SHAMROCKBAY			223	156	170	231	226	40				349	250
1	INDIANR	MEDVEJIE	BEARCOVE		3											

Age	Ancestral Stock	Facility	Release Site	Release Year												
				91	92	93	94	95	96	97	98	99	00	01	02	03
1	INIDIANR-D	MEDVEJIE	BEARCOVE			3	5	5	5	7	7	7	10	10	10	10
1	IINDIANR	SHELDONJACKS	CRESCENTBAY	55												
1	INDIANR-D	SHELDONJACKS	CRESCENTBAY	1	71	31	96	70	47	70	28	16	84	44	1	10
1	INDIANR	MEDVEJIE	DEEPINLET	101	136											
1	INDIANR-D	MEDVEJIE	DEEPINLET			136	50	42								
1	SASHINCR	STARRIGAVAN	STARRIGAVANBAY													
1	STARRIGAVANMIX	STARRIGAVAN	STARRIGAVANBAY													
1	INDIANR	SHELDONJACKS	INDIANR													
1	SEALIONCOVEN	MEDVEJIECIF	SEALIONCVLK													
1	SEALIONCOVEN	MEDVEJIECIF	SURPRISELK													
1	FALLSCR	MEDVEJIECIF	ELFENDAHLLK													
1	SPEEL-D	SNETTISHAM	FISHCR													
1	MONTANACR	JERRYMYERS	TAIYAINLET													
1	PULLENCR	JERRYMYERS	TAIYAINLET						5							
1	BURROCRMIX	BURROCREEK	BURROCR	6					13	47		50	18			
1	MONTANA-D	BURROCREEK	BURROCR													
1	TAIYAR	TAIYAR	BURROCR													
			Age1RegionTotal	9,921	9,151	7,242	9,055	9,472	11,360	10,022	8,101	12,948	12,805	12,81	13,270	14,497
2	SASHINCR	LPORTWALTER	TOLEDOHARBOR													
2	CLHMIX	CRYSTALLAKE	SLIPPERYCR													
2	SPEEL-D	SNETTISHAM	SPEELARM													
2	SPEEL-D	SNETTISHAM	SHEEPCR													
2	AUKECR	AUKECREEK	AUKECR													
2	SASHINCR	AUKECREEK	AUKECR													
2	SPEEL-D	SNETTISHAM	DREDGELK													
2	PAVLOFR	SNETTISHAM	FISHCR													
2	SPEEL-D	SNETTISHAM	FISHCR													
2	BURROCRMIX	BURROCREEK	TAIYAINLET				8									
2	PULLEN+TAIYA	BURROCREEK	BURROCR		2											
			Age2RegionTotal	-	2	-	8	-	-	-	-	-	-	-	-	-
3	SPEEL-D	SNETTISHAM	TWINLKS													
			Region Total	14,495	13,977	10,984	12,885	14,158	16,783	16,055	13,724	14,601	14,533	17,187	15,186	14,497

[1] "-D" after a stock name means it is a broodstock derived from that ancestral stock. A derived stock consists of returns to a release site. Derived stocks are F1 and subsequent generations of stock taken from the wild.

[2] Genetics experiment; stocks were not mixed

Appendix Table B-2c. Ancestral stocks and release sites of Southeast Alaska hatchery coho salmon.

ANCESTRAL STOCK					RELEASE SITE					
Name	District	Sub-Dist.	Stream	Site	Name	District	Sub-Dist.	Stream	Site	Comment
NADZAHEEN CR	101	41	10670		TAMGAS CR	101	26	Annette Is.		hatchery
KETCHIKAN CR	101	47	10250		TAMGAS CR	101	26	Annette Is.		hatchery
					WARD LK	101	47	10150	0010	
					KETCHIKAN CR	101	47	10250		hatchery
INDIAN CR	101	71	10410	2025	NAKAT INLET	101	10			THA
					HERRING COVE	101	40			THA[1]
					NEETS BAY	101	95			THA
					ANITA BAY	107	35			THA
					EARL WEST COVE	107	45			THA
					SHEEP CR	111	40	10280		hatchery
REFLECTION LK	101	80	10840		HERRING COVE	101	40			hatchery
					BOLD ISLAND LK	101	41	10070		
					WARD LK	101	47	10150	0010	
					KETCHIKAN CR	101	47	10250		hatchery
					REFLECTION LK	101	80	10840	0010	
					BELL ISLAND	101	80			mouth of stream #10990
					MARGARET LK	101	90	10390	0010	fish pass
					BURNETT INLET	106	25			THA
					NECK LK	106	30	10750		THA
SALMON LK	102	60	10870	0020	OLD FRANKS LKS	102	60	10440	0010	fish pass
RIO ROBERTS	102	70	10580	2031	RIO ROBERTS	102	70	10580	2031	fish pass
THORNE R	102	70	10580		RIO ROBERTS	102	70	10580	2031	fish pass
KLAWOCK R	103	60	10470		KLAWOCK R	103	60	10470		hatchery
					KLAWOCK LK	103	60	10470	0010	hatchery
					TUNGA LK	103	90	10090	0010	fish pass
CABLE CR	103	60	10770	2004	CABLE CR	103	60	10770	2004	fish pass
BIG CR	106	30	10800		BURNETT INLET	106	25			hatchery
ST JOHN CR	106	42	10030		ST JOHN CR	106	42	10030		fish pass
DUNCAN CREEK	106	43	10750		DUNCAN CR	106	43	10750		
MITCHELL CR	106	43	10800		MITCHELL CR	106	43	10800		fish pass
DUNCAN SALT CHUCK	106	43			CRYSTAL CR	106	44	10310		hatchery
BLIND SLOUGH	106	44			CRYSTAL CR	106	44	10310		hatchery
					OHMER CR	108	40	10500		
SASHIN CR	109	10	10060		CLIFF LK	109	10	10210		barriered[2]
					BANNER LK	109	10	10240		barriered
					FINGER LK	109	10	10250		barriered
					BLANCHARD LK	109	10	10260		barriered
					L PORT WALTER	109	10			hatchery
					LUDVIK LK	109	10			barriered
					TOLEDO HARBOR	109	10			
					FIDDLE LK	109	10			barriered
					L ROSTISLAF LK	109	10			barriered

ANCESTRAL STOCK					RELEASE SITE					
Name	District	Sub-Dist.	Stream	Site	Name	District	Sub-Dist.	Stream	Site	Comment
					JETTY CR	109	11			THA
					PORT ARMSTRONG	109	11			THA
					KASNYKU BAY	112	22			THA
					STARRIGAVAN B	113	41			mouth of stream #10150; hatchery
DEEP COVE	109	10			BANNER LK	109	10	10240		barriered
					BLANCHARD LK	109	10	10260		barriered
					DEER LK	109	13			THA
					SHEEP CR	111	40	10280		hatchery
					KASNYKU BAY	112	22			THA
SLIPPERY CR	109	43	10030		SLIPPERY CR	109	43	10030		fish pass
PORTAGE CR	110	16	10020		PORTAGE CR	110	16	10020		fish pass
KING SALMON R	111	17	10100		SPEEL ARM	111	33			hatchery
FISH CR	111	32	10560		DAVIDSON CR	111	32	10780		fish pass
SPEEL LK	111	33	10340	0010	INDIAN LK	111	33	10300		
					FIRST LK	111	33	10300	2014	
					SPEEL ARM	111	33			hatchery
					SWEETHEART LK	111	35	10200		barriered
					SALMON CR	111	40	10150		
					SHEEP CR	111	40	10280		hatchery
					TWIN LKS	111	40			landlocked
					DREDGE LK	111	50	10500	0010	fish pass
					FISH CR	111	50	10690		mouth of stream #10690
AUKE CR	111	50	10420		SALMON CR	111	40	10150		
					AUKE LK	111	50	10420	0010	hatchery
					AUKE CR	111	50	10420		
MONTANA CR	111	50	10520	2003	SPEEL ARM	111	33			hatchery
					SALMON CR	111	40	10150		
					SHEEP CR	111	40	10280		hatchery
					DREDGE LK	111	50	10500	0010	fish pass
					TAIYA INLET	115	35			THA
					BURRO CR	115	35			THA
STEEP CR	111	50	10560	2006	SHEEP CR	111	40	10280		hatchery
					GASTINEAU CH	111	43			THA
					AUKE LK	111	50	10420	0010	hatchery
					AUKE BAY	111	50			
KADASHAN R	112	42	10250		INDIAN R	112	42	10080		fish pass
PAVLOV R	112	50	10010		SHEEP CR	111	40	10280		hatchery
INDIAN R	113	41	10190		SHAMROCK BAY	113	32			THA
					BEAR COVE	113	35			THA
					CRESCENT BAY	113	36			hatchery
					DEEP INLET	113	38			THA
					INDIAN R	113	36			THA
					WRINKLENECK CR	113	41			barriered
SEALION COVE N	113	61	10050		SEALION CV LK	113	61	10050		barriered
					SURPRISE LK	113	62	10100		barriered

ANCESTRAL STOCK					RELEASE SITE					
Name	District	Sub-Dist.	Stream	Site	Name	District	Sub-Dist.	Stream	Site	Comment
SEALION CV S END	113	61	10060		SEALION CV LK	113	61	10050		barriered
FALLS CR	113	91	10140		ELFENDAHL LK	113	91	10080		barriered
GAME CR	114	31	10131		SUNTAHEEN CR	114	27	10150		fish pass
BERNERS R	115	20	10100		SALMON CR	111	40	10150		
TAIYA R	115	34	10230		BURRO CR	115	35			THA
PULLEN CR	115	34	10310		TAIYA INLET	115	35			THA
Hatchery Mixes										
TC MIX (TAMGAS CREEK)										
NADZAHEEN CR	101	41	10670		TRIANGLE LAKE	101	24	Annette Isl.		
KETCHIKAN CR	101	47	10250		TAMGAS CR	101	26	Annette Isl.		hatchery
INDIAN CR	101	71	10410	2025	TENT LK	101	26	Annette Isl.		barriered
COLUMBIA R #2 (WA)					ANNETTE BAY CR	101	41	Annette Isl.		
					DAVIS CR	101		Annette Isl.		
CLH MIX (CRYSTAL LAKE)										
DUNCAN SALT CHUCK	106	43			IRISH CR	105	32	10120		fish pass
BLIND SLOUGH	106	44			ST JOHN CR	106	42	10030		fish pass
MENDENHALL R	111	50	10570		MITCHELL CR	106	43	10800		fish pass
BEAR CR (SEWARD)	231	30	10080	2010	CRYSTAL CR	106	44	10310		THA
SHIP CR	247	50	10060		PETERSBURG AREA	106				
GREEN R (WA)					SUMNER CR	108	40	10450		
					OHMER CR	108	40	10500		fish pass
					SLIPPERY CR	109	43	10030		fish pass
STARRIGAVIN MIX										
BLIND SLOUGH	106	44			STARRIGAVAN B	113	41			mouth of stream #10150; hatchery
SASHIN CR	109	10	10060							
MENDENHALL R	111	50	10570							
LK ROSE TEAD										
BURRO CR MIX										
SHEEP CR	11	40	10280		TAIYA INLET	115	35			THA
MONTANA CR	111	50	10520	2003						
TAIYA R	115	34	10230							
PULLEN CR	115	34	10310							

[1] THA = Terminal Harvest Area
[2] barriered = returning adults will be unable to access spawning habitat.

Appendix Table B-3b. Releases of sockeye salmon in Southeast Alaska.

				Release Year									
Stage	Ancestral Stock	Facility	Release Site	1973	1975	1980	1985	1986	1987	1988	1989	1990	1991
0-SMOLT	KARTA R	BEAVER FALLS	GEORGE INLET					94,950	128,500	185,000	204,499	213,013	65,000
0-SMOLT	KARTA R	SHRIMP BAY	SHRIMP BAY							50,000	24,235		306,000
0-SMOLT	MCDONALD LK	SHRIMP BAY	SHRIMP BAY										
0-SMOLT	AUKE LK	AUKE CREEK	AUKE BAY										
0-SMOLT	LAKE CR	AUKE CREEK	AUKE BAY										143,491
0-SMOLT	AUKE LK	AUKE CREEK	AUKE CR							36,620	34,888	51,202	
			0-Smolt Region Total	-	-	-	-	94,950	128,500	271,620	263,622	264,215	514,491
FINGERLING	HUGH SMITH LK	BEAVER FALLS	BADGER LK							100,000			
FINGERLING	HUGH SMITH LK	BEAVER FALLS	HUGH SMITH LK										
FINGERLING	HUGH SMITH LK	BURNETT INLET	HUGH SMITH LK										
FINGERLING	SALMON LK	BEAVER FALLS	OLD FRANKS LKS										
FINGERLING	KARTA R	BEAVER FALLS	SALMON LK								60,381	30,480	
FINGERLING	SALMON LK	BEAVER FALLS	SALMON LK										
FINGERLING	KLAWOCK LK	KLAWOCK	KLAWOCK LK									104,039	216,579
FINGERLING	CRESCENT LK	SNETTISHAM	CRESCENT LK										69,200
FINGERLING	AUKE LK	(M) AUKE LK	AUKE LK							4,678			
			Fingerling Region Total	-	-	-	-	-	-	104,678	60,381	134,519	285,779
FRY	HUGH SMITH LK	BEAVER FALLS	BADGER LK				556,352	190,000		1,291,000		695,647	
FRY	HUGH SMITH LK	BEAVER FALLS	HUGH SMITH LK					273,000	250,000	1,206,000	532,800	1,480,800	
FRY	HUGH SMITH LK	BEAVER FALLS	BAKEWELL LK										
FRY	MCDONALD LK	BEAVER FALLS	MCDONALD LK								3,482,848	989,700	
FRY	HECKMAN LK	BEAVER FALLS	MARGARET LK							518,000			
FRY	MCDONALD LK	BEAVER FALLS	MARGARET LK									300,207	450,000
FRY	HECKMAN LK	BEAVER FALLS	HECKMAN LK							429,000			
FRY	HECKMAN LK	BEAVER FALLS	PATCHING LK							2,378,000			
FRY	SALMON LK	BEAVER FALLS	OLD FRANKS LKS										
FRY	KARTA R	BEAVER FALLS	SALMON LK									436,000	235,530
FRY	SALMON LK	BEAVER FALLS	SALMON LK							315,000			
FRY	KLAWOCK LK	KLAWOCK	KLAWOCK LK			18,364			809,000		2,470,684		
FRY	KLAWOCK LK	KLAWOCK	KLAWOCK R							592,565		99,652	
FRY	MCDONALD LK	BEAVER FALLS	VIRGINIA LK								1,886,900	888,798	736,753
FRY	TAHLTAN LAKE	SNETTISHAM	TAHLTAN LAKE									1,041,744	3,584,658
FRY	TAHLTAN LAKE	SNETTISHAM	TUYA LK										
FRY	LITTLE TATSAMENIE	SNETTISHAM	TATSAMENIE LK										673,236
FRY	TATSAMENIE LK	SNETTISHAM	TATSAMENIE LK										
FRY	LITTLE TRAPPER LK	SNETTISHAM	TRAPPER LAKE										933,791
FRY	SPEEL LK	SNETTISHAM	SPEEL LK								226,622		
FRY	CRESCENT LK	SNETTISHAM	CRESCENT LK									215,556	388,460
FRY	CRESCENT LK	SNETTISHAM	SWEETHEART LK										
FRY	SPEEL LK	SNETTISHAM	SWEETHEART LK									2,465,844	1,310,104
FRY	SPEEL LK -D[1]	SNETTISHAM	SWEETHEART LK										

Stage	Ancestral Stock	Facility	Release Site	Release Year 1973	1975	1980	1985	1986	1987	1988	1989	1990	1991
FRY	SPRING POND	SPRING POND STRM INC	SPRING POND									15,094	300,127
FRY	CHILKAT LK	SNETTISHAM	CHILKAT LK										
FRY	SPRING POND	SPRING POND STRM INC	CHILKAT LK										
			Fry Region Total	-	-	18,364	556,352	463,000	1,059,000	6,729,565	8,599,854	8,629,042	8,612,659
SMOLT	KLAWOCK LK	(M) KLAWOCK LK	KLAWOCK LK							20,609			
SMOLT	NAKVASSIN LK	LITTLE PORT WALTER	L PORT WALTER		16,019								
SMOLT	SARKAR LK	STARRIGAVAN	STARRIGAVAN B	300									
SMOLT	TAMGAS CR?	TAMGAS CREEK	TAMGAS CR										
SMOLT	HUGH SMITH LK	BEAVER FALLS	BADGER LK						13,093				
SMOLT	HUGH SMITH LK	(M) HUGH SMITH LK 101-30	HUGH SMITH LK							41,181			
SMOLT	HECKMAN LK	(M) HECKMAN LK	HECKMAN LK								5,874		
SMOLT	SALMON LK	(M) SALMON LK 102-60	SALMON LK										
SMOLT	MCDONALD LK	BURNETT INLET	BURNETT INLET										
SMOLT	MCDONALD LK	BURNETT INLET	NECK LK										
SMOLT	SPEEL LK	SNETTISHAM	SPEEL ARM										
SMOLT	SPEEL LK -D	SNETTISHAM	SPEEL ARM										
SMOLT	SPEEL LK	SNETTISHAM	SPEEL LK										
SMOLT	CRESCENT LK	SNETTISHAM	GILBERT BAY										
SMOLT	CRESCENT LK	SNETTISHAM	CRESCENT LK										
			Smolt Region Total	300	16,019	-	-	-	13,093	61,790	5,874	-	-
			Region Total	300	16,019	18,364	556,352	557,950	1,200,593	7,167,653	8,929,731	9,027,776	9,412,929

				Release Year											
Stage	Ancestral Stock	Facility	Release Site	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
0-SMOLT	KARTA R	BEAVER FALLS	GEORGE INLET												
0-SMOLT	KARTA R	SHRIMP BAY	SHRIMP BAY												
0-SMOLT	MCDONALD LK	SHRIMP BAY	SHRIMP BAY	925,900	850,900	760,922									
0-SMOLT	AUKE LK	AUKE CREEK	AUKE BAY	56,208											
0-SMOLT	LAKE CR	AUKE CREEK	AUKE BAY												
0-SMOLT	AUKE LK	AUKE CREEK	AUKE CR												
			0-Smolt Region Total	982,108	850,900	760,922	-	-	-	-	-	-	-	-	
FINGERLING	HUGH SMITH LK	BEAVER FALLS	BADGER LK												
FINGERLING	HUGH SMITH LK	BEAVER FALLS	HUGH SMITH LK					105,833							
FINGERLING	HUGH SMITH LK	BURNETT INLET	HUGH SMITH LK								202,214	380,044	455,271	465,043	423,963
FINGERLING	SALMON LK	BEAVER FALLS	OLD FRANKS LKS	104,000											
FINGERLING	KARTA R	BEAVER FALLS	SALMON LK												
FINGERLING	SALMON LK	BEAVER FALLS	SALMON LK	112,800		33,115	60,000								
FINGERLING	KLAWOCK LK	KLAWOCK	KLAWOCK LK	701,587	197,712	532,180	100,000	24,000							
FINGERLING	CRESCENT LK	SNETTISHAM	CRESCENT LK	82,885			234,080								
FINGERLING	AUKE LK	(M) AUKE LK	AUKE LK												
			Fingerling Region	1,001,272	197,712	565,295	394,080	129,833	-	-	202,214	380,044	455,271	465,043	423,963
FRY	HUGH SMITH LK	BEAVER FALLS	BADGER LK		354,000	532,982	344,272								
FRY	HUGH SMITH LK	BEAVER FALLS	HUGH SMITH LK	477,574		644,586	417,678	251,123	572,547						
FRY	HUGH SMITH LK	BEAVER FALLS	BAKEWELL LK			492,821									
FRY	MCDONALD LK	BEAVER FALLS	MCDONALD LK												
FRY	HECKMAN LK	BEAVER FALLS	MARGARET LK												
FRY	MCDONALD LK	BEAVER FALLS	MARGARET LK	200,000	200,000	100,000									
FRY	HECKMAN LK	BEAVER FALLS	HECKMAN LK												
FRY	HECKMAN LK	BEAVER FALLS	PATCHING LK												
FRY	SALMON LK	BEAVER FALLS	OLD FRANKS LKS	123,100											
FRY	KARTA R	BEAVER FALLS	SALMON LK												
FRY	SALMON LK	BEAVER FALLS	SALMON LK	517,300	1,017,300	776,228	373,204	529,493	301,056						
FRY	KLAWOCK LK	KLAWOCK	KLAWOCK LK	446,766	278,760		2,616,462	300,000	245,021	581,047	868,025	359,431	258,805	510,140	364,587
FRY	KLAWOCK LK	KLAWOCK	KLAWOCK R												
FRY	MCDONALD LK	BEAVER FALLS	VIRGINIA LK	620,800	1,144,570	1,055,365	1,331,637	1,207,867							
FRY	TAHLTAN LAKE	SNETTISHAM	TAHLTAN LAKE	1,415,459	1,947,207	903,908	1,142,856	2,296,152	2,247,730	1,900,417	1,670,615	2,228,339	1,872,611	2,532,920	2,622,535
FRY	TAHLTAN LAKE	SNETTISHAM	TUYA LK	1,632,083	1,990,370	4,690,833	2,267,443	2,473,742	2,610,838	432,651	1,603,441	866,530			1,124,248
FRY	LITTLE TATSAMENIE	SNETTISHAM	TATSAMENIE LK	1,231,894											
FRY	TATSAMENIE LK	SNETTISHAM	TATSAMENIE LK		909,452	520,947	897,500	1,724,228	3,940,933	3,596,593	1,769,032	350,139	2,319,588	2,233,200	1,353,413
FRY	LITTLE TRAPPER LK	SNETTISHAM	TRAPPER LAKE	1,810,998	1,113,128	916,083	773,375								
FRY	SPEEL LK	SNETTISHAM	SPEEL LK				253,750								
FRY	CRESCENT LK	SNETTISHAM	CRESCENT LK	551,556											
FRY	CRESCENT LK	SNETTISHAM	SWEETHEART LK		766,908	1,739,605		728,798							
FRY	SPEEL LK	SNETTISHAM	SWEETHEART LK												
FRY	SPEEL LK -D[1]	SNETTISHAM	SWEETHEART LK							275,801	518,033	520,778	532,431	510,062	525,790
FRY	SPRING POND	SPRING POND STRM INC	SPRING POND	388,000	201,753	594,000	550,700	289,500	572,350	96,500	431,670				
FRY	CHILKAT LK	SNETTISHAM	CHILKAT LK			4,817,929	2,334,264	2,691,311	3,038,171				2,743,374		

Stage	Ancestral Stock	Facility	Release Site	Release Year 1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
FRY	SPRING POND	SPRING POND STRM INC	CHILKAT LK					6,138							
			Fry Region Total	9,415,530	9,923,448	17,785,287	13,303,141	12,498,352	13,528,646	6,883,009	6,860,816	4,325,217	7,726,809	5,786,322	5,990,573
SMOLT	KLAWOCK LK	(M) KLAWOCK LK	KLAWOCK LK				11,739								
SMOLT	NAKVASSIN LK	LITTLE PORT WALTER	L PORT WALTER												
SMOLT	SARKAR LK	STARRIGAVAN	STARRIGAVAN B												
SMOLT	TAMGAS CR	TAMGAS CREEK	TAMGAS CR									7,882	7,853	41,743	968
SMOLT	HUGH SMITH LK	BEAVER FALLS	BADGER LK												
SMOLT	HUGH SMITH LK	(M) HUGH SMITH LK 101-	HUGH SMITH LK												
SMOLT	HECKMAN LK	(M) HECKMAN LK	HECKMAN LK												
SMOLT	SALMON LK	(M) SALMON LK 102-60	SALMON LK					257							
SMOLT	MCDONALD LK	BURNETT INLET	BURNETT INLET												38,024
SMOLT	MCDONALD LK	BURNETT INLET	NECK LK										443,240	461,000	356,129
SMOLT	SPEEL LK	SNETTISHAM	SPEEL ARM			2,006,579	860,000	377,471							
SMOLT	SPEEL LK -D	SNETTISHAM	SPEEL ARM							5,629,799	5,029,964	5,185,440	4,805,526	5,860,987	5,815,630
SMOLT	SPEEL LK	SNETTISHAM	SPEEL LK				148,999								
SMOLT	CRESCENT LK	SNETTISHAM	GILBERT BAY			334,000	204,000	221,490							
SMOLT	CRESCENT LK	SNETTISHAM	CRESCENT LK		65,717										
			Smolt Region Total	-	65,717	2,340,579	1,224,738	599,218	-	5,629,799	5,029,964	5,193,322	5,248,766	6,321,987	6,210,751
			Region Total	11,398,910	11,037,777	21,452,083	14,921,959	13,227,403	13,528,646	12,512,808	12,092,994	9,898,583	13,438,699	12,615,095	12,625,287

[1] "-D" after a stock name means it is a broodstock derived from that ancestral stock. A derived stock consists of returns to a release site. Derived stocks are F1 and subsequent generations of stock taken from the wild.

Appendix Table B-3c. Ancestral stocks and release sites of Southeast Alaska hatchery sockeye salmon.

ANCESTRAL STOCK							RELEASE SITE						
Name	District	Sub-Dist.	Stream		Lake	Site	Name	District	Sub-Dist.	Stream		Lake	Comment
TAMGAS CR?	101	26					TAMGAS CR	101	26				THA[1]
HUGH SMITH LK	101	30	10750		0010		BADGER LK	101	30	10120			
							HUGH SMITH LK	101	30	10750		0010	
							BAKEWELL LK	101	55	10730		0010	
MCDONALD LK	101	80	10580		0010		MCDONAsLD LK	101	80	10680		0010	
							SHRIMP BAY	101	80				
							MARGARET LK	101	90	10390		0010	
							BURNETT INLET	106	25				THA
							NECK LK	106	30	10750			
							VIRGINIA LK	107	40	10700		0010	
HECKMAN LK	101	90	10500-** [a]				MARGARET LK	101	90	10390		0010	
							HECKMAN LK	101	90	10500			
							PATCHING LK	101	90	10500-** [2]			
KARTA R	102	60	10870		0010	2021?	GEORGE INLET	101	45				hatchery
							SHRIMP BAY	101	80				
							SALMON LK	102	60	10870-**			
SALMON LK	102	60	10870-**				OLD FRANKS LKS	102	60	10440		0010	
							SALMON LK	102	60	10870-**			
KLAWOCK LK	103	60	10470		0010		KLAWOCK LK	103	60	10470		0010	hatchery
SARKAR LK	103	90	10140		0010		STARRIGAVAN B	113	41				hatchery
TAHLTAN LAKE	108	40	10150		(Canada)		TAHLTAN LAKE	108	40	10150		(Canada)	
							TUYA LK	108	80	10150		(Canada)	
NAKVASSIN LK	109	10					L PORT WALTER	109	10				hatchery
TATSAMENIE LK	111	32	10320		(Canada)		TATSAMENIE LK	111	32	10320		(Canada)	
LITTLE TATSAMENIE	111	32	10320		(Canada)		TATSAMENIE LK	111	32	10320		(Canada)	
LITTLE TRAPPER LK	111	32	10320		(Canada)		TRAPPER LAKE	111	32	10320		(Canada)	
SPEEL LK	111	33	10300	2014	0010		SPEEL ARM	111	33				THA
							SPEEL LK	111	33	10300	2014	0010	
							SWEETHEART LK	111	35	10200			barriered [3]
CRESCENT LK	111	35	10050	2035	0010		CRESCENT LK	111	35	10050	2035	0010	
							SWEETHEART LK	111	35	10200			barriered
							GILBERT BAY	111	35				THA
AUKE LK	111	50	10420		0010		AUKE LK	111	50	10420		0010	hatchery
							AUKE CR	111	50	10420			hatchery
							AUKE BAY	111	50				mouth of stream #10420
LAKE CR	111	50	10420	2010	0010		AUKE BAY	111	50				mouth of stream #10420
CHILKAT LK	115	32	10250	2067	3001-**		CHILKAT LK	115	32	10250	2067	3001-**	
SPRING POND	115	32	10250	2067	3001-**		CHILKAT LK	115	32	10250	2067	3001-**	
							SPRING POND	115	32	10250	2067	3001-**	

[1] THA = terminal harvest area
[2] -** indicates location is farther up in the watershed
[3] barriered = returning adults will be unable to access spawning habitat

Appendix Table B-4b. Releases of pink salmon in Southeast Alaska, in thousands of fish.

Ancestral Stock	Facility	Release Site	Release Year 1974	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
NEETS BAY	NEETS BAY	NEETS BAY												411	
BURNETT INLET BLEND	MEYERS CHUCK	MEYERS STREAM												1,000	
MEYERS STREAM	MEYERS CHUCK	MEYERS STREAM					10	10	9			450			
KLAWOCK R	KLAWOCK	KLAWOCK R					970	3,736							
BLACK BEAR CR	BURNETT INLET	BURNETT INLET							2,560	2,487					
BURNETT INLET BLEND	BURNETT INLET	BURNETT INLET				253	130	32	1,330	802	1,650	9,000	8,811	9,900	5,539
FLAT CR	BURNETT INLET	BURNETT INLET			800										
BURNETT INLET BLEND	BURNETT INLET	ANITA BAY													
LOVERS COVE CR	L PORT WALTER	L PORT WALTER													
SASHIN CR	L PORT WALTER	L PORT WALTER	10												
PORT ARMSTRONG BLEND	PORT ARMSTRONG	JETTY CR								7,400	7,312	9,764	12,349	19,370	16,036
POINT WHITE CR	GUNNUK CR	GUNNUK CR							43	50		3,066			
POINT WHITE CR - D[1]	GUNNUK CR	GUNNUK CR											2,874	4,160	4,193
POINT WHITE CR - D	GUNNUK CR	SE COVE													
POINT WHITE CR	GUNNUK CR	PORTAGE BAY								53					
SALMON CR	SALMON CR	SALMON CR					109	1,557	881	4,812					
FISH CR	SHEEP CR	SHEEP CR						3,029	8,953	762					
FISH CR - D	KOWEE CR	SHEEP CR										6,286	7,165	5,419	
FISH CR - D	MACAULAY	SHEEP CR												9,323	
FISH CR - D	SHEEP CR	SHEEP CR					1,000	5,388	5,446	31,251	18,562	30,469	1,259	15,034	
MACAULAY BLEND	MACAULAY	SHEEP CR													
FISH CR - D	KOWEE CR	GASTINEAU CH												2,922	
FISH CR - D	MACAULAY	GASTINEAU CH												4,266	8,899
FISH CR - D	SHEEP CR	GASTINEAU CH												4,666	
KADASHAN R	MACAULAY	GASTINEAU CH													6,133
MACAULAY BLEND	MACAULAY	GASTINEAU CH													
SHEEP CR - D	MACAULAY	GASTINEAU CH													
FISH CR	KOWEE CR	KOWEE CR		1,644	2,100	610		890		100					
FISH CR - D	KOWEE CR	KOWEE CR				1,477	2,182	2,714	3,280	6,252		141	53		
AUKE CR	AUKE CR	AUKE CR							20	88	92				
AUKE CR BLEND	AUKE CR	AUKE CR									5		16		
MEDVEJIE CR	MEDVEJIE	BEAR COVE										58	105	97	34
INDIAN R	SHELDON JACKSON	CRESCENT BAY				7,883	2,062	9,690	9,997		9,775	10,051	14,200	14,250	2,930
INDIAN R	SHELDON JACKSON	SITKA SOUND						1,000		14,537	1,295				28
STARRIGAVAN R	STARRIGAVAN	STARRIGAVAN R		1,849	2,272										
BURRO CR	BURRO CR	BURRO CR								1,297					
BURRO CR BLEND	BURRO CR	BURRO CR									1,446	2,242	671	2,327	543
HOWARD BAY CR	BURRO CR	BURRO CR								103					142
MACAULAY BLEND	BURRO CR	BURRO CR													
PULLEN CR	BURRO CR	BURRO CR													
SAWMILL CR	BURRO CR	BURRO CR							640						
BURRO CR	JERRY MYERS	TAIYA INLET								60					
JERRY MYERS BLEND	JERRY MYERS	TAIYA INLET										50	44		
PULLEN CR	JERRY MYERS	TAIYA INLET							100		50				
		Region Total	10	3,493	5,172	10,223	6,463	28,045	33,259	70,054	40,187	71,576	47,545	93,145	44,477

Ancestral Stock	Facility	Release Site	Release Year 1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
NEETS BAY	NEETS BAY	NEETS BAY														
BURNETT INLET BLEND	MEYERS CHUCK	MEYERS STREAM														
MEYERS STREAM	MEYERS CHUCK	MEYERS STREAM														
KLAWOCK R	KLAWOCK	KLAWOCK R														
BLACK BEAR CR	BURNETT INLET	BURNETT INLET														
BURNETT INLET BLEND	BURNETT INLET	BURNETT INLET	11,414	8,720	19,342	5,336	6,000	7,920	8,000							
FLAT CR	BURNETT INLET	BURNETT INLET														
BURNETT INLET BLEND	BURNETT INLET	ANITA BAY				14,629	12,190	31,030	4,180							
LOVERS COVE CR	L PORT WALTER	L PORT WALTER							246							
SASHIN CR	L PORT WALTER	L PORT WALTER														
PORT ARMSTRONG BLEND	PORT ARMSTRONG	JETTY CR	22,420	50,116	39,616	51,189	43,000	53,839	72,480	81,412	75,777	73,269	85,639	52,344	72,664	83,471
POINT WHITE CR	GUNNUK CR	GUNNUK CR														
POINT WHITE CR - D[1]	GUNNUK CR	GUNNUK CR	1,646	2,020	2,029	1,302	1,996									
POINT WHITE CR - D	GUNNUK CR	SE COVE	2,237	4,402	3,567	4,185										
POINT WHITE CR	GUNNUK CR	PORTAGE BAY														
SALMON CR	SALMON CR	SALMON CR														
FISH CR	SHEEP CR	SHEEP CR														
FISH CR - D	KOWEE CR	SHEEP CR														
FISH CR - D	MACAULAY	SHEEP CR		16,258	11,315											
FISH CR - D	SHEEP CR	SHEEP CR	17,962													
MACAULAY BLEND	MACAULAY	SHEEP CR			20,322	32,660										
FISH CR - D	KOWEE CR	GASTINEAU CH														
FISH CR - D	MACAULAY	GASTINEAU CH			5,515											
FISH CR - D	SHEEP CR	GASTINEAU CH														
KADASHAN R	MACAULAY	GASTINEAU CH														
MACAULAY BLEND	MACAULAY	GASTINEAU CH		4,926	9,905	15,769	8,663	8,540	8,744	5,901	8,709	5,670	1,682	1,724	1,697	
SHEEP CR - D	MACAULAY	GASTINEAU CH	9,670	9,921												
FISH CR	KOWEE CR	KOWEE CR														
FISH CR - D	KOWEE CR	KOWEE CR														
AUKE CR	AUKE CR	AUKE CR														
AUKE CR BLEND	AUKE CR	AUKE CR						544								
MEDVEJIE CR	MEDVEJIE	BEAR COVE	19		164	132	32	193	186	276	209	270	178	292	258	265
INDIAN R	SHELDON JACKSON	CRESCENT BAY	5,400	2,500	9,040	6,790	347	7,130	7,900	6,700	4,500	3,780	1,650	5,328	861	790
INDIAN R	SHELDON JACKSON	SITKA SOUND														
STARRIGAVAN R	STARRIGAVAN	STARRIGAVAN R														
BURRO CR	BURRO CR	BURRO CR														
BURRO CR BLEND	BURRO CR	BURRO CR	1,305	497	243	1,556	1	471	415	300	350	215				
HOWARD BAY CR	BURRO CR	BURRO CR	977													
MACAULAY BLEND	BURRO CR	BURRO CR					260									
PULLEN CR	BURRO CR	BURRO CR		1,198												
SAWMILL CR	BURRO CR	BURRO CR														
BURRO CR	JERRY MYERS	TAIYA INLET														
JERRY MYERS BLEND	JERRY MYERS	TAIYA INLET														
PULLEN CR	JERRY MYERS	TAIYA INLET														
		Region Total	73,049	100,557	121,059	133,547	72,490	109,667	102,151	94,589	89,545	83,204	89,149	59,687	75,479	84,532

[1] "-D" after a stock name means it is a broodstock derived from that ancestral stock. A derived stock consists of returns to a release site. Derived stocks are F_1 and subsequent generations of stock taken from the wild.

Appendix Table B-4c. Ancestral stocks and release sites of Southeast Alaska hatchery pink salmon.

ANCESTRAL STOCK					RELEASE SITE					
Name	District	Sub-Dist.	Stream	Site	Name	District	Sub-Dist.	Stream	Site	Comment
NEETS BAY	101	95			NEETS BAY	101	95			THA[1]
MEYERS STREAM	102	80	10170		MEYERS STREAM	102	80	10170		hatchery
KLAWOCK R	103	60	10470		KLAWOCK R	103	60	10470		hatchery
FLAT CR	106	22	10060		BURNETT INLET	106	25			THA
BLACK BEAR CR	107	10	10300		BURNETT INLET	106	25			THA
SASHIN CR	109	10	10090		L PORT WALTER	109	10			hatchery
LOVERS COVE CR	109	10	10120		L PORT WALTER	109	10			hatchery
POINT WHITE CR	109	42	10010		GUNNUK CR	109	40			THA
					SE COVE	109	41			THA
					PORTAGE BAY	110	16			
SALMON CR	111	40	10150		SALMON CR	111	40	10150		
SHEEP CR	111	40	10280		GASTINEAU CH	111	43			THA
AUKE CR	111	50	10420		AUKE CR	111	50	10420		hatchery
FISH CR	111	50	10690		SHEEP CR	111	40	10280		hatchery
					GASTINEAU CH	111	43			THA
					KOWEE CR	111	43			THA
KADASHAN CR	112	42	10250		GASTINEAU CH	111	43			THA
HOWARD BAY CR	112	61			BURRO CR	115	35			THA
STARRIGAVAN R	113	41	10150		STARRIGAVAN R	113	41	10150		hatchery
INDIAN R	113	41	10190		CRESCENT BAY	113	36			THA
					SITKA SOUND	113	36			THA
MEDVEJIE CR	113	41	10280		BEAR COVE	113	35			THA
SAWMILL CR	115	20	10520		BURRO CR	115	35			THA
BURRO CR	115	34			BURRO CR	115	35			THA
					TAIYA INLET	115	35			THA
PULLEN CR					BURRO CR	115	35			THA
					TAIYA INLET	115	35			THA
Hatchery Mixes										
BURNETT INLET										
FALLS CR	106	21	10040		MEYERS STREAM	102	80	10170		hatchery
FLAT CR	106	22	10060		BURNETT INLET	106	25			THA
BLACK BEAR CR	107	10	10300		ANITA BAY	107	35			THA
PORT ARMSTRONG										
SASHIN CR	109	10	10090		JETTY CR	109	11			THA
LOVERS COVE CR	109	10	10120							

ANCESTRAL STOCK					RELEASE SITE					
Name	District	Sub-Dist.	Stream	Site	Name	District	Sub-Dist.	Stream	Site	Comment
MACAULAY										
SALMON CR	111	40	10150		SHEEP CR	111	40	10280		hatchery
SHEEP CR	111	40	10280		GASTINEAU CH	111	43			THA
FISH CR	111	50	10690		BURRO CR	115	35			THA
KADASHAN R	112	42	10250							
AUKE CR										
SASHIN CR	109	10	10090		AUKE CR	111	50	10420		hatchery
AUKE CR	111	50	10420							
BURRO CR										
HOWARD BAY CR	112	61	?		BURRO CR	115	35			THA
SAWMILL CR	115	20	10520							
BURRO CR	115	34	10230							
PULLEN CR										
MACAULAY BLEND										
JERRY MYERS										
BURRO CR	115	34	10230		TAIYA INLET	115	35			THA
PULLEN CR										

[1] THA = terminal harvest area.

Appendix Table B-5b. Releases of chum salmon in Southeast Alaska, in thousands of fish.

			Release Year													
Ancestral Stock	Facility	Release Site	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
CARROLL R	WHITMAN LAKE	NAKAT INLET						1,342	3,170	5,078	4,895					
CARROLL R - D	WHITMAN LAKE	NAKAT INLET									1,333		4,848	4,114	4,103	2,225
NEETS BAY FALL MIX	WHITMAN LAKE	NAKAT INLET											10,041	2,363	4,446	3,477
FISH CR-HYDER	MARX CREEK	MARX CR												30	1,040	2,270
HEMLOCK CR	TAMGAS CREEK	TAMGAS CR								341						
TAMGAS CR	TAMGAS CREEK	TAMGAS CR							49							
TAMGAS CR MIX	TAMGAS CREEK	TAMGAS CR						200	435							
DISAPPEARANCE CR	BEAVER FALLS	GEORGE INLET	842	2,255	2,376	2,435										
DISAPPEARANCE CR - D	BEAVER FALLS	GEORGE INLET					2,426	1,866	11,374	8,016	3,944					
CARROLL R	NEETS BAY	NEETS BAY									1,525					
CARROLL R - D	NEETS BAY	NEETS BAY										2,844	8,328	9,463	8,418	26,654
NEETS BAY FALL MIX	NEETS BAY	NEETS BAY									14,582	24,825	31,909	17,015	22,708	9,511
DISAPPEARANCE CR	WHITMAN LAKE	NEETS BAY						1,330	15,437	8,273						
CARROLL R - D[1]	KENDRICK BAY	KENDRICK BAY														
DISAPPEARANCE CR	BEAVER FALLS	DISAPPEARANCE CR	125	45												
KLAWOCK MIX	KLAWOCK	KLAWOCK INLET											8,118	8,740		
KLAWOCK R	KLAWOCK	KLAWOCK INLET										2,620				
DISAPPEARANCE CR	KLAWOCK	KLAWOCK R									5,480					
KLAWOCK MIX	KLAWOCK	KLAWOCK R												59	3,990	
KLAWOCK R	KLAWOCK	KLAWOCK R					157	120	3,364	2,051	5,501	2,430	11,981			
BURNETT INLET MIX	BURNETT INLET	BURNETT INLET									269	512	285	571	4,500	8,600
HARDING R	BURNETT INLET	BURNETT INLET							240	306	279		204	261		
HIDDEN FALLS MIX	BURNETT INLET	BURNETT INLET										845				
MOSMAN INLET	BURNETT INLET	BURNETT INLET					30									
CRYSTAL CR	CRYSTAL LAKE	CRYSTAL CR							13	17	60	56	286		196	
BURNETT INLET MIX	BURNETT INLET	ANITA BAY														
CARROLL R - D	WHITMAN LAKE	ANITA BAY														
CARROLL R - D	EARL WEST COVE	EARL WEST COVE												1,219	2,230	2,614
SASHIN CR	LITTLE PORT WALTER	L PORT WALTER			14	17	18		67							
PORT ARMSTRONG MIX	PORT ARMSTRONG	JETTY CR														
E PORT CAMDEN	PORT ARMSTRONG	JETTY CR											223			
SECURITY BAY	PORT ARMSTRONG	JETTY CR											961	1,626	1,982	1,287
GUNNUK CR MIX	GUNNUK CREEK	KAKE SHA														
GUNNUK CR MIX	GUNNUK CREEK	SE COVE					3	1								
HIDDEN FALLS MIX	GUNNUK CREEK	SE COVE														6,426
GUNNUK CR MIX	GUNNUK CREEK	GUNNUK CR									9					
HIDDEN FALLS MIX	GUNNUK CREEK	GUNNUK CR											1,983	8,109	10,809	4,326
E PORT CAMDEN	PORT CAMDEN	E PORT CAMDEN												34	99	594
W PORT CAMDEN	PORT CAMDEN	W PORT CAMDEN													99	5
GUNNUK CR MIX	GUNNUK CREEK	PORTAGE BAY										55				
SNETTISHAM MIX	SNETTISHAM	DOTY COVE													276	
NEKA R	SNETTISHAM	SPEEL ARM								6,873						
PROSPECT CR	SNETTISHAM	SPEEL ARM			19		22	38								
LIMESTONE CR	SNETTISHAM	SPEEL ARM					94	161								
SNETTISHAM MIX	SNETTISHAM	SPEEL ARM			1	253			2,043	2,077	7,284	8,340	7,511	19,260	22,700	27,100
SNETTISHAM MIX	SNETTISHAM	MIST ISLAND														
ADMIRALTY CR	KOWEE CREEK	KOWEE CR							23							

Ancestral Stock	Facility	Release Site	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
			Release Year													
FISH CR-DOUGLAS	KOWEE CREEK	KOWEE CR			76	130		200	921	471	106					
HIDDEN FALLS MIX	KOWEE CREEK	KOWEE CR														
KOWEE CR MIX	KOWEE CREEK	KOWEE CR							9	45	214	250				
SAWMILL CR	KOWEE CREEK	KOWEE CR						25								
SHEEP CR	KOWEE CREEK	KOWEE CR										46				
HIDDEN FALLS MIX	MACAULAY	SALMON CR														
SALMON CR MIX	SALMON CREEK	SALMON CR							22	41		3,312				
MONTANA CR	SALMON CREEK	SALMON CR							777	510	1,399					
SALMON CR	SALMON CREEK	SALMON CR							30	67						
SAWMILL CR	SALMON CREEK	SALMON CR							333	296	1,283					
MACAULAY MIX	MACAULAY	SHEEP CR														
SALMON CR	MACAULAY	SHEEP CR														
SHEEP CR MIX	MACAULAY	SHEEP CR														
FISH CR-DOUGLAS	SHEEP CREEK	SHEEP CR								52	661	475	2,723	3,523	222	
GASTINEAU MIX	SHEEP CREEK	SHEEP CR														
HIDDEN FALLS MIX	SHEEP CREEK	SHEEP CR													7,011	
KOWEE CR MIX	SHEEP CREEK	SHEEP CR								48		242	1,517	628	368	
SALMON CR	SHEEP CREEK	SHEEP CR												2,738	10,500	9,414
SHEEP CR	SHEEP CREEK	SHEEP CR								4	45	217				
SHEEP CR MIX	SHEEP CREEK	SHEEP CR											51	112	1,675	709
HIDDEN FALLS MIX	MACAULAY	GASTINEAU CH														
MACAULAY MIX	MACAULAY	GASTINEAU CH														
SHEEP CR MIX	MACAULAY	GASTINEAU CH														
SALMON CR	SHEEP CREEK	GASTINEAU CH														7,640
SHEEP CR MIX	SHEEP CREEK	GASTINEAU CH														587
AUKE CR	AUKE CREEK	AUKE CR							38	54	43			21		
HIDDEN FALLS MIX	MACAULAY	AMALGA HARBOR														
MACAULAY MIX	MACAULAY	AMALGA HARBOR														
SHEEP CR MIX	MACAULAY	AMALGA HARBOR														
MACAULAY MIX	MACAULAY	LIMESTONE IN														
SHEEP CR	MACAULAY	LIMESTONE IN														
SNETTISHAM MIX	SNETTISHAM	LIMESTONE IN														8,060
CLEAR R	HIDDEN FALLS	KASNYKU BAY				213	211	179								
HIDDEN FALLS MIX	HIDDEN FALLS	KASNYKU BAY								10,291	21,636	28,500	30,080	45,300	21,140	29,181
KADASHAN R	HIDDEN FALLS	KASNYKU BAY					1,678	3,420	8,896							
SEAL BAY	HIDDEN FALLS	KASNYKU BAY							118							
HIDDEN FALLS MIX	HIDDEN FALLS	TAKATZ BAY													19,250	21,575
MEDVEJIE CR	MEDVEJIE	BEAR COVE								203	560	563	885			
MEDVEJIE MIX	MEDVEJIE	BEAR COVE												2,143	4,545	3,138
MEDVEJIE CR	MEDVEJIE	SILVER BAY								21	123	206				
KATLIAN	SHELDON JACKSON	CRESCENT BAY		70												
MEDVEJIE MIX	SHELDON JACKSON	CRESCENT BAY												333		
MEDVEJIE MIX+SJ MIX	SHELDON JACKSON	CRESCENT BAY														
NAKWASINA R	SHELDON JACKSON	CRESCENT BAY			177		647		59		791	487	683			
SANDY COVE CR	SHELDON JACKSON	CRESCENT BAY						53		50	75	27	1,387	1,610		
SHELDON JACKSON MIX	SHELDON JACKSON	CRESCENT BAY							25	35	69	115	245	302	1,600	450
HIDDEN FALLS MIX	MEDVEJIE	DEEP INLET														
MEDVEJIE CR	MEDVEJIE	DEEP INLET									1,121	25	28			
MEDVEJIE MIX	MEDVEJIE	DEEP INLET												23,081	24,621	25,003
NAKWASINA R	MEDVEJIE	DEEP INLET									657	668	3,802			

			Release Year													
Ancestral Stock	Facility	Release Site	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
SALMON LK CR	MEDVEJIE	DEEP INLET										1,096	1,518			
STARRIGAVAN R	STARRIGAVAN	STARRIGAVAN R				20	3									
HIDDEN FALLS MIX	MACAULAY	BOAT HARBOR														
MACAULAY MIX	MACAULAY	BOAT HARBOR														
HIDDEN FALLS MIX	SNETTISHAM	BOAT HARBOR														5,170
KLEHINI R	17 MI STREAM INCUB	17 MI(CHILKAT)														
KLEHINI R	31 MI STREAM INCUB	31 MI(KLEHINI)											47	36	241	606
KLEHINI R	HERMAN CR SPAWN CHAN	HERMAN CR														
BURRO CR	BURRO CREEK	BURRO CR											2	41		
BURRO CR MIX	BURRO CREEK	BURRO CR													64	91
HOWARD BAY CR	BURRO CREEK	BURRO CR										89	459	245	301	331
TAIYA R	BURRO CREEK	BURRO CR													193	80
		Region Total	967	2,370	2,663	3,068	5,289	8,935	47,444	45,221	73,945	78,844	130,106	152,976	179,328	207,122

Ancestral Stock	Facility	Release Site	Release Year 1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
CARROLL R	WHITMAN LAKE	NAKAT INLET														
CARROLL R - D	WHITMAN LAKE	NAKAT INLET	2,088	5,987	7,006	8,250	7,930	8,180	8,461	8,075	8,483	8,205	8,381	8,467	8,279	8,496
NEETS BAY FALL MIX	WHITMAN LAKE	NAKAT INLET	2,095	5,794	6,775	7,906	7,702	7,518	7,844	7,986	7,200	7,204	7,567	8,214	8,165	5,277
FISH CR-HYDER	MARX CREEK	MARX CR														
HEMLOCK CR	TAMGAS CREEK	TAMGAS CR														
TAMGAS CR	TAMGAS CREEK	TAMGAS CR														
TAMGAS CR MIX	TAMGAS CREEK	TAMGAS CR	4,021				1,429	1,506	1,545	1,000	330	330	1,222	262	773	1,530
DISAPPEARANCE CR	BEAVER FALLS	GEORGE INLET														1,567
DISAPPEARANCE CR - D	BEAVER FALLS	GEORGE INLET														
CARROLL R	NEETS BAY	NEETS BAY														
CARROLL R - D	NEETS BAY	NEETS BAY	9,022	20,739	23,281	32,525	40,197	45,520	43,378	45,195	45,292	45,106	45,375	45,977	36,494	39,027
NEETS BAY FALL MIX	NEETS BAY	NEETS BAY	23,285	22,330	25,275	25,586	25,258	20,177	16,033	20,708	20,764	19,830	20,006	12,480	17,441	14,078
DISAPPEARANCE CR	WHITMAN LAKE	NEETS BAY														
CARROLL R - D[1]	KENDRICK BAY	KENDRICK BAY		6,206	8,021	8,168	9,068	9,302	8,237	9,159	9,304	9,159	10,170	10,100	9,973	10,629
DISAPPEARANCE CR	BEAVER FALLS	DISAPPEARANCE CR														
KLAWOCK MIX	KLAWOCK	KLAWOCK INLET														
KLAWOCK R	KLAWOCK	KLAWOCK INLET														
DISAPPEARANCE CR	KLAWOCK	KLAWOCK R														
KLAWOCK MIX	KLAWOCK	KLAWOCK R														
KLAWOCK R	KLAWOCK	KLAWOCK R														
BURNETT INLET MIX	BURNETT INLET	BURNETT INLET	2,182	2,980	19,578	6,089	6,015	6,032	9,058							
HARDING R	BURNETT INLET	BURNETT INLET														
HIDDEN FALLS MIX	BURNETT INLET	BURNETT INLET														
MOSMAN INLET	BURNETT INLET	BURNETT INLET														
CRYSTAL CR	CRYSTAL LAKE	CRYSTAL CR														
BURNETT INLET MIX	BURNETT INLET	ANITA BAY				12,136	3,550	14,199	26,827							
CARROLL R - D	WHITMAN LAKE	ANITA BAY												8,335	13,960	13,631
CARROLL R - D	EARL WEST COVE	EARL WEST COVE		6,016	6,031	7,070	7,443	7,484	7,742	8,061	8,227	8,004	8,205			
SASHIN CR	LITTLE PORT WALTER	L PORT WALTER														
PORT ARMSTRONG MIX	PORT ARMSTRONG	JETTY CR		795	423											
E PORT CAMDEN	PORT ARMSTRONG	JETTY CR														
SECURITY BAY	PORT ARMSTRONG	JETTY CR	142													
GUNNUK CR MIX	GUNNUK CREEK	KAKE SHA								6,177	6,361	6,523	6,395	6,476	6,556	6,562
GUNNUK CR MIX	GUNNUK CREEK	SE COVE	948	1,144	6,278	8,662	6,839	9,828	28,914	36,245	47,528	36,156	54,527	36,941	34,952	27,660
HIDDEN FALLS MIX	GUNNUK CREEK	SE COVE													2,756	
GUNNUK CR MIX	GUNNUK CREEK	GUNNUK CR	4,696	5,910	6,841	6,395	7,142	6,410	7,703	76	717	383	185	2,806		
HIDDEN FALLS MIX	GUNNUK CREEK	GUNNUK CR														
E PORT CAMDEN	PORT CAMDEN	E PORT CAMDEN	733	1,837	2,458	2,301	2,875	2,832	2,910	1,626	1,864					
W PORT CAMDEN	PORT CAMDEN	W PORT CAMDEN		562	1,754	2,139	2,105	2,317	1,917	2,766	505					
GUNNUK CR MIX	GUNNUK CREEK	PORTAGE BAY														
SNETTISHAM MIX	SNETTISHAM	DOTY COVE														
NEKA R	SNETTISHAM	SPEEL ARM														
PROSPECT CR	SNETTISHAM	SPEEL ARM														
LIMESTONE CR	SNETTISHAM	SPEEL ARM														
SNETTISHAM MIX	SNETTISHAM	SPEEL ARM	47													
SNETTISHAM MIX	SNETTISHAM	MIST ISLAND	50													
ADMIRALTY CR	KOWEE CREEK	KOWEE CR														
FISH CR-DOUGLAS	KOWEE CREEK	KOWEE CR														

			Release Year													
Ancestral Stock	Facility	Release Site	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
HIDDEN FALLS MIX	KOWEE CREEK	KOWEE CR														
KOWEE CR MIX	KOWEE CREEK	KOWEE CR														
SAWMILL CR	KOWEE CREEK	KOWEE CR														
SHEEP CR	KOWEE CREEK	KOWEE CR														
HIDDEN FALLS MIX	MACAULAY	SALMON CR														
SALMON CR MIX	SALMON CREEK	SALMON CR														
MONTANA CR	SALMON CREEK	SALMON CR														
SALMON CR	SALMON CREEK	SALMON CR														
SAWMILL CR	SALMON CREEK	SALMON CR														
MACAULAY MIX	MACAULAY	SHEEP CR					14,635	15,703	19,570	13,340					13,046	23,004
SALMON CR	MACAULAY	SHEEP CR	110													
SHEEP CR MIX	MACAULAY	SHEEP CR	2,812													23,004
FISH CR-DOUGLAS	SHEEP CREEK	SHEEP CR														
GASTINEAU MIX	SHEEP CREEK	SHEEP CR								25,939						
HIDDEN FALLS MIX	SHEEP CREEK	SHEEP CR														
KOWEE CR MIX	SHEEP CREEK	SHEEP CR														
SALMON CR	SHEEP CREEK	SHEEP CR														
SHEEP CR	SHEEP CREEK	SHEEP CR														
SHEEP CR MIX	SHEEP CREEK	SHEEP CR	151	38,874	27,012	27,003		28,970	24,605							
HIDDEN FALLS MIX	MACAULAY	GASTINEAU CH	3,041													
MACAULAY MIX	MACAULAY	GASTINEAU CH			252	396	5,870	11,825	11,474	12,166	24,247	21,992	27,879	27,859	15,096	11,794
SHEEP CR MIX	MACAULAY	GASTINEAU CH	8,546	11,327	11,757	11,495										
SALMON CR	SHEEP CREEK	GASTINEAU CH														
SHEEP CR MIX	SHEEP CREEK	GASTINEAU CH														
AUKE CR	AUKE CREEK	AUKE CR														
HIDDEN FALLS MIX	MACAULAY	AMALGA HARBOR					2,905									
MACAULAY MIX	MACAULAY	AMALGA HARBOR			35,918	36,148	31,912	34,472	34,980	34,536	49,155	50,783	53,219	46,028	17,453	34,878
SHEEP CR MIX	MACAULAY	AMALGA HARBOR		34,745												
MACAULAY MIX	MACAULAY	LIMESTONE IN			178	333	5,833	11,411	15,421	12,983	13,994	14,474	15,100	15,144	14,617	14,002
SHEEP CR	MACAULAY	LIMESTONE IN			8,322	9,683										
SNETTISHAM MIX	SNETTISHAM	LIMESTONE IN	2,547	11,389												
CLEAR R	HIDDEN FALLS	KASNYKU BAY														
HIDDEN FALLS MIX	HIDDEN FALLS	KASNYKU BAY	36,372	37,686	36,479	36,531	33,155	37,035	49,716	37,545	37,809	48,905	38,690	38,919	36,504	38,789
KADASHAN R	HIDDEN FALLS	KASNYKU BAY														
SEAL BAY	HIDDEN FALLS	KASNYKU BAY														
HIDDEN FALLS MIX	HIDDEN FALLS	TAKATZ BAY	26,135	26,589	19,650	25,912	27,068	33,854	26,956	25,021	25,883	25,745	36,259	41,926	36,317	36,627
MEDVEJIE CR	MEDVEJIE	BEAR COVE														
MEDVEJIE MIX	MEDVEJIE	BEAR COVE	5,006	4,802	4,039	4,860	4,865	5,331	4,842	4,992	4,563	5,298	4,926	6,946	7,009	6,803
MEDVEJIE CR	MEDVEJIE	SILVER BAY														
KATLIAN	SHELDON JACKSON	CRESCENT BAY														
MEDVEJIE MIX	SHELDON JACKSON	CRESCENT BAY							3,620							
MEDVEJIE MIX+SJ MIX	SHELDON JACKSON	CRESCENT BAY										1,378	3,379	3,862	954	182
NAKWASINA R	SHELDON JACKSON	CRESCENT BAY														
SANDY COVE CR	SHELDON JACKSON	CRESCENT BAY														
SHELDON JACKSON MIX	SHELDON JACKSON	CRESCENT BAY	270	280	4	88	201	182		3,400	1,670					
HIDDEN FALLS MIX	MEDVEJIE	DEEP INLET	6,348	12,575	12,011	13,160	11,230	11,567	13,266	12,760	12,946	13,353	13,057	13,174	40,733	11,391
MEDVEJIE CR	MEDVEJIE	DEEP INLET														
MEDVEJIE MIX	MEDVEJIE	DEEP INLET	23,051	12,272	7,304	11,711	13,170	15,146	21,470	20,823	21,811	21,189	21,088	20,806	19,275	30,014
NAKWASINA R	MEDVEJIE	DEEP INLET														
SALMON LK CR	MEDVEJIE	DEEP INLET														

Ancestral Stock	Facility	Release Site	Release Year 1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
STARRIGAVAN R	STARRIGAVAN	STARRIGAVAN R														
HIDDEN FALLS MIX	MACAULAY	BOAT HARBOR	5,956	6,154	6,710	9,545	6,464									
MACAULAY MIX	MACAULAY	BOAT HARBOR	2,346	3,183				8,931	8,537	7,759	7,212	9,263	9,010	14,884	11,263	12,223
HIDDEN FALLS MIX	SNETTISHAM	BOAT HARBOR														
KLEHINI R	17 MI STREAM INCUB	17 MI(CHILKAT)		76	195	47	178	888	470	28	483			472	432	432
KLEHINI R	31 MI STREAM INCUB	31 MI(KLEHINI)	765	95	387	644	808		14	170	240	373		286		
KLEHINI R	HERMAN CR SPAWN CHAN	HERMAN CR								10	140	951		915	123	278
BURRO CR	BURRO CREEK	BURRO CR														
BURRO CR MIX	BURRO CREEK	BURRO CR	6	23	375	72	54	6	14	0	25	6				
HOWARD BAY CR	BURRO CREEK	BURRO CR														
TAIYA R	BURRO CREEK	BURRO CR														
		Region Total	172,771	280,368	284,315	314,853	285,899	356,629	405,523	358,547	356,755	354,609	383,640	371,278	330,140	371,878

[1] "-D" after a stock name means it is a broodstock derived from that ancestral stock. A derived stock consists of returns to a release site. Derived stocks are F_1 and subsequent generations of stock taken from the wild.

Appendix Table B-5c. Ancestral stocks and release sites of Southeast Alaska hatchery chum salmon.

ANCESTRAL STOCK					RELEASE SITE					
Name	District	Sub-Dist.	Stream	Site	Name	District	Sub-Dist.	Stream	Site	Comment
FISH CR-HYDER	101	15	10500	2028	MARX CR	101	15	10500	2036	spawning channel
TAMGAS CR	101	25	10250		TAMGAS CR	101	26			THA
HEMLOCK CR	101	27	10090		TAMGAS CR	101	26			THA
CARROLL R	101	45	10780		NAKAT INLET	101	10			THA
					NEETS BAY	101	95			THA[1]
					KENDRICK BAY	102	15			THA
					ANITA BAY	107	35			THA
					EARL WEST COVE	107	45			THA
DISAPPEARANCE CR	102	40	10430		GEORGE INLET	101	45	10120		hatchery
					NEETS BAY	101	95			THA
					DISAPPEARANCE CR	102	40	10430		
					KLAWOCK R	103	60	10470		hatchery
KLAWOCK R	103	60	10470		KLAWOCK INLET	103	60			mouth of stream #10470
					KLAWOCK R	103	60	10470		hatchery
MOSMAN INLET	106	22	10100		BURNETT INLET	106	25			THA
CRYSTAL CR	106	44	10310		CRYSTAL CR	106	44	10310		hatchery
HARDING R	107	40	10490		BURNETT INLET	106	25			THA
SASHIN CR	109	10	10090		L PORT WALTER	109	10			hatchery
E PORT CAMDEN	109	43	10050		JETTY CR	109	11			THA
					E PORT CAMDEN	109	43	10050		incubation boxes
W PORT CAMDEN	109	43	10080		W PORT CAMDEN	109	43	10080		incubation boxes
SECURITY BAY CR	109	45	10100		JETTY CR	109	11			THA
PROSPECT CR	111	33	10100		SPEEL ARM	111	33			hatchery
SALMON CR	111	40	10150		SALMON CR	111	40	10150		
					SHEEP CR	111	40	10280		hatchery
					GASTINEAU CH	111	43			THA
SHEEP CR	111	40	10280		KOWEE CR	111	40	10090		hatchery
					SHEEP CR	111	40	10280		hatchery
					LIMESTONE IN	111	90			THA
ADMIRALTY CR	111	41	10050		KOWEE CR	111	40	10090		hatchery
AUKE CR	111	50	10420		AUKE CR	111	50	10420		hatchery
MONTANA CR	111	50	10500	2003	SALMON CR	111	40	10150		
FISH CR-DOUGLAS	111	50	10690		KOWEE CR	111	40	10090		hatchery
					SHEEP CR	111	40	10280		hatchery
LIMESTONE CR	111	90	10050		SPEEL ARM	111	33			hatchery
CLEAR R	112	21	10050		KASNYKU BAY	112	22			THA
KADASHAN R	112	42	10250		KASNYKU BAY	112	22			THA
SEAL BAY CR	112	46	10070/10080		KASNYKU BAY	112	22			THA
HOWARD BAY CR	112	61	10120		BURRO CR	115	35			THA
STARRIGAVAN R	113	41	10150		STARRIGAVAN R	113	41	10150		hatchery
MEDVEJIE CR	113	41	10280		BEAR COVE	113	35			THA

ANCESTRAL STOCK Name	District	Sub-Dist.	Stream	Site	RELEASE SITE Name	District	Sub-Dist.	Stream	Site	Comment
					SILVER BAY	113	35			THA
					DEEP INLET	113	38			THA
SALMON LK CR	113	41	10320		DEEP INLET	113	38			THA
SANDY COVE CR	113	41	10400		CRESCENT BAY	113	36			THA
NAKWASINA R	113	43	10020		CRESCENT BAY	113	36			THA
					DEEP INLET	113	38			THA
KATLIAN	113	44	10030		CRESCENT BAY	113	36			THA
NEKA R	114	33	10230		SPEEL ARM	111	33			hatchery
SAWMILL CR	115	20	10520		KOWEE CR	111	40	10090		hatchery
					SALMON CR	111	40	10150		
KLEHINI R	115	32	10250	2077	17 MI(CHILKAT)	115	32	10250		spawning channel
					31 MI(KLEHINI)	115	32	10250	2077	spawning channel
					HERMAN CR	115	32	10250	2077	spawning channel
TAIYA R	115	34	10230		BURRO CR	115	35			THA
BURRO CR	115	34			BURRO CR	115	35			THA

Hatchery Mixes

Name	District	Sub-Dist.	Stream	Site	Name	District	Sub-Dist.	Stream	Site	Comment
TAMGAS CR										
TAMGAS CR	101	25	10250		TAMGAS CR	101	26			THA
HEMLOCK CR	101	27	10090							
NADZAHEEN	101	41	10670							
NEETS BAY, FALL										
DISAPPEARANCE CR	102	40	10430		NAKAT INLET	101	10			THA
LAGOON CR	102	40	10600		NEETS BAY	101	95			THA
KLAWOCK										
DISAPPEARANCE CR	102	40	10430		KLAWOCK INLET	103	60			mouth of stream #10470
KLAWOCK R	103	60	10470		KLAWOCK R	103	60	10470		hatchery
BURNETT INLET										
NEETS (CARROLL R)	101	45	10780		BURNETT INLET	106	25			THA
MOSMAN INLET	106	22	10100		ANITA BAY	107	35			THA
HARDING R	107	40	10490							
HIDDEN FALLS MIX										
PORT ARMSTRONG										
E PORT CAMDEN	109	43	10050		JETTY CR	109	11			THA
SECURITY BAY	109	45	10100							

ANCESTRAL STOCK					RELEASE SITE					
Name	District	Sub-Dist.	Stream	Site	Name	District	Sub-Dist.	Stream	Site	Comment
GUNNUK CR										
SECURITY BAY CR	109	45	10100		KAKE SHA	109	40			THA
SALT CHUCK CR	109	45	10130		SE COVE	109	41			THA
HIDDEN FALLS MIX					GUNNUK CR	109	42	10040		hatchery
					PORTAGE BAY	110	16			
HIDDEN FALLS										
CLEAR R	112	21	10050		BURNETT INLET	106	25			THA
KADASHAN R	112	42	10250		SE COVE	109	41			THA
SEAL BAY CR	112	46	10070/10080		GUNNUK CR	109	42	10040		hatchery
					KOWEE CR	111	40	10090		hatchery
					SALMON CR	111	40	10150		
					SHEEP CR	111	40	10280		hatchery
					GASTINEAU CH	111	43			THA
					AMALGA HARBOR	111	55			THA
					KASNYKU BAY	112	22			THA
					TAKATZ BAY	112	22			THA
					DEEP INLET	113	38			THA
					BOAT HARBOR	115	11			THA
MEDVEJIE										
MEDVEJIE CR	113	41	10280		CRESCENT BAY	113	36			THA
SALMON LAKE CR	113	41	10320		DEEP INLET	113	38			THA
NAKWASINA R	113	43	10020		BEAR COVE	113	41			
SHELDON JACKSON										
SANDY COVE CR	113	41	10400		CRESCENT BAY	113	36			THA
NAKWASINA R	113	43	10020							
KATLIAN R	113	44	10030							
SNETTISHAM										
PROSPECT CR	111	33	10100		DOTY COVE	111	31			
CRESCENT LK	111	35	10050	2035	SPEEL ARM	111	33			
LIMESTONE CR	111	90	10050		MIST ISLAND	111	34			
NEKA R	114	33	10230		LIMESTONE IN	111	90			
SHEEP CR										
SALMON CR	111	40	10150		SHEEP CR	111	40	10280		
SHEEP CR	111	40	10280		GASTINEAU CH	111	43			THA
FISH CR - DOUGLAS	111	50	10690		AMALGA HARBOR	111	55			THA
CLEAR R	112	21	10050							
KADASHAN R	112	42	10250							
SEAL BAY CR	112	46	10070/10080							
SAWMILL CR	115	20	10520							

ANCESTRAL STOCK					RELEASE SITE					
Name	District	Sub-Dist.	Stream	Site	Name	District	Sub-Dist.	Stream	Site	Comment
KOWEE CR										
ADMIRALTY CR	111	41	10050		KOWEE CR	111	40	10090		
FISH CR - DOUGLAS	111	50	10690		SHEEP CR	111	40	10280		
SAWMILL CR	115	20	10520							
MACAULAY										
ADMIRALTY CR	111	41	10050		SHEEP CR	111	40	10280		
FISH CR	111	50	10690		GASTINEAU CH	111	43			THA
SAWMILL CR	115	20	10520		AMALGA HARBOR	111	55			THA
HAINES SITE	?				LIMESTONE IN	111	90			THA
HIDDEN FALLS MIX					BOAT HARBOR	115	11			THA
SALMON CREEK										
SALMON CR	111	40	10150		SALMON CR	111	40	10150		
MONTANA CR	111	50	10500	2003	SHEEP CR	111	40	10280		
SAWMILL CR	115	20	10520		GASTINEAU CH	111	43			THA
BURRO CREEK										
HOWARD BAY CR	112	61	10120		BURRO CR	115	35			THA
TAIYA R	115	34	10230							
BURRO CR	115	34								

[1] THA = terminal harvest area

Appendix Table B-6b. Releases of steelhead in Southeast Alaska.

				Release Year														
Age	Ancestral Stock	Facility	Release Site	1964	1975	1976	1977	1978	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
0	TAMGAS CR	TAMGAS CREEK	TAMGAS CR								11,341	10,504	13,200					
0	KETCHIKAN CR	DEER MOUNTAIN	THOMAS BASIN															
0	KETCHIKAN CR	DEER MOUNTAIN	TALBOT LK									12,036						
0	KETCHIKAN CR	DEER MOUNTAIN	WARD LK								7,868							
0	KLAWOCK R	KLAWOCK	WARD LK											21,916	28,325	28,687	19,649	38,667
0	KETCHIKAN CR	DEER MOUNTAIN	KETCHIKAN CR															19,450
0	KLAWOCK R	KLAWOCK	KLAWOCK R						2,608	6,422	29,628	15,778				1,100		
0	KLAWOCK R	KLAWOCK	KLAWOCK LK										18,855	29,000	30,200	34,000	19,959	50,314
0	FALLS CR	CRYSTAL LAKE	FALLS CR			1,950												
0	CRYSTAL LK BLEND	CRYSTAL LAKE	CRYSTAL CR											31,900			90,392	
0	FALLS CR	CRYSTAL LAKE	CRYSTAL CR			1,515	630	10,741										
0	PETERSBURG CR	CRYSTAL LAKE	CRYSTAL CR		9,500													
0	PETERSBURG CR	CRYSTAL LAKE	PETERSBURG CR		8,000	6,500												
0	CRYSTAL LK BLEND	CRYSTAL LAKE	WILLIE LOWE CR											30,300				
0	FALLS CR	CRYSTAL LAKE	MONTANA CR			24,476												
0	KLAWOCK R	KLAWOCK	MONTANA CR													27,000		
0[a]	PLEASANT BAY	DEER MOUNTAIN	INDIAN R	5,000														
			Age 0 Region Total	5,000	17,500	34,441	630	10,741	2,608	6,422	48,837	38,318	32,055	113,116	58,525	90,787	130,000	108,431
1	KETCHIKAN CR	DEER MOUNTAIN	WARD LK						1,723		1,479							
1	KLAWOCK LK	KLAWOCK	WARD LK															
1	KETCHIKAN CR	DEER MOUNTAIN	KETCHIKAN CR						1,025	1,146								
1	KLAWOCK R	KLAWOCK	KLAWOCK R															
1	CRYSTAL LK BLEND	CRYSTAL LAKE	CRYSTAL CR								21,003			3,625				
1	CRYSTAL LK BLEND	CRYSTAL LAKE	CRYSTAL CR													8,600		
1	FALLS CR	CRYSTAL LAKE	CRYSTAL CR										3,322					
1	CRYSTAL LK BLEND	CRYSTAL LAKE	CRYSTAL+OHMER+FALLS									29,560						
1	CRYSTAL LK BLEND	CRYSTAL LAKE	OHMER CR															
1	SASHIN CR	LITTLE PORT WALTER	L PORT WALTER															9,523
			Age 1 Region Total	-	-	-	-	-	2,748	1,146	22,482	29,560	3,322	3,625	-	8,600	-	9,523
2	KETCHIKAN CR	DEER MOUNTAIN	WARD LK							2,816								
2	KETCHIKAN CR	DEER MOUNTAIN	KETCHIKAN CR															
2	KLAWOCK R	KLAWOCK	KLAWOCK R															
2	FALLS CR	CRYSTAL LAKE	MONTANA CR												2,440			
2	PETERSON CR	SNETTISHAM	MONTANA CR													2,353		
			Age 2 Region Total	-	-	-	-	-	-	2,816	-	-	-	-	2,440	2,353	-	-
3	PETERSON CR	SNETTISHAM	MONTANA CR															
			Region Total	5,000	17,500	34,441	630	10,741	5,356	10,384	71,319	67,878	35,377	116,741	60,965	101,740	130,000	117,954

[a] assumed age - documentation of brood year not available

Age	Ancestral Stock	Facility	Release Site	Release Year													
				1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
0	TAMGAS CR	TAMGAS CREEK	TAMGAS CR														
0	KETCHIKAN CR	DEER MOUNTAIN	THOMAS BASIN	4,525	5,021												
0	KETCHIKAN CR	DEER MOUNTAIN	TALBOT LK														
0	KETCHIKAN CR	DEER MOUNTAIN	WARD LK														
0	KLAWOCK R	KLAWOCK	WARD LK		12,047	9,632	11,406										
0	KETCHIKAN CR	DEER MOUNTAIN	KETCHIKAN CR	13,749		1,029											
0	KLAWOCK R	KLAWOCK	KLAWOCK R		13,675									4,753		5,644	
0	KLAWOCK R	KLAWOCK	KLAWOCK LK	15,994		9,278											
0	FALLS CR	CRYSTAL LAKE	FALLS CR														
0	CRYSTAL LK BLEND	CRYSTAL LAKE	CRYSTAL CR					9,491									
0	FALLS CR	CRYSTAL LAKE	CRYSTAL CR														
0	PETERSBURG CR	CRYSTAL LAKE	CRYSTAL CR														
0	PETERSBURG CR	CRYSTAL LAKE	PETERSBURG CR														
0	CRYSTAL LK BLEND	CRYSTAL LAKE	WILLIE LOWE CR														
0	FALLS CR	CRYSTAL LAKE	MONTANA CR														
0	KLAWOCK R	KLAWOCK	MONTANA CR														
			Age 0 Region Total	34,268	30,743	19,939	11,406	9,491	-	-	-	-	-	4,753	-	5,644	-
1	KETCHIKAN CR	DEER MOUNTAIN	WARD LK														
1	KLAWOCK LK	KLAWOCK	WARD LK				300										
1	KETCHIKAN CR	DEER MOUNTAIN	KETCHIKAN CR					3,469	4,371	3,456	7,269		2,461	9,012		7,165	8,756
1	KLAWOCK R	KLAWOCK	KLAWOCK R		3,560						1,510	1,540	1,975		1,866		
1	CRYSTAL LK BLEND	CRYSTAL LAKE	CRYSTAL CR														
1	CRYSTAL LK BLEND	CRYSTAL LAKE	CRYSTAL CR	9,981	2,177		9,372	8,023									
1	FALLS CR	CRYSTAL LAKE	CRYSTAL CR														
1	CRYSTAL LK BLEND	CRYSTAL LAKE	CRYSTAL+OHMER+FALLS														
1	CRYSTAL LK BLEND	CRYSTAL LAKE	OHMER CR	2,600													
1	SASHIN CR	LITTLE PORT WALTER	L PORT WALTER										13,224				
			Age 1 Region Total	12,581	5,737	-	9,672	11,492	4,371	3,456	8,779	1,540	17,660	9,012	1,866	7,165	8,756
2	KETCHIKAN CR	DEER MOUNTAIN	WARD LK														
2	KETCHIKAN CR	DEER MOUNTAIN	KETCHIKAN CR									6,439					
2	KLAWOCK R	KLAWOCK	KLAWOCK R													2,096	
2	FALLS CR	CRYSTAL LAKE	MONTANA CR														
2	PETERSON CR	SNETTISHAM	MONTANA CR														
			Age 2 Region Total	-	-	-	-	-	-	-	-	6,439	-	-	-	2,096	-
3	PETERSON CR	SNETTISHAM	MONTANA CR	5,998													
			Region Total	52,847	36,480	19,939	21,078	20,983	4,371	3,456	8,779	7,979	17,660	13,765	1,866	14,905	8,756

Appendix Table B-6c. Ancestral stocks and release sites of Southeast Alaska hatchery steelhead.

ANCESTRAL STOCK					RELEASE SITE					
Name	District	Sub-Dist.	Stream	Site	Name	District	Sub-Dist.	Stream	Site	Comment
TAMGAS CR	101	25	10250		TAMGAS CR	101	26			hatchery
KETCHIKAN CR	101	47	10250		TALBOT LK	101	47	10150		barriered[1]
					WARD LK	101	47	10150		
					KETCHIKAN CR	101	47	10250		hatchery
					THOMAS BASIN	101	47			mouth of stream #10250
KLAWOCK R	103	60	10470		WARD LK	101	47	10150		
					KLAWOCK LK	103	60	10470	0010	hatchery
					KLAWOCK R	103	60	10470		hatchery
					MONTANA CR	111	50	10500	2003	
FALLS CR	106	44	10060		FALLS CR	106	44	10060		
					CRYSTAL CR	106	44	10310		hatchery
					MONTANA CR	111	50	10500	2003	
PETERSBURG CR	106	44	10600		CRYSTAL CR	106	44	10310		hatchery
					PETERSBURG CR	106	44	10600		
SASHIN CR	109	10	10090		L PORT WALTER	109	10			hatchery
PETERSON CR	111	50	10100		MONTANA CR	111	50	10500	2003	
Hatchery Mix										
CRYSTAL LK MIX					FALLS CR	106	44	10060		
FALLS CR	106	44	10060		CRYSTAL CR	106	44	10310		hatchery
PETERSBURG CR	106	44	10600		WILLIE LOWE (SHANE) CR	107	40	10880		
					OHMER CR	108	40	10500		

[1] barriered = returning adults will be unable to access spawning habitat.

APPENDIX C

CHAPTER 7[60]

GOALS AND OBJECTIVES

Restoration of Alaska's salmon resources requires a long-range comprehensive plan to direct the efforts of those responsible for maintaining and increasing salmon production. Development of a long-range plan requires four elements: (1) a mission statement to identify what is to be accomplished by the plan, (2) goals that elaborate upon the mission statement, (3) objectives or measurable manifestations of the goal statement, and (4) strategies, which are specific methods of achieving the objectives.

Regional Planning Teams, whose responsibility was established by state statute, were to conduct regional salmon resource planning. The aim of the Southeast team was to provide a fully representative forum to address region-specific fisheries development needs. Therefore, they solicited advice from those most directly dependent upon and most familiar with the resource. Their input was used to identify a mission statement, goals, objective, and strategies for the plan.

MISSION STATEMENT

To promote, through sound biological practices, activities to increase salmon production in Southeast Alaska for the maximum social and economic benefit of the users consistent with public interest.

GOALS

1. Create a fully representative planning forum that addresses region-specific fisheries development needs.
2. Benefit all Alaskans through opportunities for commercial, sport, and subsistence fishing.
3. Provide more stable income by moderating the low-cyclical harvest fluctuations in the commercial fisheries.
4. Benefit all geographic regions and user groups by distributing salmon production equitably.
5. Provide fishermen more time and area to fish and reduce gear crowding and inter-gear conflicts by carefully planning increases in salmon production.
6. Provide economic benefit to peripheral segments of the industry.

RATIONALE

Both the Alaska State Constitution and the user group needs and aspirations provided sources of information to direct goal formulation. The following excerpts from the State of Alaska Constitution, Article VIII, Natural Resources, make it apparent that those

---

[60] Chapter 7 is excerpted in part from the *Comprehensive Salmon Plan for Southeast Alaska, Phase I* developed by the Joint Southeast Alaska Regional Planning Team, April 1981.

involved in the drafting and ratification of the constitution had a clear perspective of how renewable resources should be developed and maintained.

> The state shall encourage ". . . development of its resources by making them available for maximum use consistent with the public interest." (Section 1)
>
> "The legislature shall provide for the utilization, development, and conservation of all natural resources for the maximum benefit of its people." (Section 2)
>
> "The legislature may provide for facilities, improvements, and services . . . to assure fuller utilization and development of the fisheries . . ." (Section 5)
>
> The state shall" . . . prevent economic distress among fishermen and those dependent upon them for a livelihood and to promote the efficient development of aquaculture in the State." (Section 15)

The Constitution is extremely clear about the state policy towards aquaculture. It sets forth the above-stated fishery resource development mandates which recognize specific needs of the users and underscores the importance of the resource to local communities by encouraging their participation in resource development.

The letter of legislative intent, which facilitated preparation of this plan, is the legislative recognition of the constitution's directives. The letter provides direction for use of appropriate state funds and is an example of legislative and ADF&G encouragement of local involvement in fisheries development.

The second source of information used to formulate goals was the public involvement programs conducted by the regional aquaculture associations. Response from the resource users demonstrated strong feelings about how the fisheries should be managed and what that management should achieve. The goals drawn from the public involvement programs, while more specific, were felt to be in keeping with those goals identified from text of the Constitution of the State of Alaska.

OBJECTIVES

The legislature's letter of intent instructed the planners to establish realistic harvest objectives for some unspecified period. The RPT selected the period from 1980 to 2000 as the planning period.

Long-range harvest objectives for each species are:

1. Increase the average annual chinook harvest to 537,000 by the year 2000.
2. Increase the average annual sockeye harvest to 2.1 million by the year 2000.
3. Increase the average annual coho harvest to 2.65 million by the year 2000.
4. Increase the average annual pink harvest to 30.0 million by the year 2000.
5. Increase the average annual chum harvest to 9.7 million by the year 2000.

APPENDIX D

Alaska Department of Fish and Game- Division of Commercial Fisheries
Alaskan enhancement- Common Property commercial harvest of enhanced fish (in thousands)

Year	Harvest	Chinook	Sockeye	Coho	Pink	Chum	Total
1980	Total Commercial Harvest	321.000	1,119.000	1,136.000	14,477.000	1,650.000	18,708.000
	-Cost Recovery Harvest				2.500		2.500
	Common Property	321.000	1,119.000	1,136.000	14,474.500	1,650.000	18,705.500
	Enhanced	28.357	0.000	10.131	1.300	17.298	57.086
	Wild	292.643	1,119.000	1,125.869	14,473.200	1,632.702	18,648.414
	% Enhanced in CP harvest	8.83%	0.00%	0.89%	0.01%	1.05%	0.31%
1981	Total Commercial Harvest	270.000	1,077.000	1,406.000	18,966.000	848.000	22,575.000
	-Cost Recovery Harvest			6.141	131.000		137.141
	Common Property	270.000	1,077.000	1,399.859	18,835.000	848.000	22,437.859
	Enhanced	1.894	0.000	42.095	18.000	0.758	62.747
	Wild	268.106	1,077.000	1,357.764	18,817.000	847.242	22,375.112
	% Enhanced in CP harvest	0.70%	0.00%	3.01%	0.10%	0.09%	0.28%
1982	Total Commercial Harvest	276.000	1,488.000	2,043.000	24,189.000	1,328.000	29,329.000
	-Cost Recovery Harvest			2.105	3.998	0.000	6.103
	Common Property	276.000	1,488.000	2,040.895	24,185.002	1,328.000	29,322.897
	Enhanced	0.527	0.000	78.698	12.570	91.913	183.708
	Wild	275.473	1,488.000	1,962.197	24,172.432	1,236.087	29,139.189
	% Enhanced in CP harvest	0.19%	0.00%	3.86%	0.05%	6.92%	0.63%
1983	Total Commercial Harvest	275.000	1,555.000	1,931.000	37,523.000	1,167.000	42,459.000
	-Cost Recovery Harvest			7.396	129.594	35.068	172.058
	Common Property	275.000	1,555.000	1,923.604	37,393.406	1,131.932	42,286.942
	Enhanced	1.129	0.000	73.021	51.900	164.650	290.700
	Wild	273.871	1,555.000	1,850.583	37,341.506	967.282	41,996.242
	% Enhanced in CP harvest	0.41%	0.00%	3.80%	0.14%	14.55%	0.69%
1984	Total Commercial Harvest	257.000	1,212.000	1,842.000	24,630.000	4,089.000	32,035.000
	-Cost Recovery Harvest	1.189		22.313	165.294	431.000	619.796
	Common Property	255.811	1,212.000	1,819.687	24,464.706	3,658.000	31,415.204
	Enhanced	6.289	0.000	113.433	73.700	988.635	1,182.057
	Wild	249.522	1,212.000	1,706.254	24,391.006	2,669.365	30,233.147
	% Enhanced in CP harvest	2.46%	0.00%	6.23%	0.30%	27.03%	3.76%
1985	Total Commercial Harvest	240.000	1,861.000	2,562.000	51,959.000	3,272.000	59,899.000
	-Cost Recovery Harvest	2.011		29.530	479.207	119.571	630.319
	Common Property	237.989	1,861.000	2,532.470	51,479.793	3,152.429	59,268.681
	Enhanced	16.903	0.000	194.931	442.497	778.021	1,432.352
	Wild	221.086	1,861.000	2,337.539	51,037.296	2,374.408	57,836.329
	% Enhanced in CP harvest	7.10%	0.00%	7.70%	0.86%	24.68%	2.42%
1986	Total Commercial Harvest	259.000	1,432.000	3,353.000	45,575.000	3,297.000	53,921.000
	-Cost Recovery Harvest	1.900		70.391	45.228	155.250	272.769
	Common Property	257.100	1,432.000	3,282.609	45,529.772	3,141.750	53,648.231
	Enhanced	17.486	18.600	325.182	406.886	997.072	1,765.226
	Wild	239.614	1,413.400	2,957.427	45,122.886	2,144.678	51,883.005
	% Enhanced in CP harvest	6.80%	1.30%	9.91%	0.89%	31.74%	3.29%
1987	Total Commercial Harvest	261.000	1,362.000	1,589.000	10,035.000	2,556.000	15,804.000
	-Cost Recovery Harvest	2.466		49.405	977.720	482.973	1,512.564
	Common Property	258.534	1,362.000	1,539.595	9,057.280	2,073.027	14,291.436
	Enhanced	28.325	36.000	132.093	466.863	811.118	1,474.399
	Wild	230.209	1,326.000	1,407.502	8,590.417	1,261.909	12,817.037
	% Enhanced in CP harvest	10.96%	2.64%	8.58%	5.15%	39.13%	10.32%
1988	Total Commercial Harvest	264.000	1,460.000	1,042.000	11,202.000	3,535.000	17,504.000
	-Cost Recovery Harvest	8.700		3.611	73.786	425.346	511.443
	Common Property	255.300	1,460.000	1,038.389	11,128.214	3,109.654	16,992.557
	Enhanced	32.679	20.400	49.269	118.785	973.241	1,194.374
	Wild	222.621	1,439.600	989.120	11,009.429	2,136.413	15,798.183
	% Enhanced in CP harvest	12.80%	1.40%	4.74%	1.07%	31.30%	7.03%
1989	Total Commercial Harvest	287.560	2,115.050	2,132.630	59,316.810	1,935.480	65,787.530
	-Cost Recovery Harvest	18.000		13.000	223.000	155.000	409.000
	Common Property	269.560	2,115.050	2,119.630	59,093.810	1,780.480	65,378.530
	Enhanced	21.241	36.670	77.612	880.795	486.914	1,503.232
	Wild	248.319	2,078.380	2,042.018	58,213.015	1,293.566	63,875.298
	% Enhanced in CP harvest	7.88%	1.73%	3.66%	1.49%	27.35%	2.30%
1990	Total Commercial Harvest	332.060	2,135.660	2,663.710	31,184.790	1,884.410	38,200.630
	-Cost Recovery Harvest	22.164	0.000	117.258	988.424	336.965	1,464.811
	Common Property	309.896	2,135.660	2,546.452	30,196.366	1,547.445	36,735.819
	Enhanced	38.172	110.007	344.195	498.686	408.063	1,399.123
	Wild	271.724	2,025.653	2,202.257	29,697.680	1,139.382	35,336.696
	% Enhanced in CP harvest	12.32%	5.15%	13.52%	1.65%	26.37%	3.81%
1991	Total Commercial Harvest	333.867	2,063.489	3,196.729	61,926.192	3,336.042	70,856.319
	-Cost Recovery Harvest	21.138	1.419	313.052	1,149.500	388.374	1,873.483
	Common Property	312.729	2,062.070	2,883.677	60,776.692	2,947.668	68,982.836
	Enhanced	41.770	98.878	580.600	1,092.400	877.000	2,690.648
	Wild	270.959	1,963.192	2,303.077	59,684.292	2,070.668	66,292.188
	% Enhanced in CP harvest	13.36%	4.80%	20.13%	1.80%	29.75%	3.90%

1992	Total Commercial Harvest	225.911	2,666.410	3,695.388	34,963.308	4,936.489	46,487.506
	-Cost Recovery Harvest	16.798	2.538	264.594	2,670.609	690.166	3,644.705
	Common Property	209.113	2,663.872	3,430.794	32,292.699	4,246.323	42,842.801
	Enhanced	33.560	196.032	616.804	1,308.723	1,458.717	3,613.836
	Wild	175.553	2,467.840	2,813.990	30,983.976	2,787.606	39,228.965
	% Enhanced in CP harvest	16.05%	7.36%	17.98%	4.05%	34.35%	8.44%
1993	Total Commercial Harvest	295.767	3,190.717	3,665.007	57,299.342	7,879.850	72,330.683
	-Cost Recovery Harvest	22.000	2.685	123.574	299.846	1,231.121	1,679.226
	Common Property	273.767	3,188.032	3,541.433	56,999.496	6,648.729	70,651.457
	Enhanced	27.183	358.452	478.020	662.494	3,412.723	4,938.872
	Wild	246.584	2,829.580	3,063.413	56,337.002	3,236.006	65,712.585
	% Enhanced in CP harvest	9.93%	11.24%	13.50%	1.16%	51.33%	6.99%
1994	Total Commercial Harvest	216.522	2,392.364	5,715.764	57,646.063	10,397.421	76,368.134
	-Cost Recovery Harvest	9.860	2.600	183.626	3,472.291	1,646.600	5,314.977
	Common Property	206.662	2,389.764	5,532.138	54,173.772	8,750.821	71,053.157
	Enhanced	29.858	155.686	730.907	2,018.446	5,044.928	7,979.825
	Wild	176.804	2,234.078	4,801.231	52,155.326	3,705.893	63,073.332
	% Enhanced in CP harvest	14.45%	6.51%	13.21%	3.73%	57.65%	11.23%
1995	Total Commercial Harvest	214.080	1,795.010	3,345.618	47,964.212	11,163.564	64,482.484
	-Cost Recovery Harvest	23.636	8.420	279.748	399.618	1,620.100	2,331.522
	Common Property	190.444	1,786.590	3,065.870	47,564.594	9,543.464	62,150.962
	Enhanced	49.880	106.000	576.958	1,593.944	6,229.417	8,556.199
	Wild	140.564	1,680.590	2,488.912	45,970.650	3,314.047	53,594.763
	% Enhanced in CP harvest	26.19%	5.93%	18.82%	3.35%	65.27%	13.77%
1996	Total Commercial Harvest	202.000	2,790.342	3,035.000	64,656.000	15,800.000	86,483.342
	-Cost Recovery Harvest	31.928	10.997	196.932	727.436	3,652.767	4,620.060
	Common Property	170.072	2,779.345	2,838.068	63,928.564	12,147.233	81,863.282
	Enhanced	51.410	495.142	595.354	1,613.291	8,375.887	11,131.084
	Wild	118.662	2,284.203	2,242.714	62,315.273	3,771.346	70,732.198
	% Enhanced in CP harvest	30.23%	17.82%	20.98%	2.52%	68.95%	13.60%
1997	Total Commercial Harvest	290.660	2,449.700	1,749.260	28,657.000	11,259.620	44,406.240
	-Cost Recovery Harvest	31.747	57.100	245.404	1,776.000	3,835.000	5,945.251
	Common Property	258.913	2,392.600	1,503.856	26,881.000	7,424.620	38,460.989
	Enhanced	37.000	301.000	378.000	688.232	6,026.000	7,430.232
	Wild	221.913	2,091.600	1,125.856	26,192.768	1,398.620	31,030.757
	% Enhanced in CP harvest	14.29%	12.58%	25.14%	2.56%	81.16%	19.32%
1998	Total Commercial Harvest	231.000	1,375.000	2,911.000	42,565.000	15,560.000	62,642.000
	-Cost Recovery Harvest	19.000	34.000	313.000	1,373.000	3,834.000	5,573.000
	Common Property	212.000	1,341.000	2,598.000	41,192.000	11,726.000	57,069.000
	Enhanced	21.000	204.000	580.000	863.000	7,732.000	9,400.000
	Wild	191.000	1,137.000	2,018.000	40,329.000	3,994.000	47,669.000
	% Enhanced in CP harvest	9.91%	15.21%	22.32%	2.10%	65.94%	16.47%
1999	Total Commercial Harvest	190.000	1,160.000	3,570.000	77,700.000	14,900.000	97,520.000
	-Cost Recovery Harvest	16.000	25.000	357.000	3,263.000	3,584.000	7,245.000
	Common Property	174.000	1,135.000	3,213.000	74,437.000	11,316.000	90,275.000
	Enhanced	34.000	130.000	723.000	825.000	7,802.000	9,514.000
	Wild	140.000	1,005.000	2,490.000	73,612.000	3,514.000	80,761.000
	% Enhanced in CP harvest	19.54%	11.45%	22.50%	1.11%	68.95%	10.54%
2000	Total Commercial Harvest	230.000	1,220.000	1,970.000	20,270.000	15,850.000	39,540.000
	-Cost Recovery Harvest	37.000	114.000	290.000	248.000	4,337.000	5,026.000
	Common Property	193.000	1,106.000	1,680.000	20,022.000	11,513.000	34,514.000
	Enhanced	57.000	177.000	338.000	191.000	8,366.000	9,129.000
	Wild	136.000	929.000	1,342.000	19,831.000	3,147.000	25,385.000
	% Enhanced in CP harvest	29.53%	16.00%	20.12%	0.95%	72.67%	26.45%
2001	Total Commercial Harvest	215.000	2,021.000	3,122.000	67,127.000	8,649.000	81,134.000
	-Cost Recovery Harvest	65.000	129.000	435.000	1,183.000	2,151.000	3,963.000
	Common Property	150.000	1,892.000	2,687.000	65,944.000	6,498.000	77,171.000
	Enhanced	48.000	281.000	563.000	1,165.000	3,494.000	5,551.000
	Wild	102.000	1,611.000	2,124.000	64,779.000	3,004.000	71,620.000
	% Enhanced in CP harvest	32.00%	14.85%	20.95%	1.77%	53.77%	7.19%
2002	Total Commercial Harvest	372.000	787.000	2,986.000	45,612.000	6,294.000	56,051.000
	-Cost Recovery Harvest	33.000	36.000	756.000	975.000	2,519.000	4,319.000
	Common Property	339.000	751.000	2,230.000	44,637.000	3,775.000	51,732.000
	Enhanced	59.000	85.000	620.000	948.000	3,098.000	4,810.000
	Wild	280.000	666.000	1,610.000	43,689.000	677.000	46,922.000
	% Enhanced in CP harvest	17.40%	11.32%	27.80%	2.12%	82.07%	9.30%
2003	Total Commercial Harvest	403.000	1,450.000	2,442.000	52,481.000	9,269.000	66,045.000
	-Cost Recovery Harvest	49.000	113.000	389.000	428.000	4,974.000	5,952.000
	Common Property	354.000	1,337.000	2,053.000	52,053.000	4,295.000	60,093.000
	Enhanced	43.000	102.000	484.000	502.000	4,002.000	5,133.000
	Wild	311.000	1,235.000	1,569.000	51,551.000	293.000	54,960.000
	% Enhanced in CP harvest	12.15%	7.63%	23.58%	0.96%	93.18%	8.54%

APPENDIX E

STOCK APPRAISAL TOOL

The ADF&G Genetics Policy states that "Stocks cannot be introduced to sites where the introduced stock may have significant interaction or impact on significant or unique wild stocks" (Sec. II.A). The Stock Appraisal Tool identifies the criteria to be used by the regional planning teams and ADF&G biologists when evaluating the significance of a wild stock that may potentially interact with a hatchery release. The Stock Appraisal Tool attempts to inject as much objectivity as possible into determining the significance of a potentially impacted stock. In this context significance is defined as the importance of a stock in maintaining the overall viability and sustainability of the wild salmon resource as well as the importance of the stock in meeting fishery needs. Significance is more complex than simple production numbers. Some of our most viable fisheries depend on aggregates of wild stocks, each of which is not very large. Diversity among wild stocks is a key factor in maintaining production capacity, and the potential to maximize harvest opportunities over time. Stock significance should be considered in developing appropriate straying studies or other assessments of the potential impact of a project on naturally occurring stocks.

The Stock Appraisal Tool is modeled after one developed by Hatchery Scientific Review Group, for use in the Pacific Northwest (Barr et al. 2002). Their version looks at four stock characteristics: wildness, uniqueness, isolation, and viability. Our version splits viability into population size and population trend, and adds a criterion that addresses the human-use pattern. In the Pacific Northwest version, a numerical rating scale is used, which is possible because of the availability of a much greater amount of data on a smaller number of stocks compared with those in Southeast Alaska. In the Southeast Alaska model each of the six characteristics has a non-numerical gradient ranging from the quality that would indicate less significance (left side of the scale) to the quality that would indicate more significance (right side of the scale). The combined assessments of the six characteristics provide a qualitative estimate of significance. Admittedly this is not a perfect method; however, it does provide a consistent framework upon which to make professional judgments about the significance of wild stocks in the neighborhood of a proposed project. When this assessment is documented, it provides a record of part of the project development process.

A determination of stock significance must be based on existing knowledge. This would include any data from ADF&G, federal agencies, or hatchery corporations. It could also include local knowledge.

I. Wildness

Introduced .... Native

The wildness spectrum includes the degree of impact from previous stocking, as well as the likelihood of impacts from existing enhancement projects. It is important to remember that all species of salmon have a relatively low baseline propensity to pioneer and that the same level of influx from an enhancement project should not compromise wildness, if an appropriate stock was used for the enhancement project and the wild stock escapement is large enough to absorb a low number of strays.

II. Uniqueness

Typical of other stocks in the area .... Has unique characteristics

Based on the best existing knowledge, is there anything unique about the life history or other biological characteristics of the stock, and to what extent are these characteristics irreplaceable? The publication, *Biological Characteristics and Population Status of Anadromous Salmon in Southeast Alaska* (Halupka 2000) is a thorough review of data in existence in the late 1990s, and provides a good starting point for information. A stock that shares some characteristics with local stocks that are not shared with other, more distant stocks would occupy an intermediate point on the uniqueness scale.

III. Isolation

One of several stocks in the area .... Solitary

To what extent could a stock be considered part of a metapopulation? Is it part of a "big gene bank" that through normal processes could mitigate for low levels of gene influx from an enhancement project?

IV. Population Size

Small spawning aggregate ……. ……. ……….. ……….. ……... ……..Very large stock

Large stocks serve as large reservoirs of genetic diversity and are important for the sustainability of the total resource. Small stocks are more susceptible than large ones to adverse environmental conditions (e.g., unfavorable marine conditions) that could result in reduced population viability. Large populations are buffered from such effects and, as conditions improve, could become sources for recovery by providing a source of strays. Large populations may be critically important for maintaining species over wide geographic ranges by acting as the source populations for eventual recolonization when site-specific extinctions occur because of earthquakes, landslides, glaciers, etc. [61]

Some of the region's largest stocks are also very important in maintaining existing commercial, sport, subsistence, or personal-use fisheries. Fisheries monitoring data should be used to determine the importance of a stock in maintaining fisheries.

[61] A. Wertheimer, NMFS, personal communication

V. Population Trend

Escapement stable or increasing .... ……….Escapement declining

The escapement trend of a population can be a measure of the stock's potential to thrive as a gene pool and the potential to withstand an exogenous impact. Publications that provide a starting point for stock trend information include the most recent stock status reports compiled by ADF&G (e.g., Heinl et al. 2003; McPherson et al. 2003). The "Alexander" database maintained by ADF&G includes all existing escapement data for Southeast Alaska. A large number of escapement surveys are conducted to count pink salmon because of their importance to seine fishery management; although the numbers recorded for other species are incidental, they still may provide an indication of the overall trend. A method for determining the escapement trend of a spawning population is outlined below (Baker et al. 1996):

Data requirements:

- To calculate long-term mean escapement: need a 10 year span of observations using the same survey method. Observations must be made during at least half of the years between the first and the most recent observations.
- To calculate short-term mean escapement: within the last 5-year period, at least 3 years of observations are needed.

Trend definitions:

- Increasing: the short-term mean escapement is more than 50% greater than long-term mean escapement
- Stable: short-term mean escapement is ± 50% of the long-term mean escapement
- Declining: short-term mean escapement is less than 50% but greater than 20% of long-term mean escapement
- Precipitously declining: short-term mean escapement is less than 20% of long-term mean escapement
- Unknown: data requirement is not met

Having sufficient data to answer all the questions regarding a spawning aggregate may prove to be the exception rather than the rule. Addressing the genetic significance of small spawning populations,[62] of which there are thousands in southeast Alaska, remains a topic for future research.

[62] Baker & others (1996) use 200 as an estimate of the threshold number of spawners per year for designation as a spawning aggregate (600 for pink salmon), based on a review of previously published work by various authors.

VI. Fishery Support

Contributes to multi-stock harvest …. ……… …………. ……supports targeted fishery

The first five criteria address biological or population characteristics that may call for increased awareness of potential enhanced/wild interaction. The final criterion takes into consideration the human-use pattern of a stock. A stock may be important for cultural or economic reasons, thereby increasing its overall rating of significance. For example, in this category a small sockeye stock near a village in Southeast Alaska may be situated on the right side of the scale, whereas a similar sized population in Bristol Bay may be situated on the left side of the scale. Another example might be a large transboundary river (TBR) stock such as sockeye from the Stikine River, where directed use by different parties (i.e., U.S./Canada) results in the significance of the stock in terms of management moving to the right side of the scale.