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An Evaluation of the Port Armstrong Salmon Hatchery for Consistency with Statewide Policies and Prescribed Management Practices

by

Mark Stopha

October 2015

Alaska Department of Fish and Game **Division of Commercial Fisheries**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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AN EVALUATION OF THE PORT ARMSTRONG SALMON HATCHERY FOR CONSISTENCY WITH STATEWIDE POLICIES AND PRESCRIBED MANAGEMENT PRACTICES

by
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The Regional Information Report Series was established in 1987 and was redefined in 2006 to meet the Division of Commercial Fisheries regional need for publishing and archiving information such as project operational plans, area management plans, budgetary information, staff comments and opinions to Board of Fisheries proposals, interim or preliminary data and grant agency reports, special meeting or minor workshop results and other regional information not generally reported elsewhere. Reports in this series may contain raw data and preliminary results. Reports in this series receive varying degrees of regional, biometric and editorial review; information in this series may be subsequently finalized and published in a different department reporting series or in the formal literature. Please contact the author or the Division of Commercial Fisheries if in doubt of the level of review or preliminary nature of the data reported. Regional Information Reports are available through the Alaska State Library and on the Internet at http://www.adfg.alaska.gov/sf/publications/

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ABSTRACT

The salmon hatchery program in Alaska is governed by policies, plans, and regulations that emphasize protection of wild salmon stocks. A rotational series of hatchery evaluations will examine each hatchery for consistency with those policies and prescribed management practices. The evaluation includes a review of hatchery management plans and permits, an assessment of each hatchery program's consistency with statewide policies, and recommendations to address any deficiencies found. Management plans and permits were examined to determine whether they were current, consistent with each other, and accurately described hatchery operations.

This report reviews the Port Armstrong salmon hatchery located in lower Chatham Strait in southeast Alaska. The hatchery was constructed in the early 1980's by owner Armstrong Keta, Incorporated, a non-profit corporation. The hatchery produces pink salmon *Oncorhynchus gorbuscha*, chum salmon *O. keta,* coho salmon *O. kisutch* and Chinook salmon *O. tshawytscha* primarily for commercial harvest. All releases to date are from the hatchery.

All chum and pink salmon incubated at Port Armstrong Hatchery are thermal otolith-marked. A portion of the coho and Chinook salmon releases are marked with coded wire tags and adipose finclips. Chinook and coho salmon are sampled in the commercial and sport fisheries to assess hatchery contribution. A pilot project is underway to sample pink and chum salmon in the commercial fisheries to estimate contribution to the fisheries by Port Armstrong Hatchery. Spawning escapement goals for naturally spawning salmon stocks in systems near the hatchery and release sites have been met in most years of hatchery returns.

The basic management plan for the hatchery should be updated with a description of current permit conditions and operations. Sampling in the common property fisheries for pink and chum salmon produced by Port Armstrong Hatchery will provide more accurate estimates of hatchery contribution than earlier estimates based on historical catch records.

Key words: Port Armstrong salmon hatchery, hatchery evaluation, hatchery, pink salmon, chum salmon, Chinook salmon, coho salmon

INTRODUCTION

Alaska's constitution mandates that fish are harvested sustainably under Article 8, section 4: "Fish, forests, wildlife, grasslands, and all other replenishable resources belonging to the state shall be utilized, developed and maintained on the sustained yield principle, subject to preferences among beneficial uses."

Due in part to historically low salmon harvests, Article 8, section 15 of Alaska's Constitution was amended by popular vote in 1972 to provide tools for restoring and maintaining the state's fishing economy: "No exclusive right or special privilege of fishery shall be created or authorized in the natural waters of the State. This section 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 in the State." Alaska's salmon hatchery program was developed under this mandate and designed to supplement—not replace—sustainable natural production.

Alaska's modern salmon fisheries enhancement program began in 1971 when the Alaska Legislature established the Division of Fisheries Rehabilitation Enhancement and Development (FRED) within the Alaska Department of Fish and Game (ADF&G; FRED Division 1976). In 1974, the Alaska Legislature expanded the program, authorizing private nonprofit (PNP) corporations to operate salmon hatcheries: "It is the intent of this Act to authorize the private ownership of salmon hatcheries by qualified nonprofit corporations for the purpose of contributing, by artificial means, to the rehabilitation of the state's depleted and depressed salmon fishery. 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."[1]

Salmon fishery restoration efforts came in response to statewide annual salmon harvests of just 22 million fish in 1973 and 1974, among the lowest catches since 1900 (Figure 1). The FRED Division and PNPs engaged in a variety of activities to increase salmon production. New hatcheries were built to raise salmon. Fish ladders were constructed to provide adult salmon access to previously non-utilized spawning and rearing areas. Lakes with waterfall outlets too high for adult salmon to ascend were stocked with salmon fry. Log jams were removed in streams to enable returning adults to reach spawning areas. Nursery lakes were fertilized to increase the available feed for juvenile salmon (FRED 1975). A combination of favorable environmental conditions, limited fishing effort, abundance-based harvest management, habitat improvement and protection, and hatchery production gradually boosted salmon catches, with recent commercial salmon harvests (2004–2013) averaging 180 million fish.[2]

In Alaska, the purpose of salmon hatcheries is to supplement natural stock production for public benefit. Hatcheries are efficient in improving survival from the egg to fry or smolt stage. In natural production, estimates for pink salmon *Oncorhynchus gorbuscha* egg to fry survival in 2 Southeast Alaska creeks ranged from less than 1% to 22%, with average survivals from 4% to 9% (Groot and Margolis 1991). Under hatchery conditions, egg to fry survival is usually 90% or higher.

Alaska hatcheries do not grow fish to adulthood, but incubate fertilized eggs and release resulting progeny as juveniles. Juvenile salmon imprint on the release site and return to the release location as mature adults. Per state policy, hatcheries generally use stocks taken from close proximity to the hatchery so that any straying of hatchery returns will have similar genetic makeup as the stocks from nearby streams. Also per state policy, Alaska hatcheries do not selectively breed. Large numbers of broodstock are used for gamete collection to maintain genetic diversity, without regard to size or other characteristic. In this document, *wild* fish refer to fish that are the progeny of parents that naturally spawned in watersheds and intertidal areas. *Hatchery* fish are fish reared in a hatchery to a juvenile stage and released. *Farmed* fish are fish reared in captivity to market size for sale. Farming of finfish, including salmon, is not legal in Alaska (Alaska Statue 16.40.210).

Hatchery production is limited by freshwater capacity and freshwater rearing space. Soon after emergence, all pink and chum salmon *O. keta* fry can be transferred from fresh water to salt water. Most Chinook *O. tshawytscha*, sockeye *O. nerka*, and coho salmon *O. kisutch* must spend a year or more in fresh water before fry develop to the smolt stage and can tolerate salt water. Chinook, sockeye and coho salmon require a higher volume of fresh water, a holding area for freshwater rearing, and daily feeding. They also have a higher risk of disease mortality due to the extended rearing phase. There are economic tradeoffs between the costs of production versus the value of fish at harvest. Although Chinook, sockeye, and coho salmon garner higher prices per pound at harvest, chum and pink salmon are more economical to rear in the hatchery setting and generally provide a higher economic return.

[1] Alaska Legislature 1974. An Act authorizing the operation of private nonprofit salmon hatcheries. Section 1, Chapter 111, SLA 1974, in the Temporary and Special Acts.

[2] Data from http://www.adfg.alaska.gov/index.cfm?adfg=CommercialByFisherySalmon.exvesselquery (accessed 08/12/14).

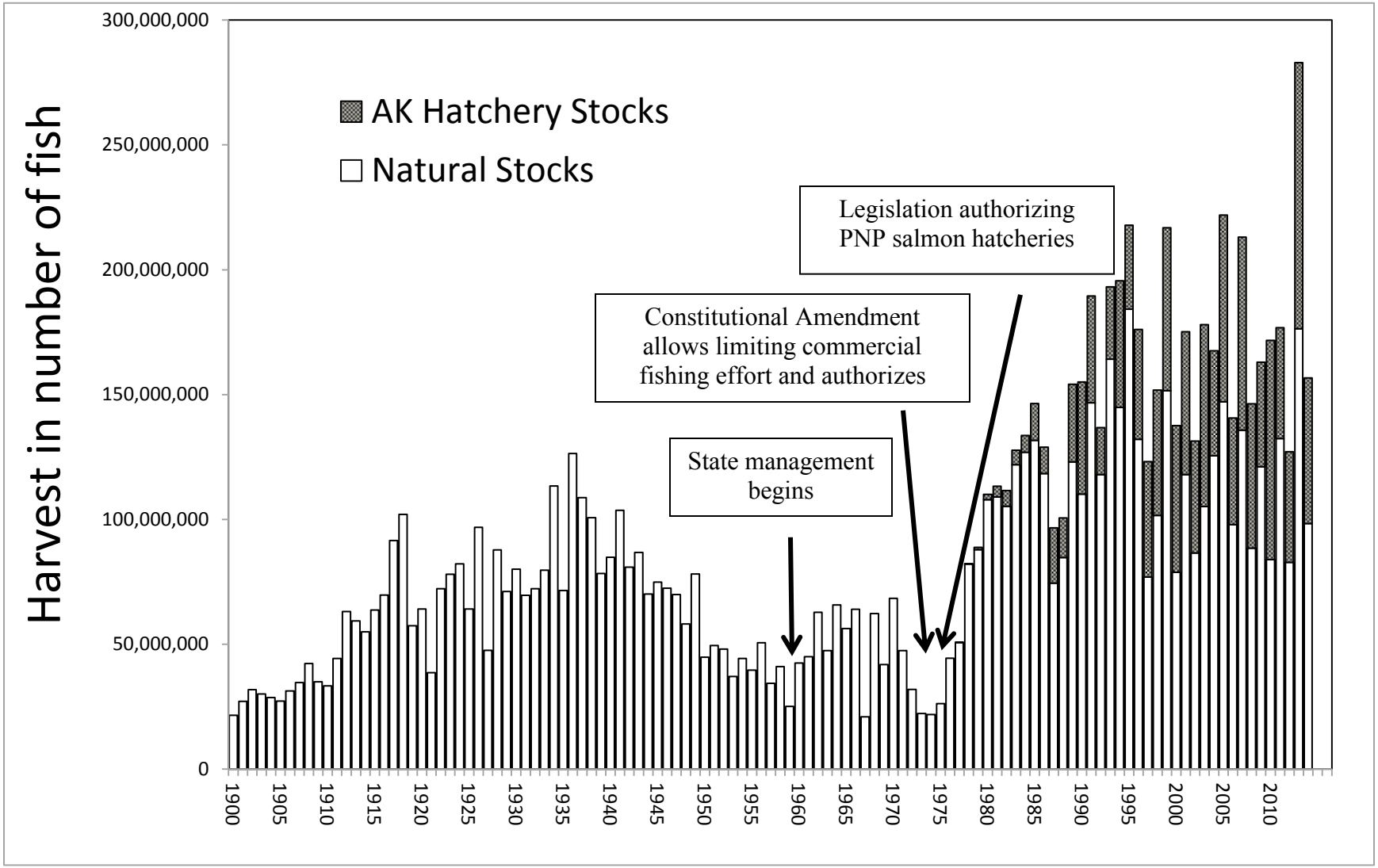

Figure 1.–Commercial salmon harvest in Alaska, 1900–2014.

Source: 1900–1976 from Byerly et al. (1999). 1977–2014 from Vercessi (2015).

Pink salmon have the shortest life cycle of Pacific salmon (2 years), provide a quick return on investment, and provide the bulk of Alaska hatchery production. From 2004 to 2013, pink salmon accounted for an average 74% of Alaska hatchery salmon returns by number, followed by chum (20%), sockeye (4%), coho (2%) and Chinook salmon (<1%; White 2005–2011; Vercessi 2012–2014).

The salmon marketplace has changed substantially since the hatchery program began. As the first adult salmon were returning to newly built hatcheries in 1980, Alaska accounted for nearly half of the world salmon supply, and larger harvests in Alaska generally meant lower prices to fishermen. Some believed the increasing hatchery production in some parts of the state was depressing salmon prices in others (Knapp et al. 2007). By 1996, rapidly expanding farmed salmon production surpassed the wild salmon harvest for the first time (Knapp et al. 2007) and wild salmon prices declined precipitously as year-round supplies of fresh, high quality farmed salmon flooded the marketplace in the U.S., Europe, and Japan.

The Alaska fishing industry responded to the competition by improving fish quality and implementing intensive marketing efforts to differentiate Alaska salmon from farmed salmon. By 2004, these efforts paid off through increasing demand and prices.

Today, Alaska typically accounts for just 12% to 15% of the global supply of salmon (Alaska Seafood Marketing Institute 2011). Alaska's diminished influence on world salmon production means that Alaska's harvest volume has little effect on world salmon prices. Prices paid to fishermen have generally increased over the past decade (2004–2013) despite large fluctuations in harvest volume (ADF&G 2014; Stopha 2013a).

Exvessel value[3] of the commercial hatchery harvest increased from $45 million in 2004 to $191 million in 2013, with a peak value for the decade of $204 million in 2010. First wholesale value[4] also showed an increasing trend, with the value of hatchery fish increasing from $138 million in 2004 to $532 million in 2013. Pink and chum salmon combined accounted for about 80% of both the exvessel value and the first wholesale value of the hatchery harvest from 2004 to 2013.

From 2004 to 2013, hatcheries contributed about a third of the total Alaska salmon harvest, in numbers of fish (White 2005–2011; Vercessi 2012–2014). With world markets currently supporting a trend of increasing prices for salmon, interest in increasing hatchery production by Alaska fishermen, processors, support industries, and coastal communities has increased as well. In 2010, Alaska salmon processors encouraged hatchery operators to expand pink salmon production to meet heightened demand (Industry Working Group, 2010).

Alaska's wild salmon populations are sustainably managed by ensuring adequate numbers of adults spawn, and the wild harvest is arguably at its maximum, given fluctuations due to environmental variability and imperfect management precision. Unlike Pacific Northwest systems, such as the Columbia River, where habitat loss, dam construction and urbanization led to the decline of salmon stocks to the point of endangered species listings, Alaska's salmon habitat is largely intact. ADF&G, with the assistance and sacrifice of commercial, sport, personal use and subsistence users, has been successful in recovery of several populations identified as

[3] Exvessel value for hatchery harvest is the total harvest value paid by fish buyers to fishermen for all salmon from http://www.adfg.alaska.gov/index.cfm?adfg=commercialbyfisherysalmon.salmoncatch (accessed 02/04/2014), multiplied by the hatchery percent of the commercial harvest in Farrington 2003, 2004; White 2005–2011, and Vercessi 2013.

[4] First wholesale value is the price paid to primary processors for processed fish from ADF&G Commercial Operators' Annual Reports obtained from Shellene Hutter, ADF&G, multiplied by the hatchery percent of the commercial harvest.

stocks of concern through restricted fishing and intensive spawning assessment projects. Other than regulatory actions, such as reductions of salmon bycatch in other fisheries or changes in fishing methods that would allow more precise management of escapement, hatchery production is the primary opportunity to substantially increase the harvest.

Alaska's salmon fisheries are among the healthiest in the world. The 2013 season was a record harvest overall, with the 283 million fish commercial harvest comprised of the second highest catch for wild stocks (176 million fish) and the highest catch for hatchery stocks (107 million fish) in Alaska's history (Figure 1). The 2013 season was the first year the hatchery harvest alone exceeded 100 million fish. The 2013 hatchery harvest alone was greater than the entire statewide commercial salmon harvest in 1987 and every year prior to 1980 except for 6 years (1918, 1934, 1936, 1937, 1938 and 1941; Figure 1).

Part of the reason for the rise in price of Alaska salmon was a message of the state's sustainable fisheries management to a growing audience of discriminating buyers. The Alaska Seafood Marketing Institute applied to the Marine Stewardship Council (MSC) for certification as a sustainably managed fishery. In 2000, the MSC certified the salmon fisheries managed by ADF&G as sustainably managed, and the state's salmon fisheries remained the only MSC certified salmon fishery in the world for nearly a decade. Salmon fisheries elsewhere (Annette Islands Indian Reserve salmon; British Columbia pink and sockeye salmon; and Iturup Island, Russia, pink and chum salmon) were later certified for much smaller geographic areas, and in some cases, only for specific salmon species (MSC 2012). Alaska's certification was MSC's broadest and most complex, covering all 5 salmon species harvested by all fishing gear types in all parts of the state. Achievement of statewide certification was a reflection of the state's commitment to abundance-based fisheries management and constitutional mandate to sustain wild salmon populations.

MSC-certified fisheries are reviewed every 5 years. When Alaska salmon fisheries were recertified in 2007 (Chaffee et al. 2007), a condition of certification was to "Establish and implement a mechanism for periodic formal evaluations of each hatchery program for consistency with statewide policies and prescribed management practices. This would include a specific evaluation of each program relative to related policies and management practices." (Knapman et al. 2009). The first of these evaluations was published by ADF&G in 2011 (Musslewhite 2011a).

The Alaska Seafood Marketing Institute changed to a new sustainable fishery certification under the Food and Agriculture Organization in 2011 (Global Trust Certification Ltd. 2011). The hatchery evaluations started under the MSC certification program continued as an important systematic assessment of Alaska salmon fishery enhancement and its relation to wild stock production at a time of heightened interest for increased hatchery production and potential impacts on wild salmon production. ADF&G established a rotational schedule to review PNP hatchery programs. Musslewhite (2011a, 2011b) completed hatchery reviews for the Kodiak region in 2011, Stopha and Musslewhite (2012) completed the hatchery review for Tutka Bay Lagoon Hatchery in Cook Inlet, and Stopha (2012a, 2012b, 2013b, 2013c, 2013d, 2013e, 2013f, 2013g, 2013h, 2014a, 2014b, 2014c, Stopha 2015a, 2015b, 2015c) completed reviews of the remainder of the Cook Inlet and Prince William Sound hatcheries, and a portion of the hatcheries in northern Southeast Alaska. This report is for the Port Armstrong Hatchery located in lower Chatham Strait in Southeast Alaska. Following completion of reviews of hatcheries in the

northern Southeast Alaska region, reviews of hatcheries in southern Southeast Alaska will follow.

OVERVIEW OF POLICIES

Numerous Alaska mandates and policies for hatchery operations were specifically developed to minimize potential adverse effects to wild stocks. The design and development of the hatchery program is described in detail in McGee (2004): "The success of the hatchery program in having minimal impact on wild stocks can be attributed to the development of state statutes, policies, procedures, and plans that require hatcheries to be located away from significant wild stocks, and constant vigilance on the part of ADF&G and hatchery operators to improve the program through ongoing analysis of hatchery performance." Through a comprehensive permitting and planning process, hatchery operations are subject to continual review by a number of ADF&G fishery managers, geneticists, pathologists, and the ADF&G commissioner.

A variety of policies guide the permitting of salmon fishery enhancement projects. They include *Genetic Policy* (Davis et al. 1985), *Policies and Guidelines for Alaska Fish and Shellfish Health and Disease Control* (Meyers 2014), and fisheries management policies, such as the Sustainable Salmon Fisheries Policy (5 AAC 39.222). These policies are used by ADF&G staff to assess hatchery operations for genetic, health, and fishery management issues in the permitting process.

The State of Alaska ADF&G genetic policy (Davis et al. 1985; Davis and Burkett 1989) sets out restrictions and guidelines for stock transport, protection of wild stocks, and maintenance of genetic variance. Policy guidelines include banning importation of salmonids from outside the state (except U.S./Canada transboundary rivers); restricting transportation of stocks between the major geographic areas in the state (Southeast, Kodiak Island, Prince William Sound, Cook Inlet, Bristol Bay, Arctic-Yukon-Kuskokwim, and Interior); requiring the use of local broodstock with appropriate phenotypic characteristics; maintaining genetic diversity by use of large populations of broodstock collected across the entire run; and limiting the number of hatchery stocks derived from a single donor stock.

Genetic Policy also recommends the identification and protection of significant and unique wild stocks: "Significant or unique wild stocks must be identified on a regional and species basis so as to define sensitive and nonsensitive areas for movement of stocks." In addition, *Genetic Policy* suggests that drainages be established as wild stock sanctuaries where no enhancement activity is permitted except for gamete removal for broodstock development. The wild stock sanctuaries were intended to preserve a variety of wild types for future broodstock development and outbreeding for enhancement programs.

These stock designations are interrelated with other restrictions of the genetic policy, including (1) hatchery stocks cannot be introduced to sites where the introduced stock may have significant interaction or impact on significant or unique wild stocks; and (2) a watershed with a significant stock can only be stocked with progeny from the indigenous stocks.[5] Davis and Burkett (1989) suggest that regional planning teams (RPTs) are an appropriate body to designate significant and unique wild stocks and wild stock sanctuaries. To date, only the Cook Inlet RPT has established significant stocks and wild stock sanctuaries. In addition, the Phase III Comprehensive Salmon Plan (described in the next paragraph) for Southeast Alaska includes a *stock appraisal tool*,

[5] Fish releases from remote release sites or in landlocked lakes where no interaction with significant or unique stock will occur need not be restricted by genetic concerns, according to the *Genetic Policy*.

which identifies criteria to be used for evaluating the significance of a wild stock under the genetic policy.

Salmon fishery enhancement efforts are guided by comprehensive salmon plans for each region. These plans are developed by the RPTs, which are composed of 6 members: 3 from ADF&G and 3 appointed by the regional aquaculture association Board of Directors (5 AAC 40.310). According to McGee (2004), "Regional comprehensive planning in Alaska progresses in stages. Phase I sets the long-term goals, objectives and strategies for the region. Phase II identifies potential projects and establishes criteria for evaluating the enhancement and rehabilitation potentials for the salmon resources in the region. In some regions, a Phase III in planning has been instituted to incorporate Alaska Board of Fisheries approved allocation and fisheries management plans with hatchery production plans."

The Alaska Fish Health and Disease Control Policy (5 AAC 41.080) is designed to protect fish health and prevent spread of infectious disease in fish and shellfish. The policy and associated guidelines are discussed in *Policies and Guidelines for Alaska Fish and Shellfish Health and Disease Control* (Meyers 2014). It includes regulations and guidelines for fish transports, broodstock screening, disease histories, and transfers between hatcheries. The *Alaska Sockeye Salmon Culture Manual* (McDaniel et al. 1994) also specifies practices and guidelines specific to the culture of sockeye salmon. These regulations and guidelines are used by ADF&G fish pathologists to review hatchery plans and permits.

The Alaska Policy for the Management of Sustainable Salmon Fisheries (5 AAC 39.222) mandates protection of wild salmon stocks in the management of salmon fisheries. Other applicable policies include the Policy for the Management of Mixed-Stock Salmon Fisheries (5 AAC 39.220), the Salmon Escapement Goal Policy (5 AAC 39.223), and local fishery management plans (5 AAC 39.200). These regulations require fishery managers to consider the interactions of wild and hatchery salmon stocks when reviewing hatchery management plans and permits.

The guidance provided by these policies is sometimes very specific, and sometimes less so. For example, the Alaska Fish Health and Disease Control Policy (5 AAC 39.223) mandates the use of an iodine solution on salmon eggs transported between watersheds—a prescribed practice that requires little interpretation. In contrast, several policies prioritize the protection of wild stocks from the potential effects of fisheries enhancement projects without specifying or mandating how to assess those effects. These less specific policies provide principles and priorities, but not specific direction, for decision making.

The initial rotation of these evaluation reports will assess the consistency of individual hatcheries with state policies by (1) confirming that permits have been properly reviewed using applicable policies, and (2) identifying information relevant to each program's consistency with state policies. Future reports may assess regional effects of hatcheries on wild stocks and fishery management.

OVERVIEW OF HATCHERY PERMITS AND PLANS

The FRED Division built and operated several hatcheries across the state in the 1970s and gradually transferred operations of most facilities to PNP corporations. Regional aquaculture associations (RAAs), whose membership is comprised of the commercial salmon fishing permit holders and representatives of other user groups interested in fisheries within the region, operate most of the PNP hatcheries in Kodiak, Cook Inlet, Prince William Sound, and Southeast Alaska.

Each RAA's board of directors establish goals for enhanced production, oversee business operations of the hatcheries, and work with ADF&G staff to comply with state permitting and planning regulations. Commercial salmon fishing permit holders may vote to impose a salmon enhancement tax on sale of salmon in their region to finance hatchery operations and enhancement and rehabilitation activities. Independent PNP corporations, not affiliated with an RAA, also operate hatcheries in several areas of the state. Both the RAAs and independent PNP hatchery organizations may harvest salmon returning to their release sites to pay for operations. Such harvests by hatchery operators are called *cost-recovery* fisheries, and are in contrast to *common property* fisheries, which are fisheries open to all commercial fishing permit holders, subsistence users and sport harvesters. Several organizations have tourist and educational programs that contribute to the financial support of their programs, as well.

RAAs do not receive a blanket permit for their hatcheries. Each hatchery is permitted separately. Acquisition of a hatchery permit is an extensive process (5 AAC 40.110–40.230). A hatchery application consists of the goals of the hatchery, production goals and hatchery site information, water flow and chemistry data, land ownership and water rights, hatchery design, initial proposed broodstock for the hatchery, and a financial plan. ADF&G staff review the application with the applicant, address any deficiencies, and draft a fishery management feasibility analysis for the proposed hatchery. The RPT reviews the hatchery plan to determine if the hatchery operation is compatible with the regional comprehensive salmon plan. A public hearing is then held. The hatchery applicant describes the proposed hatchery plan. ADF&G staff present the basic management plan for the hatchery, including fish culture aspects of the proposed hatchery and management of the hatchery return. Public testimony and questions follow the presentations. ADF&G must respond in writing to any specific objections.

Following review by the RPT and the public hearing, the application is sent to the ADF&G commissioner for final consideration. By regulation (5AAC 40.220) the commissioner's decision is based on consideration of (1) the suitability of the site for making a reasonable contribution to the common property fishery, not adversely affecting management of wild stocks, and not requiring significant alterations of traditional fisheries; (2) the operation of the hatchery makes the best use of the site's potential to benefit the common property fishery; (3) the harvest area size at the hatchery is sufficient in size to provide a segregated harvest of hatchery fish of acceptable quality for sale; (4) proposed donor sources can meet broodstock needs for the hatchery for the first cycle; (5) water sources for the hatchery are secured by permit and are of appropriate quality and quantity; and (6) the hatchery has a reasonable level of operational feasibility and an acceptable degree of potential success.

Public participation is an integral part of the PNP hatchery system. Hearings are held before a hatchery is permitted for operation. RPTs comprised of ADF&G and RAA representatives hold public meetings to define desired production goals by species, area, and time, and document these goals in comprehensive salmon plans (5 AAC 40.300). RPTs hold public meetings to review applications for new hatcheries and to make recommendations to the ADF&G commissioner regarding changes to existing hatchery operations, new hatchery production, and new hatchery facilities. Municipal, commercial, sport, and subsistence fishing representatives commonly hold seats on both RAA and independent PNP hatchery organization boards, providing broad public oversight of operations.

Alaska PNP hatcheries operate under 4 documents required in regulation: hatchery permit with basic management plan (BMP), annual management plan (AMP), fish transport permit (FTP), and annual report (Figure 2).

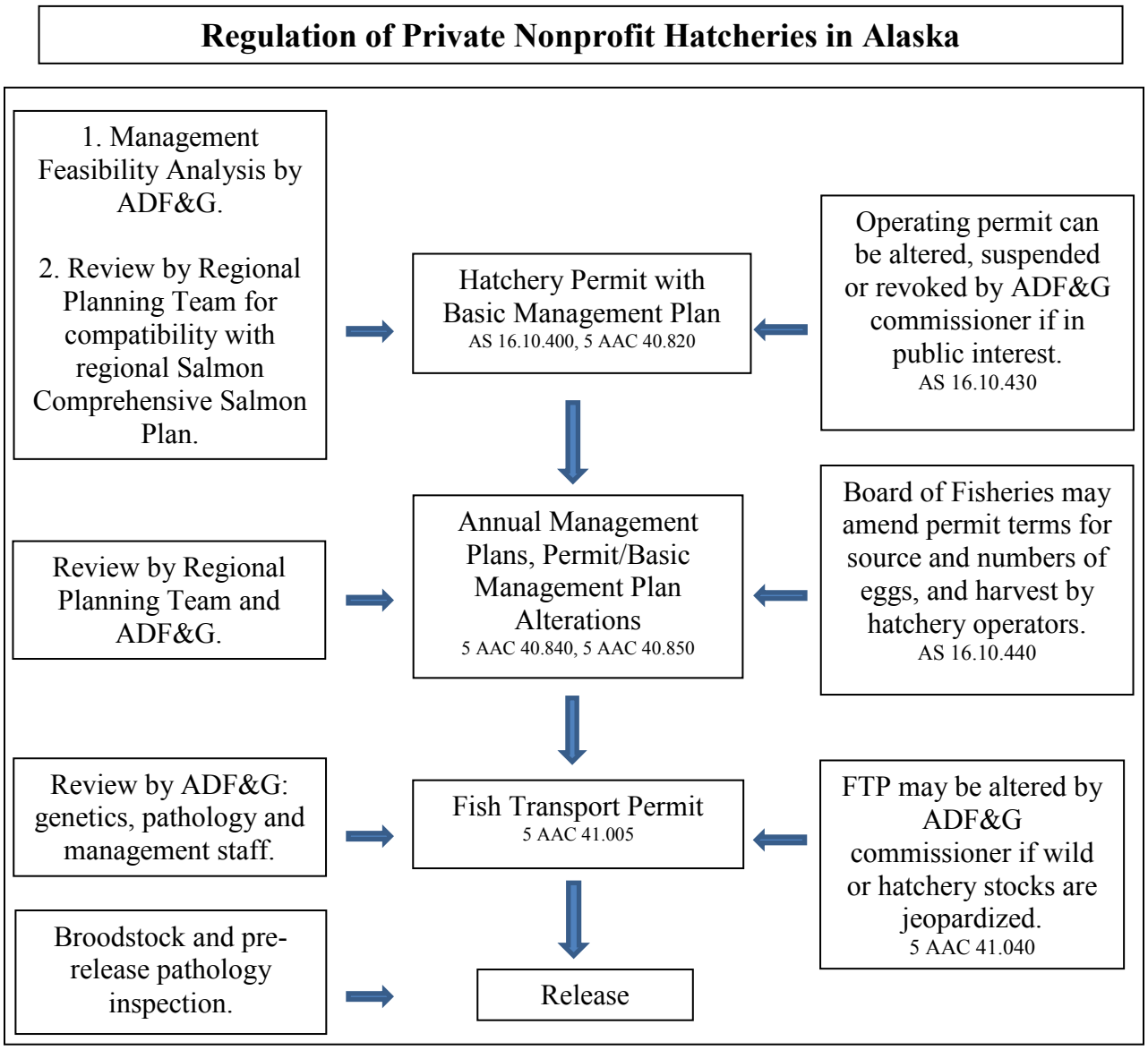

Figure 2.–Diagram of Alaska hatchery permitting process.

The hatchery permit authorizes operation of the hatchery, specifies the maximum number of eggs of each species that a facility can incubate, specifies the authorized release locations, and may identify stocks allowed for broodstock. The BMP is an addendum to the hatchery permit and outlines the general operations of the hatchery. The BMP may describe the facility design, operational protocols, hatchery practices, broodstock development schedule, donor stocks, harvest management, release sites, and consideration of wild stock management. The BMP functions as part of the hatchery permit and the 2 documents should be revised together if the

permit is amended. The permit and BMP are not transferrable. Hatchery permits remain in effect unless relinquished by the permit holder or revoked by the ADF&G commissioner.

Hatchery permits/BMPs may be amended by the permit holder through a permit alteration request (PAR). Requested changes are reviewed by the RPT and ADF&G staff and their recommendations are sent to the ADF&G commissioner. If approved by the commissioner, the permit is amended to include the PAR. Reference to a permit or hatchery permit in this document also includes approved PARs to the hatchery permit unless otherwise noted.

The AMP outlines operations for the current year. It should "organize and guide the hatchery's operations, for each calendar year, regarding production goals, broodstock development, and harvest management of hatchery returns" (5 AAC 40.840). Typically, AMPs include the current year's egg-take goals, fry or smolt releases, expected adult returns, harvest management plans, FTPs (described below) required or in place, and fish culture techniques. The AMP must be consistent with the hatchery permit and BMP.

An FTP is required for egg collections, transports, and releases (5 AAC 41.001–41.100). The FTP authorizes specific activities described in the hatchery permit and management plans, including broodstock sources, gamete collections, and release sites. All FTP applications are currently reviewed by the ADF&G fish pathologist, fish geneticist, regional resource development biologist, and other ADF&G staff as delegated by the ADF&G commissioner. Reviewers may suggest conditions for the FTP. Final consideration of the application is made by the ADF&G commissioner or commissioner's delegate. An FTP is issued for a fixed time period and includes both the specifics of the planned operation and any conditions added by ADF&G.

Each hatchery is required by law to submit an annual report documenting egg collections, juvenile releases, current year run sizes, contributions to fisheries, and projected run sizes for the following year (AS 16.10.470). Information for all hatcheries is compiled into an annual ADF&G report (e.g., Vercessi 2015) to the Alaska Legislature (AS 16.05.092).

The administration of hatchery permitting, planning, and reporting requires regular and direct communication between ADF&G staff and hatchery operators. The serial documentation from hatchery permit/BMP to AMP to FTP to annual report spans generations of hatchery and ADF&G personnel, providing an important history of each hatchery's species produced, stock lineages, releases, returns, and pathology.

PORT ARMSTRONG HATCHERY OVERVIEW

HATCHERY PERMIT

The Port Armstrong Hatchery is located on southeastern Baranof Island in lower Chatham Strait (Figure 3). The hatchery is fed from 2 lakes: Jetty Lake and Betty Lake.

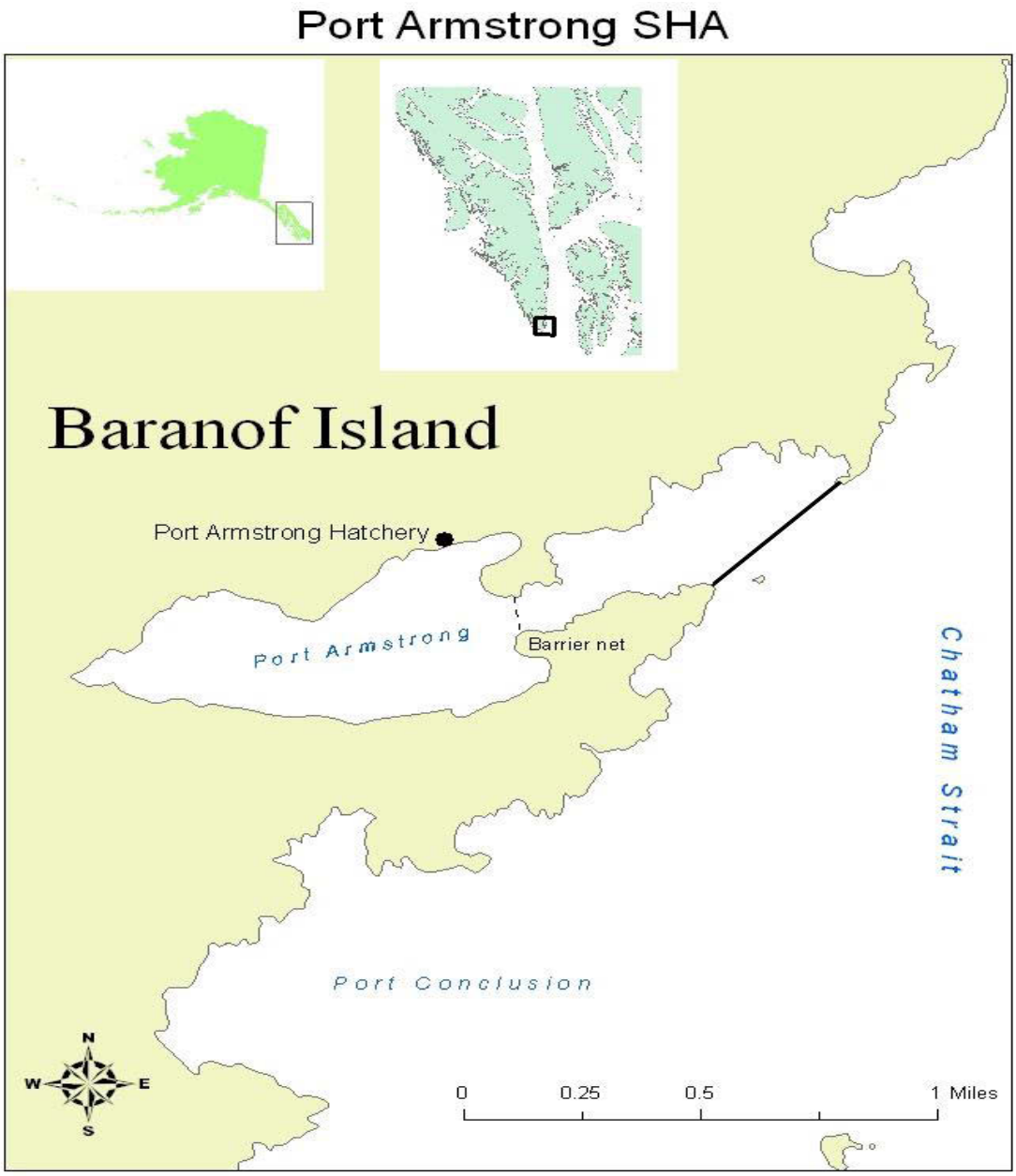

Figure 3.–Location of Port Armstrong Hatchery in Southeast Alaska.

Port Armstrong attracted the interest of ADF&G as early as 1976, when ADF&G staff contacted the land owners of the potential hatchery site regarding purchase of the land for a state hatchery.[6] Residents of nearby Port Alexander, the historic salmon trolling community located just south of Port Armstrong, also expressed interest in development of the hatchery site.[7] Some residents and the Port Alexander Trollers Association[8] were opposed to hatchery construction at the site. Port

[6] Letter from Ken Leon, ADF&G regional FRED biologist, to Richard Mathews, apparent owner of the Port Armstrong hatchery site, dated Oct 11, 1976. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[7] Resolution 76-7 from the City of Port Alexander to ADF&G, dated November 1 1976. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[8] Letter from the Port Alexander Trollers Association to NSRAA, dated January 39, 1978. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

Alexander was primarily a trolling community that harvested coho and Chinook salmon near the town. Many believed a large hatchery would bring in an increase of purse seine vessels to harvest the pink and chum salmon produced by the hatchery, and potentially require fishing closures near the hatchery for protection of broodstock.[9] The ADF&G commissioner responded to Port Alexander residents that the hatchery conceptually would produce chum and coho salmon, and that as the troll fishery did not (at the time) harvest significant numbers of chum salmon, trolling would not likely close to protect chum salmon broodstock. The commissioner also indicated that the facility would require permanent housing for up to 4 families, a population increase that would have a minimal impact on the area.[10]

In July 1977, ADF&G applied to the Alaska Department of Natural Resources (ADNR) for water rights from Betty Lake for a salmon hatchery. The application was for water sufficient for an 80 million egg salmon hatchery.[11] ADF&G was granted a permit in 1978 (ADNR permit ADL 100005).

In 1978, a private individual applied for water rights from Jetty Lake for a hydropower project, and was issued a water rights permit in 1979 (ADNR permit ADL 100144).[12] Thus 2 permits had been issued for these 2 lakes that are part of the same drainage. In 1980, the private individual went into partnership with another individual to form a PNP called Armstrong Keta, Inc. (AKI). AKI applied for a PNP hatchery for the same site as that proposed by ADF&G, and ADF&G withdrew its interest in siting a hatchery in the same location because one of the principals at AKI privately owned the land.[13] The application was for a 10 million chum salmon egg capacity. Some ADF&G FRED Division staff recommended denial of the application because the staff estimated the site had the potential for a 50 to 60 million egg capacity facility, and therefore the small size of the proposed facility would not maximize the site and water resource. Other issues included (1) the proposed site was about 1/2 mile from another FRED Division proposed site, (2) FRED Division already had a proprietary water use permit and it would nullify the applicant's claim to a water use permit, and (3) the application contained too little information on engineering and construction details.[14] Other staff reviewers from the Divisions of Commercial Fisheries, Sport Fish, and FRED did not object to the PNP application.[15]

In response to the permit denial recommendations, AKI indicated their willingness to (1) increase production to more fully utilize the site when the viability of the operation was established, (2) work with ADF&G for broodstock development if ADF&G also established a

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[9] Letter from Richard Mathews, Port Alexander resident, and accompanying petition signed by 38 residents of Port Alexander, to ADF&G, dated October 11, 1977. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[10] Letter from R. Skoog, ADF&G commissioner, to Richard Matthews, dated Sept. 14, 1977. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[11] Application for water rights from ADF&G to the Alaska Dept. of Natural Resources, dated July 1, 1977. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[12] Permit number 100144-P issued to Richard Mathews by the Alaska Dept. of Natural Resources, dated August 6, 1979. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[13] Memo from B. Sele, ADF&G area biologist, to Karen Crandall, ADF&G FRED biologist, dated January 29, 1980. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[14] Memo from J. Davis, PNP program fish culturist, to R. Burkett, FRED Division, dated January 21, 1980. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[15] Comments by H. Heinkel and D. Young on a memo from S. Moberly to H. Anderson, H. Heinkel, J. Holland and D. Young, dated November 16, 1979.

B. Sele, ADF&G area biologist, to K. Crandall, ADF&G FRED biologist, dated January 29, 1980.

Memo from B. Wilbur, ADF&G aquaculture harvest coordinator, to J. Madden, ADF&G. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

hatchery, (3) raise coho salmon fry for sale to either FRED or NSRAA for lake stocking projects, and (4) reduce the size of their hatchery if water capacity was reduced by ADF&G also building a hatchery at Port Armstrong.[16] The RPT considered the situation in early 1980, concluded the site was compatible, and recommended that AKI proceed with a final application. ADF&G staff also agreed that AKI could proceed to a final application and that all the concerns and issues arising from the dual interest in the site could be decided then.[17]

The hatchery permit application was submitted in 1980. The ADF&G Division of Commercial Fisheries staff commented that there should be no significant management problems or impacts on wild stocks with a hatchery at Port Armstrong. Staff also commented that if only the PNP hatchery was built, they would only support a hatchery that fully utilized the site's production potential because Port Armstrong was one of the few sites in Southeast Alaska that combined excellent management potential with high hatchery production potential.[18]

The public hearing was held in September, 1980, in Port Alexander, where AKI presented their hatchery plan. They noted that coho salmon were not in the initial plans because of the expense of concrete raceway construction for rearing fry to smolt, and that the ice conditions in Port Armstrong precluded using net pens in the winter. They indicated they would be interested in rearing coho to the fry stage for lake stocking in partnership with ADF&G. AKI's plan was to produce pink salmon for the initial years of hatchery operations and use the economic return from pink salmon sales to develop a chum salmon stock for the long term. A fall-run chum salmon stock was preferred to avoid both the high water temperatures possible during the middle of the summer and the potential gear conflict between purse seine and troll vessels during the traditional summer troll fishery near Port Armstrong. AKI indicated that the hatchery capacity was for 10 million eggs, and acknowledged that some Port Alexander residents had concerns that producing significant numbers of chum salmon would primarily benefit the seine fleet. AKI pledged not to increase the permitted capacity of the hatchery above 20 million eggs without input from the Port Alexander city council.[19] Those submitting written testimony were not opposed to the hatchery if the area for seining was restricted to Port Armstrong and did not include Port Conclusion waters.

Overall, ADF&G staff determined that the hatchery plan was technically feasible. The main problem with regard to fisheries management was how to harvest hatchery returns and minimize conflict between trollers and seiners in the terminal harvest area (THA). ADF&G managers recommended including Port Conclusion in the THA because of the small area available in Port Armstrong and because the fish harvested in Port Conclusion would probably be of higher quality. Managers believed that trollers fishing in the area would not be adversely affected by the hatchery or by seining in Port Conclusion. Port Alexander trollers expressed concern that the coho and pink salmon they targeted in the area would be caught by seiners targeting the hatchery returns. ADF&G managers indicated that short openings targeting fall chum salmon production would not produce a large wild stock interception by the seine fleet.

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[16] Letter from R. Mathews to Jerry Madden, ADF&G PNP coordinator received March 11, 1980. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[17] Letter from ADF&G commissioner R. Skoog to R. Mathews dated April 15, 1980. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[18] Memo from B. Wilbur, ADF&G Commercial Fisheries Division to J. Madden, FRED Division dated May 5, 1980. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[19] Quote from R. Mathews, Armstrong Keta principal, from public meeting transcript. Unpublished document obtained from Sam Rabung, ADF&G PNP Hatchery coordinator, Juneau.

The hatchery permit application put forward for the ADF&G commissioner's consideration was for chum salmon production and a THA that included Port Conclusion. The PNP hatchery program coordinator provided 2 alternative options for the deputy commissioner to consider. One would be to approve the permit with the THA confined to Port Armstrong. This would address the concerns of trollers and allow summer chum salmon production since temporal separation from pink and coho salmon stocks would not be necessary. The other option was to deny the permit based on troller objections for inclusion of Port Conclusion in the THA.[20]

The deputy commissioner recommended approval of the permit in its original form for production of fall chum salmon and a THA that included Port Conclusion. [21] The ADF&G commissioner approved the permit in February 1981 as recommended (Appendix A). The hatchery was permitted for up to 11 million pink and chum salmon eggs combined. Donor sources for pink salmon included local systems Sashin Creek and Lover's Cove Creek. Chum salmon sources were to be approved through the FTP review process. The BMP stated that donor stocks for the hatchery should be within 50 water miles of Port Armstrong, and that systems from lower Chatham Strait were desirable because migration routes will be similar to those necessary for the hatchery stocks. Chum salmon were to be fall run stocks that spawn in September and October.

Harvest management in the BMP indicated that most pink salmon returns would be necessary for cost recovery and broodstock. Chum salmon available for common property seine harvest would be caught in short seine openings to limit the interception of migrating wild stocks in the area. In addition, only a fall-run chum salmon stock was allowed to be developed to limit interference of the summer troll fisheries in the Port Conclusion area.

HATCHERY PERMIT ALTERATIONS

1984. The first permit alteration for Port Armstrong Hatchery was approved in 1984 (Appendix A). AKI requested a production increase from 11 million pink and chum salmon eggs combined to 20 million pink and 20 million chum salmon eggs, and adding 500,000 Chinook salmon eggs to the permit. AKI requested the additional chum salmon production be obtained from Hidden Falls Hatchery broodstock, which was a summer-run chum salmon stock. The Northern Southeast RPT (NSERPT) recommended a 12 million pink salmon egg capacity and 4 million fall chum salmon egg capacity. The NSERPT and ADF&G FRED Division staff recommended against Chinook salmon production until the hatchery operators had more experience. ADF&G Divisions of Commercial Fisheries and Sport Fish staff and the Port Alexander Fish and Game Advisory Committee recommended that only fall-run chum salmon be used to keep to the original intent of the Port Armstrong Hatchery permit. The Port Alexander Fish and Game Advisory Committee also recommended that Chinook and/or coho salmon production be initiated as soon as possible to benefit the troll fishery.[22] The ADF&G commissioner approved a permit alteration for egg capacities of 12 million pink, 4 million fall-run chum, and 50,000 Chinook salmon.

[20] Memo from J. Madden, ADF&G PNP coordinator, to D. Collinsworth, ADF&G commissioner, dated October 20, 1980. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[21] Memo from J. Madden, ADF&G PNP coordinator, to D. Collinsworth, ADF&G deputy commissioner, dated Sept 18, 1980. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[22] Memo from J. Madden, ADF&G PNP coordinator, to D. Collinsworth, ADF&G deputy commissioner, dated Nov. 14, 1980. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

1985. AKI requested an increase of 4 million pink salmon eggs to fill the hatchery's existing production capability. The NSERPT and ADF&G staff recommended approval of the PAR. The ADF&G commissioner approved a permit alteration to increase pink salmon capacity from 12 million to 16 million eggs.[23]

1986. AKI requested an increase for Chinook salmon production from 50,000 eggs to 80,000 eggs when 80,000 surplus fry became available from Little Port Walter Research Station hatchery. The NSERPT and ADF&G staff recommended approval of the PAR. The ADF&G commissioner approved a permit alteration to increase Chinook salmon capacity from 50,000 to 80,000 eggs.

1987. AKI requested a chum salmon production increase from 4 million eggs to 10 million eggs in keeping with the long-range plan for the hatchery. New coho salmon capacity of 500,000 eggs was also requested to benefit the local troll fishery. The NSERPT recommended approval of the PAR. ADF&G staff commented that increased coho salmon production from Port Armstrong Hatchery and other hatcheries in the region may complicate inseason management of the troll fishery for naturally spawning stocks. In addition, there was worry that coho salmon released from the hatchery could increase predation on pink and chum salmon fry. ADF&G staff indicated that AKI should pursue coho salmon broodstock from the nearby NSRAA coho salmon project at Deer Lake. Otherwise, the limited availability of coho salmon from other local stocks could delay broodstock development.[24] The ADF&G deputy commissioner approved the permit alteration.

1988. AKI requested an increase of 14 million eggs to its pink salmon program to provide fiscal stability for its operations until a determination of the chum salmon program's viability could be made. At the time of the PAR, AKI was having problems with availability of chum salmon broodstock and quality of chum salmon harvested for cost recovery sale.[25] The NSERPT and ADF&G staff recommended approval of the PAR. The ADF&G deputy commissioner approved the permit alteration to increase pink salmon capacity from 16 million to 30 million eggs.

1990. AKI requested an increase of 25 million eggs to its pink salmon program to meet future corporate financial needs. By this time, it was clear that the chum salmon program was not on track for providing necessary broodstock or quality cost recovery harvest. ADF&G encouraged AKI to drop the chum salmon program and pursue pink and coho salmon production to meet cost recovery needs. However, at issue was the timing of the pink salmon return, which would necessitate a seine fishery near the hatchery and potentially conflict with the troll fishery. AKI did not want a common property seine fishery in the terminal area because it wanted the majority of the return for cost recovery and believed hatchery returns would make sufficient contribution to the common property fisheries in lower Chatham Strait. The NSERPT recommended against the request because they did not believe it would provide a sufficient benefit to the common property fisheries, particularly the seine fisheries.

As an alternative, the NSERPT suggested increasing the requested capacity to 110 million pink salmon eggs, with half of the production for release at a remote site for a directed terminal

[23] Memo from J. Madden, ADF&G PNP coordinator, to S. Pennoyer, ADF&G deputy commissioner, dated March 15, 1985. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[24] Memo from J. Madden, ADF&G PNP coordinator, to S. Pennoyer, ADF&G deputy commissioner, dated April 9, 1987. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[25] Memo from S. McGee, ADF&G PNP coordinator, to N. Cohen, ADF&G deputy commissioner, dated May 17, 1988. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

fishery. ADF&G staff supported the NSERPT approach. In addition, the NSERPT approved the request to expand Chinook salmon production, as did ADF&G staff and the regional Chinook Salmon Planning Team.[26]

The ADF&G deputy commissioner approved a permit alteration to increase pink salmon capacity from 30 million to 55 million eggs and Chinook salmon production from 80,000 to 250,000 eggs. An additional 55 million pink salmon eggs were conditionally approved for offsite release, but it does not appear that this conditional increment under this permit alteration was ever applied or considered as part of the hatchery's permitted capacity.

1992. AKI requested an increase of 1 million eggs to its coho salmon program and a reduction of 55 million eggs for remote release of pink salmon, essentially swapping the financial benefits of the reduced pink salmon production for the increased coho salmon production. Pink salmon prices had declined significantly since the permit alteration to increase pink salmon production approved in 1989, and AKI believed that increased pink salmon production was no longer a desirable goal. Coho salmon could be released directly from the hatchery, avoiding any controversy over identification of a remote release site. Coho salmon would also be more popular to the troll fleet. The NSERPT and ADF&G staff recommended approval of the PAR. ADF&G Division of Habitat staff expressed concern that the resident rainbow trout (*O. mykiss*) not be adversely impacted by further water withdrawals from the lakes for the coho salmon production, and AKI indicated plans to reconstruct the existing dam to better control lake levels. ADF&G commercial fisheries division staff recommended mandatory marking of a portion of the coho salmon releases.[27]

The ADF&G deputy commissioner approved a permit alteration to increase coho salmon capacity from 500,000 to 1.5 million with mandatory marking of a portion of the release. Pink salmon permitted capacity, however, was not reduced by the permit alteration, apparently because the 55 million eggs conditionally approved in 1990 had not been added to the permitted capacity.

1994a. AKI requested an increase of 1.75 million eggs to its Chinook salmon program to provide Chinook salmon for Pacific Salmon Treaty mitigation. The NSERPT and ADF&G staff recommended approval of the PAR. ADF&G Division of Habitat staff expressed concern that the resident rainbow trout (*O. mykiss*) not be adversely impacted by further water withdrawals for the Chinook salmon production, and AKI indicated it had improved the existing dam and established a physical benchmark to monitor lake levels.

1994b. AKI applied for a second PAR in 1994 to increase pink salmon production by 30 million eggs for release from the hatchery to provide additional revenue to the hatchery in the face of lower pink salmon prices and increasing harvest of returns by the seine fishery. AKI also

[26] A government and industry group formed to provide guidance for Chinook hatchery production under the Pacific Salmon Treaty.
Memo from S. McGee, ADF&G PNP coordinator, to N. Cohen, ADF&G deputy commissioner, dated April 10, 1990. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[27] Memo from S. McGee, ADF&G PNP coordinator, to C. Rosier, ADF&G commissioner, dated March 19, 1992. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

requested an increase in coho salmon production for 1 year only[28] when Chinook salmon eggs for the earlier permit alteration were not available.

The Petersburg Vessel Owners Association expressed concerns that the area around Port Armstrong might be managed to protect returning hatchery fish and that, in general, local seiners did not support increased hatchery pink salmon production. In addition, seiners conducting cost recovery for AKI for coho salmon claimed to have witnessed thousands of dead pink salmon that were not utilized by the hatchery and were concerned with "mismanagement" of the resource by AKI.[29]

The request was approved by the NSERPT. ADF&G staff had some concerns about increased fry releases potentially exceeding carrying capacity for the area. Otherwise, they were not concerned about the ability to manage for hatchery returns and pink salmon escapements.[30] For coho salmon, staff requested a portion of the coho salmon releases be marked for management.[31]

The ADF&G deputy commissioner approved a permit alteration to increase pink salmon capacity for release at the hatchery from 55 million to 85 million eggs, and for a 1-year increase in coho salmon production from 1.5 million to 2.0 million eggs.

1995. The ADF&G deputy commissioner approved a PAR to extend the 1994 increase in coho salmon production for 2 additional years when Chinook eggs were not anticipated to be available.

1999. In 1999, the Deputy Commissioner issued a permit alteration that removed chum salmon production from the Port Armstrong Hatchery permit because AKI was not producing chum salmon. It is not clear who submitted a PAR or if one was submitted. The paperwork in the files indicates the permit alteration occurred after agreement was reached with AKI and the PAR recommended for approval by the RPT.[32] The permit alteration indicated that coho salmon permitted capacity "remained" at 2 million eggs, but the previous permit alteration indicated that the coho salmon capacity would return to 1.5 million eggs in 1998.

2002. AKI requested summer-run chum salmon production to diversify production at the facility. By 2002, chum salmon had become the most economically beneficial species for hatchery operators. According to their PAR, AKI indicated that the value of dark chum salmon had increased greatly in value to the extent that there was no incentive to move the terminal cost recovery area out of Port Armstrong to harvest brighter fish. AKI predicted that at full

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[28] The PAR application did not state the request was for 1 year only, but a memo from S. Morgan, ADF&G planner, to C. Rosier, ADF&G commissioner, dated Dec. 30, 1994, indicated that was their intent. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[29] Letter from Petersburg Vessel Owners Association to Steve McGee, ADF&G, dated Nov. 7, 1994. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau. To address concerns such as these, the Alaska legislature had enacted statutes in 1992 that required mixed hatchery and wild stock fisheries to be managed based on abundance of wild stocks (AS 16.05.730), and therefore, fisheries in the Port Armstrong area would not be based on fish returning to the hatchery. This was according to a memo from S. McGee, ADF&G PNP coordinator to C. Meacham, ADF&G deputy commissioner dated Dec. 9, 1994. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[30] Memo from R. DeJong, ADF&G area biologist, to D. Mecum, ADF&G coordinator, dated Nov. 4, 1994. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[31] Email from L. Shaul, ADF&G, to R. DeJong, ADF&G, dated Nov. 3, 1994. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[32] Letter from Steve McGee, ADF&G to Tim Blust, AKI director, dated March 26, 1999. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.
Letter from Tim Blust, AKI director, to Steve McGee, ADF&G, dated April 23, 1998. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

production, an annual release from 30 million chum salmon eggs would provide nearly twice the income of their current pink salmon production, and would boost AKI well above the threshold for being able to pay off loans quickly and provide a higher percentage of the return to the common property fishery.

Potential summer-run chum salmon stocks included local runs on Admiralty and Kuiu Island, as well as the Hidden Falls Hatchery stock, which AKI acknowledged was already in use in 3 other hatcheries and therefore at the *Genetic Policy* guideline limit.[33] However, it was not stated nor is it clear which 3 hatcheries AKI was referring to. The stock was in use at Gunnuk Creek and Hidden Falls, and the stock was part of the mix of stocks that make up the Macaulay Salmon Hatchery stock. There perhaps was confusion that the stock was released at a third site (Deep Inlet), but this is allowed under the *Genetic Policy.*

ADF&G managers generally supported the request, and recommended that all releases be marked to document fishery contribution. The ADF&G genetics sections raised concern that the Hidden Falls Hatchery stock was already used at 3 facilities and for that reason it would not be acceptable for Port Armstrong Hatchery, but again, it is not certain which 3 facilities were being referred to (see previous paragraph), and perhaps the geneticist made the recommendation based on the reference of use in 3 hatcheries in the application.

The NSERPT supported the alteration. The ADF&G deputy commissioner approved a permit alteration to add summer-run chum salmon to the permit at a 30 million egg capacity. The permit alteration required that all releases be marked, and that a minimum 4-year sampling program be funded to document contributions to the District 9 common property fisheries. In addition, AKI was directed to investigate an alternative release site in Port Lucy to maximize common property harvest opportunities.

The ADF&G geneticist recommended approval for use of Hidden Falls Hatchery stock under FTPs for the program (FTPs 03J-1002 and 03J-1009), apparently after resolving the issue that the stock was not in production at 3 hatcheries. The geneticist stated that developing a brood source from suggested wild stock systems in the area would amount to "mining" these stocks for several brood cycles to develop a hatchery stock, and therefore using the Hidden Falls Hatchery stock was a more acceptable approach. ADF&G Divisions of Sport Fish and Commercial Fisheries staff also recommended approval of the FTP, based on the geneticist's recommendation.

2004. According to NSERPT minutes, AKI submitted a PAR in 2004 to add Port Lucy as a release site for the chum salmon program, but the application documents were not located. There was public testimony against the Port Lucy release site. Some trollers were concerned that if Port Lucy was designated as a terminal area, the Alaska Board of Fisheries would allow seining in an area which up to that time had traditionally been a troll-only salmon fishing area. These trollers believed increased coho production would be more beneficial to all common property fisheries without interfering with traditional trolling areas. The PAR was opposed by the NSERPT[34] and apparently not moved forward in the permit alteration process for further consideration.

[33] Memo from S. McGee to Distribution dated Feb. 15, 2002. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[34] Memo from F. Pryor, ADF&G, to M. Campbell, ADF&G commissioner dated May 2, 2005. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

2005. AKI submitted a PAR to increase coho salmon capacity from 2.0 million to 3.0 million eggs, but as mentioned earlier, the AKI permitted capacity for coho salmon was actually 1.5 million eggs at the time according to the documents on file. The increase was requested for increased contribution to the troll fleet and increased contribution to cost recovery revenue. The NSERPT supported the increase, and the ADF&G deputy commissioner approved the permit alteration to increase coho salmon production to 3.0 million eggs.

2007. AKI requested substitution of coho salmon for their Chinook salmon capacity in years when they could not collect their full capacity of Chinook salmon eggs in order to maintain full production at the hatchery. ADF&G staff supported the PAR and the NSERPT recommended approval.[35] The ADF&G deputy commissioner approved the permit alteration to allow an aggregate Chinook and coho salmon capacity of 5 million eggs, with no more than 2 million of the total to be Chinook salmon eggs.

2009. AKI was granted 1-year emergency permit alteration for collection and incubation to the eyed stage of an additional 50 million chum salmon eggs at AKI for transfer to the Gunnuk Creek Hatchery near Kake, Alaska. The PAR was submitted when it was apparent that Gunnuk Creek Hatchery would fall short of broodstock. Port Armstrong Hatchery was an approved source of green chum salmon eggs for Gunnuk Creek Hatchery, but the permit alteration was needed to allow incubation to the eyed-egg stage at Port Armstrong Hatchery prior to transport.

2010a. In 2010, the 1-year duration 2009 permit alteration was recommended for approval in perpetuity by the NSERPT and PNP Hatchery Program coordinator,[36] and then approved by the ADF&G deputy commissioner. The permit alteration was different than the 2009 permit alteration in that the additional 50 million chum salmon eggs could be transferred to either Gunnuk Creek or Hidden Falls Hatcheries, whereas the 2009 permit amendment allowed eggs to be transferred only to Gunnuk Creek Hatchery.

2010b. AKI submitted a PAR to allow a permitted capacity that combined pink and chum salmon to offer flexibility to the hatchery to produce the species in the greatest demand for harvest. The NSERPT voted 3 to 3 to recommend approval of the PAR. The PNP coordinator recommended denial of the PAR because Port Armstrong Hatchery had not yet experienced full returns from the chum salmon capacity permitted at the time and so had not yet assessed their ability to manage that level of return. The ADF&G deputy commissioner denied the PAR.

2014. AKI submitted a PAR to increase pink salmon capacity by 50 million eggs (from 85 million to 135 million eggs) to increase cost recovery revenue and common property harvest. In addition, the PAR added Port Herbert as a remote release site for up to 85 million pink salmon eggs.

Pink salmon marine survival from Port Armstrong Hatchery releases had declined over the past 3 decades. Four probable causes suggested by AKI staff included growth of predator populations targeting Port Armstrong Hatchery releases, overcrowding of nearshore marine habitat as production increased, predation on pink salmon fry by expanded coho salmon releases, and unfavorable environmental conditions. AKI staff believed the first 3 causes could be addressed by establishing a remote release site.

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[35] Memo from F. Pryor, ADF&G, to D. Lloyd, ADF&G commissioner, dated April 20, 2007. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[36] Memo from B. White, ADF&G, to D. Bedford, ADF&G deputy commissioner, dated May 14, 2010. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

Port Herbert was selected because it was distant enough from Port Armstrong to reduce predation effects on pink salmon releases, it could spread out potential pink salmon fry overcrowding issues, and it would have minimal effects on wild stocks since only sockeye and coho salmon systems were located in Port Herbert.

ADF&G genetics staff recommended the production increase for the hatchery be limited to 20 million eggs and recommended that production for release from Port Herbert be limited to 55 million eggs. This meant that production of 35 million eggs would be transferred from release at the hatchery to release at Port Herbert.[37] Fry were to be differentially marked by release site and Sashin Creek monitored for strays. The NSERPT recommended the PAR as amended with the genetics staff recommendations.

The ADF&G directors of the Divisions of Commercial Fisheries and Sport Fish approved the PAR as amended by the NSERPT. When the FTP for the Port Herbert release was issued, a straying study was not required because ADF&G geneticist staff considered the release of pink salmon originally from nearby Sashin Creek brood stock posed a low genetic risk to wild populations.[38]

SALMON PRODUCTION

Pink Salmon

Port Armstrong Hatchery is one of the few Southeast Alaska hatcheries to continually produce pink salmon, and it is by far the largest pink salmon producer in the region. Gunnuk Creek Hatchery near Kake produced pink salmon until it closed in 2013. Sheldon Jackson Hatchery in Sitka continues to produce a small number of pink salmon for the common property and cost recovery fisheries. Medvejie Creek Hatchery near Sitka produces a very small number of pink salmon to mitigate the natural stock that existed in Medvejie Creek prior to hatchery construction.

Some facilities in the region began operations with pink salmon programs because of the pink salmon's short lifecycle and ease of obtaining broodstock from naturally spawning stocks (e.g., Sheep Creek Hatchery and Macaulay Salmon Hatchery, both located in Juneau). Pink salmon were used at startup, along with chum salmon, until returns of chum salmon were large enough to provide sufficient broodstock to meet egg capacity at the hatchery. Port Armstrong Hatchery, however, was not successful in their initial attempt at establishing a fall-run chum salmon return and continued with pink salmon production. Although pink salmon prices were very low in the early 2000s, prices have since strengthened as described in the Introduction.

AKI procured pink salmon eggs from local systems (Sashin Creek and Lovers Cove Creek, Figure 4) during the first 4 years of hatchery operations, and since then have relied solely on hatchery returns for broodstock. Beginning in 1990, based on estimated harvest and survival rates, adult returns exceeded 1 million fish in most years, with returns exceeding 2 million in 5 years and a peak return of over 4 million fish in 1999. Total return through the 2013 return (2011 brood year) was over 37 million pink salmon (Appendix B). Beginning in brood year 2003, all pink salmon releases are otolith thermal marked. However, no comprehensive sampling program

[37] Memorandum from L. Vercessi, ADF&G biologist, to J. Regnart and C. Swanton, ADF&G directors, dated May 6, 2014. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[38] Comments to FTP 15J-1014 application by W. Grant, ADF&G. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

was in place and return estimates continued to be estimated on assumed harvest and survival rates. In 2012, AKI began a catch sampling program to better estimate the hatchery harvest.

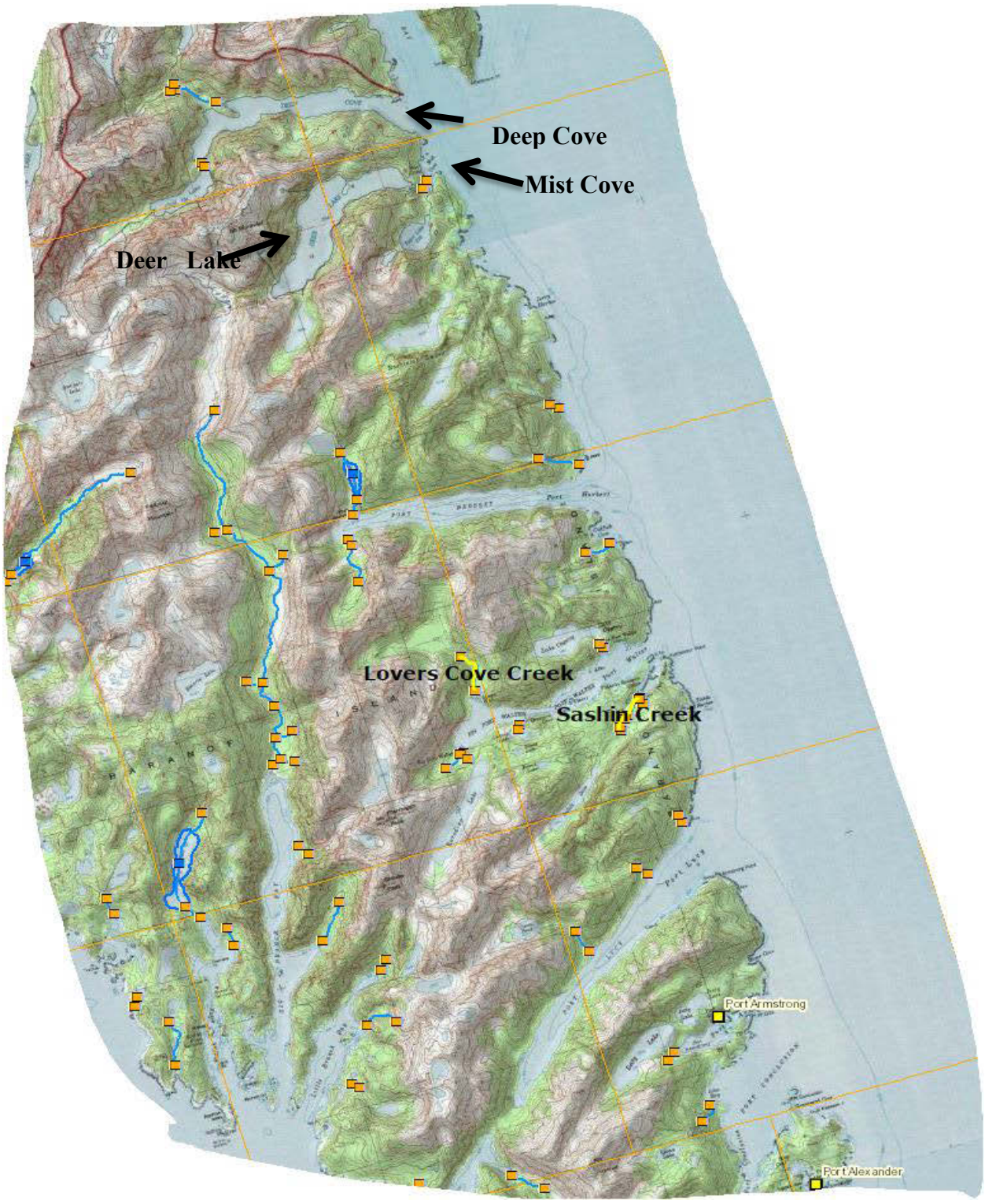

Figure 4.–Stock origin sites for Port Armstrong Hatchery pink and coho salmon.

Chum Salmon

Port Armstrong Hatchery produced fall-run chum salmon with broodstock from systems in Security Bay (1984–1987) and Port Camden (1984), and then from hatchery returns from 1988 to 1991. Returns to the hatchery were poor and AKI discontinued the program in 1994 after no eggs were taken in 1992 and 1993.

In 2003, the hatchery restarted the chum salmon program with summer-run stock. Eggs were acquired from Gunnuk Creek and Hidden Falls hatcheries from 2003 to 2006,[39] and from hatchery returns thereafter. All releases are thermal otolith marked. The egg take goal of 30 million was met with hatchery returns from 2009 to 2013. Estimated returns to date total over 800,000 chum salmon (Appendix C). Like pink salmon, chum salmon returns are based on estimated harvest rates and estimated survival rates, and not on sampling of the adult return.

Chinook Salmon

The Port Armstrong Hatchery program began with fry and egg transfers of Unuk River stock from Little Port Walter Hatchery beginning in 1985. Brood year 1991 was lost due to a pipeline failure. In 1992, AKI expanded the Chinook salmon program with funding from the Pacific Salmon Commission to release 1.5 million smolts annually. At that time, ADF&G directed AKI to abandon the Unuk River stock and switch to the King Salmon River stock being developed at Little Port Walter Hatchery.[40]

While waiting for eggs to become available from Little Port Walter Hatchery, ADF&G released Andrew Creek/Unuk River mixed stock Chinook salmon smolts in 1992 and 1993 from Port Armstrong net pens.[41] Returns from these releases were not to be used for broodstock.

Returns of the King Salmon River stock to Little Port Walter Hatchery were too low to provide surplus eggs for Port Armstrong Hatchery. In 2001, Port Armstrong renewed use of Unuk River stock eggs transferred from Little Port Walter Hatchery. Eggs were collected at Little Port Walter Hatchery and transferred to Port Armstrong Hatchery from 2001 to 2005. From 2006 to 2013, returns to the hatchery were used for broodstock. Chinook salmon returns for the Port Armstrong Hatchery were over 28,000 fish (Appendix D). Returns were estimated based on coded wire tag recoveries sampled from the fisheries and scale samples at the hatchery.

Coho Salmon

The coho salmon program was added to the hatchery permit in 1987, and intended to benefit the troll fishery and provide greater flexibility for cost recovery.[42] The long term goal was to build future production to 3 million smolts,[43] which was reached by a series of permit amendments through 2005.

From 1988 to 1994, coho broodstock was obtained from the Northern Southeast Regional Aquaculture Association (NSRAA) from stocks developed from Deep Cove and Sashin Creek (Figure 4). Returns to Port Armstrong Hatchery were primarily used thereafter, with eggs

[39] Gunnuk Creek Hatchery stock was derived from Hidden Falls Hatchery stock.

[40] 1992 Port Armstrong Hatchery annual report. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[41] These smolts were incubated and reared at Snettisham Hatchery.

[42] Memo from J. Madden, ADF&G, to S. Pennoyer, ADF&G deputy commissioner. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[43] PAR submitted by AKI in 1987. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

provided by Hidden Falls Hatchery as a backup to cover shortfalls. Releases were coded-wire-tagged and returns were sampled in the fisheries and at the hatchery to estimate total return and contributions to the fisheries. Returns to date totaled over 1.7 million fish (Appendix E).

COMPREHENSIVE SALMON PLAN

Phase I Comprehensive Salmon Plan

Three Comprehensive Salmon Plans have been developed to date in Southeast Alaska. The Phase I Southeast Alaska Comprehensive Salmon Plan (CSP) was issued in 1981, the same year as Port Armstrong received its hatchery permit.[44] The CSP established the philosophy and goals for Southeast Alaska salmon enhancement. The mission statement of the plan was "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." Harvest objectives and methods for bridging the gap between the harvest objectives and the natural and enhanced production at the time were developed in the Phase I CSP.

The CSP indicated that pink salmon projects were best sited where they would not impair pink salmon management precision or result in overharvest of naturally spawning stocks. The authors concluded that large scale, long-range hatchery production of pink salmon was not recommended unless the relative value of pink salmon increased to make it more cost effective.

Chum salmon was the most preferred species for major hatchery production with respect to management because they were less likely to disrupt management precision. Summer-run chum salmon would be harvested during existing fisheries managed for sockeye and pink salmon. Fall-run chum salmon stocks would only create management conflicts in the few areas where significant naturally spawning fall-run chum salmon stocks existed.

For coho salmon, proper site selection for hatchery releases could result in benefits to fishermen and still maintain wild stock harvest management precision. Technology for hatchery production of coho salmon existed at the time. The CSP recommended implementation of coho hatchery production in conjunction with ongoing research and evaluation of all projects.

The CSP recommended concentrated research to improve technology for Chinook salmon enhancement, and recommended that extensive hatchery production be pursued if reliable technology was developed.

The authors noted that in some years the entire harvest of hatchery-produced salmon may need to be harvested in the terminal harvest area because the adjacent fisheries are closed due to poor return of naturally spawning stocks. This made it desirable to have a large segregated terminal area to conduct the harvest.

Salmon processors indicated an increasing demand for chum and pink salmon as an inexpensive frozen fish. Processors preferred chum salmon to pink and sockeye salmon because its relatively large size was ideal for processing salmon steaks. A special demand was expressed for fall chum salmon to fill a volume gap after the coho season waned.

The Phase I CSP indicated the achievable long-term 15-year average harvest for naturally spawning fish was 16 million pink, 1.7 million chum, 1 million coho, 700,000 sockeye and 315,000 Chinook salmon. The long-range (year 2000) harvest objectives for the Phase I CSP

[44] Joint southeast Alaska regional planning teams. 1981. Comprehensive salmon enhancement plan for Southeast Alaska: Phase I. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

were to increase the harvest in Southeast Alaska to 537,000 Chinook, 2.1 million sockeye, 2.65 million coho, 30.0 million pink salmon and 9.7 million chum salmon. The objective for pink, sockeye and Chinook salmon was equal to the consecutive 30-year highest catch. The chum and coho salmon objectives were set higher than the 30-year average because of the existing proven successful hatchery technology for these species.[45]

Estimated gaps between increases available by better management and the hatchery capacity at the time were 134,000 Chinook, 1.4 million sockeye, 1.1 million coho, 14 million pink, and 4.6 million chum salmon.

Phase II Comprehensive Salmon Plan

For Phase II CSP planning, the RPTs for northern and southern Southeast Alaska developed separate plans. Port Armstrong Hatchery is located in northern Southeast Alaska. The purpose of the northern Southeast Alaska Phase II CSP was to identify and prioritize enhancement opportunities within 5 geographical units of northern Southeast Alaska: Outer Coastal Unit, Icy Strait/Chatham Strait Unit, Frederick Sound Unit, Stephens Passage Unit and Lynn Canal Unit . Port Armstrong is located in the Outer Coastal Unit (Figure 5).

The Phase II CSP was to provide direction to the efforts of the many government agencies and private groups involved with salmon management (e.g., ADF&G, U.S. Forest Service, National Marine Fisheries Service, RAAs and independent PNP hatchery operators), and serve as a framework to prevent and resolve conflicts over the use and development of the region's salmon resources.

The Phase II CSP identified gaps between the harvest objectives and current harvests for the Icy/Chatham Strait unit of 20,000 Chinook, 100,000 sockeye, 100,000 coho, 500,000 pink and 1 million chum salmon. Gaps between the harvest objectives and current harvests for the Outer Coastal unit were 30,000 Chinook, 190,000 sockeye, 175,000 coho, 3.5 million pink and 1.2 million chum salmon. These targets were to "provide an equitable distribution of production to serve user needs, while considering the limitations imposed by the availability of opportunities and requirements for effective management of wild and enhanced stocks. It is the accepted principle throughout this plan that mixed stock harvests will be managed on the basis of wild run strength, and the unit targets will direct enhancement to areas where it is believed that enhanced stocks can be harvested without ill effects on wild stocks or their management."

In northern Southeast Alaska, the Outer Coastal Unit was recommended as the best unit for pink salmon fishery enhancement because the seine fishery was managed on the basis of escapement data, not harvest data. Chum salmon hatchery production was also recommended because returns could be harvested in traditional seine fisheries that targeted pink salmon without impacting management.

Feasibility and construction of a major hatchery at Port Armstrong was recommended by ADF&G as part of the 5-year program for the CSP production of chum, coho and Chinook salmon. The CSP indicated that Port Armstrong Hatchery had the potential to produce about 100,000 adult chum salmon at its permitted capacity. Pink salmon was mentioned for Outer Coastal Unit hatcheries as a species to be produced during the startup years of the hatchery with later conversion to chum salmon when chum salmon broodstock needs were achieved from hatchery returns.

[45] According to the Phase I CSP, about half of world chum salmon production at the time was produced by hatcheries.

The Phase II plan indicated that hatchery chum salmon production could become a major portion of the seine harvest and contribute to Phase I CSP goals of moderating harvest fluctuations and providing fishermen more time and area to fish. For the troll fleet, the changing regulatory structure at the time made it difficult to determine how hatchery returns would benefit the fishery. However, if a successful enhancement program could effect a more even distribution of the troll fleet, both wild fish and fishermen should benefit.

In 1985, significant changes in hatchery production occurred in Southeast Alaska due to the Pacific Salmon Treaty (PST). From 1986 to 1992, $20 million of funding was made available for fishery enhancement projects to mitigate the harvest restrictions imposed on Southeast Alaska fishers by the PST. PST mitigation funds initially funded Chinook salmon hatchery production. Sockeye, coho and chum salmon program hatchery production funding was added in subsequent years. Adult production goals for Southeast Alaska in the U.S./Canada PST Mitigation program of 100,000 Chinook, 20,000 sockeye and 1 million chum salmon were part of the 1988 Phase II update. Achieving the 100,000 Chinook salmon production goal proved difficult, and the concept of *Chinook equivalents* was later introduced. Coho production, on a 5 coho to 2 Chinook salmon ratio, could substitute for mitigation measures for Chinook salmon production lost under the Pacific Salmon Treaty.[46]

Beginning in 1986, the Phase II plan was updated annually through 1996.[47] The 1987 update[48] indicated that Chinook salmon production was a priority for northern Southeast Alaska. The PST included federal funds for enhancement projects to mitigate harvest losses by gear groups as a result of agreements in the PST. Initial goals included the adult production of 100,000 Chinook, 1.0 million chum, and 20,000 to 40,000 sockeye salmon.

For Port Armstrong Hatchery, a proposal was submitted to the Southeast Chinook Technical Planning Team for expansion of Chinook salmon production to produce an annual return of 30,000 adults.[49] The proposed expansion was listed as a lower priority project by the NSERPT in the 1986–1992 updates[50] because of uncertainty that AKI could secure by permit the required amount of water and make the proposed hatchery improvements for the amount of funding requested.[51]

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[46] Sawmill Creek Hatchery BMP, section 2.6. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[47] Northern Southeast Regional Planning Team. 1986 (1986 Update); 1987 (1987 Update), 1989 (1988 Update), 1990 (1989 Update), 1991 (1990 Update draft), 1992 (1991 Update), 1993 (1992 Update), 1994 (1993 Update), 1995 (1994 Update), 1996 (1995 Update), 1997 (1996 Update). Comprehensive Salmon Plan, Phase II: Northern Southeast Alaska. All unpublished ADF&G documents, Juneau, Alaska, obtained from Sam Rabung, ADF&G PNP Hatchery Coordinator, Juneau.

[48] Northern Southeast Regional Planning Team. 1987. 1987 Update. Comprehensive Salmon Plan, Phase II: Northern Southeast Alaska. ADF&G, Juneau, Alaska. Unpublished document obtained from Sam Rabung, ADF&G PNP Hatchery Coordinator, Juneau.

[49] Northern Southeast Regional Planning Team. 1986. 1986 Update. Comprehensive Salmon Plan, Phase II: Northern Southeast Alaska. ADF&G, Juneau, Alaska. Unpublished document obtained from Sam Rabung, ADF&G PNP Hatchery Coordinator, Juneau.

[50] Northern Southeast Regional Planning Team. 1986 (1986 Update); 1987 (1987 Update), 1989 (1988 Update), 1990 (1989 Update), 1991 (1990 Update draft), 1992 (1991 Update), 1993 (1992 Update). Comprehensive Salmon Plan, Phase II: Northern Southeast Alaska. All unpublished ADF&G documents, Juneau, Alaska, obtained from Sam Rabung, ADF&G PNP Hatchery Coordinator, Juneau.

[51] Northern Southeast Regional Planning Team. 1994. 1993 Update. Comprehensive Salmon Plan, Phase II: Northern Southeast Alaska. ADF&G, Juneau, Alaska.

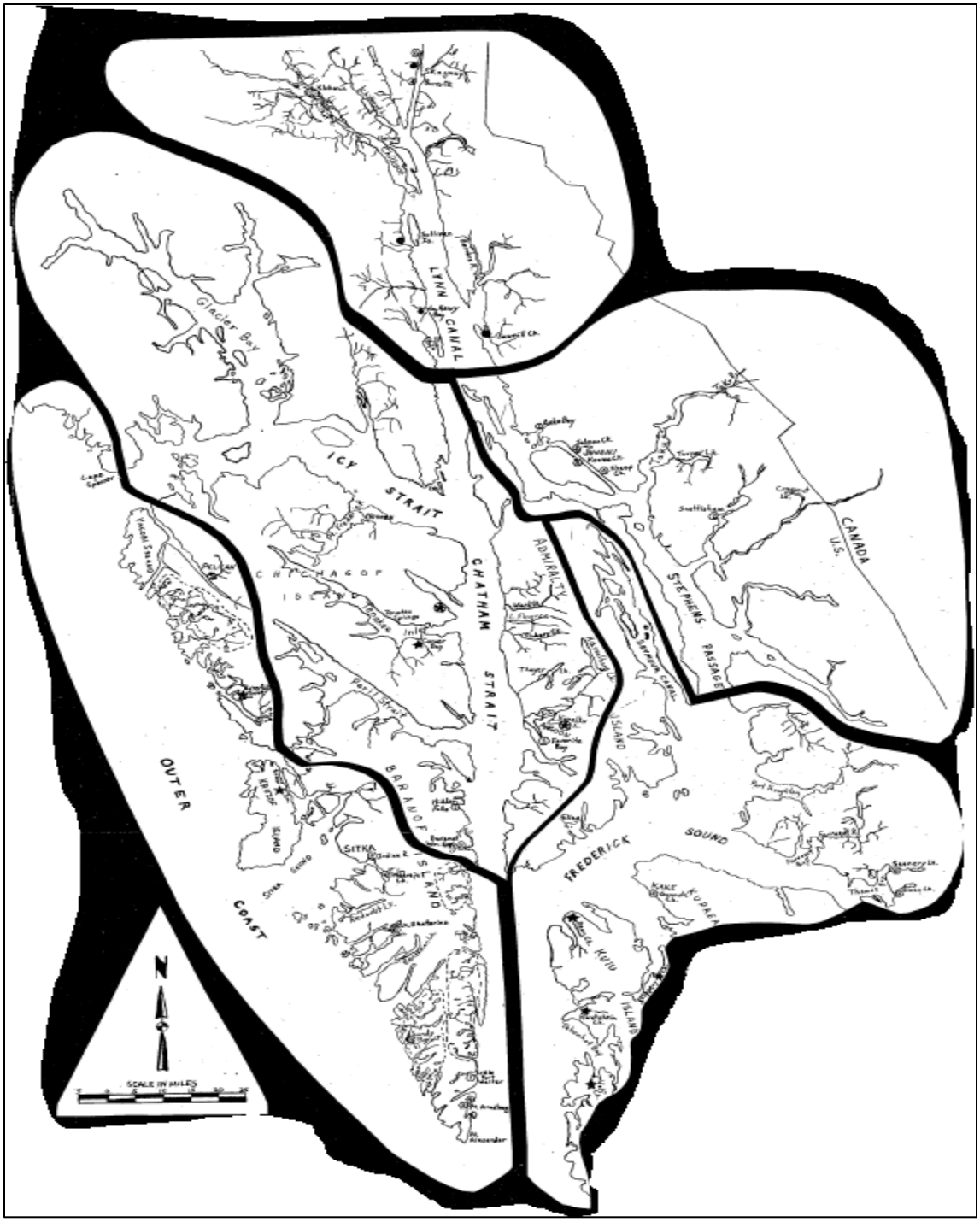

Figure 5.–Commercial fishing units for northern Southeast Alaska as described in the Phase II CSP.

Source: Northern Southeast Regional Planning Team. 1982. Comprehensive Salmon Plan, Phase II: Northern Southeast Alaska. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

When federal funding was secured for an expanded Chinook salmon program anticipated to produce 75,000 adult returns, the project was promoted to a high priority project in the 1993 CSP

Update.[52] ADF&G allocated nearly $1.2 million of federal funds to AKI to conduct the Southeast Baranof Chinook salmon project at Port Armstrong Hatchery. The funding went to capital improvements to the hatchery and operating costs for 1 year. The project was expected to produce 60,000 adults annually at full production.[53] Coho salmon eggs were incubated in place of Chinook salmon in years that Chinook salmon eggs were not available.[54]

Phase III Comprehensive Salmon Plan

The Phase III CSP (Duckett et al. 2010) was issued in 2004 and provides an extensive history of Southeast Alaska fisheries and salmon enhancement. The Phase III CSP noted that recent annual harvests of wild stocks of coho, sockeye, chum and pink salmon had generally exceeded the potential wild harvest levels proposed in the Phase I plan. Chinook salmon harvests did not meet goals because of the reduced harvest provided for in the PST, the high cost of Chinook salmon enhancement, and the low harvest rate of enhanced production by salmon trollers. The chum salmon harvest met the Phase I harvest objective of 9.7 million fish 4 times from 1990 to 2003, and the enhanced component of the harvest enabled the harvest to reach that objective in all of those years. For coho salmon, the harvest met the Phase I harvest objective of 2.65 million fish 8 times during the same period, and the enhanced component of the harvest enabled the harvest to reach that objective in 5 of those years. For pink salmon, from 1989 to 2003, the harvest objective of 30 million fish was met in all but 2 years, and in only 1 year did the hatchery-produced harvest boost the total harvest over the goal.

Phase I and Phase II CSPs provided planning focused on increasing salmon production. The Phase III CSP planning was focused on integrating hatchery production increases with natural production to sustainably manage fisheries. With the maturation of the salmon enhancement program, the goal of enhancing the salmon fishery while minimizing the potential impact of enhancement on wild stocks became paramount over the other goals of enhancing the salmon resource as a public benefit and providing greater economic and social stability.

The Phase III CSP provided *best practice* guidelines for enhancement planning to provide a systematic approach to project formulation and the decision-making process. Guidelines were developed for fishery supplementation, wild stock supplementation, and colonization. Four standards are to be documented in developing a fishery supplementation project: (A) the release site has an adequate freshwater supply for imprinting and is not in close proximity to significant wild stocks, (B) fish are adequately imprinted to the release site, (C) releases are marked and contribute to the harvest without jeopardizing the sustainability of wild stocks, and (D) the terminal area enables harvest or containment of all returning adults.

The Phase III CSP provided a stock appraisal tool for assessing the *significance* of stocks for assessment of projects with regard to the significant stock references in *Genetic Policy*. The Phase III CSP states that significance is more complex than a simple production number because some of the region's 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. The tool identified 6 stock

[52] Ibid.

[53] Ibid.

[54] Northern Southeast Regional Planning Team. 1995 (1994 Update), 1996 (1995 Update), 1997 (1996 Update). Comprehensive Salmon Plan, Phase II: Northern Southeast Alaska. All ADF&G, Juneau, Alaska, unpublished documents obtained from Sam Rabung, ADF&G PNP Hatchery Coordinator, Juneau.

characteristics of consideration: wildness, uniqueness, isolation, population size, population trend and the stock's economic and/or cultural significance.

The Phase III CSP provided a framework for assessment of new projects: "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) a description of how impacts to fishery management will be evaluated; and (E) a 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."

Since the Phase III CSP was issued in 2004, one new program has been added at Port Armstrong Hatchery: the Port Herbert release site for pink salmon. The program will be implemented according to guidelines of the Phase III CSP. All fish will be marked. The ADF&G geneticist considered the ecological and genetic impacts and recommended reducing the requested increase, which was adopted into the permit alteration. AKI will conduct a sampling program to assess contribution to the harvest in the terminal area. AKI may be required to harvest aggregations of hatchery-produced pink salmon should a significant amount remain in Port Herbert after other fisheries are complete.[55]

PROGRAM EVALUATIONS

CONSISTENCY WITH POLICY

The policies governing Alaska hatcheries were divided into 3 categories for this review: genetics, fish health, and fisheries management. The key elements of the policies in each of those categories are summarized in Tables 1–3. Tables 4–6 assess and discuss compliance of the policy elements in Tables 1–3.

[55] Memorandum from L. Vercessi, ADF&G biologist, to J. Regnart and C. Swanton, ADF&G directors, dated May 6, 2014. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

Table 1.–Key elements of the ADF&G *Genetic Policy*.

I. Stock Transport	
Use of appropriate local stocks	This element addresses Section I of the *Genetic Policy*, covering stock transports. The policy prohibits interstate or interregional stock transports, and uses transport distance and appropriate phenotypic characteristics as criteria for judging the acceptability of donor stocks.
II. Protection of wild stocks	
Identification of significant or unique wild stocks	Significant or unique wild stocks identified for each region and species as stocks most important to that region. Regional Planning Teams should establish criteria for determining significant stocks and recommend such stock designations.
Interaction with or impact on significant wild stocks	Priority is given to protection of significant wild stocks from harmful interactions with introduced stocks. Stocks cannot be introduced to sites where they may significantly impact significant or unique wild stocks.
Establishment of wild stock sanctuaries	Wild stock sanctuaries should be established on a regional and species basis. No enhancement activities would be allowed, but gamete removal would be permitted. The guidelines and justifications describe the proposed sanctuaries as gene banks of wild type variability.
Straying impacts	Prevention of detrimental effects of gene flow from hatchery fish straying and interbreeding with wild fish.
III. Maintenance of genetic variance	
Maximum of three hatchery stocks from a single donor stock	A maximum of three hatchery stocks should be derived from a single donor stock. Offsite releases, such as for terminal harvest, should not be restricted by this policy if the release sites are selected so that they do not impact significant wild stocks, wild stock sanctuaries, or other hatchery stocks.
Minimum effective population size	The policy recommends a minimum effective population size of 400. It also recognizes that small population sizes may be unavoidable with Chinook and steelhead.
Genetics review of Fish Transport Permits (5 AAC 41.010 – 41.050)	
Review by geneticist	Each application is reviewed by the geneticist, who then makes a recommendation to either approve or deny the application. The geneticist may also recommend adding terms or conditions to the permit to protect wild or enhanced stocks.

Table 2.–Key elements of Alaska policies and regulations pertaining to fish health and disease.

Fish Health and Disease Policy (5 AAC 41.080)	
Egg disinfection	Within 48 hours of taking and fertilizing live fish eggs or transporting live fish eggs between watersheds, all eggs must be treated with an iodine solution. This requirement may be waived for large scale pink and chum salmon facilities where such disinfection is not effective or practical.
Hatchery inspections	According to AS 16.10.460, inspection of the hatchery facility by department inspectors shall be permitted by the permit holder at any time the hatchery is operating.
Disease reporting	The occurrence of fish diseases or pathogens listed in 5 AAC 41.080(d) must be immediately reported to the ADF&G Fish Pathology Section.
Pathology requirements for Fish Transport Permits (5 AAC 41.005–41.060)	
Disease history	Applications for FTPs require either a complete disease history of the stock or a broodstock inspection and certification if the disease history is not available.
Isolation measures	Applications must list the isolation measures to be used during transport, including a description of containers, water source, depuration measures, and plans for disinfection.
Pathology review of FTPs	Each application is reviewed by the pathologist, who then makes a recommendation to either approve or deny it. The pathologist may also recommend to the commissioner terms or conditions to the permit to protect fish health. Transports of fish between regions are discouraged.

Table 3.–Key elements of Alaska fisheries management policies and regulations relevant to salmon hatcheries and fishery enhancement.

Sustainable Salmon Fishery Policy (5 AAC 39.222)	
I. Management principles and criteria	
Assessment of wild stock interaction and impacts	As a management principle, the effects and interactions of introduced or enhanced salmon stocks on wild stocks should be assessed. Wild stocks should be protected from adverse impacts from artificial propagation and enhancement efforts.
Use of precautionary approach	Managers should use a conservative approach, taking into account any inherent uncertainty and risks.
Salmon Escapement Goal Policy (5 AAC 39.223)	
Establishment of escapement goals	Management of fisheries is based on scientifically based escapement goals that result in sustainable harvests.
Mixed Stock Salmon Fishery Policy (5 AAC 39.220)	
Wild stock conservation priority	The conservation of wild stocks consistent with sustained yield is the highest priority in management of mixed-stock fisheries.
Fisheries management review of FTPs (5 AAC 41.010 – 41.050)	
Review by management staff	All proposed FTPs are reviewed by the regional supervisors for the Divisions of Commercial Fisheries and Sport Fish, the deputy director of the Division of Commercial Fisheries, and the local regional resource development biologist before consideration by the commissioner of ADF&G. Department staff may recommend approval or denial of the permit, and recommend permit conditions.

Genetics

Pink salmon broodstock were from Sashin and Lovers Cove creeks. Sashin Creek is about 6 miles by water from Port Armstrong, and Lovers Cove Creek about 10 miles from Port Armstrong (Figure 4, Appendix F).

The BMP indicated that chum salmon donor stocks be fall-run stocks from short, non-glacial streams that empty directly into saltwater and within 50 miles of the hatchery. Stocks in lower Chatham were desirable because migration routes would be similar to those necessary for the hatchery stocks. The early fall-run chum salmon program used stocks from Port Camden and Security Bays, across Chatham Strait from the hatchery. When the program restarted with summer-run fish, chum salmon broodstock originated from Gunnuk Creek Hatchery, whose stock had originated from Hidden Falls Hatchery stock. Hidden Falls Hatchery stock originated from stocks from Kadashan, Clear and Seal Rivers, which are northern Chatham Strait stocks and more than the guideline 50 mile distance in the BMP. AKI tried to use brood stock from numerous small local stocks but these did not produce sufficient adult returns for broodstock.

The ADF&G geneticist that recommended approval of the FTP authorizing the egg transfer from Gunnuk Creek Hatchery (FTP 03-1002, Appendix G) commented that Port Armstrong Hatchery staff had investigated wild brood stock sources but insufficient fish were found. Developing a brood source from the wild systems would mean "mining" these wild stocks for several brood cycles to develop a hatchery stock.[56] Sourcing eggs from Gunnuk Creek Hatchery was a more acceptable approach, and not expected to have any negative genetic impacts.[57]

Chinook salmon broodstock are from the Unuk River stock. The Unuk River is a mainland stock located northeast of Ketchikan, Alaska. There are no significant natural Chinook salmon stocks on Baranof Island. When the FTP application was submitted to restart the Chinook salmon program with Unuk River stock in 2001, an ADF&G Division of Commercial Fisheries biologist commented that the Unuk River broodstock was only available for small releases at Little Port Walter and Deer Mountain Hatcheries, that continued production at Little Port Walter Hatchery was uncertain, and that use of Unuk River stock at Port Armstrong Hatchery would insure maintenance of the broodstock. The ADF&G geneticist noted in recommending approval of the stock that maintenance of multiple stocks in the region was superior to the use of 1 or 2 stocks (Appendix H). The geneticist also recommended that a portion of the releases be marked because there was some evidence from previous releases that Port Armstrong Hatchery Chinook salmon had strayed to other hatchery facilities and possibly to other streams.[58]

The coho salmon broodstock were derived from the Deer Lake hatchery stock developed by NSRAA originating from Sashin Creek and Deep Cove natural stocks (Appendix I, Figure 4). The ADF&G geneticist indicated that use of this stock was consistent with *Genetic Policy*.[59]

Coho and Chinook salmon that are coded-wire-tagged have their adipose fin removed at the time of tagging. In some cases, ADF&G staff manning escapement weirs and fish wheels across the

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[56] There were sliding scale provisions to meet escapement targets before chum salmon eggs were allowed to be collected in donor streams. It is unclear if the geneticist knew this.

[57] Emailed comments on FTP 03J-1002 from D. Moore, ADF&G geneticist. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[58] Comments from ADF&G biologist C. Denton and geneticist D. Moore for FTP 01J-1005. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

[59] Comments from ADF&G geneticist B. Davis for FTP 87J-1055. Unpublished document obtained from Sam Rabung, ADF&G PNP coordinator, Juneau.

region attempt to capture fish with missing adipose fins and recover the tags to determine stock origin—more so for Chinook salmon than for coho salmon. In addition, finclipped coho and Chinook salmon that return to hatchery facilities are sampled to determine their origin.

Coho salmon are examined at hatcheries but not at most weirs on systems that monitor wild stock escapements because wild fish in these systems are also marked as smolts. This means a significant number of fish that pass the weir are expected to be adipose finclipped, and therefore a large number of fish would have to be sacrificed for sampling.

Piston and Heinl (2012) conducted hatchery chum salmon straying studies in streams across Southeast Alaska from 2008 to 2010. In 2008, a total of 14 streams were sampled. Port Armstrong Hatchery releases were found in 1 stream (Ralphs Creek) and comprised 2% of the fish sampled in that stream. Ralphs Creek is located on eastern Baranof Island and empties into the middle arm of Kelp Bay in Chatham Strait about 80 miles north of Port Armstrong. The closest stream to the hatchery that was sampled was an unnamed system on western Baranof Island that empties into West Crawfish Inlet about 50 water miles from Port Armstrong.

In 2009, no Port Armstrong Hatchery releases were found in 23 streams sampled. Again, the closest stream sampled was an unnamed system on western Baranof Island that empties into West Crawfish Inlet about 50 water miles from Port Armstrong.

In 2010, Port Armstrong releases were found in 14 of 30 streams sampled. Of the 14 streams where they were found, Port Armstrong fish comprised 5% or less of the fish sampled in 12 streams, 9% in 1 stream (Saginaw Creek, about 50 water miles distant), and 17% in 1 stream (Kadashan River, about 100 miles distant; Piston and Heinl 2012). The nearest stream where fish were found was about 25 miles from the hatchery, and this stream was the nearest stream to the hatchery that was sampled (Sample Creek). The 3 most distant streams where Port Armstrong fish were found were about 150 water miles away (Sawmill Creek, Swan Cove Creek and Harris River).

Pink salmon straying has recently been monitored at Sheldon Jackson Hatchery and the hatchery water source, Indian River, near Sitka. From 2011 to 2014, Port Armstrong Hatchery pink salmon were seen in samples in 1 year (2013), when 3 out of 94 pink salmon sampled at the hatchery were Port Armstrong pink salmon, and 7 out of 377 pink salmon sampled in Indian River were Port Armstrong Hatchery fish. Results for 2014 were not yet completed.

Wild and hatchery chum salmon interaction studies are underway in Southeast Alaska to further document the degree to which hatchery chum salmon are straying and interbreeding. The studies will assess the range of interannual variability in the straying rates and determine the effects of hatchery fish spawning with wild populations on the fitness of wild populations (Prince William Sound Science Center 2013). Results from these studies will be available in coming years.

Table 4.–The Port Armstrong Hatchery program and its consistency with elements of the ADF&G Genetic Policy (see Table 1).

I. Stock Transport	
Use of appropriate local stocks	Hidden Falls Hatchery used local broodstock for coho and chum salmon projects. Chinook salmon stocks used were somewhat distant from the hatchery but within the Southeast region. No Chinook salmon systems are near the hatchery.
II. Protection of wild stocks	
Identification of significant or unique wild stocks	The Phase III CSP provided a stock appraisal tool for assessing the *significance* of stocks for assessment of projects with regard to the significant stock references in *Genetic Policy*. New projects at Hidden Falls Hatchery implemented since the Phase III CSP was published were transfer of previously permitted programs (coho lake stocking and chum salmon release from Southeast Cove) from other hatchery permits to the Hidden Falls permit. Results from the wild and hatchery chum salmon interaction studies underway may necessitate using these significance analyses tools to assess any risk to wild stocks.
Interaction with or impact on significant wild stocks	Indigenous coho salmon stocks were used for lake stockings, except for systems barriered by falls for which nearby local stocks were used. Local stocks were used for chum salmon. Systems in the region are monitored for strays for chum, coho and Chinook salmon.
Use of indigenous stocks in watersheds with significant wild stocks	Coho salmon projects used indigenous stocks when planting fry in systems with established runs. Farragut River Chinook salmon fry reared at Hidden Falls Hatchery were planted in the Farragut River.
Establishment of wild stock sanctuaries	In Southeast Alaska, no wild stock sanctuaries have been designated by the RPT.
Straying Impacts	Chum salmon straying studies occurred from 2008 to 2011 as discussed above (Piston and Heinl 2012), with other ongoing studies currently underway (Prince William Sound Science Center 2013).
III. Maintenance of genetic variance	
Maximum of three hatchery stocks from a single donor stock	The Andrew Creek Chinook hatchery stock is also used at Medvejie, Crystal Lake, and Macaulay Hatcheries, and previously released at Port Armstrong and Sheldon Jackson Hatcheries. Hidden Falls Hatchery was allowed to continue to use Andrew Creek stock because there are no other Chinook salmon stocks nearby and the hatchery is located in a "non-sensitive" area as defined in Holland et al. (1983). Hidden Falls Hatchery coho salmon stock is also used at Port Armstrong Hatchery. Hidden Falls Hatchery chum salmon stock is used at Hidden Falls Hatchery and Port Armstrong Hatchery.[60]
Minimum effective population size	For brood year 2013, brood stock numbers used included over 71,000 chum, 2,240 coho, and 730 Chinook salmon.
Review by geneticist	The ADF&G geneticist reviewed the FTPs for the Hidden Falls Hatchery programs.

[60] Hidden Falls Hatchery chum salmon stock was also used at Gunnuk Creek Hatchery until it closed. The last release from Gunnuk Creek Hatchery was brood year 2013 released in 2014.

Fish Health and Disease

FTPs for the Port Armstrong Hatchery program were approved by the pathologist. Pathology records showed no inconsistencies with fish health and disease policies. Appropriate salmon culture techniques were used and disease reporting and broodstock screening occurred as required.

The hatchery was been inspected regularly since at least 1984, and no major chronic health issues have been identified at the facility. ADF&G fish pathology staff indicated the facility is well run and efficient. Recommendations by ADF&G inspectors were incorporated into hatchery operations.

Table 5.–The Port Armstrong Hatchery program and its consistency with elements of the Alaska policies on fish health and disease (see Table 2).

Fish Health and Disease Policy (5 AAC 41.080; amended by Meyers 2014)	
Egg disinfection	Eggs are disinfected as necessary according to ADF&G regulations and guidelines.
Hatchery inspections	Hatchery inspections were conducted regularly from at least 1984 to present.
Disease reporting	There are no chronic disease issues at the hatchery. Hatchery staff work with ADF&G fish pathology staff when fish health issues arise.
Pathology requirements for Fishery Transport Permits (5 AAC 41.010)	
Disease history	Samples were submitted as requested by the fish pathologist for disease history.
Isolation measures	Isolation procedures were described on the FTP.
Pathology review of FTPs	FTPs were reviewed by the pathologist.

Fisheries Management

Production and harvest management at Port Armstrong Hatchery evolved over time as more information about migration routes of returning hatchery fish, timing of hatchery returns, and status of local wild stocks was collected (Table 6). As managers and fishermen grew more confident with understanding these measures, releases at the hatchery were allowed to increase.

Chum and pink salmon returns are harvested primarily by the purse seine and troll fleets in lower Chatham Strait. Salmon stocks for which escapement goals are established that would likely be impacted by the hatchery harvest include the northern inside chum salmon stock complex and Southeast Baranof Island pink salmon stock complex. From 1985 to 2013, escapement goals for chum salmon were met in all years except one. Pink salmon escapement was met in 17 of 29 years, with no evident trend between the hatchery return and pink salmon escapement (Table 7).

Chinook and coho salmon are coded-wire-tagged. From the extensive sampling program occurring across the region, the harvest location, migratory timing, and total return is accurately documented. Escapements to numerous natural coho systems across the region are monitored and escapement goals were met in most years since 1980 (Skannes et al. 2015).

Table 6.–The Port Armstrong Hatchery program and its consistency with elements of Alaska fisheries management policies and regulations (see Table 3).

Sustainable Salmon Fishery Policy (5 AAC 39.222)	
I. Management principles and criteria	
Assessment of wild stock interaction and impacts	Salmon escapements are monitored to area index streams. Harvest rates and straying of hatchery fish have been monitored as stated in Table 4 and discussed in the Genetics section above.
Use of precautionary approach	Port Armstrong Hatchery salmon return timing, migration corridors, and impacts to local stocks and fisheries management were considered before significant increases to salmon production were approved.
Salmon Escapement Goal Policy (5 AAC 39.223)	
Establishment of escapement goals	Escapement goals are established for Northern Inside chum salmon stocks and for southeast Baranof Island pink salmon stocks.
Mixed Stock Salmon Fishery Policy (5 AAC 39.220)	
Wild stock conservation priority	Salmon fisheries are managed to achieve escapement goals.
Fisheries management review of FTPs (5 AAC 41.010–41.050)	
Review by management staff	The FTPs for the Port Armstrong Hatchery program were reviewed by fisheries management staff.

Table 7.–Total estimated returns of Port Armstrong Hatchery salmon and spawning escapement counts of systems or stock groups with escapement goals, 1980–2013, near Port Armstrong Hatchery.

Year	Harvest				Total[a]	Escpaement	
	Pink	Coho	Chum	Chinook		SE Baranof Pink Salmon[b]	Northern Inside Chum Salmon[c]
1985	104,000				74,000	63,000	149,000
1986	60,196				60,196	24,731	141,000
1987	289,775				289,775	24,400	106,000
1988	28,256		119	286	28,661	26,556	162,000
1989	126,389		231	2,789	129,409	31,200	53,000
1990	1,113,413	2,442	1,319	1,076	1,118,250	56,000	107,000
1991	1,385,152	27,090	1,864	834	1,414,940	78,500	76,000
1992	2,722,127	40,140		1,721	2,763,988	76,500	153,000
1993	478,623	11,483		2,432	492,538	122,500	228,000
1994	1,760,758	3,805		925	1,765,488	113,500	272,000
1995	1,343,954	86,259		957	1,431,170	186,000	209,000
1996	1,599,572		32,443		1,632,015	238,000	931,000
1997	2,496,342	77,891		1,498	2,575,731	132,500	226,000
1998	2,212,708	34,285			2,246,993	262,000	197,000
1999	4,327,788	20,244			4,348,032	251,000	318,000
2000	304,618	44,589			349,207	86,457	443,000
2001	2,459,637	207,309			2,666,946	136,340	229,000
2002	1,988,926	227,109			2,216,035	62,500	397,000
2003	1,077,424	66,355			1,143,779	53,600	210,000
2004	1,691,465	34,724			1,726,189	48,900	242,000
2005	1,786,926	19,444		1,656	1,808,026	185,000	185,000
2006	636,377	37,904	7,561	1,816	683,658	159,000	282,000
2007	1,209,973	146,144	37,758	1,534	1,395,409	128,000	149,000
2008	93,803	61,610	18,193	1,557	175,163	32,882	99,000
2009	1,392,791	113,572	131,065	2,491	1,639,919	144,000	107,000
2010	1,240,699	124,583	73,382	5,225	1,443,889	53,000	77,000
2011	1,176,351	149,451	273,934	4,233	1,603,969	186,000	125,000
2012	292,032	58,332	172,454	2,218	525,036	28,500	177,000
2013	2,204,708	136,657	170,314	2,962	2,514,641	187,000	278,000
Total:	37,574,783	1,731,422	920,637	36,210	40,263,052		
				Escapement Goal or Target:		70,000–160,000	60,000–140,000

[a] Total return includes broodstock, commercial harvest, sport harvest, holding mortalities, etc. as reported in the annual reports by Armstrong Keta, Inc., unpublished documents obtained from Sam Rabung, ADF&G PNP Hatchery coordinator, Juneau. Some categories, such as sport harvest, were not reported in all years.

[b] Pink salmon escapement data from ADF&G Alexander database. Accessed 1/13/2015. URL not publicly available.

[c] Chum salmon escapement data from Gray et al. (2014).

CONSISTENCY IN PERMITTING

Hatchery permit/BMP, AMP, and FTP documents for Port Armstrong Hatchery operations were reviewed to determine that they met the following guidelines:

- They are current.
- They are consistent with each other.
- They are an accurate description of current hatchery practices.

The hatchery permit and BMP do not expire. The BMP should be updated when any permit amendments are approved through PARs.

Some permitting documentation was not found. No FTP was found for pink and coho salmon egg takes from hatchery returns until 1998. Authorization for the egg takes and transfers were found in the annual management plans and hatchery permit.

FTPs for Chinook salmon were not found for egg and fry transfers from other facilities in 1991 and 1992 (Appendices F-I).

Egg collections and transfers were generally below permitted levels for all species, except that pink salmon egg takes significantly exceeded permitted capacity in several years (Appendices J-M).

All current operations have FTPs in place and are authorized under the hatchery permit.

RECOMMENDATIONS

1. The BMP should be updated to reflect current operations.
2. According to the 2014 Port Armstrong Hatchery AMP, contributions to the pink salmon fishery are gross estimates made years ago by ADF&G management biologists based on review of historical catch records. Currently, there is no formal sampling of the catch to estimate the contribution of Port Armstrong pink or chum salmon in the catch. Port Armstrong conducted a pilot sampling program for pink salmon from 2012 to 2014 and for chum salmon in 2014. Port Armstrong Hatchery pink salmon were found in District 109 (lower Chatham Strait) and District 110 (Frederick Sound) purse seine catches. Catch sampling should continue to update the earlier gross estimates of hatchery contribution for pink salmon and establish hatchery contribution for chum salmon. This data will provide a better assessment of the benefit of Port Armstrong Hatchery returns to the common property fisheries.

DISCUSSION

Alaska hatchery and fisheries enhancement programs are governed by a comprehensive permitting system designed to protect wild stocks and provide increased harvest opportunities. The success of enhancement efforts depends on implementing that system and ensuring policies are followed. Today, the combination of favorable environmental conditions, sustainable management of wild stock systems, and hatchery production supports economically healthy salmon fisheries in Southeast Alaska.

With full utilization of virtually the entire hatchery run and strong demand for salmon, there is heightened interest in increasing Alaska hatchery production. The processing industry has expanded infrastructure and markets for abundant salmon returns. The advent of otolith marking and additions to the time series of harvest, escapement, migration, and timing data have added to management precision for harvesting the Port Armstrong Hatchery runs while meeting spawning escapement goals to wild stock systems in most years. Continuation of the sampling program for

pink and chum salmon at Port Armstrong Hatchery will provide valuable additional information for managing area fisheries.

Garforth et al. (2012), in the first surveillance report for certification of Alaska's salmon fisheries under the Food and Agriculture Organization-based responsible fisheries management certification, indicated the need for hatchery and wild stock interaction study: "To evaluate whether or not fitness of natural-origin (wild) versus stray hatchery-origin salmon differ when spawning in the wild, survival of both types of fish and their relative spawning success needs to be documented."

The executive directors of most Alaska PNP hatchery organizations met in 2009 with the ADF&G commissioner expressing the need for such a study. The following year, plans for funding and implementing the study were initiated. A science panel composed of current and retired scientists from ADF&G, University of Alaska, aquaculture associations, and National Marine Fisheries Service with broad experience in salmon fishery enhancement, management, and wild and hatchery interactions designed a long-term research project to potentially answer some of these questions. The proposed study length was about 11 years, with 4 years initially funded.[61] The study, entitled *Interactions of Wild and Hatchery Pink and Chum Salmon in Prince William Sound and Southeast Alaska*, is currently underway (Prince William Sound Science Center 2013. Study funding is shared between the PNP operators, salmon processors, and state of Alaska and administered by ADF&G. Field work is conducted by the Prince William Sound Science Center and the Sitka Sound Science Center. The study will improve understanding of hatchery and wild stock interactions and provide Alaska-specific scientific guidance for assessing Alaska's hatchery program, including recommendations for escapement goals, fisheries management, hatchery production levels, and hatchery practices.

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[61] Steve Reifenstuhl, NSRAA Executive Director, personal communication.

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APPENDIX

Appendix A.–Port Armstrong Hatchery permit history.

Date	Permit	Permitted Capacity (millions)			
		Pink	Chum	Chinook	Coho
2/23/1981	Permit issued for 11 million pink and chum salmon eggs combined	11	11		
5/4/1984	Permit alteration increasing pink salmon capacity to 12 million eggs, fall-run chum salmon capacity to 4 million eggs, and adding 50,000 Chinook salmon eggs.	12	4	0.05	
3/20/1985	Permit alteration approved to increase pink salmon capacity from 12 million to 16 million eggs.	16	4	0.05	
7/1/1986	Permit alteration approved to increase Chinook salmon capacity from 50,000 to 80,000 eggs.	16	4	0.08	
11/21/1987	Permit alteration approved to increase fall-run chum salmon from 4 million eggs to 10 million eggs. In addition, coho salmon were added to the permit with a capacity of 500,000 eggs.	16	10	0.08	0.5
5/24/1988	Permit alteration approved to increase pink salmon capacity from 16 million to 30 million eggs.	30	10	0.08	0.5
4/17/1990	Permit alteration approved to increase pink salmon capacity from 30 million to 110 million eggs and Chinook salmon production from 80,000 to 250,000 eggs. 55 million of the pink salmon eggs were for offsite release, only.	55	10	0.25	0.5
4/7/1992	Permit alteration approved to increase coho salmon capacity from 500,000 to 1.5 million with mandatory marking of a portion of the release.	55	10	0.25	1.5
2/1/1994	Permit alteration approved to increase Chinook salmon capacity from 250,000 to 2.0 million.	55	10	2	1.5
12/21/1994	Permit alteration approved for 1 year only to increase coho production from 1.5 million eggs to 2.0 million eggs to fill unutilized space resulting from a lack of Chinook salmon eggs. Increase pink salmon from 55 million to 85 million eggs for onsite release.	85	10	2	2
12/28/1995	Permit alteration approved to extend coho increase to 2.0 million for 2 more years	85	10	2	2
3/24/1999	Permit alteration approved to delete unused chum salmon production from the hatchery permit.	85		2	1.5
5/21/2002	Permit alteration approved to add 30 million summer-run chum salmon eggs.	85	30	2	1.5
6/6/2005	Permit alteration approved to increase coho salmon production from 2 million to 3 million eggs. It appears, however, that permitted capacity at the time was only 1.5 million eggs.	85	30	2	3
5/11/2007	Permit alteration approved to backfill coho salmon eggs when the full 2 million permitted capacity for Chinook salmon cannot be reached. Total egg number (5 million) for the 2 species did not change.	85	30	2	5

-continued-

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Date	Permit	Permitted Capacity (millions)			
		Pink	Chum	Chinook	Coho
7/23/2009	Allow collection of additional 50 million eggs for incubation to eyed stage and transfer to Gunnuk Creek. One year only.	85	30	2	5
5/17/2010	Allow collection of additional 50 million eggs for incubation to eyed stage and transfer to Gunnuk Creek.	85	30	2	5
2/15/2010	Allow for 115 million pink or chum eggs taken in combination, with no more than 50 million chum salmon eggs. PAR denied.	85	30	2	5
5/16/2014	Increased pink salmon capacity from 85 million to 105 million eggs and establish Port Herbert as pink salmon release site for progeny of up to 55 million eggs.	105	30	2	5

Appendix B.–Pink salmon egg take, release, and return data for Port Armstrong Hatchery (PAH).

Brood Year	Origin	Eggs Taken	Fry Released	Total Adult Return
1983	Sashin Creek	2,900,000		
	Lovers Cove	6,100,000		
	TOTAL	9,000,000	7,400,000	148,000
1984	Sashin Creek	2,783,200		
	Lovers Cove	8,377,600		
	TOTAL	11,160,800	7,507,208	60,196
1985	PAH	13,323,331	9,763,780	289,775
1986	PAH	14,521,978	12,348,543	28,256
1987	PAH	20,958,065	19,369,700	125,115
1988	PAH	17,148,300	16,035,755	1,113,413
1989	PAH	24,004,007	22,420,058	1,393,752
1990	PAH	53,707,783	50,115,671	2,722,127
1991	PAH	41,849,487	39,616,263	478,623
1992	PAH	58,108,081	51,188,666	1,760,758
1993	PAH	58,667,837	43,000,000	1,343,954
1994	PAH	59,416,000	53,839,000	2,110,635
1995	PAH	81,360,000	72,480,000	1,821,342
1996	PAH	91,286,000	81,412,000	2,212,708
1997	PAH	80,071,739	75,776,850	4,327,788
1998	PAH	86,619,007	73,269,304	304,618
1999	PAH	89,082,366	85,638,750	2,452,610
2000	PAH	54,598,731	52,343,525	1,988,926
2001	PAH	78,906,537	72,663,780	1,077,424
2002	PAH	90,366,055	83,470,980	1,691,465
2003	PAH	89,675,516	83,835,050	1,786,926
2004	PAH	88,040,126	80,110,972	636,377
2005	PAH	87,610,268	78,172,288	1,209,973
2006	PAH	85,617,687	78,211,021	93,803
2007	PAH	64,799,838	61,734,194	1,428,278
2008	PAH	23,204,712	21,438,507	1,240,699
2009	PAH	60,150,024	53,677,075	1,176,351
2010	PAH	84,808,577	75,506,078	292,032
2011	PAH	85,870,462	82,734,292	2,204,708
2012	PAH	53,598,205	52,120,334	403,843
2013	PAH	87,840,626	79,659,097	
2014	PAH	92,207,186		
GRAND TOTAL		1,937,579,331	1,597,199,644	37,924,475

Source: Port Armstrong Hatchery annual reports. Unpublished documents obtained from Sam Rabung, ADF&G PNP Hatchery coordinator, Juneau.

Appendix C.–Chum salmon egg take, release, and return data for Port Armstrong Hatchery (PAH).

Brood Year	Origin	Eggs Taken	Fry Released	Adult Return
1984	Security Bay	1,236,400	702,540	
	Port Camden	703,000	223,000	
	TOTAL	1,939,400	925,540	92
1985	Security Bay	2,702,250	1,626,400	73
1986	Security Bay	2,171,103	1,982,450	491
1987	Security Bay	1,506,500	1,287,060	1235
1988	PAH	46,571	42,500	1049
1989	PAH	157,303	141,921	400
1990	PAH	855,167	794,673	0
1991	PAH	444,453	423,000	0
1992–2002	no eggs taken	-	-	
2003	Hidden Falls	10,000,826	9,306,909	
	Gunnuk Creek	5,516,669	4,098,640	
	TOTAL	15,536,481	13,405,549	53,384
2004	Hidden Falls	12,914,888	574,958	7,352
2005	Hidden Falls	2,716,112	2,110,821	
	Gunnuk Creek	1,911,488	1,770,390	
	TOTAL	4,627,600	3,881,211	131,998
2006	Hidden Falls	13,300,064	11,875,417	
	PAH	5,049,447	4,654,882	
	Gunnuk Creek	940,933	917,949	
	TOTAL	19,290,444	17,448,248	139,570
2007	PAH	15,348,631	13,786,610	237,927
2008	PAH	13,104,587	12,417,244	170,280[a]
2009	PAH	30,019,963	27,296,476	135,100[a]
2010	PAH	30,479,861	28,444,881	Incomplete
2011	PAH	30,139,827	26,459,338	Incomplete
2012	PAH	29,620,820	25,695,046	Incomplete
2013	PAH	30,174,044	25,028,988	Incomplete
2014	PAH	24,773,774		
GRAND TOTAL		265,853,667	201,662,093	878,951

Source: Port Armstrong Hatchery annual reports. Unpublished documents obtained from Sam Rabung, ADF&G PNP Hatchery coordinator, Juneau.

[a] Returns not complete for brood year.

Appendix D.–Chinook salmon egg take, release, and return data for Port Armstrong Hatchery (PAH).

Brood Year	Hatchery/Stock	Eggs Taken	Fry Released	Adult Return
1985	LPW/Unuk River	n/a	69,949	2,743
1986	LPW/Unuk River	80,000	75,602	0
1987	LPW/Unuk River	130,000	89,942	4,918
1988	LPW/Unuk River	165,897	144,323	1,408
1989	LPW/Unuk River	154,588	62,176	619
1990	PAH/Unuk River	160,316	88,964	
	S/AC & Unuk River	(fry transfer)	306,701[a]	
			395,665	1,860
1991	PAH/Unuk River	32,880	No release[b]	
	S/AC	(fry transfer)	1,079,757	
	DM/Unuk River	(fry transfer)	195,284	
			1,275,041	594
2001	LPW/Unuk River	181,228	106,756	4,777
2002	LPW/Unuk River	172,915	96,285	1,058
2003	LPW/Unuk River	240,465	83,479	779
2004	LPW/Unuk River	907,633	273,788	484
2005	LPW/Unuk River	215,440	148,631	4,024
2006	PAH/Unuk River	1,935,154[c]	938,557	6,571
2007	PAH/Unuk River	1,152,889[d]	606,070	1,751
2008	PAH/Unuk River	973,421	555,988	Incomplete
2009	PAH/Unuk River	734,201[e]	279,702	Incomplete
2010	PAH/Unuk River	833,753	273,553	Incomplete
2011	PAH/Unuk River	737,644	314,972	Incomplete
2012	PAH/Unuk River	384,073	238,629	Incomplete
2013	PAH/Unuk River	320,358	161,355	Incomplete
2014	PAH/Unuk River	293,450		
	GRAND TOTAL	7,883,262	3,823,816	28,843

Source: Port Armstrong Hatchery annual reports.

Note: LPW=Little Port Walter Hatchery, S=Snettisham Hatchery, DM=Deer Mountain Hatchery, AC=Andrew Creek stock.

[a] This release was from an initial transfer of 91,200 Deer Mt. Hatcher/Unuk R. stock smolt and 277,600 Crystal Lake Hatchery/Andrew Creek stock smolt.

[b] All fry loss due to water system failure.

[c] Of this total, 307,972 eyed eggs transferred to POWHA and 243,410 eggs culled due to bacterial kidney disease.

[d] Of this total, 285,017 eyed eggs transferred to POWHA and 5,520 eggs culled due to bacterial kidney disease.

[e] Of this total, 235,130 eyed eggs transferred to POWHA and 21,396 eggs culled due to bacterial kidney disease.

Appendix E.–Coho salmon egg take, release, and return data for Port Armstrong Hatchery (PAH).

Brood Year	Origin	Eggs Taken	Smotl Released	Adult Return
1988	Blanchard Lake (Deep Cove)	140,000	121,730	29,532
1989	Deer Lake (Sashin)	280,000	206,724	40,628
1990	Deer Lake (Sashin)	230,180	164,766	11,593
1991	Deer Lake (Deep Cove)	613,504	81,673	3,805
1992	Deer Lake (Sashin)	987,621	828,199	86,556
1993	PAH	663,000	457,281	
	Hidden Falls Hatchery	217,000	184,525	
	TOTAL	880,000	641,806	32,555
1994	PAH	1,098,000	751,566	
	Hidden Falls Hatchery	606,000	632,451	
	TOTAL	1,801,333	1,384,769	76,488
1995	PAH	1,830,000	1,151,800	35,301
1996	PAH	1,853,000	1,624,150[a]	20,244
1997	PAH	748,779	625,363	19,589
1998	PAH	1,611,247	1,358,299	228,619
1999	Hidden Falls Hatchery	1,163,766	975,549	230,099
2000	Hidden Falls Hatchery	1,775,298	1,468,761	67,055
2001	PAH	1,861,605	1,331,351	34,724
2002	PAH	1,576,659	1,340,985	
	Hidden Falls Hatchery	325,171		
	TOTAL	1,901,830	1,340,985	19,444
2003	PAH	2,338,298	1,581,050	36,238
2004	PAH	1,287,880	2,616,063	
	Hidden Falls Hatchery	1,746,626		
	TOTAL	3,034,506	2,616,063	147,059
2005	PAH	2,933,857	2,156,500	59,789
2006	PAH	3,296,075	2,509,128	115,826
2007	PAH	3,702,400	3,148,462	123,769
2008	PAH	4,287,737	3,223,867	149,787
2009	PAH	3,494,229[b]	2,274,860	59,027
2010	PAH	2,791,311[c]	2,380,474	136,346
2011	PAH	2,499,209	2,243,392	incomplete
2012	PAH	3,010,994[d]	2,466,514	incomplete
2013	PAH	2,195,452		incomplete
2014	PAH	2,592,000		
	TOTAL	51,198,169	33,739,621	1,764,073

Source: Port Armstrong Hatchery annual reports.

[a] 1,500,300 released in 1997 and 123,850 released in 1998.

[b] Of the total, 50,418 eggs culled due to bacterial kidney disease. Additional 882,657 eggs that were extra were culled.

[c] Of the total, 147,672 eggs culled due to bacterial kidney disease.

[d] Of the total, 127,302 bacterial kidney disease culled and 88,762 discarded.

Appendix F.–Port Armstrong Hatchery (PAH) FTPs for pink salmon.

FTP No.	Issued	Expiration	FTP Summary
81-227	1981	1987	Fertilize and incubate eggs from 5 pairs of Sashin Creek pink salmon to assess suitability for PAH. In 1982, permit expiration date extended to 1983 and egg number increased to 1.5 million eggs. In 1983, permit expiration date extended to 1985 and egg number increased to 9 million eggs. In 1985, permit expiration date extended to 1986 and egg number reduced to 5 million eggs. In 1986, permit expiration date extended to 1987 and egg number maintained at 5 million eggs.
82J-1036	1982	1986	Collect up to 1.2 million eggs from Lovers Cove Creek pink salmon to assess suitability for PAH. In 1983, permit expiration date extended to 1985 and egg number increased to 9 million eggs. In 1985, permit expiration date extended to 1986 and egg number reduced to 5 million eggs.
90J-1059	Denied		Transfer up to 15 million pink salmon eggs from PAH to Sheldon Jackson College to establish a broodstock at Sheldon Jackson College. FTP application denied due to likely genetic impacts to the Indian River stock.
90J-1063	Denied		Transfer up to 15 million pink salmon eggs from PAH to Burnett Inlet Hatchery when Burnett Inlet Hatchery was short on broodstock. FTP application denied because too many Burnett Inlet Hatchery fish taken in cost recovery and not left for brood stock, and because of likely genetic impacts to the Navy Creek stock.
98J-1009	1998	2018	Collect for incubation and release up to 85 million pink salmon eggs from hatchery returns. In 2008, the expiration date was extended from 2008 to 2018. In 2015, permit amended to increase egg take to 105 million and expiration date to 2025.
15J-1014	2015	2020	Allow up to 50 million pink salmon fry to be transported from Port Armstrong Hatchery to Port Herbert for rearing and release.
15J-1015	2015	2025	Allow up to 105 million pink salmon eggs to be collected and transported from Sashin Creek to Port Armstrong Hatchery for incubation, rearing and release in the event of a shortfall of broodstock and eggs at Port Armstrong Hatchery.

Appendix G.–Port Armstrong Hatchery (PAH) FTPs for chum salmon.

FTP No.	Issued	Expiration	FTP Summary
81-228	1981	1987	Fertilize and incubate eggs from 5 pairs of Elena Bay chum salmon to assess suitability for PAH. In 1982, permit expiration date extended to 1983 and egg number increased to 500,000 eggs. In 1983, permit expiration date extended to 1987 and egg number increased to 2 million eggs.
81-229	1981	1987	Fertilize and incubate eggs from 5 pairs of Gut Bay chum salmon to assess suitability for PAH. In 1982, permit expiration date extended to 1983 and egg number increased to 500,000 eggs. In 1983, permit expiration date extended to 1987 and egg number increased to 2 million eggs.
81-230	Withdrawn		Fertilize and incubate eggs from 5 pairs of Chaik Bay chum salmon to assess suitability for PAH. Permit application withdrawn by Armstrong Keta, Inc. on 9/3/1981.
81-231			Fertilize and incubate eggs from 5 pairs of Security Bay chum salmon to assess suitability for PAH. Permit application withdrawn by Armstrong Keta, Inc. on 9/3/1981.
82J-1037	1982	1985	Collect up to 1.2 million eggs from Patterson Bay chum salmon to assess suitability for PAH. In 1983, permit expiration date extended to 1985 and egg number increased to 9 million eggs.
82J-1038	1982	1987	Collect up to 1.2 million eggs from Security Bay chum salmon to assess suitability for PAH. In 1983, permit expiration date extended to 1987 and egg number increased to 2 million eggs.
84J-1037	Denied		Collect up to 4 million eggs from Excursion River chum salmon to develop a hatchery broodstock for PAH. Permit application was denied primarily because the distance from Port Armstrong to Excursion River was too great for acceptance by reviewers.
84J-1073	1984	1989	Collect up to 4 million eggs from Port Camden Creek chum salmon to develop a hatchery broodstock for PAH.
84J-1083	1984	1985	Collect up to 400,000 eggs from Security Bay chum salmon, incubate to eyed stage at Gunnuk Creek Hatchery, and transfer to PAH for incubation and release.
86J-1020	1986	1988	Collect up to 4 million eggs from Chaik Bay chum salmon to develop a broodstock for PAH.
03J-1002	2003	2022	Transfer up to 30 million Hidden Falls Hatchery stock chum salmon eggs from Gunnuk Creek Hatchery. In 2013, the expiration date was extended from 2012 to 2022.
03J-1009	2003	2022	Transfer up to 30 million Hidden Falls Hatchery stock chum salmon eggs from Hidden Falls Hatchery. In 2013, the expiration date was extended from 2012 to 2022.
03J-1009	2006	2016	Collection of up to 30 million chum salmon eggs from hatchery returns for release at PAH.

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FTP No.	Issued	Expiration	FTP Summary
05J-1024	Denied		Transport up to 30 million summer-run chum salmon eggs from Gunnuk Creek Hatchery to PAH for release at Southeast Cove (near Kake and Gunnuk Creek Hatchery). Eggs would first be transferred from Gastineau Hatchery to Gunnuk Hatchery under a separate FTP, so the eggs would be Gastineau Hatchery stock fish. Geneticist recommended against transfer of Gastineau Hatchery stock because it was comprised of an amalgam of many stocks and he did not recommend it be used at other facilities. ADF&G managers did not oppose the transfer as long as returns were not used for broodstock.
06J-1011	2006	2016	Collection, incubation, rearing and release of up to 30 million chum salmon eggs from fish returning to the hatchery. Amended in 2015 to allow collection of up to 60 million eggs, with up to 30 million released at PAH under this FTP, and the remaining released at Port Lucy under FTP 15J-1016.
15J-1016	2015	2025	Transport of up to 30 million chum salmon fry from PAH to Port Lucy for rearing and release.

Appendix H.–Port Armstrong Hatchery (PAH) FTPs for Chinook salmon.

FTP No.	Issued	Expiration	FTP Summary
85J-1081	1986	1990	Transfer up to 50,000 eggs from Chickamin River stock Chinook salmon from Little Port Walter Hatchery for incubation, rearing and release at PAH.
86J-1038	1986	1990	Transfer up to 80,000 eggs from Unuk River stock Chinook salmon from Little Port Walter Hatchery for incubation, rearing and release at PAH. In 1986, egg number increased to 160,000 eggs.
86J-1058	1986	1992	Transfer up to 80,000 eggs from Unuk River and Chickamin River cross stock Chinook salmon from Little Port Walter Hatchery for incubation, rearing and release at PAH.
89J-1060	1989	1989	Transfer up to 80,000 Chinook salmon eggs from Medvejie Hatchery/Unuk River stock Chinook salmon for incubation and release. This is to supplement Unuk River stock eggs lost to disease.
92J-1001	1992	2002	Transfer up to 250,000 Little Port Walter Hatchery/Unuk River stock Chinook salmon fry to PAH as a back up to returns to PAH.
94J-1014	Denied		Collect gametes from Farragut River Chinook salmon to develop a broodstock at PAH. Denied because King Salmon River stock was stock of choice and attempting to use Farragut River broodstock was impractical.
94J-1015	Denied		Transfer Crystal Lake Hatchery/Farragut River Chinook salmon stock eggs to PAH to develop a broodstock. Denied because King Salmon River stock was stock of choice and attempting to use Farragut River broodstock was impractical.
94J-1016	Denied		Transfer Crystal Lake Hatchery/Farragut River Chinook salmon stock pre-smolt to PAH to develop a broodstock. Denied because King Salmon River stock was stock of choice and attempting to use Farragut River broodstock was impractical.
94J-1018	1994	1999	Transfer up to 2 million Little Port Walter Hatchery/King Salmon River stock green Chinook salmon eggs to PAH for incubation and release to develop a broodstock.
94J-1019	1994	1999	Transfer up to 2 million Little Port Walter Hatchery/King Salmon River stock eyed Chinook salmon eggs to PAH for incubation and release to develop a broodstock.
01J-1005	2001	2015	Transfer up to 500,000 Little Port Walter/Unuk River stock Chinook salmon green eggs to PAH for rearing and release. In 2006, the permit was amended to extend the expiration date from 2010 to 2015, the egg total maximum of 2 million, and that the eggs could come from Little Port Walter Hatchery or from returns to Port Armstrong.
11J-1004	2006	2016	Collect, rear and release up to 2 million PAH/Unuk River stock Chinook salmon eggs from returns to the hatchery. This FTP application was originally submitted in 2005 when returns of the Little Port Walter Hatchery/Unuk River releases began to return to the hatchery, but the FTP was not issued. This was noticed in 2011, and the FTP was retroactively issued.
12J-1015	2012	2022	Transfer up to 2 million Unuk River stock Chinook salmon eggs from Deer Mountain Tribal Hatchery for incubation, rearing and release at PAH.
14J-1030	2014	2014	Transfer up to 150,000 Unuk River stock Chinook salmon presmolt from Little Port Walter Hatchery for rearing and release at PAH.

Appendix I.–Port Armstrong Hatchery (PAH) FTPs for coho salmon.

FTP No.	Issued	Expiration	FTP Summary
86J-1062	1986	1988	Collect up to 50,000 Sashin Creek coho salmon eggs for incubation and release for assessment as a suitable stock at PAH.
86J-1062	1986	1988	Collect up to 50,000 Rostilaf Creek/Patterson Bay/Sashin Creek coho salmon eggs for incubation and release for assessment as a suitable stock at PAH. These are returns to sites stocked from Medvejie Hatchery with the stocks listed above.
87J-1055	1987	1991	Collect up to 500,000 Deer Lake/Sashin Creek coho salmon eggs for incubation and release at PAH. These are returns to the Deer Lake project in Mist Cove.
88J-1101	1988	1992	Collect up to 250,000 coho salmon eggs from Sashin Creek broodstock for incubation and release at PAH. This is a backup plan in case the Deer Lake returns fall short.
88J-1102	1988	1992	Collect up to 250,000 coho salmon eggs from Chaik Bay broodstock for incubation and release at PAH. This is a backup plan in case the Deer Lake returns fall short.
88J-1103	1988	1992	Collect up to 250,000 coho salmon eggs from Rowan Bay broodstock for incubation and release at PAH. This is a backup plan in case the Deer Lake returns fall short.
88J-1104	1988	1992	Collect up to 250,000 coho salmon eggs from Elena Bay broodstock for incubation and release at PAH. This is a backup plan in case the Deer Lake returns fall short.
88J-1105	1988	1992	Collect up to 250,000 coho salmon eggs from Security Bay broodstock for incubation and release at PAH. This is a backup plan in case the Deer Lake returns fall short.
88J-1116	1988	1988	Transfer up to 250,000 coho salmon eggs from Crystal Lake Hatchery to PAH for incubation and release. This is a backup plan in case Blanchard Lake returns fall short. Geneticist preferred a more local stock and FTP was allowed for 1 year only.
93J-1036	1993	2015	Transfer of up to 1.5 million Mist Cove/Sashin Creek stock coho salmon eggs from Hidden Falls Hatchery returns. In 2000, amendment extended expiration date to 2010. In 2005, amendment extended expiration date to 2015 and increased egg number to 3 million.
93J-1037	1993	1999	Transfer of up to 1.5 million Mist Cove/Sashin Creek stock coho salmon eggs from Mist Cove (Deer Lake) returns. In 2000, amendment extended expiration date to 2010. In 2005, amendment extended expiration date to 2015 and increased egg number to 3 million.
98J-1010	1998	2025	Collect for incubation and release up to 1.5 million coho salmon eggs from hatchery returns. In 2005, the permit was amended to increase the egg take from 1.5 million to 3 million and extended the expiration date from 2008 to 2015. In 2007, amendment allowed the egg take to increase from 3 million to 5 million. In 2015, amendment extended expiration date from 2015 to 2025.

Appendix J.– Comparison of permitted levels of pink salmon egg take under the hatchery permit (HP), annual management plan (AMP) and fish transport permit (FTP) for Port Armstrong Hatchery (PAH).

		Egg Take Limit Permitted Under			
Brood Year	Broodstock Origin	HP	AMP	FTP	Eggs Taken
1983	Sashin Creek	11,000,000	9,000,000	9,000,000	2,900,000
	Lovers Cove			1,200,00	6,100,000
	TOTAL				9,000,000
1984	Sashin Creek	12,000,000	12,000,000	9,000,000	2,783,200
	Lovers Cove			9,000,000	8,377,600
	TOTAL				11,160,800
1985	PAH	16,000,000	16,000,000		13,323,331
1986	PAH	16,000,000	16,000,000		14,521,978
1987	PAH	16,000,000	16,000,000		20,958,065
1988	PAH	30,000,000	30,000,000		17,148,300
1989	PAH	30,000,000	30,000,000		24,004,007
1990	PAH	55,000,000	55,000,000		53,707,783
1991	PAH	55,000,000	55,000,000		41,849,487
1992	PAH	55,000,000	50,000,000		58,108,081
1993	PAH	55,000,000	55,000,000		58,667,837
1994	PAH	55,000,000	55,000,000		59,416,000
1995	PAH	85,000,000	55,000,000		81,360,000
1996	PAH	85,000,000	85,000,000		91,286,000
1997	PAH	85,000,000	85,000,000		80,071,739
1998	PAH	85,000,000	85,000,000	85,000,000	86,619,007
1999	PAH	85,000,000	85,000,000	85,000,000	89,082,366
2000	PAH	85,000,000	85,000,000	85,000,000	54,598,731
2001	PAH	85,000,000	85,000,000	85,000,000	78,906,537
2002	PAH	85,000,000	85,000,000	85,000,000	90,366,055
2003	PAH	85,000,000	85,000,000	85,000,000	89,675,516
2004	PAH	85,000,000	85,000,000	85,000,000	88,040,126
2005	PAH	85,000,000	85,000,000	85,000,000	87,610,268
2006	PAH	85,000,000	85,000,000	85,000,000	85,617,687
2007	PAH	85,000,000	85,000,000	85,000,000	64,799,838
2008	PAH	85,000,000	85,000,000	85,000,000	23,204,712
2009	PAH	85,000,000	85,000,000	85,000,000	60,150,024
2010	PAH	85,000,000	85,000,000	85,000,000	84,808,577
2011	PAH	85,000,000	85,000,000	85,000,000	85,870,462
2012	PAH	85,000,000	85,000,000	85,000,000	53,598,205
2013	PAH	85,000,000	85,000,000	85,000,000	87,840,626
2014	PAH	85,000,000	85,000,000	85,000,000	92,207,186

Appendix K.–Comparison of permitted levels of chum salmon egg take under the hatchery permit (HP), annual management plan (AMP) and fish transport permit (FTP) for Port Armstrong Hatchery (PAH).

Key: GCH= Gunnuk Creek Hatchery, HFH=Hidden Falls Hatchery.

		Egg Take Limit Permitted Under			
Brood Year	Broodstock Origin	HP	AMP	FTP	Eggs Taken
1984	Security Bay	4,000,000	4,000,000	2,000,000	1,236,400
	Port Camden			4,400,000	703,000
1985	Security Bay	4,000,000	4,000,000	2,000,000	2,702,250
1986	Security Bay	4,000,000	4,000,000	2,000,000	2,171,103
1987	Security Bay	4,000,000	4,000,000	2,000,000	1,506,500
1988	PAH	10,000,000	4,000,000		46,571
1989	PAH	10,000,000	4,000,000		157,303
1990	PAH	10,000,000	8,800,000		855,167
1991	PAH	10,000,000	8,800,000		444,453
2003	HFH	30,000,000	30,000,000	30,000,000	10,000,826
	GCH		30,000,000	30,000,000	5,516,669
2004	HFH	30,000,000	30,000,000	30,000,000	12,914,888
2005	HFH	30,000,000	30,000,000	30,000,000	2,716,112
	GCH		30,000,000	30,000,000	1,911,488
2006	HFH	30,000,000	30,000,000	30,000,000	13,300,064
	PAH		30,000,000	30,000,000	5,049,447
	GCH		30,000,000	30,000,000	940,933
2007	PAH	30,000,000	30,000,000	30,000,000	15,348,631
2008	PAH	30,000,000	30,000,000	30,000,000	13,104,587
2009	PAH	30,000,000	30,000,000	30,000,000	30,019,963
2010	PAH	30,000,000	30,000,000	30,000,000	30,479,861
2011	PAH	30,000,000	30,000,000	30,000,000	30,139,827
2012	PAH	30,000,000	30,000,000	30,000,000	29,620,820
2013	PAH	30,000,000	30,000,000	30,000,000	30,174,044
2014	PAH	30,000,000	30,000,000	30,000,000	24,773,774

Appendix L.–Comparison of permitted levels of Chinook salmon egg take under the hatchery permit (HP), annual management plan (AMP) and fish transport permit (FTP) for Port Armstrong Hatchery (PAH).

Key: LPW=Little Port Walter Hatchery, CL=Crystal Lake Hatchery, AC=Andrew Creek, S=Snettisham Hatchery, DM=Deer Mountain Hatchery.

		Egg Take Limit Permitted Under			
Brood Year	Broodstock Origin	HP	AMP	FTP	Eggs Taken
1985	LPW/Unuk River	50,000	Not Listed		69,949[a]
1986	LPW/Unuk River	80,000	[b]	80,000	80,000
1987	LPW/Unuk River		80,000	160,000	130,000
1988	LPW/Unuk River		80,000	160,000	165,897
1989	LPW/Unuk River		160,000	160,000	154,588
1990	LPW/Unuk River	250,000	160,000	160,000	160,316
	CL/AC			80,000	277,600[c]
	DM/Unuk River				91,200[c]
1991	PAH/Unuk River	250,000	160,000	Not found	32,880
	LPW			250,000	42,111[d]
2001	LPW/Unuk River	2,000,000	125,000	500,000	181,228
2002	LPW/Unuk River	2,000,000	180,000	500,000	172,915
2003	LPW/Unuk River	2,000,000	180,000	500,000	240,465
2004	LPW/Unuk River	2,000,000	180,000	500,000	907,633
2005	LPW/Unuk River	2,000,000	2,000,000	500,000	215,440
2006	PAH/Unuk River	2,000,000	2,000,000		1,935,154[e]
2007	PAH/Unuk River	2,000,000	2,000,000		1,152,889[f]
2008	PAH/Unuk River	2,000,000	2,000,000		973,421
2009	PAH/Unuk River	2,000,000	2,000,000		734,201[g]
2010	PAH/Unuk River	2,000,000	500,000		833,753
2011	PAH/Unuk River	2,000,000	2,000,000	2,000,000[h]	737,644
2012	PAH/Unuk River	2,000,000	700,000	2,000,000	384,073
2013	PAH/Unuk River	2,000,000	400,000	2,000,000	320,358
2014	PAH/Unuk River	2,000,000	400,000	2,000,000	293,450

[a] Fry transferred from Little Port Walter Hatchery.
[b] AMP indicated AKI anticipated getting 50,000 Chickamin River stock Chinook salmon eggs from LPW.
[c] Fry transferred from Snettisham Hatchery.
[d] Fry transferred from Little Port Walter Hatchery.
[e] Of this total, 307,972 eyed eggs transferred to POWHA and 243,410 eggs culled due to bacterial kidney disease.
[f] Of this total, 285,017 eyed eggs transferred to POWHA and 5,520 eggs culled due to bacterial kidney disease.
[g] Of this total, 235,130 eyed eggs transferred to POWHA and 21,396 eggs culled due to bacterial kidney disease.
[h] Oversight that FTP was not in place for egg collections from PAH returns was rectified in 2011.

Appendix M.–Comparison of permitted levels of coho salmon egg take under the hatchery permit (HP), annual management plan (AMP) and fish transport permit (FTP) for Port Armstrong Hatchery (PAH).

Brood Year	Broodstock Origin	Egg Take Limit Permitted Under			
		HP	AMP	FTP	Eggs Taken
1988	Blanchard Lake (Deep Cove)	500,000	200,000	Not Found	140,000
1989	Deer Lake (Sashin)	500,000	150,000	500,000	280,000
1990	Deer Lake (Sashin)	500,000	280,000	500,000	230,180
1991	Deer Lake (Deep Cove)	500,000	280,000	[a]	613,504
1992	Deer Lake (Sashin)	1,500,000	750,000	[b]	987,621
1993	PAH	1,500,000	1,500,000	Not Found	663,000
	Hidden Falls			1,500,000	217,000
1994	PAH	2,000,000	650,000	Not Found	1,098,000
	Hidden Falls			1,500,000	606,000
1995	PAH	2,000,000	650,000	Not Found	1,830,000
1996	PAH	2,000,000	1,700,000	Not Found	1,853,000
1997	PAH	2,000,000	275,000	Not Found	748,779
1998	PAH	1,500,000	1,000,000	1,500,000	1,611,247
1999	Hidden Falls	1,500,000	1,500,000	1,500,000	1,163,766
2000	Hidden Falls	1,500,000	1,500,000	1,500,000	1,775,298
2001	PAH	1,500,000	1,750,000	1,500,000	1,861,605
2002	PAH	1,500,000	1,800,000	1,500,000	1,576,659
	Hidden Falls		1,500,000	1,500,000	325,171
2003	PAH	1,500,000	2,000,000	1,500,000	2,338,298
2004	PAH	1,500,000	2,000,000	1,500,000	1,287,880
	Hidden Falls		1,500,000	1,500,000	1,746,626
2005	PAH	3,000,000	3,000,000	3,000,000	2,933,857
2006	PAH	3,000,000	3,000,000	3,000,000	3,296,075
2007	PAH	5,000,000	3,000,000	5,000,000	3,702,400
2008	PAH	5,000,000	3,000,000	5,000,000	4,287,737
2009	PAH	5,000,000	3,000,000	5,000,000	3,494,229[c]
2010	PAH	5,000,000	3,000,000	5,000,000	2,791,311[d]
2011	PAH	5,000,000	3,000,000	5,000,000	2,499,209
2012	PAH	5,000,000	3,000,000	5,000,000	3,010,994[e]
2013	PAH	5,000,000	3,000,000	5,000,000	2,195,452
2014	PAH	5,000,000	3,000,000	5,000,000	2,592,000

[a] No FTP was found for this egg take, but there was an egg take for Deer Lake returns of Sashin Creek stock and since this was an egg collection from Deer Lake returns, but Deep Cove stock, it may have been overlooked.

[b] The FTP for this egg take appears to have expired in 1991.

[c] Of the total, 50,418 eggs culled due to bacterial kidney disease. Additional 882,657 eggs that were extra were culled.

[d] Of the total, 147,672 eggs culled due to bacterial kidney disease.

[e] Of the total, 127,302 bacterial kidney disease culled and 88,762 discarded.