Regional Information Report No. 5J14-01

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

by

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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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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 Snettisham Salmon Hatchery located in Speel Arm of Port Snettisham about 30 air miles south of Juneau in Southeast Alaska. The hatchery was constructed in 1979 by the State of Alaska and remains under state ownership. The hatchery initially produced chum salmon *Oncorhynchus keta* for commercial harvest, and coho salmon *O. kisutch* and Chinook salmon *O. tshawytscha* for sport and commercial harvest. Steelhead *O. mykiss* and Dolly Varden *Salvelinus malma* eggs were also incubated at the facility.

The hatchery was converted to sockeye salmon production in 1988. Hatchery operations were transferred to Douglas Island Pink and Chum Incorporated, a private nonprofit corporation, in 1996. The sockeye salmon hatchery broodstock were derived from Speel Lake, a water body located near the hatchery. The facility releases smolt from the hatchery, from sites in Speel Arm, and from Sweetheart Lake in Port Snettisham. The hatchery also serves as a central incubation facility for several projects that involve collecting eggs from Canadian Lakes in the Taku and Stikine River drainages, incubating the eggs until hatching at Snettisham Hatchery, and releasing fry back to their natal lakes or to nearby lakes in systems with barriers that make the lakes inaccessible to returning adult sockeye salmon.

All fish incubated at Snettisham Hatchery are differentially otolith marked by release site. Commercially harvested salmon are sampled weekly to assess stock composition and hatchery contribution. A 6-inch minimum mesh size restriction in the commercial gillnet fishery is implemented near the entrance to Port Snettisham to limit harvest rates on natural sockeye salmon systems while allowing harvest of the larger hatchery-produced chum salmon returning to Limestone Inlet. Escapement goals to systems near the hatchery have been met in most years of hatchery production. Sampling at escapement weirs in sockeye systems in the region indicate very little straying of Snettisham Hatchery releases.

The basic management plan for the hatchery should be updated with a description of current permit conditions and operations.

Key words: Snettisham Salmon Hatchery, hatchery evaluation, hatchery, Douglas Island Pink and Chum, Incorporated, sockeye salmon hatchery

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 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" (Alaska Legislature 1974).

Salmon fishery restoration efforts came in response to statewide annual salmon harvests of 30 million fish, 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 nonutilized 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, and 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 hatchery production gradually boosted salmon catches, with recent commercial salmon harvests (2004–2013) averaging 180 million fish.[1]

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* survival in two 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 salmon and chum salmon *O. keta* fry can be transferred from fresh water to salt water. Most Chinook salmon *O. tshawytscha*, sockeye salmon *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. These three species 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

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

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 and generally provide a higher economic return.

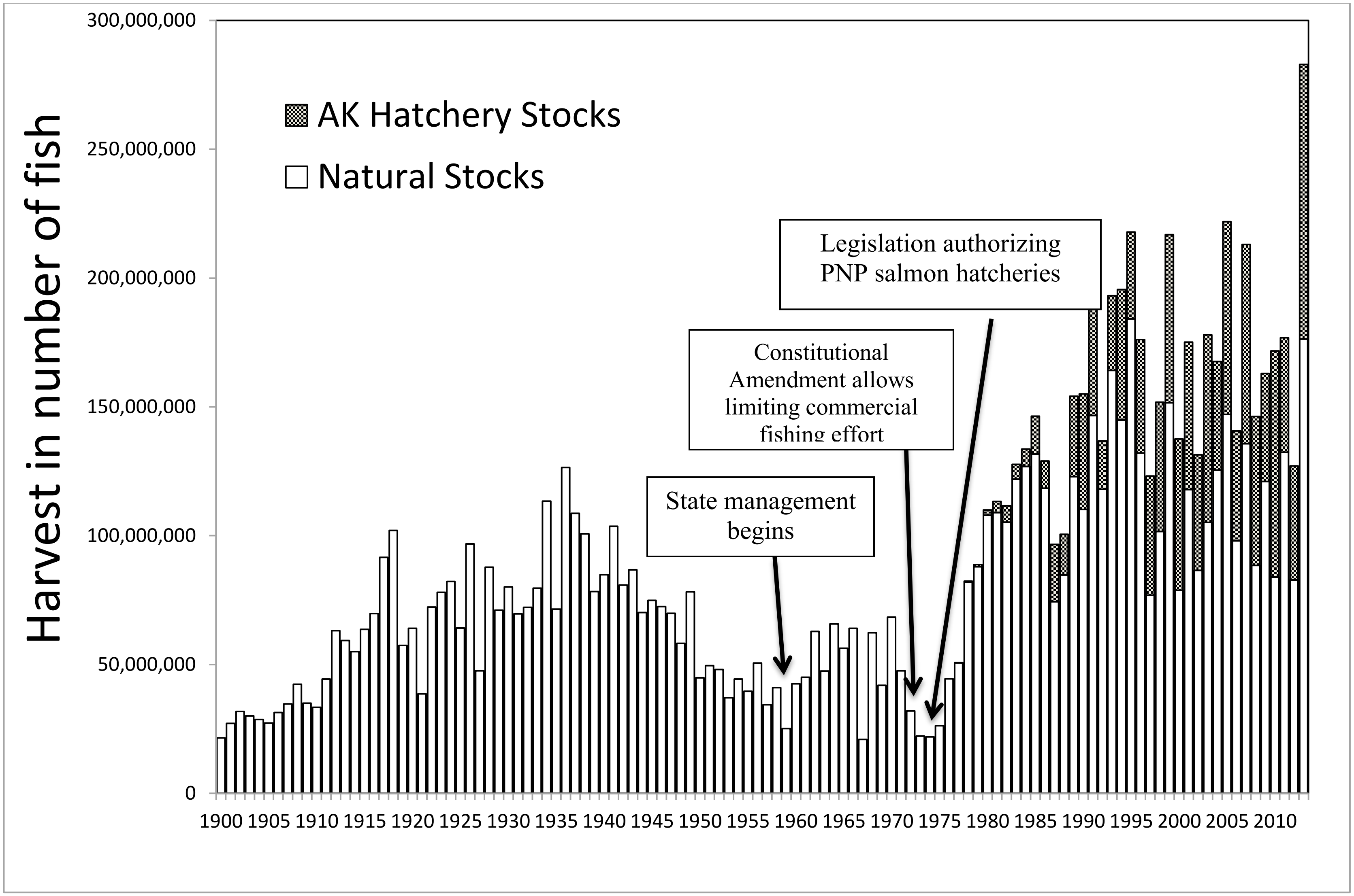

Figure 1.–Commercial salmon harvest in Alaska, 1900–2013.
Source: 1900–1976 from Byerly et al. (1999). 1977–2013 from Vercessi (2014).

Pink salmon have the shortest life cycle of Pacific salmon (two 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 of fish, followed by chum (20%), sockeye (4%), coho (2%) and Chinook (1%) salmon (Farrington 2003, 2004; 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 high quality fresh 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[2] 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[3] also showed an increasing trend, with the value of hatchery fish increasing from $138 million in 2004 to a decadal high value of $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 2004-2013, hatcheries contributed about a third of the total Alaska salmon harvest, in numbers of fish (Farrington 2003, 2004; 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

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2 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 02/04/2012), multiplied by the hatchery percent of the commercial harvest in Farrington 2003, 2004; White 2005–2011, and Vercessi 2013.

3 First wholesale value is the price paid to primary processors for processed fish from ADF&G Commercial Operators' Annual Reports multiplied by the hatchery percent of the commercial harvest.

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 stocks of concern through restricted fishing and intensive spawning assessment projects. Alaska's salmon populations are considered among the healthiest in the world. 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.

The 2013 season was a record salmon harvest. The 283 million fish commercial harvest was comprised of the second highest catch for wild stocks (176 million fish) and the highest catch for hatchery stocks (107 million fish, Figure 1) in history. The 2013 season was the first year the hatchery harvest alone exceeded 100 million fish, which was greater than the total 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 Island, Alaska, Indian Reserve salmon; British Columbia, Canada, 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 five 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 five 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 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 in increased hatchery production and the 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) completed reviews of the Trail Lakes, Port Graham and Eklutna hatcheries in Cook Inlet and the Solomon

Gulch, Gulkana, Main Bay, Cannery Creek, Wally Noerenberg and Armin F. Koernig hatcheries in Prince William Sound. This report is for the Snettisham Hatchery located in Port Snettisham about 30 miles south of Juneau. Following completion of reviews of hatcheries in the northern Southeast Alaska region, reviews of hatcheries in southern Southeast Alaska will begin.

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), *Regulation Changes, Policies, and Guidelines for Fish and Shellfish Health and Disease Control* (Meyers 2010), 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, PWS, 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.

The *Genetic Policy* also requires 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 non-sensitive areas for movement of stocks." In addition, the *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 (A) hatchery stocks cannot be introduced to sites where the introduced stock may have interaction or impact on significant or unique wild stocks; (B) a watershed with a significant stock can only be stocked with progeny from the indigenous stocks; and (C) fish releases at sites where no interaction with, or impact on, significant or unique stock will occur, and which are not for the purposes of developing, rehabilitation, or enhancement of a stock (e.g., releases for terminal harvest or in landlocked lakes) will not produce a detrimental genetic effect. 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 Southeast Alaska, enhancement activities are generally prohibited in drainages on Forest Service lands, which make up the majority of land mass in the region. In this respect, the drainages represent de facto wild stock sanctuaries (Duckett et al. 2010). In addition, the Phase III Comprehensive Salmon Plan (described in the next paragraph) for Southeast Alaska includes a *stock appraisal tool*, which identifies criteria to be used for evaluating the significance of a wild stock that may potentially interact with hatchery releases.

Salmon fishery enhancement efforts are guided by comprehensive salmon plans for each region. These plans are developed by the RPTs, which are composed of six members: three from ADF&G and three 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 *Regulation Changes, Policies, and Guidelines for Fish and Shellfish Health and Disease Control* (Meyers 2010). 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. As with the *Genetic Policy*, 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 biologists 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* 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), comprised primarily of commercial salmon fishing permit holders, operate most of the PNP hatcheries in Kodiak, Cook Inlet, PWS, 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. RAAs may vote to impose a salmon enhancement tax on sale of salmon by permit holders 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 hatcheries or release sites to pay for operations. Several organizations have tourist and educational programs that contribute to the financial support of their programs as well.

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 staff 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 review applications for new hatcheries to determine compatibility with the comprehensive salmon plan, and also 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 four documents required in regulation (5 AAC 40.110–990 and 5 AAC 41.005–100) and statute (AS 16.05.092): hatchery permit with basic management plan (BMP), annual management plan (AMP), fish transport permit (FTP), and annual report (Figure 2).

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 two documents should be revised together if the permit is altered. 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 through a permit alteration request (PAR). Requested changes are reviewed by the RPT and ADF&G staff and a recommendation is sent to the ADF&G commissioner for consideration. If no agreement is reached through the RPT, the PAR is sent to the commissioner without a recommendation. If approved by the commissioner, the permit is amended to include the alteration. Reference to a *permit* or *hatchery permit* in this document also includes approved PARs to the hatchery permit unless otherwise noted.

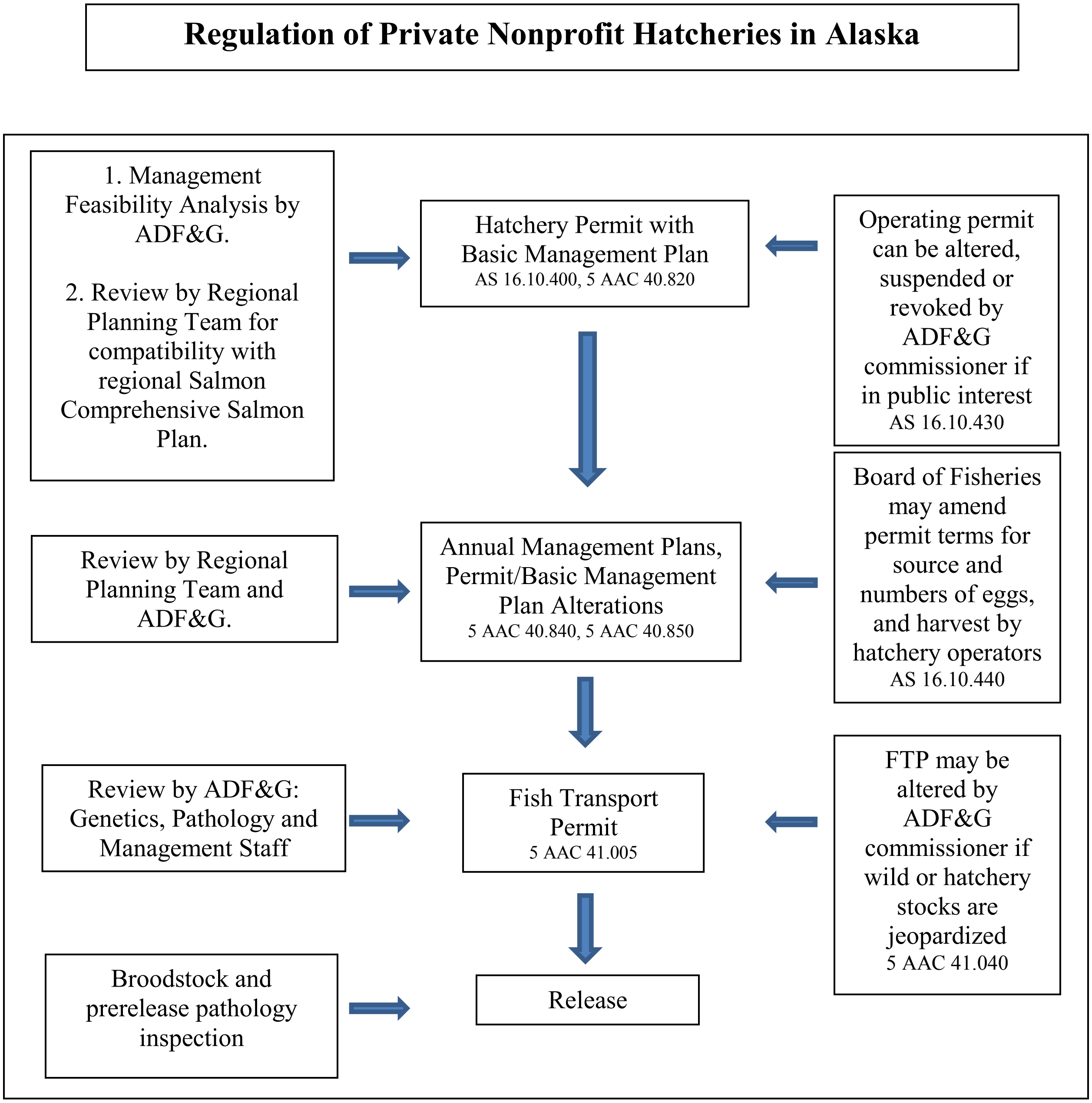

Figure 2.–Diagram of Alaska hatchery permitting process.

The AMP outlines operations for the current year and is in effect until superseded by the following year's AMP. 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 upcoming year's egg-take goals, fry or smolt releases, expected adult returns, harvest management plans, FTPs 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 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. Information for all hatcheries is compiled into an annual ADF&G report (e.g., Vercessi 2013) 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 cultured, stock lineages, releases, returns, and pathology.

SNETTISHAM SALMON HATCHERY OVERVIEW

Snettisham Hatchery was built in 1979 by the State of Alaska alongside the Snettisham hydroelectric power project at tidewater in Port Snettisham about 30 air miles south of Juneau (Figure 3). The hatchery site was chosen to take advantage of high quality water availability and infrastructure already in place for the power facility. Initial investigations of site feasibility began with small egg takes from 1976 to 1979 which were incubated in a research lab within the power plant. The water feeding the power facility and hatchery comes from two hanging lakes.[4] Water moves through two tunnels bored through rock which taps the lakes many feet below the surface.

The original intent of the hatchery was to produce Chinook and chum salmon, with a capacity for 71.5 million chum salmon eggs and 5.4 million Chinook salmon eggs. Coho salmon production was also proposed as a substitute for some or all of the Chinook salmon production.[5] Annual returns were projected to be 1.1 million chum salmon and 90,000 to 300,000 Chinook and/or coho salmon.[6]

Initial egg-take goals at Snettisham Hatchery in 1980 were for 2.5 million chum salmon eggs, 200,000 coho salmon eggs and 200,000 Chinook salmon eggs.[7] Chum salmon donor stocks were Limestone, Admiralty, and Neka creeks; coho salmon donor stock was from Speel Lake; Chinook salmon donor stocks were from the King Salmon and Situk rivers, as well as Unuk River stock eyed eggs transferred from Little Port Walter research facility and Andrews Creek stock eyed eggs transferred from Crystal Lake hatchery.

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4 Hanging lakes are lakes with waterfall outlets that are impassable to migrating fish.

5 Draft Basic Management Plan for Snettisham Hatchery, circa 1980. Unpublished document obtained from Sam Rabung, ADF&G PNP Hatchery Coordinator, Juneau.

6 Basic management plan for Snettisham Hatchery, circa 1980. Unpublished document obtained from Sam Rabung, ADF&G PNP Hatchery Coordinator, Juneau.

7 1980 Snettisham Hatchery Annual Management Plan. Unpublished document obtained from Sam Rabung, ADF&G PNP Hatchery Coordinator, Juneau.

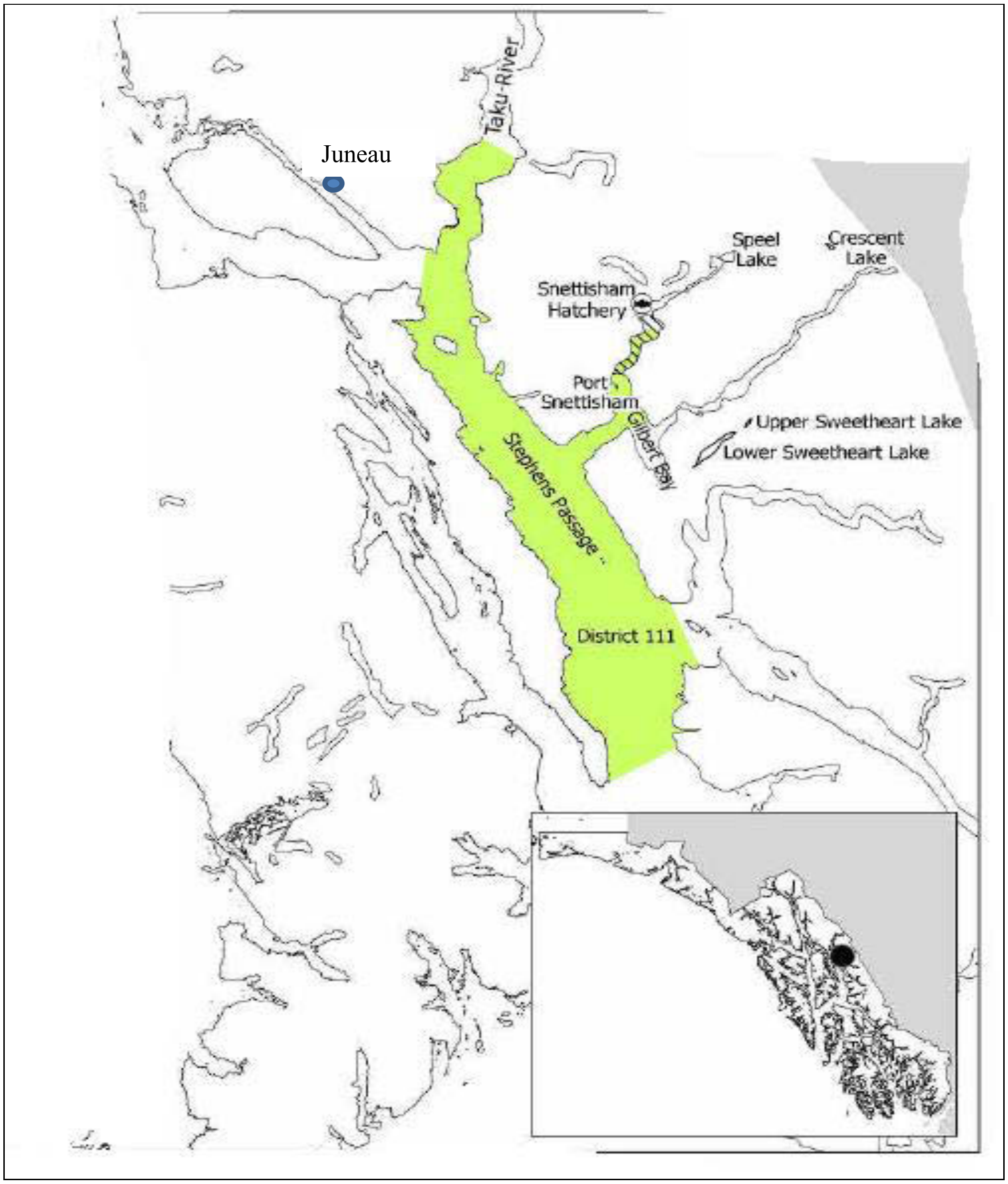

Figure 3.–Snettisham Hatchery and release sites of Speel Lake, Crescent Lake, Sweetheart Lake and Gilbert Bay in Port Snettisham. Shaded areas are commercial fishing areas.
Source: Riffe and Clark (2003).

The Snettisham Hatchery coho salmon program operated from 1978 to 1991 (Appendix A). ADF&G FRED staff decided after a decade of below standard returns that coho salmon were not well adapted to the low water temperature at the site (Holland 1990).

The chum salmon program appeared to be on schedule through 1987, when the egg take peaked at 47 million eggs (Appendix B). Remote release of chum salmon at Limestone Inlet began in 1988, and that program also appeared successful with fry released at twice the size of fry released from freshwater raceways at Snettisham Hatchery. From 1987 to 1990, however, very low returns prompted ADF&G to discontinue production, and the last fry were released in 1991.

The Limestone Inlet saltwater rearing site was transferred temporarily to the Northern Southeast Regional Aquaculture Association (NSRAA) in 1991 and permanently to DIPAC in 1992.[8]

A Dolly Varden project was initiated in response to a request from the Division of Sport Fish to investigate the potential for enhancing sport fishing in the Juneau area. About 71,000 Dolly Varden (*Salvelinus malma*) eggs were collected from Crescent Lake broodstock in 1981, incubated at Snettisham Hatchery, and the resultant approximately 1,900 juveniles released in 1984 into Twin Lakes near Juneau (Hansen 1985).

Steelhead eggs (*O. mykiss*) were collected from Peterson Creek stock fish for release at Montana Creek from 1983 to 1987. Brood year 1984 smolt were released in 1987, and brood year 1986 smolt were released in 1990 (Appendix C). There were no releases in the other years as eggs or fry succumbed to disease and gas supersaturation.

All Chinook salmon brood stocks used were of Southeast Alaska origin, except for eggs used from Chinook salmon from the Situk River near Yakutat (Appendix D). Chinook salmon reared at Snettisham Hatchery were released at Snettisham Hatchery, Auke Creek, Fish Creek, Twin Lakes, Sheep Creek, Port Armstrong, Redoubt Lake, Indian River, Little Port Walter and Montana Creek.[9] The Chinook salmon program operated from 1977 to 1994, when the program was transferred to the Macaulay Salmon Hatchery in Juneau.[10]

Sockeye salmon production replaced chum salmon production in 1988, in part to meet obligations of the U.S./Canada Pacific Salmon Treaty (PST). Sockeye salmon production was believed to be more suited to the cold water supply of the hatchery than was chum salmon production (McNair 1991).

The hatchery was divided into modules to meet the isolation protocols for sockeye salmon production to limit losses from Infectious Hematopoietic Necrosis Virus (IHNV). Four modules were for projects that collect eggs from broodstock from Canadian tributaries of the Taku and Stikine Rivers, incubate the eggs at Snettisham Hatchery, and stock the resulting fry back to the tributaries. Release sites for these projects included Tahltan, and Tuya lakes on the Stikine River, and Trapper, Tatsamenie, and King Salmon lake systems on the Taku River.

Two modules were used for production of sockeye salmon for local fishery enhancement projects using broodstock from Speel, Chilkat, and Crescent lakes. Release sites for Speel Lake stock included Speel Lake, the hatchery, and Sweetheart Lake. Crescent Lake stock release sites included the hatchery, Crescent and Sweetheart lakes, and saltwater net pens in Gilbert Bay. Chilkat Lake stock fry were released back to Chilkat Lake.

In the late 1980s and early 1990s, ADF&G transferred most state hatchery facilities to PNP operators as a cost-saving measure, including Snettisham Hatchery. Since PNP hatchery operations are primarily privately funded, any PNP corporation interested in taking over operations at Snettisham Hatchery needed to harvest a portion of the return to pay for operations. For this purpose, ADF&G expanded Snettisham Hatchery in 1993 so that sockeye salmon smolt

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8 A plan for producing sockeye salmon smolts and presmolts at Snettisham. ADF&G draft document. Unpublished document obtained from Sam Rabung, ADF&G PNP Hatchery Coordinator, Juneau.

9 1995 Snettisham Annual Management Plan. Unpublished document obtained from Sam Rabung, ADF&G PNP Hatchery Coordinator, Juneau.

10 1994 Snettisham Annual Management Plan. Unpublished document obtained from Sam Rabung, ADF&G PNP Hatchery Coordinator, Juneau.

production could be increased and result in adult return numbers in excess of broodstock needs that could be harvested for cost-recovery (McNair and Holland 2012). Following the renovations to the hatchery and the transfer of the Chinook salmon program to Macaulay Salmon Hatchery in 1994, Snettisham Hatchery stood as a sockeye salmon production facility with a capacity of 29 million eggs.[11] At full production, the program was expected to produce returns of 200,000 adult sockeye salmon annually.

In 1988, Snettisham Hatchery began thermal-marking otoliths of released fish (Hagen 1993). This technique was eventually adopted by nearly all hatcheries in the state as a mass-marking technique, and greatly aided fisheries management and assessment of hatchery returns.

In 1995, ADF&G negotiated with NSRAA to contract operations at Snettisham Hatchery, but NSRAA declined. ADF&G operated Snettisham Hatchery another year until contracting with DIPAC to take over operations in 1996.

In July 1996, DIPAC was issued hatchery permit number 39 for Snettisham Hatchery (Appendix E). The State of Alaska retained ownership of the facility and the state funded the hatchery manager position under a cooperative agreement (McNair 1997).[12] The hatchery was permitted for a capacity of 33.5 million sockeye salmon eggs. The BMP listed the allocation of hatchery incubators as follows:

Source	Egg Number (millions)
Speel Lake	12.5
Crescent Lake	3.0[a]
Tahltan Lake (Stikine River)	6.0
Tatsamenie Lake (Taku River)	6.0
Chilkat Lake	6.0
Total	33.5

[a] No more than 50% of the escapement could be used for egg collection.

In 2001, the hatchery was renovated to increase smolt-rearing capacity from 10 to 14 raceways and incubation/early start-up rearing increased from 24 start tanks to 48 start tanks. The increased capacity was to be put into use over time as the hatchery program developed.[13] To date, eight stocks have been incubated at Snettisham Hatchery, in addition to the hatchery stock of Speel Lake origin (Appendix F). Releases to date have been from a total of 11 sites (Appendix G). From 1992 to 2013, an estimated 3.6 million adult sockeye salmon have returned from Snettisham enhancement projects (Appendix H).

SNETTISHAM HATCHERY PROJECTS

Speel Lake and Snettisham Hatchery program

The Speel Lake sockeye salmon project was initially a back-stocking program, i.e., fry hatched from eggs of broodstock collected from Speel Lake were stocked back into the Speel Lake

[11] 1995 Snettisham Hatchery annual report. Unpublished document obtained from Sam Rabung, ADF&G PNP Hatchery Coordinator, Juneau.

[12] The author could not find the cooperative agreement nor length of time the hatchery manager position was funded by the state of Alaska.

[13] 2001 Snettisham Hatchery AMP. Unpublished document obtained from Sam Rabung, ADF&G PNP Hatchery Coordinator, Juneau.

system (Figure 3). The initial egg take limit from Speel Lake broodstock was 5 million eggs (FTP 88J-1070, Appendix I) under ADF&G, with the resulting fry stocked back into the lake. No more than 50% of the Speel Lake spawning escapement could be used for broodstock. The FTP stated that the project was to compensate for increased harvest rates in Port Snettisham gillnet fisheries that would harvest the chum salmon returning to Snettisham Hatchery.

The BMP indicated that Speel Lake stock sockeye salmon eggs would be available at the hatchery from returns from prior releases beginning in 1996. To maintain genetic similarity with the Speel Lake stock, the BMP indicated a tentative plan to collect milt every three years from Speel Lake sockeye to fertilize eggs collected at the hatchery; specific plans would be provided in the AMP.

Fry planting to the lake could also be required if escapements were not met due to an increased harvest rate on the Speel Lake stock during targeted harvests of Snettisham Hatchery returns. Since DIPAC is a PNP, when the operations were transferred from the State of Alaska to DIPAC, a cost-recovery fishery was necessary to fund hatchery operation costs above the funding provided for the Canadian stockings under the PST. In addition to operating the hatchery, DIPAC also took over operating the escapement-counting weir at Speel Lake.

In the BMP, the capacity for the Speel Lake program was 12.5 million eggs, but limited at the time to 9 million eggs until an adequate evaluation of survival rates, migratory behavior and manageability of adult returns was completed.

The initial FTP for Snettisham Hatchery issued to DIPAC for Speel Lake (FTP 97J-1012) was for the maximum of 12.5 million eggs and release of 8.5 million smolt, but indicated that only 6 million eggs would be taken until an adequate evaluation of survival rates, migratory behavior and manageability of adult returns was completed.[14] In 1999, capacity was increased from 6 million to 9 million eggs in the 1999 AMP, with a goal of 6 million smolt produced for release at the hatchery and 500,000 fry for release at Sweetheart Lake.[15]

In 2004, the egg take was increased from 9 million to 10.3 million to increase smolt releases from 6 million to 9 million smolts at the hatchery. The release number of fry to Sweetheart Lake (500,000 fry) remained unchanged.

In 2007, FTP 07-1021 FTP replaced FTP 97-1012 for egg takes and releases of Snettisham Hatchery/Speel Lake stock at Snettisham Hatchery. The FTP indicated a maximum 12.5 million eggs taken for hatchery returns of Speel Lake stock fish, and increased the permitted smolt release from the hatchery from 8.5 million to 9 million fish. The 2013 AMP indicated that the egg take goal is 11.8 million eggs, which is the estimated number needed to produce 9 million smolt for release at the hatchery, 500,000 fry for release at Sweetheart Lake, and a contingency buffer to mitigate potential losses from IHNV. Any excess juveniles are discarded.[16]

From 1986 to 1996, egg takes at Speel Lake ranged from 311,000 to about 3.5 million. Egg takes at Snettisham Hatchery ranged from about 3.6 million in 1996 to about 15.0 million in 2011

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[14] 1997 Snettisham Hatchery AMP. Unpublished document obtained from Sam Rabung, ADF&G PNP Hatchery Coordinator, Juneau.

[15] 1999 Snettisham Hatchery AMP. Unpublished document obtained from Sam Rabung, ADF&G PNP Hatchery Coordinator, Juneau.

[16] 2013 Snettisham Hatchery AMP. Unpublished document obtained from Sam Rabung, ADF&G PNP Hatchery Coordinator, Juneau.

(Appendix F). There were fry releases to Speel Lake in 1989 (227,000 fry) and 1995 (403,000 fry). Juvenile releases of Speel Lake stock at Snettisham Hatchery ranged from 507,000 to 9 million fish (Appendix G). Adult returns (catch and broodstock) from Snettisham Hatchery releases totaled over 3 million fish from 1996 to 2013 (Appendix H).

Crescent Lake

Crescent Lake is located on the Whiting River, which flows into Gilbert Bay in Port Snettisham (Figure 3). Eggs from Crescent Lake sockeye salmon broodstock system were incubated at Snettisham Hatchery. Fry were reared and released from saltwater net pens at Gilbert Bay and stocked into Sweetheart Lake. Crescent Lake stock was used at these sites because the Whiting River empties into Gilbert Bay near the net pen release location and near the terminus of Sweetheart Creek, so any strays to Crescent Lake from these releases would be of similar genetic makeup.[17] When broodstock were removed from Crescent Lake for these projects, fry or presmolts were returned to Crescent Lake to mitigate the impacts of egg collections when the spawning escapement was lower than established goals.

A backstocking program was initiated at Crescent Lake in the late 1980s following apparent diminished returns to the lake earlier in the decade. From 1989 to 1991 and in 1994, gametes were collected annually from Crescent Lake broodstock and the eggs incubated at Snettisham Hatchery. From 1990 to 1992, unfed fry were stocked in the lake. In addition to the fry stockings, presmolts were planted in 1990 and 1991 and smolts in 1991 to compare survivals of these stages with the unfed fry stockings. Mark–recapture studies of adult escapement into the lake in 1991 and 1992 indicated the weir counts may have significantly undercounted the spawning population, and therefore back-planting may have been unnecessary. Kelley and Josephson (1995) found that survival of planted fry and smolts were less than anticipated and recommended the back-planting program should be reconsidered due to the likely undercounting of past weir counts. The program was discontinued after the 1995 stocking.

Although the program was discontinued in 1995, FTPs were issued for the program in the event stocking of Crescent Lake was needed. FTP 97J-1011 and FTP 07J-1020 were issued to DIPAC for Crescent Lake egg takes of up to 3 million eggs and release of resulting presmolts or smolts to Crescent Lake if ADF&G required mitigation. These FTPs updated and replaced earlier FTPs 93J-1008, 91J-1007, 91J-1008, and 88J-107 issued to ADF&G.

Although Crescent Lake has a substantial return of sockeye salmon, assessing escapements has been a challenge. High water events washed out a counting weir at the lake outlet. DIPAC staff operated a sonar project to estimate escapement from 2005 to 2010. The sonar was located in the stream at the lake outlet, and fish went back and forth in front of the beam, making estimation into the lake uncertain. In addition, pink salmon migrated during the same period as sockeye salmon, further complicating the counts. Aerial survey counts did not correlate well with the sonar counts, and after six years, the sonar project was discontinued.[18]

Semiglacial water makes for difficult viewing conditions for aerial surveys. Estimating the escapement by mark–recapture experiments is difficult because the topography around the lake is

[17] Snettisham Hatchery BMP, 1996. Unpublished document obtained from Sam Rabung, ADF&G PNP Hatchery Coordinator, Juneau.
[18] Eric Prestegard, Executive Director, DIPAC, personal communication.

such that only one area allows for successful fish capture, making a complete survey of the lake population impractical.

ADF&G manages Port Snettisham very conservatively (described in the Fisheries Management section later in this report). Only large mesh gear is allowed in the portion of Stephens Passage open for gillnetting when Crescent Lake returns are expected in the area. The large mesh gear is intended to target chum salmon while minimizing harvest of Crescent Lake and Speel Lake sockeye salmon. When Port Snettisham is open to fishing, only Speel Arm, where the hatchery and the Speel Lake system are located, is open. Gilbert Bay, where the mouth of the Whiting River is located, remains closed, except for personal use fishing in Sweetheart Creek. In contrast to Crescent Lake, Speel Lake sockeye salmon escapement is accurately monitored and escapement goals are met in most years (Appendix J). When escapement cannot be monitored in Crescent Lake, ADF&G uses escapement counts to Speel Lake as a proxy for Crescent Lake escapement.

From 1989 to 1995, egg takes at Crescent Lake ranged from 551,000 to 2.6 million. (Appendix F). Juvenile releases to Crescent Lake ranged from 216,000 to 635,000 fish from 1990 to 1996 (Appendix G). Returns from Crescent Lake releases were assessed in 1996 (about 930 adults) and in 1998 (821 adults; Appendix H).

Gilbert Bay Saltwater Net Pen releases

ADF&G released Crescent Lake sockeye salmon smolts from Gilbert Bay (Figure 3) net pens in salt water in 1994 and 1995 to evaluate the site for a cost recovery fishery under FTP 93J-1009 (Appendix G).[19] The geneticist commented on the FTP that from a genetics perspective, this was a bad project because he believed that adults that avoided capture would stray. Because it was the best opportunity to make the proposed Snettisham cost recovery work, however, he supported the project, given a commitment to evaluation and reconsideration of the project if straying was a problem. The ADF&G fish pathologist commented that he did not see any apparent disease concerns. The ADF&G FRED Division regional supervisor commented that the Gilbert Bay project was being developed as a cost recovery fishery. Other reviewers approved the permit without comment.

The program was suspended in 1996 until the return could be evaluated as a terminal harvest site.[20] A total of about 41,000 adult sockeye salmon returned from the releases from 1997 to 1999 (Appendix H). The project has lain dormant since, and no FTP for the project was issued to DIPAC after they took over hatchery operations.

Sweetheart Lake

Sweetheart Lake empties into Gilbert Bay in Port Snettisham (Figure 3). The lake has a waterfall near the creek mouth that is impassable to returning adult sockeye salmon. The return to Sweetheart Lake supports the largest personal use fishery in the Juneau area. In the early years of the program, eggs for the program were collected from Speel Lake (1989, 1990, 1991 and 1995) under FTP 88J-1084 and Crescent Lake brood stock (1993, 1994 and 1996) under FTP 93J-1007. Only one egg take occurred on Sweetheart Lake returns in 1994 (Appendix F).

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[19] Eric Prestegard, Executive Director, DIPAC, personal communication.
[20] Ibid.

In his comments for FTP 93J-1007, the ADF&G geneticist expressed concern for straying of both stocks used for the Sweetheart Lake project because the adults would be prevented from reaching spawning areas by the falls and look for other systems to spawn in. The geneticist recommended an evaluation of the frequency of strays into the Speel Lake system and the Snettisham Hatchery brood stock, which was of Speel Lake stock origin. He also recommended documentation of the gene diversity within and among the Port Snettisham stocks for long-term genetic monitoring. He recommended reconsideration of the project after the first adult returns were available for evaluation. The ADF&G fish pathologist commented that there were no apparent disease concerns. The ADF&G Division of Commercial Fisheries regional supervisor commented that Crescent Lake fry would be stocked into Sweetheart Lake only when there was a surplus of fry for maintaining Crescent Lake at optimum production and that details of the project would be developed in the AMP.

A total of 2,850 sockeye salmon were sampled at Crescent Lake during 19 years of sampling between 1995 and 2013. No Sweetheart Lake strays were found. Four fish from brood year 1992 Sweetheart Lake (Crescent Lake stock) releases were recovered at the Snettisham Hatchery in 1996. A review of the state otolith mark database (http://mtalab.adfg.alaska.gov/OTO/reports/MarkSummary.aspx, accessed 6/6/2014) indicated Sweetheart Lake-released sockeye salmon were not seen elsewhere in escapement sampling in the Taku and Stikine river drainages, nor at Speel Lake.

There were no releases to Sweetheart Lake in 1997. Beginning in 1998, releases were from Snettisham Hatchery (Speel Lake) stock under FTP 98J-1008, which was later renewed under FTP 05-1014. Releases in the last decade (2004–2013) averaged about 458,000 juvenile sockeye salmon (Appendix G). Returns to this project totaled over 140,000 adult fish from 1992 to 2013 (Appendix H).

U.S.-Canada Projects

Snettisham Hatchery serves as a central incubation facility for several projects on the Stikine and Taku rivers under the PST. For these projects, Canadian staff conducts egg takes at lakes and transport fertilized eggs to Snettisham Hatchery for incubation and otolith marking. Fry are stocked back into the lakes the following spring, except for Tuya Lake, which has no sockeye salmon run. This lake is stocked with Tahltan Lake stock fry. Freshwater survival, zooplankton monitoring and lake limnology are monitored by Canadian staff.

Stikine River Program

On the Stikine River drainage, Tahltan Lake stock fry are stocked back into Tahltan Lake and also into Tuya Lake, which is located above a migration barrier waterfall on the Stikine River (Figure 4). FTPs for the Tahltan Lake (FTP 89J-1009) and Tuya Lake (FTP 89J-1011) were issued to ADF&G. New FTPs were issued to DIPAC when they took over hatchery operations (FTPs 97J-1015 and 97J-1016). From 1989 to 2013, egg collections for the Tahltan and Tuya Lake projects ranged from 967,000 to 6.9 million eggs (Appendix F). From 1990 to 2013, releases at Tahltan Lake ranged from 904,000 to 3.6 million fish (Appendix G). From 1994 to 2013, releases at Tuya Lake ranged from 756,000 to 4.7 million fish (Appendix G). From 2004 to 2006, returns from the Tahltan Lake releases exceeded 100,000 fish annually (Appendix H). From 2003 to 2013, annual returns from the Tuya Lake release averaged 37,000 fish (Appendix H).

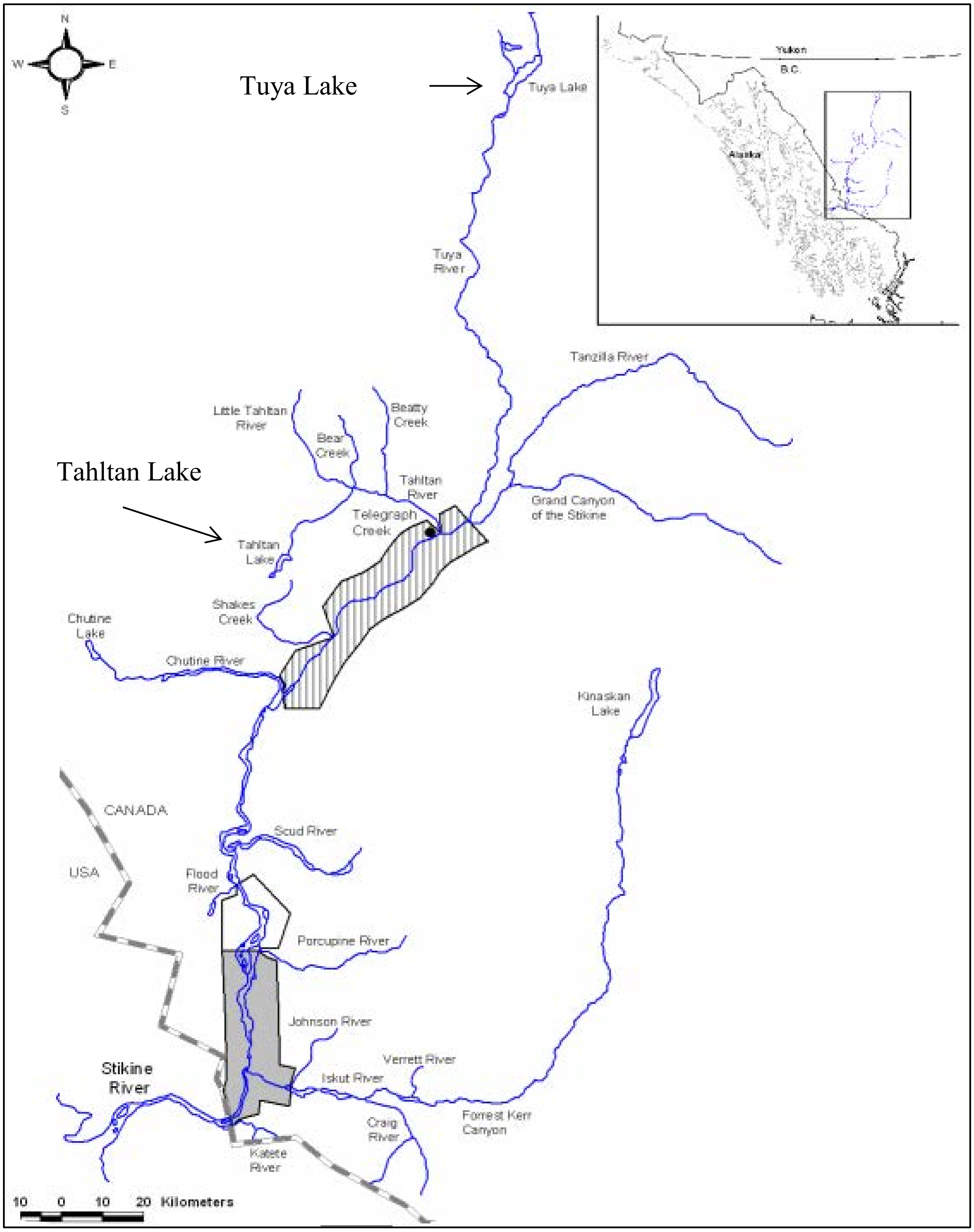

Figure 4.–Stikine River release sites of Snettisham Hatchery projects. Shaded areas are Canadian commercial fishing zones.
Source: Pacific Salmon Commission Transboundary Technical Committee (2014).

Taku River Program

On the Taku River drainage, projects occurred in the Tatsamenie, Little Trapper and King Salmon lakes (Figure 5). The Tatsamenie Lake program began with egg takes in 1990 under FTP

89J-1010 issued to ADF&G and continues to present under FTP 97J-1017 issued to DIPAC (Appendix I). Egg takes occurred at Little Trapper Lake from 1990 to 1994 under FTP 89J-1012, and in 2006 and 2007 under FTP 06J-1040. The King Salmon Lake project began with egg collection in 2012 and backstocking of the fry in 2013. Although the project was approved in the 2012 AMP, the FTP for the project (FTP 13J-1001) was not issued until after eggs were collected and transported to the hatchery—apparently an oversight. Between 1995 and 2013 returns to the Tatsamenie and Trapper lakes projects totaled over 125,000 fish (Appendix H).

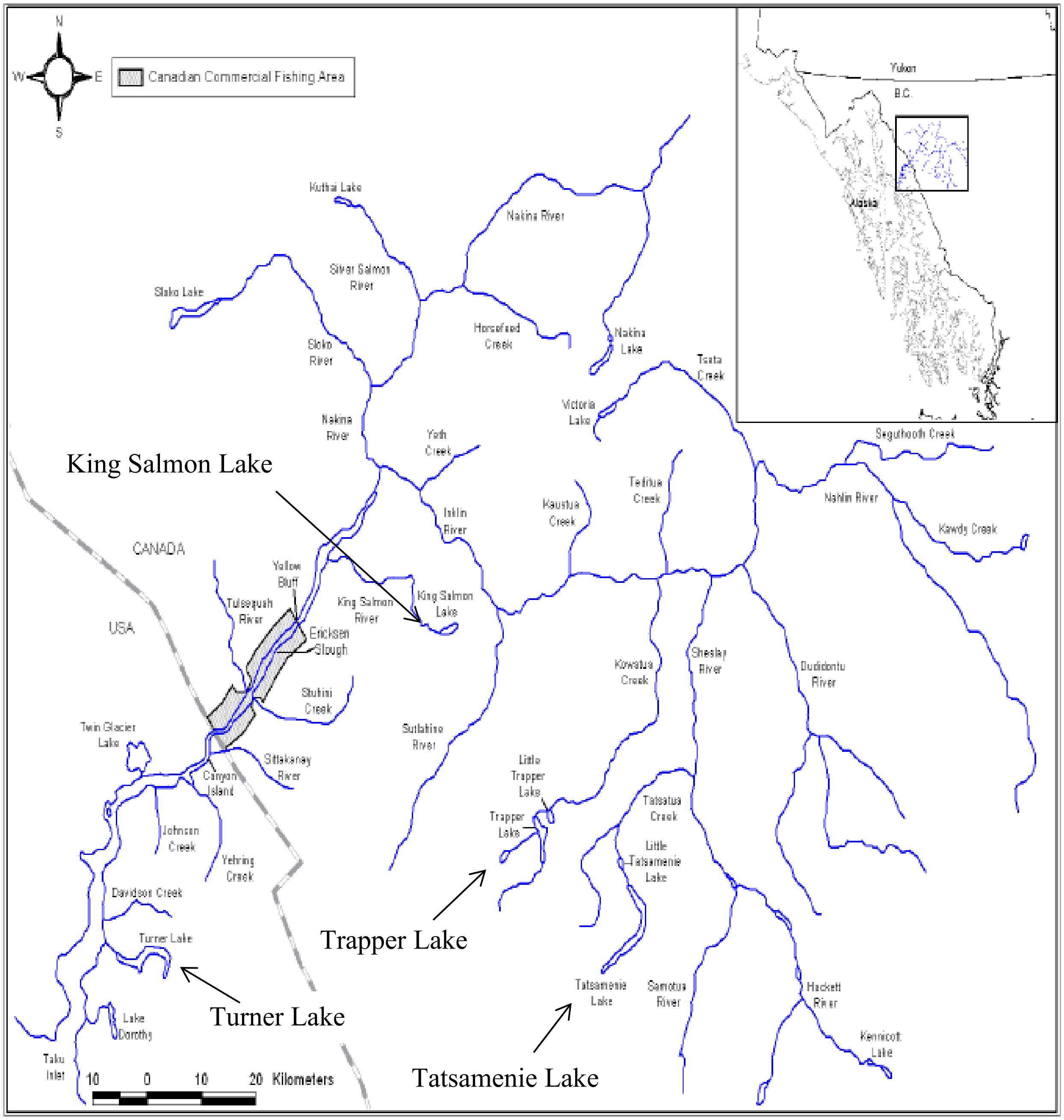

Figure 5.–Taku River projects for Snettisham Hatchery.
Source: Pacific Salmon Commission Transboundary Technical Committee (2014).

COMPREHENSIVE SALMON ENHANCEMENT PLAN

Phase I CSP

RPTs in Southeast Alaska have developed three phases of Comprehensive Salmon Plans (CSP) to date. Phase I was issued in 1981, and 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." The Phase I CSP provided harvest objectives and methods for bridging the gap between the harvest goal and the natural and enhanced production at the time.

Chum salmon comprised most of Snettisham Hatcheries production efforts from 1977 to 1991, along with Chinook and coho salmon production. According to the Phase I CSP,[21] the highest Southeast Alaska chum salmon harvest at the time (1981) was 9,350,000 fish in 1918. The highest average consecutive 30-year harvest of 5.2 million chum salmon occurred between 1915 and 1944. After 1954, chum salmon runs declined sharply, with the regionwide harvest falling below one million chum salmon in the late 1970s. The northern Southeast Alaska chum salmon harvest showed a similar dynamic to the regionwide harvest (Figure 6). The Phase I CSP indicated the achievable long-term 15-year average chum salmon harvest for naturally spawning chum salmon was 1.7 million fish. Some of the salient points of the Phase I document with regard to Snettisham Hatchery production included the NSRAA objectives to (A) increase Chinook and coho salmon for hand troll and sport fishing in the Juneau area; (B) produce summer chum salmon for gillnet in areas with little or no current fishing pressure, especially in Lynn Canal, lower Stephens Passage and Gastineau Channel; (C) produce fall chum salmon in the lower Stephens Passage gillnet harvest areas; and (D) produce chum salmon for seine harvest in lower Stephens Passage.

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. 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 chum salmon would enter existing fisheries managed for sockeye and pink salmon, and fall chum salmon could generally be discretely managed and discretely harvested in most areas of Southeast Alaska, except where significant fall chum salmon stocks occur naturally.

At the time of the Phase I CSP, successful sockeye salmon hatchery culture techniques were still being developed. Although rearing to the fry stage and stocking to lakes had been somewhat successful, extended rearing through the smolt stage for release remained a challenge due to the incidence of IHNV, a virus particularly endemic to sockeye salmon populations which can decimate eggs or juvenile fish in a hatchery setting.

[21] 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.

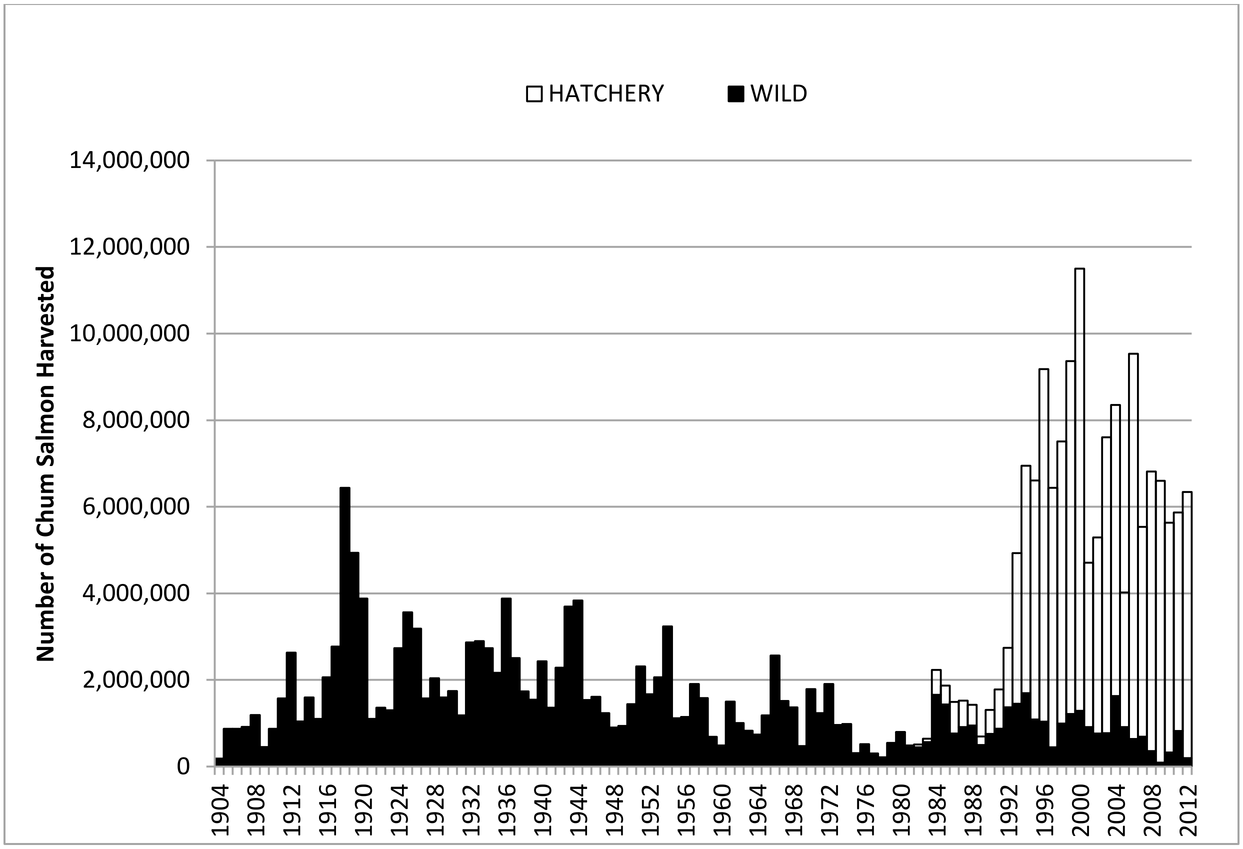

Figure 6.–Chum salmon commercial harvest, including hatchery cost recovery, in northern Southeast Alaska, 1904–2012. Hatchery component includes contributions from all hatcheries.
Source: 1985–2012 ADF&G ZEPHYR database and hatchery database accessed 12/04/2013 by Lorraine Vercessi, ADF&G PNP Assistant Coordinator, Juneau. 1904–1984 data from Byerly et al. 1999.

The long-range (year 2000) harvest objectives for the Phase I CSP were to increase the harvest in Southeast Alaska by 537,000 Chinook, 2.1 million sockeye, 2.65 million coho, 30.0 million pink salmon and 9.7 million chum salmon. Increases from better management and returns from the hatchery capacity at the time were thought to be 134,000 Chinook, 1.4 million sockeye, 1.1 million coho, 14 million pink, and 4.6 million chum salmon.

Phase II CSP

For Phase II CSP planning, the RPTs for northern and southern Southeast Alaska developed separate plans. Snettisham Hatchery is located in northern Southeast Alaska (NSE), and the NSE CSP Phase II[22] was issued in 1982. The purpose of the Phase II CSP was to identify and prioritize enhancement opportunities within five defined geographical units of NSE: Outer Coastal Unit, Icy Strait/Chatham Strait Unit, Frederick Sound Unit, Stephens Passage Unit and Lynn Canal Unit. Snettisham Hatchery and its current and former release sites are located within the Lynn Canal and Stephens Passage units, and Snettisham returns are harvested primarily in these two units (Figure 7).

[22] 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.

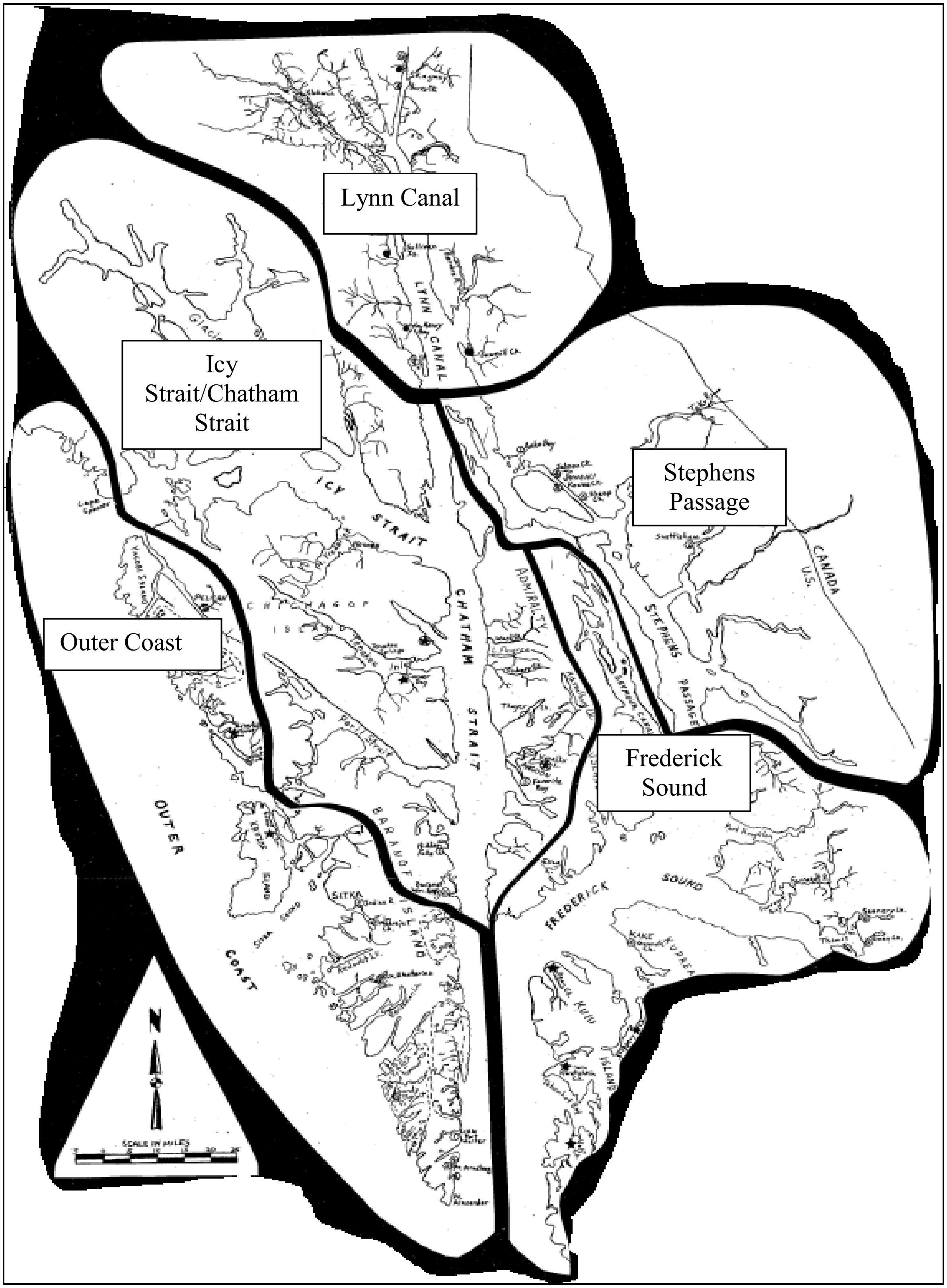

Figure 7.–Commercial fishing units for northern Southeast Alaska as described in the Phase II CSP. *Source*: Northern Southeast Regional Planning Team (1982).

The Phase II CSP was intended 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 hatchery PNP 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 Stephens Passage unit of 0 Chinook, 160,000 sockeye, 25,000 coho, 500,000 pink and 100,000 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." Recommended activities during the five years of this first Phase II plan for Snettisham Hatchery included investigation of stocking sockeye salmon in Canadian lakes in the Taku River drainage, completion of the Snettisham Hatchery, and feasibility studies for Crescent Lake fertilization.

Drift gillnet and hook and line (a.k.a. troll) are legal commercial gears in Lynn Canal and Stephens Passage Units. Purse seining is allowed in the Macaulay Salmon Hatchery special harvest areas at Amalga Harbor and Gastineau Channel. A substantial salmon sport fishery occurs in the Lynn Canal and Stephens Passage units.

The drift gillnet fishery in northern Southeast Alaska is directed primarily toward major runs of sockeye salmon and fall chum salmon to the Taku, Chilkat and Chilkoot systems. In Lynn Canal and Stephens Passage, early-run sockeye salmon, mid-summer pink salmon, and fall chum salmon are the predominant wild stocks. Summer chum salmon was the only species recommended for hatchery production for the gillnet fishery in the first Phase II plan because returning chum salmon would have temporal separation from important wild Chinook, sockeye, coho and fall chum salmon runs. Production of summer chum salmon would also extend the gillnet fishery season by providing returns during the slow summer period between sockeye salmon and fall chum salmon runs. The Phase II CSP also recommended assessment and development of off-site hatchery releases.

Sockeye production was also important in the Phase II plan. At the time, technology was not fully developed for sockeye hatchery production to the smolt stage because of the IHNV virus. Sockeye salmon production involved collecting eggs from wild broodstock, incubating and hatching the eggs in the hatchery, and returning the fry to the natal system of their parents.

The highest Southeast Alaska sockeye salmon harvest was 3.2 million fish in 1904, and the highest average consecutive 30-year harvest of 2,019,000 fish occurred between 1903 and 1932. After 1954, like chum salmon, sockeye salmon runs declined sharply, with the regionwide harvest falling below one million sockeye salmon from 1955 to 1981. The RPT in the Phase I CSP established a regional goal[23] for an annual average catch of 2.1 million sockeye salmon by the year 2000, which was carried over into the Phase II NSE CSP and Phase II NSE CSP updates. The goal was achieved in five years of the 1990s decade, but has not been achieved through 2013 (Figure 8).

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[23] The regional goal is used here since Snettishmam Hatchery contributes to both NSE and southern southeast Alaska CSP goals.

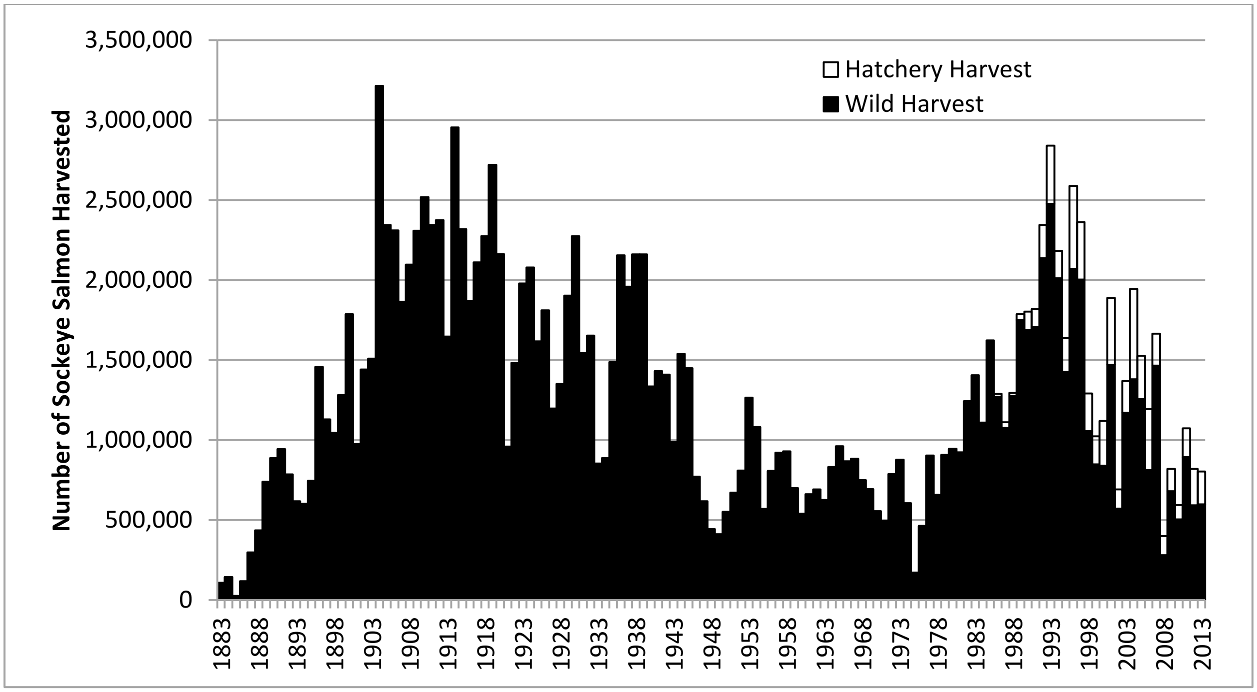

Figure 8.–Sockeye salmon commercial harvest, including hatchery cost recovery, in Southeast Alaska, 1883–2013. Hatchery component includes contributions from all hatcheries.
Source: 1985–2012 ADF&G ZEPHYR database and hatchery database accessed 12/04/2013 by Lorraine Vercessi, ADF&G PNP Assistant Coordinator, Juneau. 1904–1984 data from Byerly et al. 1999.

In 1985, significant changes in hatchery production occurred in Southeast Alaska due to the 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 agreement. Enhancement from PST mitigation funds initially focused on hatchery production of Chinook salmon.[24] Sockeye, coho and chum salmon program funding was added in subsequent years. As a result, 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 as well.[25]

Beginning in 1986, the Phase II plan was updated annually through 1996. Releases of Chinook salmon smolt reared at Snettisham Hatchery from release sites in the Juneau area in support of the sport fishery were part of the 1986 update's 5-year project plan (Northern Southeast Regional Planning Team 1986). Sockeye salmon projects in the 1986 update included development of escapement goals and assessment of the contribution of individual stocks to the Taku River fishery, and, through joint participation with the Canadian government, study and potential implementation of back stocking of Upper Trapper and Tatsamenie lakes, both of which are Canadian tributary systems to the Taku River drainage. The 1986 update indicated that studies

[24] Comprehensive Salmon Plan: Phase II: Northern Southeast Alaska. Northern Southeast Regional Planning Team, revised January 1986.

[25] Comprehensive Salmon Plan: Phase II: Northern SE Alaska. 1988 Update. Northern Southeast Alaska Regional Planning Team, Kevin C. Duffy, March 1989.

on the Taku River, including tag recoveries for U.S./Canada studies and escapement estimates for the Taku River, had been implemented, and that sockeye salmon IHNV control research was ongoing. Salmon fishery enhancement projects proposed included stocking of Turner Lake (a U.S. tributary of the Taku River); a sockeye salmon incubation project at Indian Lake near Snettisham Hatchery; and prefertilization studies at Crescent Lake (a lake emptying into Snettisham Inlet) to increase sockeye salmon production in the lake.

The 1987 Phase II CSP update (Northern Southeast Regional Planning Team 1987) indicated that Chinook salmon production was a priority for northern Southeast Alaska, and that sockeye salmon fishery enhancement was the next major challenge faced by fishery and hatchery managers in Southeast Alaska. The 1987 update also indicated that the PST, signed in 1985, included federal funds for enhancement projects to mitigate harvest losses by gear groups as a result of agreements in the PST. Initial goals included adult production of 100,000 Chinook salmon, 1.0 million chum salmon, and 20,000 to 40,000 sockeye salmon. The PST also provided for cooperative management of transboundary salmon stocks, including those in the Taku and Stikine rivers. A sockeye salmon central incubation facility was added to the enhancement projects list in the 1987 Phase II CSP update. The central incubation facility would incubate eggs and stock resulting fry into appropriate lakes of northern Southeast Alaska. The plan noted that a portion of the Snettisham Hatchery was discussed as a possible candidate as the central incubation facility, and that sockeye salmon eggs had been collected from Speel Lake the previous year and were under incubation at the hatchery.

By 1988, the Phase II CSP update (Northern Southeast Regional Planning Team 1989) indicated more urgency in developing Snettisham Hatchery as a sockeye salmon facility. Successes with sockeye salmon propagation by ADF&G in other hatcheries in the state and the need to fulfill obligations to the Southeast Alaska gillnet fleet for losses sustained due to provisions in the PST resulted in allocation of federal funds for the hatchery. A new interim facility with a 10 million sockeye salmon egg capacity was constructed in 1988, and a permanent facility with a 25 million egg capacity was to be constructed during 1989–1990. The Turner Lake sockeye salmon enhancement project was approved by the ADF&G commissioner in 1988, and awaited an environmental assessment required by the U.S. Forest Service. Sockeye salmon eggs at the Indian Lakes incubation project did not survive due to water quality problems and the project was subsequently not needed after the Snettisham Hatchery upgrade. Water chemistry and limnology samples were collected from Crescent Lake to study the feasibility of increasing production in the lake through fertilization.

The 1988 update made reference to Snettisham Hatchery regarding the NSE Chinook salmon program. Snettisham Hatchery was attempting to build the King Salmon River stock as a broodstock to replace the Andrew Creek stock, which was already in use in the region, to increase stock diversity in the NSE region. However, low returns and high incidental harvest in the gillnet fishery indicated that it would take at least three 6-year generations to build up the stock to the 4 million eggs required for the hatchery. As a result, the Southeast Alaska Chinook Planning Team recommended a portion of the King Salmon River stock program be transferred to Little Port Walter, a federal research facility, where returns would likely be better due to better survival rates and lower exploitation rates. In 1988, 119,000 King Salmon River stock eggs collected at the King Salmon River were transferred to Little Port Walter to initiate the recommendation.

Regarding Snettisham Hatchery chum salmon production, the 1998 CSP update indicated that advancing technology would allow expansion of Snettisham Hatchery to increase chum salmon incubation capacity from 71 million to 115 million eggs when broodstock development was complete.

The 1989 update (Northern Southeast Regional Planning Team 1990) indicated that following the Environmental Assessment of Turner Lake, an Environmental Impact Statement would now be needed, and a team was formed to prepare the review. The project proposed egg takes in 1990 with fry stocking in 1991. A sockeye salmon project began on the Stikine River, where limnology studies at Tahltan Lake indicated fry stocking could increase annual production by 176,000 adult sockeye salmon to the lake. Sockeye salmon eggs from Tahltan Lake broodstock were to be taken in 1989 for incubation at Snettisham Hatchery for release of fry in 1990. In addition, Tuya Lake, another tributary system to the Stikine River with a barrier falls impassable to upstream migration of sockeye salmon, was assessed. Limnology studies indicated the lake could be used to rear Tahltan Lake fry, and could increase annual production by 764,000 adult sockeye salmon. The Tuya Lake project would proceed when broodstock for the Tahltan Lake project was developed.

The 1990 update (Northern Southeast Regional Planning Team 1991) indicated that although the Turner Lake sockeye salmon enhancement plan could potentially produce about 500,000 adult sockeye salmon from planted fry, the project was stopped when no IHNV was found in the resident freshwater sockeye salmon (aka kokanee) population. Any sockeye salmon fry planted in the lake would potentially introduce IHNV to the system to which the kokanee would likely be susceptible.

The 1990 update also included the Sweetheart Lake sockeye salmon project. Based on assessments made in 1988 indicating adequate survival over the 500-foot drop from the lake to saltwater for coho salmon smolt, sockeye salmon fry were stocked in 1990, and evaluation of smolt survival was to continue in 1991. At full production, ADF&G estimated that Sweetheart Lake could produce a 100,000 adult return. Prefertilization studies at Crescent Lake, the Tahltan Lake enhancement project, and the Tuya Lake assessment continued.

The 1990 update noted that the Snettisham Hatchery would no longer produce chum salmon, and that future releases at Limestone Inlet would be continued by DIPAC after the last Snettisham chum salmon fry releases from Limestone Inlet in 1991. After 1990, sockeye salmon comprised most of Snettisham Hatcheries production.

The 1991 update (Northern Southeast Regional Planning Team 1992) showed the Taku and Stikine projects in progress, including plans for the first stocking of Tuya Lake in 1992.

The 1992 update (Northern Southeast Regional Planning Team 1993) showed several new projects added under the CSP. Chilkat Lake sockeye salmon supplemental stocking near Haines was a priority project for commercial gillnet groups in the area. PST funding was allocated for this project in 1992, and eggs were collected at the lake by NSRAA staff, incubated at Snettisham Hatchery, and the resultant fry planted in the lake. A permanent central incubation facility at Snettisham Hatchery was scheduled for completion in 1993 which would increase capacity from 14 million to 30 million eggs.

Plans at Snettisham Hatchery included developing a brood of Speel Lake stock sockeye salmon that returned to the hatchery and a Crescent Lake stock for remote release. Studies at Sweetheart

Lake indicated that fry growth in the lake and subsequent survival over the barrier falls were sufficient to continue stocking the lake. The Crescent Lake program continued with fry plantings in Sweetheart Lake and a smolt release in Gilbert Bay near the mouth of the Whiting River, which drains Crescent Lake. The Taku and Stikine rivers projects continued as described earlier. No new projects were added to the subsequent CSP updates from 1993 to 1996 (Northern Southeast Regional Planning Team 1994–1997).

The Phase III CSP (Duckett et al. 2010) was issued in 2004. The Phase III CSP noted that annual harvests of coho, sockeye, chum and pink salmon wild stocks had generally exceeded the potential wild harvest levels indicated 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 fishery enhancement, and the low harvest rate of hatchery production by salmon trollers. The sockeye salmon harvest met or exceeded the Phase I harvest objective of 2.1 million fish seven times from 1990 to 2003, and the enhanced component of the harvest enabled the harvest to reach that objective in two of those years. The Phase III CSP also provides an extensive history of Southeast Alaska fisheries and salmon fishery enhancement.

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

The Phase III CSP provided *best practice* guidelines for fishery 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) release site has an adequate freshwater supply for adequate 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 the *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 five stock 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."

PROGRAM EVALUATIONS

CONSISTENCY WITH POLICY

The policies governing Alaska hatcheries were divided into three 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. These templates identifying the key elements of state policies used to assess compliance of the Snettisham Hatchery salmon program with each policy element in Tables 4–6.

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 inter-regional 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 must be 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 impact significant or unique wild stocks.
Use of indigenous stocks in watersheds with significant wild stocks	A watershed with a significant wild stock can only be stocked with progeny from the indigenous stocks. The policy also specifies that no more than one generation of separation from the donor system to stocking of the progeny will be allowed.
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 can 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 add terms or conditions to the permit to protect wild or hatchery 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 (FTPs) (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 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

The sockeye salmon broodstock at Snettisham Hatchery originated from the Speel Lake system that adjoins the hatchery (Table 4). Adult sockeye salmon used for broodstock for the Canadian lake stockings are not be screened for marks so that progeny of only nonhatchery-reared parents are used to stock the lakes. The stocking program was agreed to at the federal level under the PST. Because the lakes are in Canada, the stockings are not specifically subject to the state's *Genetic Policy*.

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

I. Stock Transport	
Use of appropriate local stocks	Snettisham Hatchery uses local broodstock for all sockeye salmon projects.
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 the *Genetic Policy*. Presumably these appraisal tools would be applied for any new Snettisham Hatchery projects. Projects such as the Tahltan Lake project were assessed through the Pacific Salmon Treaty technical committees.
Interaction with or impact on significant wild stocks	Indigenous stocks are used for lake stockings, except for systems barriered by falls like the Sweetheart Lake and Tuya Lake projects for which nearby local stocks are used.
Use of indigenous stocks in watersheds with significant wild stocks	Projects use indigenous stocks when planting fry in systems with established sockeye runs.
Establishment of wild stock sanctuaries	In Southeast Alaska, enhancement activities are generally prohibited in drainages on Forest Service lands, which make up the majority of land mass in the region. In this respect, the drainages represent de facto wild stock sanctuaries. No wild stock sanctuaries, per se, have been designated by the RPT.
Straying impacts	Straying studies were conducted for sockeye salmon at Crescent and Speel lakes from 1994 to 2013. Escapement projects in Southeast Alaska and in the Taku and Stikine River drainages collect otolith samples from the escapement populations to track straying.
III. Maintenance of genetic variance	
Maximum of three hatchery stocks from a single donor stock	The Crescent and Speel Lake stocks are only used at Snettisham Hatchery.
Minimum effective population size	In 2013, sockeye salmon broodstock numbers used for Snettisham Hatchery projects included 5,943 fish for the hatchery and Sweetheart Lake projects, 3,130 fish for the Tahltan and Tuya projects, and 752 fish for the Tatsamenie Lake project. A total of 156 adults were used for the King Salmon Lake egg take in 2012, the only year to date for egg collections for this project. The last egg take at Little Trapper Lake in 2007 used a total of 256 adult broodstock.
Review by geneticist	The ADF&G geneticist reviewed the FTPs for the Snettisham Hatchery programs.

All Snettisham Hatchery releases are otolith marked. Returning adults are sampled at nearly all Snettisham project release sites to monitor straying incidence. Few strays from releases from any Snettisham Hatchery projects have been observed in Southeast Alaska or Canada.[26]

Fish Health and Disease

FTPs for the Snettisham Hatchery program were approved by the pathologist (Table 5). 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 (Appendix K).

The hatchery was been inspected regularly since at least 1996, and no major chronic health issues have been identified at the facility. ADF&G fish pathology staff regularly praised DIPAC staff at Snettisham Hatchery in inspection reports for good hatchery practices.

Table 5.–The Snettisham 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 2010)	
Egg disinfection	Eggs are disinfected according to the Alaska Sockeye Salmon Culture Manual (McDaniel et al. 1994).
Hatchery inspections	Hatchery inspections were conducted regularly from at least 1996 to present.
Disease reporting	There are no chronic disease issues at the hatchery. IHNV occurs sporadically, and is common in any sockeye salmon hatchery production facility.
Pathology requirements for FTPs (5 AAC 41.010)	
Disease history	Samples were submitted as requested by the fish pathologist for disease history.
Isolation measures	Isolation procedures were indicated on the FTP.
Pathology review of FTPs	FTPs were reviewed by the pathologist.

Fisheries Management

Several studies have assessed sockeye salmon stocking in the lakes in the Stikine and Taku river systems (Table 6). Mathias (2000) and Hyatt et al. (2005) found that fry survival of hatchery stockings was lower than wild fry survival in Tatsamenie Lake, with the reverse true in Tahltan Lake. Mathias (2000) recommended that the Tuya project be continued and perhaps slightly increased, and that the Tahltan Lake project be assessed for the cost–benefit analysis to ensure that the benefits derived from increased adult production outweigh fry production and evaluation costs. Mathias (2000) recommended that the Tatsamenie Lake project be cancelled because of the low fry survival. Hyatt et al. (2005) recommended continuation of the Tahltan Lake project because it appeared the lake is spawning-site limited such that the fry stockings were biologically justified.

Riffe and Mercer (2006) conducted habitat and predator–prey interaction studies at Tatsamenie Lake on stocked fry and recommended that the Transboundary Technical Committee of the

[26] Ron Josephson, ADF&G, personal communication from his review of otolith data.

Pacific Salmon Commission investigate whether excess carrying capacity actually exists in Tatsamenie Lake, since the euphotic and zooplankton density models used in the original feasibility study by Koenings and Burkett (1987) and Koenings and Kyle (1997) have failed at other systems.

Table 6.–The Snettisham Hatchery sockeye salmon fishery enhancement 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	Several studies have studied impacts of hatchery plants to the Canadian systems, including Hyatt et al. (2005), Mathias (2000), and Riffe and Mercer (2006). Straying to Crescent Lake was also assessed.
Use of precautionary approach	ADF&G and Canadian Department of Fisheries and Ocean staff establish stocking rates for the Taku and Stikine river system projects based on annual limnology studies on the lakes to be stocked.
Salmon Escapement Goal Policy (5 AAC 39.223)	
Establishment of escapement goals	Sockeye salmon escapement goals are established for the Taku and Stikine rivers and for Speel Lake.
Mixed Stock Salmon Fishery Policy (5 AAC 39.220)	
Wild stock conservation priority	The 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 Snettisham Hatchery program were reviewed by fisheries management staff.

All releases from Snettisham Hatchery are otolith marked. In addition to otolith sampling at the escapement projects described earlier in the Genetics section, the commercial harvest is sampled to estimate stock composition in the sockeye salmon fisheries that target Stikine River (District 6 and 8) and Taku River/Port Snettisham (District 11) stocks.

Escapement goals and harvest sharing for the Taku and Stikine rivers between Canadian and U.S. fisheries are established through the PST process. Natural and hatchery-reared returns to the Tahltan and Tuya lakes projects on the Stikine River, and to the Tatsamenie, Little Trapper, and King Salmon lakes projects on the Taku River, are managed as part of the total escapement to these systems.

Management of the Stephens Passage area near the hatchery is based on conservation of natural stocks in Port Snettisham. A 6-inch minimum mesh size restriction is implemented for the commercial gillnet fishery near the entrance to Port Snettisham to limit harvest rates on sockeye salmon while allowing harvest of the larger hatchery-produced chum salmon returning to Limestone Inlet. Port Snettisham proper is closed during most of the sockeye salmon return through late July or August, and only open if escapements to the Port Snettisham systems are adequate. Commercial openings directly in front of the hatchery in the hatchery special harvest areas are dependent on escapement to Speel Lake and achieving broodstock and cost-recovery goals at the hatchery. In 2013, DIPAC management did not anticipate needing a cost-recovery fishery at the hatchery since cost recovery from DIPAC chum salmon returns were expected to cover the costs of the Snettisham Hatchery smolt program.

The personal use fishery at Sweetheart Creek occurs only in the creek. No personal use fishing is permitted in Gilbert Bay to protect the natural run to Crescent Lake.

Spawning escapements to systems near the hatchery (Speel Lake and Taku River) were examined for potential impacts of hatchery returns to fisheries management. Taku River sockeye salmon escapement goals were established in 1986 (Munro and Volk 2013), and the lower goal was met in every year of Snettisham Hatchery salmon returns except 2008 (Appendix J).

A weir to monitor sockeye salmon escapement has been operated at Speel Lake since 1983. From about 1983 to 1992, ADF&G staff informally set an escapement goal of 10,000 sockeye salmon for the lake. In 1992, the goal was reduced to 5,000 fish based on accumulated stock-recruitment data and professional judgment (Riffe and Clark 2003). From 1992 to 2012, the escapement goal was met in 17 of 21 years (Appendix J).

CONSISTENCY IN PERMITTING

Hatchery permit/BMP, AMP, and FTP documents (Appendix L) for Snettisham 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.

Trapper Lake and King Salmon Lake projects should be added to the BMP.

In 2004, and from 2006 to 2009, although egg takes at Snettisham Hatchery exceeded the level stated in the AMP, egg take numbers did not exceed the level permitted by the hatchery permit and FTP, nor did the level of fry releases from these egg takes significantly exceed the permitted release levels (Appendix Y).

OTHER REQUIREMENTS

ANNUAL REPORTING AND CARCASS LOGS

All hatcheries are required to submit an annual report to ADF&G that summarizes their production and activities for the year (AS 16.10.470). The completed report is due on December 15 and the Snettisham Hatchery annual reports were received for all years.

RECOMMENDATIONS

1) The BMP for Snettisham Hatchery should be updated to reflect the current hatchery status, including addition of the Trapper Lake and King Salmon Lake projects.
2) If egg takes are to occur at Chilkat Lake, Speel, or Crescent Lakes again, adults used for broodstock should be screened for marks so that progeny of hatchery-reared parents are not used to stock the lake to comply with state *Genetic Policy*. Although these projects have not

been implemented in many years, the projects remain permitted and are part of the BMP and AMP for the hatchery.

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APPENDIX

Appendix A.–Snettisham Hatchery (SH) coho salmon egg take, releases, and returns by brood year, 1978–1990. Fry released the year after brood year. In years where egg collections occurred at both Snettisham Hatchery and Speel River, the fry were apparently mixed before release.

Brood Year	Eggs	Stock	Juveniles Released	Release Site	Return from Brood Year
1978	190,000	Speel River	9,042	First Lake	100
			155,540	Snettisham Hatchery	584
1978 Total:	190,000		164,582		
1979	201,000	Speel River	98,980	Snettisham Hatchery	714
1980	20,000	Speel River	15,172	Snettisham Hatchery	171
1981	431,000	Speel River			
	493,000	Snettisham Hatchery			
			1,137	Indian Lake	456
			295,000	Snettisham Hatchery	2,369
			289,674	Indian Lake	3,405
1981 Total:	924,000		585,811		6,230
1982	311,000	Snettisham Hatchery			
	80,000	Speel River			
			234,000	Speel Arm	7,201
			5,000	Twin Lakes	1,224
1982 Total:	391,000		239,000		8,425
1983	91,000	Snettisham Hatchery			
	276,000	Speel River			
			214,000	Speel Arm	3,078
			20,200	Dredge Lake	1,867
			3,000	Twin Lakes	1,224
1983 Total:	367,000		237,200		6,169

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Brood Year	Eggs	Stock	Juveniles Released	Release Site	Return from Brood Year
1984	721,000	Snettisham Hatchery	67,700	Indian Lake	1,587
			171,000	Snettisham Hatchery	395
			20,400	Salmon Creek	41
			16,000	Twin Lakes	6,560
			8,200	Twin Lakes	3,280
1984 Total:	721,000		283,300		11,863
1985	1,760,000	Snettisham Hatchery	120,000	Indian Lake (2nd Lake)	1,782
			572,000	Snettisham Hatchery	345
			101,000	Salmon Creek	10
			53,000	Dredge Lake	527
			53,000	Fish Creek	140
			72,000	Snettisham Hatchery	1,183
			9,400	Twin Lakes	3,800
Snettisham Hatchery Stock Total:	1,760,000		980,400		7,787
	83,000	King Salmon River	44,000	Snettisham Hatchery	7
	161,000	Montana Creek	86,000	Snettisham Hatchery	29
1985 Total:	2,004,000		1,110,400		7,823
1986	1,600,000	Snettisham Hatchery	104,000	Indian Lake	1,530
			100,000	Sheep Creek	1,094
			50,000	Fish Creek	4,846
			50,000	Dredge Lake	1,954
			99,000	Snettisham Hatchery	2,072
			23,000	Sweetheart Lake	584
			42,000	Fish Creek	5,966
			45,000	Sheep Creek	3,572
			37,000	Dredge Lake	5,935
			71,000	Snettisham Hatchery	1,207
1986 Total:	1,600,000		621,000		28,760

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Brood Year	Eggs	Stock	Juveniles Released	Release Site	Return from Brood Year
1987	134,000	Snettisham Hatchery	20,376	Fish Creek	3,995
			25,843	Dredge Lake	1,208
Snettisham Hatchery Stock Total:	134,000		46,219		5,183
	48,000	Pavlof River	27,280	Fish Creek	3,940
1987 Total:	182,000		73,499		9,123
1988	None				
1989	427,000	Snettisham Hatchery	202,000	Indian Lake	2,185
			203,798	Snettisham Hatchery	0
1989 Total:	427,000		405,798		2,185
1990	461,000	Snettisham Hatchery	220,000	Indian Lake	922

Source: 1995 Snettisham Hatchery Annual Management Plan and historical hatchery release reports. Unpublished document obtained from Sam Rabung, ADF&G PNP Coordinator, Juneau.

Appendix B.–Snettisham Hatchery (SH) chum salmon egg takes, releases and returns by brood year, 1977–1991.

Brood Year	Eggs	Stock	Fry Released	Release Site	Return from Brood Year
1976	28,000	Prospect Creek			
	6,100	Limestone Creek			
	4,900	Crescent			
1976 Total	39,000		19,000	Snettisham Hatchery	402
1977	413,000	Prospect/Limestone/Crescent	253,000	Snettisham Hatchery	3,348
1978	43,000	Prospect Creek			
	108,000	Limestone Creek			
1978 Total	151,000		116,000	Snettisham Hatchery	1,938
1979	42,000	Prospect Creek			
	171,000	Limestone Creek			
1979 Total	213,000		198,533	Snettisham Hatchery	3,335
1980	2,508,000	Neka River			
	109,000	Snettisham Hatchery			
1980 Total	2,617,000		2,043,000	Snettisham Hatchery	44,910
1981	10,024,000	Neka River	6,873,000		
	1,690,000	Limestone Creek	2,077,000		
	1,110,000	Snettisham Hatchery			
1981 Total	12,824,000		8,950,000	Snettisham Hatchery	144,196
1982	9,520,000	Neka River			
	1,290,000	Snettisham Hatchery			
1982 Total	10,810,000		7,280,000	Snettisham Hatchery	43,908
1983	10,700,000	Neka River			
	1,530,000	Snettisham Hatchery			
1983 Total	12,230,000		8,340,000	Snettisham Hatchery	163,341

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Brood Year	Eggs	Stock	Fry Released	Release Site	Return from Brood Year
1984	5,880,000	Neka River			
	3,980,000	Snettisham Hatchery			
1984 Total	9,860,000		7,511,000	Snettisham Hatchery	5,038
1985	21,700,000	Snettisham Hatchery	19,620,000	Snettisham Hatchery	12,910
1986	28,800,000	Snettisham Hatchery	22,700,000	Snettisham Hatchery	31,320
			2,760,000	Doty Cove	11,010
1986 Total	28,800,000		25,460,000		
1987	47,000,000	Snettisham Hatchery	27,100,000	Snettisham Hatchery	16,001
			8,060,000	Limestone Inlet	18,081
	6,850,000	Hidden Falls Hatchery	5,170,000	Boat Harbor	4,500
1987 Total	53,850,000		40,230,000		
1988	8,010,000	Snettisham Hatchery	693,000	Snettisham Hatchery	9,092
			5,710,000	Limestone Inlet	45,163
1988 Total	8,010,000		6,303,000		
1989	2,985,000	Snettisham Hatchery	47,000	Snettisham Hatchery	1,459
			50,000	Mist Island	401
			2,547,000	Limestone Inlet	45,746
1989 Total	2,985,000		3,647,000		
1990	2,712,000	Snettisham Hatchery	2,356,000	Limestone Inlet	14,765

Source: 1995 Snettisham Hatchery Annual Management Plan and historical hatchery release reports. Unpublished document obtained from Sam Rabung, ADF&G PNP Coordinator, Juneau.

Appendix C.–Snettisham Hatchery (SH) steelhead egg collections, 1983–1987.

Brood Year	Eggs	Stock	Release Site	Juveniles Released
1983	8,600[a]	Peterson Creek		
1984	9,500	Peterson Creek	Montana Creek	2,353
1985	28,000[b]	Peterson Creek		
1986	32,000	Peterson Creek	Montana Creek	5,998
1987	11,705[b]	Peterson Creek		

Source: 1995 Snettisham Hatchery Annual Management Plans (1983–1986). Unpublished document obtained from Sam Rabung, ADF&G PNP Coordinator, Juneau. ADF&G PNP hatchery database. URL not publicly available.

[a] Fry destroyed because of presumptive IHNV.

[b] The author inferred from the 1988 AMP that the 1985 and 1987 brood year fry died from gas supersaturation

Appendix D.–Snettisham Hatchery Chinook salmon egg take, releases, and returns by brood year, 1977–1991.

Key: AC=Andrew Creek, KSR=King Salmon River, SR=Situk River, SH=Snettisham Hatchery, CLH=Crystal Lake Hatchery, LPW=Little Port Walter research facility, UR=Unuk River, DMH=Deer Mountain Hatchery, PAH=Port Armstrong Hatchery.

Brood Year	Eggs	Stock	Smolt Released	Release Site	Return from Brood Year
1977	26,700	AC	11,600	SH	0
	39,600	SR	7,400	SH	0
1977 Total:	66,300		19,000		
1978	None				
1979	35,300	KSR	26,700	SH	276
1980	66,100	SR	39,200	SH	19
1981	20,000	KSR	7,471	SH	4
	18,000	SR	227,000[a]	SH	2,889
	159,000	AC			
	445,000	CLH			
1981 Total:	642,000		234,471		2,893
1982	83,000	KSR	65,240	SH	308
	279,000	AC	221,000	SH	1,733
1982 Total:	362,000		268,240		2,041
1983	136,000	KSR	104,196	SH	117
	5,600	SH[c]	4,930	SH	[b]
1983 Total:	141,600		109,126		117
1984	998,000	CLH/ AC [d]	26,896	Auke Lake (direct)	111
			29,003	Auke Lake (fed)	308
			29,737	Auke Lake (fed/imprint)	268
			30,620	Fish Creek (direct)	26
			29,652	Fish Creek (fed)	213
			28,335	Montana Creek	18
			30,280	Sheep Creek Hatchery	446

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Brood Year	Eggs	Stock	Smolt Released	Release Site	Return from Brood Year
			22,560	SH	22
			27,222	SH	44
	189,000	KSR	142,911[e]	SH	361[f]
	4,600	SH[g]			
1984 Total:	1,191,600		397,216		1,817
1985	5,050,000	CLH/AC	911,000	Reboubt Lake	0
			51,000	Auke Lake (direct)	127
			15,038	Auke Lake (fed)	116
			24,972	Auke Lake (fed/imprint)	77
			31,296	Fish Creek (direct)	128
			31,205	Fish Creek (fed)	277
			30,703	Montana Creek	62
			31,112	Sheep Creek Hatchery	450
			278,000	SH	591
			31,422	SH	13
			437,000	SH	551
	143,000	KSR	86,000[h]	SH	82[i]
	60,000	SH[j]			
1985 Total:	5,253,000		1,958,748		2,474
1986	144,000	KSR	70,421	SH	88
	1,160,000	CLH/AC	46,000	Auke Lake (fed)	591
			46,000	Auke Lake (fed/imprint)	658
			74,000	Fish Creek	1,379
			52,000	Montana Creek	184
			31,556	Sheep Creek Hatchery	538
			111,000	SH	570
	155,000	SH[j]	[k]		[l]
1986 Total:	1,315,000		430,977		4,008

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Brood Year	Eggs	Stock	Smolt Released	Release Site	Return from Brood Year
1987	110,000	KSR	72,004		69
	1,400,000	SH/AC	677,000		2,616
	2,800,000	CLH/AC	269,000	Indian River	90
			117,000	Auke Lake	1,775
			67,000	Fish Creek	1,237
			33,000	Montana Creek	137
			11,000	Macaulay Salmon Hatchery	112
			120,000	Sheep Creek Hatchery	1,904
			127,000	SH	408
			9,200	Twin Lakes	2,000
1987 Total:	4,310,000		1,502,204		10,348
1988	119,000	KSR		LPW	[m]
	54,000	SH/AC	19,700	SH	49
	3,220,000	CLH/AC	175,000	Auke Lake	979
			149,000	Fish Creek	1,296
			101,000	Auke Bay	578
			122,000	Sheep Creek Hatchery	1,716
			719,000	SH	2,079
			101,000	Macaulay Salmon Hatchery	818
			105,000	Fish Creek	268
			101,000	Sheep Creek Hatchery	231
			11,400	Twin Lakes	5,000
	1,140,000	SH/AC	337,000	Speel Arm	[n]
1988 Total:	4,533,000		1,941,100		13,014
1989	106,000	KSR	95,000	LPW	[o]
	10,000	SH/KSR	10,000	LPW	[p]
	150,000	SH/AC	45,952	Auke Lake	28
			45,200	Fish Creek	89
			10,900	Twin Lakes	5,000
1989 Total:	266,000		207,052		5,117

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Brood Year	Eggs	Stock	Smolt Released	Release Site	Return from Brood Year
1990	1,903,000[q]	CLH/AC	286,000	Fish Creek	164
			218,000	PAH	34
			50,147	Auke Lake	85
			59,302	Fish Creek	16
			10,900	Twin Lakes	2,000
	72,000	KSR			[r]
	142,000	SH/AC	[s]		[t]
	110,000	SH/KSR			[u]
	140,000	DMH/UR	91,000	PAH	48
1990 Total:	2,367,000		715,349		347
1991	2,140,000	CLH/AC	101,000	Auke Bay	568
			106,000	Fish Creek	NA
			1,070,000	PAH	3,426
			10,000	Twin Lakes	2,000
	1,225,000	LPW/UR	194,400	PAH	NA
	486,000	SH/AC	100,500	Auke Bay	NA
	13,000	SH/KSR	8,700	LPW	[v]
1991 Total:	3,864,000		1,590,600		3,994
1992	688,000	CLH/AC	141,000	Auke Bay	278
			143,000	Fish Creek	223
1992 Total:	688,000		284,000		501
1993	750,000	CLH/AC	283,000[w]	Indian Lake	NA
1993 Total:	750,000		283,000		

-continued-

Source: 1995 Snettisham AMP (Snettisham Hatchery Annual Management Plans. Unpublished document obtained from Sam Rabung, ADF&G PNP Coordinator, Juneau) for all data except for brood year 1991 and 1992 return data, which was from the ADF&G Mark, Tag Age lab database (URL not publicly available), and represents harvest, only. Return data presumably includes both rack return and estimated harvest contributions.

[a] Release includes Situk River, Andrews Creek, and Crystal Lake Hatchery releases.
[b] Fish from this release not tagged and therefore, the ancestral stock is not known.
[c] Fish from this release were not tagged and therefore, no return estimate was made.
[d] Hansen (1985).
[e] Includes releases from both King Salmon River stock and Snettisham Hatchery stock.
[f] Includes returns from both King Salmon River stock and Snettisham Hatchery stock.
[g] From 1985 AMP. These are hatchery returns and no ancestral stock was noted in the AMP.
[h] Includes releases from both King Salmon River stock and Snettisham Hatchery stock.
[i] Includes returns from both King Salmon River stock and Snettisham Hatchery stock.
[j] These are hatchery returns and no ancestral stock was noted.
[k] Snettisham Hatchery releases included with Crystal Lake Hatchery release number.
[l] Snettisham Hatchery returns included with Crystal Lake Hatchery returns.
[m] Eyed eggs transferred to Little Port Walter.
[n] Snettisham Hatchery returns included with King Salmon River returns.
[o] Eyed eggs transferred to Little Port Walter.
[p] Ibid.
[q] Received an additional 323,000 eggs from Crystal Lake Hatchery.
[r] Eyed eggs transferred to Crystal Lake Hatchery.
[s] Snettisham Hatchery releases included with Crystal Lake Hatchery release total.
[t] Snettisham Hatchery returns included with Crystal Lake Hatchery returns.
[u] Eyed eggs transferred to Crystal Lake Hatchery.
[v] Eyed eggs transferred to Little Port Walter Hatchery.
[w] In addition, 410,000 smolt were transferred to and released from Macaulay Salmon Hatchery.

Appendix E.–Snettisham Hatchery permit. There have been no permit alterations for the Snettisham Hatchery to date.

Date	Description	Permitted Capacity in millions Sockeye Salmon Eggs
07/15/1996	PNP hatchery permit number 39 and BMP issued to DIPAC to Snettisham Hatchery in Port Snettisham, Alaska. Hatchery permitted for 33.5 million sockeye salmon eggs. BMP brood stocks included Speel Lake, Cresent Lake, Tahltan Lake (Stikine River), Tatsamenie Lake (Taku River) and Chilkat Lake. Proposed usage in BMP was 12.5 million eggs from the Speel Lake/Snettisham stock, 3.0 million from Crescent Lake stock, and 6.0 million each from Tahltan Lake (Stikine River), Tatsamenie Lake (Taku River) and Chilkat Lake stocks.	33.5

Appendix F.–Egg collections at Snettisham Hatchery by broodstock source, 1986–2013.

Year	Chilkat Lake	Crescent Lake	Snettisham Hatchery (Speel Lake Stock)	Speel Lake	Sweetheart Lake (Speel Lake Stock)	Tahltan Lake	Tatsamenie Lake	Little Trapper Lake	King Salmon Lake	Grand Total
1986				483,000						483,000
1988				295,245						295,245
1989		547,054		3,698,485		2,995,440				7,240,979
1990		813,298		2,337,735		4,510,605	984,681	2,313,686		10,960,005
1991		1,113,701				4,245,657	1,359,751	2,952,934		9,672,043
1992		1,585,553		2,730,709		4,901,140	1,486,091	2,520,953		13,224,446
1993		2,635,517		1,873,625		6,139,524	1,143,857	1,173,853		12,966,376
1994	6,400,000	577,571		1,133,937	305,137	4,182,543	1,228,541	1,061,955		14,889,684
1995	6,154,800	1,059,036		3,064,454		6,890,608	2,406,707			19,575,605
1996	7,547,922		3,626,876	3,468,913		6,401,763	4,933,509			25,978,983
1997			6,733,418			3,221,168	4,650,517			14,605,103
1998			7,670,117			4,022,202	2,414,494			14,106,813
1999			7,976,853			3,826,318	461,436			12,264,607
2000	3,125,550		6,915,617			2,387,590	2,571,502			15,000,259
2001			8,224,423			3,305,851	3,499,157			15,029,431
2002			7,484,265			4,050,463	2,301,546			13,836,274
2003			7,699,366			5,391,049	2,451,685			15,542,100
2004			11,385,922			5,700,782	750,044			17,836,748
2005			9,879,654			4,552,460	1,810,657			16,242,771
2006			11,415,983			4,364,293	4,810,270	1,109,386		21,699,932
2007			12,103,705			4,060,288	3,673,241	899,604		20,736,838
2008			11,820,000			3,386,000	4,902,000			20,108,000
2009			13,068,000			4,469,000	1,224,000			18,761,000
2010			12,620,000			5,950,000	1,900,000			20,470,000
2011			14,930,000			6,481,000	2,190,000			23,601,000
2012			13,975,200			5,597,500	1,835,900		232,100	21,640,700
2013			11,866,000			4,217,800	1,788,600			17,872,400

Appendix G.–Sockeye salmon juvenile releases from Snettisham Hatchery by release site, 1989–2013.

Year	Chilkat Lake	Crescent Lake	King Salmon Lake	Snettisham Hatchery	Sweetheart Lake	Tahltan Lake	Tatsamenie Lake	Trapper Lake	Tuya Lake	Gilbert Bay	Speel Lake	Grand Total
1989											226,622	226,622
1990		215,556			2,465,844	1,041,757						3,723,157
1991		457,653			1,310,000	3,585,000	673,000	934,000				6,959,653
1992		634,556				1,415,459	1,232,000	1,811,000	1,632,083			6,725,098
1993		66,000			766,908	1,947,207	909,452	1,113,128	1,990,000			6,792,695
1994	4,817,929			2,006,579	1,739,605	903,908	520,947	916,083	4,690,833	334,000		15,929,884
1995	2,334,264	234,080		860,000		1,142,856	897,500	773,375	2,267,443	204,000	402,750	9,116,268
1996	2,691,311			730,471	728,798	2,296,152	1,724,228		2,473,742	221,490		10,866,192
1997	3,038,171					2,247,730	3,940,933		2,610,838			11,837,672
1998				5,629,799	275,801	1,900,417	3,596,593		432,651			11,835,261
1999				5,029,964	518,033	1,670,615	1,769,032		1,603,441			10,591,085
2000				5,185,440	520,778	2,228,339	350,139		866,530			9,151,226
2001	2,743,374			4,805,526	532,431	1,872,611	2,319,588					12,273,530
2002				5,861,331	510,062	2,532,920	2,233,200					11,137,513
2003				5,815,630	525,790	2,662,535	911,378		1,124,248			11,039,581
2004				5,972,034	266,355	2,225,916	2,140,957		2,444,671			13,049,933
2005				4,145,777	546,845	1,226,478	628,057		3,200,094			9,747,251
2006				7,590,801	240,120	1,280,322	1,471,497		2,137,548			12,720,288
2007				6,025,789	486,630	2,465,749	3,705,136	896,842	1,201,470			14,781,616
2008				7,123,374	453,437	1,539,675	2,522,024	353,175	1,536,887			13,528,572
2009				8,568,000	482,000	1,395,000	3,871,252		832,000			15,148,252
2010				8,936,000	528,000	1,828,000	718,000		976,000			12,986,000
2011				8,360,000	544,000	1,230,000	1,598,000		1,240,000			12,972,000
2012				8,997,000	500,000	2,126,000	1,892,000		1,596,000			15,111,000
2013			197,400	8,974,100	540,800	1,349,400	1,636,300		755,300			13,453,300

Appendix H.–Sockeye salmon total returns from Snettisham Hatchery by broodstock source, 1992–2013.

Year	Chilkat Lake[a]	Gilbert Bay[a]	Snettisham Hatchery[a]	Sweetheart Lake[a]	Tahltan Lake[b]	Tatsameni Lake[b]	Trapper Lake[b]	Tuya Lake[b]	Crescent Lake[a]	Grand Total
1992				322						322
1993				23,095						23,095
1994		391		21,122	33,821	100				41,222
1995		5,154			66,873	4,052	1,348	2,802		85,924
1996			51,417	3,704	32,625	3,250	2,244	38,600	930	56,051
1997		21,163	117,420		22,913	1,368	1,484	66,258		138,583
1998	100,000	24,930	35,489		2,656	343	1,093	47,383		62,339
1999	11,261	9,916	41,385		3,550	1,749	412	31,389	1,994	88,740
2000	8,131		162,326	5,090	4,167	5,973	276	34,034		194,433
2001			300,944	2,309	14,484	11,541		40,751		334,872
2002			121,035	1,708	12,929	2,499		14,136		122,763
2003			224,999	7,223	63,604	1,555		39,574		230,222
2004			515,779	14,574	125,445	1,796		9,166		527,153
2005			233,299	5,626	101,726	3,621		3,456		238,926
2006			333,138	7,803	124,790	7,002		37,928		340,941
2007			129,414	8,533	78,419	10,753		36,227		136,362
2008			90,424	9,169	26,410	14,067		41,945		95,959
2009			113,634	4,170	28,116	1,300		47,276		118,026
2010			65,883	3,412	33,889	3,262	1,049	42,121		68,180
2011			141,393	3,692	53,155	12,173	2,524	46,220		186,763
2012			213,578	6,880	16,870	11,663	1,376	28,263		235,658
2013			155,849	6,340	24,888	15,886	471	24,636		263,889
Total	119,392	61,554	3,047,456	134,772	161,250	113,852	12,276	632,164	1,751	3,590,423

[a] Data from ADF&G hatchery database obtained from Lorraine Vercessi, ADF&G Assistant PNP Hatchery Coordinator, Juneau. Includes harvest, escapement and broodstock.
[b] Data from ADF&G sockeye stock biologist Julie Bednarsky, Douglas Regional Office, Juneau. Includes harvest (both U.S. and Canada), escapement and broodstock.

Appendix I.–Summary of Fishery Transport Permits for Snettisham Salmon Hatchery. SH=Snettisham Hatchery.

FTP Number	Issued	Expiration	FTP summary and reviewer comments.
86J-1039	1988	1998	Collect up to 500,000 Speel Lake stock sockeye salmon eggs, incubate at Second Lake in the Indian Lake system, and release fry into Second Lake or Indian Lake. FTP amended to increase fry release from 500,000 to 3 million in 1990 in the event the fry were not needed at Sweetheart Lake. Issued to ADF&G/FRED.
88J-1070	1988	1998	Collect up to 5 million eggs from Speel Lake sockeye salmon, incubate at SH and release back to Speel Lake as fry. Issued to ADF&G/FRED.
88J-1071	1988	1998	Collect up to 5 million eggs from Crescent Lake sockeye salmon, incubate at SH and release back to Crescent Lake as fry. Issued to ADF&G/FRED.
88J-1084	1988	1999	Collect up to 6 million eggs from Speel Lake sockeye salmon, incubate at SH and release up to 5 million fry into Sweetheart Lake. Issued to ADF&G/FRED.
88J-1111	1988	1998	Collect up to 10 million eggs from Chilkat Lake sockeye salmon, incubate at SH and release back to Chilkat Lake as fry. Issued to ADF&G/FRED.
89J-1009	1989	1999	Collect up to 6 million eggs from Tahltan Lake sockeye salmon, incubate at SH and release back to Tahltan Lake as fry. Issued to ADF&G/FRED.
89J-1010	1989	1999	Collect up to 6 million eggs from Tatsamenie Lake sockeye salmon, incubate at SH and release back to Tatsamenie Lake as fry. Issued to ADF&G/FRED.
89J-1011	1989	1999	Collect up to 6 million eggs from Tahltan Lake sockeye salmon, incubate at SH and release back to Tuya Lake as fry. Issued to ADF&G/FRED.
89J-1012	1989	1999	Collect up to 6 million eggs from Little Trapper Lake sockeye salmon, incubate at SH and release back to Trapper Lake as fry. Issued to ADF&G/FRED.
90J-1018	1990	1990	Collect up to 50,000 eggs from Chilkat Lake sockeye salmon, incubate at spring pond on inlet stream to Chilkat Lake streamside incubators with volitional release of fry to stream. Permit issued to NSRAA.
91J-1008	1991	1999	Release up to 500,000 presmolt fry stocked in Crescent Lake from Crescent Lake broodstock sockeye salmon eggs incubated at Snettisham Hatchery. Permit issued to ADF&G.
93J-1001	1993	1998	Collect up to 600,000 eggs from Chilkat Lake sockeye salmon, incubate at spring pond on inlet stream to Chilkat Lake streamside incubators with volitional release of fry to stream. Permit issued to NSRAA.

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FTP Number	Issued	Expiration	FTP summary and reviewer comments.
93J-1005	1993	1998	Release up to 2.0 million Speel Lake stock sockeye salmon smolt from Snettisham Hatchery raceways. In 1994, FTP amended to increase release from 2.0 million to 3.5 million smolts. Issued to ADF&G/FRED.
93J-1006	1993	1999	Release up to 2 million Speel Lake stock sockeye salmon smolt from Snettisham Hatchery net pens. Issued to ADF&G/FRED.
93J-1007	1993	1999	Release up to 2.5 million Crescent Lake stock sockeye salmon fry that were incubate at Snettisham Hatchery into Sweetheart Lake. Issued to ADF&G/FRED.
93J-1008	1993	1999	Release up to 3.5 million Crescent Lake stock sockeye salmon smolt to Crescent Lake. Issued to ADF&G/FRED.
93J-1009	1993	1999	Release up to 500,000 Crescent Lake stock sockeye salmon smolt from Gilbert Bay net pens. Issued to ADF&G/FRED.
93J-1032	1993	1996	Collect up to 3 million eggs from Speel Lake for incubation, rearing and release from Snettisham Hatchery. Issued to ADF&G/FRED.
94J-1031	1994	1995	Transport up to 500,000 Snettisham/Andrews Creek stock Chinook salmon from Snettisham Hatchery to Macaulay Salmon Hatchery for rearing and release at Auke Bay. Issued to ADF&G.
97J-1010	1997	2007	Collect up to 6 million eggs from Chilkat Lake sockeye salmon, incubate and thermally mark at SH, and release back up to 4.8 million fry to Chilkat Lake. Updated and replaced FTPs 93J-1001, 90J-1018, and 88J-1111.
97J-1011	1997	2007	Collect up to 3 million eggs from Crescent Lake sockeye salmon, incubate and thermally mark at SH, and release back to Crescent Lake as smolt. This is to mitigate egg take from Crescent Lake for fry planting in Sweetheart Lake. In 1998, expiration date extended from 1998 to 2007. Updated and replaced FTPs 93J-1008, 91J-1007, 91J-1008 and 88J-107.
97J-1012	1997	2007	Collect up to 12.5 million eggs from SH sockeye salmon for incubation and release of up to 8.5 million smolt at SH. Updated and replaced FTP 93J-1005.
97J-1013	1997	2007	Collect up to 5 million eggs from Speel Lake sockeye salmon for incubation and thermal marking at SH and release as fry at Speel Lake. In 1998, expiration date extended from 1998 to 2007. Updated and replaced FTP 88J-1070.
97J-1014	1997	1998	Collect up to 3 million eggs from Crescent Lake sockeye salmon, incubate and thermally mark at SH, and release to Sweetheart Lake as fry. Updated and replaced FTP 93J-1007.

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FTP Number	Issued	Expiration	FTP summary and reviewer comments.
97J-1015	1997	2017	Collect up to 6 million eggs from Tahltan Lake sockeye salmon for incubation and thermal marking at SH and release of up to 4.8 million fry at Tahltan Lake. In 2007, expiration date extended from 2007 to 2017. Updated and replaced FTP 89J-1009.
97J-1016	1997	2017	Collect up to 6 million eggs from Tahltan Lake sockeye salmon for incubation and thermal marking at SH and release of up to 4.8 million fry at Tuya Lake. In 2007, expiration date extended from 2007 to 2017. Updated and replaced FTP 89J-1011.
97J-1017	1997	2017	Collect up to 6 million eggs from Lower Tatsamenie Lake sockeye salmon for incubation and thermal marking at SH and release as fry at Upper Tatsamenie Lake. In 2007, expiration date extended from 2007 to 2017. Updated and replaced FTP 89J-1010.
98J-1008	1998	2002	Collect up to 500,000 eggs from SH sockeye salmon for incubation and thermal marking at SH and release as fry at Sweetheart Lake.
05J-1014	2005	2017	Collect up to 500,000 eggs from SH sockeye salmon for incubation and thermal marking at SH and release as fry at Sweetheart Lake. In 2007, expiration date extended from 2007 to 2017. In 2010, FTP amended to increase eggtake from 500,000 to 600,000 eggs. Updated and replaced FTP 98J-1008.
06J-1040	2006	2016	Collect up to 1 million eggs from Little Trapper Lake sockeye salmon for incubation and thermal marking at SH and release resulting fry at Trapper Lake.
07J-1002	2007	2017	Release at Trapper Lake up to 1 million fry from Little Trapper Lake sockeye salmon eggs incubated and thermal marked at SH.
07J-1020	2007	2017	Collect up to 3 million eggs from Crescent Lake sockeye salmon, incubate and thermally mark at SH, and release back to Crescent Lake as pre-smolt or smolts. This is to mitigate egg take from Crescent Lake for fry planting in Sweetheart Lake. Updated and replaced FTPs 97J-1011, 93J-1008, 91J-1007, 91J-1008 and 88J-107.
07J-1021	2007	2017	Collect up to 12.5 million eggs from SH sockeye salmon for incubation and release as smolt at SH. Updated and replaced FTPs 97J-1012 and 93J-1005.
07J-1022	2007	2017	Collect up to 5 million eggs from Speel Lake sockeye salmon for incubation and thermal marking at SH and release as fry at Speel Lake. Updated and replaced FTPs 97J-1013 and 88J-1070.
13J-1001	2013	2015	Collect up to 250,2000 eggs from King Salmon Lake sockeye salmon for incubation and thermal marking at SH and release as fry at King Salmon Lake.

Appendix J.–Speel Lake and Taku River sockeye salmon escapement and the total return of Snettisham Salmon Hatchery sockeye salmon from all release sites, 1983–2012.

Year	Speel Lake Sockeye Salmon Escapement	Speel Lake Sockeye Salmon Escapement Goal	Snettisham Hatchery Sockeye Salmon Return	Taku River Sockeye Salmon Escapement	Taku River Sockeye Salmon Escapement Goal
1983	10,484	10,000			
1984	11,424	10,000		113,796	
1985	14,483	10,000		109,563	
1986	11,062	10,000		100,106	71,000–80,000
1987	35,927	10,000		82,136	71,000–80,000
1988	1,903	10,000		79,674	71,000–80,000
1989	15,039	10,000		95,263	71,000–80,000
1990	34,463	10,000		96,099	71,000–80,000
1991	359	10,000		129,493	71,000–80,000
1992	15,623	5,000	322	137,514	71,000–80,000
1993	34,823	5,000	23,095	108,625	71,000–80,000
1994	3,834	5,000	41,222	102,579	71,000–80,000
1995	7,668	5,000	85,151	113,739	71,000–80,000
1996	16,215	5,000	51,417	92,626	71,000–80,000
1997	6,906	5,000	138,583	71,086	71,000–80,000
1998	26,155	5,000	60,419	74,451	71,000–80,000
1999	22,115	5,000	88,708	98,241	71,000–80,000
2000	9,426	5,000	194,433	75,498	71,000–80,000
2001	12,735	5,000	334,872	144,286	71,000–80,000
2002	5,016	5,000	122,763	109,337	71,000–80,000
2003	7,014	5,000	230,222	160,366	71,000–80,000
2004	7,813	4,000–13,000	527,153	106,688	71,000–80,000
2005	7,549	4,000–13,000	238,926	120,053	71,000–80,000
2006	4,165	4,000–13,000	340,941	146,151	71,000–80,000
2007	3,099	4,000–13,000	136,362	87,763	71,000–80,000
2008	1,763	4,000–13,000	95,959	68,059	71,000–80,000
2009	3,689	4,000–13,000	118,026	71,811	71,000–80,000
2010	5,640	4,000–13,000	68,180	87,259	71,000–80,000
2011	4,777	4,000–13,000	186,763	112,187	71,000–80,000
2012	5,681	4,000–13,000	235,658	112,564	71,000–80,000

Sources: Speel Lake escapement goal from Riffe and Clark (2003). Taku River escapement goal from Munro and Volk (2013). Weir escapement counts 1983–2002 from Geiger et al (2004). 2003 escapement from Munro and Volk (2012) and 2004–2012 escapements from Munro and Volk (2013). Total MSH chum salmon return to Limestone Inlet from annual reports submitted by DIPAC, unpublished documents obtained from Sam Rabung, ADF&G PNP Coordinator, Juneau.

Appendix K.–Summary of ADF&G pathology inspections at Snettisham Hatchery.

Year	Inspection Notes
1995	Hatchery retrofitted into modules for sockeye salmon production. Recommended sealing any floor leaks in the modules, sealing of outside concrete raceways, lower the hatchery water supply to insure adequate water during a power outage, have separate utensils for each module, and replace all wooden implements with aluminum or fiberglass so they can be adequately disinfected. Consider a larger backup generator to power all necessary equipment.
1996	IHNV outbreaks in 3 of 5 raceways, and infected fry destroyed. Pathologist commented that inspection was in response to the IHNV outbreak, and that the hatchery staff was doing an excellent job, with the proper use of footbaths, immaculate incubation modules, raceways that were physically separated by an empty raceway, adequate disinfection of euthanized fish, and planned re-disinfection of eggs. Pathologist recommended building a fence around the hatchery water source to keep mammal predators such as bears out, or install a new water intake line to eliminate need for fencing; erecting covers of raceways to keep out birds; reconsidering whether adult fish that likely carry IHNV should return directly to the hatchery, or if eggs could be more safely collected from broodstock returning to Speel Lake or an offsite release site; and replacing wood boards with aluminum or other disinfectable material. Snettisham Hatchery staff doing all that can be done to adequately minimize current difficulties with IHNV.
1999	Lost several incubators of fry to IHNV. Pathologist noted numerous improvements since last inspection. Recommended extending degassing capabilities, developing depurated seawater line to raise water hardness and pH, seal and smooth concrete in outside rearing raceways, and replace wooden dam boards with aluminum in outside adult broodstock raceways. The Snettisham facility and the fish culture practices of its hatchery staff are role models for the technology and professional dedication required for culturing sockeye salmon.
2000	Several incubators of pre-emergent fry lost to IHNV. Pathologist noted several improvements since last inspection report in 1999 (which was not found in the files). Recommendations included development of a depurated seawater line as a more efficient and less expensive alternative for supplementation of incubation freshwater to raise water hardness and pH; and replacement of wooden dam boards with aluminum in the three outside adult broodstock raceways.
2002	Wooden dam boards replaced with aluminum. Other improvements noted. One obvious liability in the physical layout of hatchery operations is the close proximity of virus-carrying adult fish and the egg take area to the outside covered raceways of rearing fish. Preliminary studies by DIPAC staff have looked at possibly capturing adults and conducting the egg take about ½ mile away. However, the difficulties of maintaining a large weir in the existing tidal rip and obtaining a permit may preclude use of the site. Snettisham facility a role model for cutting edge technology and professional dedication required for sockeye salmon culture. No recommendations made.

Appendix L.–Comparison of permitted and reported sockeye salmon egg takes in hatchery permit, basic management plan, annual management plan, fishery transport permits and annual reports for Snettisham Hatchery, 1996–2013. Egg and juvenile salmon numbers are in millions and rounded.

Key: IL=Incubation Location, Exp.=Expiration, AR=Annual Report, SH=Snettisham Hatchery, SL=Speel Lake, CL=Chilkat Lake, ThL= Tahltan Lake, TsL=Tatsamenie Lake, TyL=Tuya Lake, ShL=Sweetheart Lake, LTL= Little Trapper Lake, KSL=King Salmon Lake.

Brood Year	Project	Hatchery Permit/ BMP Egg Take	AMP Egg Take	FTP for Egg Take	Egg Source	IL	FTP Exp. Year	FTP Egg Level	Egg Take from AR	Release Site	Release Year	AMP Juvenile Release Level	FTP for Release	FTP Exp. Date	FTP Release Level	Release from Annual Report
1996	CL									CL	1997	4.8	97J-1010	2007	4.8	3.0
	ThL									ThL	1997	2.4	97J-1015	2007	4.8	2.2
	ThL									TyL	1997	2.4	97J-1016	2007	4.8	2.6
	TsL									TsL	1997	4.0	97J-1017	2007	4.8	3.9
	SH									SH	1998	2.5	97J-1012	2007	8.5	2.6
	SL									SH	1998	3.0	97J-1012	2007	3.0	3.1
1997	SH	12.5	9.0	97J-1012	SH/SL	SH	2007	12.5	6.3	SH	1999	5.1	97J-1012	2007	8.5	5.0
	SH									ShL	1998	0.25	98J-1008	2007	0.5	0.28
	ThL	6.0	6.0	97J-1015	ThL	SH	2007	6.0	3.2	ThL	1998	2.4	97J-1015	2007	4.8	1.9
	ThL									TyL	1998	0.5	97J-1016	2007	4.8	0.4
	TsL	6.0	5.0	97J-1017	TsL	SH	2007	6.0	5.0	TsL	1998	4.5	97J-1017	2007	4.8	3.6
1998	SH	12.5	6.5	97J-1012	SH/SL	SH	2007	12.5	7.3	SH	2000	5.1	97J-1012	2007	8.5	5.2
	SH									ShL	1999	0.5	98J-1008	2007	0.5	0.5
	ThL	6.0	6.0	97J-1015	ThL	SH	2007	6.0	4.3	ThL	1999	1.8	97J-1015	2007	4.8	1.7
	ThL									TyL	1999	1.8	97J-1016	2007	4.8	1.6
	TsL	6.0	5.0	97J-1017	TsL	SH	2007	6.0	2.6	TsL	1999	2.1	97J-1017	2007	4.8	1.8
1999	SH	12.5	7.6	97J-1012	SH/SL	SH	2007	12.5	7.4	SH	2001	5.1	97J-1012	2007	8.5	4.8
	SH									ShL	2000	0.5	98J-1008	2007	0.5	0.5
	ThL	6.0	6.0	97J-1015	ThL	SH	2007	6.0	4.2	ThL	2000	2.5	97J-1015	2007	4.8	2.2
	ThL									TyL	2000	1.0	97J-1016	2007	4.8	0.9
	TsL	6.0	5.0	97J-1017	TsL	SH	2007	6.0	0.5	TsL	2000	0.45	97J-1017	2007	4.8	0.35
2000	SH	12.5	7.6	97J-1012	SH/SL	SH	2007	12.5	7.6	SH	2002	5.8	97J-1012	2007	8.5	5.9
	SH									ShL	2001	0.5	98J-1008	2007	0.5	0.5
	ThL	6.0	6.0	97J-1015	ThL	SH	2007	6.0	2.4	ThL	2001	2.1	97J-1015	2007	4.8	1.9
	TsL	6.0	5.0	97J-1017	TsL	SH	2007	6.0	2.8	TsL	2001	2.4	97J-1017	2007	4.8	2.3
	CL	6.0	6.0	97J-1010	CL	SH	2007	6.0	2.9	CL	2001	2.8	97J-1010	2007	4.8	2.7

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Brood Year	Project	Hatchery Permit/ BMP Egg Take	AMP Egg Take	FTP for Egg Take	Egg Source	IL	FTP Exp. Year	FTP Egg Level	Egg Take from AR	Release Site	Release Year	AMP Juvenile Release Level	FTP for Release	FTP Exp. Date	FTP Release Level	Release from Annual Report
2001	SH	12.5	7.6	97J-1012	SH/SL	SH	2007	12.5	6.8	SH	2003	5.8	97J-1012	2007	8.5	5.8
	SH									ShL	2002	0.5	98J-1008	2007	0.5	0.5
	ThL	6.0	6.0	97J-1015	ThL	SH	2007	6.0	3.3	ThL	2002	2.7	97J-1015	2007	4.8	2.5
	TsL	6.0	2.5	97J-1017	TsL	SH	2007	6.0	4.0	TsL	2002	3.1	97J-1017	2007	4.8	2.2
2002	SH	12.5	7.6	97J-1012	SH/SL	SH	2007	12.5	7.8	SH	2004	5.8	97J-1012	2007	8.5	6.0
	SH									ShL	2003	0.5	98J-1008	2007	0.5	0.5
	ThL	6.0	6.0	97J-1015	ThL	SH	2007	6.0	4.0	ThL	2003	2.2	97J-1015	2007	4.8	2.6
	ThL									TyL	2003	1.1	97J-1016	2007	4.8	1.1
	TsL	6.0	5.0	97J-1017	TsL	SH	2007	6.0	2.3	TsL	2003	2.1	97J-1017	2007	4.8	1.4
2003	SH	12.5	7.6	97J-1012	SH/SL	SH	2007	12.5	7.7	SH	2005	4.15	97J-1012	2007	8.5	4.1
	SH									ShL	2004	0.5	98J-1008	2007	0.5	0.27
	ThL	6.0	6.0	97J-1015	ThL	SH	2007	6.0	5.4	ThL	2004	2.3	97J-1015	2007	4.8	2.2
	ThL									TyL	2004	2.5	97J-1016	2007	4.8	2.4
	TsL	6.0	5.0	97J-1017	TsL	SH	2007	6.0	2.5	TsL	2004	2.5	97J-1017	2007	4.8	2.1
2004	SH	12.5	9.7	97J-1012	SH/SL	SH	2007	12.5	11.4	SH	2006	7.6	97J-1012	2007	8.5	7.6
	SH									ShL	2005	0.5	98J-1008	2007	0.5	0.5
	ThL	6.0	6.0	97J-1015	ThL	SH	2007	6.0	5.7	ThL	2005	1.5	97J-1015	2007	4.8	3.2
	ThL									TyL	2005	3.5	97J-1016	2007	4.8	1.2
	TsL	6.0	5.0	97J-1017	TsL	SH	2007	6.0	0.75	TsL	2005	0.7	97J-1017	2007	4.8	0.6
2005	SH	12.5	10.3	97J-1012	SH/SL	SH	2007	12.5	10.1	SH	2007	6.1	97J-1012	2007	8.5	6.0
	SH									ShL	2006	0.5	05J-1014	2017	0.5	0.24
	ThL	6.0	6.0	97J-1015	ThL	SH	2007	6.0	4.6	ThL	2006	1.4	97J-1015	2007	4.8	1.3
	ThL									TyL	2006	2.4	97J-1016	2007	4.8	2.1
	TsL	6.0	5.0	97J-1017	TsL	SH	2007	6.0	1.9	TsL	2006	1.6	97J-1017	2007	4.8	1.5
2006	SH	12.5	10.3	97J-1012	SH/SL	SH	2007	12.5	11.4	SH	2008	6.8	97J-1012	2007	8.5	7.1
	SH									ShL	2007	0.5	05J-1014	2017	0.5	0.5
	ThL	6.0	6.0	97J-1015	ThL	SH	2007	6.0	4.4	ThL	2007	2.7	97J-1015	2007	4.8	2.5
	ThL									TyL	2007	1.3	97J-1016	2007	4.8	1.2
	TsL	6.0	5.0	97J-1017	TsL	SH	2007	6.0	4.8	TsL	2007	4.4	97J-1017	2007	4.8	3.7
	LTL	None	1.0	06J-1040	LTL	SH	2007	1.0	1.1	LTL	2007	1.0	07J-1020	2007	4.8	0.9

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Brood Year	Project	Hatchery Permit/ BMP Egg Take	AMP Egg Take	FTP for Egg Take	Egg Source	IL	FTP Exp. Year	FTP Egg Level	Egg Take from AR	Release Site	Release Year	AMP Juvenile Release Level	FTP for Release	FTP Exp. Date	FTP Release Level	Release from Annual Report
2007	SH	12.5	10.3	07J-1021	SH/SL	SH	2017	12.5	11.4	SH	2009	8.2	07J-1021	2017	8.5	8.6
	SH									ShL	2008	0.5	05J-1014	2017	0.5	0.5
	ThL	6.0	6.0	97J-1015	ThL	SH	2007	6.0	3.8	ThL	2008	1.6	97J-1015	2017	4.8	1.5
	ThL									TyL	2008	1.5	97J-1016	2017	4.8	1.5
	TsL	6.0	5.0	97J-1017	TsL	SH	2007	6.0	4.1	TsL	2008	4.0	97J-1017	2017	4.8	2.5
	LTL	None	1.0	06J-1040	LTL	SH	2007	1.0	0.85	LTL	2008	1.0	07J-1020	2017	4.8	0.35
2008	SH	12.5	10.3	07J-1021	SH/SL	SH	2017	12.5	11.9	SH	2010	9.0	07J-1021	SH/SL	8.5	8.9
	SH									ShL	2009	0.5	05J-1014	2017	0.5	0.5
	ThL	6.0	6.0	97J-1015	ThL	SH	2017	6.0	3.2	ThL	2009	1.9	97J-1015	2017	4.8	1.4
	ThL									TyL	2009	0.78	97J-1016	2017	4.8	0.8
	TsL	6.0	5.0	97J-1017	TsL	SH	2017	6.0	5.0	TsL	2009	3.8	97J-1017	2017	4.8	3.9
2009	SH	12.5	10.3	07J-1021	SH/SL	SH	2017	12.5	12.0	SH	2011	9.0	07J-1021	SH/SL	8.5	8.4
	SH									ShL	2010	0.5	05J-1014	2017	0.5	0.5
	ThL	6.0		97J-1015	ThL	SH	2017	6.0	4.5	ThL	2010	2.2	97J-1015	2017	4.8	1.8
	ThL									TyL	2010	1.5	97J-1016	2017	4.8	1.0
	TsL	6.0		97J-1017	TsL	SH	2017	6.0	1.2	TsL	2010	1.0	97J-1017	2017	4.8	0.7
2010	SH	12.5	11.8	07J-1021	SH/SL	SH	2017	12.5	11.6	SH	2012	9.0	07J-1021	SH/SL	8.5	9.0
	SH									ShL	2011	0.5	05J-1014	2017	0.5	0.5
	ThL	6.0		97J-1015	ThL	SH	2017	6.0	5.9	ThL	2011	2.5	97J-1015	2017	4.8	1.2
	ThL									TyL	2011	2.3	97J-1016	2017	4.8	1.2
	TsL	6.0		97J-1017	TsL	SH	2017	6.0	1.9	TsL	2011	1.7	97J-1017	2017	4.8	1.6
2011	SH	12.5	11.8	07J-1021	SH/SL	SH	2017	12.5	11.9	SH	2013	9.0	07J-1021	SH/SL	8.5	9.0
	SH									ShL	2012	0.5	05J-1014	2017	0.5	0.5
	ThL	6.0	6.0	97J-1015	ThL	SH	2017	6.0	6.5	ThL	2012	2.2	97J-1015	2017	4.8	2.1
	ThL									TyL	2012	2.0	97J-1016	2017	4.8	1.6
	TsL	6.0	1.5	97J-1017	TsL	SH	2017	6.0	2.2	TsL	2012	1.3	97J-1017	2017	4.8	1.9
2012	SH	12.5	11.8	07J-1021	SH/SL	SH	2017	12.5	11.9							
	SH									ShL	2013	0.5	05J-1014	2017	0.5	0.5
	ThL	6.0	6.0	97J-1015	ThL	SH	2017	6.0	5.2	ThL	2013	2.2	97J-1015	2017	4.8	1.3
	ThL									TyL	2013	2.0	97J-1016	2017	4.8	0.8
	TsL	6.0	1.5	97J-1017	TsL	SH	2017	6.0	2.0	TsL	2013	1.3	97J-1017	2017	4.8	1.6
	KSL	None	0.25	13J-1001	KSL	SH	2015	0.25	0.23	KSL	2013	0.2	13J-1001	2015	0.25	0.2

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Appendix 1.–Page 4 of 4.

Brood Year	Project	Hatchery Permit/ BMP Egg Take	AMP Egg Take	FTP for Egg Take	Egg Source	IL	FTP Exp. Year	FTP Egg Level	Egg Take from AR	Release Site	Release Year	AMP Juvenile Release Level	FTP for Release	FTP Exp. Date	FTP Release Level	Release from Annual Report
2013	SH	12.5	11.8	07J-1021	SH/SL	SH	2017	12.5	11.9							
	SH															
	ThL	6.0	6.0	97J-1015	ThL	SH	2017	6.0	4.2							
	ThL															
	TsL	6.0	6.0	97J-1017	TsL	SH	2017	6.0	1.8							
	KSL	None	0.25	13J-1001	KSL	SH	2015	0.25								