Regional Information Report No. 5J13-06

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

by

Mark Stopha

July 2013

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

REGIONAL INFORMATION REPORT NO. 5J130-06

AN EVALUATION OF THE CANNERY CREEK SALMON HATCHERY FOR CONSISTENCY WITH STATEWIDE POLICIES AND PRESCRIBED MANAGEMENT PRACTICES

by
Mark Stopha
Alaska Department of Fish and Game, Division of Commercial Fisheries, Juneau

Alaska Department of Fish and Game
Division of Commercial Fisheries
333 Raspberry Road, Anchorage, AK 99518

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

Mark Stopha,
Alaska Department of Fish and Game, Division of Commercial Fisheries,
1255 W. 8th St. P. O. Box 115526, Juneau, AK 99811-5526, USA

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TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

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 Cannery Creek Hatchery operated by the Prince William Sound Aquaculture Corporation. The facility is a pink salmon *Oncorhynchus gorbuscha* hatchery located in Unakwik Inlet, about halfway between Valdez and Whittier in Prince William Sound, Alaska. The facility was constructed by the Alaska Department of Fish and Game in the mid-1970s. The Alaska Department of Fish and Game operated the facility from 1978 until the Prince William Sound Aquaculture Corporation, the Regional Aquaculture Association, took over operations in 1998.

The original broodstock for the hatchery was from the adjoining Cannery Creek. Pink salmon gametes are collected from adults returning to the facility and placed in incubators fed by Cannery Creek water. The hatchery is permitted to collect up to 187 million pink salmon eggs. All progeny are released onsite after about 17 days of feeding. From 2002 through 2011, adult runs averaged about 7.5 million fish. The basic management plan for the hatchery should be updated with a description of current permit conditions and operations.

Key words: Cannery Creek Hatchery, hatchery evaluation, hatchery, Prince William Sound Aquaculture Corporation

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, ADF&G 2012). 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 (2003–2012) averaging 171 million fish (Vercessi 2013).

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 and chum salmon *O. keta* fry can be transferred from fresh water to salt water. Most Chinook *O. tshawytscha*, sockeye *O. nerka*, and coho salmon *O. kisutch* must spend a year or more in fresh water before fry develop to the smolt stage and can tolerate salt water. 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 extended rearing phase. There are economic tradeoffs between the costs of production versus the value of fish at harvest. Although Chinook, sockeye, and coho salmon garner higher prices per pound at harvest, chum and pink salmon are more economical to rear in the hatchery setting and generally provide a higher economic return.

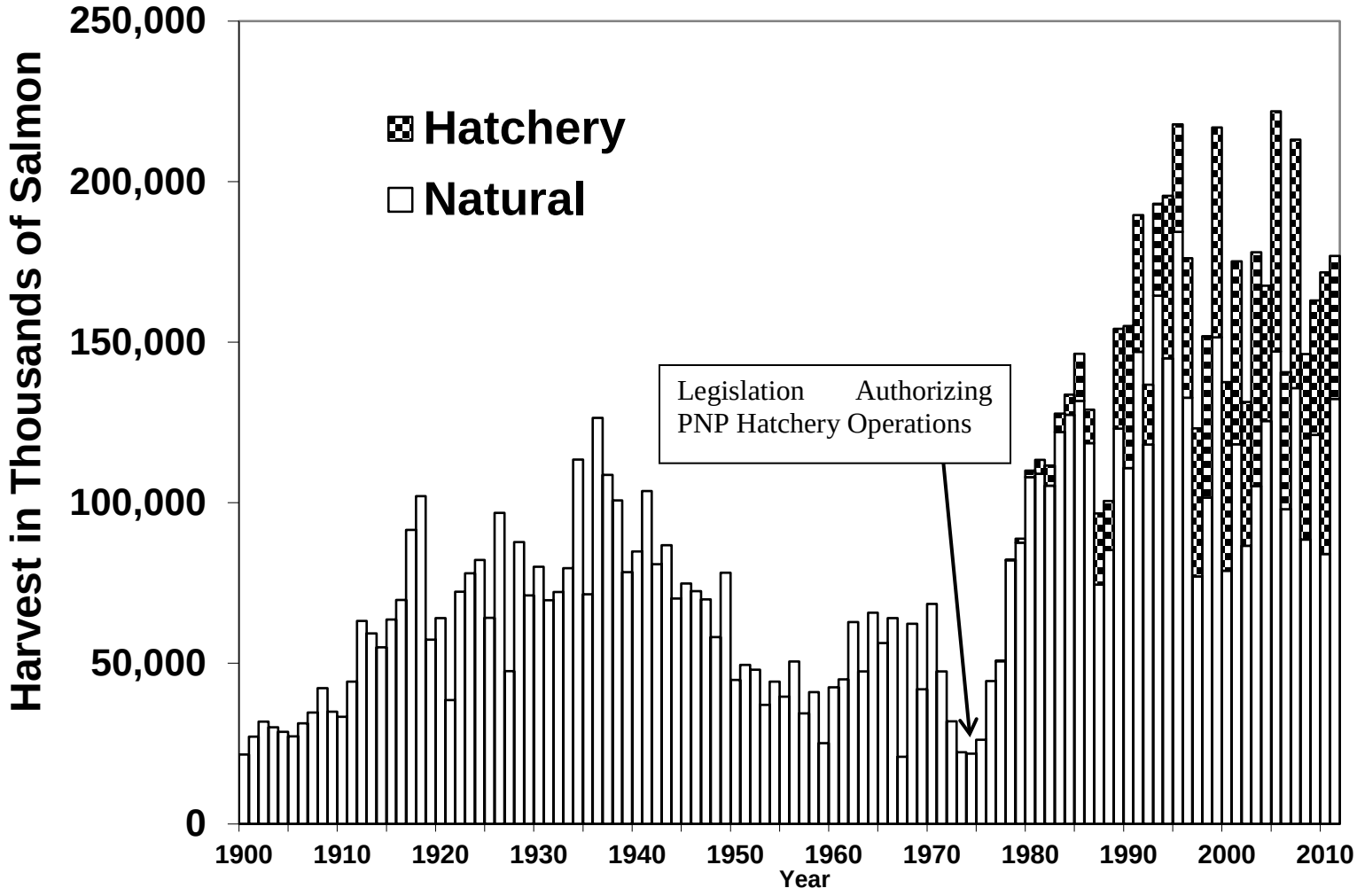

Figure 1.–Commercial salmon harvest in Alaska, 1900–2011.

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 2003 to 2012, pink salmon accounted for an average 73% of Alaska hatchery salmon returns by number, followed by chum (20%), sockeye (4%), coho (2%) and Chinook salmon (<1%) (Farrington 2003, 2004; White 2005–2011; Vercessi 2012).

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 (2003–2012) despite large fluctuations in harvest volume (ADF&G 2012). The exvessel value[1] of the commercial hatchery harvest increased from $59 million in 2003 to $104 million in 2012, with a peak value of $204 million in 2010. First wholesale value[2] also showed an increasing trend, with the value of hatchery fish increasing from $188 million in 2003 to $387 million in 2012, with a peak value of over $500 million in 2010. Pink and chum salmon combined accounted for about 80% of both the exvessel value and the first wholesale value of the hatchery harvest from 2003 to 2012. During this period, hatcheries contributed about a third of the total Alaska salmon harvest, in numbers of fish (Farrington 2003, 2004; White 2005–2011, Vercessi 2012). 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 to ensure adequate numbers of adults spawn, and the wild harvest is arguably at its maximum, given fluctuations due to environmental variability and imperfect management precision. Unlike Pacific Northwest systems, such as the Columbia River, where habitat loss, dam construction and urbanization led to the decline of salmon stocks to the point of endangered species listings, Alaska's salmon habitat is largely intact. ADF&G's system of wild stock monitoring addresses declines of salmon populations that

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[1] 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.

[2] 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.

do not meet production expectations or sustainable escapement levels. 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, overall, 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.

Part of the reason for the rise in price of Alaska salmon was a message of the state's sustainable fisheries management to a growing audience of discriminating buyers. The Alaska Seafood Marketing Institute applied to the Marine Stewardship Council (MSC) for certification as a sustainably managed fishery. In 2000, the MSC certified the salmon fisheries managed by ADF&G as sustainably managed, and the state's salmon fisheries remained the only MSC certified salmon fishery in the world for nearly a decade. Salmon fisheries elsewhere (Annette Islands Indian Reserve salmon, British Columbia pink and sockeye salmon, and Iturup Island, Russia, pink and chum salmon) were later certified for much smaller geographic areas, and in some cases, only for specific salmon species (MSC 2012). Alaska's certification was MSC's broadest and most complex, covering all 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 (FAO) in 2011 (Global Trust Certification Ltd. 2011). The hatchery evaluations started under the MSC certification program continued as an important systematic assessment of Alaska salmon fishery enhancement and its relation to wild stock production at a time of heightened interest for increased hatchery production and potential impacts on wild salmon production. ADF&G established a rotational schedule to review PNP hatchery programs. Musslewhite (2011a, 2011b) completed hatchery reviews for the Kodiak region in 2011, Stopha and Musslewhite (2012) completed the hatchery review for Tutka Bay Lagoon Hatchery in Cook Inlet, and Stopha (2012a, 2012b, 2013a, 2013b, 2013c) completed reviews of the Trail Lakes, Port Graham and Eklutna hatcheries in Cook Inlet and the Solomon Gulch and Gulkana hatcheries in Prince William Sound (PWS). This report is for the Cannery Creek Hatchery (CCH) in the PWS/Copper River region. Following completion of reviews of hatcheries in the PWS/Copper River region, reviews of hatcheries Southeast Alaska will follow.

OVERVIEW OF POLICIES

Numerous Alaska mandates and policies for hatchery operations were specifically developed to minimize potential adverse effects to wild stocks. The design and development of the hatchery program is described in detail in McGee (2004): "The success of the hatchery program in having

minimal impact on wild stocks can be attributed to the development of state statutes, policies, procedures, and plans that require hatcheries to be located away from significant wild stocks, and constant vigilance on the part of ADF&G and hatchery operators to improve the program through ongoing analysis of hatchery performance." Through a comprehensive permitting and planning process, hatchery operations are subject to continual review by a number of ADF&G fishery managers, geneticists, pathologists, and the ADF&G commissioner.

A variety of policies guide the permitting of salmon fishery enhancement projects. They include *Genetic Policy* (Davis et al. 1985), *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 US/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 (1) Hatchery stocks cannot be introduced to sites where the introduced stock may have interaction or impact on significant or unique wild stocks; (2) A watershed with a significant stock can only be stocked with progeny from the indigenous stocks; and (3) 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.

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, and hearings are held before a hatchery is permitted for operation. RPTs comprised of ADF&G and RAA personnel 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.

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 (described below) required or in place, and fish culture techniques. The AMP must be consistent with the hatchery permit and BMP.

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

the ADF&G commissioner or commissioner's delegate. An FTP is issued for a fixed time period and includes both the specifics of the planned operation and any conditions added by ADF&G.

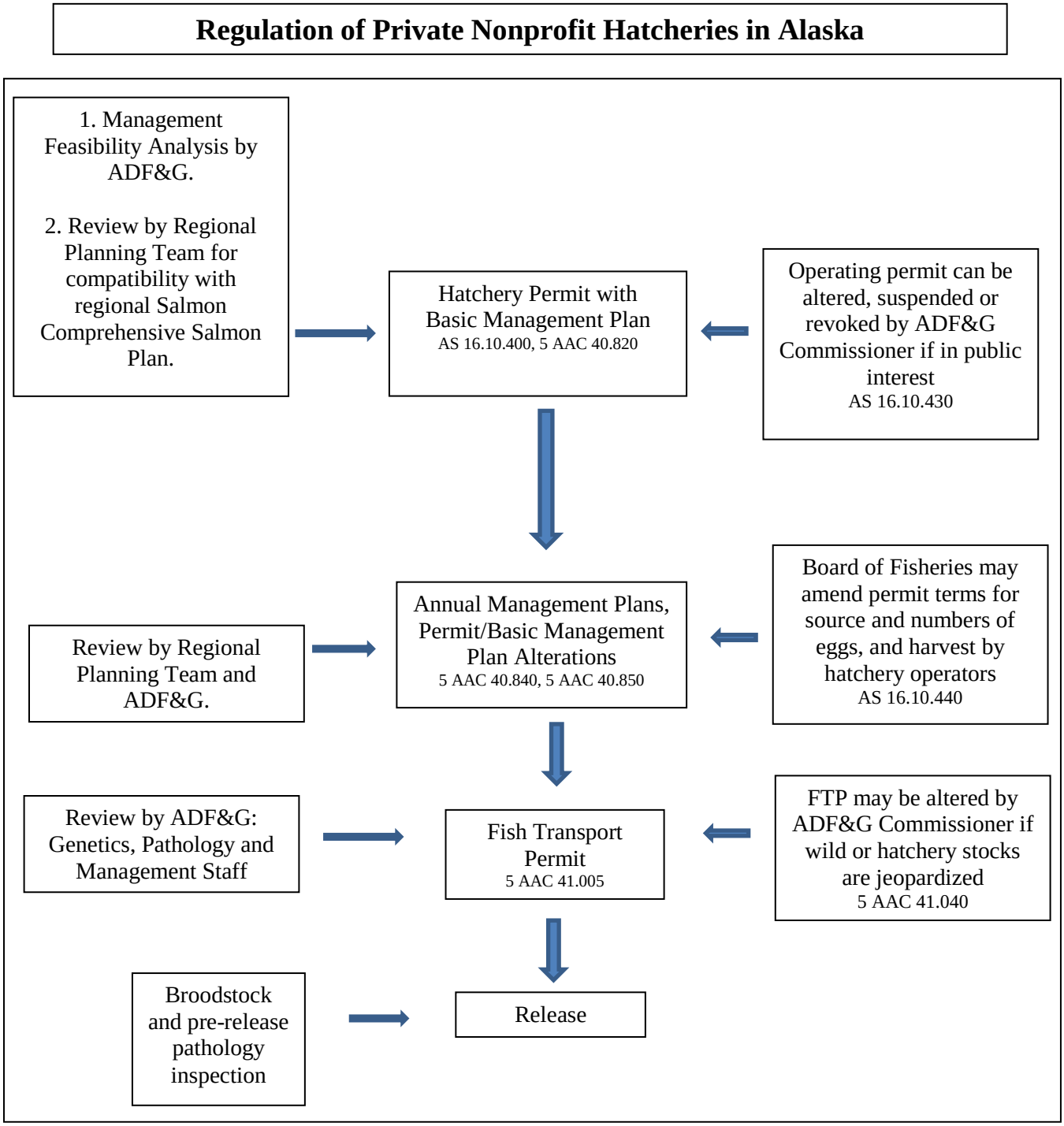

Figure 2.–Diagram of Alaska hatchery permitting process.

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.

CANNERY CREEK HATCHERY OVERVIEW

Cannery Creek Hatchery (CCH) is located in Unakwik Inlet, about halfway between Valdez and Whittier at the boundary between the Northern and Unakwik commercial fishing districts of Prince William Sound (Figure 3). The facility was constructed by the State of Alaska in the mid-1970s. ADF&G owns the facility and operated the hatchery from 1978 to 1988. Since 1988, the Prince William Sound Aquaculture Corporation (PWSAC), the Regional Aquaculture Association (RAA), has operated CCH.

Salmon returns to PWS in the early 1970s were poor due in part to productivity losses from the 1964 earthquake. PWSAC formed to develop PWS hatcheries to stabilize pink and chum salmon returns at a relatively high level, similar to runs that occurred from 1920 to 1950.[3] PWSAC also saw hatcheries as safeguards against potential impacts from oil development in the area (Yakutat and Yakutaga), as well as from the Trans-Alaska pipeline terminus in Valdez.[4] The PWSAC Board of Directors has 45 members. Twenty-seven board members are Prince William Sound (PWS) salmon permit holders, elected by PWS salmon permit holders. The remaining 18 seats are designated representatives appointed by the board from municipalities, Alaska Native organizations, processors, sport fisheries, personal use fisheries, and subsistence fisheries.[5]

ADF&G issued PNP salmon hatchery permit number 26 to PWSAC for CCH in 1988 for a permitted capacity of 147 million pink salmon eggs and 5 million chum salmon eggs. Since brood year 1995, all releases have received thermal otolith marks. Fry are fed in net pets for an average of 17 days and released in three groups into the zooplankton bloom.[6]

A permit alteration approved in 1999 increased the pink salmon capacity to 152 million eggs and deleted the chum salmon capacity. In 2010, PARs were submitted by PWSAC to increase pink salmon production at CCH, Armin F. Koernig Hatchery (AFKH) and Wally Noerenberg Hatchery by more than 20% at each facility. All of these PARs were denied by the ADF&G deputy commissioner, who cited concerns for meeting escapements in wild stock systems and straying of hatchery fish into wild stock systems.[7] In 2011, a PAR was submitted for CCH alone

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[3] PNP salmon hatchery application submitted by PWSAC for AFKH, unpublished document, 1975. Obtained from Sam Rabung, ADF&G PNP Coordinator, Juneau.

[4] W. H. Noerenberg, Executive Director, Prince William Sound Aquaculture Corporation to James Brooks ADF&G Commissioner. Biological Planning Document (part of the PNP salmon hatchery application for AFKH) for Port San Juan and Esther Salmon Hatcheries in Prince William Sound. Unpublished, 1979. Obtained from the files of Sam Rabung ADF&G PNP Coordinator, Juneau.

[5] http://pwsac.com/about/board-directors/ (Accessed 10/24/2012) and Dave Reggiani, PWSAC General Manager, personal communication.

[6] ADF&G and PWSAC. 2012. 2012 annual management plan. Cannery Creek Hatchery. Unpublished document obtained from Lorraine Vercessi, ADF&G Assistant PNP Coordinator, Juneau.

[7] Deputy Commissioner David Bedford, ADF&G, Juneau, to Dave Reggiani, General Manager, PWSAC, September 9, 2010, memorandum. Obtained from Sam Rabung, ADF&G PNP Coordinator, Juneau.

for an increase in pink salmon capacity from 152 million eggs to 187 million eggs. This PAR was approved by the ADF&G deputy commissioner (Appendix A). Neither the 2010 nor the 2011 CCH PARs were supported by ADF&G regional staff because of wild stock interception and straying concerns.

A BMP was issued for hatchery operations under ADF&G, but not to PWSAC with their hatchery permit. PWSAC has operated the facility under conditions of their hatchery permit and AMP.

Pink salmon brood stock development began in 1978 with pink salmon eggs taken from Cannery Creek broodstock, incubated at AFKH, and the fry released into Cannery Creek (McMullen and Kissel 1980). In 1981, AFKH stock pink salmon (Duck River (PWS) stock[8]) eggs were incubated at CCH and the resulting fry released to Hobo Creek for a rehabilitation project there (McDaniel et al. 1984).

Since 1989, pink salmon egg takes have ranged from 105 million in 1993 to 189 million in 2011. Fry releases averaged about 130 million per year from 1989 to 2011. Adult runs ranged from 712,000 in 1993 to nearly 20 million in 2010, with a 1989 to 2011 average run of over 6 million fish per year (Appendix B).

Chum and coho salmon were also produced at CCH (Appendix C). Chum salmon brood stock development began in 1979 when brood year 1978 chum salmon eggs from Wells River in PWS were incubated at Main Bay Hatchery, reared at AFKH, and released into Cannery Creek[9] (McMullen and Kissel 1980). Chum salmon releases continued during ADF&G operations from 1978 to 1988, with broodstocks derived from PWS wild stocks from the Wells River, Siwash Creek, and Eaglek Creeks (PWS RPT 1986). The AFKH[10] stock, which was derived primarily from Fidalgo Bay and Galena Bay systems in PWS[11], was also used. The chum salmon program was impeded by a lack of broodstock, which were harvested in the terminal area during purse seine fisheries for returning pink salmon, and warm water temperatures in Cannery Creek, which caused significant mortality during ripening. The program was discontinued in 1989 (PWS RPT, 1986).

Coho salmon from Mile 18 Creek on the Copper River flats were incubated at CCH in 1982 and the resulting unfed fry were released in 1983 into two barren lakes systems and Mile 18 Creek for a cooperative growth and feeding study between PWSAC, ADF&G and the U.S. Forest Service (McMullen and Hansen 1984, Appendix C).

ADF&G manages the area fisheries with objectives to meet escapement goals in wild stock watersheds, and to achieve cost recovery and broodstock requirements under the Cannery Creek Salmon Hatchery Management Plan (5 AAC 24.363). Allocation of hatchery fish is based on the Prince William Sound Management and Salmon Enhancement Allocation Plan (5 AAC 24.370). Because the CCH fish return intermixed with wild fish and hatchery fish from other facilities, management of the run is based on a variety of factors. Poor wild stock escapements may require closures in general fishing areas and shift harvest to the terminal areas near the hatchery. During strong wild stock runs, hatchery fish may be intercepted in other fishing districts,

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[8] AFKH AMP, unpublished document, 1979. Obtained from Sam Rabung, ADF&G PNP Coordinator, Juneau.

[9] Fish transport permit issued to PWSAC dated July 12, 1978 and amended April 4, unpublished document, 1979. Obtained from Sam Rabung, ADF&G PNP Coordinator, Juneau.

[10] AFKH Annual Report by PWSAC, unpublished document, 1988. Obtained from Sam Rabung, ADF&G PNP Coordinator, Juneau.

[11] AFKH Annual Report by PWSAC, unpublished document, 1979. Obtained from Sam Rabung, ADF&G PNP Coordinator, Juneau.

requiring fishing closures near the hatchery to provide for broodstock and cost recovery needs (PWSAC and ADF&G 2012).

For pink and chum salmon, the Northern and Unakwik districts are managed as a single area. The first pink salmon escapement goals for the Northern/Unakwik District stocks were established at least back to 1960 (Fried 1994). Escapement goals were reviewed and updated in 1994 (Fried 1994), 2002 (Bue et al. 2002), 2008 (Evenson et al. 2008) and 2011 (Fair et al. 2011). Escapement goals to the Northern District were achieved in 19 of 32 years from 1980 to 2011. Escapement goals were met in only 2 of 10 years from 1970 to 1979 (Appendix D). Monitoring for hatchery strays in the escapement was conducted from 2008 to 2010 (Brenner et al. 2012).

The first returns to the hatchery occurred in 1980, with the first years of runs exceeding 1 million fish in 1984 (Appendix B). No clear trend is evident between hatchery runs and escapements for the Northern/Unakwik districts, and there are years of poor escapements both prior to and after adult returns began to CCH (Appendix D).

PROGRAM EVALUATIONS

Hatchery permit/BMP, AMP, and FTP documents for CCH 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.

Records indicate an FTP was not issued to PWSAC until 1996 for egg collections and releases from the hatchery. This may have been an oversight by ADF&G when the state transferred operations to PWSAC. Likewise, a BMP was issued for operations under ADF&G, but not under PWSAC. PWSAC has operated the facility based on the hatchery permit and AMP.

Beginning in 1991, the AMP called for an annual egg take of 152 million eggs. The maximum allowed by the hatchery permit, however, remained at 147 million eggs from 1989 until 1998, when a permit alteration was approved that increased the permitted level to 152 million eggs. Since 1999, reported egg takes were within 5% of the permitted number for most years (Appendix E).

The 2012 AMP provides documentation of expected operations for the season, including egg-take and release goals, a listing of current FTPs, expected runs, hatchery run management, plans for otolith marking, and evaluation plans. The AMP is consistent with the permit, and a BMP is needed. Egg takes and fry releases reported in the annual report were in close agreement to levels permitted in the FTPs and AMPs (Appendix E).

The current CCH program FTP was reviewed and approved by numerous ADF&G personnel, and renewed as necessary (Appendix F).

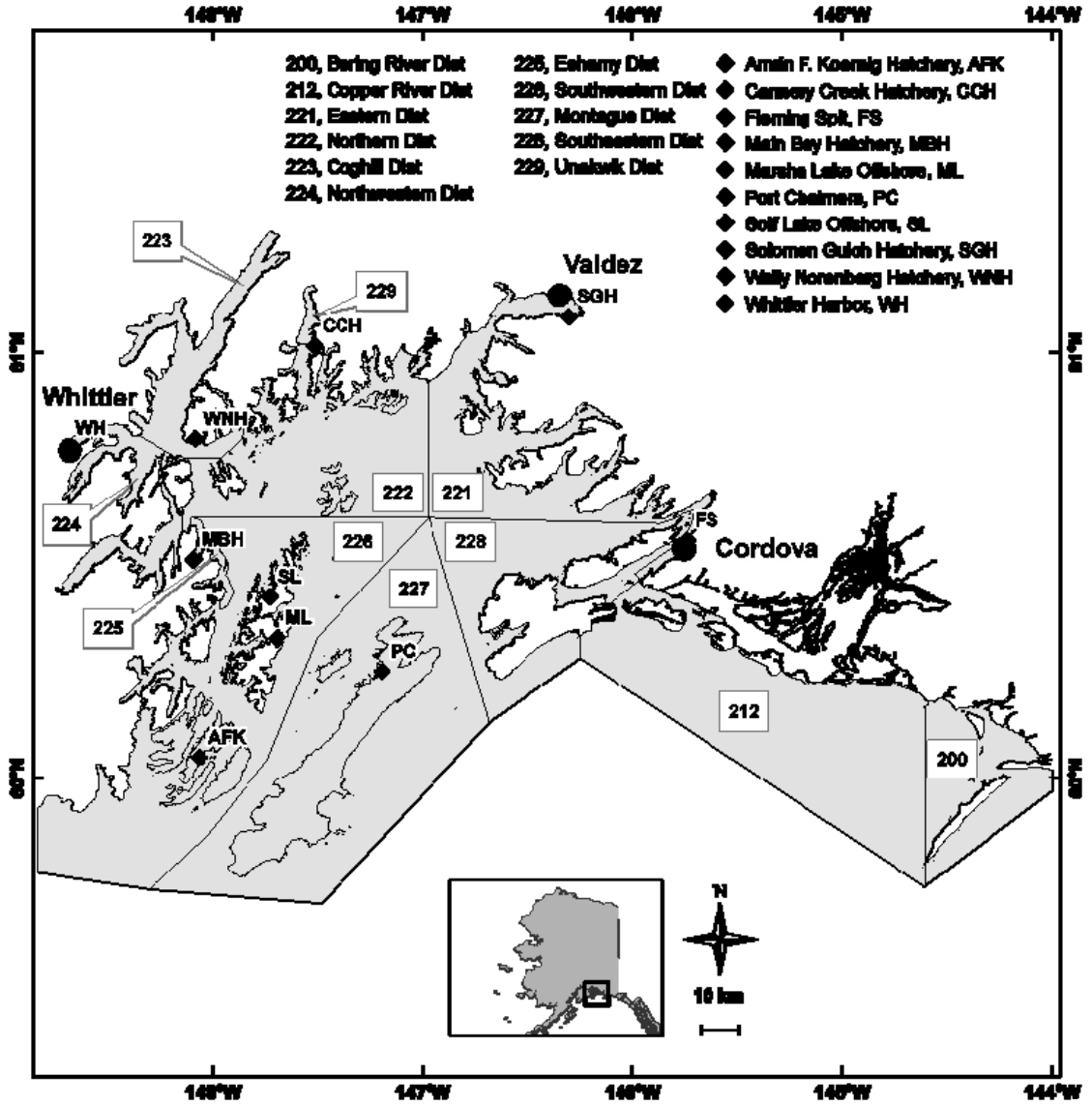

Figure 3.– Cannery Creek Hatchery and Prince William Sound Fishing Districts.

COMPREHENSIVE SALMON ENHANCEMENT PLAN

The PWS RPT has developed 3 Comprehensive Salmon Plans (CSP) to date. Phase I was issued in 1983, and served to assemble relevant information regarding the development and protection of salmon resources in the area (PWS RPT, 1983). The document assessed the region's commercial, sport, and subsistence fisheries resource needs, identified areas for enhancement and rehabilitation to meet those needs, and set 20-year goals for each fishery.

Purse seine gear is the only type of commercial fishing gear permitted in the Northern District where most CCH fish are harvested. The production objective for the Phase I CSP at CCH was to "provide salt water rearing facilities for 68 million pink salmon fry." At the time, CCH had

fish handling facilities for an annual egg take of 50 million pink salmon eggs, and the Phase I plan reported that a capital improvement request to the legislature had been submitted to fund improvements to increase capacity for an additional 30 million eggs to meet the plan objective. The RPT also conducted a survey as part the Phase I CSP to ask the fishing community about their desires for enhancement. Purse seine respondents ranked the Northern District third as a preferred fishing district and second as a preferred district for new enhancement projects. Pink salmon was the preferred species.

The CSP Phase II was issued in 1986 (PWS RPT, 1986). The purpose of the Phase II plan was to recommended 5-year goals to achieve the 20-year goals in the Phase I plan. The Phase II plan recommended increasing the capacity of CCH from 50 million eggs to 100 million eggs to provide annual harvests of about 5 million pink salmon. Following publication of the Phase II plan, the CCH site capacity increased from 50 million eggs to a permitted capacity of 147 million eggs when PWSAC was issued a permit for the hatchery in 1988 (Appendix A).

The Phase III CSP was issued in 1994. The purpose of the Phase III plan was to "achieve optimum production of wild and enhanced salmon stocks on a sustained yield basis through an integrated program of research, management, and application of salmon enhancement technology, for the benefit of all user groups." The plan recommended a guideline potential maximum increase in CCH production from 147 million eggs to 207 million eggs over the following 10-year period if fishery management issues, genetic guidelines and stock interactions allowed (PWS-Copper River RPT 1994). No further CSP plans have been issued to date, and the current permitted pink salmon capacity at CCH is 187 million eggs.

The Phase III plan also recommended five biological and economic criteria as the hatchery program in PWS was developed. Two recommendations—that growth rates of juvenile salmon during the early marine period should be density independent over the long term, and that abundance of juvenile salmon predators is independent of juvenile salmon abundance over the long term—are not addressed here because these parameters would likely be influenced by more than one hatchery. These issues may be addressed in future enhancement evaluations that address issues on a regional scale. Two recommendations—that straying remain below 2% of the wild stock escapement over the long term and that wild stock escapement goals must be achieved over the long term—can be assigned to an individual hatchery and are addressed in this document.

The fifth recommendation of the Phase II plan was that the long-term average cost of hatchery operation, management, and evaluation must remain 50% of the value of hatchery production and that the RPT will determine how to calculate costs and values of the hatchery program and establish more definitive decision criteria regarding economic benefits. The RPT has not defined these values and costs to date.

The RPT developed a "Project Criteria Checklist" in the Phase III plan to evaluate new project applications. The RPT encouraged applicants to use the checklist to develop the information for discussion by the RPT so that hatchery operators would have a better understanding of their role in fisheries regional development. The checklist appeared to be used in the first few years after issuance of the Phase III plan, but was not used thereafter.

In addition, the revised charter for the RPT under Phase III Plan states that the RPT will update the Comprehensive Salmon Plan at least once a year, and will provide an updated plan to the commissioner each year. Annual reports have not occurred since issuance of the Phase III Plan.

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 were used to assess compliance of the CCH 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 enhanced stocks.

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

Fish Health and Disease Policy (5 AAC 41.080)	
Egg disinfection	Within 48 hours of taking and fertilizing live fish eggs or transporting live fish eggs between watersheds, all eggs must be treated with an iodine solution. This requirement may be waived for large scale pink and chum salmon facilities where such disinfection is not effective or practical.
Hatchery inspections	According to AS 16.10.460, inspection of the hatchery facility by department inspectors shall be permitted by the permit holder at any time the hatchery is operating.
Disease reporting	The occurrence of fish diseases or pathogens listed in 5 AAC 41.080(d) must be immediately reported to the ADF&G Fish Pathology Section.
Pathology requirements for Fish Transport Permits (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 donor stock of pink salmon was from Cannery Creek, the site of the hatchery.

Brenner et al. (2012) reported CCH pink salmon straying primarily to wild systems near the hatchery in the Northern District. In eight northern district streams sampled, four streams contained less than 5% hatchery fish, two streams contained 5.5% and 8.1% hatchery fish, and two streams contained 10.6% and 15.1% hatchery fish. Strays from CCH were also found in appreciable numbers (>5%) in streams sampled in all the Eastern and Southwestern districts, and in lower levels in the Coghill, Northwestern, Eshamy, and Montague districts. Significant stocks and wild stock sanctuaries have not been defined by the PWS RPT, and therefore it is not possible with respect to the *Genetic Policy* to assess the importance of straying of CCH fish into wild systems relative to public policy.

In 2012, ADF&G awarded the Prince William Sound Science Center (PWSSC) a contract for a four-year study entitled "Interactions of Wild and Hatchery Pink and Chum Salmon in Prince William Sound and Southeast Alaska."[12] The project will study the extent and annual variability in straying of hatchery pink and chum salmon in PWS, and the effects, if any, on productivity of wild salmon stocks due to straying of hatchery salmon.

According to the 2012 AMP, the expected pink salmon broodstock collection schedule is derived from historical run timing curves at the hatchery. A collection schedule is to be implemented based on run-timing percentages by date to ensure run timing is proportionally represented in the broodstock. If inseason catch data indicate the run is earlier or later than the historical run curve, PWSAC can consult with ADF&G to alter the schedule accordingly.

In practice, most hatchery managers do not actively manage for run timing during the egg takes at large-production hatcheries like CCH. For logistical efficiency, egg takes do not begin until the number of salmon, their maturation, and sex ratios are adequate to allow the egg take to begin and continue without delay until the permitted egg collection goal is reached. These efficiencies are important for later hatchery processes, including otolith thermal marking and hatch timing (Dave Reggiani, PWSAC General Manager, personal communication).

[12] http://www.adfg.alaska.gov/index.cfm?adfg=fishingHatcheriesResearch.main, (Accessed 02/01/2013).

Table 4.–The current Cannery Creek Hatchery salmon fishery enhancement program and its consistency with elements of the ADF&G *Genetic Policy* (see Table 1).

I. Stock Transport	
Use of appropriate local stocks	CCH used broodstock from the indigenous stock. Releases are from the hatchery, only.
II. Protection of wild stocks	
Identification of significant or unique wild stocks	No stocks were identified as significant stocks or unique wild stocks to date in PWS by the RPT.
Establishment of wild stock sanctuaries	No wild stock pink salmon sanctuaries are designated for PWS by the RPT.
Straying Impacts	Straying, defined here as the estimated proportion of CCH fish sampled that strayed into wild stock streams and died in the streams, were highest in streams sampled nearest the hatchery in the Northern District (up to 15.1%), with appreciable straying (up to 7.7%) in streams sampled in all the Eastern and Southwestern districts. Lower level straying (less than 2%) was found in the Coghill, Northwestern, Eshamy, and Montague districts (Brenner et al. 2012). Effects of straying are currently under study by the PWSSC.
III. Maintenance of genetic variance	
Maximum of three hatchery stocks from a single donor stock	Cannery Creek is the donor stock for Cannery Creek and Main Bay hatcheries.
Minimum effective population size of 400	The AMP for CCH requires about 357,000 adult pink salmon brood stock to meet egg-take goals.
Review by geneticist	The ADF&G geneticist reviewed and approved the FTPs for the CCH pink salmon programs with no concerns.

Fish Health and Disease

FTPs for the CCH program were approved by the pathologist (Table 5). Pathology records showed no inconsistencies with fish health and disease policies. Appropriate pink salmon culture techniques are being used, and disease reporting and broodstock screening have occurred as required.

The hatchery was been inspected regularly since at least 1988, and no major health issues have been identified at the facility. Inspectors commented that the facility was in good order, and that the cold hatchery water keeps egg fungus and other potential health issues to a minimum.

Table 5.–The current Cannery Creek Hatchery salmon fishery enhancement 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	Not used.
Hatchery inspections	Hatchery inspections were conducted regularly from at least 1988 through 2011.
Disease reporting	There have been no chronic disease issues at the hatchery
Pathology requirements for FTPs (5 AAC 41.010)	
Disease history	The disease history is complete.
Isolation measures	No physical transport occurs for onsite release, according to the FTP.
Pathology review of FTPs	FTPs were reviewed and approved by the pathologist.

Fisheries Management

Pink salmon returning to the hatchery are harvested primarily in the Northern District purse seine fishery. Significant harvests occur in some years in the Coghill and Southwestern districts as well (Botz et al. 2012). Subsistence, sport, and personal use harvests are minimal.

Since brood year 1995, all CCH releases have been marked (thermal otolith marks; Table 6). Hatchery contribution is estimated from otoliths sampled from the fisheries.

Escapement goals are established for Northern District pink salmon watersheds. From 1980 to 2011, pink salmon escapement goals were met in 19 out the 32 years (Appendix D). A portion of the escapements in wild systems are likely strays from CCH and other PWS hatcheries (Brenner et al. 2012).

Table 6.–The current Cannery Creek Hatchery 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	Adult runs are sampled for presence of hatchery otolith markings to estimate contributions to the fisheries. Straying studies are ongoing in Prince William Sound.
Use of precautionary approach	ADF&G manages the salmon fishery to meet escapement goals.
Salmon Escapement Goal Policy (5 AAC 39.223)	
Establishment of escapement goals	Escapement goals are established for the Northern District pink salmon systems.
Mixed Stock Salmon Fishery Policy (5 AAC 39.220)	
Wild stock conservation priority	A management plan is in place for the CCH run. Special harvest areas allow targeted harvest of hatchery returns and minimal incidental catch of other stocks.
Fisheries management review of FTPs (5 AAC 41.010 – 41.050)	
Review by management staff	The FTPs for the CCH program were reviewed by fisheries management staff.

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 annual report must include "information pertaining to species; brood stock source; number, age, weight, and length of spawners; number of eggs taken and fry fingerling produced; and the number, age, weight, and length of adult runs attributable to hatchery releases, on a form to be provided by the department." The completed report is due on December 15 and the CCH annual reports have been received for all years.

Alaska hatcheries are required to document the disposal of the carcasses of salmon used for broodstock (5 AAC 93.350). If the carcasses are disposed, the hatchery must record the number of males and females disposed each day, and whether the gametes were fertilized, unused, or used for roe sales. A maximum of 10% of the total number of females can be used for roe sales without utilizing the carcass; the proceeds from any excess must be surrendered to ADF&G. CCH carcass logs appear complete and timely.

RECOMMENDATIONS

1) The only BMP for CCH was issued when ADF&G operated the facility. A BMP for CCH should be developed for current hatchery operations under PWSAC.

DISCUSSION

Alaska hatchery and fisheries enhancement programs are governed by a comprehensive permitting system designed to protect wild stocks and provide increased harvest opportunities. The success of enhancement efforts depends on implementing that system and ensuring policies are followed.

The ADF&G constructed CCH in response to poor salmon returns to PWS and most of Alaska during the 1970s. Today, the combination of favorable environmental conditions, sustainable management of wild stock systems, and hatchery production supports healthy salmon fisheries in PWS.

With full utilization of virtually the entire hatchery run and strong demand for pink salmon, there is heightened interest in increasing Alaska hatchery production. The processing industry has expanded infrastructure and markets for abundant pink salmon returns. The advent of thermal-marking otoliths and additions to the time series of harvest, escapement, migration, and timing data have added to management precision for harvesting the CCH run and providing for adequate escapement to wild stock systems.

Straying of CCH pink salmon has been documented for over two decades (Sharr et al. 1995, Joyce and Evans 2000, Brenner et al. 2012). Hatchery strays were included in escapement counts of wild systems and hatchery fish may have spawned with wild fish. Garforth et al. (2012), in the first surveillance report for certification of Alaska's salmon fisheries under the FAO-based responsible fisheries management certification, indicated the need for hatchery and wild stock interaction study: "To evaluate whether or not fitness of natural-origin (wild) versus stray hatchery-origin salmon differ when spawning in the wild, survival of both types of fish and their relative spawning success needs to be documented."

A science panel composed of current and retired scientists from ADF&G, University of Alaska, aquaculture associations, and National Marine Fisheries Service, with broad experience in salmon enhancement, management, and wild and hatchery fish interactions, designed a long-term research project to potentially answer some of these questions. The initial four-year study entitled "Interactions of Wild and Hatchery Pink and Chum Salmon in Prince William Sound and Southeast Alaska" currently underway is funded by the state of Alaska and administered by ADF&G, with field work conducted by the PWSSC and Sitka Sound Science Center. The study will improve understanding of hatchery and wild stock interactions and provide Alaska-specific scientific guidance for assessing Alaska's hatchery program, including recommendations for escapement goals, fisheries management, hatchery production levels, and hatchery practices at CCH and other hatcheries in the state.

ADF&G recognizes the importance of PWSAC within the PWS region and strongly supports the effective and continued operation of PWSAC hatcheries. The ADF&G determines PWSAC to be in full compliance with its hatchery permit, annual management plans and other agreements with the department, and recently renewed the operations contract with PWSAC for CCH (Jeff Regnart, ADF&G Director of Commercial Fisheries, personal communication).

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APPENDIX

Appendix A.–History of Cannery Creek Hatchery permit and permit alterations, 1988–2011.

Date	Description	Permitted Capacity in millions of eggs	
		Pink Salmon	Chum Salmon
06/22/1988	PNP hatchery permit number 26 issued to PWSAC to operate the Cannery Creek Hatchery. Hatchery permitted for 147 million pink salmon and 5 million chum salmon eggs.	147	5
02/09/1999	Permit alternation approved to increase pink salmon capacity from 147 to 152 million eggs, and to delete chum salmon capacity.	152	0
03/09/2010	Permit alternation denied to increase pink salmon capacity from 152 to 187 million eggs.	152	
08/23/2011	Permit alternation approved to increase pink salmon capacity from 152 to 187 million eggs.	187	

Appendix B.–Cannery Creek Hatchery pink salmon egg takes, fry releases and adult runs. The State of Alaska owns the facility and operated the hatchery, 1978–1988.

Year	Eggs	Fry Released	Total Adult Run
1978	4,039,000		
1979	3,550,000	2,826,000	
1980	23,299,000	2,694,000	90,348
1981	14,544,000	21,289,000	141,440
1982	24,973,677	13,933,000	764,214
1983	34,335,345	22,123,000	469,441
1984	48,634,047[a]	31,200,000	1,139,000
1985	72,900,000[b]	36,500,000	2,594,000
1986	44,200,000	56,200,000	853,000
1987	106,276,128	42,600,000	2,131,726
1988	64,408,295	95,396,455	227,688
1989	161,000,000	59,000,000	5,540,665
1990	152,000,000	144,000,000	2,534,297
1991	154,000,000	142,000,000	8,501,296
1992	156,000,000	132,000,000	1,516,369
1993	105,300,422	140,000,000	712,223
1994	158,000,000	85,000,000	9,640,886
1995	155,000,000	130,000,000	5,072,900
1996	155,000,000	140,000,000	6,516,672
1997	160,000,000	137,000,000	6,038,325
1998	153,000,000	138,000,000	7,079,103
1999	156,000,000	132,000,000	8,722,850
2000	159,000,000	132,000,000	6,544,358
2001	153,000,000	139,000,000	2,121,102
2002	157,000,000	139,000,000	1,588,501
2003	162,000,000	136,000,000	8,341,388
2004	152,000,000	136,000,000	2,940,688
2005	152,000,000	127,000,000	13,479,739
2006	152,000,000	138,000,000	2,906,689
2007	152,000,000	141,000,000	7,430,043
2008	152,000,000	131,000,000	11,013,594
2009	155,600,000	141,000,000	3,261,664
2010	152,000,000	139,000,000	19,728,888
2011	189,000,000	135,000,000	4,491,060

Sources: Pink salmon egg take and release data: 1978–1988 PWSAC website http://pwsac.com/about/hatcheries/cannery-creek-hatchery/ (Accessed 11/07/12); 1989–2011 from PWSAC annual reports submitted to ADF&G. Pink Salmon adult run data: 1980–1996 from Sharp et al. 2000); 1997–2005 from Hollowell et al. (2007).; 2005–2010 from Botz et al. (2012); 2011 from Jeremy Botz, Prince William Sound ADF&G management biologist, personal communication, from ADF&G database.

[a] 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).

[b] About 103M eggs collected, and about 34.1M transferred to Main Bay Hatchery (Lorraine Vercessi, ADF&G PNP Assistant Coordinator, personal communication).

Appendix C.–Cannery Creek Hatchery coho and chum salmon egg takes, fry releases and adult runs. The State of Alaska owns the facility and operated the hatchery, 1978–1988. There was no accounting of runs reported from the 1983 coho salmon release.

	Chum Salmon			Coho Salmon	
Year	Eggs	Fry Released	Adult Run	Eggs	Fry Release
1978	667,020				
1979	615,000	21,045			
1980	3,280,231	469,124			
1981	1,166,000	2,448,251			
1982		866,891		188,304	
1983	1,900,000		9,700		178,000
1984	804,000	1,796,000	51,900		
1985	351,000	760,000	36,400		
1986	41,000	284,000	4,975		
1987	487,000	35,000	0		
1988	4,760,000[a]	200,000	5,174		

Sources: 1978 egg take and 1979 release from McMullen and Kissel (1980); 1979 egg take and 1980 release from McMullen and Kissel (1981); 1980 egg take and release from McMullen and Kissel (1981); 1981 egg take and release from ADF&G (McMullen and Kissel 1982); 1982 egg take and release from McMullen et al. (1983); 1983 egg take, release and run data from McMullen and Hansen (1984); 1984 egg take, release and run data from Hansen (1985); 1985 egg take, release and run data from Hansen (1986); 1986 egg take, release and run data from Hansen (1987); 1987 egg take, release and run data from Holland (1988); 1988 egg take, release and run data from Holland (1989); 1979 and 1983 egg take numbers from ADF&G Database from Lorraine Vercessi, ADF&G Assistant PNP Coordinator, personal communication.

[a] 4,487,000 pink salmon fry from this egg take released at Unakwik Inlet in 1989, Lorraine Vercessi, ADF&G Assistant PNP Coordinator, personal communication.

Appendix D.–Total Cannery Creek Hatchery pink salmon run, pink salmon escapement index counts in the Northern and Unakwik fishing districts, and escapement goals for the Northern and Unakwik fishing districts, Prince William Sound, 1970–2011.

Year	Northern and Unakwik Districts	Escapement Goal	Total Hatchery Run
1970	**125,360**	140,000-160,000	
1971	**126,210**	140,000-160,000	
1972	**83,900**	140,000-160,000	
1973	**69,660**	140,000-160,000	
1974	206,750	140,000-160,000	
1975	**38,260**	140,000-160,000	
1976	**106,248**	140,000-160,000	
1977	**47,897**	140,000-160,000	
1978	**88,816**	140,000-160,000	
1979	271,952	140,000-160,000	
1980	**105,551**	140,000-160,000	90,348
1981	206,282	140,000-160,000	141,440
1982	198,838	140,000-160,000	764,214
1983	138,993	140,000-160,000	469,441
1984	439,886	140,000-160,000	1,139,000
1985	166,768	140,000-160,000	2,594,000
1986	**131,956**	140,000-160,000	853,000
1987	**114,522**	140,000-160,000	2,131,726
1988	140,981	140,000-160,000	227,688
1989	**95,445**	140,000-160,000	5,540,665
1990	110,638	115,000-141,000	2,534,297
1991	**159,909**	192,000-235,000	8,501,296
1992	**72,323**	115,000-141,000	1,516,369
1993	**95,602**	192,000-235,000	712,223
1994	178,151	115,000-141,000	9,640,886
1995	**84,447**	192,000-235,000	5,072,900
1996	218,022	115,000-141,000	6,516,672
1997	**65,260**	192,000-235,000	6,038,325
1998	213,288	115,000-141,000	7,079,103
1999	214,723	192,000-235,000	8,722,850
2000	168,247	115,000-141,000	6,544,358
2001	**163,573**	192,000-235,000	2,121,102
2002	138,204	115,000-141,000	1,588,501
2003	262,502	175,000-390,000	8,341,388
2004	163,858	110,000-235,000	2,940,688
2005	579,079	175,000-390,000	13,479,739
2006	211,603	110,000-235,000	2,906,689
2007	**156,063**	175,000-390,000	7,430,043
2008	141,396	110,000-235,000	11,013,594
2009	**119,747**	175,000-390,000	3,261,664
2010	287,570	110,000-235,000	19,728,888
2011		175,000-390,000	4,467,965

Source: Escapement goals: 1980–1994 Fried (1994); 2002–2005 Bue et al. (2002); 2005–2011 Evenson et al. (2008). Pink salmon adult run data: 1980–1996 from Sharp et al. (2000); 1997–2005 from Hollowell et al. (2007); 2005–2010 from Botz et al. (2012); 2011 from Jeremy Botz, Prince William Sound ADF&G management biologist, personal communication, from ADF&G database.

Note: Numbers in bold indicate years in which lower bound of escapement goal was not reached.

Appendix E.–Comparison of permitted and reported egg takes in hatchery permit, basic management plan, annual management plan, fish transport permits and annual reports for Cannery Creek Hatchery pink salmon, 1989–2011. Numbers are in millions and rounded.

Year	Permit	AMP	FTP	Annual Report
1989	147	140		161
1990	147	140		152
1991	147	152		154
1992	147	152		156
1993	147	152		105
1994	147	152		155
1995	147	152		155
1996	147	147	147	155
1997	147	147	147	160
1998	147	152	152	153
1999	152	152	152	156
2000	152	152	152	159
2001	152	152	152	153
2002	152	152	152	157
2003	152	152	152	162
2004	152	152	152	152
2005	152	152	152	152
2006	152	152	152	152
2007	152	152	152	152
2008	152	152	152	152
2009	152	152	152	156
2010	152	152	152	152
2011	187	187	187	189

Appendix F.–Summary of Fish Transport Permit for Cannery Creek Hatchery.

FTP Number	Issued	Expiration	Summary and reviewer comments.
96A-0040	1996	2021	Cannery Creek Hatchery egg take of up to 147 million eggs and release resultant fry from the hatchery. In 1998, FTP amended to increase egg take from 147 million to 152 million eggs. Permit effective period extended in 2006 through 2011. In 2011, permit extended through 2021, and permitted capacity increased to 187 million eggs.