THE STATE of ALASKA
GOVENOR Bill Walker

Department of Fish and Game

DIVISION OF COMMERCIAL FISHERIES
Southeast Region Office

Douglas Island Building
802 3rd Street
Douglas, AK
Management: 907. 465.4250
Fax: 907.465.4944

To: Lorraine Vercessi
Statewide PNP Hatchery Coordinator
Commercial Fisheries – Statewide Office, Juneau

Date: 05/1/17

Thru: Dan Gray
Regional Management Coordinator
Commercial Fisheries – Sitka

Telephone: (907) 747-6688 – CF
(907) 747-5355 – SF
Fax: (907) 747-6693

Robert Chadwick
Regional Management Coordinator
Sport Fisheries – Sitka

Subject: Management Feasibility Analysis for Baranof Warm Springs Hatchery

From: Flip Pryor
Regional Resource Development Biologist
Commercial Fisheries – Douglas

Per your request, and as specified by **5 AAC 40.130. Management Feasibility Analysis**, the following information has been prepared for Sustainable Salmon concerning a proposed hatchery located at Baranof Warm Springs, Alaska. Baranof Warm Springs is a small community located on the eastern side of Baranof Island, within the jurisdiction of the City and Borough of Sitka, Alaska. As stated in regulation, a management feasibility analysis (MFA) must include, at a minimum, the following information:

1) an estimate of potential contributions to the common property fishery;
2) potential size and location of a special harvest area;
3) special management considerations or the need for additional studies;
4) potential broodstock sources;
5) an assessment of production potentials for each species; and
6) additional factors considered by the department to be relevant to the proposed hatchery operation.

Background Information

A completed MFA must be included when submitting a private nonprofit (PNP) hatchery permit application to ADF&G.

Sustainable Salmon is applying for a large-scale multiple species salmon hatchery and release site within Warm Springs Bay, near the community of Baranof Warm Springs, on the eastern side of Baranof Island. The proposed hatchery would be located approximately 10 miles south of Hidden Falls Hatchery (HFH). The applicant proposes to release large numbers of Chinook (Oncorhynchus tshawytscha), coho (O. kisutch), chum (O. keta), and pink salmon (O. gorbuscha) from the facility, with adults returning to the site. The desired incubation and rearing levels, in eggs, during the first reproductive cycle are: 7.5 million chum; 1.875 million Chinook; 375,000 coho and 100,000 pink salmon. At full capacity the proposed incubation and rearing levels, in eggs, are: 100 million pink, 80 million chum, 25 million coho, and 10 million Chinook salmon (Chinook and coho production levels may be adjusted for a combined capacity of 35 million eggs). All proposed production numbers are flexible based on joint analysis by Sustainable Salmon and ADF&G.

The proposed chum salmon returns are expected to run concurrent with HFH chum salmon, which start to return in late-June. The proposed pink salmon returns are expected to occur near the tail end of the chum salmon run. Sustainable Salmon would like to use Keta River stock Chinook salmon, currently in the early development phase at Little Port Walter Research Facility. If Keta River stock Chinook salmon have a similar return timing as HFH Chinook salmon, returning adults would be harvested in Southeast Alaska common property fisheries from late April through early July. The proposed coho salmon returns are also expected to occur similar to HFH coho salmon, which are harvested in Southeast Alaska common property fisheries form July through September.

The community of Baranof Warm Springs, located on the northwest corner of Warm Springs Bay, is comprised of approximately 15 homes, most of which are occupied seasonally. Baranof Warm Springs is accessible by boat and floatplane. The City and Borough of Sitka has zoned the town site land recreational. The City and Borough of Sitka maintains the boardwalk that is the main thoroughfare, and the State of Alaska maintains the community dock. The community is a recreational destination due to its proximity to the thermal hot springs, access to Baranof Lake, and a large scenic waterfall that flows into Warm Springs Bay. The area surrounding Warm Springs Bay is comprised of state, Federal, city, and privately owned lands.

Baranof Lake has a barrier falls on the lake outlet that prevents upstream fish migration. Baranof Lake has a self-sustaining population of cutthroat trout (Oncorhynchus clarki). Baranof Lake is listed as a "high-use cutthroat trout lake" relative to the regional sport fishery, and is a popular fly-in fishing lake used by recreational anglers.

Potential Contributions to Common Property Fisheries

Sport Fisheries

Potential Contribution to Sport Fisheries

The initial production of Chinook and coho salmon at Baranof Warm Springs Hatchery (BWSH) would receive limited local sport effort. Currently there is one lodge that supports charters for sport fishing, and up to 15 seasonal homes that may yield some sport effort. Returning adults from the anticipated full production model would likely be caught in sport fisheries near Sitka and perhaps other communities adjacent to the migration corridors along the inside waters of Icy Strait and Chatham Strait. Sitka sport

fisheries, on average, harvest about 25,000 fish annually in the entire Sitka Area (which includes all of Baranof Island and the west coast of Chichagof Island). An increase or redistribution of effort could potentially occur with the introduction of large numbers of Chinook and coho salmon releases. Some targeted effort would likely occur near the terminal area; however, because of the lack of infrastructure required to support large-scale lodge-type sport fishing in the Baranof Warm Springs area, most of the sport harvest of returning BWSH salmon would likely be taken in outside fisheries, or the corridor fisheries.

Because of the physical distance between BWSH and large population centers (Sitka and Juneau), sport anglers from such communities are unlikely to harvest a significant proportion of hatchery-produced adults. Residents of smaller communities such as Angoon or Kake may travel to target these fish in the near-terminal area; however, the harvest would likely be small relative to the common property commercial fisheries. Closures to sport fisheries would not likely be required to protect broodstock.

Management of Sport Fisheries

It is anticipated that Chinook and coho salmon returning to BWSH will be harvested in marine sport fisheries. Sport fisheries will be managed as described in general codified regulations for those waters. The department may use emergency order (EO) authority to address issues inseason.

Potential Contribution to Commercial Fisheries

Troll Fisheries

Chinook Salmon Troll Fishery: We assume that Chinook salmon produced at BWSH will demonstrate a similar pattern of catch in the troll fishery as HFH Chinook salmon. HFH Chinook salmon are harvested in the troll fishery throughout the region. Chinook salmon released at BWSH are likely to contribute primarily to the troll fisheries in Districts 109, 110, 112, 113, and 114. The contributions will be greatest in the spring troll fisheries during May and June, and less so during the first summer troll fishery in July. Harvest rates of HFH Chinook salmon have been estimated to be 15% of the return. Applying the HFH average annual harvest rate to the projected annual Chinook salmon return of 171,000 fish from BWSH gives an annually projected harvest in the troll fishery of 26,000 fish. At these projected troll fishery harvest rates, the number of Chinook salmon that would escape to the terminal area would be approximately 145,000 fish.

Coho Salmon Troll Fishery: We assume that coho salmon produced at BWSH will demonstrate similar pattern of catch in the troll fishery as HFH coho salmon. Coho salmon released at BWSH are likely to contribute to the troll fisheries in Districts 109, 110, 112, 113, and 114. The majority of the catch will most likely occur in Districts 113 and 114. Harvest rates of HFH coho salmon have been estimated to be 33% of the return. Applying the HFH average annual harvest rate to the projected annual BWSH coho salmon returns of 1.9 million fish gives an annually projected harvest in the troll fishery of 635,000 coho salmon. At these projected troll fishery harvest rates, the number of coho salmon that would escape to the terminal area would be approximately 1.265 million fish.

Seine Fisheries

Hidden Falls Hatchery Terminal Seine Fishery: The southern boundary of the HFH Terminal Harvest Area (THA) is located about 2 nautical miles north of Warm Springs Bay. The HFH THA extends approximately 2 nautical miles offshore of the Baranof Island coastline, with the northern boundary at the latitude of South Point at the southern entrance to Kelp Bay. Historically, HFH released around 50 million chum salmon fry in Takatz Bay and 40 million chum fry in Kasnyku Bay with a 10-year average adult chum salmon return of around 1.3 million fish. The HFH chum salmon return is a critical early-season opportunity for the Southeast Alaska seine fleet and is typically fished intensively from the end of June through the third week of July. Historically, up to 200 seine vessels have participated in openings at the HFH THA with the highest effort occurring in late-June or early-July. Given the close proximity of Warm Springs Bay to the HFH THA, it can be expected that a significant number of BWSH Chinook and chum salmon would be harvested by seiners in the HFH THA chum salmon fishery. The amount of BWSH salmon harvested in the HFH THA chum salmon fishery would depend on whether BWSH salmon return through the northern or the southern reaches of Chatham Strait, and the overall effort in the HFH THA chum fishery. An abundance of BWSH salmon passing through the HFH THA may attract additional seine effort and/or affect the distribution of fishing effort in that fishery. Given the importance of the HFH THA chum salmon fishery to the seine fleet, BWSH should not expect any alterations to the management of that fishery for either cost recovery or broodstock purposes. The HFH chum salmon fishery is over by the first week of August and would not be a factor with the BWSH coho salmon return.

In 2016, HFH began efforts to move the Takatz Bay chum salmon releases to Thomas Bay and Bear Cove, due to extremely poor marine survivals of hatchery-produced salmon on the east side of Baranof Island. The effects on fleet behavior from moving the Takatz Bay chum salmon release is unknown at this time.

Traditional Seine Fisheries and Chinook Salmon: Traditional seine fisheries occur along the Baranof Island shoreline in Section 9-A, and Section 12-A, beginning as early as mid-July. Specific areas opened to seining in July nearest to Warm Springs Bay include the Kelp Bay area in Section 12-A, immediately north of the HFH THA to target both pink and summer chum salmon and the shoreline south of the latitude of Point Gardner and north of Red Bluff Bay in Section 9-A to target mid-run pink salmon returning to Red Bluff Bay. There have been some years of high pink salmon abundance when Section 12-A along the Baranof Island shoreline, including the shoreline immediately outside of Warm Springs Bay, has also been opened to seining. Other July seine openings in Section 12-A include Point Augusta, Tenakee Inlet, and the Hawk Inlet shoreline. However, mid-July seine openings in either Section 9-A or Section 12-A occur after most of the Chinook salmon would be expected to have returned to Warm Springs Bay. BWSH Chinook salmon harvest in these seine fisheries would likely be minimal.

Traditional Seine Fisheries and Coho Salmon: It can be expected that substantial numbers of BWSH coho salmon would be harvested in seine fisheries when coho salmon production is at full capacity. According to HFH coded wire tag recovery data for the period 1991-2016, seine gear harvests about 9% of the total HFH coho salmon return on average. Assuming a similar harvest rate and survival expectations are achieved with BWSH coho salmon, the expected harvest in seine fisheries would be approximately 17,500 fish when the BWSH is at full capacity. With a large number of hatchery coho

salmon potentially accessible in the traditional seine areas in August, it is fair to assume that a higher than normal seine effort might be attracted to these areas, particularly to areas nearest the hatchery.

Traditional Seine Fisheries and Chum Salmon: Traditional seine fisheries occur along the Baranof Island shoreline in Section 9-A, and Section 12-A, beginning as early as mid-July. Specific areas opened to seining in July nearest to Warm Springs Bay include the Kelp Bay area in Section 12-A, immediately north of the HFH THA to target both pink and summer chum salmon and the shoreline south of the latitude of Point Gardner and north of Red Bluff Bay in Section 9-A to target mid-run pink salmon returning to Red Bluff Bay. There have been some years of high pink salmon abundance when Section 12-A along the Baranof Island shoreline, including the shoreline immediately outside of Warm Springs Bay, has also been opened to seining. Other July seine openings in Section 12-A include Point Augusta, Tenakee Inlet, and the Hawk Inlet shoreline. However, mid-July seine openings in either Section 9-A or Section 12-A occur after most of the chum salmon would be expected to have returned to Warm Springs Bay. Assuming similar run timing as HFH chum salmon. BWSH chum salmon harvest in these seine fisheries could be minimal.

Traditional Seine Fisheries and Pink Salmon: Traditional seine fisheries occur along the Baranof Island shoreline in Section 9-A, and Section 12-A, beginning as early as mid-July. Specific areas opened to seining in July nearest to Warm Springs Bay include the Kelp Bay area in Section 12-A, immediately north of the HFTHA to target both pink and summer chum salmon and the shoreline south of the latitude of Point Gardner and north of Red Bluff Bay in Section 9-A to target mid-run pink salmon returning to Red Bluff Bay. There have been some years of high pink salmon abundance when Section 12-A along the Baranof Island shoreline, including the shoreline immediately outside of Warm Springs Bay, has also been opened to seining. Other July seine openings in Section 12-A include Point Augusta, Tenakee Inlet, and the Hawk Inlet shoreline. BWSH pink salmon harvest in these seine fisheries could be fairly significant.

Findings of the Alaska Board of Fisheries through the Southeast Alaska Allocation Task Force state that the management of traditional wild stock fisheries are not to be restricted for the purpose of providing for hatchery cost recovery goals. It further states that management actions may be implemented in close proximity to the hatchery terminal areas for the purpose of providing for hatchery broodstock.

Terminal Harvest Area (Warm Springs Bay)

Chinook Salmon: At full BWSH production, an adult return of 171,000 Chinook salmon could be expected. In 2016, the total regional commercial Chinook salmon harvest was 319,000 and the combined common property hatchery contribution was around 42,000, or 13.1%. The long-term average troll harvest rate of HFH Chinook salmon is 27% (range from 9%–36%). Additionally, HFH Chinook salmon are harvested in the seine fishery with a long-term average harvest rate of 25% (range from 0%–51%), mostly in the HFH THA chum salmon fishery. It is impossible to predict the harvest rate of BWSH Chinook salmon in the nearby HFH THA chum fishery but assuming a harvest rate of 10%, the total expected harvest rate of BWSH Chinook in all common property fisheries could be around 25%. Based on these numbers at full production, a total of 128,000 Chinook salmon could be expected to return to the BWSH terminal area.

This size of a return to the terminal area would require a very aggressive cost recovery effort in order to maintain quality and value of the harvest. Alternatively, directed common property seine openings in Warm Springs Bay could be provided to maintain fish quality and achieve the desired goal of 60% utilization by common property fisheries. Cost recovery harvests would be restricted to well within Warm Springs Bay in order to minimize harvests of wild stock pink salmon. If it is determined that terminal common property seine openings are needed to maintain fish quality or are desired for the purpose of achieving common property contribution goals, a THA will need to be established. The department would likely restrict the THA to within Warm Springs Bay to minimize harvest to wild stocks (primarily pink salmon) with the option to expand the THA outside the bay, by emergency order, if wild stock concerns are minimal.

Coho Salmon: At full BWSH production, there could be an estimated adult return of 1,900,000 coho salmon. Common property troll gear harvests of HFH produced coho salmon (from 1991–2016) have averaged 34% and all-gear harvests have averaged 45%. Expected seine harvest rates of 9% combined with troll harvest rates provides a common property harvest rate of 34%. Based on a harvest rate range of 34-46%; 1.04 – 1.3 million coho salmon would be expected to return to the BWSH terminal area at full production. Aggressive cost recovery harvest to maintain quality and value of harvest would be necessary. As with Chinook salmon, achieving a 60% harvest rate of coho salmon in common property fisheries would likely require the need for directed terminal common property seine fisheries in Warm Springs Bay. The THA would be restricted to within Warm Springs Bay to minimize impacts to numerous wild stock coho salmon transiting Chatham Strait during that time.

Chum Salmon: At full BWSH production, an adult return of 1,847,000 chum salmon could be expected. Based on a harvest rate of 30%; 1.3 million chum salmon could be expected to return to the BWSH terminal area at full production. Aggressive cost recovery harvest to maintain quality and value of harvest would be necessary. As with Chinook salmon, achieving a 60% harvest rate of chum salmon in common property fisheries would likely require the need for directed terminal common property seine fisheries in Warm Spring Bay. The THA would be restricted to within Warm Springs Bay to minimize impacts to numerous wild stock coho salmon transiting Chatham Strait during that time.

Pink Salmon: At full BWSH production, an adult return of 1,924,000 pink salmon could be expected. Based on a harvest rate of 20%, 1.5 million pink salmon could be expected to return to the terminal area at full production. Aggressive cost recovery harvest to maintain quality and value of harvest would be necessary. As with Chinook salmon, achieving a 60% harvest rate of pink salmon in common property fisheries would likely require the need for directed terminal common property seine fisheries in Warm Springs Bay. The THA would be restricted to within Warm Springs Bay to minimize impacts to numerous wild stock salmon transiting Chatham Strait during that time.

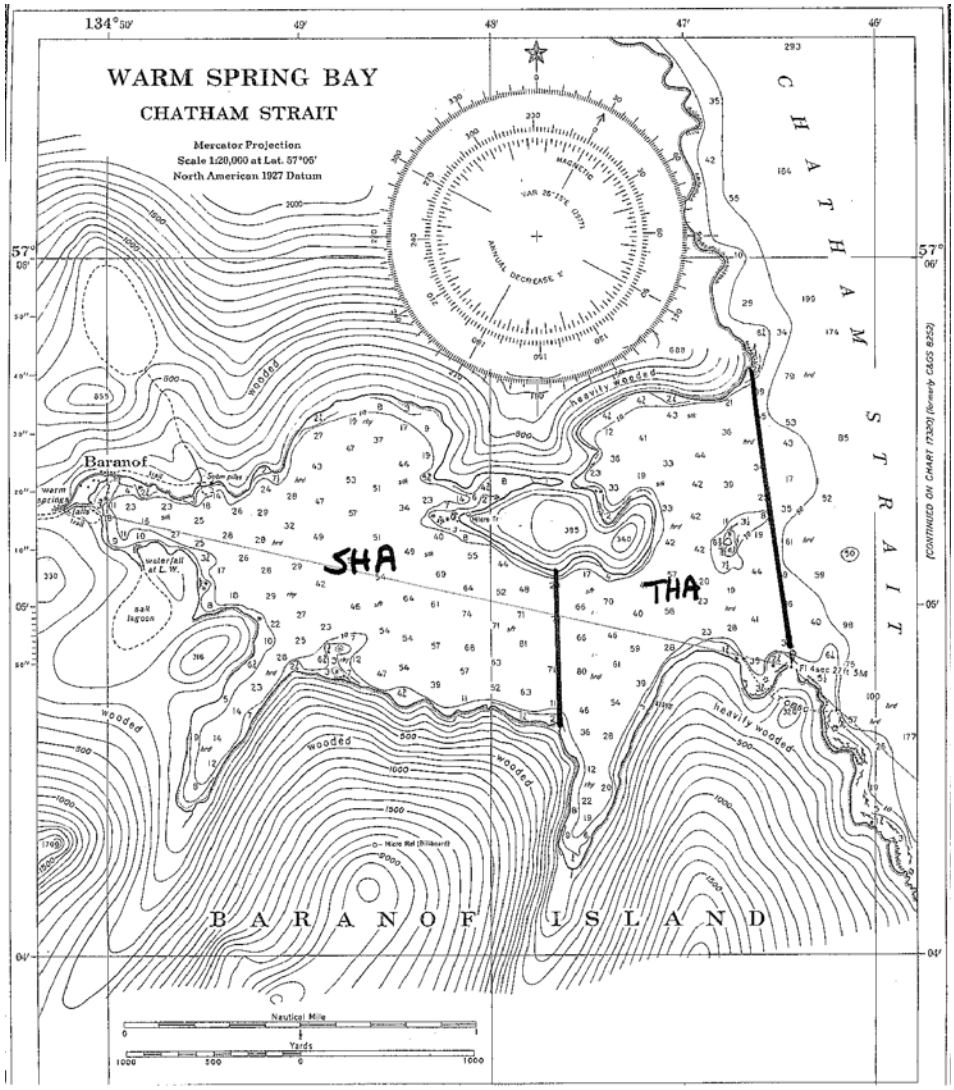
Potential Size and Location of Special Harvest Area

A SHA will be necessary in order to conduct cost recovery operations. The sport harvest of Chinook or coho salmon in the area would likely not be significant. Expected broodstock needs of Chinook, coho, chum, and pink salmon will need to be secured for maturation within Warm Springs Bay within net pens or behind a barrier net. Based on the department's best estimates at this time, in the absence of a terminal common property harvest, the operator will need to plan and prepare to harvest 1.5 million pink, 1.3 million chum, 1.1 million coho, and 128,000 Chinook salmon annually for cost recovery and

broodstock needs. The operator should recognize that expected returns will fluctuate annually based on changing marine survivals of smolt released. Aggressive cost recovery harvest will be needed to keep pace with returns, prevent excessive straying of returns into wild stock spawning areas, maintain high quality of fish harvested, and prevent waste of salmon. Multiple contract seine vessels may be required for a season spanning several months for Chinook and coho salmon, and multiple tenders or a floating processor will likely be needed during peak harvest operations.

Should the hatchery appear to fall behind during cost recovery harvesting operations, or if the 60% utilization by common property fisheries is an expected goal for the facility, then terminal common property harvests will likely be necessary. Access to terminal harvest areas may be regulated by the Alaska Board of Fisheries (Board), which has allocation authority. The Joint Northern and Southern Southeast Regional Planning Team may make recommendations or write proposals to the Board based on the Southeast Alaska Area Enhanced Salmon Allocation Management Plan (**5 AAC 33.364**). Initially the department would expect terminal seine and troll fisheries to develop in the area based on expected returns. Seine fisheries would likely be limited to within Warm Springs Bay in order to prevent excessive harvests of wild stocks migrating in Chatham Strait. A larger area may be provided for terminal seine harvests than for cost recovery harvest due to the greater numbers of boats expected to participate. Terminal troll harvests may occur within or outside this area. Due to many unknowns, the department would retain the option to modify either the THA or SHA inseason as necessary depending on actual run sizes of both wild stock and hatchery returns. During years of large returns or if escapement goals are certain to be met, the SHA or THA could be expanded outside of the bay on a seasonal basis.

The following suggested SHA and THA are presented for discussion and comment. The SHA is the same as that proposed during the previous applications for a hatchery in 1985 and 2010.



Special Management Considerations or Need for Additional Studies

One of the most important tools for managing this project will be an evaluation plan to assess impact and measure success as outlined in the *Comprehensive Salmon Enhancement Plan for Southeast Alaska: Phase III* (ADF&G 2004) (CSP).

Evaluation of Survival and Contribution

The CSP states that all pink and chum salmon are to be mass marked; and Chinook and coho salmon require a coded wire tag (CWT) program to evaluate marine survivals, compare success between release groups, and evaluate fishery contributions. More recently with new increments of coho salmon, mass otolith marking is used to supplement CWT data. Otolith marking can be used for stray sampling, improved terminal sampling, or for sampling fisheries for stock composition and return timing.

The default CWT tagging rate for Chinook salmon is 10%, with a minimum of 30,000 tags per release group. Tagging rates of 6% to 15% are now used in other facilities, and rates vary somewhat annually. Required tagging rates are determined by the department based on recovery rates for sampling strata. Tagging rates are reevaluated over time during the annual management plan process based on performance history. Exact rates required will need to be evaluated based on sampling goals. Higher rates for Chinook salmon allow for spring troll fishery sampling which allows management to target stocks of Alaska hatcheries Chinook salmon in specific spring fishing areas.

The default CWT tagging rate for coho salmon is 2% to10%, with a minimum of 20,000 tags per release group. Tagging rates of 5 to 10% can be expected for initial releases. As for Chinook salmon, tagging rates for coho salmon can be reevaluated once a performance history is evident.

Because of the unprecedented scale of this proposed new facility, mass otolith marking for all Chinook and coho salmon releases may be a requirement to document straying and to evaluate stock composition in terminal and traditional fisheries. The additional harvest numbers, along with the additional tagged fish recovered, will require additional ADF&G port sampling effort in various delivery locations throughout Southeast Alaska. Sampling at Pelican, Elfin Cove, Hoonah, and Juneau may be covered with overtime hours, but sampling from Districts 9, 10, and 12 in Petersburg, and all Districts in Sitka will most likely require hiring additional port sampling staff. Additional sampling costs will be incurred with ADF&G CWT lab, to process, decode, error check, and enter additional CWT data.

Wild Salmon Stocks

Protection of wild stocks is a primary consideration in the assessment of proposed salmon enhancement projects, therefore locating a hatchery facility on a system where interactions with wild stocks would occur is generally not acceptable. There are a few wild salmon stocks in the immediate vicinity of Baranof Warm Springs. The outlet of Baranof Lake is a barrier to upstream migration; however chum, coho, and pink salmon, as well as cutthroat trout have been identified in the lower section of the river near tidewater. There are four freshwater systems that drain into Warm Springs Bay that have documented anadromous fish present (ADF&G 2009). The outlet of Sadie Lake contains wild populations of chum, coho, and pink salmon as well as cutthroat trout. An unnamed stream immediately south of Baranof Warm Springs contains coho, chum, and pink salmon. Another stream inside Warm Springs Bay on its southeast side contains chum, coho, and pink salmon. Outside Warm Spring Bay there are numerous streams that contain wild populations of chum, pink, and coho salmon.

Because of the large quantity of fish being proposed and consequently the large number of adults that would return, these surrounding streams could experience high rates of exploitation as a result of incidental harvest during fisheries targeting hatchery returns. In addition, unharvested salmon produced at the proposed hatchery could potentially stray into these streams. Aggressive cost recovery operations might reduce these potential effects. The implications of the proposed large number of salmon, and their returns to Warm Springs Bay are unknown. Potentially negative consequences exist as interspecific and intraspecific competition occurs between local salmon stocks and other marine species.

Studies for evaluation of Chatham corridor escapements would be desirable, especially for both coho and Chinook salmon run timings. The department has little information concerning coho salmon escapements, but initiating a program of stream surveys would be desirable to better understand

background levels for wild salmon escapements and to further add to understanding of quantities, distances, or effects of straying.

Interactions with Other Species

Adult Chinook and coho salmon eat juvenile sablefish, along with other forage fish species during their final migration and growth. ADF&G troll logbooks from 1977 through 1984 reported young sablefish as the fourth most common species in the stomach contents of Chinook and coho salmon (Wing 1985). Sablefish support a valuable commercial fishery in Chatham Strait; however, the sablefish population there has been declining during recent years. Information is lacking to predict potential interactions between species. A new hatchery program of this size may suggest additional review of troll logbook comments and more detailed sampling while returns are developed. Effects of large quantities of foraging Chinook and coho salmon smolt may also warrant further study, again because of the large scale of this project.

Potential Broodstock Sources

In previous PNP hatchery permit applications for Warm Springs Bay, the department recommended that the broodstock used at Warm Springs Bay be the same as broodstocks used at HFH, given the potential stock interactions between the two facilities due to their close proximity.

Andrew Creek stock Chinook salmon is currently being used at HFH. The ancestral population of Andrew Creek Chinook salmon originates from a tributary of the Stikine River in central Southeast Alaska, approximately 100 miles from Warm Springs Bay. The Andrew Creek stock is the most produced stock in Southeast Alaska in terms of production numbers and numbers of facilities using the stock. Hatcheries currently using the Andrew Creek stock are Crystal Lake Hatchery, HFH, Medvejie Creek Hatchery, and Macaulay Salmon Hatchery. Under the current genetics policy, it stipulates “A single donor stock cannot be used to establish or contribute to more than three hatchery stocks.” This policy applies to hatchery stocks used for broodstock collection and was not intended to apply to remote/off-site releases for the purpose of terminal harvest.

Sustainable Salmon has requested the use of Keta River stock Chinook salmon. In 2013, the Little Port Walter Marine Research Station (LPW) began a broodstock development program by collecting approximately 92,000 Chinook salmon eggs from Keta River. In 2015 LPW released approximately 47,000 brood year 2013 smolt, and from the release expects to see a total of 467 adult Chinook salmon return from 2016 through 2022 (2015 LPW Hatchery Annual Report). Given that LPW is a research facility, it does not have the capacity to contribute the approximately 2 million surplus eggs needed to start the Chinook salmon program at BWSH. A remote egg take in Keta River will be necessary to collect enough eggs to start a broodstock program at BWSH, if Keta River stock Chinook salmon is used.

Sashin Creek and Deep Cove coho salmon stocks are currently being used at HFH. The ancestral population of Sashin Creek stock coho salmon originates from Sashin Lake located at the head of Little Port Walter, at the southeast tip of Baranof Island. Little Port Walter is located in lower Chatham Strait 20 miles from Cape Ommaney and the open Gulf of Alaska. Sashin Creek is less than a mile from LPW and approximately 55 miles south Warm Springs Bay. Sashin Creek supports natural runs of pink, chum,

and coho salmon, steelhead and rainbow trout (*O. mykiss*), Dolly Varden char (*Salvelinus malma*), and coastrange sculpins (*Cottus aleuticus*). The ancestral population of Deep Cove stock coho salmon originates from a cove located approximately 45 miles south of Warm Springs Bay, along the west arm of Patterson Bay, on the southeast coast of Baranof Island. The presence of Chinook, coho, and pink salmon has been observed in the creek draining into Deep Cove. Sashin Creek and Deep Cove stock coho salmon eggs could be obtained from Port Armstrong Hatchery (PAH), LPW, or HFH.

The chum salmon stock currently used at HFH originates from the Kadashan Bay, Clear, and Seal Bay rivers and is collectively known as "Hidden Falls stock". The Kadashan Bay and Seal Bay rivers flow into Tenakee Inlet, which is approximately 60 miles north of Warm Springs Bay, on the east side of Chichagof Island. The Clear River flows into Kelp Bay, on the northern east side of Baranof Island. The Clear River is approximately 20 miles north of Warm Springs Bay. The "Hidden Falls stock" chum salmon can be obtained from PAH and HFH.

Port Armstrong Hatchery is the only facility in Southeast Alaska currently producing pink salmon at a commercial level. Port Armstrong Hatchery uses Sashin Creek stock pink salmon. Collecting eggs from naturally occurring populations of pink salmon in Warm Springs Bay may be advisable.

Assessment of Production Potential

The initial production goal, in eggs, during the first reproductive cycle is: 7.5 million chum; 1.875 million Chinook; 375,000 coho and 100,000 pink salmon. At full capacity the production goal, in eggs, is: 100 million pink, 80 million chum, 25 million coho and 10 million Chinook salmon. The following table was built assuming all the egg-take goals are met, 90% survival from green egg to eyed egg stage, 95% survival from eyed egg to fry, and 90% from fry to smolt for all species. Additionally, estimated marine survivals are based on long-term average survivals of nearby facilities. The long-term marine survival rate of HFH production can be used for most species (2.22% for Chinook salmon, 9% coho salmon, 3% for chum salmon). The long-term marine survival rate of Port Armstrong Hatchery pink salmon is 2.5%.

Initial Production Levels

Species	Eggs	Smolts	Adult Returns
Chinook salmon	1,875,000	1,442,812	32,030
Coho salmon	375,000	288,562	25,970
Chum salmon	7,500,000	5,771,250	173,138
Pink Salmon	100,000	76,950	1,924

Full Production Levels

Species	Eggs	Smolts	Adult Returns
Chinook salmon	10,000,000	7,695,000	170,829
Coho salmon	25,000,000	19,237,500	1,923,750
Chum salmon	80,000,000	61,560,000	1,846,800
Pink Salmon	100,000,000	76,950,000	1,923,750

Additional Relevant Factors Considered

Baranof River and Lake Water Rights

Alaska water law is based on the doctrine of prior appropriation, giving the first appropriator of water from a given water source (the senior water right holder) a priority of right over subsequent (or junior) appropriators on a "first-in-time, first-in-right" basis. Priority is based on the date the application to appropriate water is filed and accepted by the Alaska Department of Natural Resources (DNR), the state agency that administers water rights in Alaska. Senior water right holders have a legal standing to assert their water rights against conflicting uses of water from appropriators junior in priority.

On December 11, 2013, ADF&G was issued a certificate of reservation (the legal document establishing an instream flow water right) for the Baranof River. This certificate of reservation (Land Administration System no. 13805) was established for the purpose of protecting fish and wildlife habitat, migration, and propagation. It has a priority date of April 10, 1992. Section 46.15.145 (d) of the Water Use Act states "after the issuance of a certificate reserving water, the water specified in the certificate shall be withdrawn from appropriation and the commissioner shall reject an application for a permit to appropriate the reserved water".

On April 25, 2012, Dale Young dba Hawken, LLC was issued a permit to appropriate water (LAS 27397) from Baranof Lake for the purpose of operating a fish hatchery. A permit to appropriate water is defined in DNR's Water Management regulations (11 AAC 02.010(b)) as "an instrument granting the holder the right, limited to a definite period of time and subject to the terms and conditions contained in it, to construct works necessary to the appropriation of water and to establish a beneficial use." LAS 27397 allows for a maximum withdrawal rate of 20 cubic feet per second (cfs). It has a priority date of August 25, 2009 and an expiration date of April 24, 2019.

Water use from Baranof Lake directly affects downstream flows in the Baranof River. As such, water rights from the lake are considered along with water rights from the river with respect to priority dates. ADF&G's certificate of reservation for Baranof River (LAS 13805, priority date April 10, 1992) is senior in priority to Mr. Young's permit to appropriate water from Baranof Lake (LAS 27397, priority date August 25, 2009). Therefore, LAS 27397 is subject to the reserved flows specified in LAS 13805.

Condition (9) of LAS 27397 states in part:

"…This permit is further subject to ADF&G's Instream Flow Reservation, LAS 13805, when it is issued and as it may be amended from time to time, regarding, but not limited to, minimum in-stream flow releases, lake water surface elevation requirements, fish screen, rates of decrease in water levels or flow rates, monitoring, recording, and reporting."

Condition (15) of LAS 27397 states:

"The Permittee (Dale Young) shall not withdraw water from Baranof Lake at any time if the river's instantaneous flow is, or becomes, lower than any of the water flow rates specified in condition (9) above."

The USGS operated a stream gage (no. 15098000) on Baranof River from October 1, 1915 to September 30, 1927; and from October 1, 1957 to September 30, 1974. Based on an analysis of the percent of time a specified mean daily flow was equaled or exceeded over the period of record for this gage, mean daily flows in the Baranof River can be expected to be below LAS 13805 reserved flows 30% of the time during December–February, 25% of the time during March–April and October–November, and 10% of the time during May–September. Looking at it in another way, if the hatchery were withdrawing their permitted 20 cfs, flows would drop below the reserved flows 29% of the time on an annual basis (ranging from 12% of the time during July and 51% of the time during February). As noted above, when flows are below reserved flows, condition (15) of LAS 27397 states that the permittee shall not withdraw water from Baranof Lake.

Baranof Lake Considerations

Baranof Lake is located at the head of Warm Springs Bay. High mountains surround Baranof Lake and much of the lake's shoreline is very steep sided and quickly drops off into deep water. The lake is 4.8 km long and 0.6 km wide and has a surface area of 324 ha, a maximum depth of 87, and mean depth of 38 m (Schmidt 1982). There is one primary inlet stream (Baranof River) and several small tributaries that drain into Baranof Lake. Baranof Lake has a barrier falls on the lake outlet that prevents upstream fish migrations and is relatively unique in the fact that it supports only one species of fish, cutthroat trout. In 2003, the abundance of cutthroat trout ≥180 mm FL in Baranof Lake was estimated at 8,739 fish (SE = 2,028; Harding et al. 2009) using a Petersen closed population model.

Harding et al. (2009) concluded that spawning of cutthroat trout in Baranof Lake occurred primarily in May and early June, yet potentially extending into July and starting before the lake is free of ice. Observations related to cutthroat trout spawning activity were made along lake margins in areas where water temperatures were noticeably warmer attributed to geothermal activity (Harding et al. 2009). Further observations indicate that the outlet remains ice-free during the winter and provides an ideal area for overwinter rearing (Harding et al. 2009). In addition to spawning in major inlet and outlet streams, cutthroat trout are also believed to utilize these small inlet streams. Geothermal activity along lake margins may play a role in cutthroat trout spawning time and success in these small inlet streams. The adjacent topography and bathymetric information for Baranof Lake suggests that a decrease in lake levels below natural fluctuations at any time could severely restrict fish passage into the inlet and outlet streams. Thus, critical spawning and rearing habitat could be isolated from lake dwelling cutthroat trout if water levels were lowered. Serious consideration should be made if operations of the proposed hatchery and hydro result in significant declines in water levels that would affect important cutthroat spawning and rearing areas. Sufficient water flows need to be ensured in the outlet stream during periods of low flow to protect resident or naturally spawning stocks.

In 1995, ADF&G, Division of Sport Fish, collected kidney tissues and ovarian fluids from cutthroat trout in Baranof Lake in order to establish a disease history for this particular stock (Accession No. 95-0584). A total of 38 out of the 38 samples collected tested positive for the antigen for *Renibacterium salmoninarum* (Rs), while no other bacterial or viral pathogens were detected. While presence of the antigen for bacterial kidney disease (BKD) in non-anadromous cutthroat trout species is common, the existence of BKD in the water source could be a cause for concern for fish culture using this water source. Although the applicant did not indicate the use of pen rearing in the lake, future use of this rearing method will require the separate review and approval by the department.

Baranof Lake has been stocked in the past with both rainbow trout and cutthroat trout, and other salmon species, but currently only supports naturally producing cutthroat trout (Harding et al. 2009). For the most part, historical records are confusing, incomplete, and limited with regard to stocking of barren lakes in Southeast Alaska. Around the time of the establishment of the Territorial Fish Commission (1919) and again when the Department of Fisheries (1949) was created, emphasis was placed on stocking barren lakes (Roppel 1982). Lake stockings have been recorded for Baranof Lake in 1918 and 1924 with cutthroat trout; in 1938 with Sashin Lake rainbow trout; and between 1917 and 1920 with eyed eggs and fry of pink, sockeye (*O. nerka*), and coho salmon. There are limited records indicating any success from these plantings (Roppel 1982).

A trend of declining trout harvests in Southeast Alaska in the 1980s prompted a general conservation concern and studies were initiated to investigate specific populations. Baranof Lake was selected as one of the long-term research lakes because of its relatively high density of cutthroat trout that provided contrast with the other long-term research lake (Turner Lake), which had low cutthroat trout density. Sampling in Baranof Lake was conducted between 1994 and 2003 which estimated annual abundance, size, and age of the populations (Harding et.al. 2009). Abundance of cutthroat trout at Baranof Lake averaged 8,235 (SD = 1,980) fish ≥180 mm FL and ranged from 5,616 (SE = 573) to 12,511 (SE = 1,059). There was no trend in abundance at Baranof Lake during this time and maximum sustain yield is an estimated 1,575 fish ≥180 mm FL or 19% of average abundance.

Trout research personnel were first asked to investigate and provide comments on the cutthroat trout resource in Baranof Lake during 1988 in response to a request to draw down the lake for a proposed hatchery. In February 1989, the habitat in the outlet to Baranof Lake was assessed. The objective was to document presence or absence of cutthroat trout in the lake outlet during the winter. The lake outlet was ice-free and water was flowing between the lake and the falls, temperatures were in the teens, and there was very deep snow. Backpack electroshockers and minnow traps were used to sample the outlet. Numerous cutthroat trout were caught by both methods, and fish were observed throughout all areas of the outlet. Forty-eight of the fish were measured and weighed and ranged in size from 45 mm FL to 215 mm FL. The consensus of the biologists who conducted the sampling and Dale Young (the permit applicant who provided logistical support), was that the outlet of Baranof Lake provides critical overwintering habitat to both rearing and adult fish and any activity that reduced winter flow could have negative impacts to cutthroat trout.

Baranof Lake Sport Fishing and Subsistence Considerations

Sport fishing at Baranof Lake has been an important activity for residents of the nearby community of Baranof Warm Springs and cruise ship passengers. The lake can be accessed via a short trail and there is a USFS recreational cabin located near the southwest corner of the lake that provides angler access. Cabin users have been surveyed by ADF&G regarding their angling experience and success during 1994, 1995, 1999, 2002, and 2006. Estimated annual average harvest of cutthroat trout was 42 and ranged from 8 to 156. Baranof Lake is also surveyed annually by ADF&G as part of the Statewide Harvest Survey (SWHS). Estimates of angler participation and success generated by the SWHS are more encompassing and include anglers who access the lake via the trail from Baranof Warm Springs. Estimates of annual harvest from the SWHS between 1990 and 2002 averaged nearly 300 (range from 78-841) cutthroat trout, and the number of trout caught and released was over 2,000 fish (range from

773-4,304). Sport fishing regulations in Baranof Lake are: two cutthroat trout daily, two in possession, 14-inch minimum and 22-inch maximum size limit. Only un-baited, artificial lures may be used.

Baranof Lake was one of 5-6 lakes in Southeast Alaska identified by USFS in the late 1990s as a water body that could support trout harvest by federally qualified subsistence users. Subsequent expansion of the federally managed subsistence trout fishery is no longer limited to specific systems. The annual reported subsistence harvest of trout from Baranof Lake, if any, is not considered significant.

A lodge near Baranof Warm Springs has maintained a small skiff in Baranof Lake since the early 1990s and has been available for clients to use during guided or unguided angling trips. Small cruise ships routinely stop in Baranof Warm Springs and several provide fishing equipment for their clients. The ADF&G Division of Sport Fish Business/Guide Licensing and Logbook program reports that 24 trips to Baranof Lake were conducted in 2009 by three guides to take 69 non-residents and three residents sport fishing. No cutthroat trout were reported harvested during the freshwater guided trip, but 453 were reported as caught and released.