

# 2023 ANNUAL MANAGEMENT PLAN

## GULKANA HATCHERY I and II

### Prince William Sound Aquaculture Corporation

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This Annual Management Plan (AMP) plan is prepared to fulfill the requirements of 5 AAC 40.840. This plan must organize and guide the hatchery's operations, for each calendar year, regarding production goals, broodstock development, and harvest management of hatchery returns. Egg take through release details are included in planning for succeeding calendar years. In-season assessments and project alterations by Prince William Sound Aquaculture Corporation (PWSAC) or Alaska Department of Fish and Game (ADF&G) may result in changes to this AMP in order to reach or maintain program objectives. PWSAC will notify the ADF&G private nonprofit (PNP) hatchery program coordinator in a timely manner of any departure from the AMP. The ADF&G PNP coordinator will advise as to whether an amendment, exception report, or other action is warranted. No variation or deviation will be implemented until an AMP amendment has been approved or waived by both the department and PWSAC. This policy applies to all hatchery operations covered under the AMP.

#### I. OPERATIONAL PLAN

##### 1.1 Egg-take Goals by Species

**Sockeye Salmon, Gulkana I:** The maximum number of sockeye salmon eggs is 35.0 million. Broodstock requirements are 11,900 females and 7,100 males for a total of 19,000 fish, assuming:

- a. 3,300 eggs/female
- b. 2:1 female to male spawning ratio, minimum (may be closer to 3:2 depending on male availability)
- c. 10% green/over-mature female at rack

**Sockeye Salmon, Gulkana II:** The maximum number of sockeye salmon eggs is 1.75 million. Broodstock requirements are 650 females and 350 males for a total of 1,000 fish, assuming:

- a. 3,300 eggs/female
- b. 2:1 female to male spawning ratio
- c. 18% green/over-mature female at rack

This year's expected brood at Gulkana I and II are in section 3.3.

##### 1.2 Broodstock Acquisition and Data Reporting

All data associated with egg take and broodstock collection will be provided to the department by November 1 each year. Data will be provided in electronic format (Excel file) and include all the categories presented in the template attached as Table 5. Data to be collected specifically includes the numbers of green and over-ripe females from the broodstock and associated cost recovery. PWSAC planned egg takes are shown in Table 2 and egg-take schedules are shown in Table 3.

**Sockeye Salmon, Gulkana I:** August 15–October 15

**Sockeye Salmon, Gulkana II:** July 25–August 20

### 1.3 Egg-take Schedule

August 15 to September 5: 0.5–1.0 million/day  
September 6 to September 15: 1.0–1.5 million/day  
September 16 to October 5: 1.5–2.5 million/day  
October 6 to October 15: 1.0–1.5 million/day.

### 1.4 Egg Transport and Carcass Disposal Plans

**Sockeye Salmon, Gulkana I:** Eggs taken at Gulkana I (GHI) will be fertilized and water hardened on site. The eggs will be hand-carried approximately 75 yards to one of the 134 tote incubators.

Broodstock carcasses will be either given to residents of the area (for dog food) or will be disposed of in the Gulkana River to ensure adequate nutrient input into Paxson Lake in accordance with Alaska Department of Environmental Conservation (DEC) requirements. If an additional broodstock carcass disposal log is required by ADF&G, all disposals will be logged on the carcass disposal form and reported to the department within 30 days after egg take and disposals are completed.

If insufficient broodstock are available at the GHI facility, a broodstock collection area will be established at the outlet of Summit Lake and/or Pup Lake (Pup Lake is downstream from Crosswind Lake).

**Sockeye Salmon, Gulkana II:** Eggs taken for Gulkana II (GHII) will be fertilized and water hardened at GHII from GHII broodstock, then transferred to GHII for seeding in one of twelve incubation boxes.

In light of recent low incubation survivals at GII, a portion or all of the eggs may be incubated at GI while operations are evaluated to improve survivals. All GII fry incubated at GI would be transported back to GII for release.

Broodstock carcasses will be disposed of in the Gulkana River in accordance with DEC requirements. If an additional broodstock carcass disposal log is required by ADF&G, all disposals will be logged on the carcass disposal form and reported to the department within 30 days after egg-take and disposals are completed.

## 1.5 Incubation Plans

### **Hatchery Production Summary**

<b>Species</b>	<b>Facility</b>	<b>Green Eggs</b>	<b>Fry Released</b>
Sockeye Salmon	Gulkana I	35,000,000	20,700,000
Sockeye Salmon	Gulkana II	1,750,000	1,300,000

The incubators at GHI are “tote”-style incubators. At GHII, all incubators are “Kitoi”-style incubators. Sockeye salmon survival from green egg to fry release is estimated to be 75%.

All eggs will be incubated at GHI and GHII during 2023.

## 1.6 Rearing and Release Plans

**Sockeye Salmon, Gulkana I:** Eggs will hatch in gravel substrate inside stream-side tote incubators. Outmigration from the incubators is volitional, with enumeration by electronic counters. Surviving fry from the 2022 egg-take will be released into Paxson Lake from the GHI site (up to 6 million). As the egg-take goal in 2022 was not met, it is unlikely there will be any fry released into Crosswind and Summit Lakes in 2023. Release numbers to Crosswind, Paxson, and Summit lakes are adjusted due to the egg-take shortage. Fry destined for Paxson Lake will be reared for approximately 10–14 days. Fry destined for Crosswind Lake will be reared for approximately 10–14 days until all are accumulated and ice melts on Crosswind for the aerial transport. Any fry released in Summit Lake will be reared approximately two to four weeks, allowing for a more desirable open-water release.

In 2023, the feasibility trial of a late large program on Paxson released fish will continue. A portion of the fry will be held back and reared up to 2 grams in size. It will take an anticipated 8 weeks to reach 2 grams, which means these fish will be released around late July or into August. This will reduce the amount of time in the wild that they are exposed to predation and lake rearing. This should ultimately help to improve overall survivals and aid in meeting return targets.

**Sockeye Salmon, Gulkana II:** Eggs will hatch in gravel substrate incubators and the resulting fry will be fed prior to release. Outmigration from incubators is volitional, with enumeration by electronic counters. An estimated 1.3 million fry will be released from the 2022 egg take at the site. Fry from GHI may be used to cover a shortfall if the green-to-fry survival is lower than anticipated at the GHII facility to reach the 1.3 million fry release goal.

PWSAC’s anticipated 2023 releases are shown in Table 4.

## 1.7 Fry Transport Methods

Fry from the incubation site will be air dropped at Crosswind Lake by a Thrush aircraft with a 500-gallon, oxygen-supported tank with approximately 1.0 million fry per load. Fry will be transported to Summit Lake in a 300-gallon fish stocking tank with approximately 330,000 fry per load and will be primarily released into Gunn Creek or may be released directly into Summit Lake via boat transports.

## 1.8 Permitted Capacity

Gulkana Hatchery was issued PNP Hatchery Permit #42 in 2000. It is currently permitted to incubate 36.75 million sockeye salmon eggs.

### **Fish Transport Permit Summary**

<b>FTP Number</b>	<b>Expiration Date</b>	<b>Purpose</b>
<b>SOCKEYE SALMON</b>		
96A-0034	4/30/26	Allows transfer and release of 10 million fry from GHI into Crosswind Lake.
96A-0038	4/30/26	Allows transfer and release of 6 million fry from GHI into Paxson Lake.
96A-0039	4/30/26	Allows transfer and release of 6 million fry from GHI into Summit Lake.
97A-0048	7/17/30	Allows egg take and incubation of 35 million GHI x Gulkana River stock sockeye salmon eggs at the GHI location.
97A-0049	7/17/30	Allows egg take, incubation, and resultant release of 1.75 million GHII x Gulkana River stock sockeye salmon eggs at GHII.
16A-0054	4/30/30	Allows the egg take of 35 million GHI x Gulkana River stock sockeye salmon eggs at the Summit Lake adult weir location. Eggs will be incubated at the GHI location.
16A-0055	4/30/30	Allows the egg take of 35 million GHI x Gulkana River stock sockeye salmon eggs at the Pup Lake adult weir location (downstream from Crosswind Lake). Eggs will be incubated at the GHI location.
20J-1023	8/1/2030	Allows 1.75 million green eggs to be transported from GHII to GHI, incubated and reared over winter at GHI, and transported back to GHII before release.

## **II. DONOR STOCK MANAGEMENT**

The hatchery sockeye salmon runs will be sufficient to meet broodstock goals for 2023 and no donor stock management is anticipated. It is recognized that the broodstock in the brood collection area is a mixture of natural and hatchery-spawned fish. Hatchery escapement is managed in the commercial fishery months earlier and management cannot take further action if a shortfall of broodstock occurs.

### 2.1 Fish Collection Techniques

**Sockeye Salmon, Gulkana I:** Fish are captured by dip net and seine at the hatchery site or from adjacent springs. A weir is installed annually at the Summit Lake and Pup Lake (downstream from Crosswind Lake) outlets for otolith mark recovery. In the event of a broodstock shortfall, either or both weirs will be used to capture the necessary broodstock.

**Sockeye Salmon, Gulkana II:** A weir in the Gulkana River is used to hold fish while dip nets, seines, and snagging gear are used to capture fish from behind the weir for egg take. Enhanced returns that enter the hatchery site stream are captured by dip net and seine.

### III. HATCHERY RETURN MANAGEMENT

PWSAC operates five facilities: Armin F. Koernig Hatchery (AFK), Cannery Creek Hatchery (CCH), GH, Main Bay Hatchery (MBH), and Wally Noerenberg Hatchery (WNH). The corporation generates revenues for annual operations from a 2% enhancement tax and from the sale of hatchery-produced salmon returning to the facilities.

In 1997, the PWSAC Board of Directors (BOD) elected to have corporate cost recovery based upon revenue goals specific to the seine and gillnet salmon fisheries rather than a goal of harvesting a fixed percentage of the returning adults. This results in each gear group paying for enhanced production from which they benefit. PWSAC calculates these revenue goals by allocating production costs between the seine-caught and gillnet-caught salmon fisheries.

On March 9, 2023, the PWSAC BOD approved the annual corporate budget for Fiscal Year 2024 detailing potential sources of revenue and expenditures. The pink salmon cost-recovery revenue goal is \$9,290,767. The WNH chum and MBH sockeye salmon cost-recovery revenue goals are \$5,381,694 and \$1,500,000 respectively. Additional revenue may be generated through PWSAC's raceway fish sales during its egg-take full utilization program.

PWSAC uses preseason assumptions for the number of returning fish, price per pound, and average adult weight to calculate the total projected value of the returning hatchery-produced salmon. Based on these assumptions, PWSAC estimates that approximately 21% of the total run will be required to meet the revenue goal in the Fiscal Year 2024 financial plan.

Hatchery escapement means all fish that escape the common property fishery. Two categories of escapement: (a) the number of brood to meet production objectives; and (b) the number of hatchery-produced fish taken for the hatchery harvest requirement, to be used to pay for the hatchery's reasonable operating and capital costs (5 AAC 40.990(6)).

**Pink Salmon Returns:** The AFK, CCH, and WNH pink salmon runs will be managed collectively through openings and closures of respective hatchery subdistricts. Managing the enhanced pink salmon runs in aggregate may result in site-specific CPF contribution rates being above or below the approximate target of 84% CPF pink salmon harvest.

**WNH Chum and MBH Sockeye Salmon Runs:** The WNH chum salmon and MBH sockeye salmon runs will be managed collectively through openings and closures of respective hatchery subdistricts. The collective management will be managed concurrently for the WNH chum and MBH sockeye salmon revenue goal. Managing the returns in aggregate may result in site-specific CPF contribution rates being above or below the approximate targets of 56% and 86% for the WNH chum and MBH sockeye salmon harvest, respectively.

The AFK Hatchery and Port Chalmers remote release chum salmon runs are expected to have a 100% CPF harvest.

Reduction of CPF opportunity in hatchery subdistricts may be necessary to ensure hatchery escapement objectives are met. PWSAC will work closely with local ADF&G management biologists to achieve the seine and gillnet fisheries revenue goals as rapidly as possible to allow for an orderly and consistent CPF.

### 3.1 Probable Hatchery Fish Migration Routes and Timing

Sockeye salmon stocks from both GHI and II coincide with wild stock run timing. The peak enhanced sockeye salmon return coincides with some Copper River Delta and some Upper Copper River wild stocks. Management priority is to sustain wild stock yield and diversity. The harvest of hatchery-produced sockeye salmon is based on the forecasted return and management of wild stocks. Therefore, hatchery stocks will be harvested at the same rate as wild stocks.

Sockeye salmon returns from the three release sites for GHI fry occur throughout the commercial fishery and escapement timing. Returns from the GHII release site occurs throughout the early and middle segments of the escapement period. Each release site has demonstrated somewhat different timing as determined by coded-wire-tag recoveries in the commercial fishery and historical timing data. Gulkana I and II sockeye salmon are intermingled with other stocks of sockeye salmon and other species of salmon to such an extent that no targeted harvest can occur within the commercial fishery or mainstream in-river fisheries. However, harvests can occur at terminal return points, especially Summit and Crosswind Lakes where the fish are segregated from any natural stocks.

Harvest management is limited to development of daily timing and abundance data for each enhanced stock release group, which, when used in conjunction with natural stock timing data, ensures protection of natural-stock components of the return.

Based on tag and otolith mark recoveries in commercial harvest areas, returning hatchery fish migrate through the Copper River commercial fishery in two surges. GHII fish overlap early upriver and Delta wild stocks. Gulkana I returns coincide with the Delta wild stocks and the later component of the upriver wild stocks. Hatchery and Delta stocks are present in the commercial catch from the beginning of the commercial fishing season (mid-May). These fish are possibly milling in the deep waters offshore of the Copper River Delta and are harvested by commercial fisherman offshore. See Figure 1 for a map of the Copper River watershed.

### 3.2 Special Harvest Area

The Crosswind Special Harvest Area (SHA) was established in accordance with 5 AAC 40.005 and consists of the waters of Dog Creek west of approximately 145°52.83'W long. downstream to a weir located at approximately 62°34.70'N lat., 145°53.7'W long. (Figure 2). All longitude and latitude coordinates are based on the North American Datum of 1983. PWSAC may construct a weir or series of weirs to conduct a cost-recovery harvest. Seines, traps, or dip nets may also be used to harvest cost-recovery fish in the SHA. PWSAC, or its contractor, may harvest sockeye salmon during periods established by emergency order (EO). All other species must be allowed free upstream or downstream passage.

The intent for developing this SHA is to limit the return of surplus hatchery-produced sockeye salmon into Crosswind Lake, provide local economic opportunity, and provide state residents with

a source of salmon. There is negligible salmon spawning habitat at Crosswind Lake and no natural production escapement goal has been established. This SHA will prevent most of the returning sockeye from migrating into the system while providing benefits to both PWSAC and state residents.

In order to provide state residents with the opportunity to use excess production from Crosswind Lake, PWSAC, or its contractor, may, at their discretion, give away up to 30 sockeye salmon per household to residents who come to the site and request fish. PWSAC will work with the Divisions of Sport and Commercial Fisheries area management biologists for harvest record requirements as applicable.

If PWSAC is unable to harvest the surplus hatchery-produced sockeye salmon in the SHA, they will, under authority of ADF&G, destroy all sockeye salmon in excess of broodstock and escapement needs. Disposal of these fish is undesirable; however, allowing them to escape into Crosswind Lake is also problematic. Excess destroyed sockeye salmon will be left in the stream below the weir in the SHA.

3.3 Hatchery Returns

**Sockeye Salmon, Gulkana I:** PWSAC’s historical records indicate that >70% of the returning Gulkana adults are 5-year olds. In 2022, the Gulkana Hatchery run was low for all age classes. The sibling relationship between 4-year-old fish last year and 5-year-old fish this year indicates lowered expected survivals at all locations.

As a result, PWSAC’s anticipated 2023 adult run of GHI stock is 119,400 fish, assuming a 0.45% at Paxson and 0.31% at Crosswind (Table 1).

**Sockeye Salmon Projected Run Summary**

<b>Total Run</b>	<b>Broodstock</b>	<b>CPF Harvest and Escapement</b>
62,100	19,000	43,100
<b>% of Total</b>	<b>31%</b>	<b>69%</b>

### Sockeye Salmon Projected Run, Age-Composition Summary

Nursery Lake	BY	Fry Released	Anticipated Fry-Adult Survival	Anticipated Total BY Return	Return Age	2023 Projected Run	% of Total
<b>Crosswind Lake</b>	2018	8,427,130	0.25%	21,081	Age-5	15,000	56%
	2019	8,912,385	0.48%	42,366	Age-4	12,000	44%
					<b>Total</b>	<b>27,000</b>	<b>100.0%</b>

<b>Paxson Lake</b>	2018	5,782,935	0.53%	30,556	Age-5	22,000	84%
	2019	5,498,985	0.27%	14,885	Age-4	4,100	16%
					<b>Total</b>	<b>26,100</b>	<b>100.0%</b>

<b>Summit Lake</b>	2018	0	NA	0	Age-5	0	0%
	2019	0	NA	0	Age-4	0	0%
					<b>Total</b>	<b>0</b>	<b>0%</b>

Historical average return age composition: 72% age-5 and 28% age-4.

**Sockeye Salmon, Gulkana II:** PWSAC's anticipated 2023 adult run of GHII stock is 2,200 fish, assuming a 0.80% fry to adult survival (Table 1).

### Sockeye Salmon Projected Return Summary

Total Run	Broodstock	CPF Harvest and Escapement
2,200	1,000	1,200
<b>% of Total</b>	<b>45%</b>	<b>55%</b>

### Sockeye Salmon Projected Run, Age-Composition Summary

Nursery Lake	BY	Fry Released	Anticipated Fry-Adult Survival	Anticipated Total BY Return	Return Age	2023 Projected Run	% of Total
<b>Paxson Lake</b>	2018	257,0643	0.95%	2,439	Age-5	1,900	86%
	2019	463,170	0.24%	1,105	Age-4	300	14%
					<b>Total</b>	<b>2,200</b>	<b>100.0%</b>

Historical average return age composition: 77% age-5 and 23% age-4.

### 3.4 Separation of Brood and Sales Fish



Historically, only brood fish have been harvested by the Gulkana Hatchery operator. Under ADF&G management, hatcheries were operated through general fund appropriations and were not subject to or permitted to conduct cost-recovery operations. Since PWSAC has managed the Gulkana Hatchery, facility operating and capital costs have been met through the 2% enhancement tax and through cost recovery revenues made by the sale of MBH sockeye salmon and WNH chum salmon. In an effort to avoid excess fish entering Crosswind Lake, a special harvest area (SHA) has been designated to allow the hatchery operator the opportunity to harvest the returning adults. Although no directed management is required to meet the adult return objectives, the fish that incidentally escape into the Crosswind Lake drainage and are harvested for sale will be considered cost-recovery fish.

### 3.5 Cost Recovery of Hatchery Fish

No cost recovery harvest will occur in the Copper River District due to the mixed-stock fishery. However, cost recovery harvest may occur within the designated SHA for Gulkana, which provides a harvest opportunity on fish returning to Crosswind Lake.

### 3.6 Special Management Strategies

Mixed-stock, mixed-species management occurs in the commercial, sport, personal use, and subsistence fisheries. Commercial harvest rates cannot be increased due to the potential to overharvest natural stocks. Commercial harvest interception of 60% is anticipated. Since hatchery fish may be able to withstand a higher harvest rate than wild stocks, the upriver harvest rate for hatchery fish may differ from downriver exploitation rate.

#### 3.6.1 On and Off-Station Returns (Crosswind, Summit, Hatchery Site)

Off-station returns will occur at Crosswind and Summit Lake, with the only on-station return occurring at the hatchery facility. No special management strategy is required because the return location are above the commercial fishery.

#### 3.6.2 Wild and Hatchery Stock Management

Hatchery and wild stocks are intermingled in all fisheries in the Copper River, as well as at the Miles Lake sonar. Recoveries of otolith-marked fish are presently being used to estimate numbers and timing of the enhanced stock for in-season management. Managing for wild stock escapement is the priority in the commercial fishery which could result in excessive escapement of the enhanced stock return to the hatchery and lake stocking sites.

### 3.7 Commercial Harvests

The commercial harvest occurs at the mouth of the Copper River. The outer boundary of the Copper River District, as described in 5 AAC 24.301, is a line three miles due south of a line from Pinnacle Rock to Hook Point. There are 535 commercial drift gillnet permits in Area E. Only driftnets 150 fathoms or less may be fished in the Copper River District. Openings are by EO only.

### 3.8 Sport Fish Harvest

The current estimated sockeye salmon harvest in the Gulkana River is less than 1,500 fish, with the majority caught prior to arrival of GHI and II stocks. Sport fishermen on the Gulkana River harvest less than five percent of the Gulkana River sockeye salmon escapement. Due to this early season effort, a lesser percentage of these fish would be hatchery-produced. To encourage participants of this fishery to fish later in the season, SHAs will almost certainly be needed on the Gulkana River to fully utilize available fish. From 1988 through 1990, Paxson Lake, Summit Lake, and Gunn Creek were open to sport fishing of sockeye salmon during times when hatchery returns were available. In 1991, additional area was opened, and Crosswind Lake is already open to sport harvest. In 2000, the West Fork Gulkana sport limit was increased from 3 to 6 salmon after August 1 to target hatchery surplus. However, these management accommodations have failed to attract sport anglers to target these hatchery stocks due to difficult access to the fishing locations and the late timing of the returns.

### 3.9 Subsistence and Personal Use Harvests

Subsistence: Gear is limited to fish wheels and dip nets (plus rod and reel under federal subsistence regulations) in the Glennallen Subdistrict of the Upper Copper River District and drift gillnets in the Copper River District. Currently, fish wheel and dipnet fishermen in the Glennallen Subdistrict are allocated 61,000–82,500 of the upriver sockeye salmon escapement while actual harvests have ranged from 52,000–108,000 sockeye salmon. In all but 6 years, hatchery contribution to the Chitina Subdistrict personal use and Glennallen Subdistrict subsistence fisheries has been combined and has ranged from 3–22% since 2008. In 2013, 2014, 2019, 2020, 2021, and 2022 hatchery contribution sampling was done in both the Chitina and Glennallen subdistricts with hatchery sockeye contributing 21%, 24%, 2%, 10%, 8%, and 1%, respectively, during those years to the subsistence fishery. The subsistence fishery tends to occur concurrently with fish availability throughout the season. Escapement goals at the Miles Lake sonar station include sufficient wild stock sockeye salmon to satisfy this harvest without jeopardizing the spawning escapement.

Personal Use: Gear is limited to dip nets (plus fish wheel and rod and reel under federal subsistence regulations) in the Chitina Subdistrict (below Chitina-McCarthy Bridge). Current allocations allow for the harvest of 100,000 to 150,000 salmon in this subdistrict. Since 2008 harvest in the Chitina Subdistrict personal use and Glennallen Subdistrict subsistence fisheries has included a combined 4,000–68,000 hatchery produced sockeye salmon. In 2013, 2014, 2019, 2020, 2021, and 2022 hatchery contribution sampling was done separately in both the Chitina and Glennallen subdistricts with hatchery sockeye contributing 10,300, 28,900, 8,000, and 3,600, 12,700, and 3,400 fish, respectively, during those years to the personal use fishery. However, effort in the dipnet fishery is concentrated on the early portion of the run with an average of 17% of all effort concentrated during the weeks hatchery fish are most prevalent in the fishery.

### 3.10 Avoidance of Nontarget species

Gulkana I: No nontarget species issues.

Gulkana II: No nontarget species issues.

## IV. EVALUATION STUDIES

### 4.1 Otolith Recovery in Returning Adults

The recovery of otolith-marked fish from the 2023 runs of Gulkana Hatchery sockeye salmon will be directed at collecting from the commercial fishery, personal use fishery, Glennallen Subdistrict subsistence fishery, hatchery harvests, and broodstock. Otolith mark data will be used by ADF&G and PWSAC to measure fishery contribution and marine survival of salmon. ADF&G will provide PWSAC with preliminary otolith mark-recovery data from fishery samples by December 1 each year, and any additional otolith data from straying studies and other projects by April 1 each year. Similarly, PWSAC will provide ADF&G with independently collected otolith mark-recovery data by April 1 each year. These data are to be the individual specimen otolith-mark results.

### 4.2 Nursery Lake Monitoring

Out-migrating juvenile sockeye salmon may be sampled and evaluated from Summit and Crosswind lakes daily from approximately May 20 through July 15. In 2023, it is intended to investigate and, if possible, establish and operate a smolt monitoring station at the outlet of Paxson Lake following ADF&G recommendation. The samples will provide information on the quantity and condition of the juvenile sockeye salmon, which helps to indicate the potential for over or under-utilization. Zooplankton will be sampled and evaluated from Summit, Paxson, and Crosswind lakes at approximately three-week intervals from June–September. The samples provide information on quantity of the juvenile sockeye salmon food source, which helps to indicate the potential for over or under-utilization. Raw data from both projects will be provided to ADF&G in a timely manner as specified in sections 5.3 and 5.4 of the Gulkana Hatchery Basic Management Plan (BMP).

### 4.3 Otolith Marking

PWSAC began otolith marking in 2000. During the spring outmigration period (March–May 2023), 100% of sockeye salmon production will be otolith-marked. All the fry will receive the same otolith mark by exposing them to 3,000 ppm strontium chloride solution for a 24-hour duration. 1.0 million fish will have a mark of Sr:E2 for a late large program. Multiple marks to differentiate between nursery lakes may be possible in the future should the otolith-marking system be completely developed. The table below summarizes the 2023 strontium chloride otolith mark assignment by the ADF&G Mark, Tag, and Age Lab (MTAL). Voucher samples are collected and submitted along with data per the ADF&G MTAL sampling protocol. Planned otolith marks may change with confirmation from the North Pacific Anadromous Fish Commission Mark Coordinator for Alaska.

<b>Species</b>	<b>Number of Fry</b>	<b>SrCl Otolith Mark</b>	<b>Intended Release Location</b>
Sockeye Salmon	10,000,000	HS1	Crosswind Lake
Sockeye Salmon	5,000,000	HS1	Paxson Lake
Sockeye Salmon	1,000,000	HS2	Paxson Lake
Sockeye Salmon	6,000,000	HS1	Summit Lake

## V. ATTACHMENTS

FIGURE 1. Gulkana River Drainage

FIGURE 2. Copper River Commercial Fishery Management Areas

TABLE 1. 2023 PWSAC Hatchery Return Forecast Summary

TABLE 2. 2023 Planned Egg Takes

TABLE 3. 2023 PWSAC Hatchery Egg-take Schedules

TABLE 4. 2023 PWSAC Estimated Salmon Releases

TABLE 5. 2024 PWSAC Estimated Salmon Releases

TABLE 6. Egg-take Data Template for Each Species at Each Hatchery

## VI. APPROVAL

### Recommendation for Approval: Gulkana Hatchery Annual Management Plan, 2023

Geoff Clark, PWSAC, General Manager 4/26/2023

Mark Somerville, Area Management Biologist, Division of Sport Fish 4/27/2023

Jeremy Botz, Area Management Biologist, Division of Commercial Fisheries 4/27/2023

Jeff Estensen, Regional Supervisor, Division of Sport Fish 5/1/2023

Bert Lewis, Regional Supervisor, Division of Commercial Fisheries 4/27/2023

Ethan Ford, Regional Resource Development Biologist, Div. of Commercial Fisheries 4/27/2023

Lorraine Vercessi, PNP Hatchery Program Coordinator, Div. of Commercial Fisheries 5/15/2023

**The 2023 Gulkana Hatchery Annual Management Plan is hereby approved:**

Tom Taube, Deputy Director, Division of Sport Fish 5/17/2023

Peter Bangs, Assistant Director, Division of Commercial Fisheries 5/17/2023

Figure 1. Gulkana River Drainage

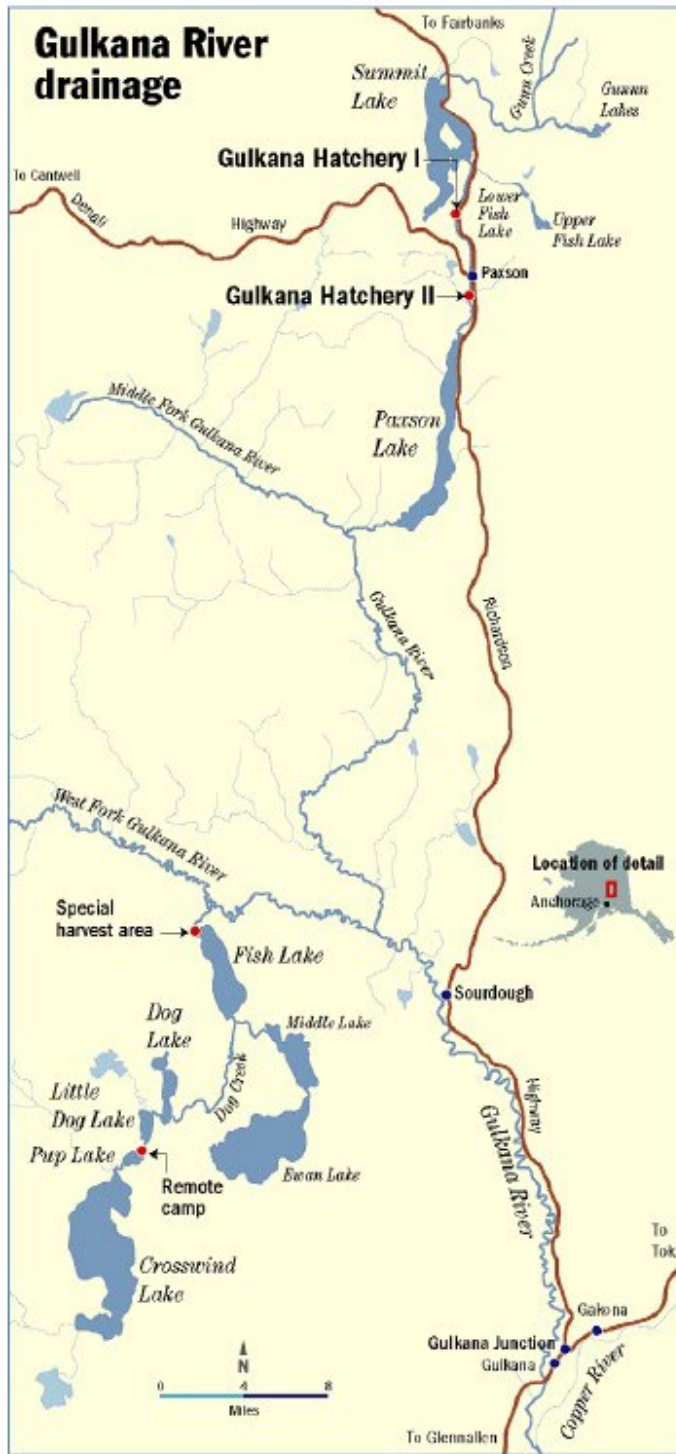


Figure 2. Copper River Commercial Fishery Management Areas

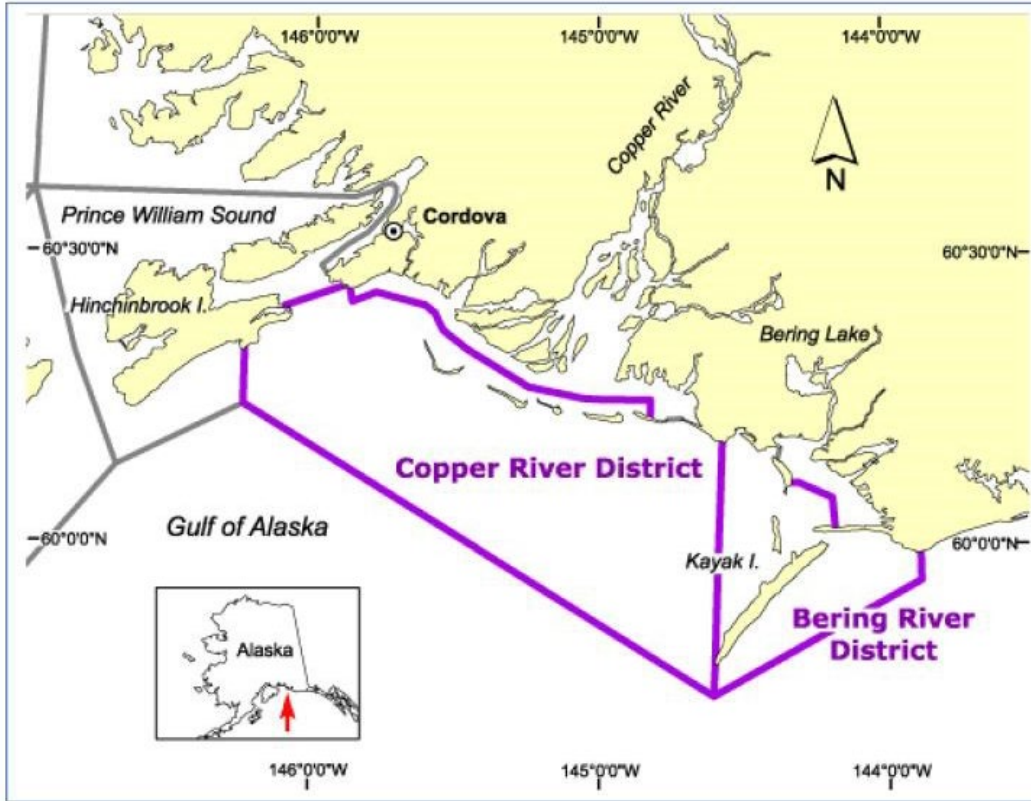


TABLE 1. 2023 PWSAC Hatchery Return Forecast

**PRINCE WILLIAM SOUND AQUACULTURE CORPORATION  
2023 HATCHERY RETURN FORECAST**

SITE/ LOCATION	SPECIES	RUN TIME	ADULT RETURN ESTIMATE			EST. MARINE SURVIVAL
			LOW	POINT	HIGH	

**RETURNS TO THE HATCHERIES**

AFK	PINK	JUL 19 - SEP 05	4,100,000	6,800,000	9,500,000	3.97%
	CHUM	JUN 1 - JUL 27	150,000	190,000	240,000	1.06%

CCH	PINK	JUL 23 - SEP 07	8,100,000	11,300,000	14,500,000	7.01%

WNH	PINK	JUL 19 - SEP 05	1,900,000	6,100,000	10,200,000	4.60%
	CHUM	JUN 1 - JUL 27	1,950,000	2,210,000	2,460,000	3.01%
	COHO	AUG 01 - SEP 20	75,000	122,000	170,000	4.54%

MBH	COGHILL SOCKEYE	JUN 15 - AUG 01	826,000	934,000	1,043,000	9.09%

GH - Fry to Adult Survival

GH	CROSSWIND LAKE SOCKEYE		22,000	27,000	32,000	0.31%
	PAXSON LAKE - GI SOCKEYE		22,300	26,100	30,100	0.45%
PAXSON LAKE - GII SOCKEYE		1,900	2,200	2,400	0.80%	
	SUMMIT LAKE SOCKEYE					



### RETURNS TO REMOTE RELEASE LOCATIONS

PORT CHALMERS	CHUM	JUN 1 - JUL 27	560,000	650,000	740,000	2.50%
CORDOVA	COHO	AUG 01 - SEP 20	3,100	5,900	8,700	5.90%
WHITTIER	COHO	AUG 01 - SEP 20	2,800	4,600	6,300	4.60%
CHENEGA	COHO	AUG 01 - SEP 20	1,500	2,900	4,300	5.80%
CHENEGA	CHINOOK	MAY 25 - JULY 10	120	230	330	0.48%

### TOTAL PWSAC RETURNS

PINK	14,100,000	24,200,000	34,200,000	5.19%
CHUM	2,660,000	3,050,000	3,440,000	2.19%
COHO	82,400	135,400	189,300	4.54%
CHINOOK	120	230	330	0.48%
SOCKEYE -SOUND, MBH	826,000	934,000	1,043,000	9.09%
SOCKEYE - GH,COPPER RIVER	46,200	55,300	64,500	0.52%

TABLE 2. 2023 Planned Egg-Takes.

PRINCE WILLIAM SOUND AQUACULTURE CORPORATION

2023 EGG-TAKE GOALS

SPECIES	HATCHERY	ORIGINAL DONOR STOCK	EGG-TAKE LOCATION	EGG-TAKE GOAL
CHUM	WALLY NOERENBERG	WELLS RIVER	WNH	153,000,000
SOCKEYE	MAIN BAY	COGHILL LAKE	MBH	12,400,000
	GULKANA I	GULKANA RIVER	GHI	35,000,000
	GULKANA II	GULKANA RIVER	GHII	1,750,000
	TOTAL			49,150,000
PINK	ARMIN F. KOERNIG	LARSEN, EWAN, GALENA	AFK	190,000,000
	CANNERY CREEK	CANNERY CREEK	CCH	187,000,000
	WALLY NOERENBERG	LARSEN, EWAN, GALENA	WNH	148,000,000
	TOTAL			525,000,000
COHO	WALLY NOERENBERG	CORBIN CREEK	WNH	3,685,000
		POWER CREEK/FLEMING SPIT	CDV	135,000
		TOTAL		
CHINOOK	WALLY NOERENBERG	WJHSFH	WNH	50,000
TOTAL PWSAC				731,200,000

TABLE 3. 2023 PWSAC Hatchery Egg-Take Schedules

PRINCE WILLIAM SOUND AQUACULTURE CORPORATION

2023 EGG-TAKE SCHEDULE

		DATE																			
SITE	SPECIES	30-Jun	07-Jul	14-Jul	21-Jul	28-Jul	04-Aug	11-Aug	18-Aug	25-Aug	01-Sep	08-Sep	15-Sep	22-Sep	29-Sep	06-Oct	13-Oct	20-Oct	27-Oct	03-Nov	
AFK	PINK									24-Aug			15-Sep								
CCH	PINK									24-Aug			17-Sep								
GH I GH II	SOCKEYE								15-Aug									15-Oct			
	SOCKEYE																				
MBH	SOCKEYE																				
	MBH-COGHILL																				
WNH	CHUM	01-Jul						01-Aug													
	PINK																				
	COHO												24-Aug		15-Sep						
																		19-Oct			11-Nov

TABLE 4. 2023 PWSAC Estimated Salmon Releases

**PRINCE WILLIAM SOUND AQUACULTURE CORPORATION**

**2023 ANTICIPATED SALMON RELEASES**

SPECIES	HATCHERY	ORIGINAL DONOR STOCK	BROOD YEAR	RELEASE LOCATION	ESTIMATED FRY/ SMOLT RELEASE
CHUM	WALLY NOERENBERG	WELLS RIVER	2022	WNH	72,800,000
			2022	PORT CHALMERS	40,700,000
			2022	AFK	19,500,000
SOCKEYE	MAIN BAY	COGHILL LAKE	2021	MBH	9,650,000
	GULKANA I	GULKANA RIVER	2022	PAXSON LAKE	4,100,000
			2022	SUMMIT LAKE	0
			2022	CROSSWIND LAKE	0
	GULKANA II	GULKANA RIVER	2022	PAXSON LAKE	1,300,000
			<b>TOTAL</b>	<b>15,050,000</b>	
PINK	ARMIN F. KOERNIG	LARSEN, EWAN, GALENA	2022	AFK	174,900,000
	CANNERY CREEK	CANNERY CREEK	2022	CCH	171,300,000
	WALLY NOERENBERG	LARSEN, EWAN, GALENA	2022	WNH	134,800,000
			<b>TOTAL</b>	<b>481,000,000</b>	
COHO	WALLY NOERENBERG	CORBIN CREEK	2021	WNH	2,800,000
		MILE 18	2021	CORDOVA	100,000
		CORBIN CREEK	2021	WHITTIER	100,000
		MILE 18	2021	CHENEGA	50,000
			<b>TOTAL</b>	<b>3,050,000</b>	
CHINOOK	WALLY NOERENBERG	SHIP CREEK	2021	CHENEGA	44,000
			<b>GRAND TOTAL</b>	<b>632,144,000</b>	

TABLE 5. 2024 PWSAC Estimated Salmon Releases

**PRINCE WILLIAM SOUND AQUACULTURE CORPORATION**

**2024 ANTICIPATED SALMON RELEASES**

SPECIES	HATCHERY	ORIGINAL DONOR STOCK	BROOD YEAR	RELEASE LOCATION	ESTIMATED FRY/ SMOLT RELEASE	
CHUM	WALLY NOERENBERG	WELLS RIVER	2023	WNH	73,200,000	
			2023	PORT CHALMERS	40,800,000	
			2023	AFK	19,400,000	
						<b>TOTAL</b>
SOCKEYE	MAIN BAY	COGHILL LAKE	2022	MBH	11,080,000	
	GULKANA I	GULKANA RIVER	2023	PAXSON LAKE	6,000,000	
			2023	SUMMIT LAKE	4,700,000	
			2023	CROSSWIND LAKE	10,000,000	
	GULKANA II	GULKANA RIVER	2023	PAXSON LAKE	1,300,000	
			<b>TOTAL</b>	<b>33,090,000</b>		
PINK	ARMIN F. KOERNIG	LARSEN, EWAN, GALENA	2023	AFK	171,600,000	
	CANNERY CREEK	CANNERY CREEK	2023	CCH	168,800,000	
	WALLY NOERENBERG	LARSEN, EWAN, GALENA	2023	WNH	133,600,000	
			<b>TOTAL</b>	<b>474,000,000</b>		
COHO	WALLY NOERENBERG	CORBIN CREEK	2022	WNH	1,000,000	
			2022	CORDOVA	100,000	
			2022	WHITTIER	100,000	
			2022	CHENEGA	50,000	
			<b>TOTAL</b>	<b>1,250,000</b>		
CHINOOK	WALLY NOERENBERG	SHIP CREEK	2022	CHENEGA	45,900	
				<b>GRAND TOTAL</b>	<b>641,485,900</b>	

