



California Department of Fish and Wildlife

Coho Salmon Conservation Hatchery Feasibility Study – Executive Summary

Final
Revision No. #1



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Revision Log

Revision No.	Date	Revision Description
0	August 12, 2024	Initial Draft Document
1	August 28, 2024	Final Document

1.0 Introduction

This Executive Summary is intended to be used as a companion document to the *Coho Salmon Conservation Hatchery Feasibility Study* (Project) produced for the California Department of Fish and Wildlife (CDFW) by McMillen, Inc (McMillen). CDFW received a grant from the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) to fund a Feasibility Study for a new Coho Salmon (*Oncorhynchus kisutch*) conservation hatchery in the Santa Cruz Mountains with the goal of supplementing and reintroducing Coho Salmon to several historic Coho Salmon watersheds within the Santa Cruz Mountains Diversity Stratum (SCMDS). McMillen was awarded a contract by CDFW under Agreement Number P2299051 executed on June 2, 2023; the Project was conducted between June 2023 and June 2024.

The Central California Coast Coho Salmon is an endangered fish species currently listed under the California Endangered Species Act (CESA) and the U.S. Federal Endangered Species Act (ESA). Occupying only a small fraction of their historic range, Coho populations in the SCMDS of the Central California Coast Coho Salmon Evolutionarily Significant Unit (CCC ESU) are largely confined to extant populations in Scott Creek drainage (northern Santa Cruz County). The Scott Creek Coho population is currently supplemented by a small fish hatchery operation (Kingfisher Flat Hatchery, KFH) that is limited to a maximum fish production capacity of approximately 30,000 smolts. The KFH site is space-limited, and fish production has been affected in recent years by insufficient water quantity/filtration, high water temperatures, and fish pathogen concerns.

In 2016, CDFW and NMFS formed a Technical Advisory Committee (TAC) to discuss pertinent issues related to a new conservation hatchery for Central California Coast Coho Salmon. Over time, the TAC developed an assessment of conservation hatchery goals, objectives and general specifications for a fish hatchery program capable of producing up to 250,000 smolts and sufficient to help rebuild populations of Coho Salmon in streams in the SCMDS to a point where they may become self-sustaining. Required for future design efforts tied to a proposed conservation hatchery, the TAC developed the following planning criteria and fish numbers by life stage and tank requirements for a conservation hatchery capable of producing between 150,000 and 250,000 Coho Salmon smolts (from CDFW Project Scope of Work; Table 1-1):

The balance of this document summarizes the key Project tasks and findings associated with the Coho Salmon Conservation Hatchery Feasibility Study.

2.0 Design Criteria

The design criteria developed for the Project are the general standards required for the State of California and represent the typical biological, civil, geotechnical, architectural, structural, mechanical, electrical, and instrumentation and controls codes and guidelines. The hatchery will need to follow these codes and guidelines as it advances to design for each major engineering discipline. These criteria were applied during the Project's evaluation but must be confirmed or updated to reflect current codes and standards in future design phases.

3.0 Bioprogram

CDFW and NOAA Fisheries staff identified core biological design criteria for rearing vessels/tanks to support a 150,000 and 250,000 smolt/captive broodstock program scenario shown in Table 3-1. After discussions with CDFW and NOAA Fisheries, it was determined that a 75,000 Smolt Program may also be a viable alternative. A bioprogram for the new hatchery was developed, which includes production capacities of 75,000, 150,000 to 250,000 smolts, utilizing both hatchery and natural origin broodstock sources, genetically informed artificial spawning, a mixed fish release strategy to include all life stages, and fish release locations in streams throughout the SCMDS. The bioprograms for each production scenario are detailed in Appendix B of the Feasibility Study.

Table 3-1. Fish Numbers and Tank Requirements: 75,000, 150,000 and 250,000 Smolt Program

Life Stage	Number of Fish			Tanks Needed			Tank Descriptions
	75,000 Smolts ¹	150,000 Smolts	250,000 Smolts	75,000 Smolts	150,000 Smolts	250,000 Smolts	
Adult/Spawning	305	610	1,015	3	6	10	20-foot-diameter circular tanks, 7-foot-wall height, 6-foot-water depth.
Eggs	228,000	456,000	758,000	8	16	26	Heath tray stacks. 16 trays per stack. Maximum loading density of 2,500 eggs per tray.
Fry/Parr	≥ 125,000	≥ 250,000	≥ 350,000	9	18	27	20-foot-long raceway, 3 feet wide with a 4-foot-wall height and 3-foot-water depth. Or 8-foot-diameter circulars, 5-foot-wall height, 4-foot-water depth.
Smolts	75,000	150,000	250,000	6	12	20	20-foot-diameter circulars, 7-foot-wall height, 6-foot-water depth.

Life Stage	Number of Fish			Tanks Needed			Tank Descriptions
	75,000 Smolts ¹	150,000 Smolts	250,000 Smolts	75,000 Smolts	150,000 Smolts	250,000 Smolts	
	Additional Tank Space						
Smolt release groups, quarantine, or rescue rearing	N/A			5 – 10			15-foot-diameter circulars, 7-foot-wall height, 6-foot-water depth.

4.0 Site Descriptions

A Project Kickoff Meeting was held on July 20, 2023, with key Project participants identified in the attendee list below (collectively “Project Team”).

Table 4-1. Kickoff Meeting Attendees

Name	Role/Organization
Daniel Niederberger, PE	CDFW PM, Hatchery Program Engineer
Manfred Kittel	CDFW Region 3 Fisheries Program Supervisor
Darrick Muir	CDFW Bay Delta Region 3 Hatchery Supervisor
Joel Casagrande	NMFS West Coast Region - TAC Team Member
Erick Sturm	Southwest Fisheries Science Center - TAC Team Member
Peter McHugh	CDFW Environmental Interim Program Manager Bay Delta Region
Stephen Swales	CDFW Statewide Coho Recovery Coordinator
Noah Hornsby, PE	McMillen – Project Manager
Derek Nelson, PE	McMillen – Project Director
Jeff Heindel	McMillen – Project Biologist
Laura Bailey, PE	McMillen – Project Engineer
Evan Jones	McMillen – Biologist

The Project Team evaluated 14 potential locations utilizing a Google Earth desktop review. The potential locations were discussed in detail with particular focus on site ownership, site size (acreage), water availability, as well as the ability to obtain water rights as key criteria in the initial investigations. The desktop review and subsequent discussion resulted in the following list of sites to be visited by the Project Team.

- Swanton Ranch – Train Field Site (CalPoly Owned)

- Swanton Ranch – Train Station Site (CalPoly Owned)
- Olympia Quarry (Private Owner)
- Hanson Quarry (Private Owner)

At each site, the Project Team discussed site pros and cons, hatchery layout, and potential to meet the recovery program goals. Additionally, each site was documented using photographs and detailed notes. Project-specific siting criteria (Site Water Supply, Site Location, Site Constructability, Site Environmental/Permitting Impacts) and relative weighting (scoring) of sites were developed and evaluated with input from both project engineers as well as TAC members. A Siting Evaluation Report was developed and is attached to the Feasibility Study as Appendix A (Siting Evaluation Report). Detailed site evaluations resulted in the identification/selection of two (2) sites that would be advanced in the Final Evaluation Report (Task 5).

- Swanton Ranch – Train Field Site (CalPoly Owned)
- Swanton Ranch – Train Station Site (CalPoly Owned)

This was later reduced to focusing on the Swanton Ranch – Train Field Site and developing alternatives for three different program sizes.

5.0 Alternatives Development

The main components and infrastructure needed for the 250K, 150K, and 75K Smolt Programs were identified and presented in Section 5 of the Feasibility Report. Key criteria for each program, such as site access, water supply, intake systems, water treatment, effluent, staff residences or housing, power supply, and the potential for photovoltaic systems, were evaluated. A detailed summary of the production areas was provided, including the preferred rearing vessel types, sizes, total quantity, and total footprint. Space constraints and the acquisition of additional water rights were identified as potential limiting factors for the establishment of each of these programs. General site layouts and high-level details were depicted in figures included in Appendix C of the Feasibility Report.

6.0 Alternative Cost Evaluation

McMillen used historical costs based on similar technical projects, as the basis of our Opinion of Probable Construction Cost (OPCC) estimates for this Project. The OPCC estimates are consistent with a Class 5 estimate as defined by the AACE classification system and are based on the figures in Appendix C and the narratives in Section 5 of the Feasibility Report.

Table 6-1. Summary of Alternative Cost Estimates

Description	250,000 Smolt Program	150,000 Smolt Program	75,000 Smolt Program
Direct Construction Costs	\$50,546,000	\$39,370,000	\$33,180,000
Contingency (Const Cost 15%)	\$7,582,000	\$5,906,000	\$4,977,000
Overhead (6%)	\$3,033,000	\$2,362,000	\$1,991,000
Profit (8%)	\$4,044,000	\$3,150,000	\$2,654,000
Bond Rate (Approximate 1%)	\$505,000	\$394,000	\$332,000
Total Construction Price	\$65,710,000	\$51,182,000	\$43,134,000
Accuracy Range -30%	\$45,997,000	\$35,830,000	\$30,190,000
+50%	\$98,565,000	\$76,780,000	\$64,695,000

Annual operating costs were not estimated at this stage of the project. As this project progresses into more detailed levels of design, a Zero Net Energy (ZNE) analysis should be performed to help determine what the annual operating costs will be and how much renewable energy offset will be required to meet the State of California’s ZNE initiative.

7.0 Environmental Permitting

The proposed Project would involve the construction of a new hatchery facility and associated infrastructure. It would involve the development of a new water supply/intake/pump station, requiring instream construction, for the hatchery operations. A list of anticipated permits, agency review time, submittal requirements, and supporting documentation for the proposed project, regardless of which alternative is selected, is summarized in Section 7 of the Feasibility Report.

8.0 Alternatives Assessment

All three alternatives discussed in the Feasibility Report were advanced from siting study to bioprogramming and then to alternatives development. It was determined that there is sufficient space at the Swanton Ranch Train Field site for all three alternatives and upgrades to power supply could be made to accommodate each alternative. The selection of the preferred alternative was based on the available space and access to the site, water supply available to each program, cost, and additional encumbrances specific to each program. It was determined

that the 150k and 75k smolt programs were both feasible, while the 250k smolt program was not due to the limited water supply available at the site.

9.0 Conclusions and Recommendation

The main limiting factor at the Swanton Ranch Train Field Site was the available water supply for fish rearing purposes. Available water at this site includes a riparian water right of 1.75 cfs and a seasonal groundwater right of 0.59 cfs. It is estimated that one production well with an approximate flow of 1.78 cfs will also be available for hatchery use. The total maximum flow available is approximately 4.21 cfs. The 250,000 smolt program will require a maximum flow of 5.63 cfs, the 150,000 smolt program requires a maximum flow of 3.17 cfs, and the 75,000 smolt program requires a maximum flow of 2.32 cfs. Based on the water supply available and the water requirements for each program, only the 150,000 and 75,000 smolt programs are feasible at this site.

Based on the input provided by the TAC Team at the start of this project, it was estimated that a 150,000 to 250,000 smolt program would be sufficient to support the Coho Salmon recovery program in the SCMDS. It was noted in later discussions that a 75,000 smolt program would nearly double the current program production levels and significantly aid in recovery efforts. However, as previously stated, the 250,000 Smolt Program is unfeasible due to the limited water supply at the Swanton Ranch Train Field site, leaving the 150,000 and 75,000 smolt programs as the only feasible alternatives.

The lowest cost alternative is the 75,000 smolt program at an estimated total construction cost of \$43,128,000, primarily because it is the smallest production program requiring less overall production space. However, there is an economy of scale as the program size increases. The 150,000 smolt program has an estimated total construction cost of \$51,180,000. This represents an overall construction cost increase of approximately 16% to achieve a 100% increase in production capacity between the 75,000 and 150,000 smolt programs. While both alternatives are feasible for construction, the 150,000 smolt program provides a better return on the money needed to build each program.

Based on the available water supply, recovery goals, cost to construct, and input provided by CDFW and the TAC Team, the 150,000 smolt program is recommended as the preferred alternative to advance for the new Coho Hatchery. The 150,000 smolt program meets the goals stated at the start of this project. Additionally, this facility can be adaptively managed to reduce production levels down to the 75,000 smolt program on an as needed basis to meet changing water availability from year to year. This provides the program with the maximum flexibility in terms of production goals while still meeting the needs of the recovery program.

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