Annual Report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects Authorized under the Department of the Army Regional General Permit No. 12

For the period of January 1, 2024, through December 31, 2024

Prepared by the Pacific States Marine Fisheries Commission for the California Department of Fish and Wildlife

March 1, 2025

Cover photo Gulch C Coho Salmon Fish Passage Improvement Project on Gulch C, tributary to Noyo River, Mendocino County, California.

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Introduction

The San Francisco District of the U.S. Army Corps of Engineers (USACE) re-issued Regional General Permit No. 12 (RGP-12) to the California Department of Fish and Wildlife (CDFW) on May 18, 2022. Pursuant to section 404 of the Clean Water Act, RGP-12 authorizes an array of instream, riparian, and upslope habitat improvement activities. This authorization is within the U.S. Army Corps of Engineers, San Francisco District (Figure 1). The authorization applies to salmonid habitat restoration projects specifically funded under the Fisheries Restoration Grant Program (FRGP).

Special Condition #1 of RGP-12 is to implement Terms and Conditions as stipulated in the National Marine Fisheries Service (NMFS) biological opinion (BO). The BO was issued on May 8, 2023, and is Consultation Number WCRO-2021-03365. The BO Section 1.1.1.3 Project Tracking and Annual Reporting stipulates that CDFW submit an annual report on the previous year's restoration activities by March 1st to NMFS. This report is submitted in compliance with those Terms and Conditions, and this document summarizes data for FRGP projects administered by CDFW that utilized RGP-12.

This report includes analysis of data documenting effects of FRGP activities on listed salmonids and their critical habitat, including effects from exposure to project implementers and monitoring activities by CDFW during the calendar year. Metrics have been compiled and validated. Information is included about each restoration project or monitoring effort conducted during the reporting period. Summaries compare actual activity exposure and mortality data to the maximum activity exposure and mortality anticipated for each species.

A narrative description of any requested variances from the limitations as described in the BO Proposed Action section and their resolution is included.

This report also summarizes implementation assessments provided by CDFW grant managers for restoration projects with activity during 2024. Effectiveness, validation, and Before After Control Impact (BACI) assessments conducted by the Pacific States Marine Fisheries Commission's (PSMFC) Monitoring and Evaluation of Salmonid Habitat Restoration (MESHR) program are also summarized. It also includes a narrative description of how any project-specific information collected during the previous year (such as effectiveness monitoring) was or should be used to assess the effects and benefits of salmonid restoration projects authorized through FRGP.

Questions regarding this report should be directed to Mr. Timothy Chorey at (916) 838-0760 or via email at Timothy.Chorey@wildlife.ca.gov.

California Map of U.S. Army Corps of Engineers Regulatory Boundaries

Prepared by the San Francisco District, 10/2000

Figure 1. USACE Districts. Report activities occurred in the U.S. Army Corps of Engineers, San Francisco District.

Effects of Program Activities on Juvenile Listed Salmonids and their Critical Habitat

Fish Relocation Activities

Restoration construction can require fish exclusion from the project site to minimize harm and mortality to salmonids and other aquatic species. In 2024, nine restoration projects required fish relocation. Project-specific relocation details are presented in the attached file *Appendix_1_Relocation_RGP12_2024.xlsx*. Fish relocation activities are reported for the following Evolutionarily Significant Units (ESU) or Distinct Population Segments (DPS):

- Southern Oregon/Northern California Coastal (SONCC) coho salmon

- Central California Coastal (CCC) coho salmon

- Coastal California (CC) Chinook salmon

- Northern California (NC) steelhead

- CCC steelhead

- South-Central California Coast (S-CCC) steelhead.

The BO (Section 2.8.4) states that injury or mortality from fish relocation is anticipated to be no more than three percent of the affected listed species for each project. A summary of reported juvenile salmonids by ESU/DPS captured and relocated prior to dewatering for project implementation compared to estimates of handling and three percent mortality are presented in Table 1.

Table 1. Annual exposure estimates and anticipated injury and mortality response of juvenile salmonid species resulting from capture and relocation prior to dewatering, as well as crushing and desiccation, compared to reported.

	SONCC coho salmon	CCC coho salmon	CC Chinook salmon	NC steelhead	CCC steelhead	S-CCC steelhead
Maximum Number of Juveniles	1,650	425	30	8,850	1,575	1,575
Reported Number of Juveniles	44	0	2	268	1,197	0
3% Mortality	50	13	1	226	47	47
Reported Number of Mortalities	0	0	0	2	29	0
Reported Mortality	0.0%	0.0%	0.0%	0.75%	2.42%	0.0%

Monitoring Activities

Limits for handling, capturing, and tagging juvenile salmonids, as well as mortality limits, during monitoring activities and reported numbers of juveniles observed are summarized in Table 2 along with reported results. No juvenile salmonids were handled, captured, or tagged, and there were no injuries or mortality from monitoring activities.

Table 2. Annual exposure estimates of juvenile salmonids captured, handled, and tagged during project monitoring, and anticipated injury mortality response compared to reported numbers.

ESU/DPS	Maximum Number of Juveniles Captured and Handled	Reported Numbers of Juveniles Observed	Maximum Number of Juveniles PIT tagged	Anticipated injury and mortality (3%)
SONCC coho salmon	2500	**216**	25	75
CCC coho salmon	500	**376**	50	15
CC Chinook salmon	30	**0**	10	1
NC steelhead	9000	**333**	900	270
CCC steelhead	1000	**0**	100	30
S-CCC steelhead	1000	**201**	100	30

Project Locations

Project locations ranged from the California-Oregon border south to Monterey County, and as far east as Siskiyou County. A project list organized by United States Geological Survey (USGS) Fourth Field Hydrologic Unit Code (HUC) 8 and Fifth Field HUC 10 are found in *Appendix_2_HUC_RGP12_2024.xlsx* in the attached files. The locations of the 14 projects on the 2024 RGP-12 Project Notification List with work done in 2024 are presented in Figure 2. Individual project details stratified by primary benefitted species ESU for salmon and DPS for steelhead (anadromous rainbow trout *Oncorhynchus mykiss*) is provided in attached file *Appendix_3_ESU_DPS_RGP12_2024.xlsx*.

Annual Performance Measures

Restoration on any project consists of one or more distinct features. Features are defined as a physical element intended to interact with the environment to improve anadromous salmonid habitat. Project-specific performance measures of restoration features constructed during 2024 are found in the attached file *Appendix_4_Annual_Implementation_Measures_RGP12_2024.xlsx*.
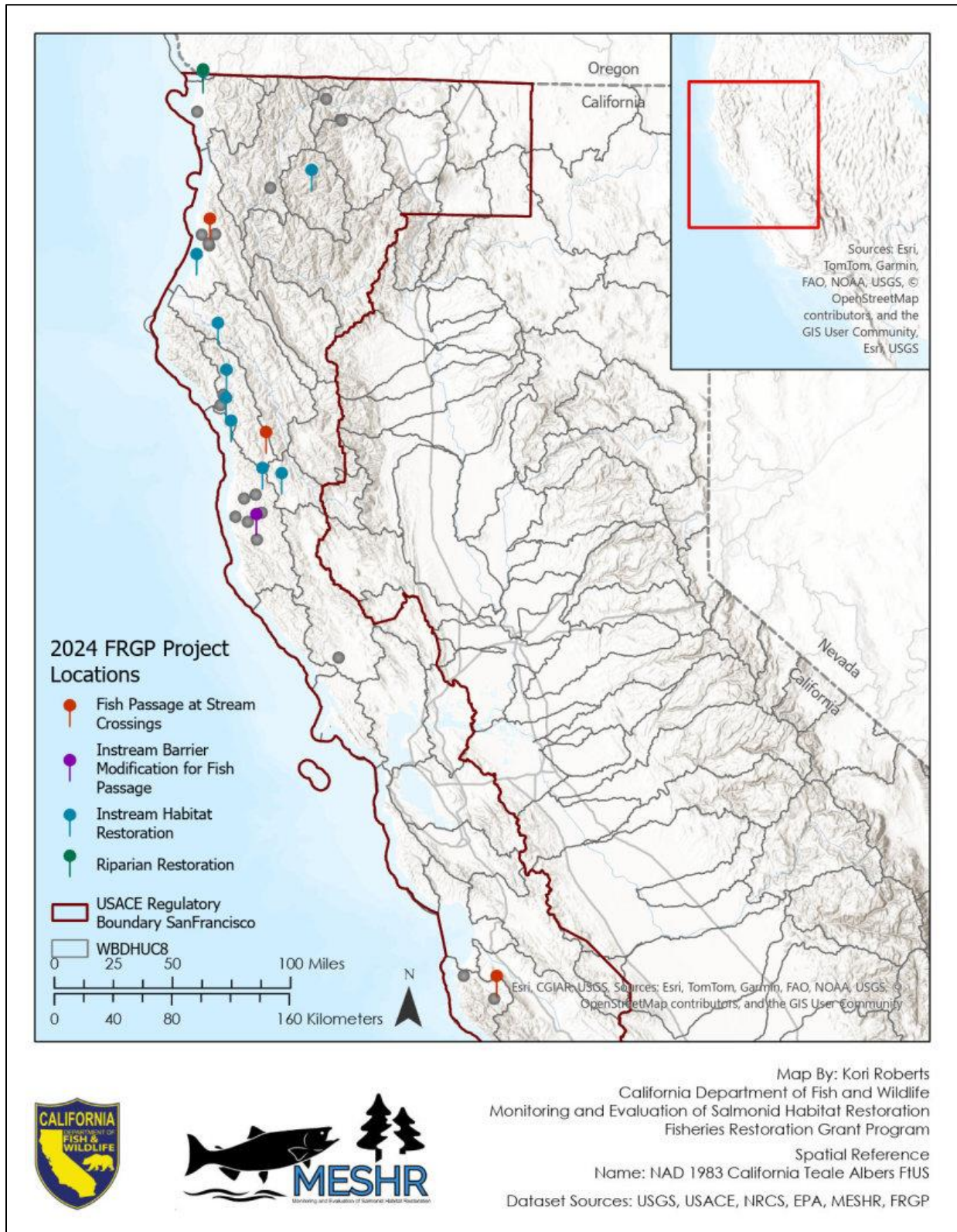
Figure 2. Project locations from the 2024 RGP-12 Notification List for the Fisheries Restoration Grant Program with work completed in 2024.

Annual performance measures of restoration features implemented during 2024 are summarized in annual reports written by grantees and confirmed in the field by CDFW grant managers (Table 3).

Table 3. Annual performance measures of projects with features implemented in 2024.

2024 Annual Performance Measures		Total
Number of instream structures implemented within the stream channel.		330
Type of instream structures implemented within the stream channel.	Log, rootwad, boulder instream habitat restoration combinations | Boulder structures (other) | Log/rootwad structures (other) | Boulder cluster | Boulder/log combo constrictor - single | Single log structure (digger/cover log) | Multiple log structure (spider logs/cover log complex) | Cover root wads | Cover logs (horizontal) | Unanchored large wood | Log wing-deflectors (constrictor) – single | Log wing-deflectors (constrictor) – opposing	
Length of stream bank (feet) stabilized or planted with riparian species.		12,806
Number of culverts replaced or repaired.		7
The number of miles of restored access to unoccupied salmonid habitat (from culverts replaced or repaired).		1.87
Distance (miles) of road decommissioned.		2.3
Distance (feet) of aquatic habitat disturbed at each project site.		11,192
Length of bio-engineered streambank (feet) restored.		3,629
Active channel width at bio-engineered streambank (feet) restored.		58
Size (acres) of off-channel habitat features enhanced or created.		1.3

2024 Annual Performance Measures	Total
Size (length) of off-channel habitat features enhanced or created.	3,792
Size (depth) of off-channel habitat features enhanced or created.	22
Size of dams removed (cubic yards).	2,525
Number of dams removed.	1
Number of miles of restored access to unoccupied salmonid habitat (from dam removal).	1.1

A summary of two projects with off-channel habitat enhancement metrics are listed in Table 4 and Table 5, listed by individual features.

Table 4. Size (acres, length, and depth) of off-channel habitat enhanced or created by individual features from Q2210507 Upper Tryon Creek Restoration Project, Phase 2.

Acres	Length (Feet)	Depth (Feet)
0.037	52	2.6
0.045	74	4.4
0.055	79	3.6
0.070	108	3.5

Table 5. Size (acres, length, and depth) of off-channel habitat enhanced or created by individual features from Q2310514 Ryan Creek Off-Channel Coho Habitat Implementation Project.

Acres	Length (Feet)	Depth (Feet)
0.9	1584	5.0

How Project-specific Information Collected was Used to Assess the Effects and Benefits of Salmonid Restoration Projects

Implementation Monitoring

Methods

The BO (Section 2.8.4) requires that CDFW provide NMFS with a list of projects authorized under RGP-12 to be conducted each year (Notification List). Work status definitions for the Notification List and Appendix 2 are provided in Table 6.

Table 6. Work status definitions.

Status	Description
Not started	Proposal selected for funding but grant not written yet, or grant written but on-the-ground work has not started.
Ongoing	From the beginning to the end of on-the-ground work.
Completed	From the end of on-the-ground work until the grant is closed.

Work status of restoration projects included on the RGP-12 2024 Notification List are in Table 7.

Table 7. Work status of restoration projects included on the RGP-12 2024 Notification List.

Project Type	Not Started	Ongoing	Completed	Total
Fish Passage at Stream Crossings	0	4	3	7
Instream Habitat Restoration	1	23	2	26
Instream Barrier Modification for Fish Passage	0	2	0	2
Riparian Restoration	0	1	0	1
Project Design	0	6	0	6
Total	**1**	**36**	**5**	**42**

FRGP project status definitions for the Notification List and Appendix 2 are provided in Table 8.

Table 8. FRGP Project Status Definitions.

Status	Description
Field work not started	On-the-ground work has not started.
Field work in progress	From the beginning to the end of on-the-ground work.
Field work completed	From the end of on-the-ground work until the grant closeout.
Closed	Grant agreement has been closed out.

FRGP project status for restoration projects on the 2024 RGP-12 2024 Notification List are in Table 9.

Table 9. FRGP project status for restoration projects on the RGP-12 2024 Notification List.

Project Type	Field Work Not Started	Field Work in Progress	Field Work Completed	Closed	Total
Fish Passage at Stream Crossings	1	3	0	3	7
Instream Habitat Restoration	10	9	5	2	26
Instream Barrier Modification for Fish Passage	1	1	0	0	2
Riparian Restoration	0	1	0	0	1
Project Design	0	6	0	0	6
Total	12	20	5	5	42

All stages of monitoring (pre-treatment, implementation, and post-treatment) evaluate feature construction and effectiveness. Implementation monitoring occurs the same year as feature construction and is done multiple times on the same project if features are constructed over multiple years. For example, an instream habitat restoration project could include 20 instream structures but only four were completed during 2024. Implementation monitoring for 2024 would only report on the four completed features and the remaining features would receive implementation monitoring during the year of construction.

Implementation monitoring by CDFW grant managers assesses installation of individual restoration features throughout construction. Completed features are rated as excellent, good, fair, poor, or fail, based on the criteria presented in Table 10.

Table 10. Implementation feature ratings criteria.

Rating	Implementation	Action
Excellent	Meets all specifications and exceeds expectations.	No action required.
Good	Meets all specifications and expectations.	No remedial action required.
Fair	Does not meet some specifications and expectations but implemented adequately.	Probably not serious enough to require remedial action.
Poor	Does not meet most specifications and expectations, implemented inadequately.	Serious enough to require remedial action.
Fail	Fails to meet specifications, implemented incorrectly, or not implemented.	Serious enough to require remedial action.

Results

Fourteen projects had work done in 2024 and thirteen received implementation monitoring by grant managers, including 360 of 386 features implemented (Table 11). Not all grant managers completed implementation monitoring on 100% of project features. Sproul Creek Salmonid Habitat Restoration Project closed in 2023 but received project maintenance in 2024 on failed features. The grant manager was unaware further implementation monitoring was needed for permit compliance after the grant closed. Chimney Rock Creek Upslope Watershed and Instream Habitat Restoration Project and Red Bank Off-Channel Fisheries and Riparian Habitat Enhancement Project also did not complete implementation monitoring on 100% of their features because of the remoteness and difficulty accessing the project locations.

Of the features that received implementation monitoring by grant managers, 347 (96.4%) received a good or excellent rating (16 excellent and 331 good). The remaining 13 (4%) features were rated fair, and no features were rated as poor or fail. Project-specific implementation monitoring information of restoration features constructed during 2024 is provided in *Appendix_5_Feature_Ratings_RGP12_2024.xlsx*.

Table 11. Feature implementation ratings assigned in 2024 by project type.

Project Type	Total Number of Project Features	Number of Features Monitored	Excellent	Good	Fair	Poor	Fail
Fish Passage at Stream Crossings	21	21	7	13	1	0	0
Instream Habitat Restoration	308	280	9	261	12	0	0
Riparian Restoration	14	14	0	14	0	0	0
Instream Barrier Modification	43	43	0	43	0	0	0
Total Feature Ratings	**386**	**360**	**16**	**331**	**13**	**0**	**0**
% Of Total	**100%**	**93%**	**4.1%**	**85.8%**	**3.4%**	**0%**	**0%**

An implementation rating is assigned to the project based on criteria presented in Table 12. For example, a project is rated good if 80% or more of its features were rated as either good or excellent, with no more than 10% of features rated as poor and no features rated as fail. Grant managers work with grantees to remedy features rated as poor or fail. Upon remediation, the final feature rating is reported as excellent, good, or fair.

Table 12. Project rating criteria based on cumulative percentage of feature ratings.

	Excellent Feature Ratings	Good Feature Ratings	Fair Feature Ratings	Poor Feature Ratings	Fail Feature Ratings
Excellent Project Rating	≥ 80%			0%	0%
Good Project Rating	≥ 80%	≥ 80%		≤ 10%	0%
Fair Project Rating	≥ 80%	≥ 80%	≥ 80%		<10%
Poor Project Rating	≥ 50%	≥ 50%	≥ 50%		<25%
Failed Project Rating	<50%	<50%	<50%	≥ 50%	≥ 50%

All thirteen projects monitored at implementation received project ratings. (Table 13).

Table 13. Project ratings for implementation monitoring in 2024.

Project Type	Projects Monitored	Excellent	Good	Fair	Poor	Fail
Fish Passage at Stream Crossings	3	1	2	0	0	0
Instream Habitat Restoration	8	0	8	0	0	0
Riparian Restoration	1	0	1	0	0	0
Instream Barrier Modification for Fish Passage	1	0	1	0	0	0
Total Project Ratings	**13**	**1**	**12**	**0**	**0**	**0**
% Of Total	**100%**	**8%**	**92%**	**0%**	**0%**	**0%**

Discussion

Implementation monitoring documents conditions at fish habitat restoration sites immediately after treatment and evaluates whether projects were constructed as proposed. All thirteen projects with implementation monitoring in 2024 received an overall project rating of good or excellent, indicating they were all implemented properly.

Because implementation monitoring occurs shortly after construction it is limited in its assessment of long-term stability of the project design as it interacts with natural elements. If the project design performs poorly or fails it can receive maintenance or otherwise be revisited to ensure it functions as intended.

Effectiveness Monitoring

Methods

Effectiveness monitoring by MESHR is conducted on a stratified random selection of 10% of each project type in each USACE watershed (i.e., North Coast, North Central Coast, and San Francisco Bay) funded each year. Effectiveness monitoring has two phases: pre-

treatment monitoring and post-treatment monitoring (Table 14). In addition, MESHR conducts BACI monitoring, which collects more quantitative data both before and after construction.

Pre-treatment monitoring documents baseline data on habitat conditions before on-the-ground restoration treatments begin, providing a benchmark to evaluate restoration activity effectiveness. Pre-treatment monitoring is generally conducted before construction the same year as project implementation.

Post-treatment monitoring is usually conducted three years after project completion to ensure projects experience multiple winter high-flow periods. Post-treatment monitoring may be deferred to other years, or additional monitoring may be added if appropriate and resources are available.

BACI monitoring collects baseline data prior to construction and then returns to measure post-treatment conditions the year after construction, and again three, five, and ten years following construction.

Table 14. Projects that received effectiveness monitoring in 2024.

Grant Number	Project Type	Grant Name	Monitoring Visit
Q2110506	Instream Habitat Restoration	Brandon Gulch Coho Stream Habitat Enhancement Project	Pre-effectiveness
Q2110508	Instream Habitat Restoration	Albion River and Tom Bell Creek Instream Habitat Enhancement Project	Pre-effectiveness
Q2110514	Instream Habitat Restoration	Ryan Creek Off-Channel Coho Habitat Implementation Project	Pre-effectiveness
Q2210509	Instream Habitat Restoration	Chimney Rock Creek Upslope Watershed and Instream Habitat Restoration Project	Pre-effectiveness
Q2210524	Fish Passage at Stream Crossing	Little Case Two Barrier Removal Project	Pre-effectiveness
Q2210526	Fish Passage at Stream Crossing	Lindsay Creek Coho Barrier Removal Project	Pre-effectiveness
Q2240402	Fish Passage at Stream Crossing	Bradley (Ringer) Cachagua Creek Fish Passage Project	Pre-effectiveness
Q2310502	Instream Barrier Modification for Fish Passage	Neefus Gulch Fish Passage Improvement (Phase II), Earthen Dam Barrier Removal	Pre-effectiveness

Grant Number	Project Type	Grant Name	Monitoring Visit
Q1910506	Fish Passage at Stream Crossing	Morrison Creek Tributary Barrier Removal	Post-effectiveness
Q1910527	Watershed Restoration (Upslope)	Indian Creek Sediment Reduction and Salmonid Habitat Enhancement Project	Post-effectiveness
Q1940404	Fish Passage at Stream Crossing	Potrero Creek Fish Project - Carmel Valley Athletic Club, Carmel Valley	Post-effectiveness
Q2010505	Instream Habitat Restoration	Somerville Creek Instream Restoration Project	Post-effectiveness
Q2010506	Instream Habitat Restoration	Sproul Creek Salmonid Habitat Restoration Project	Post-effectiveness
P1210311	Instream Habitat Restoration	Ramon Creek Sediment Reduction and Instream Enhancement Project	Post-effectiveness BACI Year 10
P1310309	Instream Barrier Modification	Olds Creek Coho Habitat Barrier Removal Project	Post-effectiveness BACI Year 10

Results

Pre-treatment monitoring was conducted on eight restoration projects in 2024 (Table 15) and 275 out of 284 features were evaluated. Nine upslope road features were not monitored on the Chimney Rock Creek Upslope Watershed and Instream Habitat Restoration Project, including six upslope sediment stabilization and three stream crossing decommissioning features. The MESHR team was not able to complete pre-treatment surveys on these features before construction due to challenging access conditions.

Table 15. Number of pre-treatment projects monitored during 2024 by project type.

Project Type	Total
Fish Passage at Stream Crossings	3
Instream Habitat Restoration	4
Instream Barrier Modification for Fish Passage	1
Riparian Restoration	0
Watershed Restoration (Upslope)	0
Total	8

Post-treatment effectiveness monitoring evaluates structural integrity and function of completed restoration features three years after implementation. Each feature is rated as excellent, good, fair, poor, or fail, based on the criteria presented in Table 16.

Table 16. Post-treatment effectiveness feature rating criteria.

Rating	Goals	Targets	Unintended effects	Structural condition
Excellent	Achieved all stated goals.	Met or exceeded targeted values.	No negative unintended effects. Unintended positive effects may outweigh failure to achieve a targeted value.	Excellent to Good.
Good	Achieved most stated goals.	Did not quite meet targeted values. If no targets were specified, maximum rating is Good.	No negative unintended effects.	Excellent to Fair.
Fair	Partially achieved most goals, or goals not achieved were outside the control of the feature.	Did not meet targeted values, but the feature still has some functional value.	May have minor unintended negative effects that partially offset goals.	Excellent to Fair.
Poor	Achieved at least one goal; goals not achieved were the fault of the feature.	Did not meet targeted values, feature has little functional value.	May have minor or major unintended negative effects that offset or negate a targeted gain.	Excellent to Poor.

Rating	Goals	Targets	Unintended effects	Structural condition
Fail	Achieved no goals; feature has no functional value.	Did not meet targeted values.	May have unintended negative effects that are degrading the habitat and outweigh achieved goals.	Excellent to Fail (may be completely gone).

There were 134 project features ready for post-treatment evaluation in 2024, of which 131 (98%) were monitored. The three features not monitored at post-treatment were also not monitored at pre-treatment because the feature locations were not flagged or were unclear, making them impossible to locate. This included two features for the Somerville Creek Instream Restoration Project and one feature for the Morrison Creek Tributary Barrier Removal Project.

During post-treatment monitoring no features received an excellent rating (0%), 110 features (84%) received a good rating, seven features (5%) received a fair rating, eight features received a poor rating (6%), and six features (5%) received a fail rating (Table 17). Feature and project ratings for completed projects monitored in 2024 are in an attached Excel file *Appendix_6_Effectiveness_RGP12_2024.xlsx*.

Table 17. Feature ratings from post-treatment effectiveness monitoring by project type.

Project Type	Excellent	Good	Fair	Poor	Fail	Total
Fish Passage at Stream Crossings	0	15	0	0	0	15
Instream Habitat Restoration	0	76	7	8	6	97
Instream Barrier Modification for Fish Passage	0	0	0	0	0	0
Watershed Restoration (Upslope)	0	19	0	0	0	19
Riparian Restoration	0	0	0	0	0	0
Instream Bank Stabilization	0	0	0	0	0	0
Fish Screening of Diversions	0	0	0	0	0	0
Water Conservation Measures	0	0	0	0	0	0
Total	0	110	7	8	6	131
% Of Total	0%	84%	5%	6%	5%	100%

An effectiveness rating for the whole project is calculated from the individual feature ratings using the same criteria described for implementation monitoring in Table 12 above. Project proposals do not always list specific numeric targets for habitat improvements, which are required for an excellent rating. In 2024, five projects received effectiveness project ratings (Table 18).

Table 18. Project ratings from post-treatment monitoring in 2024.

Project Type	Excellent	Good	Fair	Poor	Fail	Total
Fish Passage at Stream Crossings	0	2	0	0	0	2
Instream Habitat Restoration	0	1	1	0	0	2
Instream Barrier Modification for Fish Passage	0	0	0	0	0	0
Watershed Restoration (Upslope)	0	1	0	0	0	1
Riparian Restoration	0	0	0	0	0	0
Total	0	4	1	0	0	5
% of Total	**0%**	**80%**	**20%**	**0%**	**0%**	**100%**

Discussion

Pre-treatment effectiveness monitoring documents existing habitat conditions prior to implementation as a baseline to assess restoration effectiveness during post-treatment. Eight restoration projects received pre-treatment effectiveness monitoring in 2024 and will be revisited three years following project implementation.

For some projects, such as the Brandon Gulch Coho Stream Habitat Enhancement Project and the Albion River and Tom Bell Creek Instream Habitat Enhancement Project, implementation was planned for 2024 but postponed after pre-treatment monitoring was already completed. In these instances, post-treatment monitoring would still occur three years after construction, but four years after pre-treatment monitoring. Pre-treatment monitoring is not generally repeated the following year unless conditions change dramatically.

Post-treatment effectiveness monitoring documents restoration outcomes relative to pre-treatment benchmarks and rates the overall success of a project after three years. Depending on the project type, this may include documenting erosion, plant growth, scouring or substrate deposition at instream structures, or successful fish passage at a former barrier.

Four of the five restoration projects monitored for post-treatment in 2024 were rated good for overall effectiveness, indicating they continued to meet proposed project objectives. The remaining project received a fair overall effectiveness rating as 20% of project features were rated as poor or failed. This was due to insufficient support for instream LW structures relative to the size of the stream. During high winter flows, many features shifted downstream or broke off at the anchor points, limiting feature effectiveness in achieving habitat improvements.

Effectiveness of restoration projects is typically assessed three years after implementation. While short-term monitoring can provide immediate data it has limitations in detecting long term trends and effects on habitat and can have misleading results.

Validation Monitoring

Three project types that receive effectiveness monitoring also receive validation monitoring: instream habitat improvement (HI), fish passage at stream crossings (FP), and instream barrier modification for fish passage (HB). An upslope watershed restoration (HU) project can also include validation monitoring if it has an instream component. As of 2014, a subset of HI projects with validation monitoring also received BACI monitoring to evaluate habitat metrics, fish response, and effectiveness of large wood (LW) treatments. This 2024 validation monitoring report includes data collected from January 1 to December 31, 2024.

Methods

Validation monitoring consists of three distinct efforts: 1) juvenile snorkel surveys, 2) winter adult spawning surveys, and 3) minnow trapping. All three validation project types receive snorkel surveys prior to implementation and three years after implementation. Adult spawning surveys are limited to fish passage projects (FP and HB) and can begin the first winter after implementation and continue until fish or redd presence is documented above the former barriers.

Minnow trapping is conducted when snorkel surveys are not a suitable option due to poor water quality or visibility, or to document for winter non-natal rearing.

Juvenile Snorkel Validation Surveys

Snorkel surveys are used to determine juvenile salmonid presence (or absence) and density in stream reaches directly associated with instream features (often LW) or

upstream of migration barrier removal locations. Snorkel dives are typically performed during the same site visit as effectiveness monitoring, both immediately prior to project implementation (pre-treatment) and three years after implementation (post-treatment). Juvenile snorkel surveys are also done in both treatment and control reaches during BACI monitoring. Snorkeling protocols were adapted from Duffy (2005) and Garwood and Ricker (2017).

For HB and FP projects, up to five pool units are randomly selected immediately upstream and downstream of the migration barrier removal location. For HI projects, up to five randomly selected pool and/or run habitat units adjacent to proposed LW structure locations are selected for snorkeling at pre-treatment and revisited following three winters. Minimum qualifications to snorkel habitat units include maximum residual depth ≥ 0.8 feet (ft), average wetted width ≤ 16.4 ft, and visibility ≥ 4 ft. If the average wetted width of a pool or flatwater run is ≥ 16.5 ft, maximum depth must be ≥ 1.5 ft.

Each unit is surveyed from downstream to upstream by one diver in a single pass (to minimize fish and sediment disturbance) during daylight hours. A waterproof flashlight is used to view undercut banks or other dimly lit areas. Fish are identified by species when able, grouped by age class, and enumerated. Age class designation is assigned according to visually estimated lengths: 0-3 inches (in) = young-of-year (YOY); 3-6 in = 1+ years of age; > 6 in = 2+ years of age. Physical dimension measurements (average width, maximum length, and maximum residual water depth) for each unit are recorded. Fish densities are calculated by dividing fish numbers by square feet (length x width) of the pool. Air and water temperatures are recorded at each site prior to entering the water and again if water temperatures could increase to stressful levels (> 68° F).

Coho Salmon (*Oncorhynchus kisutch*) and steelhead trout are the primary targeted species for validation monitoring; however, Chinook Salmon (*Oncorhynchus tshawytscha*) and coastal cutthroat trout (*Oncorhynchus clarkii clarkii)* are also recorded. Chinook Salmon may be underrepresented because surveys are often conducted after most juveniles have begun migrating to the ocean.

BACI Surveys

The BACI monitoring protocol used by MESHR was adapted from the Washington State Salmon Recovery Funding Board (Crawford 2011) and the U.S. Environmental Protection Agency (Kaufmann et al. 1999). The intent of BACI is to determine whether the addition of LW structures provides improvements to stream habitat over time based on analysis of standardized, repeatable measurements such as LW volume, channel substrate, residual water depth, residual pool depth, and juvenile fish relative abundance.

Projects are monitored more intensively and for a longer period than effectiveness assessments, with habitat and fish parameters measured prior to treatment, and after treatment at one, three, five, and 10 years later. During pre-treatment, treatment and

control reaches are selected, physical habitat parameters are recorded, and juvenile salmonid numbers are estimated during snorkel surveys.

All qualifying pool and run habitat units in both the control reach and treatment reach are snorkeled from downstream to upstream. Fish are identified to species, grouped by age class, and enumerated following methods described earlier for juvenile snorkel validation monitoring. Air and water temperatures are recorded at the start of each reach and may be repeated if conditions suggest a measurable change.

Minnow Trapping Surveys

The goal of minnow trapping surveys is to determine juvenile salmonid presence and density in stream reaches directly associated with migration barrier removal locations or instream features when snorkeling is not a viable option. Up to five minnow traps are baited with sterilized salmon roe and left in calmer water with cover. Individual traps are deployed for approximately two hours and all fish captured are documented and released. Salmonid lengths are also recorded.

Adult Spawning Validation Surveys

Adult spawning surveys record counts of total redds, live fish, and carcasses in reaches immediately upstream and downstream of a barrier removal location. Live fish and carcasses are identified by species and sex, if possible. If multiple surveys within the season are planned (especially for complete barrier projects), identified redds are marked with flagging indicating the date and redd number to avoid re-counting redds in later surveys.

Habitat parameters are recorded along standard reach lengths of approximately 20 bankfull channel widths tracked using a Garmin™ GPS 60CSx unit or Avenza Maps. Stream flows can also be tracked using a USGS proxy gauge from a nearby stream. If a surveyed reach does not contain suitable spawning habitat, landowner permission may be pursued for surveys further upstream of the standard 20 bankfull channel widths.

Data Analysis

Validation monitoring data is collected on paper datasheets, then put into Excel to later undergo quality control to correct potential errors.

Snorkel survey data are analyzed to calculate salmonid size distributions and densities by species, and total and mean habitat measurements. To examine relative abundances, species density is calculated as the mean number of species per square foot. For data analysis all size classes (YOY, 1+, 2+) are combined by species. To examine wetted habitat the total length surveyed, mean unit length, total unit area, mean unit area, mean unit depth, mean unit maximum depth, total unit volume, and mean unit volume are calculated. For each mean the standard error (± SE) is calculated. All analyses are

completed using Microsoft Excel for Microsoft 365 MSO (Version 2412 Build 16.0.18324.20092).

Validation Monitoring Project Selection

The 2024 effectiveness monitoring selection by MESHR designated six new projects to receive pre-treatment validation monitoring, but five of these six projects were postponed until 2025 or later. An additional eight projects previously selected and postponed were eligible for validation monitoring in 2024, but one of these eight was postponed again until 2025 or later. Eight projects received pre-treatment validation monitoring and are summarized in Table 19.

Table 19. Restoration projects receiving validation monitoring during pre-treatment monitoring in 2024.

Grant #	Project Type Code	Project Title	Grantee
Q2110506	HI	Brandon Gulch Coho Stream Habitat Enhancement Project	Mendocino Land Trust
Q2110508	HI	Albion River and Tom Bell Creek Instream Habitat Enhancement Project	Trout Unlimited
Q2110514	HI	Ryan Creek Off-Channel Coho Habitat Implementation Project	Pacific Coast Fish, Wildlife and Wetlands Restoration Association
Q2210509	HI	Chimney Rock Creek Upslope and Instream Habitat Restoration Project	Trout Unlimited
Q2210524	FP	Little Case Two Barrier Removal Project	Eel River Watershed Improvement Group (ERWIG)

Grant #	Project Type Code	Project Title	Grantee
Q2210526	FP	Lindsay Creek Coho Barrier Removal Project	Pacific Coast Fish, Wildlife and Wetlands Restoration Association
Q2240402	FP	Bradley (Ringer) Cachagua Creek Fish Passage Project	Resource Conservation District of Monterey County
Q2310502	HB	Neefus Gulch Fish Passage Improvement (Phase II), Earthen Dam Barrier Removal	Trout Unlimited, Inc.

Six projects received post-treatment validation monitoring, four for post-treatment effectiveness monitoring and two for BACI juvenile surveys. One project received spawner surveys to document possible fish passage above previous barriers. One project received minnow trapping validation monitoring. All post-treatment projects included in 2024 validation monitoring are summarized in Table 20.

Table 20. Restoration projects that received post-treatment validation monitoring in 2024.

Grant #	Project Type	Project Title	Grantee
P1210311	HU	Ramon Creek Sediment Reduction and Instream Enhancement Project	Trout Unlimited
P1310309	HB	Olds Creek Coho Habitat Barrier Removal Project	Trout Unlimited
Q1910506	FP	Morrison Creek Tributary Barrier Removal	Smith River Alliance

Grant #	Project Type	Project Title	Grantee
Q1940404	FP	Potrero Creek Fish Project - Carmel Valley Athletic Club, Carmel Valley	Trout Unlimited, Inc.
Q2010505	HI	Somerville Creek Instream Restoration Project	Trout Unlimited, Inc.
Q2010506	HI	Sproul Creek Salmonid Habitat Restoration Project	Eel River Watershed Improvement Group (ERWIG)

Results

Young-of-year (YOY) trout can be progeny of steelhead trout, resident rainbow trout, coastal cutthroat trout, or a rainbow trout and cutthroat trout hybrid. Although steelhead trout are often the most abundant trout at restoration sites, trout juvenile identification at this size can be inaccurate. Unless otherwise specified, we will refer to all juvenile trout observations as trout.

Pre-Treatment Snorkel Survey Observations

The following projects received pre-treatment snorkel validation monitoring in 2024:

- Q2110508 – Albion River and Tom Bell Creek Instream Habitat Enhancement Project – 2021
- Q2110506 – Brandon Gulch Coho Stream Habitat Enhancement Project
- Q2210509 – Chimney Rock Creek Upslope and Instream Habitat Restoration Project
- Q2210524 – Little Case Two Barrier Removal Project
- Q2210526 – Lindsay Creek Coho Barrier Removal Project
- Q2240402 – Bradley (Ringer) Cachagua Creek Fish Passage Project

Q2110508 - Albion River and Tom Bell Creek Instream Habitat Enhancement Project – 2021 (HI)

The project goal is to increase the quantity and quality of instream Coho Salmon habitat by installing 43 LW features within Tom Bell Creek and mainstem Albion River. LW features will restore geomorphic function by increasing pool frequency and depth, increase availability of velocity and temperature refugia, and sort instream substrate. Implementation was postponed until the summer of 2025.

Five pools were snorkeled on June 5, 2024. One juvenile trout was observed in three snorkeled pools in Tom Bell Creek. Seven juvenile trout and three juvenile Coho Salmon were observed in two snorkeled pools in the mainstem Albion River. The total area surveyed was 2,266.7 ft², with an average unit area of 473.34 ft² and average maximum residual depth of 2.56 ft (Table 21).

Table 21. Albion River and Tom Bell Creek Instream Habitat Enhancement Project pre-treatment snorkel validation survey data.

No. of Units Surveyed	Avg Unit Area (ft²)	SE (ft²)	Avg Max Residual Depth (ft)	SE (ft)	*O. mykiss* observations	Density fish/ft²	SE	*O. kisutch* observations	Density fish/ft²	SE
5	473.34	169.63	2.56	0.48	8	0.0031	0.0016	3	0.00053	0.00053

Q2110506 – Brandon Gulch Coho Stream Habitat Enhancement Project (HI)

The project goal is to improve the quality and quantity of spawning and rearing habitat for Coho Salmon by installing 35 LW structures over 0.74 miles in Brandon Gulch. The added LW should achieve the good category for LW and key-piece frequencies, as outlined in the Recovery Plan for Central CA Coast Coho Salmon. Implementation has been postponed until the summer of 2025.

Five pools were snorkeled on May 15, 2024. The total area surveyed was 1401.55 ft², with an average unit area of 280.31 ft² and average maximum residual depth of 1.62 ft. Two juvenile trout and twenty-seven juvenile Coho Salmon were observed (Table 22).

Table 22. Brandon Gulch Coho Stream Habitat Enhancement Project pre-treatment snorkel validation survey data.

No. of Units Surveyed	Avg Unit Area (ft²)	SE (ft²)	Avg Max Residual Depth (ft)	SE (ft)	*O. mykiss* observations	Density fish/ft²	SE	*O. kisutch observations*	Density fish/ft²	SE
5	280.31	64.37	1.62	0.08	2	0.0032	0.0021	27	0.14	0.0090

Q2210509 – Chimney Rock Creek Upslope and Instream Habitat Restoration Project (HI)

The project goal is to increase LW density by installing approximately 52 LW features within 1.7 miles of Chimney Rock Creek to restore salmonid habitat. It will also permanently decommission 3.5 miles of abandoned legacy streamside and riparian road to reduce sediment delivery by preventing approximately 11,721 cubic yards of eroded sediment from entering Chimney Rock Creek. Thirty-four individual sediment source delivery features, including 13 stream crossings and 20 potential fill failures, will be treated within the watershed.

Five pools were snorkeled on September 9, 2024. The total area surveyed was 1,629.2 ft², with an average unit area of 325.84 ft² and average maximum residual depth of 1.9 ft. Seventy-seven juvenile trout were observed (Table 23).

Table 23. Chimney Rock Creek Upslope and Instream Habitat Restoration Project pre-treatment snorkel validation survey data.

No. of Units Surveyed	Avg Unit Area (ft²)	SE (ft²)	Avg Max Residual Depth (ft)	SE (ft)	O. mykiss observations	Density fish/ft²	SE	O. kisutch observations	Density fish/ft²	SE
5	325.84	96.17	1.9	0.59	77	0.035	0.116	0	0	0

Q2210524 – Little Case Two Barrier Removal Project (FP)

The project will replace two existing culverts on Little Case Creek with bridges, allowing fish passage at all flows for all life stages to approximately one mile of spawning and rearing habitat for Coho Salmon, Chinook Salmon, and steelhead. Additionally, log and boulder structures will be added to provide habitat within the project area and promote long-term channel stability.

Five pools were snorkeled on May 22, 2024. The total area surveyed was 3,471.50 ft², with an average unit area of 694.30 ft² and average maximum residual depth of 3.94 ft. Eighty-seven juvenile trout and fifty-seven juvenile Coho Salmon were observed (Table 24). All Coho Salmon were observed below the lower barrier, while trout were observed throughout, including above the upper barrier.

Table 24. Little Case Two Barrier Removal Project pre-treatment snorkel validation survey data.

No. of Units Surveyed	Avg Unit Area (ft²)	SE (ft²)	Avg Max Residual Depth (ft)	SE (ft)	O. mykiss observations	Density fish/ft²	SE	O. kisutch observations	Density fish/ft²	SE
5	694.30	255.32	3.94	0.97	87	0.025	0.016	57	0.016	0.007

Q2210526 – Lindsay Creek Coho Barrier Removal Project (FP)

The project goal is to remove two barriers to salmonid passage with a focus on Coho Salmon, by upgrading two culverted stream crossings, one on Lindsay Creek and one on a tributary of Lindsay Creek (Crystal Creek). This will restore year-round unimpeded access to anadromous rearing and spawning habitat for juvenile and adult Coho Salmon in both creeks, including approximately one mile in mainstem Lindsay Creek and 0.33 miles on Crystal Creek.

Five pools were snorkeled on May 21, 2024. The total area surveyed was 891.20 ft², with an average unit area of 178.24 ft² and average maximum residual depth of 1.50 ft. Six juvenile trout and 13 juvenile Coho Salmon were observed above and below the lower barrier (Table 25). No pools were snorkeled above the upper barrier due to inadequate water.

Table 25. Lindsay Creek Coho Barrier Removal Project pre-treatment snorkel validation survey data.

No. of Units Surveyed	Avg Unit Area (ft²)	SE (ft²)	Avg Max Residual Depth (ft)	SE (ft)	*O. mykiss* observations	Density fish/ft²	SE	*O. kisutch* observations	Density fish/ft²	SE
5	178.24	53.51	1.50	0.483	6	0.007	0.002	13	0.015	0.003

Q2240402 – Bradley (Ringer) Cachagua Creek Fish Passage Project (FP)

The project will replace a concrete low flow crossing with a free span, low deck bridge to open access for steelhead to over ten miles of spawning and rearing habitat in Cachagua Creek. The proposed bridge will allow the full range of design fish passage flows to pass beneath the structure. Channel reconstruction will include excavation of approximately 255 linear ft of channel, mostly upstream of the existing ford, to remove the profile discontinuity created by the aggradation upstream of the existing ford.

Five pools were snorkeled on June 6, 2024. The total area surveyed was 1,817 ft², with an average unit area of 363.4 ft² and average maximum residual depth of 1.26 ft. There was a total of 176 juvenile trout observations.

Ninety-eight juvenile trout were observed below the existing low flow concrete crossing and 78 juvenile trout above (Table 26).

Table 26. Bradley (Ringer) Cachagua Creek Fish Passage Project pre-treatment snorkel validation survey data.

No. of Units Surveyed	Avg Unit Area (ft²)	SE (ft²)	Avg Max Residual Depth (ft)	SE (ft)	*O. mykiss* observations	Density fish/ft²	SE
5	363.40	60.58	1.26	0.254	176	0.097	0.023

Post-treatment Snorkel Survey Observations

The following projects received post-treatment snorkel validation monitoring in 2024:

- Q1910506 – Morrison Creek Tributary Barrier Removal
- Q1940404 – Potrero Creek Fish Project - Carmel Valley Athletic Club, Carmel Valley
- Q2010505 – Somerville Creek Instream Restoration Project
- Q2010506 – Sproul Creek Salmonid Habitat Restoration Project

Q1910506 – Morrison Creek Tributary Barrier Removal Project (FP)

The project goal was to improve upstream fish passage for adult and juvenile Coho Salmon and reduce sediment delivery to Morrison Creek. One undersized culvert and a nearby abandoned overflow culvert were replaced with a single 30-foot span prefabricated bridge with a natural channel bottom.

Five pools were snorkeled on April 16, 2024. The total area surveyed was 497 ft², with an average unit area of 99.4 ft² and average maximum residual depth of 0.85 ft. A total of 14 juvenile Coho Salmon and one juvenile trout were observed, of which six Coho Salmon were above the former barrier (Table 27).

Table 27. Morrison Creek Tributary Barrier Removal Project post-treatment snorkel validation survey data.

No. of Units Surveyed	Avg Unit Area (ft²)	SE (ft²)	Avg Max Residual Depth (ft)	SE (ft)	O. mykiss observations	Density fish/ft²	SE	O. kisutch observations	Density fish/ft²	SE
5	99.4	10.58	0.85	0.15	14	0.028	0.008	1	0.002	0.002

Q1940404 – Potrero Creek Fish Passage Project – Carmel Valley Athletic Club (FP)

The project goal was to provide fish passage and improve flood conveyance while maintaining safe vehicle access across Potrero Creek to existing commercial facilities. Two corrugated metal culverts and concrete aprons were replaced with a single arched culvert approximately 23 ft long with a 12 x 8 ft span to provide a 16 ft roadway width. The culvert bottom was embedded approximately 3.5 ft and native streambed material created a natural channel bottom providing fish passage akin to adjoining channel reaches.

Four pools were snorkeled on June 5, 2024. The total area surveyed was 267 ft², with an average unit area of 66.75 ft² and average maximum residual depth of 0.93 ft. Through all pools a total of 25 juvenile trout were observed (Table 28).

Table 28. Potrero Creek Fish Passage Project post-treatment snorkel validation survey data.

No. of Units Surveyed	Avg Unit Area (ft²)	SE (ft²)	Avg Max Residual Depth (ft)	SE (ft)	O. mykiss observations	Density fish/ft²	SE
4	66.75	11.59	0.93	0.09	25	0.094	0.033

Q2010505 – Somerville Creek Instream Restoration Project (HI)

This project goal was to improve the quality and quantity of Coho Salmon spawning and rearing habitat via installation of 28 instream structures containing 131 pieces of LW, including 19 with rootwads, in 0.7 miles of Somerville Creek. The structures will increase floodplain and side channel inundation, provide refugia for migrating salmonids, and promote large and small wood recruitment.

Four pools were snorkeled on May 29, 2024. The total area surveyed was 939.15 ft², with an average unit area of 234.79 ft² and average maximum residual depth of 1.18 ft. A total of five juvenile Coho Salmon and 11 juvenile trout were observed (Table 29).

Table 29. Somerville Creek Instream Restoration Project post-treatment snorkel validation survey data.

No. of Units Surveyed	Avg Unit Area (ft²)	SE (ft²)	Avg Max Residual Depth (ft)	SE (ft)	*O. mykiss* observations	Density fish/ft²	SE	*O. kisutch observations*	Density fish/ft²	SE
4	234.79	82.51	1.18	0.266	11	0.012	0.008	5	0.005	0.003

Q2010506 – Sproul Creek Salmonid Habitat Restoration Project (HI)

The project goal was to improve the habitat quality and quantity available to salmonids in Sproul Creek by installing 72 LW structures. The LW features will increase floodplain frequency, side channel inundation, velocity refugia, pool depths and shelter, and substrate aggradation.

Four pools were snorkeled on June 17, 2024. The total area surveyed was 11,874.40 ft², with an average unit area of 2374.88 ft² and average maximum residual depth of 4.34 ft. A total of 127 juvenile Coho Salmon and 43 juvenile trout were observed (Table 30).

Table 30. Sproul Creek Salmonid Habitat Restoration Project post-treatment snorkel validation survey data.

No. of Units Surveyed	Avg Unit Area (ft²)	SE (ft²)	Avg Max Residual Depth (ft)	SE (ft)	*O. mykiss* observations	Density fish/ft²	SE	*O. kisutch observations*	Density fish/ft²	SE
5	2374.88	960.49	4.34	0.637	43	0.004	0.001	127	0.011	0.002

BACI Snorkel Survey Observations

The following projects received post-treatment BACI snorkel monitoring in 2024:

- P1310309 – Olds Creek Coho Habitat Barrier Removal Project
- P1210311 – Ramon Creek Sediment Reduction and Instream Enhancement Project

P1310309 – Olds Creek Coho Habitat Barrier Removal Project (FP)

This project removed remnants of an eleven-foot-tall flashboard dam in Olds Creek that spanned the channel 620 ft upstream of the Noyo River confluence and was a total barrier to juvenile salmonids and a partial barrier to adult salmonids. The dam played an active role at the former Union Lumber Company mill from approximately 1908 until 1928, when fire destroyed the mill and much of the mill town of Irmulco. The dam extended four to six ft above the water surface during summer months with an estimated 500 cubic yards of gravel and fine sediments behind it. Habitat upstream remained accessible to steelhead trout most years during high flow events.

An additional instream habitat restoration project added LW features to Olds Creek between 2016 and 2019. The project added 48 features using 116 pieces of LW within 1.13 miles of the stream. The project goal was to increase the quality and quantity of salmonid rearing habitat by providing cover, increasing pool depth and frequency, and sorting and collecting spawning gravels. The LW was also designed to create velocity refugia during peak winter flows for juvenile and migrating adult salmonids.

The year ten BACI post-treatment juvenile snorkel survey was completed July 2, 2024. The survey area consists of three reaches approximately 500 ft in length, one control reach and two treatment reaches (upper and lower). The control reach is located upstream of the treatment reaches. Unfortunately, LW structures were built in the control reach after initiation of the BACI study, so the control reach did get some treatment. Four pools were snorkeled in the control reach and 12 within the treatment reaches. The total area surveyed in the control reach was 4,748 ft², with an average unit area of 1,187 ft² and average maximum residual depth of 3.0875 ft. The total area surveyed in the treatment reaches was 6,456.50 ft², with an average unit area of 538.05 ft² and

average maximum residual depth of 2.52 ft. Overall juvenile trout numbers were lower, and Coho Salmon densities were higher in the treatment reaches (Table 31).

Table 31. Olds Creek Coho Habitat Barrier Removal Project BACI, year ten post-treatment snorkel survey results from 2024.

Reach	No. of Units Surveyed	Avg Unit Area (ft²)	SE (ft²)	Avg Max Residual Depth (ft)	SE (ft)	*O. mykiss* observations	Density fish/ft²	SE	*O. kisutch* observations	Density fish/ft²	SE
Control	4	1187	426.19	3.0875	0.38	28	0.0081	0.0025	84	0.20	0.0031
Treatment	12	538.042	77.42	2.517	0.23	38	0.0071	0.0017	220	0.38	0.0052

P1210311 – Ramon Creek Sediment Reduction and Instream Enhancement Project (HI)

A total of 57 LW features were installed using 127 pieces of LW within 2.5 miles of Ramon Creek. The LW features were placed to improve instream habitat for salmonids by increasing shelter and enhancing complexity within the stream channel. The upslope component of this project decommissioned 6.9 miles of streamside road to prevent over 12,000 cubic yards of sediment from entering the stream. Fifty-nine sediment source sites were treated within 2.62 acres of upslope habitat, including 37 stream crossings and 22 road slides.

The year ten BACI post-treatment juvenile snorkel survey was completed July 1, 2024. Four pools were snorkeled in both the treatment and control reaches. The total area surveyed in the control reach was 884.46 ft², with an average unit area of 221.12 ft² and average maximum residual depth of 1.18 ft. The total area surveyed in the treatment reach was 8.69 ft², with an average unit area of 217.25 ft² and average maximum residual depth of

1.37 ft. Total salmonid observations were higher in the control reach (16 juvenile trout and 26 juvenile Coho Salmon) than the treatment reach (16 juvenile trout and 16 juvenile Coho Salmon; Table 32).

Table 32. Ramon Creek Sediment Reduction and Instream Enhancement Project BACI, year ten post-treatment snorkel survey results from 2024.

Reach	No. of Units Surveyed	Avg Unit Area (ft²)	SE (ft²)	Avg Max Residual Depth (ft)	SE (ft)	O. mykiss observations	Density fish/ft²	SE	O. kisutch observations	Density fish/ft²	SE
Control	4	221.12	30.35	1.18	0.15	16	0.020	0.0048	26	0.030	0.0072
Treatment	4	217.25	51.07	1.37	0.28	16	0.16	0.0056	16	0.018	0.0039

Minnow Trapping Survey Observations

Two projects received pre-treatment minnow trapping surveys in 2024:

- Q2110514 – Ryan Creek Off-channel Coho Habitat Implementation Project
- Q2310502 – Neefus Gulch Fish Passage Improvement (Phase II), Earthen Dam Barrier Removal

Q2110514 – Ryan Creek Off-channel Coho Habitat Implementation Project (HI)

This project will improve connectivity to and enhance an existing 0.5 acre perennial on-stream pond and construct a large off-channel alcove. The pond and alcove will provide non-natal winter high flow refugia and rearing habitat for Coho Salmon. In addition, 18 LW features will be constructed along 1,600 ft of mainstem Ryan Creek.

On March 14, 2024, nine minnow traps were set in various locations within the project area for approximately two hours. Four traps were set in the off-channel pond, one at the pond's outlet, one in the right bank alcove to Ryan Creek, two in Ryan Creek, one upstream and one downstream of the alcove outlet and the last in a small tributary. No salmonids were trapped. Nine Three-Spined stickleback (*Gasterosteus aculeatus*) and three California newts (*Taricha torosa*) were trapped in the off-channel pond (Table 33).

Table 33. Ryan Creek Off-channel Coho Habitat Implementation Project pre-treatment minnow trapping survey results.

Number of Traps Set	*O. mykiss* observations	*O. kisutch* observations	*G. aculeatus*	*T. torosa*
9	0	0	9	3

Q2310502 – Neefus Gulch Fish Passage Improvement (Phase II), Earthen Dam Barrier Removal (FP)

This project will remove an earthen dam and associated spillway and restore approximately 1,600 ft of the historical stream channel upstream of the dam. LW will be placed in the restored stream channel to maintain grade control and force geomorphic features. Two tributaries flowing into the project area will have their natural drainage restored and will be lined with course substrate. An existing cross-drain that relieves road drainage from Appian Way will be replaced and the parking area will be gravel surfaced. Revegetation will occur along the channel banks.

On June 25, 2024, three minnow traps were set downstream of the barrier in three pools with adequate depth (1.5 ft) for 3.5 hours but only captured two Pacific giant salamanders *Dicamptodon tenebrosus* (Table 34). Above the barrier dewatering had already begun and there was not enough water to set traps upstream. Ross Taylor and Associates conducted dewatering and relocation on Neefus Gulch in preparation for construction. They found no salmonids above the barrier, but a single juvenile steelhead was captured at the confluence of the spillway and natural channel downstream of the barrier (Herrera and Halligan 2024). This was likely one of the same pool units sampled by MESHR.

Table 34. Neefus Gulch Fish Passage Improvement (Phase II), Earthen Dam Barrier Removal Project pre-treatment minnow trapping survey results.

Number of Traps Set	O. mykiss observations	O. kisutch observations	D. tenebrosus
3	0	0	2

One project received a post-treatment winter validation minnow trapping survey in 2023:

• P1510523 – Fish Passage Improvement at South Fortuna Boulevard

P1510523 – Fish Passage Improvement at South Fortuna Boulevard (FP)

An existing culvert was retrofitted with a notched bottom and a forty-foot roughened rock chute was added below the culvert. Fish passage was enhanced during low and high flows which provides access to 10.95 miles of historical habitat for Coho Salmon.

Four minnow traps were placed around the crossing, one above and three below. The only fish captured were two freshwater sculpin (*Cottus* sp.), one in each of two traps below the crossing (Table 35).

Table 35. Fish Passage Improvement at South Fortuna Boulevard post-treatment minnow trapping survey results.

Number of Traps Set	O. mykiss observations	O. kisutch observations	Cottus sp.
4	0	0	2

Adult Spawning Survey Observations

One project received adult spawning surveys in 2024:

- Q2210524 – Little Case Two Barrier Removal Project

Q2210524 – Little Case Two Barrier Removal Project (FP)

A total of 2,884 ft of stream channel was surveyed on December 19, 2024, starting below the former lower barrier and continuing approximately 1,500 ft above the former upper barrier. Water visibility was excellent and potential spawning habitat was evident throughout but live fish, carcasses, or redds were not observed (Table 36).

Table 36. Adult spawning survey observations from barrier removal projects sites conducted in 2024.

Project Title	Reach Length (ft)	Live Fish	Carcass	Redds
Little Case Two Barrier Removal Project	2,884	0	0	0

Discussion

Pre-treatment validation monitoring is essential to document baseline salmonid presence and density prior to restoration to compare it to post-treatment data. However, small changes in fish density from individual surveys can be due to daily, seasonal, or annual variability in fish relative abundance in a particular stream or stream reach. Larger sample sizes over a longer period are necessary for statistical analyses to determine if variability in fish densities is significant. MESHR conducts pre- and post-treatment validation surveys under as similar conditions as possible (e.g., flow, temperature, visibility, or seasonal redistribution of salmonids) given crew and construction scheduling to reduce potential variability in fish densities; however, pre-treatment monitoring receives priority in scheduling due to implementation deadlines. Additional factors may also affect salmonid distribution.

Documenting fish response to barrier removal or modification using spawner surveys is more informative for complete barrier removals than for partial or temporal barrier modifications or LW addition projects.

Re-colonization of habitat above former barriers by adult anadromous salmonids typically occurs within one to five years after barrier removal (Anderson and Quinn 2007, Kiffney et al. 2008, and Pess 2009). Success of validation spawner surveys depend on 1) availability of suitable spawning habitat above a former barrier, 2) discovery of this habitat by

spawners, 3) overlap of run timing with time of spawner surveys, and 4) annual variability of run size and spawner distribution. All are important considerations when evaluating spawner survey data, particularly when sample sizes remain low in the first years after implementation. No evidence of fish above a barrier at pre-treatment followed by observed fish upstream after barrier removal suggests new habitat was opened by the project. However, confidence in re-occupation above the barrier would increase with more surveys during both pre- and post-treatment monitoring.

One fish passage improvement proved successful during post-treatment validation monitoring. In early spring 2024, snorkel validation on the Morrison Creek Tributary Barrier Removal Project found juvenile Coho Salmon for the first time above the former barrier, an undersized culvert.

Effects and Benefits Discussion

Fish relocation activities were conducted on nine implementation projects in 2024. A total of 1,511 salmonids were captured, including two CC Chinook Salmon, 44 SONCC Coho Salmon, 268 NC steelhead, and 1,197 CCC steelhead. Mortalities were limited to two NC steelhead (0.75% of captured) and 29 CCC steelhead (2.42% of captured). No juvenile salmonids were captured, handled, or tagged during project effectiveness monitoring. A total of 1,126 juvenile salmonids were observed during snorkel surveys and no negative fish response was observed. Across all projects 11,192 ft of aquatic habitat was disturbed by implementation construction activities.

These short-term effects will result in long-term benefits. For example, 330 instream structures were constructed within the stream channel. Seven culverts were replaced or repaired, restoring access to 1.87 miles of previously unoccupied salmonid habitat. Over 1.3 acres of off-channel habitat features were enhanced or created and approximately 2.3 miles of road was decommissioned. Validation and BACI surveys provided data to guide future restoration.

Brief case study reports that summarize project objectives and outcomes following post-treatment effectiveness and validation monitoring are made annually. Case studies for 2024 are presented in a separate file titled *Appendix_7_Case_Studies_RGP12_2024.pdf* submitted with this report and will be added to past projects on the CalFish website.

Bio-engineering

The BO (section 2.5.6.1.8) requires CDFW to report to NMFS on all projects that use bio-engineered bank stabilization methods. For each project that includes application of bio-engineering, the length of bio-engineered streambank restored per project must be less than three times the active channel width of that project.

Four projects reported using bio-engineering methods in 2024:

- Little Case Two Barrier Removal Project (28 ft of bio-engineered streambank, 15 ft active channel width).
- Red Bank Off-Channel Fisheries and Riparian Habitat Enhancement Project (653 ft bio-engineered streambank, 25 ft active channel width).
- Lower Stotenburg Coho Habitat Enhancement Project (848 ft bio-engineered streambank, 10 ft active channel width).
- Neefus Gulch Fish Passage Improvement (Phase II), Earthen Dam Barrier Removal (2100 ft bio-engineered streambank, 8 ft active channel width).

Three of the four projects reported lengths of bio-engineered streambank restored that exceeded three times the active channel width: Red Bank Off-Channel Fisheries and Riparian Habitat Enhancement Project, Lower Stotenburg Coho Habitat Enhancement Project, and Neefus Gulch Fish Passage Improvement (Phase II), Earthen Dam Barrier Removal.

The bio-engineering extent of take threshold was added to the BO May 8, 2023. The three projects that inadvertently exceeded the threshold were solicited in 2022 and 2023. Regrettably we did not update our processes sufficiently to alert us to the potential for the bio-engineering take exceedance in these projects. Now that this issue has come to light, a process to evaluate proposals and inclusion of projects in programmatic permits will be created to prevent bio-engineering exceedance moving forward.

<u>Variances</u>

The BO (section 1.1.1.4) requires CDFW to provide NMFS with a narrative description of any requested variances from the limitations described in the Proposed Action and their resolution. Two projects requested for variance in 2024:

- Q2310502 Neefus Gulch Fish Passage Improvement (Phase II), Earthen Dam Barrier Removal – requested to begin dewatering the pond above the barrier slated for removal prior to June 15, 2024, and as early as June 1, 2024. The earlier start allowed removal of species from the pond above the dam while water quality conditions were more suitable to minimize stress on aquatic species during dewatering and relocation. The water above the dam was also rerouted downstream of the barrier and improved water quality (dissolved oxygen, temperature) also benefitted downstream species.

- Q2210507 Upper Tryon Creek Restoration Project, Phase 2 – requested to begin fish relocation prior to the start date of June 15, 2024, and as early as June 11, 2024. No change was requested on the date of June 15, 2024, to begin dewatering. The

earlier relocation start date was to accommodate the availability of required staff and equipment.

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