Red Bank Off-Channel Fisheries and Riparian Habitat Enhancement Project

2024 Annual Monitoring Memorandum

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Contents

All photos are credited to Salmon River Restoration Council, unless otherwise noted.

I. Background and Introduction

The Red Bank project area is located along the North Fork Salmon River, about 7.5 river miles upstream of its confluence with the South Fork Salmon River near Forks of Salmon, California. The entire project area is located on United States Forest Service (USFS) lands, within the Klamath National Forest.

The purpose of this project is to increase the abundance of complex off-channel habitat for coho salmon, spring-run Chinook, and other salmonids by providing both winter high flow and summer thermal refugia. The SONCC Coho Recovery Plan states that summertime temperatures and lack of winter rearing habitat are the greatest stressors for juvenile coho in the Salmon River and enhancing such areas is the highest priority for recovery (NMFS 2014). This project will address four critical elements of long-term restoration and maintenance of both water quality and fish habitat on the Salmon River: 1) the restoration of side channel habitat where migrating smolts can take refuge from the strong hydraulics of the main channel, increasing winter rearing habitat for juveniles; 2) access to over-summer rearing habitat through pool development; 3) restoring riparian vegetation that provides shade and subsequent cooler water temperatures during warm summer/fall months and future large woody debris recruitment; and 4) restoring large woody debris into barren side channels to provide increased cover and rearing habitat for adult and juvenile salmonids.

Due to a combination of factors, including simplification and fragmentation of habitat, coho and spring-run Chinook populations are declining on the Salmon River. The Salmon River Floodplain Habitat Enhancement and Mine Tailing Remediation Project Phase 1: Technical Analysis of Opportunities and Constraints, identifies the site as a high priority for treatment in order to enhance the long-term viability of fluvial processes and fisheries on the Salmon River (Stillwater 2018). The Salmon River Restoration Council identified the Red Bank riverbar as a high priority for riparian salmonid habitat restoration (SRRC 2008).

The Red Bank riverbar is located within a reach of the North Fork Salmon River that is a key coho and spring-run Chinook salmon spawning reach on a river with limited potential for these species. The low gradient of this reach of the river makes it preferred habitat for these salmon; for both spawning and rearing. The Salmon River Restoration Council and the Karuk Tribe have observed juvenile and spawning spring-run Chinook in the project area. Coho salmon spawning has been observed in the project vicinity, as well as juvenile coho in nearby tributaries.

Within the project area, much of the alluvial bar has been degraded by historical placer gold mining and dredging. Prior to restoration implementation, he Red Bank riverbar consisted of a poorly vegetated, large alluvial floodplain with one discontinuous, generally plane-bed primary side channel, several discontinuous generally plane-bed high-flow secondary side channels, and vegetated alluvial terraces. On the upstream end of the alluvial bar, the primary side channel and portions of the high-flow side channels are very poorly vegetated, all channels are dry throughout the late summer and fall. Lower on the bar, those channels converge into a generally plane-bed single channel and riparian vegetation becomes more prolific as the channel becomes perennial due to cool groundwater seeps. The existing side channel complex is currently active

during moderate to high flows, which provides limited seasonal habitat value and is lacking habitat complexity for juvenile salmonids. These off-channel areas are currently considered marginal habitat for coho, spring-run Chinook, and other salmonids and are in need of enhancement.

Thus far, Red Bank project implementation has occurred over two construction seasons. In the following report these two periods are referred to as phase one and phase two of construction or implementation seasons one and two. The duration of the first construction season, or phase one, was from July 31st – September 26th 2023. The second construction season, or phase two, occurred from July 16th – August 26th, 2024. The monitoring findings presented in this report encompass the calendar year of 2024. Therefore, the observations herein reflect monitoring results from the interim period between construction season one and season two, from January 1st, 2024 – July 16th, 2024. Monitoring resumed at the close of construction season two, and the data collected from August 26th – December 31st, 2024 is also presented. See the Interim and Final As-Built Plans for construction details.

***Image 1**: Aerial of the project area pre-implementation, February 2016. Credit: Scott Harding and Whelan Gilkerson.*

***Image 2**: Aerial of the project area between phase one and two of implementation, October 2023. Credit: Mike Love & Associates (MLA). See the Interim and Final As-Built Plans for construction details. A final project map is forthcoming.*

***Image 3**: Aerial of the project area post-phase two of implementation, October 2024. Credit: Mike Love & Associates (MLA). See the Interim and Final As-Built Plans for construction details. A final project map is forthcoming.*

II. Project Goals and Objectives

The purpose of the project is to increase the abundance of complex off-channel rearing habitat with high intrinsic potential for year-round rearing of juvenile salmonids by providing both high-flow and thermal refugia. Objectives include:

1. Enhance and increase the area of perennial groundwater-fed pools in the lower portion of the primary side channel for thermal refugia;
2. Increase in-channel bed complexity using large wood features to maintain pool habitat that supports thermal refugia, provides high-flow velocity refugia, and sorts gravel and substrate to increase habitat diversity;
3. Create self-sustaining alcoves for high-flow off-channel refugia;
4. Create large wood complexity in off-channel habitats;
5. Enhance riparian vegetation and shading across the site to reduce water and air temperatures and increase biodiversity and habitat complexity;
6. Minimize removal of large riparian vegetation; and
7. Use native and salvaged materials.

Habitat enhancement includes increasing habitat complexity in the riverbar side channels, creating high-flow backwaters and alcoves, and revegetating the Red Bank riverbar on the North Fork Salmon River. Enhancement methods at Red Bank include multi-log structures, boulder clusters, brush baffles (i.e., excavated trenches filled with wood and slash), harvesting selected trees onsite for habitat features, and extensive revegetation.

***Image 4 (above)**: Lower Primary Side Channel or Perennial Channel, before construction, August 2023.*

Image 5 (above): *The partially restored Lower Primary Side Channel, post-phase one implementation. August 2023.*

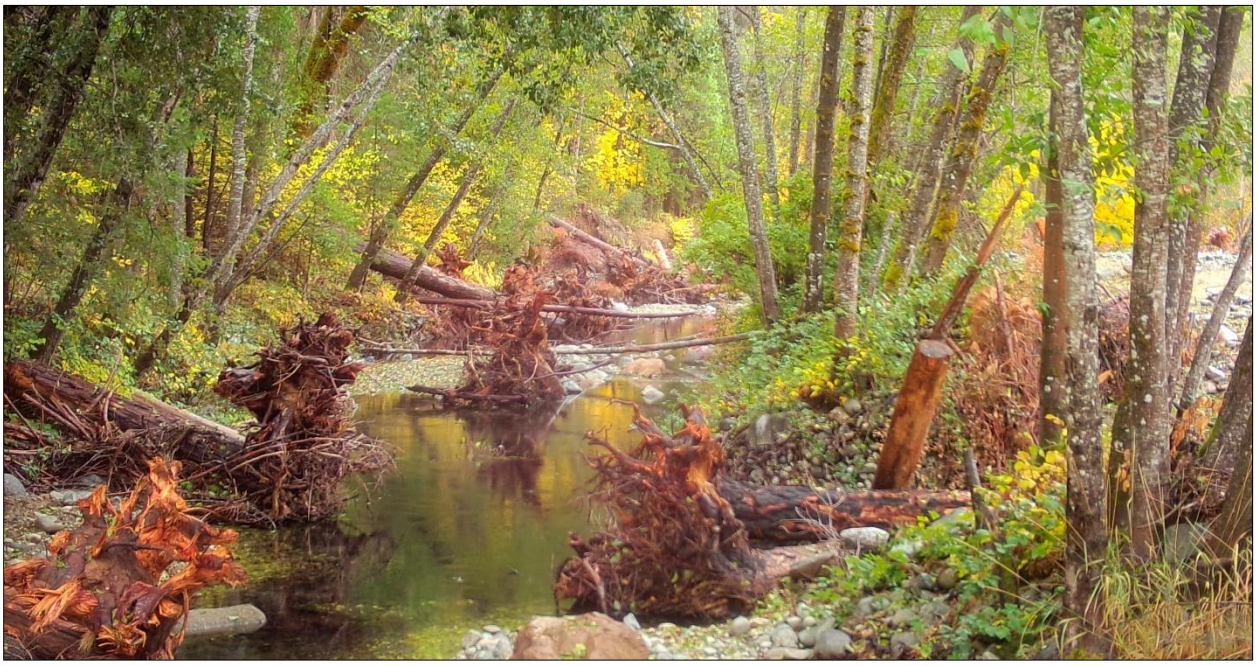


Image 6 (above): *The restored Lower Primary Side Channel, post-phase two implementation. November 2024.*

Image 7 (above): *Constructing/restoring the Lower Primary Side Channel. August 2023.*

III. Monitoring Methods

Note: *Detailed methods are included in the Red Bank Habitat Enhancement Project Monitoring and Maintenance Plan (SRRC 2024b). See the Interim and Final As-Built Plans for construction details.*

Restoration effectiveness will be evaluated through a pre- and post-implementation intensive monitoring effort, including changes to fish habitat (winter and summer refugia and temperature), fish observations (salmonids), avian observations, natural vegetative recruitment, revegetation success, and non-native invasive species (priority noxious weeds). Post-implementation monitoring is currently funded through March 2026.

Following the intensive monitoring effort, the schedule for additional monitoring will be re-evaluated as necessary to determine optimum monitoring schedules and techniques. At minimum, annual inspections will be completed. The SRRC is committed to monitoring Red Bank for the life of the project.

Interim As-Built surveys were completed by MLA in October 2023. Final As-Built surveys were completed by MLA in October 2024. The off-channel habitat created by this project is intended to be self-maintaining. However, there may be unforeseen conditions that warrant maintenance or modifications to the project site. In the event that items of concern arise, SRRC will consult with appropriate resource agencies, including CDFW, USFS, and USFWS to determine what action, if any, is warranted.

Physical Monitoring:

As-Built Plans

Record drawings, or As-Built Plans, were prepared by MLA, the project engineers, for the project in April 2024 and April 2025. These were both prepared using the construction plans and denote where construction activities deviated from the design plans or where additional features are located. Survey benchmarks have been established to permit follow-up monitoring surveys.

Annual Inspection

Annual inspections by SRRC are conducted at the beginning of the summer after high spring flows have subsided. Inspections include visual observation for any potential erosion, sedimentation, stability of log structures, revegetation success, and non-native plant species encroachment.

Photomonitoring

Photomonitoring is conducted by SRRC to document physical and vegetative response to the project and identify any issues of concern that may require maintenance. Photopoints were established as part of pre-construction activities, from established locations and are located with a GPS to ensure consistent and comparable views (see Attachment 1). During the first two years after construction, photomonitoring will be conducted twice a year: once during leaf-off and during leaf-on. If funding allows, a third year of full photomonitoring will occur post-implementation. Areas of revegetation will have post-implementation photopoint monitoring on an annual basis in early summer. *The Photo Point Monitoring Handbook, General Technical Report PNW-GTR-526* (Hall 2002), is used as a guide to conduct photomonitoring. Additional photos will be taken during notable flow events. Observed changes at each site will be noted in this report, with particular focus on:

- Geomorphic change,
- Functionality and stability of log structures,
- Sedimentation patterns within the pools and alcoves,
- Overall bank stability along the restored channels,
- Natural regeneration of native vegetation,
- Overall revegetation plant success,
- Encroachment into the project area by invasive vegetation.

Survey of Hydraulic Features

As part of the second year of post implementation monitoring, MLA will perform a combination of photogrammetry and RTK/GNSS and total-station surveys to obtain a georectified aerial photogram and derive a DEM of the project area. Vegetation will be partially removed from the photogrammetry using the sufficient to evaluate ground elevations using Pix4Dmatic software.

The second-year DEM will be compared to the as-built DEM to evaluate changes in project area topography and changes to large wood and other project features. These changes will be field validated.

MLA will document changes to the project area in a Second-Year Topographic Assessment Memorandum that will be referenced in the second SRRC Annual Monitoring Memorandum. The MLA memorandum will include dates and flows of large flow events that occurred during the monitoring period, select profiles and/or cross sections where changes occurred, a discussion of changes to large wood and backwater features, maintenance needs, and lessons learned.

Additional Longitudinal Profiles and Cross Sections will be conducted by SRRC if changes in the channel morphology are observed within two years after implementation in the restored channel. If funding allows and circumstances necessitate, a third year of surveys will occur post-implementation. Surveys will be conducted during the dry season. The profiles will be used to evaluate changes to the channel and assess potential sedimentation.

Water Quality

Water monitoring will be used to evaluate when water conditions support fish passage and juvenile salmonid habitat. SRRC conducts continuous water temperature monitoring and additional water temperature monitoring on a monthly basis in the Red Bank project area and in the North Fork Salmon River. Monitoring staff also measure flows, and alcove/ critical pool water depths as requested by project engineers. At the end of the three-year monitoring period, a re-evaluation will be made to determine optimum monitoring schedules and techniques for the life of the project. Monitoring will be conducted only when it is safe and feasible to do so.

Biological Monitoring:

Fisheries

SRRC has been surveying anadromous fish in the project area for over 30 years. SRRC initiated project-specific fisheries monitoring one year prior to implementation to provide baseline conditions for comparison to post-implementation conditions. SRRC conducts monthly post-implementation fisheries monitoring throughout the project site according to protocols specified in *CDFW California Salmonid Stream Habitat Restoration Manual, Part IV. Fish Sampling Methods* (Flosi et al.,1998) and *Salmonid Field Protocols Handbook: Techniques for Assessing Status and Trends in Salmon and Trout Populations* (Johnson 2007). Presence/absence surveys of juvenile and adult coho salmon, Chinook salmon, and steelhead/rainbow trout (*Oncorhynchus mykiss),* will be conducted each month after implementation, conditions permitting, for two years. If funding allows, a third year of full fisheries surveys will occur post-implementation. Surveys include the Red Bank side channel complex and proximal North Fork Salmon River to establish understanding of spatial and temporal occupancy of salmonids in the vicinity of the project area. Monitoring will be conducted only when it is safe and feasible to do so; for example, snorkel surveys within the main channel will likely be limited to May through November.

Vegetation

Inspection of revegetation measures will include the condition of streambank erosion control measures, numeric survival by species, and overall qualitative health and vigor of revegetation and natural recruitment. Revegetation survival in Enhanced Planting Areas (EPAs), brush baffles, emergent plantings, and natural recruitment will be evaluated on an annual basis. SRRC will monitor erosion and vegetation for two years post-implementation, at which point the need for continued monitoring will be assessed. If funding allows, a third year of full vegetation surveys will occur post-implementation. Due to site conditions, vegetation is expected to be difficult to establish. Encroachment of non-native species will be noted and recorded. If priority noxious weeds, such as the Class-A species spotted knapweed (*Centaurea stoebe)*, begin growing within the project area, the vegetation will be treated by SRRC prior to seed set.

Avian

Klamath Bird Observatory (KBO) is partnering with SRRC, using standardized bird monitoring techniques to describe bird and habitat metrics (avian diversity, territory density, reproductive indices, and vegetation characteristics). In 2018 and 2019 pre-implementation avian spot-mapping and vegetation were conducted by KBO, with additional surveys at this site and elsewhere on the North Fork in 2020 (See Attachment 4). Avian monitoring data will be used as metrics of habitat quality and ecosystem function (ecological indicators), to advance efforts to measure benefits of restoration and identify opportunities for improvement in restoration methods. By studying a suite of bird species' responses to habitat change, we can quantify whether or not land management has reached its desired condition. Two years of post-implementation monitoring will be conducted five years following implementation (in 2029) in order to allow for vegetation changes to influence avian use of the site.

IV. Monitoring Findings

Summary of Findings

Interim post-implementation monitoring began in September 2023 and ended July 2024, which occurred between implementation seasons one and two. Post-implementation monitoring resumed in September 2024, following the second season of implementation. Winter 2023-2024 observations can be found in the Red Bank First Winter Observation Report (SRRC 2024c). The following report encompasses monitoring findings from the calendar year of 2024.

Hydrologic observations overview:

There has been improved hydraulic connection in the side channel complex (Objective 1). Segments of the side channel complex have activated at varied flow levels as designed, with associated alcoves offering slow water refugia during high flow events (Objective 3). During the monitoring year 2024 the Primary Side Channel conveyed water from January to June of 2024 and reengaged again from November to December 2024. The connection to the Far Side Channel

Channel was improved during phase two implementation and the channel engaged at lower flows than in the previous winter (2023-2024). The Perennial Channel, which is also referred to as the Lower Primary Side Channel, was wetted year round, though it naturally disconnected from the North Fork Salmon River from July until October. The Secondary Side Channel activated during both significant monitoring season flow events in 2024 at flows less than those determined during modeling (see Lessons Learned). Log structures throughout the site are functioning as intended, and are actively scouring, sorting gravels, and recruiting sediment (Objectives 2 & 4).

Fisheries observation overview:

Juvenile Chinook salmon were observed rearing throughout the enhanced Side Channels and in the backwaters when they were fully connected before outmigrating, between March and May. The enhanced perennial section of the Primary Side Channel provided cold water refugia for salmonids during summer months when river conditions were less favorable. Juvenile Chinook continued to occupy the Perennial Channel in June and July before relocation, as well as the enhanced refugia at the mouth of the Perennial Channel. Juvenile steelhead/rainbow trout were observed rearing in the project area between March and July (when relocation occurred), and returned to the enhanced project area from October to December. Juvenile salmonids were observed under cover provided by the enhanced log structures and willow baffles. Three adult steelhead were visually detected during spot checks in the enhanced project area, all of which were seen using refugia or cover during high flow conditions. Although adult salmonids were observed, safety concerns at these flow levels prevented surveyors from conducting full snorkel surveys. Eight Chinook redds were observed in the North Fork Salmon River adjacent to the project area. A total of ten steelhead redds were documented in the project are, seven in or adjacent to the Primary Side Channel alcove inlet, one in the Primary Side Channel, and two at the entrance to Backwater 5.

Vegetation observation overview:

Partial revegetation with native species has occurred within the Enhanced Planting Areas (EPAs), along the Primary, Far, Perennial, and Secondary Side Channels, within Backwaters 2-8 and the alcoves, and in areas of disturbance across the riverbar (Objectives 5 and 7). During phase one and two of construction live willow and cottonwood stakes were planted by the Contractors. SRRC carried out partial planting of native container plants post-phase one and post-phase two implementation, in Fall 2023 and Fall 2024. Survival surveys conducted in 2024 indicate that willow survival was poor. Revegetation survival from the 2023 planting effort within the EPAs was modest, but natural recruitment of native herbaceous species was notable. Although overall cover is still low, there were a number of native species that readily recruited to areas planted in 2024. Staff observed a significant decrease in plant survival and an increase in individuals with poor health between July 9th to September 19th, 2024, when subsequent revegetation survival surveys occurred. The most significant decreases in vigor were observed in the EPAs on the west side of the Primary Side Channel. The heat wave compounded the effects of the increased sun exposure on the west side of the Primary Side Channel. Survey findings indicate that these factors combined were responsible for the decreases in vigor observed. Broadcast seeding of native forb and grass species occurred in Fall 2023 and Fall 2024, to restore areas of disturbance. Germination from the Fall 2023 seeding effort was evaluated in 2024, and

was considered successful. Priority invasive plants are present within the project site, including spotted knapweed, yellow starthistle (*Centaurea solstitialis)*, and Dyer's woad (*Isatis tinctoria)*, but have received thorough manual and mechanical treatments for several years both pre-implementation and post-implementation. Hand treatments of one of three populations of yellow starthistle in the project area has yielded a notable absence this year in the infestation site. Additionally, mechanical treatment of Himalyan blackberry (*Rubus armeniacus)* was a component of construction in phase one and two. Equipment uprooted, pulled, and scraped blackberry throughout the site, with a focus in the Secondary Channel, while retaining the white alder canopy (Objective 6). The backberry was then spread in unvegetated areas on the open bar where it desiccated in the sun.

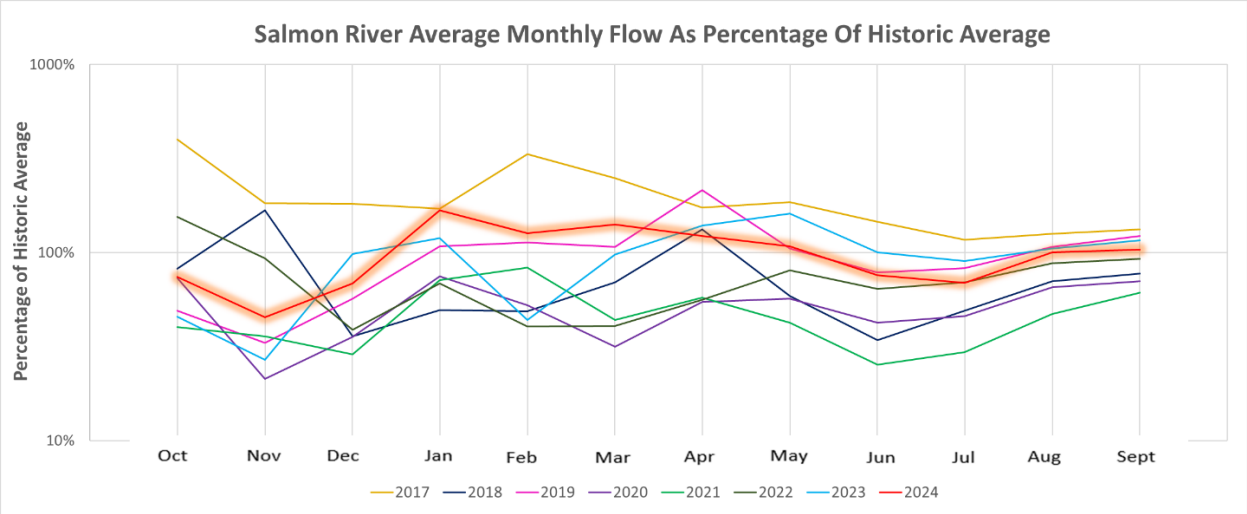


Figure 1: *Salmon River discharge as percentage of historic average.*

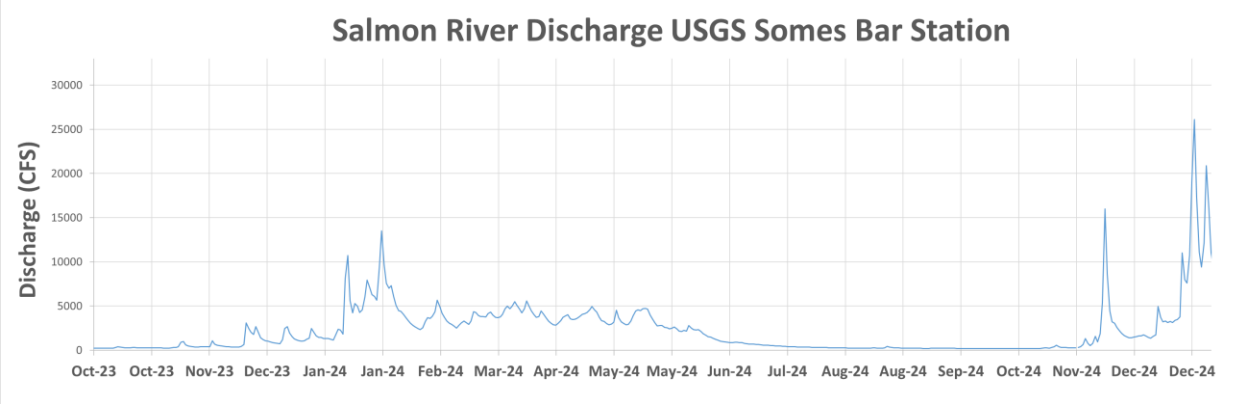


Figure 2: *Discharge in cubic feet per second (CFS) at Somes Bar USGS Station in Fall 2024 since phase two implementation.*

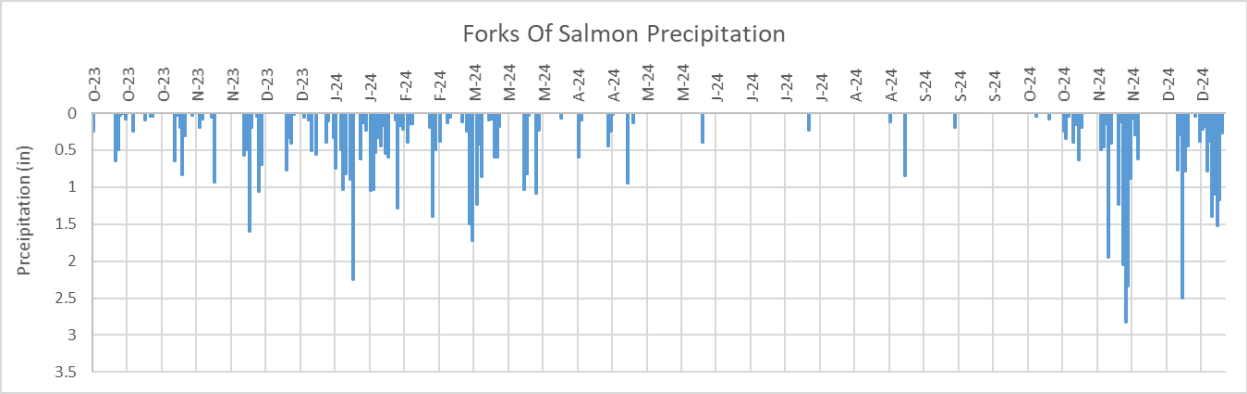


Figure 3: *Daily Precipitation in Forks of Salmon in Fall 2024 since phase two implementation.*

Image 8: *High flows on November 22nd, 2024 fully engaged project features and provided velocity refugia throughout the site. Aerial photo of the Primary Side Channel (on right) and the Far Side Channel (center) with Backwaters 4, 5, 6, 7, and 8 visible at approximately 20,900 CFS at the Salmon River gage on its descent after a peak of 21,700 CFS.*

***Image 9 (above)**: Image shows the enhanced mouth of the Primary Side Channel on February 27th, 2024.*

***Image 10 (above):** High flows on December 30th, 2024 engaged project features and provided velocity refugia throughout the site. Note the still water in the abutment jam alcove at center. Aerial photo at approximately 16,000 CFS at the Salmon River USGS gage.*

Physical Monitoring:

Physical Monitoring

Pre-Implementation

MLA established survey benchmarks to permit follow-up monitoring surveys. SRRC staff established 40 GPS-located photomonitoring sites prior to construction, collecting "leaf on" photos and "leaf off" photos for post implementation comparison. Additionally, an aerial image using a drone was taken on February 16th, 2016 (see Image 1).

As-Built Surveys

MLA completed an interim as-built survey in October 2023, at the conclusion of phase one. MLA completed final as-built surveys during October 2024And developed an As-Built Memorandum in May 2025 (MLA 2025). During implementation, MLA ensured that cuts and fills were managed properly with respect to corresponding mining claims during construction and that grading was completed to design specification. Additional surveys will be conducted after major flow events. See the Interim and Final As-Built Plans for construction details.

Annual Inspection

In June 2024, during the annual site inspection, post-phase one implementation, visual observations indicated that all project features were stable and in good condition, including engineered log jams, side channels, alcoves and backwaters. Most project features were are functioning as intended Log structures throughout the project area initiated scour, altering the channel morphology, which resulted in an increased pool frequency and depth, gravel sorting, and the deposition of fine sediment. The alcove adjacent to the abutment jam was not performing as intended at low flows, as the pool became disconnected from the channel and offered no thermal refugia. This was corrected during phase two of implementation by raising the elevation of the alcove bed so that it will activate primarily during winter high flow events and drains positively as flows lower. Notable observed sedimentation at the inlet to Backwater 4 was corrected during phase two of construction in 2024. Vegetation survival in enhanced planting areas was modest, despite the fact that these had only been partially planted out. Willow stake plantings appeared to have had poor success and survival of the emergent species planted along the perennial portion of the Primary Side Channel was limited.

Photomonitoring

Photomonitoring documented the integrity of project features, flow connectivity throughout the project, and will include enhanced planting area conditions. SRRC collected leaf-off and leaf on photos on a biannual basis at the 40 photo points in 2022, 2023, and 2024. Enhanced planting area photopoints will be added after revegetation concludes, in Fall 2025. Revegetation photo sets will be collected annually during the leaf-on period for two years post-completion. If funding allows, a third year of full photomonitoring will occur post-implementation. All photos will be shared upon request. Stationary game camera images were used to evaluate the timing of

the hydrologic connections between the constructed features and the river, see the following section for details. Continuous photomonitoring documented connectivity in the spring-fed lower portion of the channel as well as changes in connectivity at the enhanced creek mouth. Additionally, when feasible, photos were taken during the high flow events. At least one image of each feature and additional images of interest are included in this document. Additional aerial imagery has been obtained intermittently following phases one and two of construction, during high flows (see Images 8, 10, 12, 15, 16, 50, & 51).

Biannual photo points were modified following phase two implementation to reflect project outcomes. At the conclusion of construction season two, in preparation for "leaf-off" photomonitoring in winter 2025, six of the original photo points were omitted and three new photo points were added to reflect project outcomes. There are currently 37 photo points.

Survey of Hydraulic Features

Re-surveying of Longitudinal Profiles and Cross Sections will be conducted by MLA as part of as-built investigations during Spring 2025. Additional Longitudinal Profiles and Cross Sections will be conducted by SRRC if changes in the channel morphology are observed within two years after implementation in the restored channel. If funding allows and circumstances necessitate, a third year of surveys will occur post-implementation. Surveys will be conducted during the dry season. The profiles will be used to evaluate changes to the channel and assess potential sedimentation.

Hydrologic Connections

Along with onsite-observations, stationary game camera images were used to evaluate the timing of the hydrologic connections between constructed features and the river. In 2024, during the winter following phase one of construction, flows remained low with the exception of a single flow event peaking at 19,700 cubic feet per second (CFS) at the Salmon River USGS gage in Somes Bar, on January 13th, 2024, allowing logs within project features to soak up water and stabilize and banks to settle. See the Red Bank Habitat Enhancement: Winter Observation Report for Winter 2023-2024 flow details (SRRC 2024c).

In 2024, during the winter following phase two of construction, three significant flows events occurred; the first on November 22nd peaked at 22,700 CFS, and the second on December 24th peaked at 14,800 CFS, and the third on December 29th, 2024 peaked at 32,400 CFS. During these events, the river fully engaged the Red Bank project site, including the Primary Side, Far Side, Mid and Perennial Channels, and all Backwaters (Objective 2). The Perennial Channel remained perennial throughout the entire monitoring year (Objectives 1 & 2), all other features were dry by July 2024, and remained so during peak river temperatures.

***Image 11 (above)**: Aerial image of the Red Bank Project Area, February 2024 (post-phase one implementation).*

***Image 12 (above)**: Aerial image of the Red Bank Project Area, December 30th, 2024 (post-phase two implementation).*

Red Bank Off-Channel Habitat

Primary Side Channel

Image 13 (above): *The Primary Side Channel pre-implementation, April 2023.*

Reporting year 2024:

The Primary Side Channel was designed to engage at winter base flow (20% exceedance), which is the equivalent of approximately 2,800 CFS at the Somes Bar USGS gage. Thus, the feature was engaged as expected immediately following the November 21st, 2024 storm event (see Image 15). The channel then reactivated on December 13th, 2024 around approximately 2,000 CFS, following a small series of winter storms. The engineered log jams and design-built fill plug mid-bar functioned as expected and prevented flow from eating into the western portion of the bar.

Image 14 (above): *Aerial image of the Primary Side Channel post-phase one implementation, as the hydrograph was descending, around 10,000 CFS (at the USGS gage) on January 14th, 2024.*

Image 15 (above): *Primary Side Channel activated in the first high flow event post-phase two (facing upstream). Photo from November 22nd, 2024 as the hydrograph was ascending, at approximately 20,900 CFS (at the USGS gage).*

Image 16 (above): *Aerial image of the Primary Side Channel post-phase two implementation. Photo taken as the hydrograph was descending, around 16,000 CFS (at the USGS gage) on December 30th, 2024.*

Far Side Channel

Reporting year 2024:

During the 2024 monitoring season, the Far Side Channel was connected to the Primary Side Channel at winter base flow as designed (see Image 17). The channel activated at lower flows than during winter 2023-2024 and connection improvements constructed during phase two of implementation increased flow from the primary channel significantly. Sedimentation in the Far Side Channel has been minimal, however there has been some good sorting behind log-structures in the lower channel reach before its confluence with the lower Primary Side Channels, also referred to as the Perennial Channel (Images 19 and 20).

Image 17 (above): *Improvements to connection between Far Side Channel and Primary Side Channel (upper Far Side Channel) were made in phase two of implementation. Photo from December 2024.*

Image 18 (above): *Lower Far Side Channel activated during April 2024.*

Image 19 (above): *Far Side Channel pre-implementation, September 2022.*

Image 20 (above): *Far Side Channel post-phase one implementation, July 2024. This segment of far side channel work was completed in phase one.*

Perennial Channel

Reporting Year 2024:

The perennial section of the Primary Side Channel, located on the downstream end of Red Bank riverbar, remained inundated throughout the entirety of the 2024 monitoring season as designed (see Images 21-25). The Perennial Channel connected with the North Fork Salmon River on the downstream end when the full length of the Primary Side Channel was activated. By July 2024, the Perennial Channel had disconnected from the mainstem North Fork Salmon River, which occurs on an annual basis. A number of juvenile fish were isolated in the disconnected Perennial Channel. However, water quality and available juvenile fish habitat cover in the remaining wetted section of the channel remained excellent until fish relocation and phase two construction began (see the Water Quality and Fisheries Monitoring sections for details). Water quality in the perennial segment of the Primary Side Channel is anticipated to provide hospitable conditions for fish throughout the summer months.

The perennial section of the Primary Side Channel conveys the entire flow from the Primary Side and Far Side Channels during winter flows. However, during the two major flow events beginning on November 22nd, 2024 and December 29th, 2024, respectively, flows backed up and activated the Secondary Channel (see Images 50-51). The outcome of these high flow events resulted in the activation of the Secondary Channel through the breaching of the constructed berm at the entrance to the Secondary Channel (see Lessons Learned). There was minimal

functional change to the Perennial Channel during these periods. During these particular high flow events, water levels in the Perennial Channel exceeded the heights of log structures, however the structures remained intact with little to no observable log movement or structural change.

Image 21 (above): *Perennial Channel Log Structures (facing downstream). Pre-implementation, April 2023.*

Image 22 (above): *Post-phase one Perennial Channel Log Structures (facing downstream). March 2024.*

Image 23 (lower left): *Perennial Channel. November 1st 2024.*

Image 24 (lower right)*: Perennial Channel. November 22nd 2024.*

Image 25 (above): *Perennial Channel Log Structures (facing upstream). November 1st 2024*

Secondary Channel

Reporting year 2024:

The Secondary Channel activated beginning on November 22nd, 2024 (see Lessons Learned). This channel was expected to activate in a 1.5-year event and that that particular high flow was a 1.7-year event. Storm flows overtopped the enhanced planting area just downstream of the confluence of the Far Side and Primary Channels. Over time this flow path cut a channel into the berm built in 2024 at the entrance to the channel, thereby increasing the amount of flow conveyed by the Secondary Channel (see Images 27, 52, 57, and 58). This berm was built to divert moderate flows into the Perennial Channel and create a passive backwater from the North Fork Salmon River into the Secondary Channel (Backwater 3). In Spring 2025 the Project Team will evaluate whether any modifications to the constructed berm are warranted.

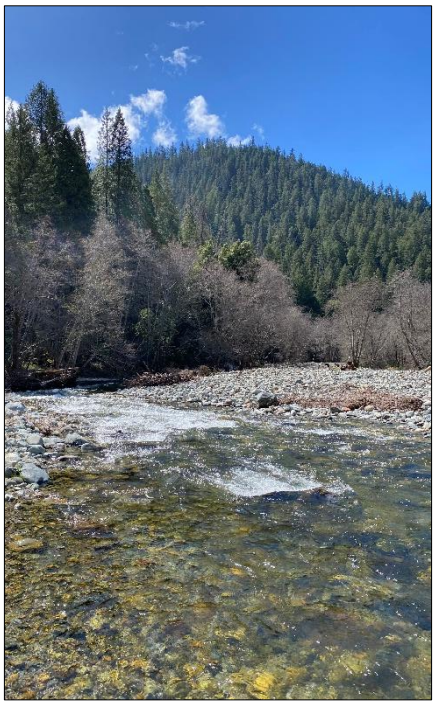


Image 26 (left)*: The Secondary Channel inlet (dry) lies on stream right of the Lower Primary Side Channel (flowing). See the gap in the alders of the prior to berm construction in August 2024. Photo from April 2024.*
Image 27 (right)*: Secondary Channel activation point, with the breach of the constructed berm seen center frame. December 2024.*

Backwaters 1, 2, 3, 4, 5, 6, 7 and 8
Reporting year 2024:

Constructed backwaters functioned as designed, activating during various flows and gradually disconnected as flows receded (see Images 28-35) (Objective 3). After winter 2023, a moderate amount of sediment deposited at the inlet of Backwater 4. Alterations were made during phase two of implementation (see Winter Observation Report, SRRC 2024c). However, preliminary observations following the winter high flows in 2024 indicate that sedimentation in this location may remain an issue. Stranding does not appear to have occurred in this alcove, despite the sediment deposition.

***Image 28 (above)**: Backwater 2 connection with North Fork Salmon River. December 2024*

***Image 29 (above):** Backwater 5 connection with the Primary Side Channel. December 2024.*

***Image 30 (above)**: Backwater 6, February 2024.*

***Image 31 (above)**: Backwater 7, August 2024.*

***Image 32 (below)**: Backwater 3, April 2024.*

***Image 33 (upper left)**: Backwater 8, August 2024.*

***Image 34 (upper right)**: Backwater 4, August 2024.*

***Image 35 (above)**: Backwater 1, August 2024.*

Water Quality

Implementation

During construction seasons one and two, water quality controls were overseen by SRRC and MLA staff. A temporary bridge was placed across the North Fork Salmon River to access the Red Bank riverbar and side channel complex. During the bridge placement and removal an excavator crossed in the wet to place abutments and crossing material. The channel substrate in this location is primarily large cobble. Therefore, bridge placement and removal activities disturbed minimal sediment. Observed mobilized sediment dissipated quickly and had partially dispersed by the first pool downstream of construction. This sediment completely dispersed by the second pool downstream of construction. SRRC staff observed water quality in the North Fork Salmon River for the entirety of bridge construction and removal.

The majority of the site did not have surface flows throughout construction in either 2023 or 2024. During construction within the perennial section of the Primary Side Channel, also referred to as the Perennial Channel, SRRC monitored dewatering activities. Under SRRC's construction oversight, contractor staff placed required screening downstream of dewatering activities. Dewatering was performed in accordance with biologic requirements and to specifications described in the RBHE final designs and required permits. Final erosion controls and site stabilization were completed by September 26th, 2024.

Post-Implementation

Monitoring year 2024 brought significant flows to the project area. The first high flow was between phases one and two of construction on January 13th, 2024 peaking at 19,600 CFS. The second high flow was after phase two, on November 22nd 2024 peaking at 22,700 CFS. The third high flow occurred on December 24th peaking at 14,800 CFS. Finally, the fourth on December 29th 2024, saw a flow of 32,700 CFS at the Salmon River USGS gage in Somes Bar. SRRC staff deployed continuous temperature and water level loggers in the North Fork Salmon River, in the Primary Channel and Far Side Channel. Monthly water quality monitoring included downloading continuous logger data, collecting spot temperature and dissolved oxygen readings in the activated features and the river, as well as critical observations throughout project features.

Temperatures in the Perennial Channel provide summer thermal refugia for salmonids. Summer primary channel temperatures remained much lower than daily river temperatures, notably staying well below 20 degrees Celsius (see Figure 4). Water quality observations show that the perennial section of the Primary Side Channel had excellent water temperature and good dissolved oxygen (DO) levels during the summer months. Importantly, during monthly monitoring SRRC staff consistently observed healthy fish with normal behavior in all activated features of the project.

Reporting Year 2024:

Constructed project features provide quality velocity and thermal refugia for salmonid species. In 2024 the Perennial Channel provided summer refugia for salmonid species with consistent, beneficial water quality. Observed groundwater input maintained temperatures within the Perennial Channel that were consistently colder than the North Fork Salmon River during summer months while the channel was disconnected from the River and the upper Primary Channel (see Figure 4) (Objective 1). Water quality observations showed that the groundwater-fed portion of the Perennial Channel also offered thermal refugia during winter months with a slight buffer in temperature when compared with the North Fork Salmon River when the Perennial Channel was connected to the upper Primary Side Channel. Dissolved Oxygen in the Perennial Channel remained favorable for salmonids.

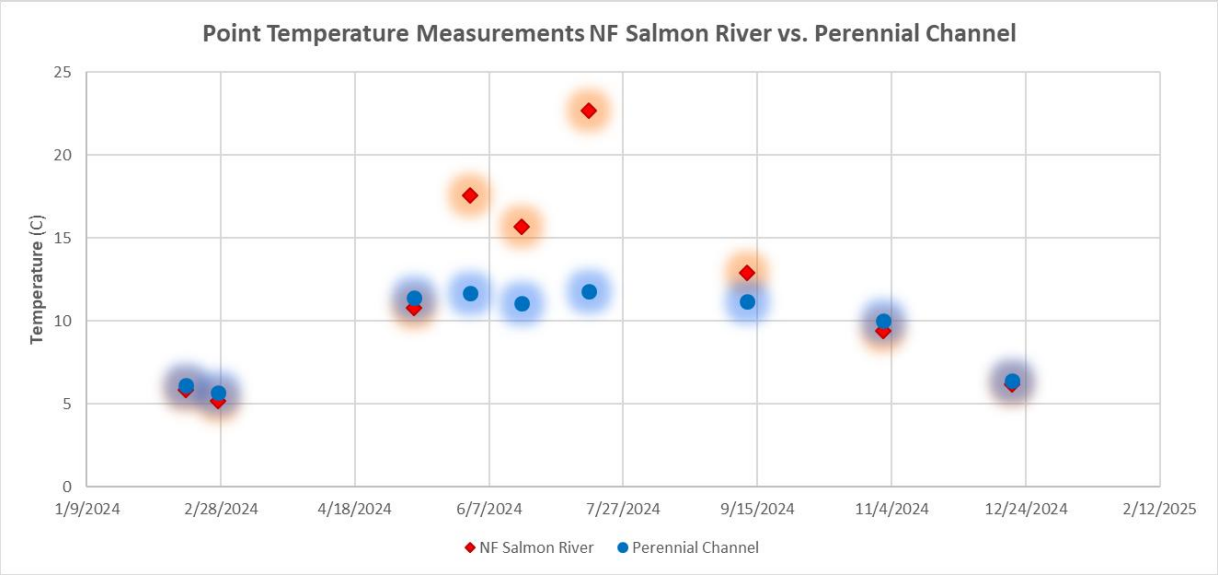


Figure 4: *Point Temperature Measurements North Fork Salmon River vs. Perennial Channel*

Optimum water temperatures for the growth of coho salmon range from 14 to 18°C (Sullivan, et al., 2000). Coho salmon may seek thermal refugia when temperatures reach 19 degrees Celsius and 22 degrees Celsius is the threshold for when they become stressed (Sullivan et al. 2000). Water temperatures between 22 and 24°C have been observed as distribution limiting to all salmonids (USEPA 1999). Point Temperature measurements show that temperatures in the groundwater-fed Perennial Channel remain well below the threshold temperature for salmonids (see Figure 4) while temperatures in the North Fork Salmon River exceeded the critical threshold of 22 degrees in July 2024.

Image 36: *SRRC Staff performs monthly water quality monitoring in the Perennial Channel in December 2024.*

Biological Monitoring:

Fisheries

Implementation

Precautions were taken at the beginning of construction seasons one and two to minimize impacts to aquatic organisms. Ahead of the bridge placement, SRRC staff encouraged fish and other aquatic life to voluntarily relocate from the North Fork Salmon River at the engine fill. During construction of the Primary Side Channel the heavy equipment contractor and SRRC staff installed fish exclusion screens at the upstream and downstream ends of the Primary Side Channel in accordance with standard protocols. The lower Primary Side Channel, also referred to as the Perennial Channel, is perennial and provides year-round aquatic habitat. SRRC and Karuk Tribe staff relocated fish and other aquatic organisms from the Perennial Channel into the North Fork Salmon River, in an effort led by the Karuk Tribe Fisheries Biologist, prior to dewatering efforts and channel equipment work in both season one and two of construction.

***Image 37**: Karuk Tribe Fisheries staff assisting with the 2024 relocation effort in the Perennial Channel.*

In construction season one, on August 10th, 2023, fish and wildlife were relocated. A total of 32 juvenile steelhead/rainbow trout, 71 speckled dace (*Rhinichthys osculus*), nine adult Foothill yellow-legged frogs (*Rana boylii)*, and over 100 aquatic invertebrates were relocated in 2023.

The following construction season, in phase two, on July 18th and 19th, 2024, SRRC and Karuk Tribe staff relocated fish and aquatic organisms from the Perennial Channel. Due to the increased complexity and added cover from phase one Implementation, relocation efforts were considerably more challenging (see Image 37). There were also substantially more aquatic organisms holding in the channel post-phase one implementation (Objectives 1 and 2). In 2024 a total of 2 juvenile Chinook, 78 juvenile steelhead/rainbow trout, 107 speckled dace, and one unidentified lamprey ammocoete were relocated. A total of 136 Foothill yellow-legged frog tadpoles and frogs, four Western Toad tadpoles and frogs (*Anaxyrus boreas)*, three Northern Pacific Tree Frog tadpoles (*Pseudacris regilla)*, one rough-skinned newt (*Taricha granulosa)*, and over 1500 aquatic invertebrates were relocated, including one Western pearlshell freshwater mussel (*Margaritifera falcata)*. No injuries or mortalities occurred in the relocation efforts. Associated data was submitted to CDFW and NOAA immediately upon completion of the effort.

Post-Implementation

In 2024 SRRC Fisheries staff conducted monthly presence/absence surveys in the enhanced habitat of the Red Bank project area when safe and feasible to do so (SRRC 2024a). Adjacent areas of the North Fork Salmon River were also surveyed in July, September, and October, when flows allowed. Areas of likely adult coho salmon, Chinook salmon, and steelhead trout spawning were monitored during their respective spawning seasons. Surveys did not occur in January due to high flows and staffing shortages. Surveys also did not occur in August due to construction in the project area.

Image 38: *SRRC Staff perform monthly fisheries monitoring in the Perennial Channel post-phase one implementation.*

Reporting Year 2024:

High flows prevented surveyors from accessing the site in January. Monthly surveys resumed in February 2024. During this visit, safety considerations prevented surveyors from snorkeling the majority of the project area. During high flows, conditions are hazardous in the immediate vicinity of wood structures. However, one adult steelhead was observed in the Perennial Channel and three adult steelhead were observed in the North Fork pool adjacent to Backwater 2. In February no juvenile fish were observed within the project area.

In March safety concerns at higher flows (4,800 CFS at the USGS gage) again prevented snorkeling in all areas of the project. Surveyors noted that there were likely more fish present than the 206 total juvenile Chinook counted. Most were sheltering in slow water under and behind brush baffle and rootwad structures. Surveyors also noted that the entrances to Backwaters 4 and 6 were blocked by sediment accumulation, with some juvenile Chinook at the entrance to Backwater 6. Although water depths limited visibility and access, six steelhead redds were located in the area of the Primary Side Channel inlet alcove and adjacent North Fork at the top of the bar, and one steelhead redd was observed in the Perennial Channel.

April's monitoring occurred at lower flows and more of the project area was effectively surveyed. A total of 309 juvenile Chinook and 72 juvenile steelhead/rainbow trout were counted throughout the enhanced habitat, with most observed actively using cover provided by project features (see Image 40). A school of juvenile chinook were once again observed at the blocked entrance of Backwater 6. No adults were observed in the project area. One new steelhead redd was counted in the North Fork at the top of the bar, with staff indicating that it had likely been present but not visible due to high water during the March survey. Two new steelhead redds were observed in the Primary Side Channel just above the entrance to Backwater 5, for a total of ten redds in the project area and the adjacent section of the North Fork. May's survey saw fewer juvenile Chinook (125 total) but more juvenile steelhead/rainbow trout (268 total) using enhanced habitat. No adult fish were observed.

Image 39: *Juvenile Chinook salmon fry in the project area.*

River flows dropped significantly (810 CFS at the USGS gage) for June's survey. The Primary Side Channel and Far Side Channel were dry. The Perennial Channel was still flowing, but staff noted shallow transitions between some pools. With the drop in water level fewer fish were observed. In the Primary Side Channel inlet alcove 102 juvenile steelhead/rainbow trout were observed and 48 were found in the Perennial Channel. No juvenile Chinook were observed within the enhanced habitat; however, twelve were utilizing the coldwater refugia at confluence of the Perennial Channel and the North Fork. No adults were observed in June. July's monitoring occurred six days after the start of the Shelly Fire, nearby in Siskiyou County, and conditions were smoky. Water levels were lower, with Perennial Channel pools disconnected. A total of 42 juvenile steelhead/rainbow trout were observed in the Project Area. The North Fork was snorkeled from the engine fill to the bottom of the bar. This segment of the river held 80 juvenile Chinook, over 500 juvenile steelhead/rainbow trout, and one adult resident rainbow trout. Fisheries staff participated in fish and aquatic species relocation on July 18th and 19th, prior to the second phase of project implementation. Subsequently, August monitoring did not take place due to ongoing construction.

Post-Implementation monitoring resumed in September after the end of the construction season. Flows were near the low point of the year (182 CFS at the USGS gage). During this survey the

Perennial Channel was barely connected to the North Fork. The Perennial Channel outlet alcove was no longer providing effective thermal refugia, with no fish observed. A single juvenile steelhead/rainbow trout remained in the cold pool at the very top of the Perennial Channel and 35 juvenile steelhead/rainbow trout were counted in shady areas of the Primary Side Channel inlet alcove. In this first survey after phase two it was expected that few fish would be seen in the Perennial Channel as flows restricted access for fish to reoccupy this habitat following construction. In the North Fork, from the engine fill to the bottom of Red Bank bar, 12 juvenile Chinook, over 500 juvenile steelhead/rainbow trout, and one half pound steelhead were observed. In contrast, October's survey took place just after the first heavy rain event of the fall, when flows had risen (300 CFS at the USGS gage). Water temperatures had dropped, and staff noted large amounts of freshly scoured algae floating downstream, which partially limited underwater visibility. Most enhanced features in the project area remained dry, however. In the Primary Side Channel inlet alcove, 7 juvenile steelhead/rainbow trout were counted. In the North Fork, over 500 juvenile steelhead/rainbow trout and 8 juvenile Chinook were counted. Six complete Chinook redds were observed in the North Fork riffle at the engine fill, with one Jack Chinook carcass found just downstream. Two additional Chinook redds were observed at the pool tailout below the Red Bank bar in the North Fork, just downstream of Jones Gulch.

November monitoring occurred four days after a significant high flow event (over 22,000 CFS at the Somes Bar USGS gauge). The flows had dropped substantially, which allowed surveyors access to the site (3100 CFS at the USGS gage). In the project area notable changes to the channel structure were apparent, especially in the area where the Primary Side Channel and the Far Side Channel join. Safety concerns, particularly from mobile debris, prevented staff from a full snorkel survey of the Perennial Channel. Few fish were present, but all fish that were observed were using project features — eight juvenile steelhead/rainbow trout were under rootwad cover in the Perennial Channel, and nine juvenile steelhead/rainbow trout sheltered from the high flows in Backwater 5. One adult steelhead was in willow cover at the Primary Side Channel inlet alcove. Substantial scour and rearrangement of coarse bed material rendered previously visible Chinook redds in the North Fork engine fill riffle completely indiscernible, and no new redds or spawning activity were observed.

Water levels continued to drop before the project area was surveyed in December, revealing further change to the site. The Far Side Channel was found to be dry, with perched cobble material at the entrance channels impeding flow. A new pool, disconnected at this water level, had formed and was providing decent refugia just below a cross-channel log structure near the bottom of the Far Side Channel access channel. When viewed underwater, the wood structures in the Perennial Channel could be seen actively sorting gravel and sediment. Water temperatures were very cold, however (the lowest water temperature of the year was recorded at the USGS gage two days prior), and very few fish were seen—four juvenile steelhead/rainbow trout sheltering in Perennial Channel rootwads.

	Primary Side Channel inlet alcove			Primary Side Channel			Perennial Channel			Far Side Channel			Backwater 2			Backwater 5		
Date	Juv. Coho	Juv. Chinook	Juv. steelhead/ rainbow Trout	Juv. Coho	Juv. Chinook	Juv. steelhead/ rainbow Trout	Juv. Coho	Juv. Chinook	Juv. steelhead/ rainbow Trout	Juv. Coho	Juv. Chinook	Juv. steelhead/ rainbow Trout	Juv. Coho	Juv. Chinook	Juv. steelhead/ rainbow Trout	Juv. Coho	Juv. Chinook	Juv. steelhead/ rainbow Trout
2/15/2024	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/21/2024	0	70	2	0	22	2	0	39	0	0	66	0	0	0	0	0	9	0
4/9/2024	0	14	0	0	89	2	0	35	16	0	141	54	0	9	0	0	21	0
5/31/2024	0	0	21	0	29	50	0	32	87	0	64	89	0	0	0	0	0	21
6/20/2024	0	0	102	n/a	n/a	n/a	0	0	48	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7/9/2024	0	0	19	n/a	n/a	n/a	0	0	23	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
9/27/2024	0	0	35	n/a	n/a	n/a	0	0	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10/28/2024	0	0	7	n/a	n/a	n/a	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

11/26/2024	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	9
12/13/2024	0	0	0	0	0	0	0	0	4	n/a	n/a	n/a	0	0	0	0	0	0

***Table 1**: Juvenile salmonid observations in the project area in 2024.*

Over the course of 2024, no juvenile Coho were observed in the project area, or elsewhere in the entire North Fork Salmon River. Juvenile Chinook, first seen at the site in March as fry, were initially observed using particularly shallow, low velocity, off-channel refugia, and were often under the cover provided by installed wood and brush baffles. Juvenile steelhead/rainbow trout emerged later in April, but exhibited similar rearing patterns, sheltering from high flows under features providing cover during the spring.

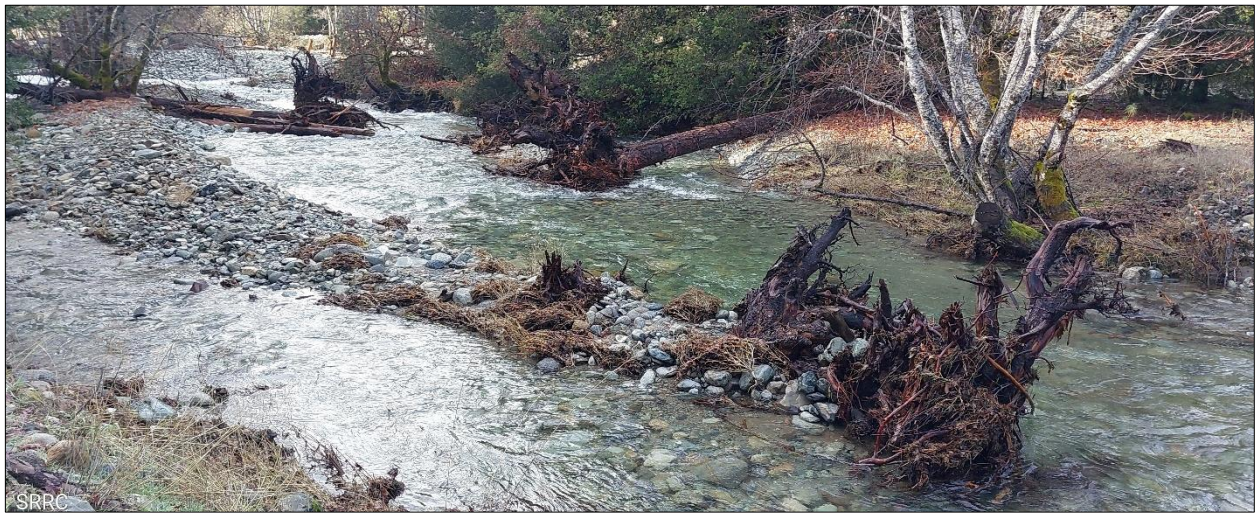


***Image 40:** Rootwad cover structures in the Far Side Channel offer cover from predation and slow water refugia for fish, December 2024.*

Due to sediment accumulation at the entrances to Backwaters 4 and 6, these features were relatively inaccessible when flows dropped below the level required for entry during this period. As water levels dropped and temperatures rose in late spring/early summer, juvenile fish grew, thereby becoming stronger swimmers able to occupy deeper, higher velocity habitat. Juvenile Chinook in particular were observed to move into deeper and faster channels of the project area and then into the North Fork, coinciding with the warming and disconnection of the upper Primary Side Channel, which provided winter and early spring rearing refugia. No juvenile Chinook were detected by surveyors within the enhanced habitat from June onward, although they did benefit from the thermal refugia at the outlet of the Perennial Channel that month. However, two juvenile Chinook were recovered in the Perennial Channel during relocation efforts in mid-July. Juvenile Chinook were observed in the North Fork adjacent to the Red Bank bar in declining numbers after July, corresponding with seasonal outmigration patterns. This

indicates that for juvenile Chinook in the first year post-implementation the enhanced habitat of the project area primarily functions as crucial rearing habitat early in the season, and declining use has been observed as the season goes on. In contrast juvenile steelhead/rainbow trout were found within the project area all year. Numbers declined as the project area dried up, but when late fall/early winter rains and high flows arrived, juvenile steelhead/rainbow trout moved back into the wetted project area to take advantage of the shelter afforded by the project structures and features.

Adult fish usage of the project area followed similar patterns of varying use by different species. No adult Coho or evidence of Coho spawning were found at the site or in the North Fork in 2024. Adult Chinook spawned in the North Fork adjacent to and below the main bar, but were not seen using enhanced habitat. Most project features were dry during Spring and Fall-run Chinook spawning season, and those features that did have water did not provide suitable holding or spawning habitat during this time of year. Red Bank is within the spatial overlap area of Spring-run and Fall-run Chinook salmon spawning. Reports describe the North Fork Salmon River in the area of Red Bank campground as "a notable spawning ground for both runs" (USFS 2025). Data from collaborative Spring Chinook spawning surveys, collected as part of a separate effort during this time period, indicates that two redds (one at the North Fork engine fill riffle and one below Jones Gulch) were marked during spawning surveys on 10/2/24 and assessed to be of Spring-run origin. The 2024 Fall Chinook spawning survey data has not yet been published, but the remaining six (of eight total) Chinook redds are temporally more indicative of Fall-run Chinook spawning. Adult steelhead, with an early spring spawning period during higher base flows, were observed occupying channels in the project area, and a total of ten Steelhead redds were found within or immediately adjacent to enhanced habitat.

Cumulatively, these observations demonstrate that fish usage of the Red Bank project area closely tracks the changing needs of anadromous salmonids as they progress through their respective life cycles. Rearing refugia are crucial in the winter and early spring seasons, particularly for Chinook which emerge as fry first. As water temperatures increase and the project area dries up, Juvenile Chinook fish usage declines and shifts to juvenile steelhead/rainbow trout. Adult fish usage was noted with the onset of fall precipitation and continued into the winter months with Steelhead observed in the project site. Finally, the velocity refugia offered by project features, once again become critical to overwintering juveniles as winter rains commence and high flows return.

Incidental observations of other aquatic species and amphibians were also noted during monthly monitoring of the project area. Speckled dace, Foothill yellow-legged frogs, and aquatic garter snakes (*Thamnophis atratus*) were common in the warmer months. During June's survey over a dozen Western toads were seen in the Primary Side Channel inlet alcove, including active breeding pairs. There is a large bed of several hundred Western Pearlshell mussels in the North Fork, on river right just downstream of the engine fill (SRRC 2024a).

Vegetation

Implementation

During construction seasons one and two, heavy equipment was used to create Enhanced Planting Areas (EPAs) and slot-EPAs, which were excavated to groundwater, augmented with vertical logs which function as wicks, backfilled with quality soil salvaged from the site as well as slash and chips, and covered in wood mulch (see Image 41). The slot-EPAs differ from other EPAs in that they were placed on the slopes of backwaters and alcoves, in a narrow oblong configuration with cover rootwads emerging from the ground surface (see Image 42). EPAs built in 2023 were partially planted and partially mulched in Fall 2023 (Objectives 5 & 7). On July 9th, before the second season of construction and earth moving, SRRC plants program staff visited the site to monitor the survival of 2023 plantings and to mark all plantings from 2023, regardless of survival status. This was done to help the contractors place mulch in the EPAs without burying the individuals planted in these areas in fall 2023.

***Image 41 (left)**: A finalized small Enhanced Planting Area (EPA) built in 2024, which is roughly 20'x20' in dimension.*

***Image 42 (right)**: A Slot-EPA under construction. These features were constructed with logs, slash, cuttings, and fill material, and were then mulched.*

***Image 43 (lower left)**: Contract crews placing live willow stakes into the baffles. Note the groundwater at the base of the excavated pit.*

During channel and EPA construction in phase one and two of implementation, all willow cuttings were planted throughout the side channel complex within brush baffles, willow clusters, log structures, alcoves, and EPA features. Prior to phase two construction, from June 24th - July 1st, 2024 a total of 827 willow cuttings, including 275 arroyo willow (*Salix lasiolepsis)*, 175 pacific willow (*Salix lasiandra)*, and 377 coyote willow (*Salix exigua)*, were harvested from various areas throughout the North Fork on the Salmon River. This is in addition to the 1,893 mixed willow and 15 black cottonwood (*Populus tricocarpa)* cuttings planted on site in phase one in 2023. On July 25th, 2024 18 cottonwood cuttings were harvested roughly 1000 feet upriver of the Red Bank. All cuttings were stored submerged and covered in a pool at the top of Red Bank bar until placement. The live willow stakes were planted by contractors into willow baffles and willow clusters (see Images 43 and 44), as well as in select riparian EPAs and slot-EPAs. Additionally, the cottonwood cuttings were placed in select riparian planting areas. To improve cutting survival, the planting method for live stakes in the willow baffles and clusters was changed in phase two. Contractors jetted fines into each feature, using sand and a powerful hose, to displace air pockets and saturate the growth medium (see Image 44). The willow and cottonwood cuttings are intended to become sources of recruitment throughout the restored channel and in the riparian corridor (Objective 5 & 7).

***Image 44 (right)**: Contractors jetting fines into a willow cluster feature.*

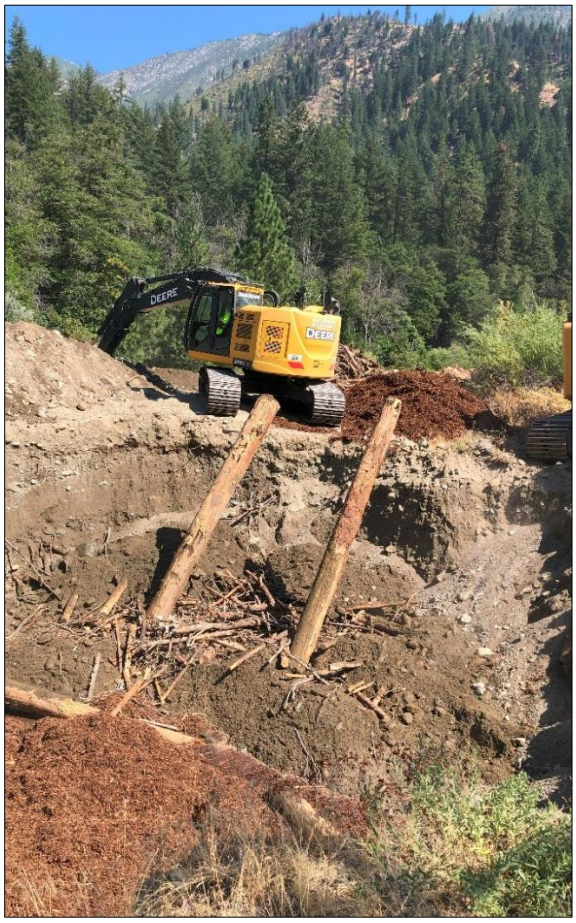


***Image 45 (left)**: A large EPA under construction, roughly 40'x40' in dimension. These features were constructed with logs, slash and fill material, and were then mulched and planted.*

Post-Implementation

In September SRRC plants program staff returned to the site to perform a second round of survival counts, as well as assessments of willow and emergent plant survival. A second count was conducted because the month of July was extremely hot, with temperatures exceeding 110°F on the river bar for more than three weeks. It is suspected that this heat wave may have killed or impacted the health of several of the 2023 plantings.

In the Fall of 2024 SRRC staff planted 1,068 nursery plants, oak acorns, and emergent plants throughout the project area. A subset of the nursery plants and all acorns were planted in EPAs. The emergent species Pacific rush (*Juncus patens*) and horsetail (*Equisetum hymale*) were planted in hospitable riparian habitat along the Far Side Channel, Secondary Channel, and the Perennial Channel, and Backwater 2.

Reporting Year 2024:

In the first year of monitoring vegetation at the Red Bank project area revegetation was modestly successful when considering the survival of nursery plants, willow cuttings, and number of naturally recruiting native species. Due to the pulse of excessive heat, the survival monitoring was performed twice, once on July 9th and then again on September 17th (see Table 2, for comparison of 2024 survival pre- and post- the heat wave).

***Image 46**: SRRC staff planting plugs and hand-mulching in an EPA in Fall 2023.*

S Survival surveys prior to phase two implementation (and before the heat wave) indicated moderate levels of survival by container plantings. Of the 288 container plants and white oak acorns (*Quercus alba*) planted in EPAs in 2023, 161 were observed still living, which equates to a survival rate of 59.64%. Nine of the 288 individuals planted in 2023 were in poor health, roughly 3.81%. One-hundred and twenty-four individuals were dead, a mortality rate of 43.06%. The majority of the mortalities occurred in EPAs west of the Primary Channel, which is on a sparsely vegetated river bar where there is increased potential for drought/exposure mortality. East of the primary channel, mixed conifer and live oak forest provides additional cover for planted individuals and is likely providing a slight thermal refuge, decreasing drought/exposure stress, even during high intensity heat events.

Survival surveys post-heat wave indicated a decrease in survival from July to September. Of the 288 individuals planted in enhanced planting areas in 2023, which include container plants and white oak acorns, 137 were observed still living, a survival rate of 47.57%. Thirty-three of the 288 individuals were in poor health, roughly 11.46%. One-hundred and fifty-one individuals were dead, a mortality rate of 52.43%. The majority of additional mortalities occurred in planting areas west of the primary channel, where drought stress and exposure are the biggest threat to survival. Furthermore, there was an error in the Contractors interpretation of the materials contract. Therefore, less mulch was delivered to the site than would adequately cover the constructed EPAs in 2023. In Fall 2023 SRRC staff hand-mulched each individual plant and portions of the EPAs (see Image 46). This error was likely a compounding factor in plant mortality throughout the site.

Between the first round of monitoring, pre heat wave, and the second round of monitoring, post heat wave an additional 27 dead individuals were recorded, all of which occurred in enhanced planting areas west of the primary channel. Both east and west of the primary channel, there was an increase in the number of "poor health" individuals, from 9 pre-implementation to 33 post-implementation. This could be a response to the overall drought and heat conditions overwhelming any buffer that the oak and coniferous forest shading the east side of the channel

may have provided (see Table 2). Initial observations indicate that individuals planted close to the buried logs and those along the margins of the EPAs were more likely to survive than those planted in exposed areas.

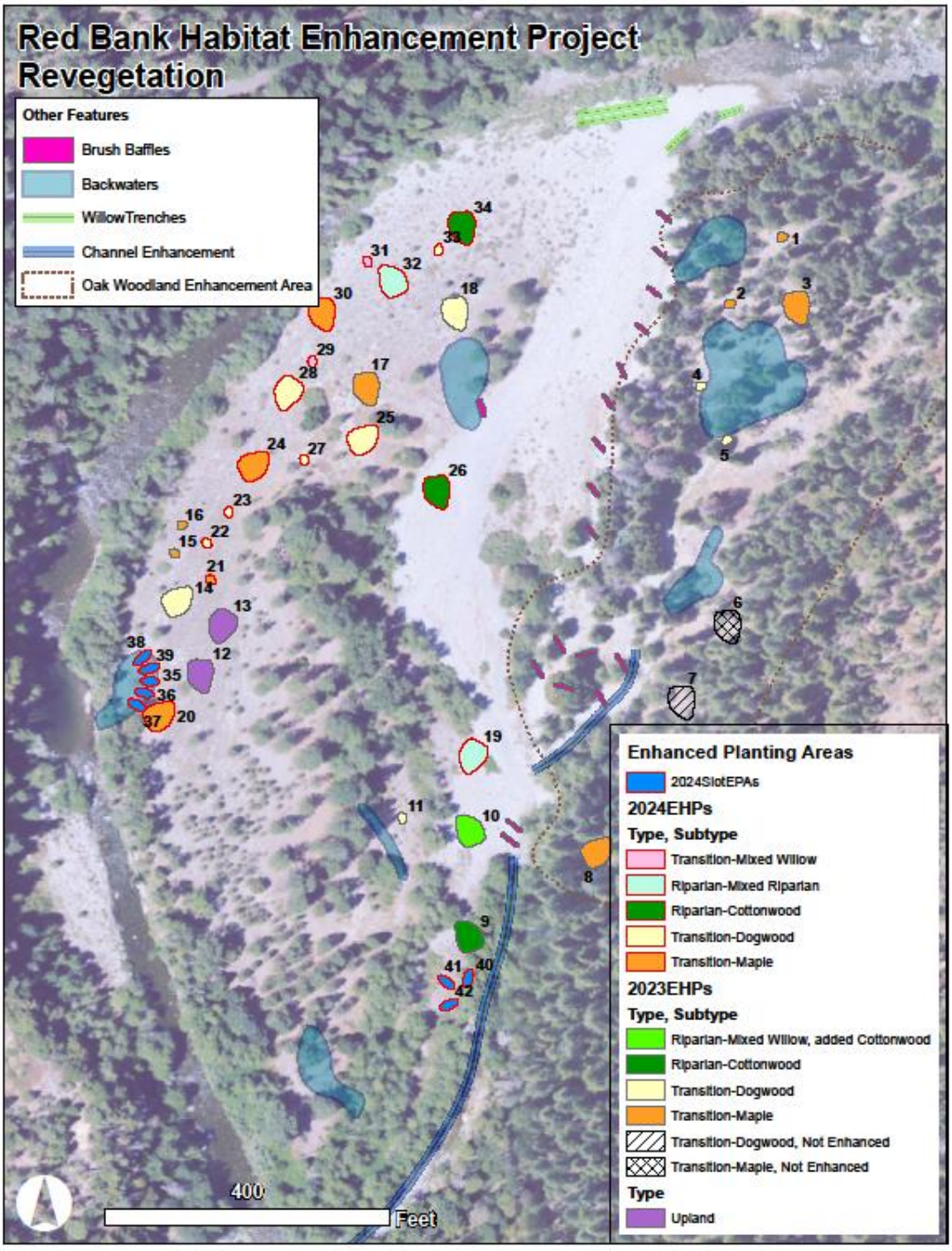
Although there were increases in mortality between pre and post-implementation, there were also a number of species naturally recruiting to the enhanced planting areas. East of the primary channel live oak, owl clover, California brome, white oak, dwarf tidy lupine, yarrow, Oregon goldenaster, mugwort, manzanita, and pink honeysuckle were observed recruiting to the planting areas. Despite less survival of container plantings west of the primary channel, native species were observed recruiting to the planting areas, including: mugwort, live oak, Oregon goldenaster, buckwheat, and California grape.

Post-phase one survival surveys covered the 25 areas where willows were planted in the summer of 2023 (phase one). At four of the willow stake locations, SRRC staff were unable to find any surviving individuals. Of the willow stakes observed, 152 were alive, reflecting a survival rate of 8% across the site (see Attachment 3). Of the 400 torrent sedges planted in backwaters and along wetted channels in 2023, 20 of them were found alive in 2024 monitoring efforts, a survival rate of 5% (see Attachment 3).

Plant species that exhibited survival rates higher than 75% in planting sites east of the primary channel were: big leaf maple (*Acer macrophylum)*, western redbud (*Cercis occidentalis)*, and snowberry (*Physocarpus capitatus)*. All other container plant species survival rates were less than 56%.

Table 2: *Pre- and Post- heat wave, 2024 Summer (July 9th-pre heat wave) and Fall (September 17th- post heat wave) survival survey results of container plants and acorns in the enhanced planting areas. Changes between pre- and post- heat wave survival are indicated in red text.*

	East of Primary Channel		West of Primary Channel		Overall Project Site	
	Pre-heat wave	Post-heat wave	Pre-heat wave	Post-heat wave	Pre-heat wave	Post-heat wave
Total Plants	128	128	160	160	288	288
Total Surviving	82	85	82	**52 (-30)**	164	**137 (-30)**
Percent Survival	64.06%	66.41%	51.25%	52.20%	56.94%	47.57%
Total Poor Health	9	**26 (+17)**	0	**12 (+12)**	9	**33 (+29)**
Percent Poor	7.03%	16.41%	0%	7.50%	3.13%	11.46%
Total Mortalities	43	43	78	**108 (+30)**	124	**151 (+30)**
Percent Mortality	29.69%	29.69%	48.75%	47.80%	43.06%	52.43%



***Map 1**: Revegetation elements post-phase two implementation - Enhanced Planting Areas (EPAs). See the Interim and Final As-Built Plans for construction details. Pending As-Built completion updates, willow baffles and clusters from phase two will be added to a future map.*

In preparation for implementation phases one and two, noxious weed surveys and treatments occurred in the project area, staging area, and engine fill. Surveyors continue to find and treat large numbers of dyer's woad and moderate numbers of spotted knapweed. For the second consecutive year no starthistle was observed on the main Red Bank bar. All starthistle treated were found at the staging area and engine fill. Prior to implementation a total of 16,251 dyer's woad (210 of which were rosettes) were treated (see Images 47 and 48) and 802 adult starthistle were treated. Seven spotted knapweed rosettes and one adult were treated. Furthermore, we found 11 spotted knapweed (7 adults, 4 rosettes) less than 100' upstream of the project area. Four of these individuals had gone to seed. It is reasonable to suspect that we may be treating more spotted knapweed within the project area in 2025.

***Image 47 (left)**: One of the Dyer's woad populations before treatment, May 2024.*

***Image 48 (right)**: One of the Dyer's woad populations after treatment, May 2024.*

During implementation, an additional 101 yellow starthistle were hand pulled in the staging area. No seeded yellow starthistle plants were observed in the staging area during either treatment. One post-implementation noxious weeds survey was conducted during which no spotted knapweed was observed in the project area, however, four knapweed with seed heads were found just upstream of the project area. These plants were pulled and the seed heads bagged and incinerated. Contractors removed Himalayan blackberry along access routes and along the Secondary Side Channel in phase one and two. The vines were mechanically dug, bladed, pulled, and relocated to barren areas to desiccate, while preserving the white alder canopy (Objective 6).

The second round of revegetation planting occurred in November 2024, post-phase two implementation in EPAs, slot-EPAs, in backwaters, and along suitable riparian corridors. In 2024, SRRC planted 333 container plants in EPAs across the project area. Additionally, 630 plugs were planted along the wetted channel and alcove edges.

Avian

As mentioned in the monitoring methods section, two years of post-implementation monitoring will be conducted in five years following implementation (in 2024 and 2025), in order to allow for vegetation changes to influence avian use of the site. See Attachment 4 for pre-implementation monitoring summaries.

Data

The Interim As-Built Plans were completed in October 2023 and are available upon request. Final As-Built Plans were completed in October 2024. Photomonitoring information, fisheries data, and vegetation data are available in Attachments 1 through 3, respectively. All photomonitoring photos will be shared upon request. Findings are summarized in this document (including significant photos), with all data available to CDFW, USFS, USFWS, and other project partners upon request.

Lessons Learned/Next Steps

Reporting Year 2024:

Preliminary High Flow Observations

In November and December of 2024, multiple storm systems moved through the region, delivering significant precipitation. Three notable high flow events occurred in the Salmon River basin, the first reaching 22,700 CFS, the second reaching 14,800 CFS, and the third reaching 32,400 CFS at the mainstem Salmon River USGS gage in Somes Bar. The peak flows are estimated to represent a 4.4-year event. At the writing of this report, only preliminary assessments have occurred, offering limited insights into the results of these events. It is suspected, though not confirmed, that flows on the North Fork may have been higher than in an average event of these magnitudes, which could indicate that the North Fork received a disproportionate amount of water when compared to the South Fork in typical events of these sizes. Immediately following both events, yet still in high flow conditions, SRRC crews captured drone imagery of the project area on November 26th and December 30th, 2024 (see Images 8, 10, 12, 15, 16, 50, & 51).

***Image 49**: During high flows log structures in the Perennial Channel scoured pools, sorted and aggraded sediments. January 2025.*

As flows rose across the site in both events, the project features largely functioned as intended at high flows. Water spread across the floodplain, through the broad network of side channels, providing ample flow diversity (see Image 8). Backwaters and alcoves provided slow water, willow baffles directed flow, and log structures engaged providing channel roughness. Willow baffles provided the added benefit of slack water behind most structures. Notably, the Perennial and

Secondary Channel reached bankfull. This flow path entering the Secondary Channel received a significant amount of water and breached the berm constructed in phase two in 2024 (see Images 50 and 27).

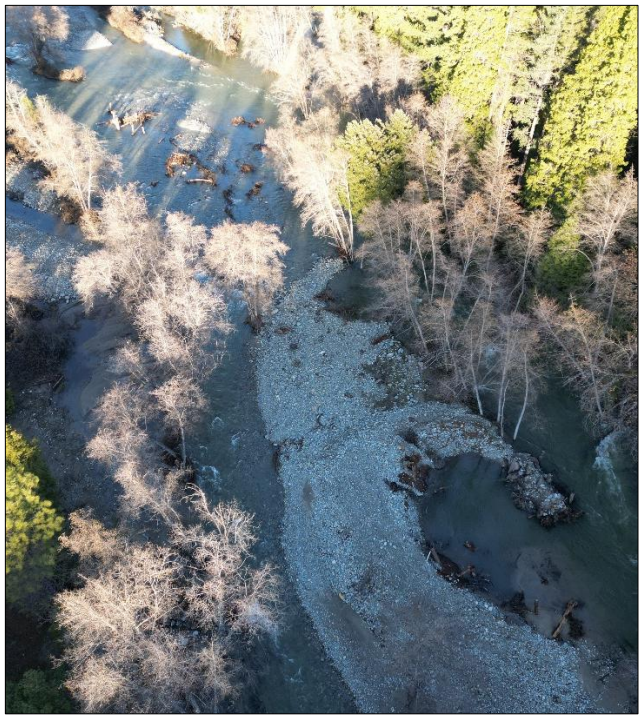


Image 50 (left): *Aerial image of the flow split between the Perennial Channel (on right) and the Secondary Channel (on left), during the highest flows on December 30th, 2024. The Perennial Channel is at bankfull. Note the abutment jam alcove (lower right) offers slow water refugia during these flows.*

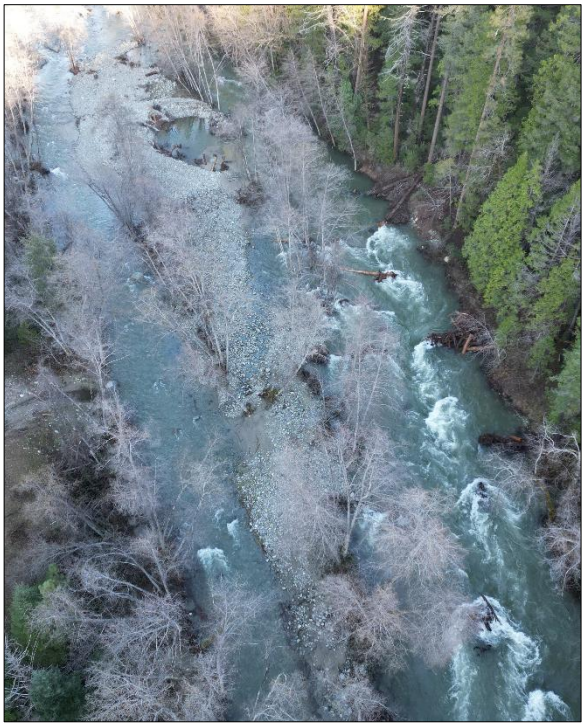


Image 51 (right): *Aerial image downstream of the Perennial Channel (on right) and the Secondary Channel on December 30th, 2024 (post-phase two implementation.*

When flows receded, change was observed throughout the site. Log structures had scoured pools, sorted gravels, racked woody debris, and aided in the deposition of fine sediment (see Image 49). Alcove banks were lined with deposited small and medium woody debris. Channel shape, roughness, and bed material and distribution changed. Additionally, in flows this high, it was anticipated that there would be alterations to flow paths, the movement bed material, and the loss of riparian revegetation.

The upper Primary Side Channel flowed through the lower portion of mid-bar bank revetment installed in 2024, along a straighter path than previously. While the majority of this water still entered the Perennial Channel, the new angle of the thalwag directed more flow into the Secondary Channel than anticipated. Designs included a constructed swale at the top of Backwater 3, which ran perpendicular to the entry point of the Secondary Channel. This feature was intended to divert moderate flows into the Perennial Channel. Both high flow events overtopped the swale, and the second event downcut a channel through the constructed swale.

Notably, the Secondary Channel, which was previously characterized throughout by sandy substrate, is now lined with coarse bed material which apparently deposited atop the preexisting channel bed (see Images 57 and 58). The movement of cobbles indicate that flows were substantial enough for transport of medium-sized substrate material. This same flow path flowed directly through several riparian EPAs, which either became buried or scoured, thereby impacting the revegetation. Additionally, the majority of the emergent species planted along the Perennial Channel were lost from scour or deposition.

***Image 52 (above)**: The Secondary Side Channel inlet on stream right between high flows. Note the scour through the constructed berm. November 26, 2024.*

***Image 53 (above)**: The Primary Side Channel log revetment completed in phase two of construction (seen center right). October 2024.*

***Image 54 (above)**: The Primary Side Channel from the mid-bar perspective, facing downstream. This channel cut a new flow path through the bank revetment mid-bar in the 2024 winter high flows (seen center right). December 2024.*

***Image 55 (above)**: The Primary Side Channel from the mid-Bar perspective, facing upstream, in January 2024. Note the clump of alders on the left.*

***Image 56 (above)**: The Primary Channel from the mid-Bar perspective, from above, in February 2025. Note the clump of alders seen on left in the photo above is now in the middle of the Primary Side Channel.*

***Image 57 (left)**: Secondary Side Channel post-phase two implementation. August 2024. Note the bed material is characterized by fine sediment.*

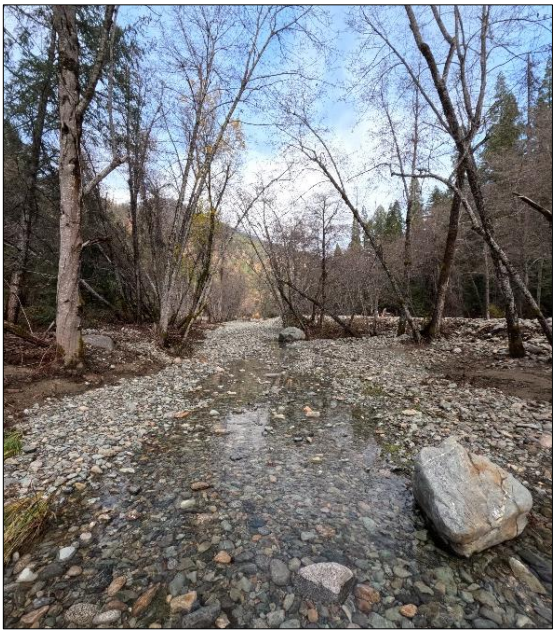


***Image 58 (right)**: Secondary Side Channel after high winter flows. Note that the bed material is now coarse, cobbles which appear to have aggraded over the existing bed.*

Sediment deposition was noted in several areas in addition to the Secondary Channel. From the top of the project to the bottom, material aggraded at the inlet to the Primary Side Channel, the mouth of Backwater 4, the inlet of the Far Side Channel, the mouth of Backwater 5, the mouth of Backwater 6, within the Primary Side Channel mid-bar, atop several riparian EPAs, and behind the abutment jam.

SRRC staff coordinated site visits on February 28th and April 18th, 2025 with SRRC staff, Mike Love & Associates, and the Karuk Tribe Fisheries Biologist respectively, to assess the site post-winter and to discuss the results of high flows. The group determined that the site requires additional maintenance to improve future outcomes. A preliminary plan is underway to return to Red Bank in Summer 2025 for a third season of implementation for project repairs.

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Attachment 1: Photomonitoring Points

Folder Name	Site ID	Name	Directions	Lat	Long
Access Route	AR1	From Sawyers Bar rd.	230	41.29975	-123.227122
Access Route	AR2	Engine fill	190, 220, 240, 270, pano 230, 50	41.299286	-123.227014
Access Route	AR3	Main bar towards engine fill	30, 75, 110, 160, 200, 230, 280, 340, pano 130	41.29865	-123.228053
Access Route	AR4	From campground upstream	90, 135, 175, 195, pano 130	41.298478	-123.229456
Access Route	AR5	From campground midstream	55, 90, 130, 160, 190, 210	41.298178	-123.229969
Access Route	AR6	From campground downstream	60, 90, 120, 150,180, panos 90, 120, 180	41.298008	-123.230333
Access Route	AR7	Main bar to campground upstream	20, 105, 155, 200, 240, 270, 310, 340	41.298081	-123.229603
Access Route	AR8	Main bar to campground downstream	10, 50, 110, 260, 300, 340	41.297933	-123.22985
Side Channel Complex	SC1	Backwater 4	150, 190, 230, 270, 320	41.298531	-123.22745
Side Channel Complex	SC2	Backwater 4 and brush bundles	15, 55, 80, 100, 140, 175, 220, 270, 330, panos 50, 150, 220, 330	41.298297	-123.227633
Side Channel Complex	SC3	Backwater 7	95, 145, 180, 215,260,310, pano 165	41.297997	-123.227081
Side Channel Complex	SC4	Backwater 8	245, 270, 300, 335, pano 300	41.297722	41.297722
Side Channel Complex	SC5	Backwater 8 from terrace	235, 265, 290, 320, 350, pano 300	41.297581	-123.226753
Side Channel Complex	SC6	Backwaters 7&8 from far side channel	0, 25, 55, 330, pano 25	41.297469	-123.227403
Side Channel Complex	SC7	Backwater 6 from terrace	5, 240, 300, 330, pano 330	41.297042	-123.227367
Side Channel Complex	SC8	Backwater 6	25, 35, 65, 80, 90, 105, 125, 130, 190, 290, 330, 355, panos 100, 240	41.297106	-123.227656
Side Channel Complex	SC9	Far side channel structures in channel	60, 95, 130, 170, 205, panos 170, 100	41.296525	-123.228025
Side Channel Complex	SC10	Far side channel structures stream left	230, 260, 300, 335, 355, pano 300	41.29675	-123.227631
Side Channel Complex	SC11	Primary side channel from mid main bar	10, 50, 95, 140, pano 70	41.297003	-123.228944
Side Channel Complex	SC12	Backwater 5 from island	20, 230, 265, 300, 345	41.297581	-123.228272
Side Channel Complex	SC13	Far side channel from island	35, 75, 120, 155, 190	41.297544	-123.228081
Side Channel Complex	SC14	Primary side channel from upper main bar (same location as MB9)	50, 85, 120, 165, 200, 230, pano 150	41.297889	-123.228453
Lower Side Channel	LC1	At side channel confluence	0, 210, 240, 275, 320, pano 275	41.296331	-123.228181

Lower Side Channel	LC2	At boulder split	10, 195, 215, 240, 270, 310, 340, panos 245, 270, 330	41.296075	-123.228247
Lower Side Channel	LC3	In channel upstream	10, 50, 90, 150, 190, 230, 270, 330, panos 10, 200	41.295356	-123.228533
Lower Side Channel	LC4	In channel midstream	15, 65, 130, 165, 200, 250, 300, 345, pano 10, 210	41.295136	-123.228581
Lower Side Channel	LC5	In channel downstream	5, 25, 75, 125, 180, 215, 240, 290, 340, panos 20, 220	41.294661	-123.229058
Lower Side Channel	LC6	At mouth	20, 50, 60, 80, 125, 170, 210, 230, 265, 305, 355, panos 20, 250, 25, 255	41.294581	-123.229181
Main Bar	MB1	Backwater 1	20, 60, 100, 150, 195, 250, 300, 335, pano 270	41.295031	-123.2288
Main Bar	MB2	Secondary and primary side channels	30, 80, 140, 175, 210, 250, 300, 350	41.295303	-123.228808
Main Bar	MB3	Backwater 3 and secondary side channel	30, 70, 115, 160, 200, 230, 260, 300, 340, panos 100, 270	41.295769	-123.228603
Main Bar	MB4	Backwater 3	30, 85, 110, 150, 185, 235, 285, 345, pano 150	41.295933	-123.229236
Main Bar	MB5	Backwater 2	0, 15, 70, 135, 180, 210, 260, 300, 335, pano 0	41.296328	-123.230106
Main Bar	MB6	Reveg main bar	25, 60, 75, 125, 175, 225, 330	41.297206	-123.229856
Main Bar	MB7	Reveg mid-upper bar	35, 80, 120, 170, 215, 240, 290, 315, 355	41.297625	-123.229642
Main Bar	MB8	Upper main bar	45, 95, 155, 200, 250, 300, 360, panos 70, 200	41.298058	-123.229208
Main Bar	MB9	Backwater 5 (same location as SC14)	5, 270, 315, pano 280	41.297889	-123.228453
Downstream	DS1	Staging area	30, 60, 120, 240, 290, 310, 350, pano 10	41.295297	-123.231614
Downstream	DS2	Facing mouth of lower side channel	30, 60, 100, 165, 190, pano 100	41.294528	-123.229839
Downstream	DS3	North fork river right	5, 35, 85, 130, 335, 340, pano 40	41.294175	-123.229792

Attachment 2: Fisheries Data

Reporting Year 2023:

Date	Total	Juv	Adults	Crew	START			END			Feature/Reach	Juveniles							Adults							Redds (specify)	Carcasses (specify)	Other	Notes
					Time	Air temp (°C)	Water temp (°C)	Time	Air temp (°C)	Water temp (°C)		Coho 0+	Coho 1+	Chinook 0+	Chinook 1+	O. mykiss 0+	O. mykiss 1+	Juv Total	Chinook	Jack Chinook	Steelhead	1/2 pound or steelh	Coho	Jack Coho	Adult Total				
10/20/2023				D. Malone, Porzha, S. Darch	9:57	NA	NA	13:04	17.8	17.3	Perennial Channel outlet alcove	0	0	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0	Flow @ gauge 256 cfs. Notable suspended fines in abutment jam alcove after t-part work. Physical/WQ people should wait for a survey yr. Backwater 2 dry. Surveyed perennial channel upstream. Checked outlet alcove as discrete habitat unit. Channel connected but juvenile passage barrier at ramp pool. Dave & I walked other wetted area but no fish observed in the channel. Bring flashlights for perennial channel (dark!). 2 fisheries survey years but as habitat is complex in winter/spring months at least.
											Perennial Channel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 fall chinook	
											Primary Side Channel inlet alcove	0	0	77	0	0	0	77	0	0	0	0	0	0	0	0	0	0	
											NF @ engine fill	NA	NA	NA	NA	NA	NA	0	2	0	0	0	0	0	2	4 (Chinook)	0	0	
											Backwater 2																		
											TOTAL	0	0	77	0	3	0	80	2	0	0	0	0	0	2	4	0	0	
11/13/2023				A. Ayers & S. Darch	10:40	10.9	7.4	12:30	14.0	7.6	Primary Side Channel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		Flow @ gauge 350 cfs @ 8:00. No fish observed yet - not much water. Two rough-skinned newts observed mating in pool in Perennial Channel approx. 600 ft above confluence - probably rough-skinned newts. 0+ & 1+ trout using sandy debris at confluence. Backwater 2 dry. Water temp 11.0 @ abutment alcove.
											Perennial Channel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Newts	
											TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
12/12/2023				M. Velarde, A. Ayers, D. Malone, Porzha	10:15	0.9	3.5	12:12	7.9	3.5	Primary Side Channel inlet alcove	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	USGS gauge at mouth: 960 cfs. Primary Side Channel: mostly dry, large disconnected pool near bottom of channel. Far Side Channel: dry but recently wetted, some gravel recruitment near top. Log jams activated, willows were caught up in them. Lower Side Channel: gravel recruitment, scour. Secondary Side Channel: only small pool, not recently inundated. Most 1+ steelhead appeared to be resident trout.
											Primary Side Channel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
											Far Side Channel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
											Lower Side Channel	0	0	2	0	25	22	49	0	0	0	0	0	0	0	0	10+ trout		
											Secondary Side Channel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
											Backwater 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
											TOTAL	0	0	2	0	25	22	49	0	0	0	0	0	0	0	0	1	0	

Reporting Year 2024 (February-June):

Date	Total	Juv	Adult	Crew	START			END			Feature/Reach	Juveniles							Adults							Redds (specify)	Carcasses (specify)	Other	Notes
					Time	Air temp (°C)	Water temp (°C)	Time	Air temp (°C)	Water temp (°C)		Coho 0+	Coho 1+	Chinook 0+	Chinook 1+	O. mykiss 0+	O. mykiss 1+	Juv Total	Chinook	Jack Chinook	Steelhead	1/2 pounder steelh	Coho	Jack Coho	Adult Total					
2/15/2024				A. Ayers & I. Swift	11:35	7.4	4.8	14:10	7.0	5.2	Primary Side Channel inlet alcove	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Gauge 3000 cfs at 9:00, 3250 at 16:00. Relatively easy to cross to bar at this flow, but dry suit is a necessity. Water relatively swift in project site channels- not much off-channel habitat currently engaged. No juvenile fish observed in project site- one adult steelhead in lower perennial channel (marked on map), and 2 adult steelhead in NF pool adjacent to Backwater 2. Carefully checked all structures but no fish. Backwaters 1, 3, 4, 6, 7, 8 not engaged at this flow. Mart had sand buildup (bars) at entrances. Signs that mart had been engaged/wetted during higher flows. All features engaged checked for fish if enough water/safe to do so; everything else walked & checked for redds (0 found).
											Perennial Channel	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	
											Far Side Channel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
											Backwater 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
											Backwater 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
											TOTAL	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	
3/21/2024				A. Ayers & I. Swift	9:30	8.7	6.4	12:43	15.0	6.9	Primary Side Channel inlet alcove	0	0	70	0	2	0	72	0	0	1 (adjacent)	0	0	0	0	6 (redhead)	0	0	Flow at gauge 4800 cfs @ 8:00. Some features, especially Perennial Channel, difficult/unsafe to snorkel at this flow. Crossing from Red Bank back to engine fill may be difficult at higher flows- not recommended over 5500 cfs. Water too deep and swift to see redds in some areas. Likely more than counted. Likely many more juvenile Chinook present that counted- difficult access to some areas and features. Entrance to Backwaters 4 & 6 blocked by sediment accumulation- 30+ Chinook observed directly at mouth of BW6, but no access. Most 0+ Chinook in Perennial Channel observed at or near tap of feature; fewer lower in channel- 3 individuals in mid-stream structures. Many butterflies at engine fill- variety.
											Perennial Channel	0	0	39	0	0	0	39	0	0	0	0	0	0	0	1 (redhead)	0	0	
											Far Side Channel	0	0	66	0	0	0	66	0	0	0	0	0	0	0	0	0	0	
											Primary Side Channel	0	0	22	0	0	2	24	0	0	0	0	0	0	0	0	0	0	
											Backwater 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
											Backwater 5	0	0	9	0	0	0	9	0	0	0	0	0	0	0	0	0	0	
											TOTAL	0	0	206	0	2	2	210	0	0	0	0	0	0	0	7	0	0	
4/9/2024				A. Ayers & S. Price & J. Stea	10:40	12.4	6.1	14:58	21.5	8.8	Primary Side Channel inlet alcove	0	0	14	0	0	0	14	0	0	0	0	0	0	0	7 (redhead)	0	0	Flow at gauge 2820 cfs @ 8:00. 90+ Chinook in BW2 much smaller in size compared to other fish at site. Added some small sandy debris & branches at cover to BW2. Entrance to BW4 still cut off by sand buildup. Lower flow make river bottom more visible at tap of bar- new redds counted were likely present but not visible in previous surveys. BWs 1, 3, 4, 6, 7, 8 all dry. Deer at entrance to BW7. School of Chinook at entrance of BW6. Community tour day.
											Perennial Channel	0	0	35	0	4	12	51	0	0	0	0	0	0	0	1 (redhead)	0	0	
											Far Side Channel	0	0	141	0	34	20	195	0	0	0	0	0	0	0	0	0	17 deer	
											Primary Side Channel	0	0	89	0	1	1	91	0	0	0	0	0	0	0	0	0	0	
											Backwater 2	0	0	9	0	0	0	9	0	0	0	0	0	0	0	0	0	0	
											Backwater 5	0	0	21	0	0	0	21	0	0	0	0	0	0	0	2 (redhead, at entrance)	0	0	
											TOTAL	0	0	309	0	39	33	381	0	0	0	0	0	0	0	10	0	0	
											Primary Side Channel inlet alcove	0	0	0	0	21	0	21	0	0	0	0	0	0	0	0	0	0	Flow at gauge 2170 cfs @ 0800. Crossing almost undoable. Lots of cover coming through bar, including at top of Backwater 2 and multiple places in Far Side Channel and Perennial Channel. Features look good at this flow, planting or filling in. Shorebirds, kingfisher, dippers.
5/31/2024				A. Ayers & I. Swift	10:00	21.8	10.0	12:42	29.1	11.7	Primary Side Channel	0	0	29	0	28	22	79	0	0	0	0	0	0	0	0	0	0	
											Perennial Channel	0	0	32	0	47	40	119	0	0	0	0	0	0	0	0	0	0	
											Far Side Channel	0	0	64	0	56	33	153	0	0	0	0	0	0	0	0	0	0	
											Backwater 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
											Backwater 5	0	0	0	0	21	0	21	0	0	0	0	0	0	0	0	0	0	
											TOTAL	0	0	125	0	173	95	393	0	0	0	0	0	0	0	0	0	0	
6/20/2024				A. Ayers, I. Swift, K. Deniz	9:15	22.2	12.0	11:25	31.3	13.0	Primary Side Channel inlet alcove	0	0	0	0	102	0	102	0	0	0	0	0	0	0	0	0	0	Flow at gauge 810 cfs @ 0700. Primary Side Channel and Far Side Channel completely dried up. Small pool/puddle all that remains of PSC. Some subsurface flow coming out of tap of Backwater 2- otherwise all backwaters dry. Perennial Channel starts just below former confluence of PSC & FSC. Pools still have water but transitioning very shallow in some places. Over 100 Western Pearlshell mussels in river right above & below engine fill site. 3 Western toads mating in PSC inlet alcove- many toads present in alcove.
											Perennial Channel	0	0	0	0	48	0	48	0	0	0	0	0	0	0	0	0	0	
											Perennial Channel outlet alcove	0	0	12	0	0	16	28	0	0	0	0	0	0	0	0	0	0	
											TOTAL	0	0	12	0	150	16	178	0	0	0	0	0	0	0	0	0	0	

Reporting Year 2024 (July-December):

Date	Total	Juv	Adult	Crew	START			END			Feature/Reach	Juvenile						Adult							Reddr (specify)	Carcasser (specify)	Other	Notes
					Time	Air temp (°C)	Water temp (°C)	Time	Air temp (°C)	Water temp (°C)		Cohu 0+	Cohu 1+	Chinook 0+	Chinook 1+	O. mykiss 0+	O. mykiss 1+	Juv Total	Chinook	Jack Chinook	Steelhead	1/2 pounder steel	Cohu	Jack Cohu	Adult Total				
7/9/2024				A. Ayers & S. Robertson	9:17	25.0	18.0	10:35	29.8	18.4	NF @ engine fill	0	0	13	0	many	many	13	0	0	0	0	0	0	0	0	0	Flow at gauge 476 cfs. Smokey. Bald eagle, shorebirds, ducks, FYLF. Perennial Channel pools disconnected. Very cold water at tap. No water in Primary Side Channel, Far Side Channel, backwaters.
											Primary Side Channel inlet alcove	0	0	0	0	19	0	19	0	0	0	0	0	0	0	0	0	0	
											North Fork	0	0	51	0	many	many	51	0	0	0	2	0	0	2	0	0	0	
											Perennial Channel	0	0	0	0	23	0	23	0	0	0	0	0	0	0	0	0	0	
											Perennial Channel outlet alcove	0	0	16	0	16	0	32	0	0	0	rainbow trout	0	0	1	0	0	0	
											TOTAL	0	0	80	0	58	0	138	0	0	0	3	0	0	3	0	0	0	
9/27/2024				A. Ayers, V. Nolan, J. Pearloo	10:20	20.0	14.9	14:00	29.9	15.7	NF @ engine fill	0	0	0	0	many	many	0	0	0	0	0	0	0	0	0	0	Flow at gauge 182 cfs. 2 watersnakes. No water in Primary Side Channel, Far Side Channel, or backwaters. Perennial Channel barely connected by a trickle to NF @ bottom. One steelhead in pool at very top of Perennial Channel- decent habitat. No redds in NF riffle yet. Muzzels present at engine fill site- Western Pearlshells. Lots of algae- very slippery.
											Primary Side Channel inlet alcove	0	0	0	0	35	0	35	0	0	0	0	0	0	0	0	0	0	
											North Fork	0	0	12	0	many	many	12	0	0	0	1	0	0	1	0	0	0	
											Perennial Channel	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	
											Perennial Channel outlet alcove	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
											TOTAL	0	0	12	0	36	0	48	0	0	0	1	0	0	1	0	0	0	
10/28/2024				A. Ayers & J. Pearloo	11:30	9.0	10.0	13:25	12.8	10.4	NF @ engine fill	0	0	3	0	n/a	n/a	3	0	0	0	0	0	0	0	0	0	Flow at gauge 300 cfs @ 0700. Heavy rain yesterday and this morning. Medium-to-poor visibility due to large amounts of freshly scoured algae moving down. Water rising. Perennial Channel barely connected to NF @ confluence. Still disconnected at tap. More water than last month in all features. Some coopfuse spat at tap of Backwater 2. FYLF @ Perennial Channel, kingfisher.
											Primary Side Channel inlet alcove	0	0	0	0	6	1	7	0	0	0	0	0	0	0	0	0	0	
											North Fork	0	0	5	0	n/a	n/a	5	1	0	0	0	0	0	1	6 Chinook	Jack Chinook	0	
											North Fork pool below bar	0	0	0	0	n/a	n/a	0	1	0	0	1	0	0	2	2 Chinook	0	0	
											Perennial Channel	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	
											TOTAL	0	0	8	0	8	1	17	2	0	0	1	0	0	3	8 Chinook	Jack Chinook	0	
11/26/2024				A. Ayers & S. Straich	11:50	11.0	6.3	15:05	10.0	6.5	Primary Side Channel inlet alcove	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	Flow at gauge 3100 cfs @ 0730. Flow on 11/22/24 2200 cfs-- first visit since high flow. Less water than expected in Far Side Channel. Water blew through FSC/PSC confluence area, cutting channel through bar into Secondary Channel. Looks like some planting area on main bar were flooded. Few fish present. Many turning heavy rootwad cover in Perennial Channel. No redds observed in enhanced habitat. Redds in North Fork riffle at top of bar no longer visible-- lots of cobbles moved during high flow, leaving no spawning. Adult steelhead in pillbox at Primary Side Channel inlet alcove. Unable to fully survey Perennial Channel due to safety concerns.
											Primary Side Channel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
											Far Side Channel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
											Perennial Side Channel	0	0	0	0	7	1	8	0	0	0	0	0	0	0	0	0	0	
											Backwater 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
											Backwater 5	0	0	0	0	9	0	9	0	0	0	0	0	0	0	0	0	0	
											TOTAL	0	0	0	0	16	1	17	0	0	1	0	0	0	1	0	0	0	
12/13/2024				A. Ayers, V. Nolan, J. Pearloo	9:55	5.3	4.7	13:30	5.6	4.7	Primary Side Channel inlet alcove	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Flow at gauge 1470 cfs. Far Side Channel completely dry-- perched cobbles and gravel at entrance to Far Side Channel impeding flow. Decent pools still below FSC cross-channel log. Perennial Channel looking good- good features, actively sorting gravel & sediment. No available cover in Backwater 2. Cold water; few fish. No redds visible.
											Primary Side Channel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
											Far Side Channel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
											Perennial Channel	0	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	
											Backwater 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
											Backwater 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
											TOTAL	0	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	

Attachment 3: Revegetation Survival

Preliminary Survival Data of Container Plants West of the Primary Side Channel July 2024 (pre-heat wave):

Red Bank Habitat Enhancement Project
Planting Zone Survival Survey Data
J. Jackson & M. O'Neil
Date: July 9th, 2024

			West of Primary Channel																												
Species	**Common Name**	**Total Pl**	PC-9			PC-10			PC-11			PC-12			PC-13			PC-14			PC-15			PC-16			PC-17			PC-18		
Shrubs			**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**
Amelanchier alnifolia	western serviceberry																														
Cercis occidentalis	western redbud											3		5								1		1			1				
Cercocarpus betuloides var. ber	birch-leaf mountain mahogany																														
Corylus cornuta subsp. californic	California hazelnut																														
Physocarpus capitatus	Pacific ninebark																														
Rosa californica	California rose																														
Ribes sanguineum	red flowering currant														5		3														
Cornus sericea	dogwood (sericea)								1		2							4		4										4		4
Philadelphus lewisii	mock orange		2						1			4		2	4		2	4												1		3
Salix lasiolepis	arroyo willow																														
Salix melanopsis	dusky willow																														
Symphoricarpos albus	snowberry								1		1							6			2			2			7		1	6		
Trees																																
Acer macrophyllum	bigleaf maple		3		3																2			1		1	4		4			
Betula occidentalis	water birch																														
Calocedrus decurrens	incense cedar																														
Pinus lambertiana	sugar pine																														
Pinus ponderosa	ponderosa pine																														
Populus trichocarpa	cottonwood							2																							
Pseudotsuga menziesii	doug fir																														
Salix lasiandra	Pacific willow																														
Quercus garryana	white oak										3	1		5	1		5			6	1	2	1	2	2	4	4		2		
Herbs & Vines																																
Artemisia douglasiana	mugwort																														
Lonicera hispidula	pink honeysuckle																					1			1		4				
Rubus ursinus	California blackberry																														
Clematis ligusticifolia	creek clematis								1									1		3									1		3
Vitis californica	California grape																														
Total Plants		**0**																													
			Healthy	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**
			5	0	3	0	2	0	4	0	6	8	0	12	10	0	10	15	0	13	5	0	4	5	0	4	14	0	14	16	0	12
			PC-9	Total	8	PC-10	Total	2	PC-11	Total	10	PC-12	Total	20	PC-13	Total	20	PC-14	Total	28	PC-15	Total	9	PC-16	Total	9	PC-17	Total	28	PC-18	Total	28
	Natural Recruitment																														
	Willow species, % survival																														
	Additional Notes																														
	Total Plants - West of Primary Channel	**162**	PC-9	% mort.	37.50%	PC-10	% mort.	0.00%	PC-11	% mort.	60.00%	PC-12	% mort.	60.00%	PC-13	% mort.	50.00%	PC-14	% mort.	46.43%	PC-15	% mort.	44.44%	PC-16	% mort.	44.44%	PC-17	% mort.	50.00%	PC-18	% mort.	42.86%
			PC-9	% surviv	62.50%	PC-10	% surviv	100.00%	PC-11	% surviv	40.00%	PC-12	% surviv	40.00%	PC-13	% surviv	50.00%	PC-14	% surviv	53.57%	PC-15	% surviv	55.56%	PC-16	% surviv	55.56%	PC-17	% surviv	50.00%	PC-18	% surviv	57.14%
	Total Surviving	84	**Notes:**																												
	Percent survival	**51.9%**																													
	Total Poor Health	2																													
	Percent Poor	**1.2%**																													
	Total Mortalities	78																													
	Percent Mort	**48.1%**																													

Preliminary Survival Data for Container Plants East of the Primary Side Channel July 2024 (pre-heat wave):

Red Bank Habitat Enhancement Project
Planting Zone Survival Survey Data
J. Jackson & M. O'Neil
Date: July 9th, 2024

			East of Primary Channel																								
Species	**Common Name**	**Total Pl**	PC-1			PC-2			PC-3			PC-4			PC-5			PC-6			PC-7			PC-8		
Shrubs			**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**
Amelanchier alnifolia	western serviceberry																										
Cercis occidentalis	western redbud		1					1	3												2		1	2		1
Cercocarpus betuloides var. bet	birch-leaf mountain mahogany																										
Corylus cornuta subsp. californi	California hazelnut																										
Physocarpus capitatus	Pacific ninebark																										
Rosa californica	California rose																										
Ribes sanguineum	red flowering currant																										
Cornus sericea	dogwood (sericea)												2	1		2	1	4	1	4							
Philadelphus lewisii	mock orange											1				1			1	2							
Salix lasiolepis	arroyo willow																										
Salix melanopsis	dusky willow																										
Symphoricarpos albus	snowberry		2			2		1	5		1	2			2			4		2	5	1		6		
Trees																											
Acer macrophyllum	bigleaf maple		2			2			6												4		2	6		
Betula occidentalis	water birch																										
Calocedrus decurrens	incense cedar																										
Pinus lambertiana	sugar pine																										
Pinus ponderosa	ponderosa pine																										
Populus trichocarpa	cottonwood																										
Pseudotsuga menziesii	doug fir																										
Salix lasiandra	Pacific willow																										
Quercus garryana	white oak				3			3	1		5			3			3	2		4	3		3	2		4
Herbs & Vines																											
Artemisia douglasiana	mugwort																										
Lonicera hispidula	pink honeysuckle			1				1																			
Rubus ursinus	California blackberry																										
Clematis ligusticifolia	creek clematis											1			1			2		1							
Vitis californica	California grape																										
Total Plants		**0**																									
			Healthy	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**	**Healthy**	**Poor**	**Mortalit**
			5	**1**	**3**	**4**	**0**	**5**	**15**	**0**	**6**	**4**	**2**	**4**	**3**	**3**	**4**	**12**	**2**	**13**	**14**	**1**	**6**	**16**	**0**	**5**
			PC-1	**Total**	**9**	**PC-2**	**Total**	**9**	**PC-3**	**Total**	**21**	**PC-4**	**Total**	**10**	**PC-5**	**Total**	**10**	**PC-6**	**Total**	**27**	**PC-7**	**Total**	**21**	**PC-8**	**Total**	**21**
	Natural Recruitment																										
	Willow species, % survival																										
	Additional Notes																										
	Total Plants - East of Primary Channel	**128**	**PC-1**	**% mort.**	**33.33%**	**PC-2**	**% mort.**	**55.56%**	**PC-3**	**% mort.**	**28.57%**	**D4**	**% mort.**	**40.00%**	**D5**	**% mort.**	**40.00%**	**D6**	**% mort.**	**48.15%**	**D7**	**% mort.**	**28.57%**	**D7**	**% mort.**	**23.81%**
			PC-1	**% surviv**	**66.67%**	**PC-2**	**% surviv**	**44.44%**	**PC-3**	**% surviv**	**71.43%**	**D4**	**% surviv**	**60.00%**	**D5**	**% surviv**	**60.00%**	**D6**	**% surviv**	**51.85%**	**D7**	**% surviv**	**71.43%**	**D7**	**% surviv**	**76.19%**
	Total Surviving	82	**Notes:**																								
	Percent survival	**64.1%**																									
	Total Poor Health	9																									
	Percent Poor	**7.0%**																									
	Total Mortalities	46																									
	Percent Mort	**35.9%**																									
	Plants added:																										
	Original Percent Surviva	**64.1%**																									
	Overall Percent Survival	**64.1%**																									

Preliminary Survival Data for Container Plants West of the Primary Side Channel September 2024 (post-heat wave):

Red Bank Habitat Enhancement Project
Planting Zone Survival Survey Data
J. Jackson & M. O'Neil
Date: September 17th, 2024

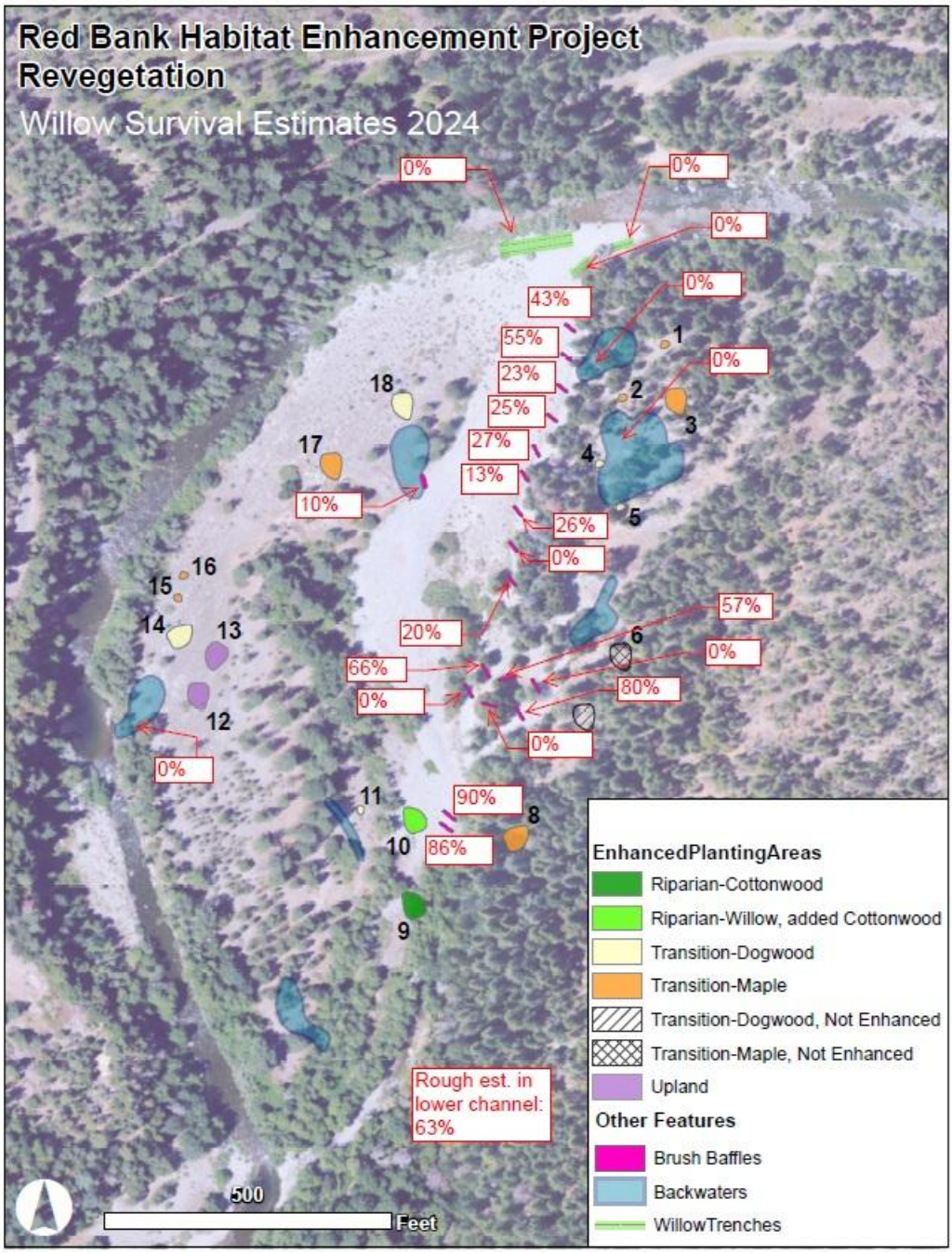
			West of Primary Channel																												
Species	**Common Name**	**2023 Tot**	PC-9			PC-10			PC-11			PC-12			PC-13			PC-14			PC-15			PC-16			PC-17			PC-18		
Shrubs			Healthy	Poor	Mortalit	Healthy	Poor	Mortalit	Healthy	Poor	Mortalit	Healthy	Poor	Mortalit	Healthy	Poor	Mortalit	Healthy	Poor	Mortalit	Healthy	Poor	Mortalit	Healthy	Poor	Mortalit	Healthy	Poor	Mortalit	Healthy	Poor	Mortalit
Amelanchier alnifolia	western serviceberry																														
Cercis occidentalis	western redbud	31										1	2	5	3	1	4						1			1	1		1			
Cercocarpus betuloides var. ber	birch-leaf mountain mahogany																														
Corylus cornuta subsp. californic	California hazelnut																														
Physocarpus capitatus	Pacific ninebark																														
Rosa californica	California rose																														
Ribes sanguineum	red flowering currant																														
Cornus sericea	red osier dogwood (sericea)	34									3								1	7									2	1	5
Philadelphus lewisii	mock orange	28	2							1		1		5	2		4			4									2		2
Salix lasiolepis	arroyo willow																														
Salix melanopsis	dusky willow																														
Symphoricarpos albus	snowberry	58									2								1	1	4			2			2	2		6	4		2
Trees																																	
Acer macrophyllum	bigleaf maple	40	1		5																	1	1		1		1	2	4	2			
Betula occidentalis	water birch																														
Calocedrus decurrens	incense cedar																														
Pinus lambertiana	sugar pine																														
Pinus ponderosa	ponderosa pine																														
Populus trichocarpa	cottonwood						2																								
Pseudotsuga menziesii	doug fir					0	0	0																							
Salix lasiandra	Pacific willow																														
Quercus garryana	white oak	75									3	2		4			6	1		5	1		2	1		2	2		4	6		
Herbs & Vines																																	
Artemisia douglasiana	mugwort																														
Lonicera hispidula	pink honeysuckle	8																				1			1				4		
Rubus ursinus	California blackberry																														
Clematis ligusticifolia	creek clematis	14							1											4												4
Vitis californica	California grape																														
Total Plants		**288**																													
			Healthy	Poor	Mortalit	Healthy	Poor	Mortalit	Healthy	Poor	Mortalit	Healthy	Poor	Mortalit	Healthy	Poor	Mortalit	Healthy	Poor	Mortalit	Healthy	Poor	Mortalit	Healthy	Poor	Mortalit	Healthy	Poor	Mortalit	Healthy	Poor	Mortalit
			3	0	5	0	2	0	1	1	8	4	2	14	5	1	14	2	2	24	2	1	6	2	0	7	7	4	17	14	1	13
			PC-9	Total	8	PC-10	Total	2	PC-11	Total	10	PC-12	Total	20	PC-13	Total	20	PC-14	Total	28	PC-15	Total	9	PC-16	Total	9	PC-17	Total	28	PC-18	Total	28
	Natural Recruitment		Pacific willow: 1																								flag w. no plant:4, mugwort: 4, acmispon:1, Q. chrysolepis: 1, wode: 10 ind. (pulled)			Q. chrysolepis: 5, buckwheat: 2, california grape: 2,		
	Willow species, % survival																														
	Additional Notes								All planting clusters had 1-5 wode plants			All planting clusters had 1-5 wode plants			All planting clusters had 1-5 wode plants			All planting clusters had 1-5 wode plants			All planting clusters had 1-5 wode plants			All planting clusters had 1-5 wode plants						many of the dead impossible to find		
	Total Plants - West of Primary Channel	**162**	PC-9	% mort.	62.50%	PC-10	% mort.	0.00%	PC-11	% mort.	80.00%	PC-12	% mort.	70.00%	PC-13	% mort.	70.00%	PC-14	% mort.	85.71%	PC-15	% mort.	66.67%	PC-16	% mort.	77.78%	PC-17	% mort.	60.71%	PC-18	% mort.	46.43%
			PC-9	% surviv	37.50%	PC-10	% surviv	100.00%	PC-11	% surviv	20.00%	PC-12	% surviv	30.00%	PC-13	% surviv	30.00%	PC-14	% surviv	14.29%	PC-15	% surviv	33.33%	PC-16	% surviv	22.22%	PC-17	% surviv	39.29%	PC-18	% surviv	53.57%
	Total Surviving	54	**Notes:**																												
	Percent survival	**33.3%**																													
	Total Poor Health	14																													
	Percent Poor	**8.6%**																													
	Total Mortalities	108																													
	Percent Mort	**66.7%**																													

Preliminary Survival Data for Container Plants East of the Primary Side Channel September 2024 (post-heat wave):

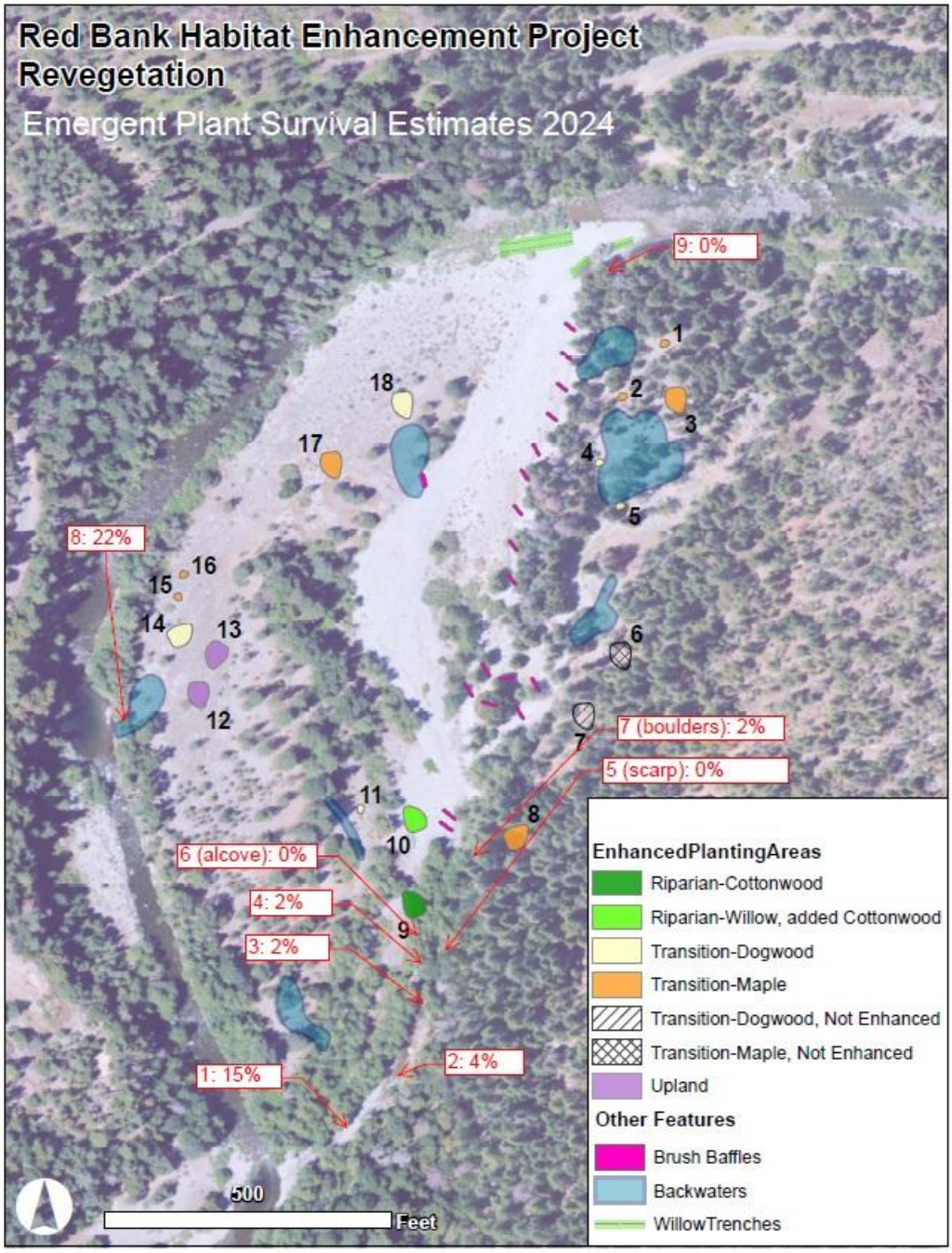
Red Bank Habitat Enhancement Project
Planting Zone Survival Survey Data
J. Jackson & M. O'Neil (w/Pirish Plants and Irie/Todd)
Date: September 17th, 2024

			East of Primary Channel																									
Species	**Common Name**	**2023 Tot**	**PC-1**			**PC-2**			**PC-3**			**PC-4**			**PC-5**			**PC-6**			**PC-7**			**PC-8**		
Shrubs			**Healthy**	**Poor**	**Mortality**	**Healthy**	**Poor**	**Mortality**	**Healthy**	**Poor**	**Mortality**	**Healthy**	**Poor**	**Mortality**	**Healthy**	**Poor**	**Mortality**	**Healthy**	**Poor**	**Mortality**	**Healthy**	**Poor**	**Mortality**	**Healthy**	**Poor**	**Mortality**
Amelanchier alnifolia	western serviceberry																									
Cercis occidentalis	western redbud	31	1					1	2	1											2		1	2	1	
Cercocarpus betuloides var. bet	birch-leaf mountain mahogany																									
Corylus cornuta subsp. californic	California hazelnut																									
Physocarpus capitatus	Pacific ninebark																									
Rosa californica	California rose																									
Ribes sanguineum	red flowering currant																									
Cornus sericea	dogwood (sericea)	34											2	1		2	1	2	5	2						
Philadelphus lewisii	mock orange	28										1					1		2	1						
Salix lasiolepis	arroyo willow																									
Salix melanopsis	dusky willow																									
Symphoricarpos albus	snowberry	58	1		1	2			3	1	2	2				2		3	2	1	5		1	5		1
Trees																										
Acer macrophyllum	bigleaf maple	40	1	1		1	1		4	2											1	5		5		1
Betula occidentalis	water birch																									
Calocedrus decurrens	incense cedar																									
Pinus lambertiana	sugar pine																									
Pinus ponderosa	ponderosa pine																									
Populus trichocarpa	cottonwood																									
Pseudotsuga menziesii	doug fir																									
Salix lasiandra	Pacific willow																									
Quercus garryana	white oak	75			3			3	1		5	2		1	2		1	2		4	2		4	3		3
Herbs & Vines																										
Artemisia douglasiana	mugwort																									
Lonicera hispidula	pink honeysuckle	8			1			1																		
Rubus ursinus	California blackberry																									
Clematis ligusticifolia	creek clematis	14												1	1			2		1						
Vitis californica	California grape																									
Total Plants		**288**																								
			Healthy	**Poor**	**Mortality**	**Healthy**	**Poor**	**Mortality**	**Healthy**	**Poor**	**Mortality**	**Healthy**	**Poor**	**Mortality**	**Healthy**	**Poor**	**Mortality**	**Healthy**	**Poor**	**Mortality**	**Healthy**	**Poor**	**Mortality**	**Healthy**	**Poor**	**Mortality**
			3	**1**	**5**	**3**	**1**	**5**	**10**	**4**	**7**	**5**	**2**	**3**	**3**	**4**	**3**	**9**	**9**	**9**	**10**	**5**	**6**	**15**	**1**	**5**
			PC-1	**Total**	**9**	**PC-2**	**Total**	**9**	**PC-3**	**Total**	**21**	**PC-4**	**Total**	**10**	**PC-5**	**Total**	**10**	**PC-6**	**Total**	**27**	**PC-7**	**Total**	**21**	**PC-8**	**Total**	**21**
	Natural Recruitment		Q. chrysolepis:2, owl clover, california brome, "silver grass", Q. garryana: 2			3 flags w/ no plant, Q. chrysolepis:3, bunchgrass:2, lupin:1, california brome:~50			2 flags w/ no plants, Q. chrysolepis:2, Q. garryana:1, lupin: 1, california brome: 2, yarrow: 1, "silver grass"			Q. chrysolepis:5, Q. garryana:3			manzanita seedling: 1, solidago: 25, mugwort: 25			4 flags w/ no plant, manzanita, california brome: 8, lupin:2, Q. chrysolepis: 2			flag w/ no plant: 4; couldn't locate last oak acorn (no flag) lupin: 1, california brome: 12 ind (1% c), solidago: 1			Q. chrysolepis: 1, flag w/ no plant: 3, pink honeysuckle: 7		
	Willow species, % survival																									
	Additional Notes								Sheep sorrel-31, st. johns wort: 1			sheep sorrel: 1, sweet pea: 1 (pulled), dogtail grass abundant									~10 woad plants			Himalayan blackberry coming into EPA		
	Total Plants - East of Primary Channel	**128**	**PC-1**	**% mort**	**55.56%**	**PC-2**	**% mort**	**55.56%**	**PC-3**	**% mort**	**33.33%**	**D4**	**% mort**	**30.00%**	**D5**	**% mort**	**30.00%**	**D6**	**% mort**	**33.33%**	**D7**	**% mort**	**28.57%**	**D7**	**% mort**	**23.81%**
			PC-1	**% survi**	**44.44%**	**PC-2**	**% survi**	**44.44%**	**PC-3**	**% survi**	**66.67%**	**D4**	**% survi**	**70.00%**	**D5**	**% survi**	**70.00%**	**D6**	**% survi**	**66.67%**	**D7**	**% survi**	**71.43%**	**D7**	**% survi**	**76.19%**
	Total Surviving	85	**Notes:**																							
	Percent survival	**66.4%**																								
	Total Poor Health	27																								
	Percent Poor	**21.1%**																								
	Total Mortalities	43																								
	Percent Mort	**33.6%**																								
	Plants added:																									
	Original Percent Survival	**66.4%**																								
	Overall Percent Survival	**66.4%**																								

Willow Survival Estimates 2024:



Emergent Plant Survival Estimates 2024:



Attachment 4: Avian Monitoring

Excerpted from the *Salmon River Bird and Vegetation Monitoring: 2019 Summary Report* (Rockwell and Stephens 2019).

In 2018 and 2019, Klamath Bird Observatory, in partnership with the Salmon River Restoration Council, completed a first and second year of pre-restoration spring and fall bird monitoring and associated vegetation surveys along the North Fork Salmon (see Table 3). In 2019, we completed the second year of baseline bird and vegetation surveys along the North Fork Salmon River: 1) point counts and relevé vegetation surveys at 40 points on an 11 km long-term monitoring reach, 2) spot-mapping, Vickery Index, and intensive vegetation surveys at two restoration sites during the songbird breeding season, and 3) fall area search surveys at one of the two restoration sites during the fall migration period.

Three riparian focal species identified in the PIF Riparian Bird Conservation Plan were detected at Red Bank (Table 3), which will provide important context for interpreting long-term trends, as each focal species is associated with a unique habitat component of riparian systems (RHJV 2004); Common Yellowthroat (*Geothlypis trichas)*, Song Sparrow (*Melospiza melodia)*, and the Black-Headed Grosbeak (*Pheucticus melanocephalus)*. Willow flycatchers (*Empidonax trailii)*, the state-endangered species, were detected onsite in 2018. It is assumed that they were migrating through as none were observed breeding. These species are associated with a particular habitat component in riparian systems. Therefore, their presence and long-term trends may indicate the effects of these riparian restoration actions when subsequent post-implementation surveys occur (RHJV 2004).

While focal riparian species Black-headed Grosbeak and Yellow-breasted Chat (*Icteria virens)* were among the most common birds in the area, we detected fewer Song Sparrows and Yellow Warblers (*Setophaga petechial)* than expected, both along the entire point count reach and at the site level (but note that we recorded many more Song Sparrow territories in 2019 compared to the previous year). Other species, such as Common Merganser (*Mergus merganser)*, Warbling Vireo (*Vireo gilvus*), Cassin's Vireo (*Vireo cassinii)*, Song Sparrow, and a couple of warbler species had substantially different abundance between 2018 and 2019. This amount of annual variation points to the importance of completing multiple years of pre-restoration surveys when possible.

Because half of our planned site-level study species were present in low densities on the restoration sites, we added Warbling Vireo and Lazuli Bunting (*Passerina amoena)* as additional focal species after 2019. While Lazuli Buntings are typical of oak or mixed oak-conifer forest, they can also inhabit riparian zones, and were observed on plots in 2018 – however, in 2019 they were not present in sufficient density to obtain a good sample size. We found more Warbling Vireo territories, but this year they were less abundant than Song Sparrows on our study plots. We suspect that lower Vickery reproductive index values for Lazuli Bunting and Warbling Vireo may be affected by small sample sizes and our ability to detect their nesting behaviors, and not necessarily a true lower success rate than other study species. The mean value of Black-headed Grosbeak Vickery Index remained quite high (even higher than 2018), despite a substantial number of first nest attempts that failed early in the season. Most of these pairs then had a

successful second nest, resulting in the same Vickery score as if they had had a single successful nest.

Common Name	*Scientific Name*	Total no. of detections	Red Bank 2018	Red Bank 2019	PIF Riparian	PIF Conifer	PIF Oak	CDFW
American Robin	*Turdus migratorius*	98	95	3				
Cedar Waxwing	*Bombycilla cedrorum*	23	23	0				
Bushtit	*Psaltriparus minimus*	20	0	20				
Golden-crowned Sparrow	*Zonotrichia atricapilla*	16	5	11				
Stellar's Jay	*Cyanocitta stelleri*	11	7	4		2nd		
Oregon Junco	*Junco hyemalis oregonus*	7	0	7		1st		
Northern Flicker	*Colaptes auratus*	5	5	0				
MacGillivray's Warbler	*Geothlypis tolmiei*	5	0	5		1st		
Black Phoebe	*Sayornis nigricans*	4	2	2				
Spotted Towhee	*Pipilo maculata*	4	4	0				
White-crowned Sparrow	*Zonotrichia leucophrys*	3	3	0				
Belted Kingfisher	*Megaceryle alcyon*	3	0	3				
Common Yellowthroat	*Geothlypis trichas*	3	2	1	X			
Mountain Quail	*Oreortyc pictus*	3	0	3		2nd		
Ruby-crowned Kinglet	*Regulus calendula*	3	0	3				
Downy Woodpecker	*Picoides pubescens*	2	1	1				
Pileated Woodpecker	*Dryocopus pileatus*	2	2	0		1st		
Lesser Goldfinch	*Spinus psaltria*	2	2	0				
Pacific Wren	*Troglodytes pacificus*	2	1	1				
Western Tanager	*Piranga ludoviciana*	2	2	0		1st		
Song Sparrow	*Melospiza melodia*	1	0	1	X			

Yellow-rumped Warbler	*Setophaga coronata*	1	1	0		2nd		
American Dipper	*Cinclus mexicanus*	1	0	1				
Black-headed Grosbeak	*Pheucticus melanocephalus*	1	1	0	X			
Chestnut-backed Chickadee	*Poecile rufescens*	1	0	1				
Common Raven	*Corvus corax*	1	1	0				
Lincoln's Sparrow	*Melospiza lincolnii*	1	1	0				
Mourning Dove	*Zenaida macroura*	1	0	1				
Sharp-shinned Hawk	*Accipiter striatus*	1	1	0				
Sooty Grouse	*Dendragapus fugliginosus*	1	1	0				
Black-throated Gray Warbler	*Setophaga nigrescens*	0	0	0		1st		
Fox Sparrow	*Passerella iliaca*	0	0	0		1st		
Hutton's Vireo	*Vireo huttoni*	0	0	0			X	

Table 3. *Number of detections of each species recorded on-plot during fall area search surveys in 2018 and 2019 at Red Bank, listed in descending order of total number of detections. Other columns denote whether birds are designated as focal species in the California Partners in Flight (PIF) Riparian Bird Conservation Plan (RHJV 2004), PIF Coniferous Forest Bird Conservation Plan (primary or secondary focal species; CalPIF 2002a), PIF Oak Woodland Bird Conservation Plan (CalPIF 2002b), or as species of special concern by the California Department of Fish and Wildlife (1st, 2nd, or 3rd priority; Shuford and Gardali 2008).*

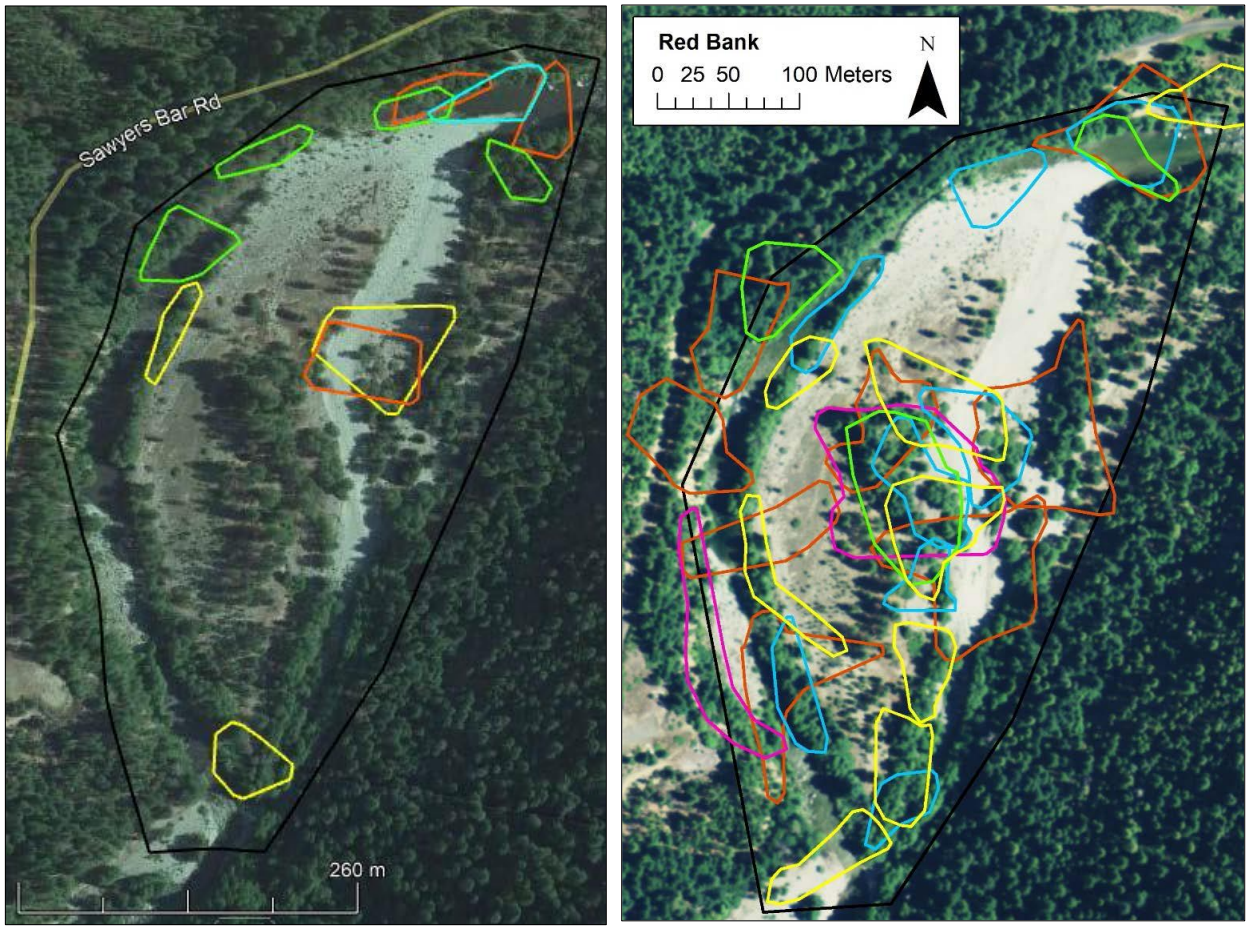


Figure 5. *Location of focal riparian bird territories at Red Bank in 2018 (left) and 2019 (right). Orange = Black-headed Grosbeak, blue = Song Sparrow, green = Warbling Vireo, yellow = Yellow-breasted Chat. A likely three additional Yellow-breasted Chats were detected on the southwest and southeast part of Red Bank in 2018, but not frequently enough during standardized spot-mapping periods to count as distinct territories (although fledglings were observed at two of these). Warbling Vireo was added as a focal species mid-season, so territories drawn here are tentative (KBO 2018). No Yellow Warbler territories were established in this plot (KBO 2019).*

No Yellow Warbler territories were established at Red Bank, similar to 2018, although a male was present at Red Bank from at least May 15-24, and a female was observed on May 30. We believe that this species is stopping over briefly on spring migration, and then moving on to other areas to breed. This species is often associated with robust willow thickets, and this type of habitat structure is generally scarce along the North Fork Salmon, where the riparian habitat tends to be narrow along the canyon bottoms. While Yellow Warblers frequently occupied sites with a cottonwood-alder canopy and blackberry understory along the Trinity River (Rockwell pers. obs., Rockwell and Stephens 2018a), we have not observed them breeding in this habitat type along the Salmon River. Reconnection and revegetation of the wider floodplains present at Red Bank (i.e. increasing willow cover) has the potential to benefit these species, as migration stopover habitat if not as breeding habitat.

In fall, the most commonly detected bird species were quite different this year than in 2018, and many species were recorded in one year but not the other. This reflects the substantial amount of variation common in fall that is expected due to migratory flocking behavior, and highlights why multiple visits per year and multiple years of data are preferable when possible. For example, last year we conducted surveys during times when large flocks of American Robins (*Turdus migratorius)* and Cedar Waxwings (*Bombycilla cedorum)* were eating grapes at Red Bank (S. Rockwell pers. obs; Table 2), but this year we did not happen to conduct surveys at the same time as any large roving flocks, and the number of detections of these same species was very low in 2019. The opposite was true for Bushtits (*Psaltriparus minimus)*; we encountered a nomadic flock at one of the Red Bank area search plots in 2019, but none were present on plots during surveys last year.

Future research will include post-restoration monitoring of the same metrics five years after restoration actions are complete. Continued communication with the Salmon River Restoration Council will be necessary to best use bird monitoring data to develop questions about different restoration techniques and designs (e.g., planting mixtures, plant densities, irrigation or other stewardship), and ensure that monitoring results are applicable to adaptive management. We will also discuss the most appropriate return interval for point count surveys along the long-term monitoring reaches. Future reports will relate bird abundance, diversity, and breeding success to habitat components and specific vegetation features. Bird metrics will be used as feedback about the success of restoration practices. Some bird metrics may decrease immediately post-restoration if riparian vegetation is impacted in the short term. However, if restored sites are on a successful trajectory towards becoming quality riparian habitat for birds and thus other terrestrial wildlife, then metrics such as spring and fall bird abundance, diversity, and mean reproductive index are expected to eventually re-attain baseline levels or increase in the years following restoration. If certain components of restoration are less successful, results from bird monitoring will help identify habitat components that have not yet been achieved, and inform adaptive management for both re-entry into restored sites and design of future sites (KBO 2019).