Kelly Bar Habitat Enhancement

Monitoring Memorandum

March 2021

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Cover Photo: December 2019 image of post-implementation conditions
(Photo Credit: Whelan Gilkerson, Merkel & Associates)
All photos were taken by SRRC unless noted otherwise.

Implemented features, clockwise from the upper left: Willow Pond October 2019, red currant June 2020; Kelly Pond February 2021.

I: Background and Introduction

Kelly Bar is located within the North Fork Salmon River watershed, two miles downriver of Sawyers Bar, California, in Siskiyou County. It is located at the intersection of Sawyers Bar Road and Forest Road 40N42. This stretch of river is an important spawning and rearing area for coho and spring Chinook salmon, imperiled species throughout California and the Pacific Northwest. The Final Southern Oregon/Northern California Coast (SONCC) Coho Recovery Plan (NMFS 2014) identifies improving the quality and extent of rearing habitat and refugia as the highest priority for recovery of coho in the Salmon River.

Prior to implementing this pilot project, the project area consisted of roughly 12 acres of mostly barren, large alluvial floodplain with several sparsely vegetated, discontinuous, remnant high-flow side channels and vegetated alluvial terraces. The high-flow side channels were largely dry throughout the summer and fall. In 2008, the SRRC conducted an assessment that evaluated riparian conditions throughout the Salmon River (SRRC 2008). The assessment identified the project area as a high priority for restoration of riparian conditions and salmonid habitat. The reach of river surrounding the project area is preferred habitat for coho and spring Chinook salmon and is known to host the species. Therefore, there was a need to enhance both winter and summer refugia on Kelly Bar, an area that has been identified as having High Intrinsic Potential in the Final SONCC Coho Recovery Plan.

In coordination with the United States Forest Service (USFS), SRRC led the development of engineering designs and implementation to enhance salmonid habitat at Kelly Bar. Michael Love & Associates (MLA) served as the project engineer and developed the final designs for the project, with geologic studies and recommendations provided by Pacific Watershed Associates. The designs and implementation were funded by the California Department of Fish and Wildlife. Construction was completed by Travis Carmesin Construction with oversight and supervision provided by SRRC, MLA, and Chris Moore. Treatments included excavation of channels, alcoves, and ponds, constructing engineered log jams and small wood habitat features, enhanced planting areas, diverse riparian planting, and cattle exclusion fencing.

The project is funded through CDFW's Fisheries Restoration Grant Program, 2017 Kelly Gulch Fisheries and Riparian Habitat Enhancement Phase II (Agreement #P1610526) and 2018 Kelly Gulch Fisheries and Riparian Habitat Enhancement Phase I and III (Agreement #P1710524), which includes the following: California Environmental Quality Act compliance, US Army Corps of Engineers (USACE) Clean Water Act section 404 Regional General Permit 12, and State Water Resources Control Board (SWRCB) section 401 Certification. A USFS National Environmental Policy Act Environmental Assessment was completed and the project was also covered under a SWRCB Construction General Permit (CGP) waiver and CDFW Section 1600 Streambed Alteration Agreement (SAA). The SWRCB CGP waiver expired on October 23rd, 2019 and the USACE 404 permit expired on December 1st, 2020. The SWRCB 401 certification expires in July 2021 and 2022, and the CDFW SAA expires in September 2023.

Construction began on August 1st, 2019. Heavy equipment construction and final site stabilization (with equipment) was completed by October 15th, 2019. Manual work and demobilization was completed by October 19th, 2019. Revegetation with diverse, native, nursery plants was completed in early December 2019, when weather conditions were appropriate for successful planting.

Image 1: Post-Implementation conditions. December 2019.
(Image Credit: Whelan Gilkerson, Merkel & Associates)

II: Project Objectives and Goals

The goal of this project is to increase the abundance of complex off-channel rearing habitat with intrinsic potential for year-round rearing of juvenile coho and other salmonids by providing both winter high flow and summer thermal refugia.

Specific project objectives include:

1) Create self-sustaining side-channels with off-channel alcoves for high-flow off-channel refugia.
2) Provide off-channel high-flow and thermal refugia using groundwater-fed ponds and exploiting hyporheic flows in the alcoves.
3) Increase in-channel bed complexity using large wood features.
4) Create large wood complexity in off-channel habitats.
5) Increase riparian shading to reduce summer water temperatures.
6) Improve connectivity of Kelly Gulch with the river for fish ingress and egress.
7) Minimize removal of large riparian vegetation
8) Balance cuts and fills within the boundary of each of the two mining claims within the project area.

Improvements at the Kelly Bar Habitat Enhancement project consist of the following components (See image 1):

1) Improved channels that provide hydrologic connection and fish access between the North Fork Salmon River and Kelly Bar and West Bar (across the river) during high flows and backwatering events, diversifying channel habitat and providing much needed slow water refugia. See Image 1.
    a) On Kelly Bar:
        - The Overflow Channel includes an alcove and an enhanced channel with brush baffles that extends upstream along the river bar towards a constructed engineered log jam at the top of the bar (see image 3). The inlet of the Overflow Channel was lowered to increase flooding frequency into the channel.
        - The Seasonal Channel is a hyporheic flow fed channel that contains log habitat structures and brush baffles that provide habitat and stabilize the stream bank (See images 3 and 5).
    b) On West Bar:
        - The Mid-Bar Channel includes an alcove and enhanced channel that extends upstream along the river bar towards a constructed engineered log jam at the top of the bar. The inlet of the channel was lowered to increase flooding frequency into the channel. The alcove provides summer refugia.
        - The Mid-Bar Channel contains log habitat structures and brush baffles that provide habitat and stabilize the stream bank.
        - The Back-Bar Channel enhancement with a large wood apex jam at the inlet. The inlet of the channel was lowered to increase flooding frequency of the Back-Bar Channel.

2) Deepening and enlarging Kelly and Willow Ponds to enhance off-channel habitat and provide hydrologic connection to the North Fork Salmon River during high flow and backwatering events. Log habitat structures provide habitat and stabilize the features.
   a) Kelly Pond provides winter refugia.
   b) Willow Pond provides both winter and summer refugia.
3) Enhanced planting areas and riparian planting throughout the project site.
4) Livestock exclusion fencing to protect revegetation and site stabilization efforts.

Image 2: Kelly Bar prior to implementation.
January 2019.

Image 3: Kelly Bar post-implementation. Seasonal Channel on left,
Overflow Channel and Kelly Bar Alcove on right. January 2020.

Image 4: Mid-Bar Channel engineered log jam structural uprights (i.e., piles) being installed. Summer 2019.

Image 5: Seasonal Channel construction. Summer 2019.

Image 6: Mid-Bar engineered log jam completed. Summer 2019.

III. Monitoring Methods

Detailed methods are included in the *Kelly Bar Habitat Enhancement Project Monitoring and Maintenance Plan (SRRC 2018).*

Restoration effectiveness will be evaluated through a three-year post-implementation intensive monitoring effort, including changes to fish habitat (winter and summer refugia, temperature, and dissolved oxygen), fish observations (primarily salmonids), natural vegetative recruitment, revegetation success, and non-native invasive species (priority noxious weeds and American bullfrogs). Avian observations (primarily neotropical migratory species) will be completed five years following implementation. Monitoring methods include physical, biological, and water quality monitoring as described in the following section. See Attachment 6 for a summary of the monitoring methods.

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. Additionally, these projects are considered by CDFW to be pilot projects for restoring off-channel habitat, and monitoring them provides opportunities for gaining a better understanding of physical and biological responses of such projects.

Image 7: Kelly Pond prior to implementation.
January 2019.

Image 8: Kelly Pond post-implementation.
January 2020.

Following the three-year intensive monitoring effort, the project will be monitored for the life of the project. 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. In the event that items of concern arise, the SRRC will initiate consultation with the appropriate resource agencies, including CDFW and USFS, to determine what action, if any, is warranted.

Image 9: Aerial image prior to implementation.
Februay 2016.
(Photo Credit: Mike Love, Michael Love & Associates)

Image 10: Aerial image post-implementation.
December 2019.
(Photo Credit: Whelan Gilkerson, Merkel & Associates).

Physical Monitoring

Photomonitoring

Photo monitoring will be conducted 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-implementation activities in June 2018, from established locations that are located with GPS coordinates to ensure consistent and comparable views (Attachment 2). Photo locations included the mouths of the alcoves, inlets to the channels, engineered log jams, ponds, and areas that have received revegetation treatments. During the first three years after construction, the photopoint monitoring will be conducted twice a year: once during the focus period for fish usage (leaf-off, late fall through mid-spring) and once during the dry season (leaf-on). Additional photos will be taken during notable flow events. The Photo Point Monitoring Handbook, General Technical Report PNW-GTR-526 (Hall 2002), is used as a guide to conduct photomonitoring. Focal observation elements include:

- Functionality and stability of log structures (Project objectives 1, 3, and 4)
- Sedimentation patterns within the ponds, alcoves, and pools adjacent to the Salmon River channel (Project objectives 2 and 6)
- Overall bank stability along the channels (Project objectives 1, 2, and 6)
- Natural regeneration of native vegetation (Project objectives 5 and 7)
- Overall revegetation plant success (Project objective 5)
- Encroachment into the project area by invasive vegetation (Project objective 5)

In addition to photopoint monitoring, 5 stationary game cameras were placed after implementation, and are being used across the site to monitor key project features during various flows. The stationary camera photos were used to identify when features were engaged and disengaged throughout the 2020 monitoring period.

Survey of Hydraulic Features in Connecting Channels

Longitudinal profiles and cross sections will be conducted once per year by SRRC for three years following implementation in the restored channels. Surveys will be conducted during the dry season. The profiles will be used to evaluate changes to the channel and assess potential sedimentation and aggregation.

Biological and Water Quality Monitoring

Surveys of the functional use by the target species can be determined with biological and water sampling. Biological and water quality monitoring will be used to evaluate habitat conditions and effectiveness of treatments.

Water Quality

During construction, SRRC and MLA staff provided oversight to ensure all water quality controls were installed and maintained. As part of intensive post-implementation monitoring SRRC conducts monthly water quality monitoring to measure water temperature and dissolved oxygen in all ponds and alcoves. Monitoring staff also measure alcove and critical pool water depth. The ponds will be monitored for their life time; if water quality is determined to be

detrimental to salmonid health (e.g., extreme temperature or dissolved oxygen levels.), they will be re-evaluated and potentially altered to provide seasonal high flow refugia for salmonids.

In addition to monthly water quality surveys, stationary temperature and water level logging devices have been installed in both ponds and in the Salmon River itself to monitor fish habitat conditions of project features relative to river conditions. 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.

Fisheries

SRRC has been surveying anadromous fish in the project area for over 25 years, which provides long-term baseline conditions for comparison to post-implementation conditions. SRRC initiated project specific fisheries and water monitoring two years prior to design to provide project specific baseline conditions for comparison to post-implementation conditions with participants from SRRC, the Karuk Department of Natural Resources and USFS. Surveys were completed just prior to and during construction to determine fish clearance necessity during implementation.

SRRC will conduct monthly pre- and 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* (CDFW 1998) and *Salmonid Field Protocols Handbook: Techniques for Assessing Status and Trends in Salmon and Trout Populations* (Johnson et al. 2007). Presence/absence surveys of juvenile and adult coho salmon, Chinook salmon, steelhead, and rainbow trout, are conducted through visual observation (streambank and underwater observation, i.e., snorkel surveys) for several months prior to implementation and each month after implementation, conditions permitting, for three years. Surveys include Kelly pond, Willow pond, the lower bar alcove and the proximal reach of the North Fork Salmon River. Observations are used to establish understanding of spatial and temporal occupancy of salmonids in the project area.

Invasive species are also monitored in the ponds, including American bullfrog. Bullfrog monitoring will continue for a total of five years, at which point the need for continued monitoring will be assessed.

Vegetation

Due to the gravel/cobble substrate and droughty conditions of the river bars, vegetation is expected to be difficult to establish. Inspection of revegetation measures includes condition of streambank erosion control measures, numeric survival by species, overall qualitative health and vigor of revegetation, and natural recruitment. Areas of revegetation will have post-implementation photopoint monitoring using GPS-located monitoring sites in early summer for three years following implementation. Additionally, SRRC will monitor erosion and vegetation for five years, at which point the need for continued monitoring will be assessed. If, revegetation efforts fail and natural regeneration is inadequate, remedial actions will be recommended.

SRRC Plants Crews have monitored Kelly Bar for invasive species for more than twenty years. Encroachment of non-native species will be noted and recorded. If target non-native invasive

species, such as spotted knapweed, begin growing within the project area, the vegetation will be treated by SRRC's Plants Crew, either manually or mechanically 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 spring 2018 and 2019, and fall 2018 pre-implementation avian spot-mapping and vegetation surveys were conducted by KBO (see Attachment 7 for pre-implementation monitoring summaries). 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 in five years following implementation (in 2024 and 2025), in order to allow for vegetation changes to influence avian use of the site.

IV. Monitoring Findings

Summary of findings

The Kelly Bar Habitat Enhancement project serves as a pilot project for future enhancement design on the Salmon River, the observed information provides valuable insight into designing future off-channel restoration projects. Post implementation monitoring began in December 2019 and ended in December 2020. Physical and biological monitoring methods show greatly increased connectivity between the river and off-channel habitat, consistent fish presence in newly created winter high-flow and thermal refugia, and observations of successful vegetation establishment throughout the project site. Monitoring efforts showed that the overall available fish habitat has been substantially increased, that the ponds are used by steelhead/trout and Chinook salmon and have not been populated by invasive bullfrogs, and revegetation pilot experiments are proving to be largely effective. Objectives have been met for this project, though due to the low water year and need for feature settling, continued monitoring of Kelly Pond is needed to confirm our assumptions. The project goal has been achieved and habitat enhancement has successfully increased the abundance of complex off-channel rearing habitat for juvenile coho, and other salmonids, by providing both winter high flow and summer thermal refugia.

Image 11: Kelly Bar post-implementation showing Seasonal Channel on left, Overflow Channel at center, and Kelly Bar Alcove on right. January 2021.

2020 was a remarkably low water year with monthly flows consistently below average (see figure 1). Therefore, monitoring findings have been interpreted within the context of a very dry year. The only significant flow occurred on January 26th, 2020 with a rain on snow event that raised the river to 3,106 CFS at the project site early in the morning. The Somes Bar river gauge at the mouth of the Salmon River reached 16,600 CFS during this event. During this event, the river fully engaged Kelly Bar, including the Kelly Bar Overflow and Seasonal Channels (see image 18). On West Bar, the event caused a lengthy backwater in the West Bar Alcove, though the Mid-Bar channel did not fully engage, and as expected given the flow levels, the Back-Bar Channel did not engage (this feature engages during 2-year events and greater). Attachment 5 shows river flows at the Somes Bar River Gauge during the 2020 monitoring period.

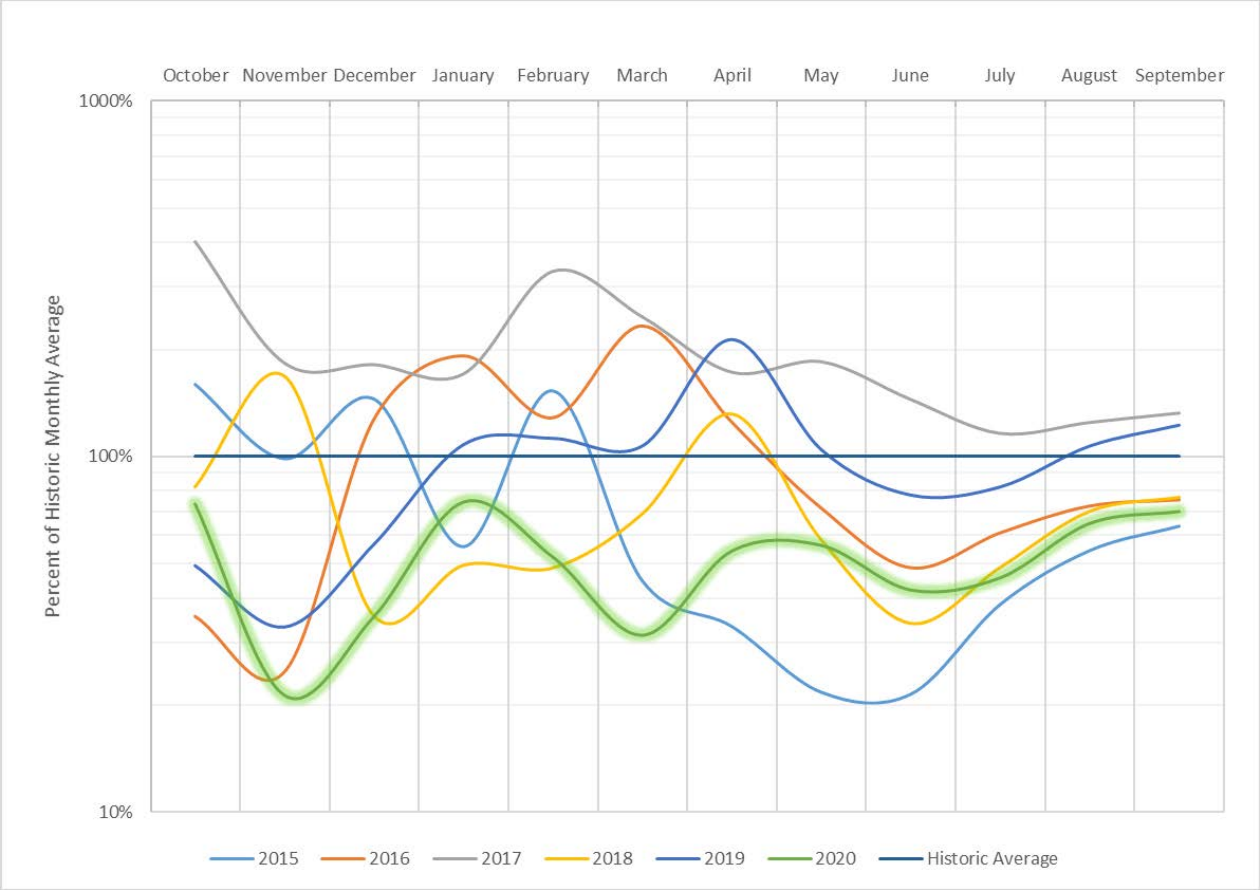

Figure 1: Salmon River monthly flows as percentage of historical monthly mean.
Flows measured at the Somes Bar River Gauge Station

The following images show project features before implementation and now those project areas provide both winter high-flow and summer thermal refugia:

Image 12: Mid-Bar Alcove before implementation. January 2019.

Image 13: Mid-Bar Alcove post-implementation. August 2020.

Image 14: Willow Pond prior to implementation. January 2019.

Image 15: Willow Pond post-implementation. August 2020.

This project was funded through CDFW's Fisheries Restoration Grant Program, the following metrics are included here to meet reporting requirements for the grant program. CDFW FRGP Performance Measures:

The Kelly Bar Habitat Enhancement Project was built to the following specifications. As built surveys are included in Appendix 1.

Performance measures for Salmonid Habitat Restoration and Acquisition Project:

- Overall stream length treated (miles): 0.47
- Area of instream features installed within bankfull channel (square feet): 7,352

Performance measures for where Instream Habitat work was conducted:

- Instream habitat funding (dollars): $846,697
- Total length of instream habitat treated (miles): 0.47

Performance measures for where channel reconfiguration and Connectivity was conducted:

- Length of stream treated for channel reconfiguration/connectivity (miles): 0.71
- Length of off-channel stream created (miles): 0.28
- Area of off-channel or floodplain connected (acres): 0.96

Performance measures for where Channel Structure Placement was conducted:

- Instream features installed/modified (number): 37
- Length of stream treated for channel structure placement (miles): 0.96
- Area of streambed created (acres): 0.36
- Expected amount pools created through channel structure placement (number): 23

Image 16: Willow Pond prior to implementation. June 2018.

Image 17: Willow Pond post implementation. February 2021.

Image 18: Location of Kelly Bar Engineered Log Jam prior to implementation. June 2018.


Image 19: Kelly Bar Engineered Log Jam post-implementation. January 2021.


Image 20: West Bar Alcove prior to implementation. March 2019.


Image 21: West Bar Alcove post-implementation. January 2020.

Physical Monitoring

As-Built Survey

MLA completed As-Built surveys in October of 2019 (Attachment 1). They were prepared from the construction plans and use red-line markups to denote where construction activities deviated from the design plans. During implementation, MLA ensured that cuts and fills were managed properly with respect to corresponding mining claims during construction (objective 8).

As noted in the Technical Memorandum accompanying the As-Built plans, the project was constructed as designed, with only one substantial change to the design plans. The Apex Bar Jam on the Back-Bar Channel was moved about 60 feet upstream, where it would better interact with the existing Back-Bar Channel. The entrance to the high-flow channel was lowered to allow about a 2-year flow event to engage the Back-Bar channel.

Monitoring Surveys

SRRC completed As-Built cross section surveys on February 11th, 2020 for the Mid-Bar and Back-Bar Channels after the January storm event. Though surveys were conducted after this flow event, results show that the channels were not altered from the constructed conditions and therefore they will provide a baseline for future cross section surveying (objective 3). Pebble counts taken on 12/16/19, 2/11/20 and 3/25/20 provide baseline information with which to compare future monitoring data (objective 3).

In June 2020, during the annual site inspection, visual surveys of the project area indicated that no substantial changes were observed in project features, including engineered log jams, side channels, alcoves, ponds, or the fence. All project features were stable, including log structures. No significant sedimentation was observed (objectives 1 and 4). Re-surveying cross-sections and longitudinal profiles was not conducted in 2020 because no changes would have been detectible. This was expected, as winter 2019/2020 did not have any significant river flow events.

Photomonitoring

To date, SRRC has collected 790 photos from the 44 photopoints established prior to construction (Attachment 2). All photos will be shared upon request. At least one image of each feature and additional images of interest are included in this document. Stationary game camera images were used to evaluate the timing of the hydrologic connections between the constructed features and the river, see following section for details.

Hydrologic Connections

Along with onsite-observations, stationary game camera images were used to evaluate the timing of the hydrologic connections between the constructed features and the river. Post-construction flows remained low, allowing logs within project features to soak up water and stabilize, and the low flows also allowed time for banks to settle. As mentioned previously, only one significant flow event occurred. On the morning of January 26th, 2020 a rain on snow event raised the river to 3,106 CFS at the project site. During this event, the river fully engaged Kelly Bar, including the Kelly Bar Overflow and Seasonal Channels during (see image 3). Willow Pond and the West

Bar alcove remained perennial throughout the monitoring year (objective 2), all other features were dried out by July and remained so during peak river temperatures. SRRC deployed continuous water level loggers but technical difficulties have delayed processing the data. Water level summaries will be included in subsequent monitoring reports.

Kelly Bar

Overflow Channel

The Overflow Channel was designed to engage during 1.2- year flow events (~2,036 CFS), thus the Overflow Channel was engaged as expected during the January 26th storm event. The engineered log jam activated the Overflow Channel and performed as designed, interacting with alcove water levels to control sedimentation and dig the alcove deeper (objective 3, see image 3 and 11).

Seasonal Channel

The Seasonal Channel was connected to the river through June as designed (see image 3 and 11). The channel dried up slowly over the summer from downstream to upstream toward Willow Pond, leaving a shallow perennial channel for about 100 feet downstream of the pond.

Kelly Bar Alcove

The Kelly Bar Alcove functioned as designed, despite the low water year (see image 23). It acted as a river backwater for most of the wet season and interacted with the Overflow Channel and Seasonal Channel flows as designed. The Alcove was connected to the river and the Seasonal Channel through early June, then slowly dried up by early July.

Image 22: Kelly Bar Alcove prior to implementation. January 2019.


Image 23: Kelly Bar Alcove post-implementation. January 2021.

Willow Pond

Willow Pond remained perennial (see images 15 and 17). Water levels in the pond are directly related to river water elevation. Following the January storm event the pond remained connected to the river from the Seasonal Channel through early June (objective 2).

Kelly Pond

Kelly Pond was introduced to the design after pre-design monitoring had been completed. The site of the pond was recognized during the design process to offer an opportunity for an off-channel pond and the feature was included with the intention of providing winter rearing habitat with access from Kelly Gulch. The pond was identified as a project feature after groundwater monitoring wells were placed in the area. Therefore, the groundwater behavior of the proposed feature was unknown prior to implementation. Still the project team decided it was worth the effort to develop an off-channel pond because these much needed fish rearing features are rare on the Salmon River.

Groundwater was not exposed in the Kelly Pond feature when it was created in 2019, which was also a low water year, similar to 2020. During winter and spring storm events groundwater does fill the pool and at winter baseflow Kelly Gulch flows into Kelly Pond. A constructed outflow channel connects Kelly Pond to the North Fork Salmon (See image 24). The pond functioned well as a high flow refuge for fish during the January storm event, (See image 8). Kelly Pond is surface water fed and rebounds quickly following precipitation events. Figure 2 shows the quick drop in water level following minor storm events between November 13th and 19th 2020. Due to the low water year in 2020, during summer months, Kelly Gulch decreased substantially, then dried up upstream of the pond, which is highly unusual for Kelly Gulch. The Kelly Pond outflow channel was engaged during storm events as designed. Kelly Gulch remained connected to the pond into June when SRRC staff blocked fish access to the pond, and by mid-July the pond had dried out.

Image 24: Kelly Pond outflow channel to the Salmon River. January 2020.

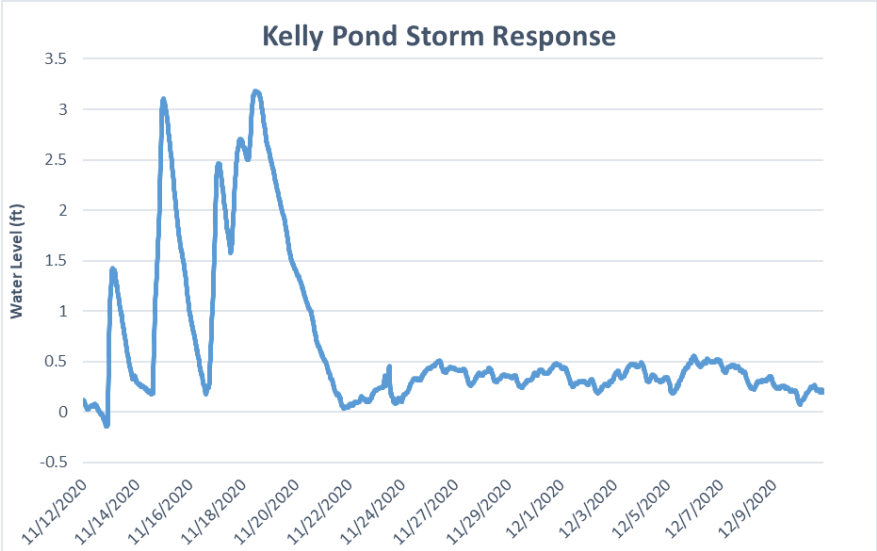

Figure 2: Kelly Pond Minor Storm Response

West Bar

Mid-Bar Channel

The West Bar Mid-Bar Channel was designed to engage during flow greater than 500 CFS (25% exceedance flow). During the January 26th, 2020 flow event, the Mid-Bar Channel did not engage as expected however the alcove greatly expanded up the bar due to backwatering from the river (see image 21). Field observations indicated that a riffle crest in the river that controls the water levels at the inlet of the Mid-Bar Channel appears to have dropped in elevation since the project was designed. This drop in elevation would result in a decrease in the activation frequency of the Mid-Bar Channel.

Mid-Bar Alcove

The Mid-Bar Alcove remained perennial and provided a large backwater up the Mid-Bar Channel during high flows, the alcove provided greatly enhanced refugia as compared to pre-implementation conditions (objectives 1 and 2, see images 20, 21, 25, and 26).

Figure 25: West Bar Alcove summer thermal refugia post-implementation. August 2020.


Figure 26: Just completed West Bar Alcove. September 2019.

Back-Bar Channel

The Back-Bar Channel was not engaged during the 2020 monitoring year due to low river flow events. This feature functioned as expected since it is engineered to engage during 2-year events.

Image 27: Recently completed Back-Bar Channel. October 2019.

Biological and Water Quality Monitoring

Water Quality

Implementation

During construction, water quality controls were overseen by SRRC and MLA staff. The majority of the site did not have surface flows throughout construction. The West Bar Alcove was connected to the river during construction, sandbags were used to prevent sediment from entering the river during excavation. When the sandbags were removed following completion of construction, a small, short-duration sediment plume did enter the Salmon River, just after completion it was quite dispersed by the first pool below construction and completely dispersed by the second pool downstream of construction.

A temporary bridge was used to access West Bar across the North Fork Salmon River. During placement and removal an excavator crossed in the wet, to place abutments and crossing material. Very little sediment was disturbed during this process as the crossing location is large cobble. Observed sediment dissipated quickly and was very dispersed by the first pool downstream construction and completely dispersed by the second pool downstream of construction.

Kelly Gulch was very briefly blocked during placement of the culvert temporary crossing. The Gulch was naturally disconnected from the river during placement and also removal of the temporary crossing. Very brief sedimentation was observed during placement and removal of the

Kelly Gulch crossing. In Kelly Gulch, sediment dissipated quickly and could not reach the river as the Gulch was disconnected. SRRC provided direct oversight of water quality controls during the excavation of the engineered log jams to ensure all protocols were followed (see image 4). Final erosion controls and site stabilization were completed by October 15th, 2019.

Post-Implementation

Water Quality throughout the project site provided both winter and summer refugia for salmonid species. The West Bar Alcove has visible groundwater input and summer temperatures were consistently colder than the river during summer months (objective 2). During the summer dissolved oxygen levels in the alcove never fell below 5.5 ppm. Water quality observations showed that the groundwater-fed Willow Pond provided perennial fish habitat and the surface-fed Kelly Pond provided quality winter habitat.

Temperatures in Willow Pond provided both winter and summer thermal refugia for salmonids. Winter pond temperatures remained higher than river temperatures and in summer months they remained below peak river temperatures, notably staying below 20 degrees Celsius (see figures 3 and 4). Additionally, seasonal fluctuations were less dramatic than in the river. Water quality observations show that Willow Pond had low dissolved oxygen (DO) levels during the summer months (4.36 ppm on July 26th). Importantly, fish appeared healthy and not affected by the DO levels. Dissolved Oxygen levels in Willow Pond were consistently higher than pre-implementation observations (see figure 5). During the 2021 monitoring season data collection locations will be moved in Willow Pond in order to better understand the pond's temperature and DO profile relative to observations of preferred fish habitat.

Kelly Pond, a seasonal feature which gets surface flows from Kelly Gulch, provided winter thermal refugia, with temperatures remaining above the river throughout cold months, indicating favorable growing conditions for juvenile fish (figure 3). Dissolved oxygen levels remained favorable when the pond was engaged

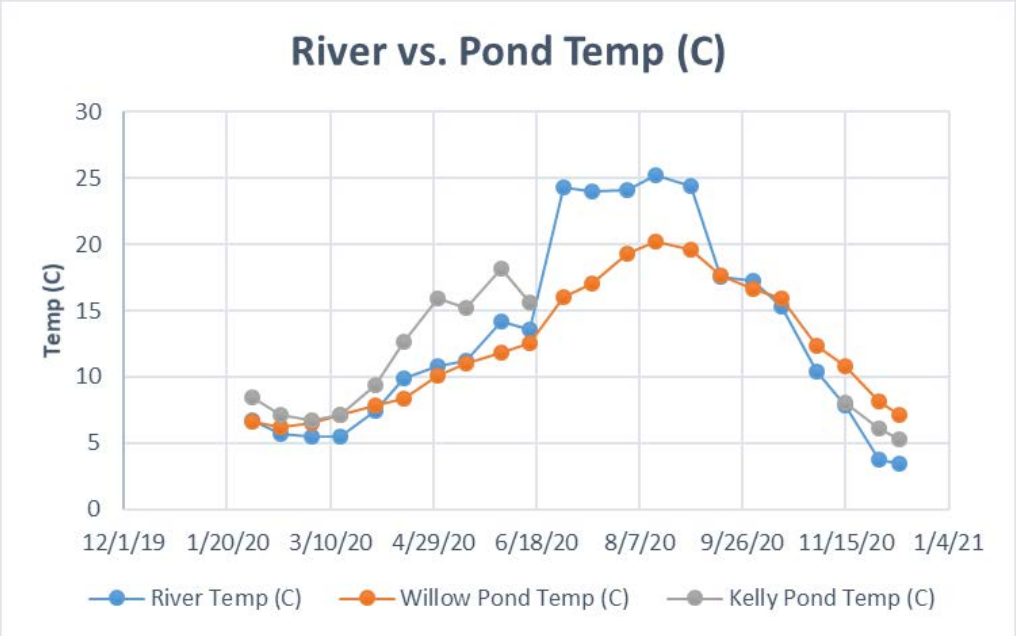

Figure 3: Willow and Kelly Pond Temperature vs. River Temperature

Willow Pond Temperature Summary

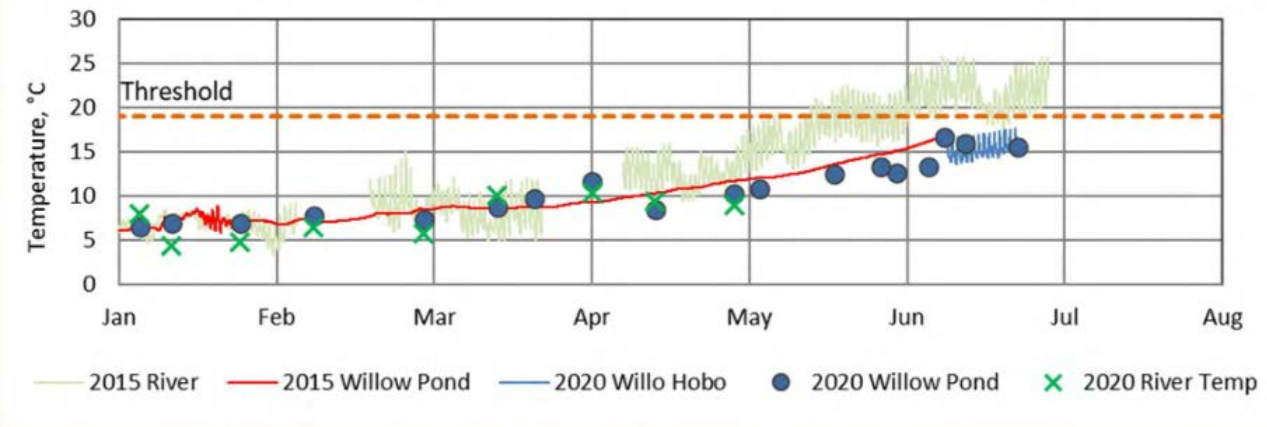

Figure 4: Willow Pond Temperature Summary. The orange dashed line indicates 19 degrees Celsius, the threshold for when coho salmon may seek thermal refugia.

Temperatures in Willow Pond never exceeded the upper tolerance threshold for salmonids (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. Figure 4 shows that the temperature loggers deployed in Willow Pond and the river malfunctioned providing incomplete hobo data.

Willow Pond Dissolved Oxygen Summary

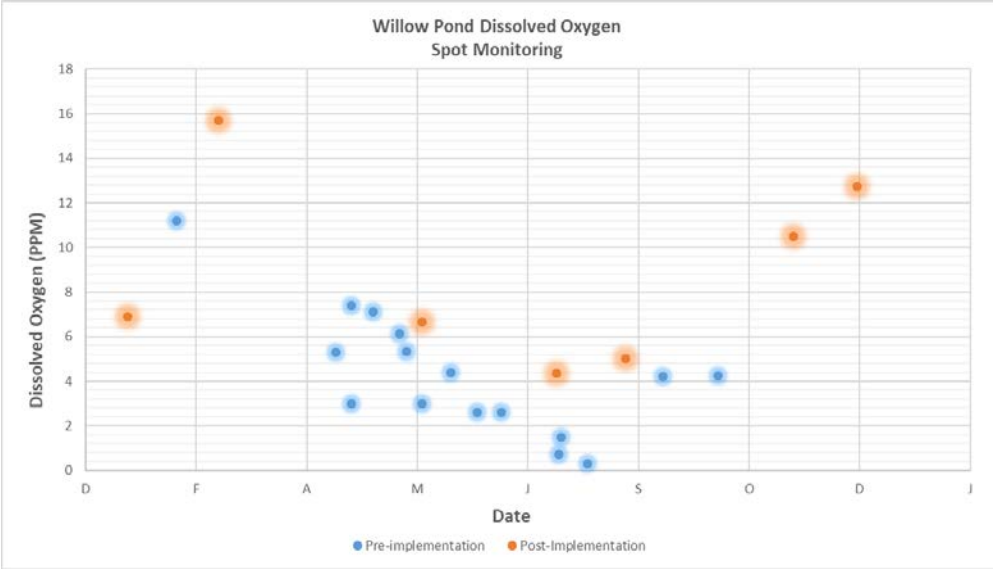

Figure 5: Willow Pond Dissolved Oxygen Summary

Fisheries

Implementation

On July 31st 2019, prior to implementation, SRRC and Karuk Fisheries Biologists and Crew placed a coffer dam upstream in Kelly Gulch and dewatered the reach to be cleared of fish.17 young of the year steelhead, 1 salamander and several aquatic invertebrates were relocated. On

August 20th 2019, the SRRC Fisheries Biologist and Crew returned to section off the Kelly Pond Outflow Channel feature and relocate the fish upstream of the project. During this second fish clearing, 5 young of the year steelhead and several aquatic invertebrates were relocated.

Post- Implementation

This project is designed to be a pilot project and will be used to evaluate feature suitability, fish behavior, and restoration effectiveness, which will help SRRC refine restoration designs in future projects. Throughout the project, fish were observed using winter and summer thermal refugia and fish were observed using wood structures in both ponds and the West Bar Alcove for cover (objective 4). SRRC biologists have observed juvenile steelhead/trout and Chinook salmon in Willow Pond, Kelly Pond, and the West Bar Alcove regularly since implementation (see figure 6). The general presence of salmonids is greatly increased throughout the project area. For example, only 3 juvenile Chinook were observed throughout all 7 pre-implementation surveys and on April 26th 2020 during one post implementation survey, SRRC fisheries staff observed more than 30 young of the year Chinook in the West Bar Alcove. On that same day two dozen steelhead juveniles and a 1+ Chinook were observed in Kelly Pond and 6 steelhead in Willow Pond. One relatively large, healthy resident trout was observed in Willow Pond throughout the summer. All constructed fish habitat features were observed to have fish use, including young of the year Chinook observed using the Kelly Bar Alcove.

Post Implementation Fish Observations

	Kelly Pond		Willow Pond		Kelly Bar Alcove		West Bar Alcove		NF Salmon River	
Date	Chinook	O. mykiss	Chinook	O. mykiss	Chinook	O. mykiss	Chinook	O. mykiss	Chinook	O. mykiss
1/30/2020		1								
2/5/2020										
2/18/2020	1	3								
3/4/2020		6		12						22
3/25/2020		4	1			2				
4/8/2020	1	20		6	30			12		
4/26/2020	1	26		6	30					
5/8/2020		30	1							
5/23/2020		36								
7/30/2020							2	23	4	
8/12/2020				40			3	29		
8/21/2020			3	64				24		
9/1/2020			1	25			3	35		
1/11/2021				1						
2/25/2021			1	4						

Figure 6: Post Implementation Fish Observations

Kelly Pond provided winter thermal refugia, with temperatures remaining above the river throughout cold months, indicating favorable growth growing conditions for juvenile fish (see figure 3). Dissolved oxygen levels remained favorable until the pond went dry. Kelly Pond disengaged from the river too early in the spring to allow fish to get water quality signals to move to the creek or river. When Kelly Pond began drying up in May 2020, SRRC fisheries staff expressed concern for the remaining fish. On June 24th 2020, Karuk Tribe Fish Biologists visited

the site and relocated 46 steelhead and 2 chinook into the river and Willow Pond. Karuk Tribe staff identified, aged, and PIT tagged the fish that were salvaged from the pond. Figure 7 shows the size and species distribution of fish salvaged from Kelly Pond. SRRC will be working with the Karuk Tribe Fish Biologists in the future to scan for the PIT tagged fish and learn about where fish might be utilizing features of the project.

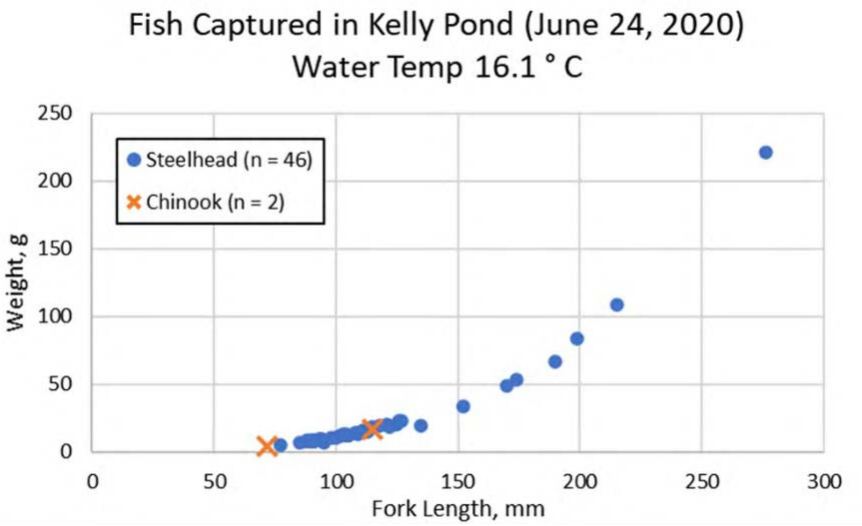

Figure 7: Size distribution of fish relocated from Kelly Pond.

Willow Pond, in contrast is controlled by groundwater and maintains water level and water quality throughout the year. On August 21st, 2020, 67 juvenile fish were observed in Willow Pond, including three Chinook. Dissolved oxygen (DO) levels at this time were low, however the observed fish were healthy and active in the pond indicating the fish were not affected by the DO levels. Water temperature was favorable for fish throughout the year (see figure 3) providing colder water during summer months and warmer water during winter months providing thermal refuge for growth.

On July 23rd, 2020 USFS District Fish Biologist Maija Meneks and crew e-fished for lamprey at Willow Pond. No lamprey were observed in the pond. The habitat did not appear good for ammocoetes at the time of the survey because the pond has fairly shallow fine sediment, no current or flow, and productivity of appropriate filterable foods was likely poor. It was noted that there was a small school of salmonids flitting around in the middle of the pond, avoiding the surveyors.


Image 27: Foothill yellow-legged frog photographed at Kelly Bar post-implementation. July 2020.

Although no formal foothill yellow-legged frog monitoring was performed, SRRC staff observed foothill yellow-legged frog juveniles and adults from June through August in the West Bar alcove and Willow Pond.

Vegetation

Implementation
The dry, exposed nature of Kelly Bar prior to implementation, with its notably sparse vegetation and expansive cobble fields provided for a challenging revegetation process. The Kelly Bar Habitat Enhancement Project is a pilot project for native species revegetation methods, examining the effectiveness of willow baffles, willow stakes, and enhanced planting areas. SRRC and MLA oversaw the willow baffle construction (see images 35 and 36) and willow planting. SRRC and Chris Moore oversaw planting area enhancements (see images 28, 30, and 32). Enhanced planting areas are treatments to improve the poor production of the site, resulting in little plant diversity and shade to the river. Treatments occurred throughout the project and included excavating to groundwater, adding large and small wood pieces to increase organic matter and wick moisture up through the soil profile, salvaging and backfilling the pit with the best soil we could find during other project disturbance, adding woody mulch on top to retain water and inhibit weeds, and then planting with diverse native trees and shrubs. Manual planting with nursery plants was completed during weather conditions appropriate for successful revegetation, in late November – early December 2019. These enhanced planting areas are meant to create islands of vegetation within the rocky bar to accelerate the process of vegetation growth and recruitment throughout the site.

MLA and SRRC monitored and guided riparian vegetation removal to ensure the minimum disturbance necessary to complete the project (objective 7). Much of the vegetation disturbed was Himalayan blackberry, an invasive species, which was piled onsite and later burned. Additionally, topsoil with propagules was buried during construction as deeply as possible. Prior to being brought on site, all equipment was cleaned to reduce the potential of bringing invasive species into the project area. Existing trees on the bar were not disturbed when possible and a particular focus was placed on the preservation of trees along existing and future channels, and perennial flow areas. Willows and cottonwoods disturbed through the implementation process were salvaged and replanted in appropriate locations.

Over the course of six collection days in September 2019, SRRC collected 3,294 locally sourced willow cuttings. The cuttings were from 4 varieties of willow: arroyo, coyote, dusky, and Pacific. They were bundled and stored in Willow Pond to soak prior to being planted. Willow stakes were placed in 17 willow baffles, planted along constructed and existing alcove/ stream banks, and were included in 16 planting zones (see Attachment 3).

Post- Implementation
SRRC botanists completed a plant survival survey on June 23rd 2020. Many plants were observed to be flowering and thriving throughout planting areas during the June surveys. Of the 594 nursery shrubs and trees planted, observations from the survey show that 87% of plants on West Bar and 85% of plants on Kelly Bar had survived with good health (Attachment 3 and Images 28 - 32). This is remarkable considering the incredibly dry 2020 water year indicating that the enhanced planting area design is functioning as planned, providing enhanced growth medium and moisture availability for establishing trees and shrubs. Some enhanced planting areas on Kelly Bar were provided supplemental water during summer months in order to evaluate the cost-effectiveness of passive irrigation on planting success.

Image 28: Successful revegetation at site RSU1 Enhanced Planting Area on Kelly Bar. June 2020.

Image 29: Enhanced Planting Area DSU2 before implementation on West Bar. June 2018.

Image 30: Enhanced Planting Area DSU2 post-implementation on West Bar. August 2020.

Image 31: Enhanced Planting Area DSU4 before Implementation on Kelly Bar. June 2018.

Image 32: Enhanced Planting Area DSU4 post-implementation on Kelly Bar. August 2020.

Willow survival was variable, with many planting areas establishing easily and others experiencing complete mortality (Attachment 4). Willow survival mapping shows this disparity could be related directly to feature type and harvesting/planting timing, with nearly 100% survival around ponds, alcoves, and channels and 0% survival in the engineered log jams. Willow stakes planted in baffles along channels had mixed survival, ranging from 100% to as low as 10%. In areas of baffles with high mortality (31%), the locations are all relatively perched above groundwater. With the exception of one small section of willow stakes planted by students and those planted around the large wood structures, riparian willow survival was notably high with about 70% overall willow survival (objective 5).

SRRC anticipated 50% mortality of willow plantings due to the timing of planting. Planting willows in the engineered log jams in August and elsewhere in the project in early October was necessary because heavy equipment was required for planting. It was not unexpected that the willows planted in the log structures in August perished, those willows were salvaged during clearing for construction on August 1st, they were old, mature plants, and though they were placed in water, they could not be entirely submerged during storage. Older plants are poor candidates for salvage because they tend to get very stressed when moved. Additionally, the tops of these willows were not clipped following planting, this likely resulted in excess moisture loss and eventual mortality. Collecting willows in September is quite a shock to the plant and can often lead to mortality. It is preferential to collect and plant willows during dormancy. However, since this was not an option, SRRC collected and planted willows as late into the construction window as possible. The surprising successful willow establishment (see image 33) throughout the project area is likely due to soaking the willows for two weeks and placing the cuttings in groundwater, (objective 5). Willows have started naturally recruiting throughout the project.

White sweetclover was observed throughout the project site. This species, though non-native, is not considered a concern. It flushes after a disturbance and then goes back to ambient levels within several years of disturbance. Himalayan blackberry was observed throughout the project as well. SRRC staff focused on treating new growth in enhanced planting areas.

Image 33: Successful willow planting at Willow Pond. July 2020.

Dyer's woad occurred throughout the project area, SRRC staff manually dug up 9,000 plants throughout the site. It should be noted that the site had not been treated for Dyer's woad previously, except along Sawyers Bar Road. SRRC took this opportunity to treat this species on a much larger scale to help planted vegetation establish.

Only 6 spotted knapweed were observed and manually dug up within the project. SRRC anticipated that dormant seeds would germinate due to the disturbance from implementation. However, that did not occur. It is possible the seedlings will take more than a single growing season to emerge. SRRC is dedicated to monitoring for this species since 120,558 plants were treated at this site in 1999 alone, the site may host many 100,000s of dormant seeds.

Image 34: Forks of Salmon Elementary students visit Kelly Bar to plant willows and learn about the project. In this image they are learning about the West Bar Alcove. November 2019.

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 7 for pre-implementation monitoring summaries.

Lessons Learned/Next Steps

SRRC has improved data collection protocols for 2021, including more data points in the West Bar Alcove, improved location of dissolved oxygen and temperature data loggers in Willow Pond, and coordinating water quality monitoring with fisheries surveys to better understand fish use of the project site.

Kelly Gulch is usually perennial but went dry in 2020 due to the very low water year. Kelly Pond disengaged from the river earlier than expected. Some fish were stranded in the pond in June and were salvaged by Karuk Tribe Fisheries Biologists with support from SRRC. SRRC, Karuk Fisheries Biologist, and MLA have met onsite to discuss Kelly Pond's performance during the remarkably dry year. SRRC will continue to monitor the pond's functionality. If fish become stranded, Karuk Fish Biologists will lead fish relocation if necessary. Following monitoring in 2021, if any corrective measures are proposed, they would be developed in partnership with the US Forest Service, Karuk Tribe, CDFW, and MLA. Environmental compliance, including permits, are secured for the Kelly Pond feature area through 2022, with the exception of USACOE section 404 permit. The expected ground disturbance to enhance Kelly Pond is less than one acre, therefore a Construction General Permit would not be needed to improve the pond feature.

In January 2021, SRRC began the second year of restoration effectiveness monitoring of the Kelly Bar Habitat Enhancement Project. A year-two monitoring report will be developed and shared with project partners by March 31st, 2022.

Image 35: Willow Baffle creation. Oct 2019.

Image 36: Completed Willow Baffles. October 2019

V: References

Gary Flosi, Scott Downie, James Hopelain, Michael Bird, Robert Coey and Barry Collins. 1998. California Salmonid Stream Habitat Restoration Manual, Part IV. Fish Sampling Methods. CDFW Wildlife and Fisheries Division.

Hall, Frederick C. 2002. Photo Point Monitoring Handbook: Part A- Field Procedures. US Department of Agriculture (USDA).

Johnson, David Horton. 2007. Salmonid Field Protocols Handbook Techniques for Assessing Status and Trends in Salmon and Trout Populations. American Fisheries Society.

National Marine Fisheries Service (NMFS). 2014. Final Recovery Plan for the Southern Oregon/Northern California Coast Evolutionarily Significant Unit of Coho Salmon (*Oncorhynchus kisutch*). NMFS. Arcata, CA.

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Sullivan, K., D.J. Martin, R.D. Cardwell, J. E. Toll, and S. Duke. 2000. An analysis of the effects of temperature on salmonids of the Pacific Northwest with implications for selecting temperature criteria. Sustainable Ecosystems Institute, Portland Oregon.

Attachment 1: As-Built Plans

The Following Pages Include the As-Built Technical Memo from Michael Love & Associates and As-Built Plans.

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822 -2411

Technical Memorandum

Date: March 29, 2021

To: Melissa Van Scoyoc, Habitat Restoration Coordinator, Salmon River Restoration Council

From: Rachel Shea, P.E. Engineering Geomorphologist, Michael Love & Associates, Inc. shea@h2odesigns.com 707-822-2411

Subject: **As-Built Plans for the Kelly Bar Off-Channel Fisheries and Riparian Habitat Project Phases I, II, and III (CDFW FRGP Grant Agreements #P1610526 and #P1710524)**

PURPOSE

This memorandum presents the results of the As-Built survey for the Kelly Bar project.

AS-BUILT TOPOGRAPHIC SURVEY AND PLANS

An As-Built topographic survey was conducted for the project area in October, 2019. The survey was performed using a Total Station tied to horizontal and vertical control points established during implementation for the project. The survey included longitudinal profiles of the constructed channels, locations and reference point elevations for the constructed large wood structures, and pond bathymetry.

As-Built conditions are shown as red linework overlain on the design plans for the project in Attachment 1.

Enhanced planting areas are not shown.

CHANGES FROM DEIGN CONDITIONS

Generally, the project was constructed as designed, with the following exceptions:

- Sheet 6: The Mid Bar Alcove alignment was shifted to the west to avoid several large alder trees on the east side.
- Sheet 8: The location Apex Bar Jam on the Overflow Channel was shifted slightly to better line up with the alignment of the Overflow Channel.
- Sheet 8: The Apex Bar Jam on the Back Bar Channel was moved about 60 feet upstream to the location of an established high-flow channel into the Back Bar Channel. The mouth of the high flow channel just upstream of the Apex Bar Jam was lowered so that it would become engaged during about a 2-year flow event.
- Sheet 10: The locations of the Boulder Weirs on the Kelly Pond Outfall Channel were adjusted slightly to minimize disturbance to large willow trees on the south side of the channel. The structures were constructed to the specified elevation.
- Sheets 8 and 10: The specified number of large wood structures (Root Wad/Cover Structures, and Log Cover Structures) were installed. Locations of structures were adjusted slightly to better meet field conditions.

- Sheet 13: The three Apex Bar Jams were generally constructed as specified, with the following exceptions:
    - At the Kelly Bar and West Bar Station 56+50 jams, specified pile tip elevations for all anchored piles were achieved. Pile tip elevations of unanchored piles were installed with within 2-feet of the specified embedment. It is not expected that the shorter-embedded piles will affect the overall stability of the structure.
    - Bedrock was encountered at a pile embedment depth between 3-5 feet during installation of the West Bar Station 53+50 jam. To compensate for the shorter than specified piles, 30 tons of ½ ton rock was installed to stabilize the structure.
    - At the Kelly Bar and West Bar Station 56+50 jams, the installed minimum foundation depth was up to 1-foot higher than specified. It is not expected that this will affect the stability of the structures during a scour event.
    - The foundation for the West Bar Station 53+50 jam was installed 2 feet deeper than specified, which will contribute to structure stability during a scour event.

The changes to the design plans described above are relatively minor and are not expected to affect the stability or performance of the project.

Attachment 1. As-Built Plans

SALMON RIVER RESTORATION COUNCIL

VICINITY MAP
NOT TO SCALE

PLANS FOR CONSTRUCTION OF

KELLY BAR OFF-CHANNEL FISHERIES AND RIPARIAN HABITAT DESIGN

January, 2018

Final Plans

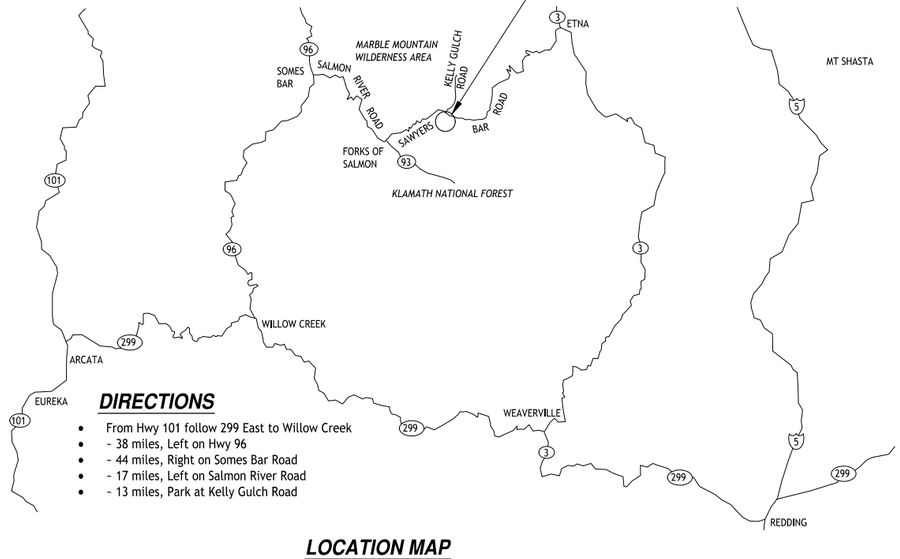
Prepared For:

- **SALMON RIVER RESTORATION COUNCIL**
- **CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE, FISHERIES RESTORATION GRANTS PROGRAM (AGREEMENT No. P1310303)**
- **KLAMATH NATIONAL FOREST**

PROJECT LOCATION

APPROX 125 MILES FROM EUREKA, CA

LATITUDE: 41°18' 57.26"N
LONGITUDE: -123°10'4.16"W



DIRECTIONS

- From Hwy 101 follow 299 East to Willow Creek
- ~ 38 miles, Left on Hwy 96
- ~ 44 miles, Right on Somes Bar Road
- ~ 17 miles, Left on Salmon River Road
- ~ 13 miles, Park at Kelly Gulch Road

LOCATION MAP
NOT TO SCALE

Sheet Number	Sheet Title
1	TITLE
2	LEGEND, ABBREVIATIONS & NOTES
3	WATER MANAGEMENT
4	EXISTING CONDITIONS
5	CONSTRUCTION ACCESS AND SPOILS PLACEMENT
6	MID-BAR SIDE CHANNEL PLAN
7	MID-BAR PROFILE AND SECTIONS
8	KELLY BAR OVERFLOW AND SEASONAL CHANNEL PLAN
9	OVERFLOW PROFILE AND SECTION
10	KELLY GULCH POND AND OUTFLOW CHANNEL PLAN
11	KELLY GULCH POND PROFILE AND SECTION
12	CONSTRUCTION DETAILS
13	CONSTRUCTION DETAILS (2)
14	CONSTRUCTION DETAILS (3)
15	CONSTRUCTION DETAILS (4)
16	CONSTRUCTION DETAILS (5)

AS BUILT
DATE 12/18/19
R.E. NAME Rachel Shea, P.E.
Rachel Shea
R.E. Signature for final approval of As-built information

Michael Love & Associates, Inc.
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

Salmon River Restoration Council
PO BOX 1089 • 25531 Sawyers Bar RD, Sawyers Bar CA 96027
530-462-4665 Fax 530-462-4664

REGISTERED PROFESSIONAL ENGINEER
MICHAEL A. LOVE
No. 71691
CIVIL
STATE OF CALIFORNIA

AS-BUILT (12/18/19)

VERIFY SCALE
THIS BAR IS ONE INCH LONG AT FULL SCALE

Salmon River Restoration Council
KELLY BAR OFF-CHANNEL
FISHERIES AND RIPARIAN HABITAT DESIGN

1_TITLE - TITLE-AB

DATE
JAN. 2018
SUBMITTAL
FINAL
DESIGN
RS / ML
DRAWN
NN
SHEET
~~1~~ of 16

Q:\Kelly Bar\DWG\SHEETS\1_TITLE.dwg

LEGEND AND SYMBOLS

EXISTING

- FENCE LINE
- 95 EXISTING CONTOUR AND ELEVATION
- +99.0 SPOT ELEVATION
- CHANNEL THALWEG OR DRAINAGE
- 1+00 ALIGNMENT STATIONING (FEET)
- CONTROL POINT/TEMPORARY BENCH MARK
- FLOW DIRECTION
- BEDROCK

NEW

- SURVEY CONTROL POINT
- 16 SPOT ELEVATION
- 1+00 STATIONING ALONG ALIGNMENT (FEET)
- SLOPE LINE
- LOG/LARGE WOOD STRUCTURE
- WATER SURFACE
- SPOIL PLACEMENT AREAS
- BRUSH BAFFLES

ABBREVIATIONS

APPROX, ~	APPROXIMATELY	NFSR	NORTH FORK SALMON RIVER
CA	CALIFORNIA	NTS	NOT TO SCALE
CL	CENTERLINE	OZ	OUNCE
CP	SURVEY CONTROL POINT	O.C.	ON CENTER
CFS	CUBIC FEET PER SECOND	RD	ROAD
DIA	DIAMETER	R.C	RELATIVE COMPACTION
EG	EXISTING GROUND	STA	STATION
EL	ELEVATION	SY	SQUARE YARDS
(E)	EXISTING	TBM	TEMPORARY BENCHMARK
EP	AVERAGE DAILY EXCEEDANCE PROBABILITY	TYP	TYPICAL
FG	FINISHED GROUND	W/	WITH
'	FOOT OR FEET	WSE	WATER SURFACE ELEVATION
LOD	LIMIT OF DISTURBANCE	YR	YEAR
MAX/MIN	MAXIMUM/MINIMUM	(1.5:1)	(HORIZONTAL:VERTICAL) SLOPE
(N)	NEW	%	PERCENT

1 / 4 SECTION DETAIL OR TYPICAL NAME

SHEET NUMBER ON WHICH SECTION, DETAIL OR TYPICAL APPEARS

GENERAL NOTES

1. The term "Owner" is defined as authorized qualified professional(s) designated by Salmon River Restoration Council (SRRC). All improvements shall be accomplished under the approval, inspection and to the satisfaction of the authorized professionals. The landowner is the U.S. Forest Service.
2. In the event cultural resources (i.e., historical, archaeological, paleontological, and human remains) are discovered during grading or other construction activities, work shall be halted within a 100 foot radius of the find. The U.S. Forest Sercive shall be consulted for an on-site evaluation. If human burials or human remains are encountered, the Contractor shall also notify the county coroner.
3. If hazardous materials or what appear to be hazardous materials are encountered, stop work in the affected area immediately and contact 911 or the appropriate agency for further instruction.
4. Contractor is responsible for complying with all project permits. Copies of all permits shall remain on site.
5. A set of signed working drawings shall be kept on site at all times.
6. Contractor agrees to assume sole and complete responsibility for the work area during the course of construction, including safety of all persons and property. This requirement shall apply continuously and shall not be limited to normal working hours.
7. Contractor shall defend, indemnify and hold Owner and its representatives, and the U.S. Forest Service harmless from any liability, real and or alleged, in conjunction with the performance of this project.
8. Placed materials not conforming to specifications shall be removed and replaced as directed by the Owner at no additional cost to the Owner.
9. Traffic control shall conform to California Manual of Uniform Traffic Control Devices (2012).
10. Contractor shall be responsible for providing their own water and power for operations, irrigation and dust control. Water shall not be pumped from the creek/river for these uses.
11. Noted dimensions take precedence over scale.

SURVEY AND STAKEOUT NOTES

1. Channel topography was surveyed by Michael Love & Associates in October 2014. Overbank topography derived from LiDAR surveys.
2. Horizontal Datum: North American Datum 1983 (NAD83), California State Plane Zone 1, in feet.

   Vertical Datum: North American Vertical Datum 1988 (NAVD88), in vertical feet.
3. Construction stakeout will be provided by the Owner. Stakeout will consist of the following:

a. Establishment of temporary monuments for elevation control (minimum of 2 per project area).

b. Offset stakes of the channel centerlines at 25 to 50-foot-foot intervals.

c. Reference stations of instream structures

4. It shall be the responsibility of the Contractor to preserve staking temporary monuments for elevation control and to provide any additional staking necessary to perform the specified work.
5. It shall be the responsibility of the Contractor to construct the project to the lines and grades specified in the construction documents.

CONSTRUCTION ACCESS AND PROJECT AREA RESTORATION NOTES

1. Contractor shall submit a plan for construction access, indicating locations of access areas and temporary river and stream crossings, for approval by Owner prior to mobilization.
2. There shall be no clearing beyond approved construction access areas and the Limit of Grading shown on the plans.
3. Upon completion of all construction activities, construction access areas are to be restored to a condition equal to or better than found prior to undertaking the work and to the satisfaction of the Owner. Construction access areas shall be ripped to a minimum depth of 6" inches and stabilized as specified.

CLEARING, GRUBBING, AND SLASH SALVAGE NOTES

1. The extent of clearing shall be minimized to the extent possible within construction access areas to allow maneuverability of equipment.
2. Grubbing shall be minimized except where it conflicts with finished grade.
3. Trimming along the edges of construction access areas, using standard arborist equipment, can be performed with the permission of the Owner.
4. Slash removed within approved construction access areas and the Limit of Grading shall be retained in as large pieces as feasible (15 to 20' foot lengths), including the root wad, and stockpiled for incorporation into log structures. Slash consists of small trees, shrubs, and branches. Woody material remaining after construction of wood structures shall be dispersed as specified at the direction of the Owner or chipped and used for site stabilization as specified in the contract documents.

EXCAVATION NOTES

1. The geologic report prepared by Pacific Watershed Associates is available upon request.
2. Excavated materials shall be segregated and stockpiled in 4 stockpile areas, including (1) Cobble materials from the surface, (2) Sandy materials, (3) Mixed Sand/Cobbles from the subgrade, and (4) Top 2 feet of material in Kelly Pond. Segregation will be directed by Owner. No screening of materials will be required.
3. Backfill shall consist of materials, as specified, from the segregated stockpile areas. All Backfill shall be placed in 6-inch lifts and track or bucket-compacted to 80% R.C. or to the satisfaction of the Owner.
4. Excavation shall include excavation and handling of saturated soils. Contractor shall be prepared to dewater and /or transport saturated soil in a manner that prevents excess discharge or spillage of soils or water within the construction access area or on adjacent properties or roadways. Should any discharge occur, the Contractor shall be responsible for immediate and complete cleanup. Multiple handling of material may be necessary.
5. Unsuitable material shall become the property of the Contractor and shall be removed from the site by the Contractor for disposal in an approved location. Unsuitable material includes concrete, grouted riprap, pipes, and other manmade materials within work areas.
6. All typical sections are looking up station (upstream).
7. Grading shall be at the direction of owner and may change slightly to fit with existing natural features and vegetation. Unless otherwise specified, tolerance for finished grade shall be a rough surface within ± 0.3 feet of finished grade. The tolerance for horizontal locations shall be ± 1.0 feet unless otherwise directed by owner.
8. Stockpiled material from Kelly Pond shall be used for sub-surface backfill in Kelly Pond.
9. Excess excavated material shall be transported to the designed Spoil Placement Areas. Material shall be spread to a maximum thickness of 1 foot, unless otherwise specified, be sloped to create positive drainage, and have a finished surface of ± 0.2 feet to prevent localized ponding. Spoils shall not be placed within 2 feet of tree trunks > 3 inches in diameter.
10. Shoring and Trench Safety: Attention is directed to Labor Code Section 6705 of the State of California relating to lateral and subjacent support, and the Contractor shall comply with this law.

UTILITY NOTES

1. All utilities shown (if any) were located from above ground visual structures. No utility research was conducted for the site. Notify Underground Service Alert (DigAlert) at least two days prior to any grading or excavation within the site by calling 811 or 1-800-227-2600.
2. Contractor is responsible for any damage to utilities, features and structures located in the project area and construction access routes. Contractor shall avoid disruption of any utilities unless previously arranged with the Owner.
3. Construction may take place in the vicinity of overhead utility lines. It is the Contractor's responsibility to be aware of and observe the minimum clearances for workers and equipment operating near high voltage, and comply with the Safety Orders of the California Division of Industrial Safety as well as other applicable safety regulations.

SEQUENCE OF CONSTRUCTION

1. For each project area, work phasing shall occur as follows, unless otherwise approved by Owner in writing. All fish removals will be conducted by Owner.

West Bar

1. Mobilization.
2. Installation of temporary Erosion and Sediment Control measures, as necessary.
3. Installation of temporary Flow/ and Fish Isolation measures on Kelly Gulch and fish removal. Install temporary Waterway Crossing across Kelly Gulch.
4. Clearing for access to the temporary Waterway Crossing at River.
5. Installation of temporary Flow/ and Fish Isolation measures and fish removal.
6. Installation of temporary Waterway Crossing across River.
7. Clearing for access.
8. Excavation of the Mid-Bar channel Inlet and Alcove, leaving a plug of native material between the newly excavated areas and active river flow. Spread excavated material in designated Spoil Placement Area.
9. Install log structures.
10. Install Brush Baffles and Willow Stakes.
11. Installation of temporary Isolation measures to isolate connecting area of Inlet and Alcove with the River. Remove fish. Completion of Inlet and Alcove excavation and connection with the River.
12. Installation of temporary Isolation measures in work area of Apex Bar Jam near River station 56+75. Remove fish and construct Apex Bar Jam.
13. Restore construction access areas and install stabilization measures.
14. Removal of temporary Waterway Crossing and Isolation measures.
15. Demobilization.

Kelly Bar (Willow Pond, Seasonal and Overflow Channel)

1. Mobilization.
2. Installation of temporary Erosion and Sediment Control measures, as necessary
3. Clearing for access.
4. Excavation of the Willow Pond, Overflow and Seasonal Channels leaving a plug of native material between the newly excavated areas and active river flow. Spread excavated material in designated Spoil Placement Area.
5. Install log structures.
6. Install Brush Baffles and Willow Stakes.
7. Installation of temporary Isolation measures to isolate connecting area of the Alcove with the River. Remove fish. Completion of Alcove excavation and connection with the River.
8. Restore construction access areas and install stabilization measures.
9. Removal of temporary Isolation measures.
10. Demobilization.

Kelly Gulch and Pond

1. Mobilization.
2. Installation of temporary Erosion and Sediment Control measures, as necessary.
3. Installation of temporary Isolation Measure on surface drainage connection from Kelly Gulch to the Pond. Remove fish.
4. Clearing for access.
5. Excavation of Kelly Pond, Connecting and Outlet Channels, leaving a plug of native material between the newly excavated areas and active river flow. Spread excavated material in designated Spoil Placement Areas.
6. Install Temporary Road.
7. Install log and rock structures.
8. Install Brush Baffles and Willow Stakes.
9. Installation of temporary Isolation measures to isolate connecting area of the Outfall Channel with the River. Remove fish. Completion of Alcove excavation and connection with the River.
10. Stabilization of the work area.
11. Removal of temporary Isolation measures.
12. Fence Installation.
13. Demobilization.

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VERIFY SCALE
THIS BAR IS ONE INCH LONG AT FULL SCALE

Salmon River Restoration Council
KELLY BAR OFF-CHANNEL
FISHERIES AND RIPARIAN HABITAT DESIGN

LEGEND, ABBREVIATIONS & NOTES

DATE
JAN. 2018
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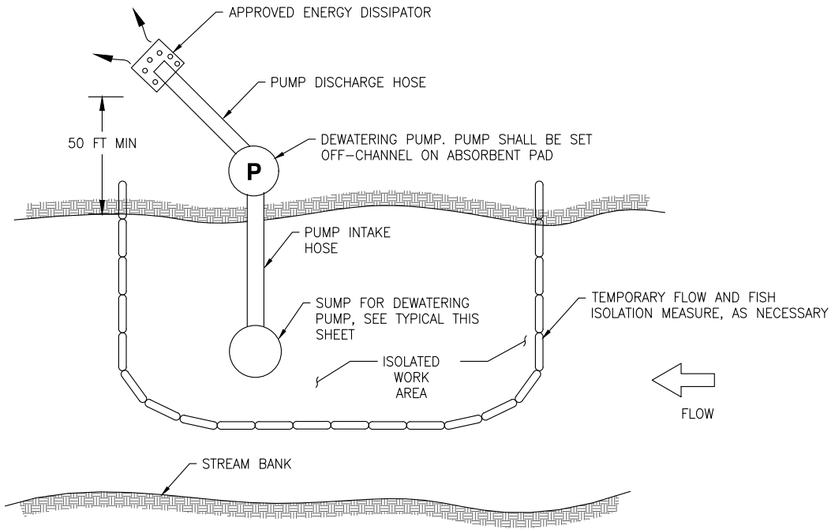
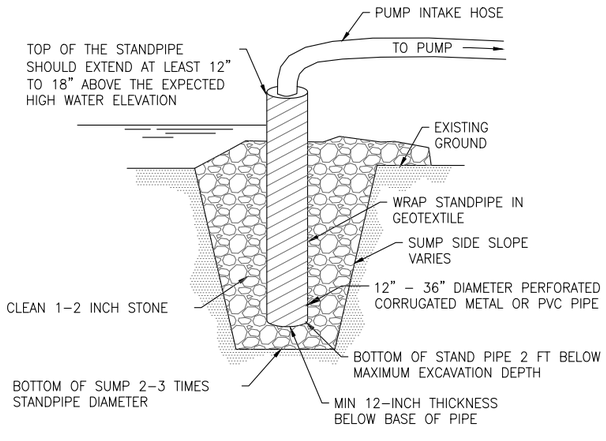
NN
SHEET
2 of 16

Q:\Kelly Bar\DWG\SHEETS\1_TITLE.dwg



TEMPORARY WORK AREA ISOLATION AND DEWATERING MEASURES

PLAN **(NTS)**



SUMP PIT

SECTION **(NTS)**

WATER POLLUTION CONTROL SPECIFICATIONS

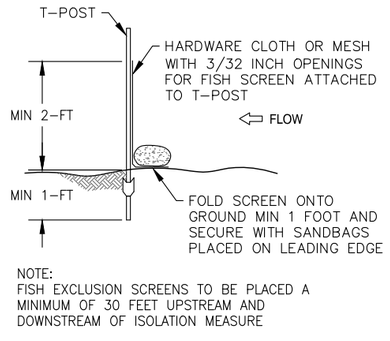
1. At minimum the Contractor shall employ the following Best Management Practices (BMPs) as applicable, as described in the current California Stormwater BMP Handbook for Construction (BMP Handbook) (www.casqa.org) including:

EC-1 Scheduling	NS-4 Temporary Stream Crossing
EC-2 Preservation of Existing Vegetation	NS-5 Clear Water Diversion
EC-6 Straw Mulch	NS-9 Vehicle Equipment and Fueling
EC-8 Wood Mulching	NS-10 Vehicle and Equipment Maintenance
EC-10 Velocity Dissipation Devices	SE-7 Street Sweeping and Vacuuming
WE-1 Wind Erosion Control	WM-2 Material Use
WM-3 Stockpile Management	WM-4 Spill Prevention and Control
WM-5 Solid Waste Management	WM-9 Sanitary/Septic Waste Management

2. Not all necessary erosion and sediment control BMP's are designated in the contract documents. The Contractor, as necessary, shall implement other BMP's as specified in the BMP Handbook dictated by site conditions or as directed by the Owner. Contractor shall be responsible for all fines and cleanup resulting from a stormwater pollution violation.
3. It is the responsibility of the Contractor to minimize erosion and prevent the transport of sediment to sensitive areas.
4. All erosion and sediment control measures shall be maintained in accordance to their respective BMP Fact Sheet until disturbed areas are stabilized.
5. Sufficient Erosion Control Supplies shall be available on-site at all times to deal with areas susceptible to erosion during rain events. Contractor must ensure that the construction site is prepared prior to the onset of any storm.
6. Contractor shall keep project areas generating dust well-watered during the term of the contract in accordance with WE-1.
7. The Contractor shall have spill containment materials located at the site with operators trained in spill control procedures.
8. The Contractor shall provide bear-proof receptacles for common solid waste at convenient locations on the job site and provide regular collection of wastes.
9. Covered and secured storage areas for potentially toxic materials shall be provided. All hazardous material containers shall be placed in secondary containment.
10. Vehicle and equipment maintenance shall be performed off-site whenever practical.
11. All sediment deposits on paved surfaces shall be swept at the end of each working day, as necessary or as directed by the Owner. A stabilized construction entrance may be required to prevent sediment from being deposited on paved roads.
12. It will be at the responsibility of the Contractor to fix any deficiencies indicated by the Owner to prevent erosion and control sediment.
13. Spoil Placement Areas 2, 4, 5, 6 and 7 shall be stabilized with wood chip mulch, unless otherwise specified.

WATER MANAGEMENT NOTES

1. Contractor shall submit a Water Management Plan for approval by the Owner prior to construction. The Plan shall include materials, methods, and approximate locations of water management devices, as well as a contingency plan for addressing unforeseen water management issues, such as storm events, groundwater etc.
2. Water Management shall be performed in accordance with Water Pollution Control Specifications and as specified in the contract documents.
3. The need for a clearwater diversion is not anticipated, though isolation and dewatering of the work areas will be necessary. Work areas shall be isolated until fully stabilized.
4. Approximate location of temporary Flow/Fish Isolation measures are shown on the plans, but can be changes with approved water management plan.
5. SRRC will provide a qualified Biologist for fish removal.
6. Contractor shall be prepared to implement isolation, and dewatering operations such that they occur in a timely manner and do not impact the work schedule.
7. Contractor shall be responsible for providing pumps and pipes with adequate capacity to maintain suitable dewatered working conditions within the work area.
8. Any gas powered pumps used on-site shall be placed on absorbent pads out of the stream channel.
9. Dikes, cofferdams, or other suitable measures shall be used to isolate areas requiring dewatering. Additional control measures in isolated areas where dewatering is not required shall include turbidity curtains, filter fabric isolation, or other suitable methods.
10. The outlet of the dewatering pump shall be directed onto a flat area able to receive water and allow it to percolate into the soils such that it does not return to work area. An approved Energy Dissipater Device shall be used to prevent surface erosion.



NOTE:
FISH EXCLUSION SCREENS TO BE PLACED A MINIMUM OF 30 FEET UPSTREAM AND DOWNSTREAM OF ISOLATION MEASURE

FISH EXCLUSION SCREEN

TYPICAL SECTION **(NTS)**

A WATER MANAGEMENT

TYPICAL

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KELLY BAR OFF-CHANNEL
FISHERIES AND RIPARIAN HABITAT DESIGN

WATER MANAGEMENT

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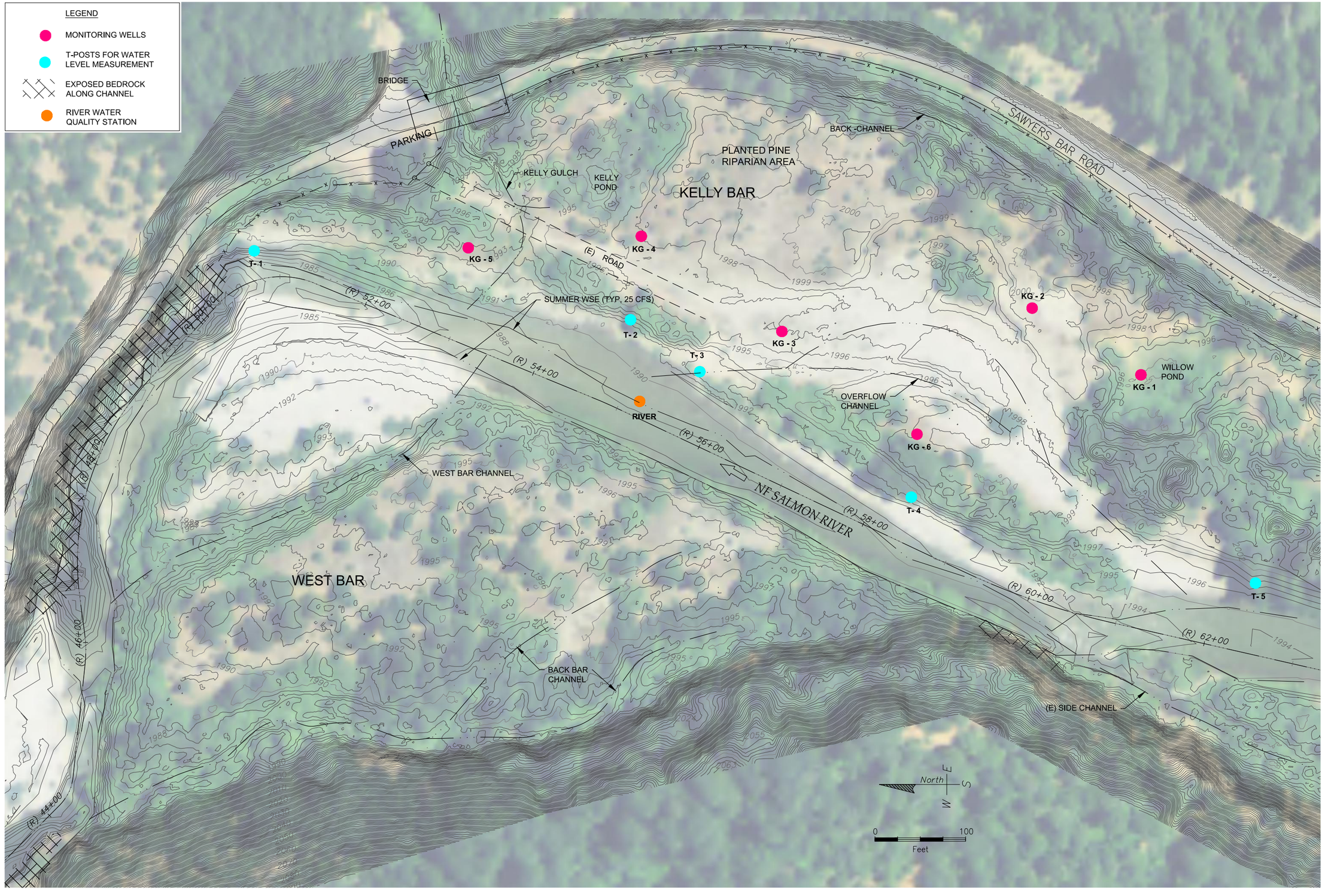
NN
SHEET
3 of 16



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EXISTING CONDITIONS

DATE	JAN. 2018
SUBMITTAL	FINAL
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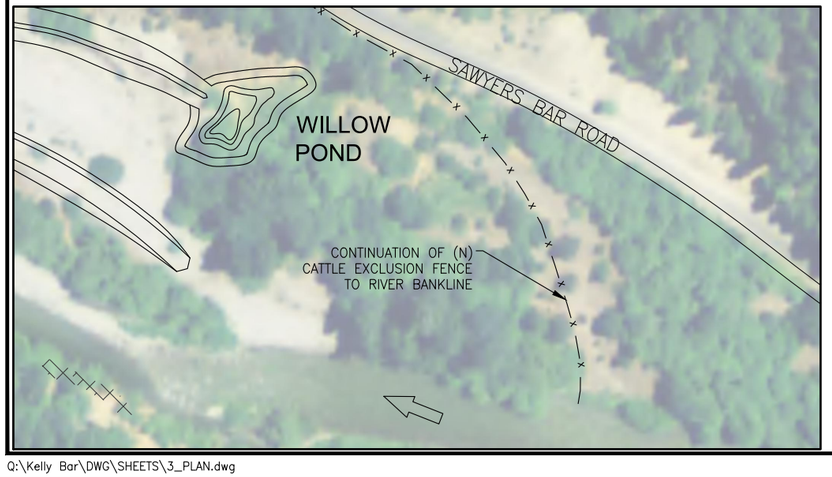
DRAWN	NN
SHEET	4 of 16

SURVEY CONTROL POINTS				
CP #	Description	Elevation	Northing	Easting
CP1	nail and shiner in road	2005.730	2365136.8520	6240699.3790
CP2	nail and shiner in wooden bridge post 1	2009.370	2364873.7790	6240861.7840
CP3	nail and shiner in wooden bridge post 2	2008.774	2364806.5290	6240884.2790

NOTE:
EXCAVATED MATERIALS SHALL NOT BE TRANSPORTED TO SPOIL PLACEMENT AREAS ACROSS MINING CLAIM BOUNDARY.

KELLY GULCH
CP3
CP2
(E) BRIDGE
SAWYERS BAR ROAD
PARKING
(N) GATE
SPOIL PLACEMENT AREA 6, APPROX. 580 CY
SPOIL PLACEMENT AREA 7, APPROX. 130 CY
TEMPORARY STREAM CROSSING
TEMPORARY RIVER CROSSING
SUMMER WSE (TYP)
PLANTED PINE RIPARIAN AREA
KELLY BAR
KELLY POND
(E) ROAD
SEASONAL CHANNEL
SPOIL PLACEMENT AREA 5, APPROX 1400 CY
SPOIL PLACEMENT AREA 4, APPROX 200 CY
BERM SPOIL PLACEMENT AREA 2, APPROX. 3,600 CY
CONTINUATION OF (N) CATTLE EXCLUSION FENCE TO RIVER BANKLINE (SEE INSERT)
WILLOW POND
OVERFLOW CHANNEL
SPOIL PLACEMENT AREA 3, APPROX. 280 CY
WEST BAR
SPOIL PLACEMENT AREA 1, APPROX. 180 CY
MID-BAR CHANNEL
NE SALMON RIVER
SHEET 10
SHEET 6
SHEET 8
(E) BACK BAR CHANNEL
MINING CLAIM BOUNDARY (APPROX)
SUMMER WSE (TYP)



North
0 Feet 100

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CONSTRUCTION ACCESS AND SPOILS PLACEMENT

DATE	JAN. 2018
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FISHERIES AND RIPARIAN HABITAT DESIGN

MID-BAR SIDE CHANNEL PLAN

DATE	JAN. 2018
SUBMITTAL	FINAL
DESIGN	RS / ML
DRAWN	NN
SHEET	6 of 16

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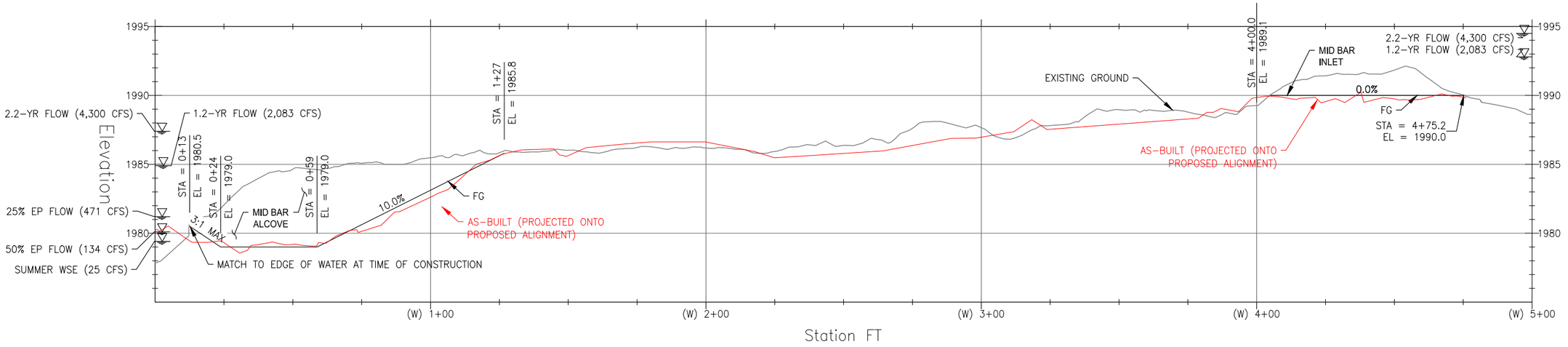
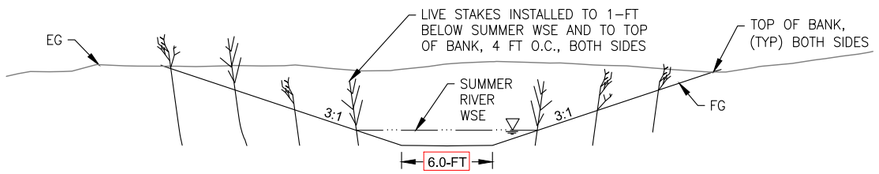


MID-BAR CHANNEL INLET AND ALCOVE
PROFILE ALONG (W) ALIGNMENT

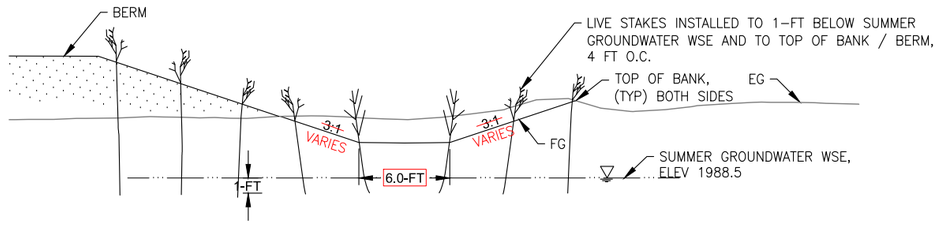
HORIZONTAL SCALE: 0 10 20 Feet

VERTICAL SCALE: 0 2 4 Feet



NOTE: INSTALL ROOT WAD/COVER STRUCTURES AT SUMMER WSE WHERE SPECIFIED.

A MID-BAR CHANNEL ALCOVE SECTION
TYPICAL NTS



NOTE: INSTALL ROOT WAD/COVER STRUCTURES ALONG CHANNEL TOE WHERE SPECIFIED.

B MID-BAR CHANNEL INLET SECTION
TYPICAL NTS

AS BUILT
DATE December, 2019
R.E. NAME Rachel Shea, P.E.
Rachel Shea
R.E. Signature for final approval of As-built information

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KELLY BAR OFF-CHANNEL
FISHERIES AND RIPARIAN HABITAT DESIGN

MID-BAR PROFILE AND SECTIONS

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SHEET 7 of 16

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KELLY BAR

WEST BAR

MINING CLAIM BOUNDARY (APPROX)

SAWYERS BAR ROAD

(E) ROAD

SEASONAL CHANNEL

LIMIT OF GRADING

CHANNEL TOE

SLOPE BREAK

CATTLE EXCLUSION FENCING

BRUSH BAFFLES TYP OF 5 ON SEASONAL CHANNEL, LENGTH 30-FT (APPROX) (6/15)

LOG COVER STRUCTURE (TYP), SEE (1/12)

POND TOE 1990.0

ROOT WAD/COVER STRUCUTRES (TYP), SEE (3/12)

BERM CREST 1998.0

BENCH APPROX. ELEV 1992 TO 1993, INSTALL 8 ROOT WAD/COVER STRUCTURES ON BENCH AS DIRECTED BY OWNER. SEE (3/13)

BRUSH BAFFLES TYP OF 8 ON OVERFLOW CHANNEL, LENGTH 30-FT (APPROX)

BERM CREST 2001.5

WILLOW POND

LIMIT OF GRADING 1996.0

CHANNEL TOE

ALCOVE

OVERFLOW CHANNEL

AS-BUILT CENTERLINE

DEEP POOL ELEVATION 1989.0

(E) TAILINGS PILES

LIMIT OF GRADING

BACK CHANNEL APEX BAR JAM, SEE (4/13)

SUMMER WSE (TYP)

BRUSH BAFFLE APPROX 50-FT LONG

OVERFLOW CHANNEL APEX BAR JAM INCORPORATE BETWEEN (E) ALDER TREES

SUMMER WSE (TYP)

AS-BUILT CHANNEL INLET

(E) BACK BAR CHANNEL

NF SALMON RIVER

(E) SIDE CHANNEL

NOTE:
AT THE DIRECTION OF THE OWNER, BRUSH BAFFLES CAN BE INSTALLED IN-LIEU OF LOG CONSTRICTORS AT 2 LOCATIONS

North

0 30
Feet

AS BUILT
DATE December, 2019
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Rachel Shea
R.E. Signature for final approval of As-built information

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Addendum 1

VERIFY SCALE
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KELLY BAR OFF-CHANNEL
FISHERIES AND RIPARIAN HABITAT DESIGN

KELLY BAR OVERFLOW AND SEASONAL CHANNEL PLAN

DATE	JAN. 2018
SUBMITTAL	FINAL
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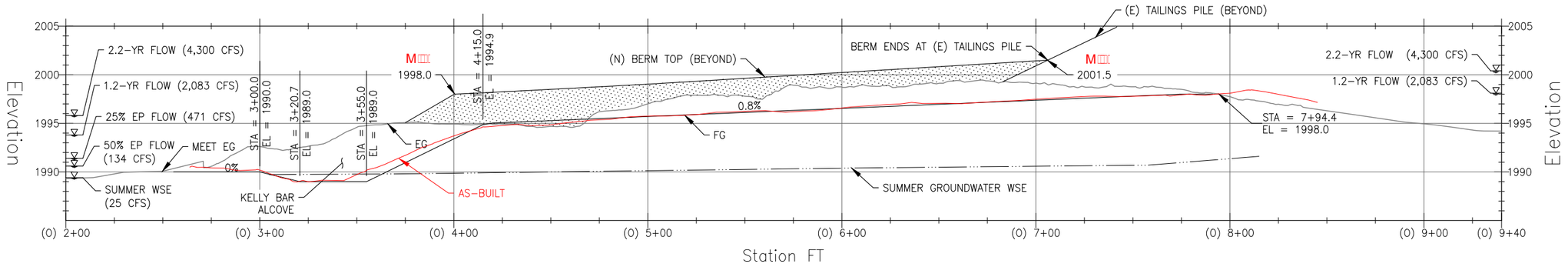
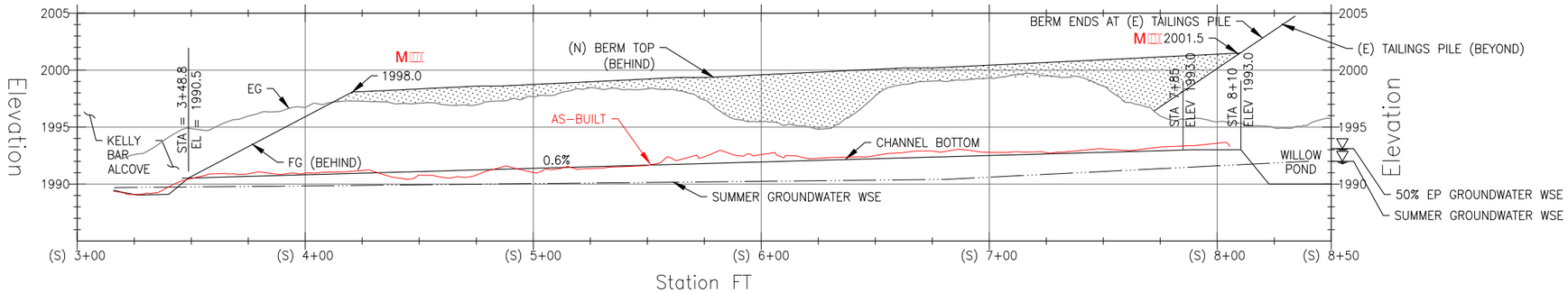


KELLY BAR OVERFLOW CHANNEL THALWEG
PROFILE ALONG (O) ALIGNMENT

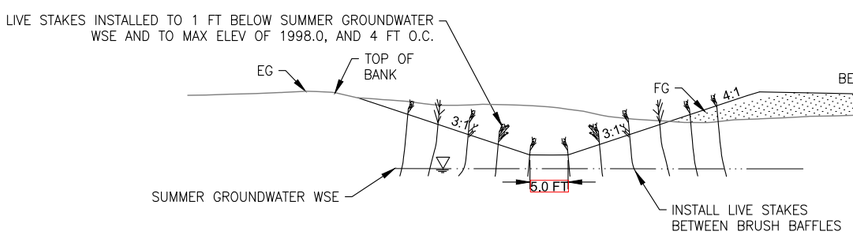
HORIZONTAL SCALE: 0 15 30 Feet
VERTICAL SCALE: 0 3 6 Feet



KELLY BAR SEASONAL CHANNEL THALWEG
PROFILE ALONG (S) ALIGNMENT

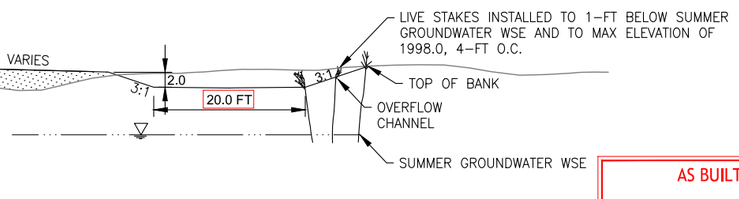
HORIZONTAL SCALE: 0 15 30 Feet
VERTICAL SCALE: 0 3 6 Feet

SEASONAL CHANNEL



NOTE: INSTALL ROOT WAD/COVER STRUCTURES ALONG CHANNEL TOE WHERE SPECIFIED ON SEASONAL CHANNEL

OVERFLOW CHANNEL



C KELLY BAR SECTION
TYPICAL **NTS**

AS BUILT
DATE December, 2019
R.E. NAME Rachel Shea, P.E.
Rachel Shea
R.E. Signature for final approval of As-built information

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KELLY BAR OFF-CHANNEL
FISHERIES AND RIPARIAN HABITAT DESIGN

OVERFLOW PROFILE AND SECTION

DATE JAN. 2018
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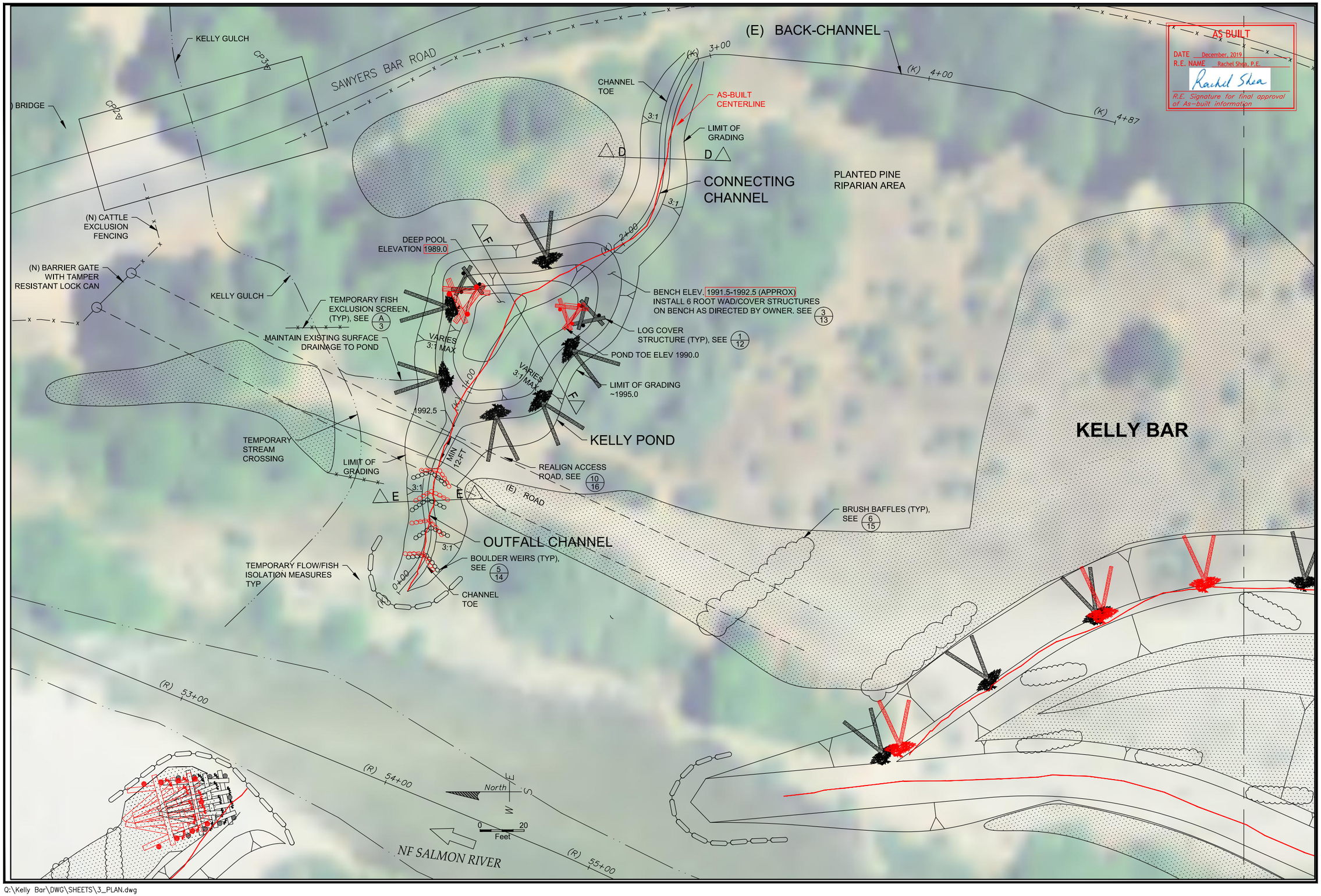

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FISHERIES AND RIPARIAN HABITAT DESIGN

KELLY GULCH POND AND OUTFLOW CHANNEL PLAN

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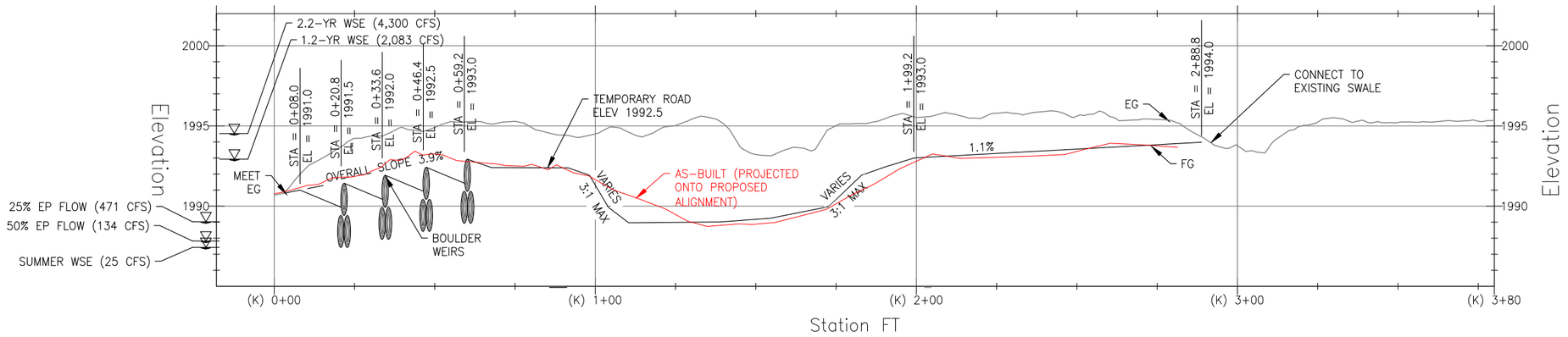
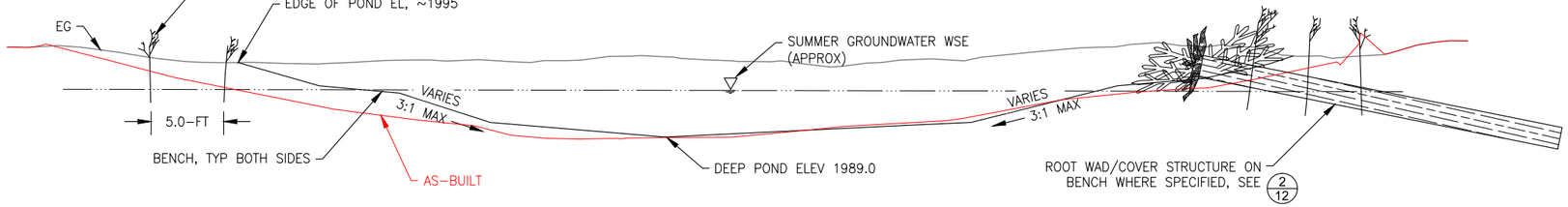


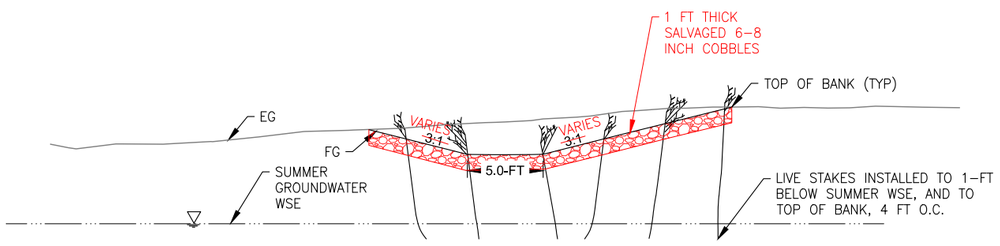
KELLY POND
PROFILE ALONG (K) ALIGNMENT

HORIZONTAL SCALE: 0 10 20 Feet

VERTICAL SCALE: 0 2 4 Feet

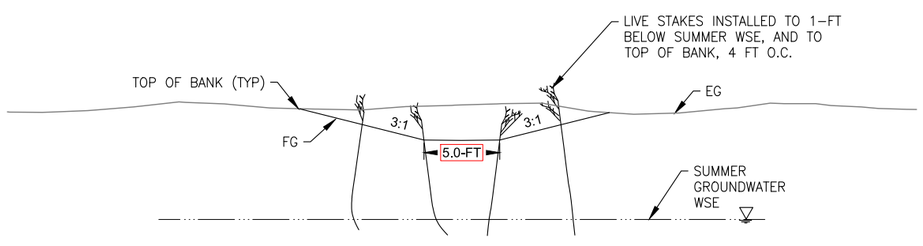


F KELLY POND
TYPICAL NTS



E KELLY POND OUTFALL CHANNEL SECTION
TYPICAL NTS

NOTE: INSTALL ROOT WAD/COVER STRUCTURES AT CHANNEL TOE WHERE SPECIFIED



D CONNECTING CHANNEL SECTION
TYPICAL NTS

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Rachel Shea
R.E. Signature for final approval of As-built information

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Salmon River Restoration Council
KELLY BAR OFF-CHANNEL
FISHERIES AND RIPARIAN HABITAT DESIGN

KELLY GULCH POND PROFILE AND SECTION

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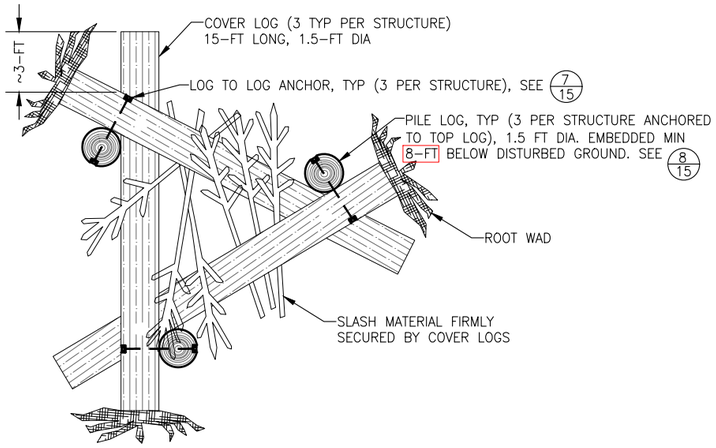
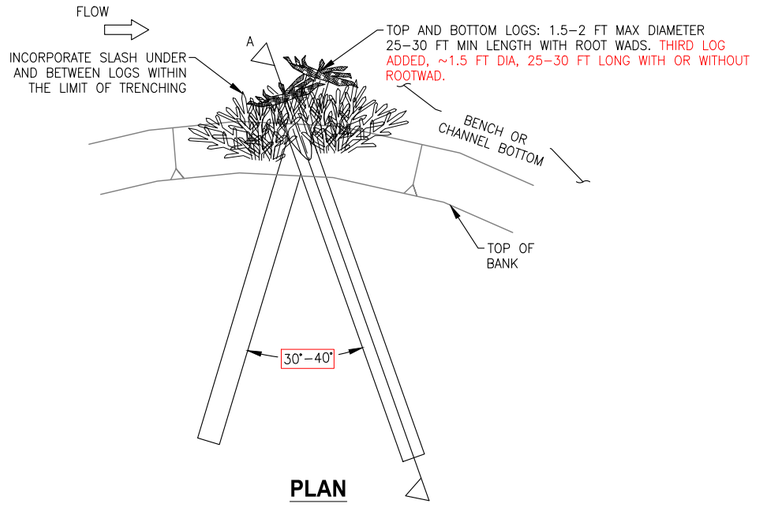
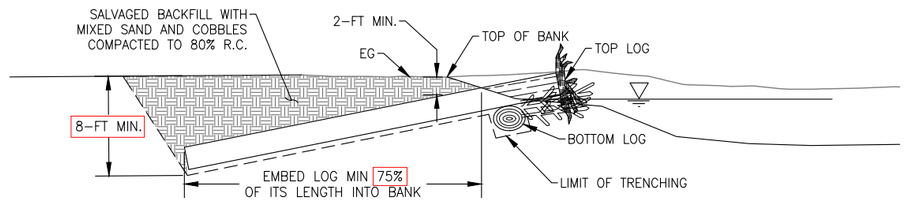


1 LOG COVER STRUCTURE
TYPICAL **NTS**



PLAN



SECTION A

3 ROOT WAD/COVER STRUCTURES
TYPICALS **NTS**

AS BUILT
DATE December, 2019
R.E. NAME Rachel Shea, P.E.
Rachel Shea
R.E. Signature for final approval of As-built information

Michael Love & Associates, Inc.
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

Salmon River Restoration Council
PO BOX 1089 • 25531 Sawyers Bar RD, Sawyers Bar CA 96027
530-462-4665 Fax 530-462-4664

REGISTERED PROFESSIONAL ENGINEER
MICHAEL A. LOVE
No. 71681
CIVIL
STATE OF CALIFORNIA

VERIFY SCALE
THIS BAR IS ONE INCH LONG AT FULL SCALE

Salmon River Restoration Council
KELLY BAR OFF-CHANNEL
FISHERIES AND RIPARIAN HABITAT DESIGN

CONSTRUCTION DETAILS

DATE JAN. 2018
SUBMITTAL FINAL
DESIGN RS / ML
DRAWN NN
SHEET 12 of 16

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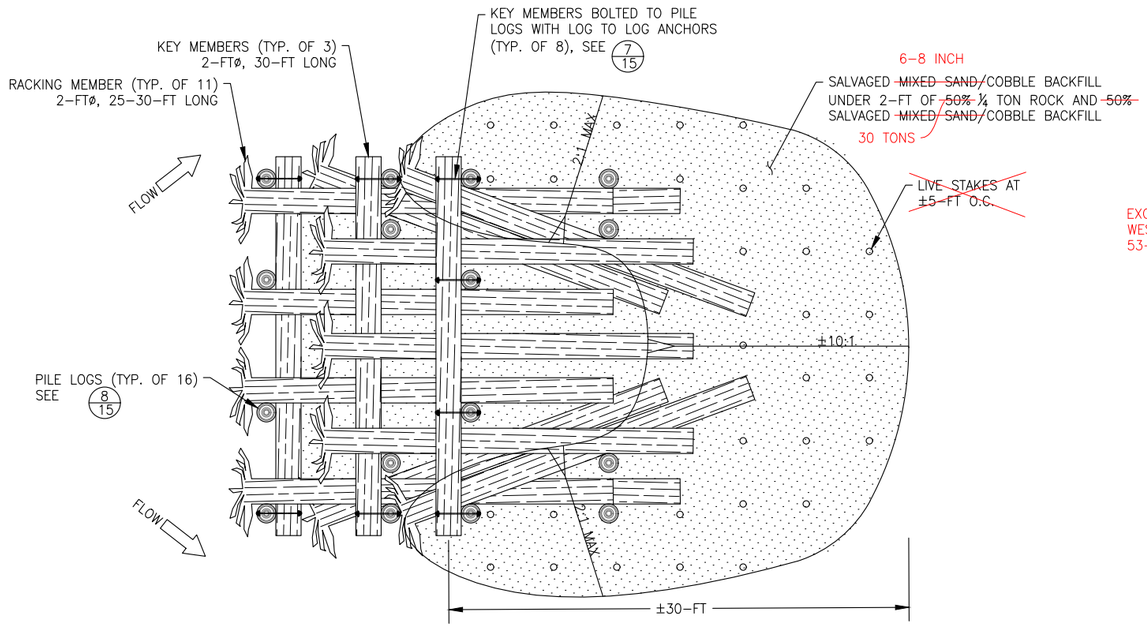
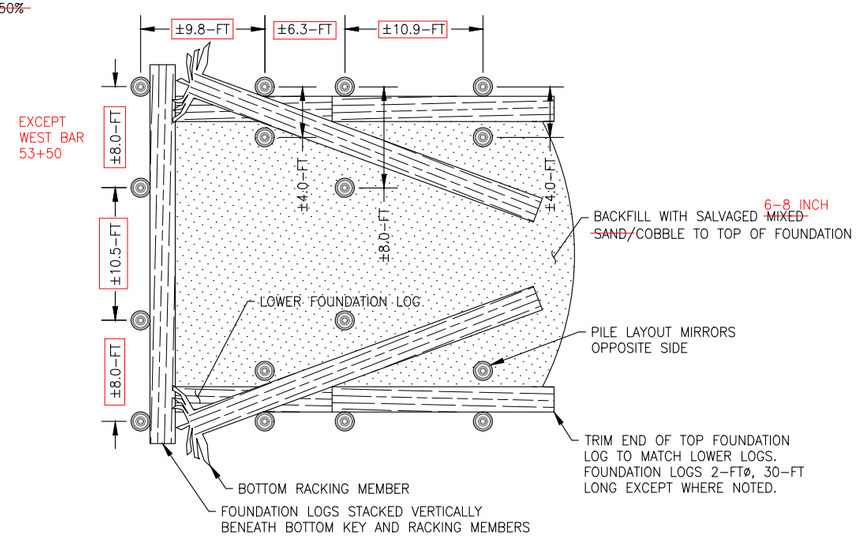
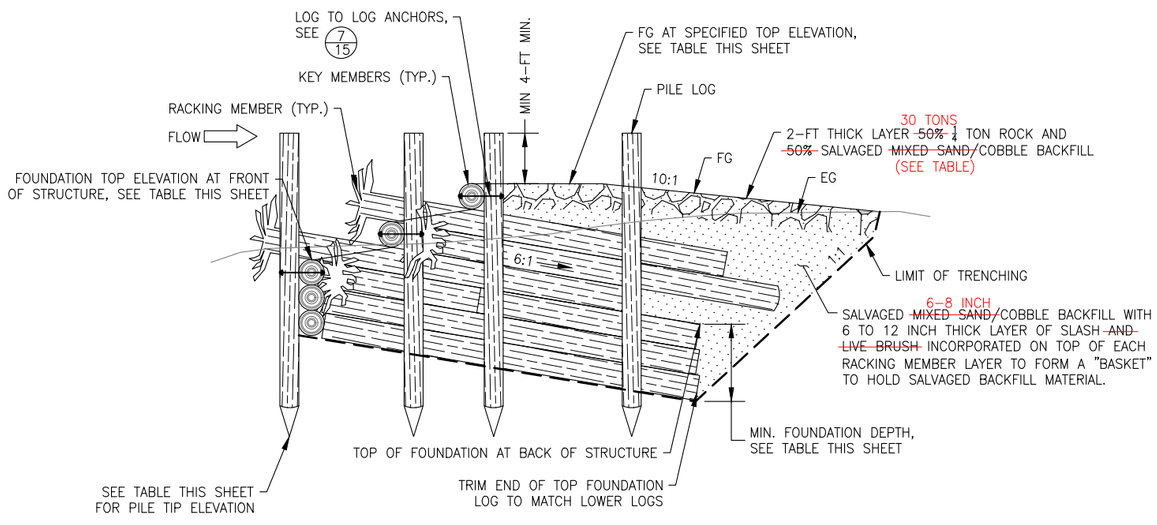


NOTE: NOT ALL FOUNDATION LOGS SHOWN

PLAN
NTS



PILE LAYOUT AND FOUNDATION PLAN
NTS



ELEVATION
NTS

4 APEX BAR JAM
TYPICAL

APEX BAR JAM ELEVATION TABLE

STRUCTURE	~~MIN.~~ TOP ELEVATION	FOUNDATION TOP ELEVATION AT FRONT OF STRUCTURE	MIN. FOUNDATION DEPTH	MAX. PILE TIP ELEVATION
KELLY BAR (R) 61+00 30 FT WIDE	2001.0 √	1993.0 √	4 ~~5~~-FT	1979.0 *
WEST BAR (R) 56+50 30 FT WIDE	1997.0 √	1989.0 √	5 ~~6~~-FT	1975.0 *
WEST BAR (R) 53+50 25 FT WIDE	1994.0 √	1986.0 √	5 ~~3~~-FT	1972.0 **

* PILE TIP ELEVATION ACHIEVED ON ALL ANCHORED PILES. REMAINING PILES INSTALLED TO WITHIN 2 FEET OF SPECIFIED EMBEDMENT

** □□□R□□□□□□□□□ □□□□□□□□□□□□M□□DM□□□D□□□□□□DR□□□□□□□□□□□1□□□□ □R□□□ □DD□D□□□ □M□DD□□□□□□R□□

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REGISTERED PROFESSIONAL ENGINEER MICHAEL A. LOVE No.71681 CIVIL STATE OF CALIFORNIA

VERIFY SCALE
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Salmon River Restoration Council
KELLY BAR OFF-CHANNEL
FISHERIES AND RIPARIAN HABITAT DESIGN

CONSTRUCTION DETAILS (2)

DATE JAN. 2018
SUBMITTAL FINAL
DESIGN RS / ML
DRAWN NN
SHEET 13 of 16

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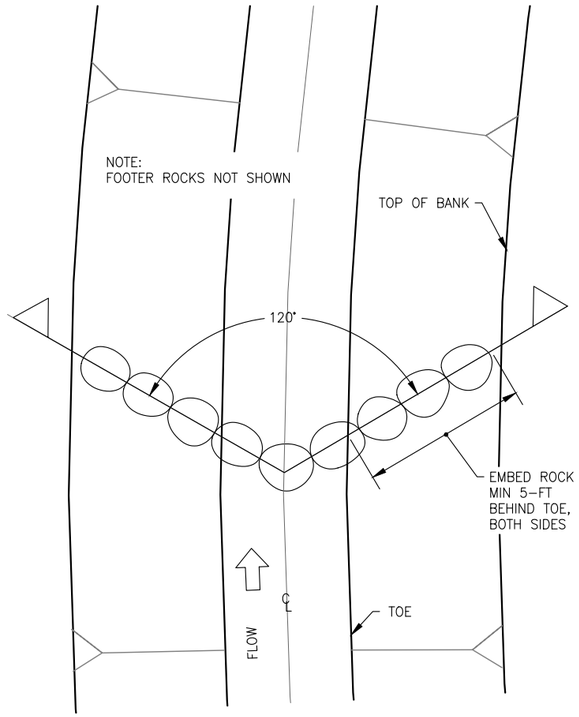


PLAN

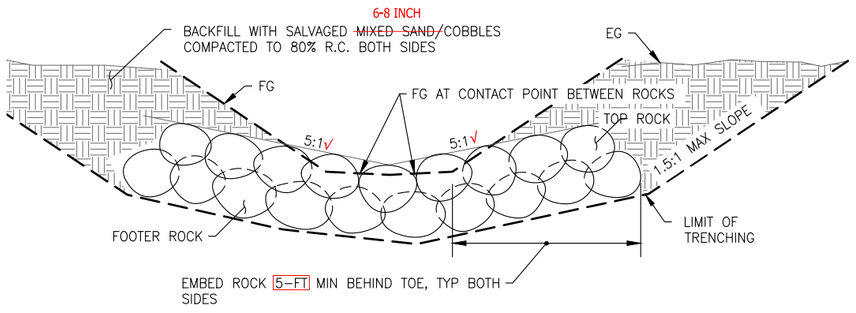
SPECIFICATIONS FOR BOULDER WEIRS

Materials

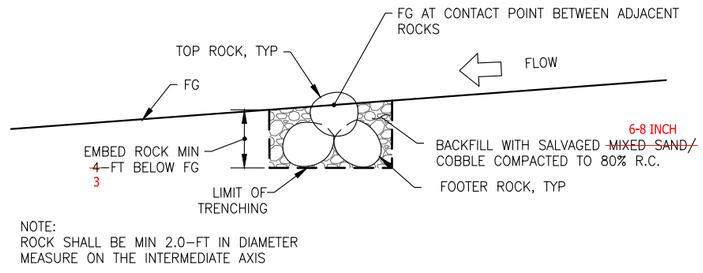
1. Rock size shall be as specified on the plans. Rocks larger than 3.0-feet in diameter will not be accepted.
2. Rocks shall be measured along the intermediate (B) axis. The ratio of the longest (A) to shortest axis (C) (A/C) shall not exceed 2.0.
3. Backfill material shall be as specified on the design plans.

Execution

1. Excavate trench to the minimum depth for the entire structure.
2. Placement of boulders shall be at the discretion of the Owner but is generally as shown on the plans.
3. Rocks to be hand selected and individually placed.
4. Rocks to be in contact with one another at a minimum of 6 points.
5. Finished grade shall be measured at point of contact between top rocks.
6. Refer to Plans for additional details.
7. Backfill and compact trench.



SECTON



PROFILE

5 BOULDER WEIR
TYPICAL **NTS**

AS BUILT
DATE December, 2019
R.E. NAME Rachel Shea, P.E.
Rachel Shea
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Salmon River Restoration Council
KELLY BAR OFF-CHANNEL
FISHERIES AND RIPARIAN HABITAT DESIGN

CONSTRUCTION DETAILS (3)

DATE
JAN. 2018
SUBMITTAL
FINAL
DESIGN
RS / ML
DRAWN
NN
SHEET
14 of 16

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SPECIFICATIONS FOR LOG STRUCTURES

Materials

1. Owner will provide all logs. Cutting of logs shall not be performed without permission of owner.
2. Logs shall meet the dimensions shown on the contract documents. Log diameter shall be the average (midpoint) diameter of the specified length log. Pile Logs shall have bark removed.
3. Log lengths shall not be accomplished by joining multiple logs, unless approved by owner.
4. Rebar shall be threaded. Rebar, washer and hex-nuts shall be steel. All Thread is acceptable.
5. Rebar shall be a minimum of 1-inch thick and shall have a corresponding nut. Washer Plates shall be min 4-inch x 4-inch x 5/16 -inch thick. Manufactures certifications for all materials shall be submitted for Owner approval prior to delivery.
6. Backfill material and Rock shall be as specified on the design plans.
7. Salvaged small woody material shall be material stockpiled during Clearing and Grubbing Operations or provided by owner.

Execution

1. Log structures shall be installed as specified on the Contract Documents.
2. Excavate trench to the minimum depth for the entire structure.
3. Install logs to the line and grade specified. Tolerance for finished grade shall be ± 0.1 feet vertically and ± 1.0 feet horizontally
4. Pile logs shall be driven or installed via excavation. If necessary, cut point on pile tip to facilitate installation. An augured pilot hole may be used to facilitate driving of Pile Logs. Pilot hole shall be at least 8 inches smaller than the Pile Log diameter to ensure adequate skin friction is obtained. After installation, cut top of pile to specified height.
5. All logs shall be anchored where specified. Anchors shall be located a minimum of 2 feet from the end of the log unless otherwise noted. Root was/cover structures do not require anchoring.
6. Rebar shall be inserted through the center of each log and bolted as specified. Rebar, washer, and nut, shall be fully recessed within the log. Cut rebar within 1-inch of nut.
7. To minimize movement of logs, anchoring shall be installed such that connections are tight.
8. After installation, the bolted ends of the rebar shall be mushroomed to prevent the connection from loosening.
9. Backfill and compact trench.

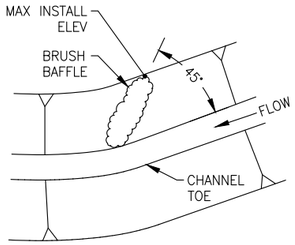
SPECIFICATIONS FOR BRUSH BAFFLES AND WILLOW STAKES

Materials

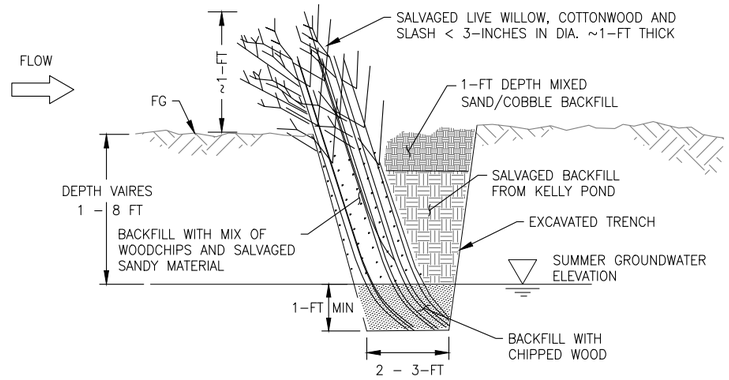
1. Live willow and cottonwood shall be salvaged from site or provided by the Owner.
2. Material shall be relatively straight, a minimum of ½-inch in diameter, and the specified length.
3. Material shall be live and freshly cut. Materials not installed within 2 hours of cutting shall be covered and thoroughly sprayed with water once per hour until installation. Material shall not be stored more than 48 hours before installation.
4. Slash shall consist of salvaged woody material or material provided by owner. Material shall be less than 3-inches in diameter and of similar length as the live plant material.
5. Chipped wood shall be from salvaged wood on-site. Wood pieces a minimum of 6-inches in diameter and 1-foot long are acceptable substitutes for chipped wood.
6. Backfill shall be as specified.

Execution

1. Materials shall be installed to the line and grade as specified on the design plans, and where directed by Owner.
2. Create pilot holes or trenches the entire depth of the material installation.
3. Install material with leaf buds facing up using methods that minimize crushing or splitting.
4. Trim plant material such that material extends approximately 1-foot above ground level.

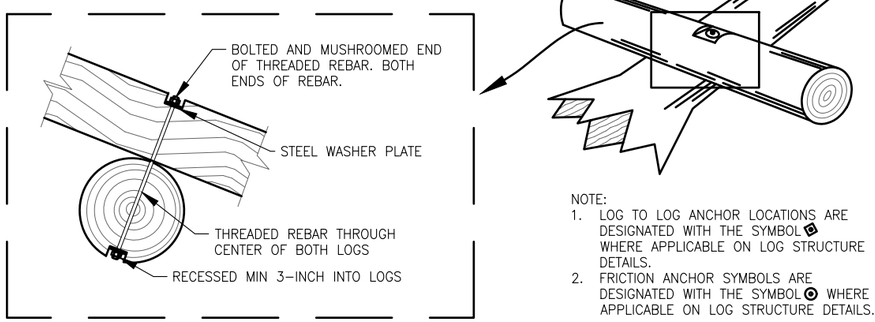


BRUSH BAFFLES
PLAN



BRUSH BAFFLES
SECTION

6 BRUSH BAFFLES
TYPICALS **NTS**



NOTE:
1. LOG TO LOG ANCHOR LOCATIONS ARE DESIGNATED WITH THE SYMBOL ⊡ WHERE APPLICABLE ON LOG STRUCTURE DETAILS.
2. FRICTION ANCHOR SYMBOLS ARE DESIGNATED WITH THE SYMBOL ⊙ WHERE APPLICABLE ON LOG STRUCTURE DETAILS.

7 LOG TO LOG ANCHOR
SECTION **NTS**

AS BUILT
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Rachel Shea
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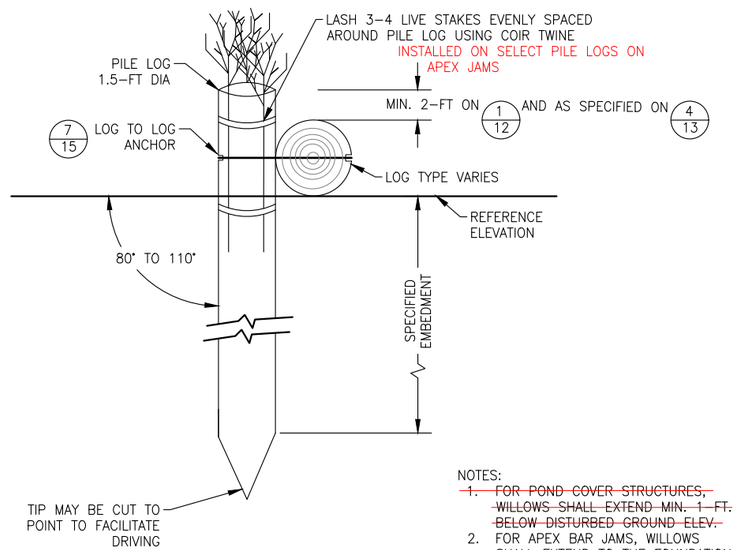

NOTES:
1. ~~FOR POND COVER STRUCTURES, WILLOWS SHALL EXTEND MIN. 1 FT. BELOW DISTURBED GROUND ELEV.~~
2. FOR APEX BAR JAMS, WILLOWS SHALL EXTEND TO THE FOUNDATION TOP ELEVATIONS.

8 TYPICAL PILE LOG
ELEVATION **NTS**

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FISHERIES AND RIPARIAN HABITAT DESIGN

CONSTRUCTION DETAILS (4)

DATE
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15 of 16

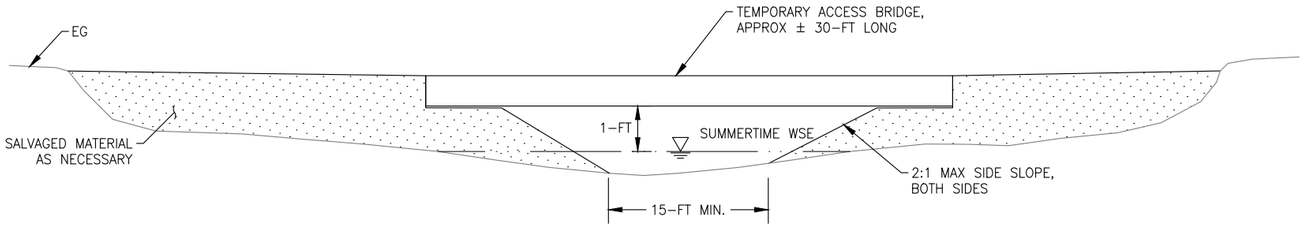
Q:\Kelly Bar\DWG\SHEETS\6_DETAILS.dwg

FENCING SPECIFICATIONS

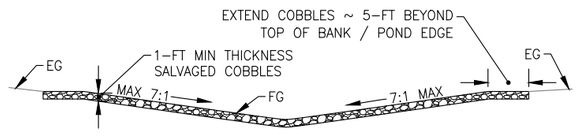
1. New fencing shall conform to Natural Resources Conservation Service Construction Specifications (NRCS) Standard 382. Manufactures certifications for all materials shall be submitted for Owner approval prior to delivery.
2. Fencing shall be installed as specified on the design plans and as directed by the Owner.

SPECIFICATIONS FOR TEMPORARY WATERWAY CROSSINGS

1. Contractor shall submit their proposed materials and methods to accomplish temporary water way crossings across Kelly Gulch and the River for Owner-Approval prior to execution. The Kelly Gulch crossing shall include a minimum 24" pipe to convey streamflow.
2. The crossings shall be in accordance with the design plans and with NS-4 in the BMP Handbook.
   a. Crossing shall be installed such that the active flow area of the waterway is undisturbed during all phases of installation, use, and removal.



9 TEMPORARY RIVER CROSSING
SECTION NTS



10 REALIGNED ACCESS ROAD CROSSING
SECTION NTS

AS BUILT
DATE December, 2019
R.E. NAME Rachel Shea, P.E.
Rachel Shea
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CONSTRUCTION DETAILS (5)

DATE JAN. 2018
SUBMITTAL FINAL
DESIGN RS / ML
DRAWN NN
SHEET 16 of 16

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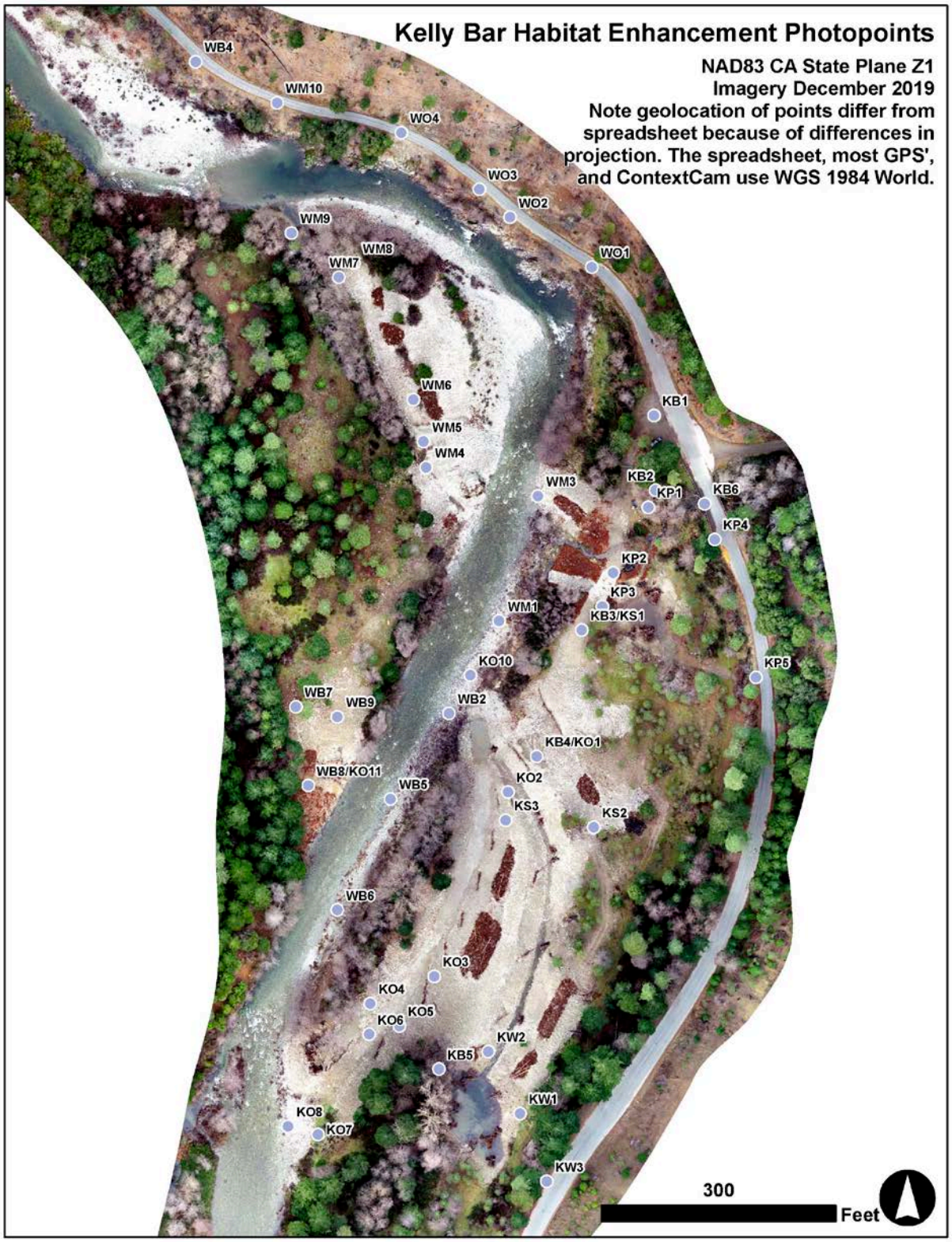
Attachment 2: Photomonitoring Locations



Photomonitoring Points
Coordinates in WGS 1984 World

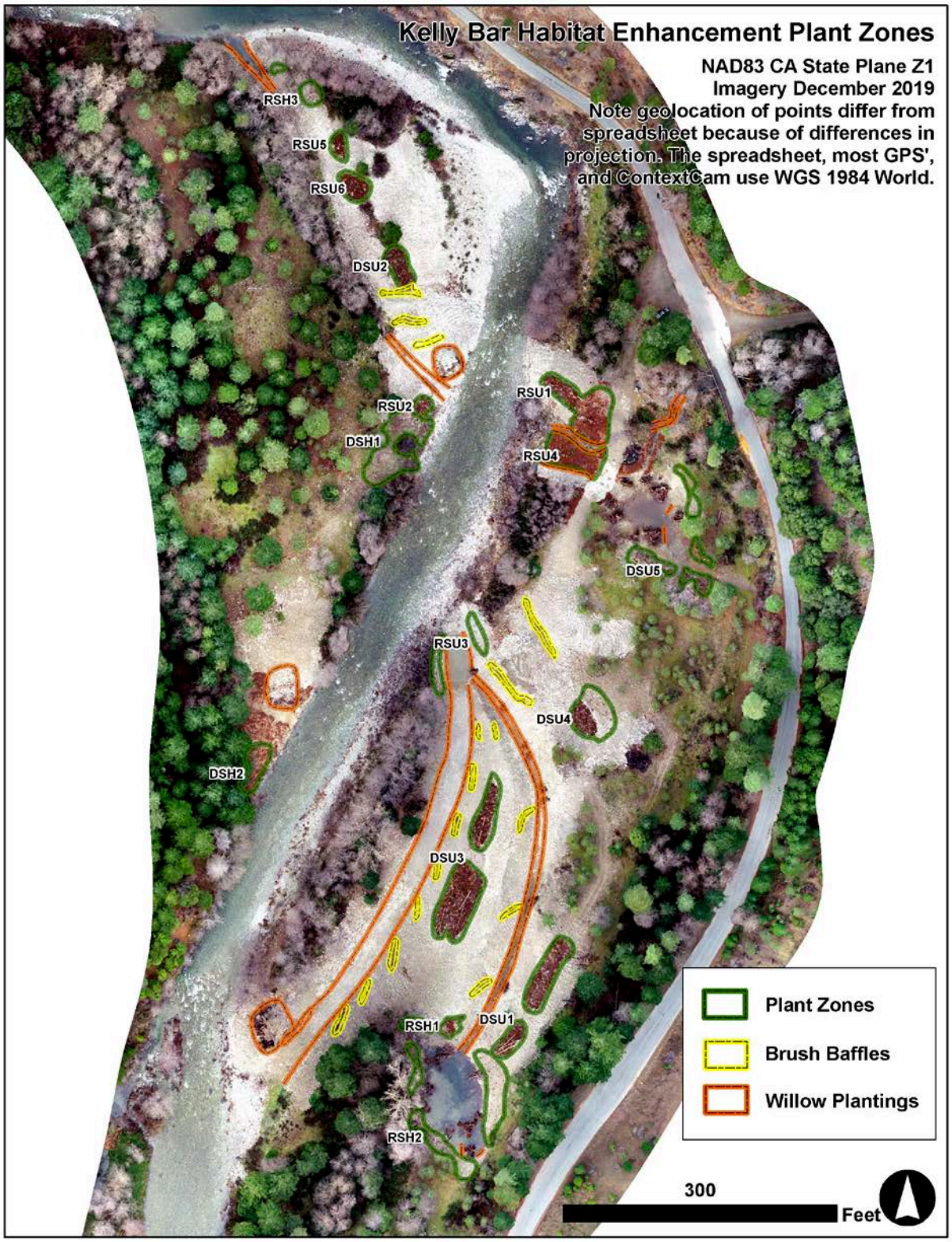
Point_ID	Name	Direction	Lat	Lon	Notes
KB1	access looking at berm from sr rd	200	41.3162999999999	-123.1682361109990	
KB2	access looking at kelly gulch	185	41.3160361110999	-123.1682250000000	
KB3/KS1	view from access route and seasonal channel and reveg pano	190, pano 225	41.3155416667000	-123.1685583329990	
KB4/KO1	kelly bar and overflow alcove	0, 15, 70, 120, 170, 195, 225, 255, 300, 335, 350, panos 0, 200, 320	41.3150944444000	-123.1687611109990	added pano 0 Aug 2020
KB5	kelly bar upstream pano	pano 45	41.3139888888999	-123.1691972219990	
KB6	kelly gulch from bridge down	looking up 260, looking down 260	41.3159916667000	-123.1679944440000	
KO2	overflow channel downstream	220, 250, 300, 325	41.3149679349999	-123.1688927900000	
KO3	overflow channel upstream	0, 235, 280, 320	41.3142241979999	-123.1691302859990	
KO4	overflow elj downstream	190, 225, 255	41.3142166666999	-123.1695222219990	
KO5	overflow elj across	325	41.3141333332999	-123.1695249999990	
KO6	overflow elj	15	41.3140861111000	-123.1695194440000	
KO7	overflow inlet 1	5, 25, 260, 295, 330, 345	41.3137102207999	-123.1697168820000	
KO8	overflow inlet 2	0, 20, 50, 80, 105, 140, 190, 235, 275, 330	41.3137805555999	-123.1698972220000	
KO10	overflow alcove downstream	20, 70, 115, 150, 185, 215	41.3153770000000	-123.1690750000000	site created Aug 2020; similar to K09 but moved upstream slightly
KP1	kelly pond stream right	120, 160, 200, pano 195	41.3159767869999	-123.1682553509990	
KP2	kelly pond outlet	270, 300	41.3157444444000	-123.1684166670000	
KP3	kelly pond stream left	25, 55, 100, 335, pano 90	41.3156258336999	-123.1684648260000	added 100 Aug 2020
KP4	kelly pond from bridge (stand on bridge)	205, 235, 265	41.3158749999999	-123.1680083330000	
KP5	kelly pond inlet from sb rd	310	41.3153830000000	-123.1677560000000	relocated slightly; previous coordinates 41.3155055555999, -123.167747222
KS2	seasonal channel	190, 225, 270, 310, 345, pano 285	41.3148472222000	-123.1684916669990	
KS3	reveg along seasonal channel	45, 95, 145	41.3148805555999	-123.1689777779990	
KW1	willow pond stream right	25, 190, 230, 275, 325, 350, pano 320	41.3138361111000	-123.1688166670000	
KW2	willow pond stream left	0, 20, 50, 85, 130, 165, 190, 320	41.3140527778000	-123.1689694439990	added 190 Jan 2019
KW3	willow pond from sb road	275, 320, 330, pano 10	41.3135900000000	-123.1686300000000	site created Mar 2019; all are leaf-off only photos
WB2	backbar inlet downstream of inlet	230, 255	41.3152416666999	-123.1691722220000	discontinued pano 280 Aug 2020
WB4	backbar channel outlet	170, 195	41.3174601420000	-123.1704770799990	
WB5	backbar inlet across	0, 225, 260, 285, 305, 335	41.3149380000000	-123.1694400000000	site created Aug 2020; similar to WB1 but moved upstream slightly
WB6	backbar inlet upstream	10, 325, 350	41.3145450000000	-123.1696810000000	site created Aug 2020
WB7	backbar inlet stream right	110, 150, 195, 225, 265, 300	41.3152580000000	-123.1698870000000	site created Aug 2020
WB8/KO11	backbar inlet stream left and overflow inlet river left	35, 70, 175, 315	41.3149810000000	-123.1698250000000	site created Aug 2020
WB9	backbar inlet behind ELJ	175, 200, 235, 260	41.3152250000000	-123.1696940000000	site created Aug 2020; similar to WB3 but moved upstream slightly
WM1	midbar inlet upstream of inlet	30, 300, 330,355, pano 40	41.3155753874000	-123.1689359650000	
WM3	midbar inlet downstream of inlet	10, 225, 255, 280, 315, 345	41.3159972221999	-123.1688249999990	
WM4	midbar channel inlet stream right	115, 165, 210, 250, 300, 325, 335	41.3161063368999	-123.1692949640000	added 115 Aug 2020; discontinued 325 Aug 2020
WM5	midbar channel inlet stream left	35, 70, 105, 135, 355	41.3161972222000	-123.1693083330000	discontinued 355 Aug 2020
WM6	midbar channel	150, 190, 235, 285, 320, 340	41.3163443318999	-123.1693593480000	
WM7	midbar channel in channel	175, 330	41.3167944444000	-123.1696666670000	
WM8	midbar alcove stream right panos	pano 10, pano 230	41.3168611111000	-123.1695722219990	added 230 Jan 2019
WM9	midbar alcove and stream left pano	20, 45, 70, 95, 125, 325, 350, pano 70	41.3169253310000	-123.1699370209990	
WM10	midbar outlet from sb rd	175	41.3172861111000	-123.1700472219990	
WO1	west bar 1	205, 230, 250	41.3168324849999	-123.1685177970000	added 230 Jan 2019
WO2	west bar 2	210, 230, 255	41.3169805555999	-123.1690527779990	added 230 Jan 2019; discontinued 260 Aug 2020
WO3	west bar 3	170, 205, 215, 250, 270	41.3170388889000	-123.1690833330000	added 250 and 270 Jan 2019; 270 leaf-off only
WO4	west bar 4	155, 190, 230	41.3172833332999	-123.1694305559990	added 190 Mar 2019

Plant Zone Photomonitoring Points
Coordinates in WGS 1984 World

Point_ID	Direction	Lat	Lon	Notes
DSH1	10, 20, 40, 50, 65, 90, 120, 145, 185, 215	41.315812	-123.169299	added 120 and 145 Aug 2020
DSH2	20, 185, 285, 335	41.314804	-123.169830	
DSU1	0, 35, 45, 60, 165, 205, 235, 260, 270	41.314075	-123.168736	added 270 Aug 2020
DSU2	15, 20, 100, 210, 270, 325	41.316340	-123.169282	added 20 and 100 Aug 2020
DSU3	15, 15(2), 60, 175, 205, 210, 335	41.314560	-123.168943	
DSU4	20, 100, 215, 275, 300	41.314982	-123.168524	
DSU5	0, 60, 90, 90(2), 110, 130, 145, 180, 260, 280, 305, 340	41.315434	-123.168173	added 0, 60, 130, 145, 180, and 260 Aug 2020
RSH1	40, 115, 245, 205	41.314052	-123.169034	added 205 Aug 2020
RSH2	10, 15, 25, 115, 130, 135, 165, 180, 185, 235, 280, 290, 330, 335	41.313714	-123.169096	added 15, 130, 165, 180, 235, 280, and 290 Aug 2020
RSH3	40, 165, 250, 330	41.316840	-123.169647	
RSU1	35, 75, 125, 165, 210, 290	41.315967	-123.168621	added 75 and 165 Aug 2020
RSU2	20, 45, 160, 180	41.315920	-123.169175	added 20 and 180 Aug 2020
RSU3	10, 30, 95, 190, 215, 215(2), 265, 295, 310, 360	41.315207	-123.168937	added 95, 190, 310, and 360 Aug 2020
RSU4	105, 115, 180, 300, 345	41.315775	-123.168591	
RSU5	0, 70, 165, 305	41.316706	-123.169530	added 0, 305 Aug 2020
RSU6	25, 135, 155, 270	41.316574	-123.169454	

Note that plant zone photos are only taken once per year in June.

Attachment 3: Plant Zones



Plant Zone species and survival at Kelly Bar:

The June 2020 survey observations indicated 85.3% surviving in good health.

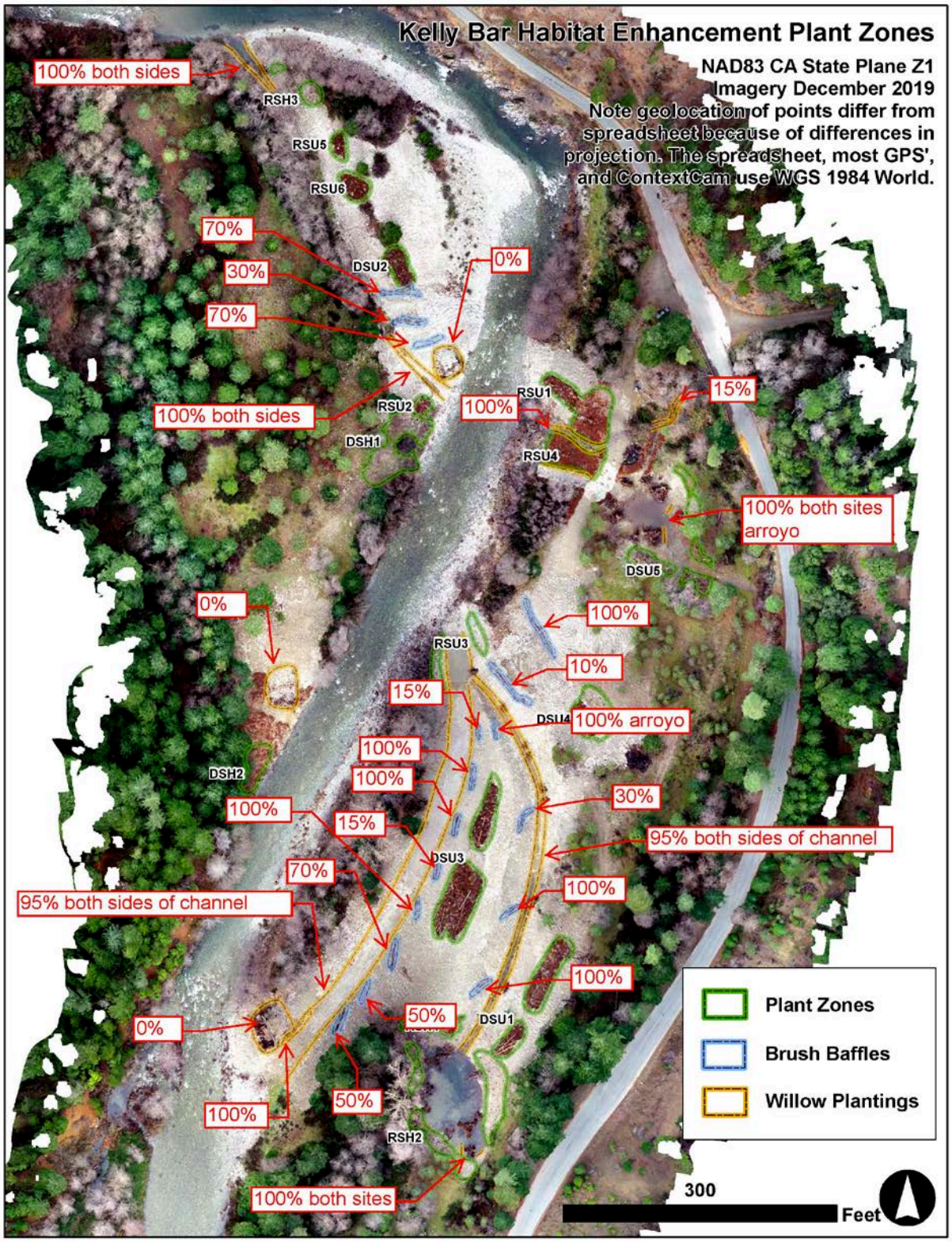
Planting Zone Survival Survey Results																													
M. Van Scoyoc & D. Malone-Persha																													
23-Jun-20																													
		Kelly Bar Sites																											
Species	Total KB	RSH1			RSH2			RSU1			RSU3			RSU4			DSU1			DSU3			DSU4			DSU5		
		Healthy	Poor	Mortality	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	7																			5			2					
Berberis aquifolium var. *repens*	21																6			7			3			5		
Cercis occidentalis	14				2			1						1			4			3			2			1		
Cornus sericea/stolonifera	14	0			3			5						2			2			2								
Corylus cornuta californica	21									1				2			5			4			2			7		
Philadelphus lewisii	19	1		1	10			0		4				0		2										1		
Physocarpus capitatus	13	3			1		1	7									1											
Prunus virginiana var. demissa	19				5	2	1	6						3			1	1										
Ribes roezlii var.cruentum	15																4		1	4	1		0		2	1		2
Ribes sanguineum	23	2			3			3									4			4		1	1			5		
Rhomnus illicifolia	20																5	1		7		1	2			4		
Rosa californica	10										3			0			2			2						3		
Rosa gymnocarpa	11	2			3	1	1	1		2				1														
Rosa woodsii	40							8			3						8			7			6			8		
Ceanothus integerrimus	5																2			3								
Total	**252**	**8**	**0**	**1**	**27**	**3**	**3**	**31**	**0**	**7**	**6**	**0**	**0**	**9**	**0**	**2**	**44**	**2**	**1**	**48**	**1**	**2**	**18**	**0**	**2**	**35**	**0**	**2**
Broadleaf Trees																												
Acer macrophyllum	10	2			2			3						1			1			1								
Alnus rhombifolia	16				4			6			4			2														
Betula occidentalis	15	1			4			5			3										2							
Cornus nuttalii	13	1			1	1		3						1			3			0		1				1	1	
Fraxinus latifolia	19	1			2			1									4			4			4			3		
Populus trichocarpa	13		1					4						2			4			2								
Total	**86**	**5**	**1**	**0**	**13**	**1**	**0**	**22**	**0**	**0**	**7**	**0**	**0**	**6**	**0**	**0**	**12**	**0**	**0**	**7**	**2**	**1**	**4**	**0**	**0**	**4**	**1**	**0**
Conifer Trees																												
Calocedrus decurrens	32		1		0				2		1			2			2	3		6	3		7	2	1	2		
Pinus lambertiana	20					1		1	1		2			2			1			4	3		2	1		2		
Pseudotsuga menziesii var. men	37	1			1	1		1	1		1	1					8			7	5		4	4		1	1	
Total	**89**	**1**	**1**	**0**	**1**	**2**	**0**	**2**	**4**	**0**	**4**	**1**	**0**	**4**	**0**	**0**	**11**	**3**	**0**	**17**	**11**	**0**	**13**	**7**	**1**	**5**	**1**	**0**
		Healthy	Poor	Mortality	Healthy	Poor	Mortality	Healthy	Poor	Mortality	Healthy	Poor	Mortality	Healthy	Poor	Mortality	Healthy	Poor	Mortality	Healthy	Poor	Mortality	Healthy	Poor	Mortality	Healthy	Poor	Mortality
Total All	**427**	**14**	**2**	**1**	**41**	**6**	**3**	**55**	**4**	**7**	**17**	**1**	**0**	**19**	**0**	**2**	**67**	**5**	**1**	**72**	**14**	**3**	**35**	**7**	**3**	**44**	**2**	**2**
Planting Zone Totals		RSH1	Total	17	RSH2	Total	50	RSU1	Total	66	RSU3	Total	18	RSU4	Total	21	DSU1	Total	73	DSU3	Total	89	DSU4	Total	45	DSU5	Total	48
Total Poor Health	41																											
Total Mortalities	22																											

Plant Zone species and survival at West Bar:

The June 2020 survey observations indicated 87.4% surviving in good health.

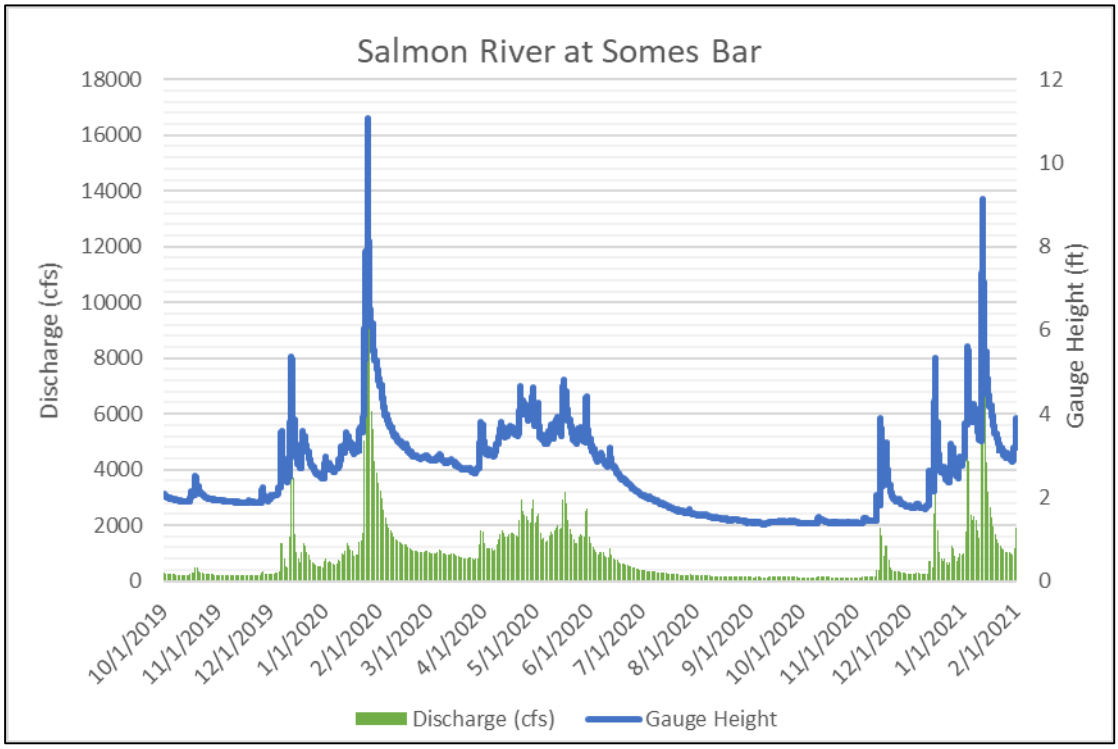
Planting Zone Survival Survey Results																							
M. Van Scoyoc & D. Malone-Persha																							
23-Jun-20																							
		West Bar Sites																					
Species	Total WB	RSH3			RSU2			RSU5			RSU6			DSH1			DSH2			DSU2		
		Healthy	Poor	Mortality	Healthy	Poor	Mortality	Healthy	Poor	Mortality	Healthy	Poor	Mortality	Healthy	Poor	Mortality	Healthy	Poor	Mortality	Healthy	Poor	Mortality
Amelanchier alnifolia	2																			2		
Berberis aquifolium var. *repens*	5							1			1									3		
Cercis occidentalis	7							1			3			1			0			2		
Cornus sericea/stolonifera	8	2			2			2			1							1				
Corylus cornuta californica	9				1			2			1			0			2			2		1
Philadelphus lewisii	11	2			2			2			2			2			1					
Physocarpus capitatus	12	2			0		2							5			3					
Prunus virginiana var. demissa	11	2			2			1						3			2			1		
Ribes roezlii var.cruentum	5																			5		
Ribes sanguineum	4																			3		1
Rhomnus illicifolia	5													1						4		
Rosa californica	10													4		3	0		2	1		
Rosa gymnocarpa	4				2			0			2			0								
Rosa woodsii	8													4			2			2		
Total	**101**	**8**	**0**	**0**	**9**	**0**	**2**	**9**	**0**	**0**	**10**	**0**	**0**	**20**	**0**	**3**	**10**	**1**	**2**	**25**	**0**	**2**
Broadleaf Trees																						
Acer macrophyllum	10	1			1			1			1			2			2			1	1	
Alnus rhombifolia	4	1	1		2																	
Betula occidentalis	5	2			1	1											1					
Cornus nuttalii	7	2			0		1	1						0		1				1	1	
Fraxinus latifolia	1													0						1		
Populus trichocarpa	6	2			2			1						1			0					
Total	**33**	**8**	**1**	**0**	**6**	**1**	**1**	**3**	**0**	**0**	**1**	**0**	**0**	**3**	**0**	**1**	**3**	**0**	**0**	**3**	**2**	**0**
Conifer Trees																						
Calocedrus decurrens	14				1			2			1		1	3			1	1		3		1
Pinus lambertiana	10							2			2		1	3			0			2		
Pseudotsuga menziesii var. menzi	9					1		2			2			0			0			4		
Total	**33**	**0**	**0**	**0**	**1**	**1**	**0**	**6**	**0**	**0**	**5**	**0**	**2**	**6**	**0**	**0**	**1**	**1**	**0**	**9**	**0**	**1**
		Healthy	Poor	Mortality	Healthy	Poor	Mortality	Healthy	Poor	Mortality	Healthy	Poor	Mortality	Healthy	Poor	Mortality	Healthy	Poor	Mortality	Healthy	Poor	Mortality
Total All	**167**	**16**	**1**	**0**	**16**	**2**	**3**	**18**	**0**	**0**	**16**	**0**	**2**	**29**	**0**	**4**	**14**	**2**	**2**	**37**	**2**	**3**
Planting Zone Total		**RSH3**	**Total**	**17**	**RSU2**	**Total**	**21**	**RSU5**	**Total**	**18**	**RSU6**	**Total**	**18**	**DSH1**	**Total**	**33**	**DSH2**	**Total**	**18**	**DSU2**	**Total**	**42**
Total Poor Health	7																					
Total Mortalities	14																					

Attachment 4: Willow Survival



Attachment 5: Salmon River Hydrograph

December 2019- December 2020 at the Somes Bar River Gage at the mouth of the Salmon River.



Attachment 6: Summary of Monitoring Methods

Phase	Resource/ Deliverable	Timing	Methods
Pre-Implementation	Photomonitoring	2018 and 2019 Once during leaf-off (Feb) and once during leaf-on (June).	- Pretreatment areas - Leaf on and leaf off photos - Photo Point Monitoring Handbook, General Technical Report PNW-GTR-526 (Hall 2002) will be used as a guide to conduct photomonitoring
Pre-Implementation	Fisheries	2018 and 2019 June - October	- Monthly snorkel surveys will include Kelly Gulch (including the mouth), Kelly Pond, and the Salmon River along the entire project reach. - Presence absence surveys from Glasgow Gulch to Little North Fork. - Flosi et al., 2010 and Johnson et al. 2007 will be used as a guides to conduct observations.
Pre-Implementation	Vegetation	2018 and 2019 End of June - August	Survey and treat target priority non-native species
Pre-Implementation	Water Quality	2018 and 2019 Annually	- April - September, weekly if possible, collect dissolved oxygen and water temperature measurements throughout the water column in Willow Pond. - Track notable river flows at the site, tracking at what flows the channels engage and disconnect. - Hobo temps in Kelly Gulch, alcove at West Bar, and the river (downstream of Cora's bridge).
Pre-Implementation	Avian Species	2018 and 2019 Spring - Fall	- Spring and early summer spot mapping. - Summer 2018 intensive vegetation surveys. - Spring and early summer point counts along long-term monitoring reach. - Summer 2018 releve assessments at point count locations. - Fall area searches.

Phase	Resource/ Deliverable	Timing	Methods
Implementation	Fisheries	2019 August and September	-Fish relocation by a qualified biologist provided by the Karuk Tribe assisted by SRRC. Aquatic species will be removed from the wetted work areas after fish exclusion screen placement installations. -Fish surveys as soon as possible after implementation.
Post-Implementation	Fisheries	2020 - 2022 Each month, conditions permitting	- Snorkel surveys of entire implemented project area, and will include the North Fork Salmon River from Glasgow Gulch to Little North Fork to establish understanding of spatial and temporal occupancy of salmonids in the vicinity of the project area. Late fall and winter (conditions permitting) surveys will focus on side channel habitat within the area and enhanced project habitat (ponds, alcoves, and side channels). - Flosi et al., 2010 and Johnson et al. 2007 will be used as a guides to conduct observations. - As conditions are appropriate survey for coho in Kelly Gulch. - As conditions are appropriate spawning surveys in the main channel for coho and steelhead. - Visual observation in the ponds for stranding and bullfrogs. - Visual observation in ponds and alcoves for foothill yellow-legged frogs. - Consider using minnow traps and PIT tag reader to improve juvenile fish data in features. - Potentially survey Kelly Gulch up to the lowest culvert for steelhead.

Phase	Resource/ Deliverable	Timing	Methods
Post-Implementation	Water Quality	2020 - 2022 Each month, conditions permitting	- Dissolved oxygen and water temperature throughout the water column in the ponds, the alcoves, and in the Salmon River. During this monitoring period and depending on funding and personnel availability, as well as existing conditions and the results of current observations, the SRRC will attempt to monitor water temperature and dissolved oxygen once per week during summer baseflow. - Track notable river flows at the site with game cameras, tracking at what flows the channels engage and disconnect. - Hobo temps in ponds, alcoves, and Kelly Gulch. - Monitoring well depth monthly. - Set up permanent depth measurement sites and measure depth depending on existing conditions and safety.
Post-Implementation	Photomonitoring	2020 - 2022 - Twice a year: once during leaf-off (Feb) and once during leaf-on (June). - Additional photos will be taken during notable flow events.	- Alcoves, connecting channels, engineered log jams and channel inlets, ponds, and revegetation treatments. - Photo Point Monitoring Handbook, General Technical Report PNW-GTR-526 (Hall 2002) will be used as a guide to conduct photomonitoring -UAV image one per year only if there are site changing flows during leaf-off, low water.
Post-Implementation	Hydraulic Feature Profiles	2020 - 2022 Once per year during the focus period for fish usage.	- Surveys will be referenced to survey benchmarks and conducted with equipment with the minimum accuracy of an engineer's level or total station. - Conditions permitting, a flow measurement in the connecting channels will also be taken during the time of survey. - Once in 2020 complete pebble counts in main channel (and side channels as appropriate) during low flow conditions. Perform additional pebble counts in following years as necessary.
Post-Implementation	Annual Inspection	2020 -2022 Once per year at the beginning of the summer, after high spring flows have subsided	Inspect streambank erosion control measures, log structures, sediment accumulation, and bank stability.

Phase	Resource/ Deliverable	Timing	Methods
Post-Implementation	Vegetation	2020 - 2022 May - September	- Numeric survival by species and overall qualitative health and vigor of revegetation and natural recruitment. - Survey for priority non-native species.
Post-Implementation	Annual Monitoring Memoranda	Due March 31 each year	
Post-Implementation	Annual Inspection	Life of the project. Once per year at the beginning of the summer, after high spring flows have subsided.	Inspect streambank and feature stability and evolution. As necessary, complete pebble counts in main channel (and side channels as appropriate) during low flow conditions.
Post-Implementation	Fisheries	2023 - 2024 Several times per year	- Visual observations of juvenile salmonids and bullfrogs in the ponds. - The schedule for additional monitoring will be re-evaluated as necessary to determine optimum monitoring schedules and techniques for the life of the project.
Post-Implementation	Vegetation	2023 - 2024 May - September	- General evaluation of revegetation and natural recruitment. - Survey for priority non-native species. - The schedule for additional monitoring will be re-evaluated as necessary to determine optimum monitoring schedules and techniques for the life of the project.
Post-Implementation	Water Quality	2023 - 2024 Spring - Fall	- During late summer drought conditions, dissolved oxygen and water temperature throughout the water column in the ponds will be collected as necessary. - Hobo temps in ponds, alcoves, and Kelly Gulch. - The schedule for additional monitoring will be re-evaluated as necessary to determine optimum monitoring schedules and techniques for the life of the project.

Phase	Resource/ Deliverable	Timing	Methods
Post-Implementation	Avian Species	2024 and 2025 Spring - Fall	- Spring and early summer spot mapping. - Summer intensive vegetation surveys. - Spring and early summer point counts along long-term monitoring reach. - Summer releve assessments at point count locations. - Fall area searches. - The schedule for additional monitoring will be re-evaluated as necessary to determine optimum monitoring schedules and techniques for the life of the project.

Attachment 7: Pre-Implementation Avian Monitoring Summaries.

Excerpted from the *Salmon River Bird and Vegetation Monitoring: 2018 Summary Report* (Rockwell and Stephens 2018).

In 2018, Klamath Bird Observatory, in partnership with the Salmon River Restoration Council, completed a first season of pre-restoration spring and fall bird monitoring and associated vegetation surveys along the North Fork Salmon River.

Two standardized 5-min. point count surveys were completed at each of 40 stations located between approximately one and seven miles west of Sawyers Bar (on May 22-25 and June 11-14), to describe the breeding bird community along this section of the North Fork Salmon River. Forty relevé vegetation surveys were conducted by each of two observers at the point count stations (80 surveys total) and at Kelly Bar intensive vegetation surveys at 28 points on Kelly Bar were completed (randomly placed at a density of 4 points per ha).

We completed 9 site level monitoring visits to Kelly Bar between May 7 and July 4. We mapped territories of five focal riparian bird species representing a variety of niches within riparian habitat and collected Vickery reproductive index data from each territory. We aggregated data from all visits, and used location and behavioral observations to establish territory boundaries (Figure 1). Mean Vickery reproductive index was relatively high, ranging from 3.77 for Black-Headed Grosbeak to 4.5 for Yellow-breasted Chats. No Yellow Warbler territories were detected.

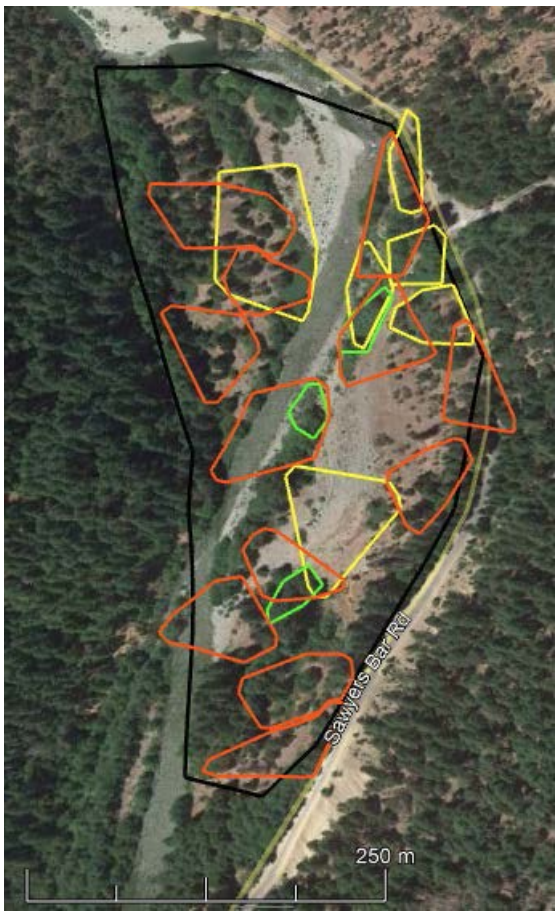


Figure 1. Location of focal riparian bird territories at Kelly Bar. Orange = Black-headed Grosbeak, blue = Song Sparrow, green = Warbling Vireo, yellow = Yellow-breasted Chat.

Additionally, fall area search surveys were conducted on 4 plots at Kelly Bar (three visits for a total of 12 surveys), on September 8, September 28, and October 11.

These data represent the first year of baseline bird and vegetation metrics along an 11 km long-term monitoring reach on the North Fork Salmon River. Six riparian focal species identified in the Partners in Flight conservation plan were detected at the 11 km reach level, 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). While focal riparian species Black-headed Grosbeak and Yellow-breasted Chat were among the most common birds in the area, we detected fewer Song Sparrows and Yellow Warblers than expected, both along the entire point count reach and at the site level. Because half of our planned site-level study species were present in very low densities on the future restoration site, midway through the season we added Warbling Vireo to pilot it as a possible riparian focal species, so territories drawn in

Figure 1 are tentative. We found them to be sufficiently abundant, and in the future we will collect all metrics for Warbling Vireos. Based on this first year of monitoring, we also determined that Lazuli Bunting will make a good additional focal species for site-level monitoring.

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

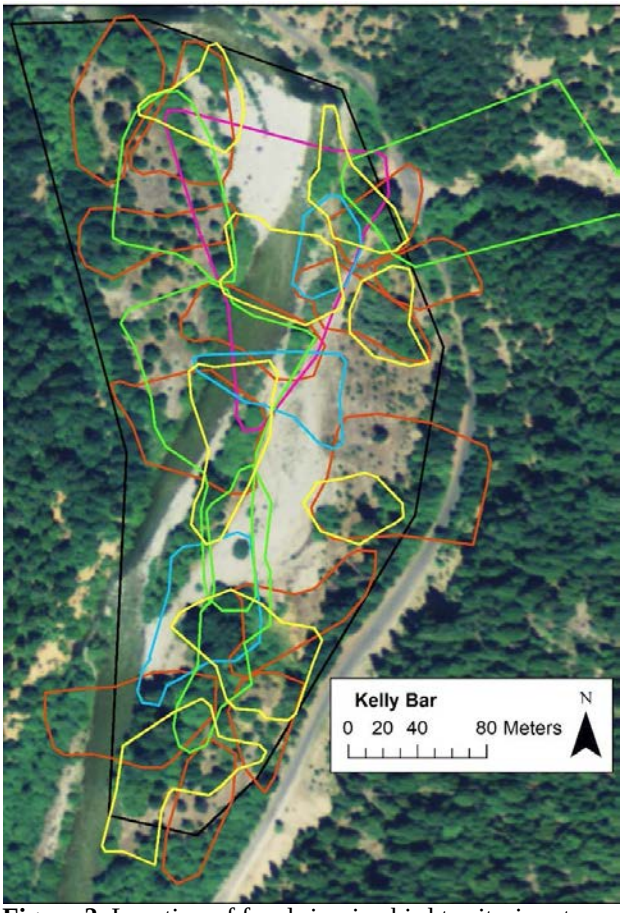


Figure 2. Location of focal riparian bird territories at Kelly Bar. Orange = Black-headed Grosbeak, pink = Lazuli Bunting, blue = Song Sparrow, green = Warbling Vireo, and yellow = Yellow-breasted Chat.

In 2019, Klamath Bird Observatory, in partnership with the Salmon River Restoration Council, completed a second year of pre-restoration spring and fall bird monitoring and associated vegetation surveys along the North Fork Salmon.

Two standardized 5-minute point count surveys were completed at each of 40 stations located between approximately one and seven miles west of Sawyers Bar (on May 24-28 and June 11-14), to describe the breeding bird community along this section of the North Fork Salmon River. Forty relevé vegetation surveys were conducted by each of two observers at the point count stations in 2018, and by one observer in 2019, for a total of 120 surveys. In 2019, we again completed intensive vegetation surveys at 28 points on Kelly Bar.

We completed 10 visits each Kelly Bar between April 30 and June 29. High flow levels prevented us from accessing the west side of Kelly Bar until mid-June; only 3 surveys were completed with an observer physically on that side (in other weeks we mapped any birds we could hear from the east side). We mapped territories of six focal bird species representing a variety of niches within riparian habitat and collected Vickery reproductive index data from each territory. We aggregated data from all visits, and used location and behavioral observations to establish territory boundaries (Figure 2). Mean Vickery index values tended to be higher than in 2018, ranging from 2.00 for Lazuli Bunting to 4.63 for Yellow-breasted Chat. Fall area search surveys were not conducted because the restoration project was under construction.

In this second year of baseline bird and vegetation surveys along the North Fork Salmon River, six riparian focal species identified in the PIF Riparian Bird Conservation Plan were detected along the 11 km reach (Table 1), 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). While focal riparian species Black-headed Grosbeak and Yellow-breasted Chat

were among the most common birds in the area, we detected fewer Song Sparrows and Yellow Warblers 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, Warbling Vireo, Cassin's Vireo, 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.

In 2018, we added Warbling Vireo and Lazuli Bunting as riparian focal species. 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. No Yellow Warbler territories were established at either site, similar to 2018. State-endangered Willow Flycatchers were heard singing at Kelly Bar on May 23 and 29. We believe that both of these species are stopping over briefly on spring migration, and then moving on to other areas to breed. These species are both often associated with robust willow thickets, and this type of habitat structure is generally scarce along the North Fork Salmon.

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.

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.