
North Coast Regional Water Quality Control Board

December 22, 2016

Betsy Stapleton
Scott River Watershed Council
591-C Collier Way
Etna, CA 96027

Dear Ms. Stapleton:

Subject: Notice of Applicability (NOA) for Coverage under the State Water Resources Control Board General 401 Water Quality Certification Order for Small Habitat Restoration Projects SB12006GN

File: Mid-French Creek Side-Channel Beaver Dam Analogue Project
CW-828580; WDID No. 1A161386WNSI

This letter is to certify coverage of the Scott River Watershed Council's Mid-French Creek Side-Channel Beaver Dam Analogue Project (project) under the General 401 Water Quality Certification Order for Small Habitat Restoration Projects (SHRP Order); Order No. SB12006GN. The proposed project includes construction of six beaver dam analogues (BDAs), with allowance for construction of up to a maximum of 14 following specified adaptive-management procedures, within a naturally occurring side-channel adjacent to French Creek; a tributary to the Scott River watershed.

Project Goals:

The proposed project has been developed to accomplish the following objectives: (1) create slow-water habitat for winter and summer rearing of juvenile coho salmon; (2) provide an additional monitoring site for evaluation of juvenile coho salmon passage over, around, and through multiple BDAs; (3) evaluate groundwater recharge around a hyporheic fed side-channel feature of French Creek; (4) evaluate beaver utilization of installed BDAs; and (5) evaluate geomorphic changes resulting from the installation and management of BDAs.

Background:

On September 26, 2016, the North Coast Regional Water Quality Control Board (Regional Water Board) received a Notice of Intent (NOI) from the Scott River Watershed Council (applicant) to comply with the terms of, and obtain project coverage under, the SHRP Order.

On October 17, 2016, the Regional Water Board issued a Notice of Exclusion¹ (NOE) to the applicant due to several inconsistencies and/or missing information necessary to authorize the project under the SHRP Order. Required modifications included, but were not limited to: additional information in the NOI regarding project GPS locations; clarifications on future adaptive-management activities; limits on the types of materials to be used, specifically excluding the use of bentonite; and recalculations of project size. The applicant subsequently revised and provided additional information and modifications to the original NOI following the Regional Water Board's issuance of the NOE.

On November 11, 2016, the project applicant requested postponement of the Regional Water Board's issuance of a NOA to allow for additional time to pre-consult with other state and federal regulatory agencies on the project.

Project Location

The project is located in French Creek, a tributary to the Scott River watershed in Siskiyou County. The Scott River watershed is listed as impaired under the Section 303d of the federal Clean Water Act for excess sediment and elevated temperatures. In 2006, the Regional Water Board adopted the Action Plan for the Scott River Watershed Sediment and Temperature Total Maximum Daily Loads (TMDLs). The Scott River TMDLs were developed with the goal of recovering the beneficial uses of the watershed, including the populations of native anadromous salmonids like Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*Oncorhynchus kisutch*), and steelhead trout (*Oncorhynchus mykiss*).

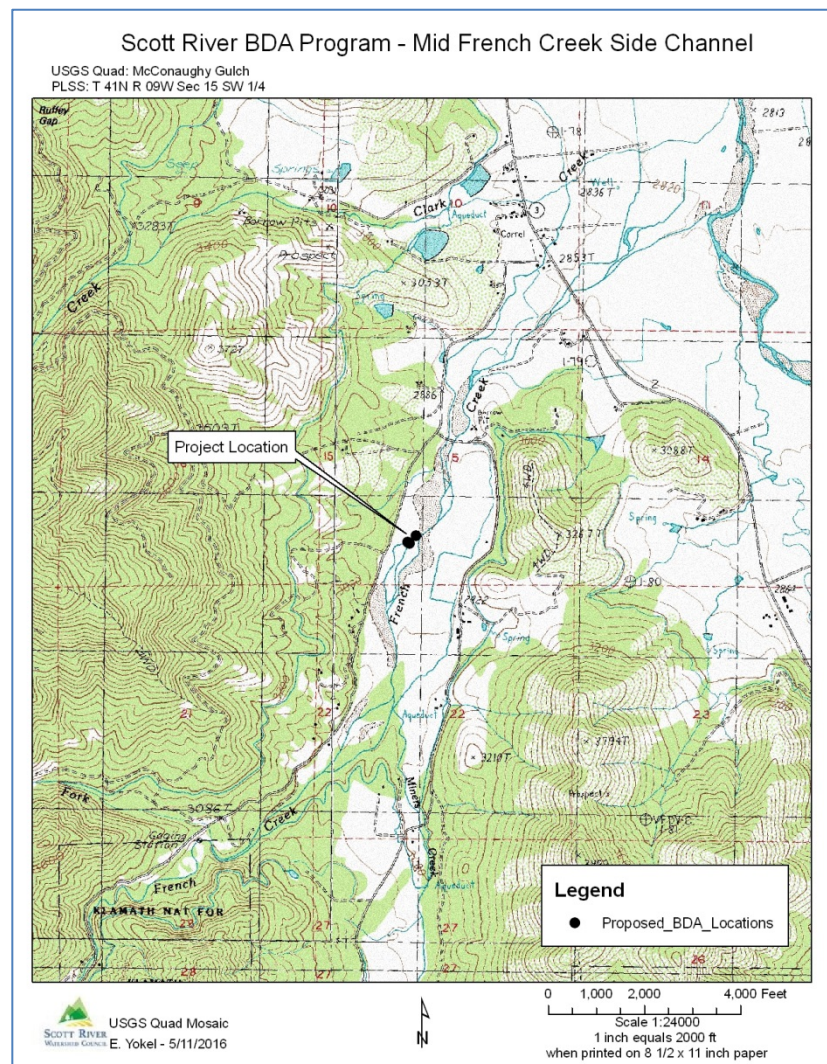


Figure 1 - Project location map

¹ As detailed in the SHRP Order, the State or Regional Water Board must issue either a Notice of Applicability (NOA) or NOE within 30 days of receipt of an NOI, or the applicant may proceed with the proposed project.

Project Inspection

On May 24, 2016, Regional Water Board staff participated in an inspection of the proposed project site. Present during the inspection were Jonathan Warmerdam and Jake Shannon of the Regional Water Board; Donna Cobb of the California Department of Fish and Wildlife; and Michael and Betsy Stapleton, the landowners and project applicants. The purpose of the inspection was to visit the proposed project site, evaluate conditions, and discuss different implementation strategies in advance of eventual permitting application submissions.

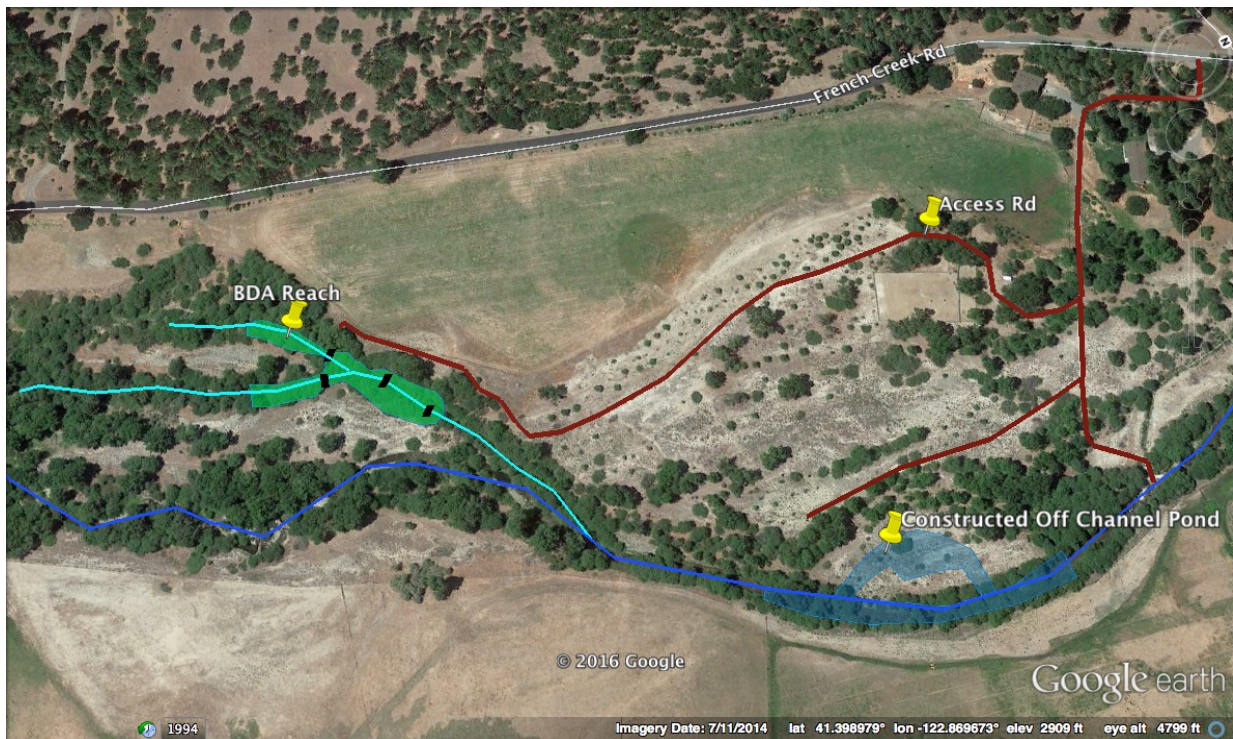


Figure 2 - Project aerial image

Project Description

The project proposes to construct at least six individual BDAs in a 100-meter segment of naturally occurring side channel adjacent to French Creek (see “BDA Reach” in Figure 1 above). Additionally, the applicant has included an adaptive management strategy to allow for future construction of up to eight additional BDAs (for a maximum combined total of 14), as the project area changes over time. The proposed project also includes an adaptive management strategy for maintenance and repair of installed BDAs in response to different hydrologic events, scour, substrate accumulation, channel bed elevation changes, and/or natural beaver manipulation.

The most downstream BDA location (BDA #1) includes three stepped structures in close proximity that were designed by the applicant to avoid or minimize an impediment to fish migration through the side-channel. The project proposes to install three “mini-BDAs” in step series at BDA #1 (a-c) to ensure that no single water surface elevation change is greater than 12 inches. The extent of the impoundment above BDA #1 is designed to

extend upstream for approximately 100-150 feet to the next project site at BDA #2. Water impounded above BDA #2 is designed to extend upstream to BDA #3. As proposed in the NOI, the maximum height of each individual BDA from thalweg to BDA crest will be three feet. As BDAs fill with sediment additional BDAs may be placed upstream or downstream to maintain pool habitat. No BDA crest, either those in the original construction cycle, or those built over the course of the project as adaptive management responses, will exceed the height of the incision trench banks.

BDAs will be installed by driving untreated fir or pine posts into the channel bottom perpendicular to flow across the side-channel, and extending laterally up both banks. Posts will be installed at approximately 1-foot spacing, and shall be driven several feet into the substrate.

Locally harvested willow branches are proposed to be collected from within the riparian zone on the property. Willows are harvested and woven between the posts to form a basket-like structure across the side-channel at each BDA site. Willow will be harvested at a rate of not more than 30% of the vegetative coverage at any site. This may consist of removal of 30% of an individual clump, or entire clumps at not >30% of the number of clumps based on the density, age and vigor of the plants. All willow harvest sites, whether at actual structure site, or at alternative harvest sites, will be identified for review by California Department of Fish and Wildlife (CDFW) staff, or similarly qualified biologist, prior to the start of willow harvest to determine the presence of potential occupation by Willow Flycatcher.

Up to a total of 32 cubic yards of rock/cobble material will be either obtained onsite or locally sourced from a commercial distributor to be incorporated across the project BDAs. Additionally, up to 30 cubic yards of smaller, local sediments may be incorporated into the BDAs to minimize permeability and promote recharge. Construction of the BDAs will include a matrix of both materials, intermixed with straw, to reduce permeability.

The project includes a description of Construction, Adaptive Management Guidelines, and Best Management Practices. As described in the attachment to the NOA, the project will allow for adaptive management of constructed BDAs per the techniques and methods described in the "2015 Beaver Restoration Guidebook" (U.S. Fish and Wildlife Service (Janine Castro), National Oceanic and Atmospheric Administration (Michael Pollock and Chris Jordan), Portland State University (Gregory Lewallen), U.S. Forest Service (Kent Woodruff)) and/or under the direction and supervision of Dr. Michael Pollock, beaver guidebook principal author.

As proposed in the project attachment and described in the Beaver Restoration Manual, adaptive management strategy will generally adhere to the following principals: *"BDAs are intended to mimic beaver dams, they require ongoing maintenance and repair, similar to beaver dams. The amount and type of maintenance needed depends on project objectives. Typical maintenance includes extending the length of the structure as a result of end cutting, replacing sections that have been damaged (often from underscour), and raising the height of a structure, typically by constructing a new BDA on top of the sediment wedge that has accumulated upstream of an existing BDA."*

The proposed project includes a series of environmental impact avoidance and minimization measures with conditions associated with:

1. Wet weather restrictions based on local forecasts.
2. Seasonal work window limitations (June 15 to October 15).
3. Worksite notification and compliance.
4. Visual downstream turbidity monitoring to limit impacts on water quality.
5. Monitoring to avoid disturbance of adult salmonids and redds.
6. Minimization of stream zone impacts and disturbance to riparian vegetation.
7. Willow Flycatcher protections.
8. General habitat protection measures.
9. Petroleum, chemical, and other pollutants storage, use, and measures to prevent accidental spills.
10. Erosion and sediment controls.

The NOI includes a description of the existing Scott River BDA Monitoring Program which applies to other BDA projects in the watershed. The applicant is proposing to incorporate the BDAs under the proposed project into this larger Monitoring Program if additional funding is obtained. The Scott River BDA Monitoring Program includes several monitoring parameters related to: adult and juvenile fish passage across BDAs, stream temperatures above and below BDAs, dissolved oxygen, beaver naturalization of structures, pre- and post- aerial surveys of vegetative cover, and hydrogeomorphic changes in habitat.

Project Size

The total of ground disturbance associated with the project is estimated to be 1.0 acre and 115 linear feet. The applicant has provided the calculations used to determine the total size of the project. The proposed project size does not exceed what is allowed for coverage under the General 401 Water Quality Certification Order for Small Habitat Restoration Projects and associated Categorical Exemption (15333) from the California Environmental Quality Act.

Project Associated Discharge

The discharge of materials into waters of the state resulting from the project includes those associated with the posts, willow, cobble and rock, local sediment, and straw.

Project Time Frame

Proposed project start date: May 15, 2017

Expected date of completion: November 4, 2021

Seasonal work window: May 15 to October 15

Monitoring Plan

The applicant proposes to collect information regarding project outcomes and measurable performance standards to achieve several specific goals. The project is seeking to create approximately 0.5 acres of slow water habitat, monitor the utilization of the newly created habitat by anadromous salmonids, and identify the effects of BDA installation on groundwater and surface water habitats.

The Monitoring Plan is somewhat adaptive in nature, and depends in part on the acquisition of additional public funding assistance in order to be incorporated into the larger, Scott River BDA Monitoring Program. Absent the additional funding acquisition (and the larger proposed deliverables from the Scott River BDA Monitoring Program), the project must still conduct monitoring and reporting to achieve reasonable performance measures.

At a minimum, the project shall include the following monitoring and reporting elements:

1. Pre- and post- photo documentation of all BDA sites, taken from comparable vantage point, and labeled with dates and location.
2. Quantification of aerial slow-water habitat created following BDA construction.
3. Volume and type of materials used at each BDA site.
4. As-built construction details for each BDA.
5. Fish utilization information.
6. Description of any adaptive management activities conducted during previous year.
7. Surface and groundwater monitoring data, as available.
8. Beaver utilization monitoring.
9. Pre- and post- implementation geomorphic change analyses (longitudinal profiles and cross-sectional profiles each BDA).

Seasonal Work Plan

SRWC will submit a work plan for construction of ancillary structures or major repair activities to NCRWCQB and CDFW at least 30 days prior to the proposed work window. The work plan will provide details on specific construction activities for each project site, including equipment type, materials, access and BMPs. NCRWCQB and CDFW will work with SRWC to provide a notice to proceed (NTP) within 30 business days of receiving the work plan. Construction will not commence until the NTP is received and the BMPs are in place.

Notice of Applicability & Project Determination

Regional Water Board staff has determined that the proposed activities as described in the NOI are categorically exempt from CEQA review and may proceed under the General 401 Water Quality Certification Order for Small Habitat Restoration Projects.

Receiving Water:	French Creek Scott River Hydrologic Area 105.40
Filled / Excavated Area:	0.48 acres (BDAs)
Total Impacts:	Acreage Temporarily Impacted: 1.00 Length Temporarily Impacted: 115 linear feet
Dredge Volume:	None
Discharge Volume:	100 wooden posts 45 cubic yards of willow material <30 cubic yards of locally sourced sediment

<32 cubic yards of washed cobble/gravel
<18 bales of straw

Latitude/Longitude: 41°23'53.29" / 122°52'11.43"

SHRP Order Special Conditions:

Section D of the SHRP Order includes special conditions that apply to all authorized projects. In particular, the following special conditions D(1) and D(4) are emphasized relative to the project and must be achieved for authorization to proceed under the SHRP Order:

1. Other Permits – This Order does not relieve the project applicant from the responsibility to obtain other necessary local, state, and federal permits, nor does this Order prevent the imposition of additional standards, requirements, or conditions by any other agency.
4. Endangered, Threatened, Candidate, Rare, Sensitive, or Special Status Species – The project will not result in a taking, either directly or through habitat modification, of any plants or animals identified as endangered, threatened, candidate, rare, sensitive or special status species in local or regional plans, policies, or regulations or by CDFW, the U.S. Fish and Wildlife Service, or the National Marine Fisheries Service, unless the take is authorized by those agencies.

Reporting

As required in Section B, Item 4, of the *General 401 Water Quality Certification Order for Small Habitat Restoration Projects*, Monitoring Reports shall be submitted at least annually documenting the achievement of performance standards and project goals. In addition, a Notice of Completion (NOC) shall be submitted by the applicant no later than 30 days after the project has been completed. A complete NOC includes at a minimum: photographs with a descriptive title, the date each photograph was taken, the name of the photographic site, the WDID number indicated above, and success criteria for the project. The NOC shall demonstrate that the project has been carried out in accordance with the project description as provided in the applicant's NOI. Please include the project name and WDID number with all future inquiries and document submittals. Document submittals shall be made electronically to: NorthCoast@waterboards.ca.gov

The State Water Resources Control Board General 401 Water Quality Certification Order for Small Habitat Restoration Projects SB09016GN can be found here:

http://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/generalorders/shrpcert032713.pdf

Please call Jonathan Warmerdam at (707) 576-2468 or Jake Shannon at (707) 576-2673 if you have any questions.

Sincerely,

Matthias St. John
Executive Officer

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Enclosure: NOI for Mid-French Creek Side-Channel BDA

cc: Michael Harris, California Department of Fish and Wildlife
Michael.Harris@wildlife.ca.gov
Curt Babcock, California Department of Fish and Wildlife
Curt.Babcock@wildlife.ca.gov
Clifford Harvey, State Water Resources Control Board
Clifford.Harvey@waterboards.ca.gov
Jennifer Siu, U.S. Environmental Protection Agency
Siu.Jennifer@epa.gov

Mid French Side Channel BDA Project

Notice of Intent (NOI) for Water Board General 401 Water Quality Certification

Applicant: Scott River Watershed Council

Contact: Betsy Stapleton, Board Chair

Contact Email: 5104stapleton@gmail.com

Project Address: 5104 French Cr. Rd, County of Siskiyou, Etna Ca. 96027

Landowners: Michael and Betsy Stapleton

APN: 023-171-060

Date: 12/15/2016

This project, installation of Beaver Dam Analogues (BDAs) in a naturally occurring side-channel of French Creek, Siskiyou County California, is undertaken to improve habitat and further the overall evaluation and monitoring goals of the Scott River BDA project as outlined in California Department of Fish and Wildlife LSAA Agreement # 1600-2014-0094-R1 as revised per National fish and Wildlife Foundation (project funder), California Department of Fish and Wildlife, National Oceanic, Atmospheric Administration and Scott River Watershed Council (SRWC) and North Coast Regional Water Quality Control Board WDID # 1A14055WBSI. The goals of implementing BDAs at this site are to further the scientific study of juvenile salmonids, specifically the ability and mechanisms of coho salmon to travel over, around and through constructed BDAs in order to utilize slow water habitat, which has been identified as a limiting factor for juvenile coho production in the Scott; and to provide vital off-channel rearing habitat for juvenile salmonids. The Mid-French Side-Channel site has been identified as a low risk location to implement additional BDAs in the Scott River Basin after discussion with project Principle Investigator, Dr. Michael Pollock, California Fish and Wildlife staff, and North Coast Regional Water Board staff. The specific goals for BDAs at this location are:

1. Create slow water habitat for winter and summer rearing of juvenile coho salmon
2. Provide an additional monitoring site for evaluation of juvenile coho salmon passage over, around and through multiple BDAs
3. Evaluate groundwater recharge around a hyporheic fed side-channel feature of French Creek.
4. Evaluate Beaver utilization of installed BDAs.
5. Evaluate geomorphic changes resulting from the installation and adaptive management of BDAs.

Need for Project:

The California Department of Fish and Wildlife (CDFW) Recovery Strategy for California Coho Salmon (2004) Coho Recovery Tasks states: "Current information shows a positive relationship between coho salmon presence and beaver ponds. The (Scott River) valley was historically heavily populated with beaver until mid-1800s. Today small populations exist. The rather stable ponds created by these animals, especially on valley tributaries, likely created year round fish rearing habitat, including the period of low stream flow. Changes in stream channel form and function may have limited riparian restoration potential. Changes in hydrologic conditions, such as changes in groundwater and water use may also limit riparian restoration potential. The loss of off-channel habitat results in a loss of productive rearing and over-wintering areas, often favored by species such as the coho salmon."ⁱ

The CDFW Southern Oregon Northern California Coast Coho Salmon (SONCC) Recovery plan task number: Scott HM-1-1e suggests, "Evaluate the use of beaver ponds and other efforts that contain similar benefits to increase habitat complexity. Short-term: Review literature (studies done in Washington and Oregon). Hold workshops and publish newsletters as appropriate. Investigate projects in prioritized areas to support beaver activity if

appropriate. Coordinate with related projects to improve stream complexity and habitat. If projects are planned, ensure that riparian growth is adequate or provide materials for beaver needs, so that appropriate riparian cover is maintained. Long-term: Include implementation monitoring. If beaver reintroduction fails or is found to be inappropriate, consider analogous habitat attribute efforts.”ⁱⁱ

The NOAA Final SONCC Recovery Plan, NOAA Fisheries states: “The Scott River Watershed Lack of Floodplain and Channel Structure. The ongoing alteration of floodplain and channel structure from mining and other anthropogenic activities has reduced complex channel margin and pool habitat availability, disconnected the floodplain from the adjacent channel, and simplified instream habitat throughout the Scott River basin, creating a high stress for all life stages except for the egg stage (medium) and the juvenile stage (very high).” It goes on to say (p. 36-25) “Since the construction of the first levees in the 1930s, much of the remaining mainstem Scott River has also been channelized in a continuing effort to control flood impacts and maximize acreage of agricultural lands adjacent to the river. This has destroyed low velocity margin and side channel habitat, making winter rearing habitat a significant limiting factor to juvenile coho salmon survival.”ⁱⁱⁱ

Recovery Action SONCC-ScoR.2.2.75: Reconnect the channel to the Construct off channel habitats, alcoves, backwater habitat, Population wide 2d Channel Structure floodplain and old stream oxbows.

Recovery Action SONCC-ScoR.2.2.75.1: Identify potential sites to create refugia habitats. Prioritize sites and determine best means to create rearing habitat.

Recovery Action SONCC-ScoR.2.2.75.2: Implement restoration projects that improve off channel habitats to create refugia habitat, as guided by assessment results

This project addresses limiting factors identified in both the NOAA and CDFW Recovery Plans and implements the tasks identified above.

Use of Beaver Dam Analogues:

The creation of off-channel or side channel habitats is not included in the CDFW Restoration Manual, however their use is becoming standard practice in California with the appropriate guidelines and minimization measures. Similarly, the use of BDAs for restoration is new to California, but is well established elsewhere. In addition to being mentioned in the CDFW Recovery Strategy for California Coho Salmon (2004) as noted above. The theory and practice of using BDAs is explicated in the 2015 Beaver Restoration Guidebook (Chapter 6: Beaver Dam Analogues) from the U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, Portland State University and U.S. Forest Service (Castro et al. 2015).^{iv}

The 2016 restoration Biological Opinion recently signed by the National Marine Fisheries Service for the North-Central California Coast region (Santa Rosa office jurisdiction), section 1.3.2.2 (p. 6) states: "Creation of Off-channel/Side-channel Habitat Features: Floodplain habitats such as wetlands, sloughs, and off-channel features are important habitat areas for salmonids, particularly during winter months, providing velocity refugia during high winter flow events and improving growth and survival of rearing juveniles (Tschaplinski 1988, Aitkin 1998, Martens and Connolly 2014). Although projects to increase off-channel and side-channel habitats are relatively new to California, many such projects have been built in western Washington and Canada. Estuarine restoration projects may include off-channel and side-channel habitat components that can provide rearing habitat for salmonids."^v

The Biological Opinion specifically mentions BDAs (p.7) "Projects that enhance or create off-channel/side-channel areas will provide important rearing areas and velocity refugia for salmonids. These restoration projects may include:

removal or breaching of levees and dikes, channel and pond excavation, constructing wood or rock tailwater control structures, beaver dam analogues and construction of large woody material and rock boulder habitat features. Implementation of these types of projects may require the use of heavy equipment and construction of temporary access roads."

Over the past three years, the Scott River Watershed Council (SRWC) has implemented eight BDAs in the Scott basin, with six remaining functional at this time. SRWC has been working under the direct supervision of the project Scientific Lead, Dr. Michael Pollock of NOAA Northwest Fisheries Science Center. In addition to developing a considerable body of knowledge regarding the building and management of BDAs, SRWC has developed strong collaborative relationships with multiple regulatory, scientific and technical advisors. These project collaborators will ensure that, in addition to the management and minimization measures contained in this document, the BDAs identified for construction in this NOI will not cause significant harm to environmental resources.

Site selection and design:

Survey data of the side-channel feature, as well as the main French Creek were obtained for design considerations. BDA placement was based on property boundary, inundation levels, habitat volumes, and fish passage considerations.

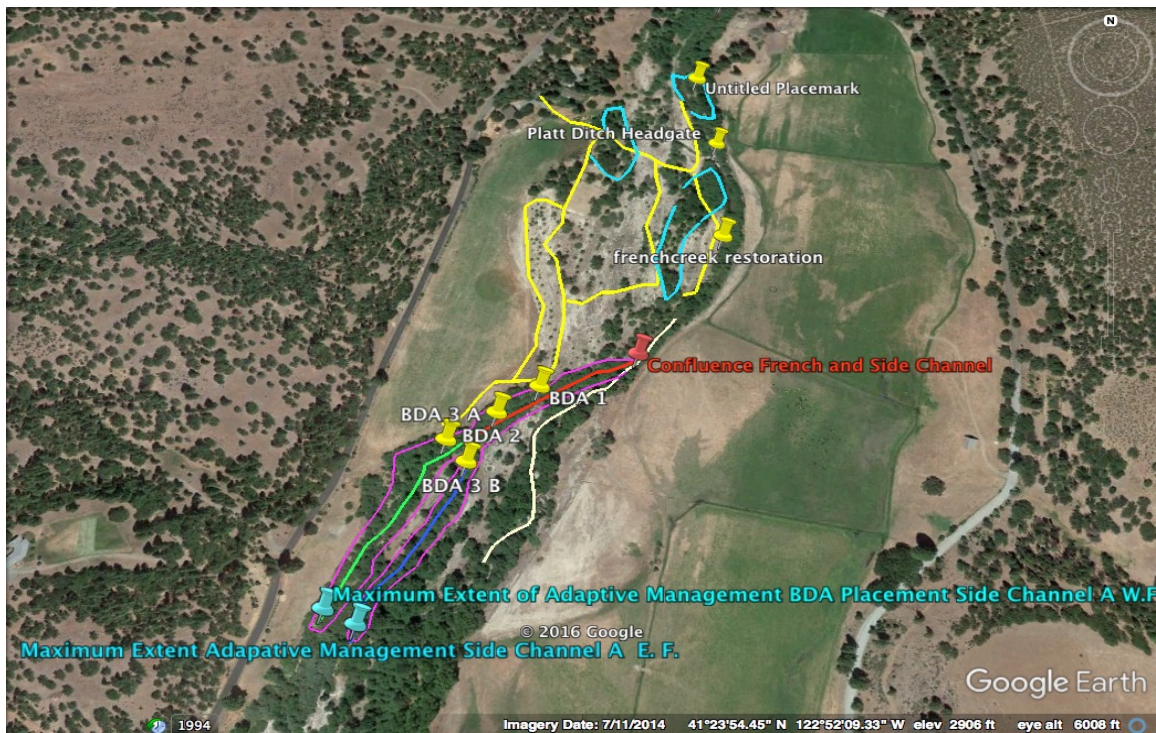
Risk Considerations:

The BDAs will be placed in a side-channel, so BDA placement has low risk of impacting salmon migration, as the main channel will remain unaltered. Further, there is no historic record of spawning in the side-channel, previous monitoring has shown water quality suitable for juvenile salmon rearing, the water is supplied by subsurface flow so downstream effects are unlikely, the property is owned by a willing landowner and there are no nearby

infrastructure concerns. Surface water enters the channel only under high flows. After high flow events, if fish passage conditions are not evident, SRWC will do snorkel surveys to evaluate for fish presence and provide fish passage as developed in consultation with CDFW.

All provisions of the attached SRWC Construction and Adaptive Management Guidelines will apply to the project.

General Site Description:



White Line: Mainstem French Creek

Redline: Mid French Side Channel A

Green Line: Mid French Side Channel A West Fork

Blue Line: Mid French Side Channel A East Fork

Fushia Line: Project Boundaries

Yellow Pins denote BDA locations. Each is labeled.

Teal Pins denote maximum upstream extent of adaptive management activities in Side Channel A West Fork (Lat: 41°23'45.46"N and Long: 122°52'19.83"W)

Side Channel A East Fork (Lat: 41°23'44.97"N and Long: 122°52'18.49"W)

Red Pin denotes the confluence of Side Channel A and the Mainstem French Creek, which is the downstream extent of the project.

The project boundaries lie ~100 ft. laterally to the channel margin of Side Channel A.

General Site Characteristics:

The selected site is located in a naturally occurring side-channel feature on French Creek, a prime west-side, cold water tributary of the Scott River. This side-channel feature has no known coho spawning, but juvenile coho have been observed rearing under both summer and winter conditions for many years. The channel is fed by hyporheic flow and has had documented water quality suitable for juvenile coho salmon through base flow periods. The location of the side channel off of the main French Creek channel makes this an ideal location to evaluate for juvenile coho passage at BDAs. Juveniles found to be rearing behind the BDA would be there because of volitional passage through the BDA to seek the conditions created. The side-channel feature is separated from the main French Creek channel by a berm that has been breached during the 2015-16 winter events. This berm is breaching downstream of the proposed BDA locations and the flow through the breach provides sufficient water to ensure that the side-channel feature will remain connected to the main French Creek through base flow periods with sufficient depth that juvenile fish leaving that BDA should be able to return to the main French Creek as they wish.

900 feet downstream of the proposed BDA sites, there is a separately proposed additional restoration project consisting of in-stream wood placement within the main channel and a constructed off-channel pond

habitat feature. Retained and enhanced groundwater from the BDAs may have a positive influence in the water surface elevations at these nearby downstream features during baseflow conditions. A landowner-maintained groundwater monitoring well in the vicinity of the downstream restoration feature will provide baseline data to evaluate the BDA influence at this site (see Mid French Groundwater Monitoring by Stapleton).

The side channel feature has heavy vegetation with willow, cottonwood and alder. There is evidence of recent past beaver activity, providing the hope that beaver would colonize the site.

The main channel of French Creek through this reach transitions from a well connected floodplain-channel in the upper end of the reach, to a more incised channel in the mid and lower end of the reach. Just above the side-channel connection, French Creek is anastomosing and connected to the floodplain. The upper portion of the reach experiences inundation in most water years, and is heavily vegetated. Just downstream of the side-channel main channel confluence, the river right bank along French Creek was ripped after the 1964 flood, and as a result the channel is incised, there is only a narrow band of riparian vegetation and the floodplain is seldom inundated.

Side Channel Characteristics:

The side channel is likely a historic channel. The side channel has remained wetted with high quality water (See "Stapleton Pool") documented in 2012. It remained wetted through the 2014 and 2015 extreme drought years with observed rearing juvenile salmonids. The side channel already has emergent vegetation with cattails and other aquatic vegetation, and is heavily shaded. Under current conditions it meets the cover and velocity criteria for coho rearing. Placing BDAs will increase depths from a current maximum pool depth of 5-8" to up to 3 feet and expand the volume of habitat significantly.

The incised morphology and lack of habitat complexity of the downstream reach of French Creek, and documented use of the existing slow water refugia in the side channel, make it a desirable location to create additional critical juvenile salmonid summer and winter rearing habitat.

Reach length:

Side-channel reach approx. 300 ft.

Reach location:

Side channel confluence is 2.2 miles from French Creek-Scott River confluence.

Bankfull width:

Average typical flow width within side channel is 2.5-12ft. Channel varies from 5-10ft cross section and is approximately 3-4 ft below the floodplain.

The channel has never been observed to be filled.

Substrate:

Primarily sand and small gravel (1-2 inch).

Infrastructure and Built Environment Risk Considerations: None

Fish and Wildlife Habitat Risk Considerations: Minimal (due to the project design and monitoring, and implementation of extensive protection measures)

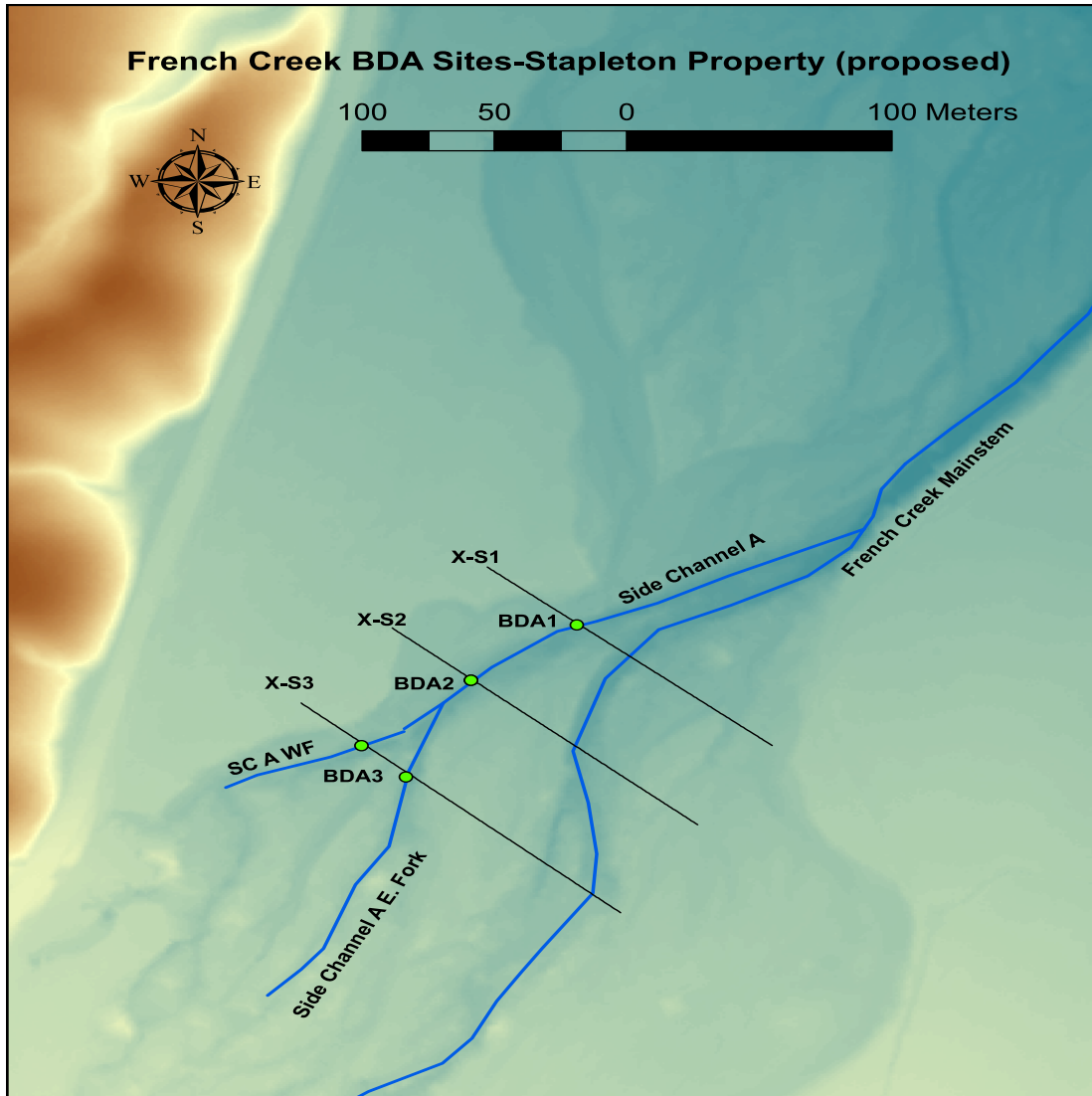
Water Quality Risk Considerations: Minimal (due to the project design and monitoring, and implementation of extensive protection measures)



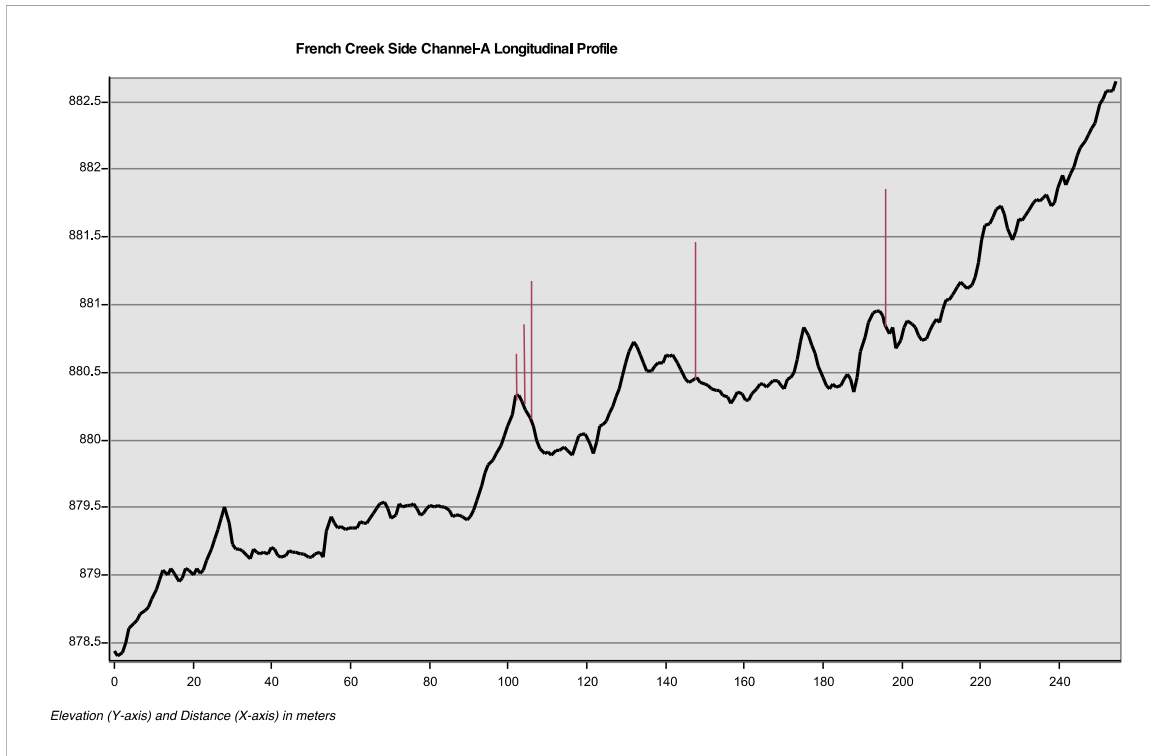
Photo 1 (above): Photo of confluence of side channel and main channel French Creek, looking upstream. Side channel enters in mid/right side of image, and mainstem French is on left side. This confluence remained wetted throughout the 4 past years of baseflow periods and is expected to provide volitional access for juvenile coho into BDA enhanced side-channel habitat upstream.



Photo 2: Photo of confluence of side channel and main channel French Creek, looking upstream from river left side of main channel. Flow from side channel is entering image on the right and flowing to the left.



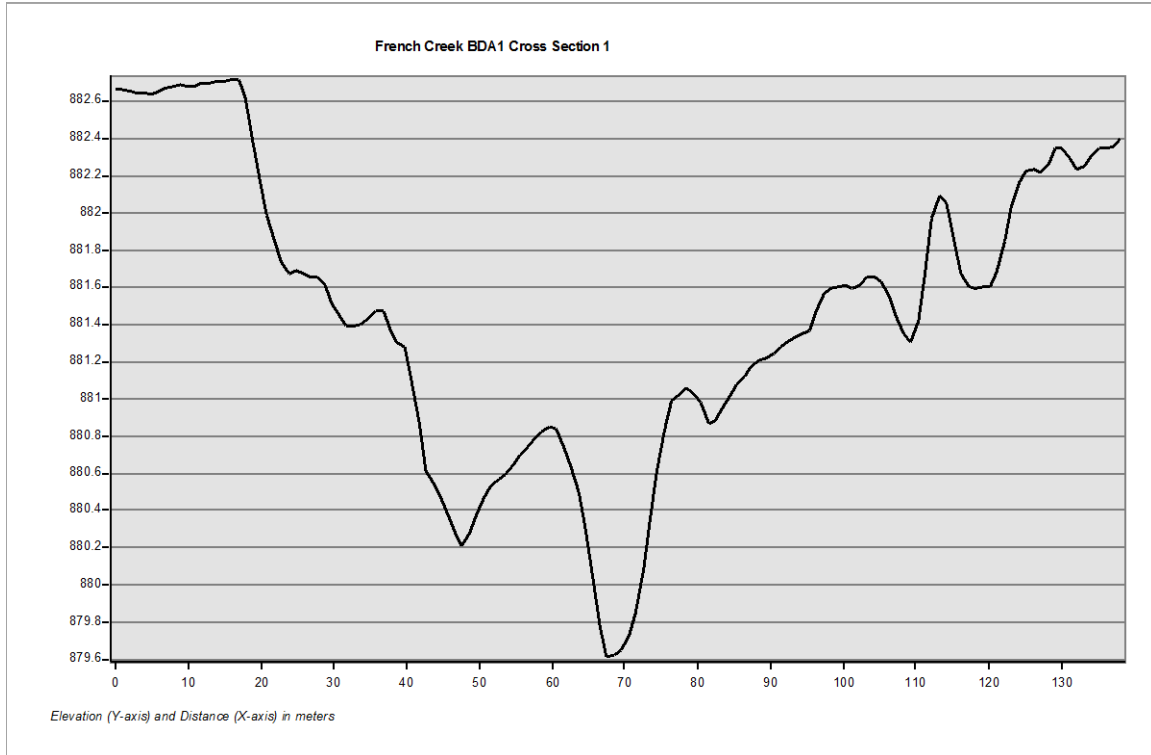
Lidar Imagery of Mid French Side Channel BDA sites



Longitudinal Profile Mid French Side Channel "A": Vertical Red Lines denote BDAs. BDA 1 (most downstream @ 100 meters on X axis) is a series of three BDAs with a 1 ft drop from crest to crest. The height of the crest BDA 2 (@ 150 meters on X axis) is 1 ft higher than BDA 1 and BDA 3 crest (@190 meters on the X axis) is 1ft. higher than the crest of BDA 2. The confluence of the side channel with the mainstem French is @ 0 meters on the X axis.

The cross sectional profiles in the individual BDA descriptions are looking downstream with river left on the left hand side on the cross section. In each transect, French Creek is the right hand side of the cross section.

French Creek Side Channel BDA 1:



This cross section represents the entire transect bar for BDA 1 on the Lidar image page 8. The side channel is represented by the channel between 40 and 60 meters on the horizontal axis. French Creek is between 60 and 75 meters on the X axis.

GPS Lat: 41°23'53.29"N Long: 122°52'11.43"W or 50' upstream or downstream to field fit for on-site conditions.

Distance from side channel confluence with main French Creek: ~100 ft.

Structure dimensions: 20-30 ft. wide (perpendicular to streamflow) and 5-ft linear feet along stream. Structure posts will be placed across stream channel and into existing stream bank. Current channel is approximately 15 ft. wide, however the greater length will be installed at first construction to diminish

the need for repeat entry for post pounding for adaptive management. Maximum anticipated future lateral expansion is an additional 15 feet at each margin. Only the existing channel will have willow weaving and berming at this time.

Extent of Impoundment: 100-150 ft

Site Design Considerations:

This is the most downstream BDA in the side channel. As such it is to be a "step series" of "mini-BDAs" to ensure that no single WSE change is >12 ". This is denoted by the series of three vertical lines on the longitudinal profile. BDA 1 (a), BDA 1 (b) and BDA 1 (c) will each be approx. 5 ft of linear streambank impact and spaced 5 feet apart. The breach in the berm between main French Creek and Side Channel is just downstream of the BDA site. This BDA site lies in the Stapleton property.

Construction:

Time Estimate for constructing:

2-6 days total consisting of:

- 1-2 days Post pounding
- 1.5 day harvesting and weaving willow
- 2 days berming and sealing (stuffing, stacking, layering cobble, straw, gravel, and woody matrix).

Material and techniques: See attached construction and adaptive management guidelines.

Posts: 25-30 locally harvested, untreated fir/pine posts. Post-line will be extended into the banks to have in place for anticipated future scour and channel widening events.

Willow: Likely sufficient material on site 10-15 cubic yards.

Cobble/rock: No cobble immediately at site. 1.5 <10 cubic yards imported material per adaptive management parameters, 3-6" river run rock.

Weed free straw or pasture grasses: 1-3 bales

Mud: Reduction of permeability of BDA with imported fine grained silt/clay material. See attached construction and adaptive management guidelines.

Fine grained material to be layered on length of BDA and /or placed into specific orifice flow points to reduce structure porosity. <10 cubic yards of imported fines.

Equipment: See attached construction and adaptive management guidelines.

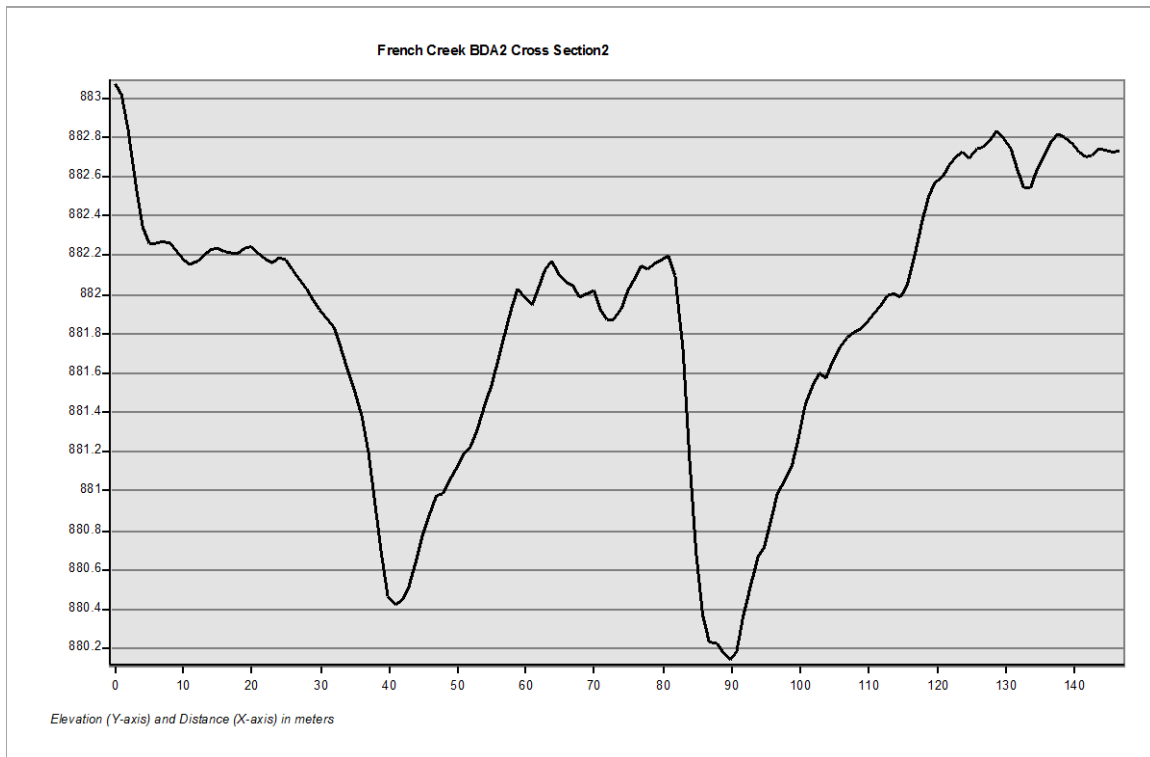
Access:

Established ranch access roads along side channel margin will be used, along with established or created footpaths. Temporary vehicular access will be established by cutting brush from ranch road to BDA site. A single access route will serve for the construction of the three sub-BDAs in the BDA 1 series. Seven to ten <3" alder trees and some blackberry vines will need to be removed. Additional tree/shrub removal necessitated by on-site implementation variables will not exceed this number by more than 100%, and largest diameter tree removal shall not exceed 10".



Photo 3: Picture Mid-French Side Channel BDA 1. Looking downstream, showing streamflow towards side channel and main channel confluence.

French Creek Side Channel BDA 2:



Cross Section of BDA 2. The cross section represents the entire transect line on the longitudinal profile. The Side Channel is the section of the cross section between 30-55 meters on the horizontal axis. French Creek is between 80 and 118 meters on the X axis.

Lat: 41°23'52.29"N Long: 122°52'13.26"W or 50' upstream or downstream to field fit for on-site conditions.

Distance from side channel confluence with main French Creek: ~200 ft
Structure dimensions; 20-30ft wide (perpendicular to streamflow) and 5 feet linear stream impact. The greater length will be installed at first construction to diminish the need for repeat entry for post pounding. Only the existing channel will have willow weaving and berming this time.

Extent of Impoundment Upstream: ~ 75 ft

Site Design Considerations:

This site is just above a former pool feature that accumulated much sand during the 2015-2016 high flow events. A BDA at this location will inundate a large inset channel and will extend the area inundation another 75' upstream

Construction:

Time Estimate for constructing BDA 2:

- 1 -6 days total consisting of:
 - 1.5 days prepping and pounding posts,
 - 1.5 day harvesting and weaving willow
 - 2 days berming and sealing (stuffing, stacking, layering cobble, straw, gravel, and woody matrix).

Material estimates:

Posts: 20-25. locally harvested, untreated posts needed for BDA. Post-line will be extended into the banks to have in place for anticipated future scour and channel widening events. Maximum anticipated future lateral expansion is an additional 15 feet at each margin.

Willow: Likely sufficient material on site 10-15 cubic yards

Cobble/rock: No cobble immediately at site. <12 cubic yards imported material per adaptive management parameters total for both BDA 3 (a) and (b).

Weed free straw or pasture grasses: 1-3 bales

Mud: Reduction of permeability of BDA with imported fine grained silt/clay material. See attached construction and adaptive management guidelines.

Fine grained material to be layered on length of BDA and /or placed into specific orifice flow points to reduce structure porosity. <10 cubic yards of imported fines both for BDA 2.

Equipment:

See attached construction and adaptive management guidelines.

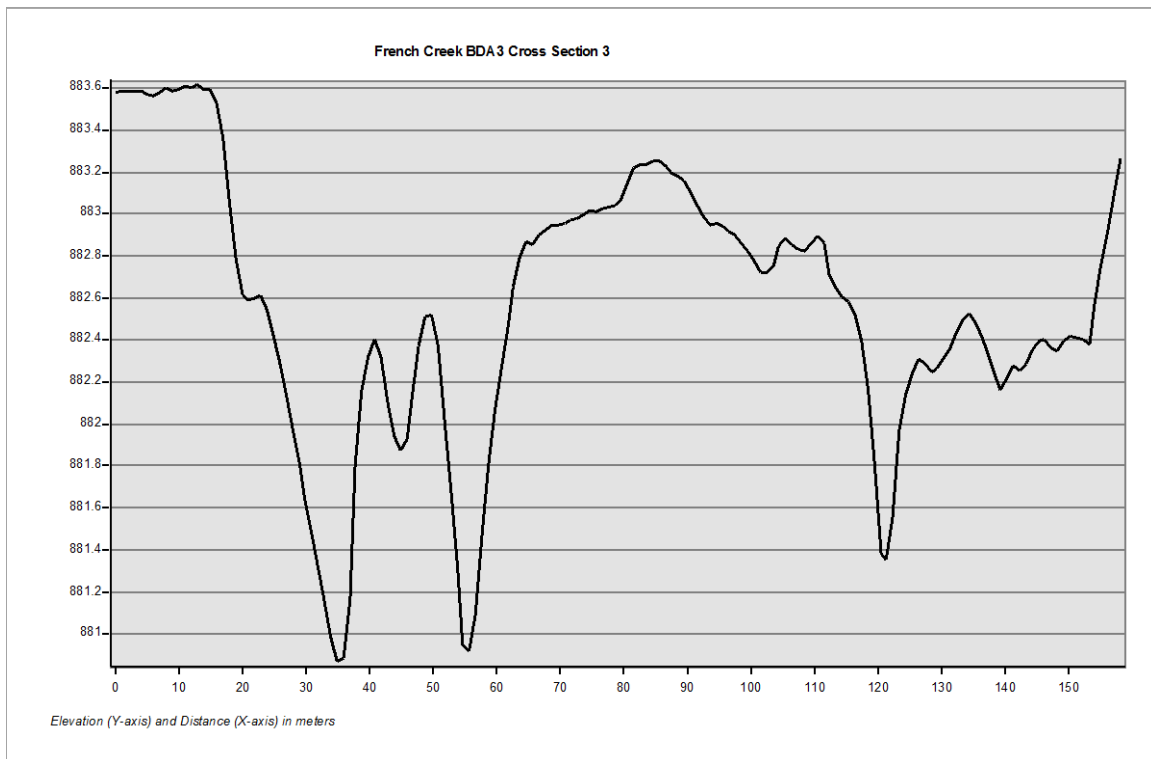
Access:

Established ranch access roads along side channel margin will be used, along with established or created footpaths. Temporary vehicular will be established by cutting brush from Ranch Road to BDA site. One 4" alder tree, three to five <2" alder tree, and one 5' willow bunch. Additional tree/shrub removal necessitated by on-site implementation variables will not exceed this number by more than 100%, and largest diameter tree removal shall not exceed 10".



Photo 4: French Creek Side Channel BDA #2: looking upstream

French Creek Side Channel BDA 3:



Side Channel A West Fork 28-40 Meters and Side Channel A East between 50-60 on the X axis. French Creek is between 118 and 128 meters on the X axis.

BDA 3 (a) West Fork Lat: 41°23'45.46"N Long: 122°52'19.83"W 50' upstream or downstream to field fit for on-site conditions.

BDA 3 (b) East Fork Lat: 41°23'44.97"N Long: 122°52'18.49"W 50' upstream or downstream to field fit for on-site conditions.

Distance from side channel confluence with main French Creek; ~ 200

Site Characteristics:

This site lies upstream of where two side channel features anastomoses into the primary side channel. A small BDA in each secondary side channel is proposed to retain fine sands that may be transported during high flow events and extend the area of groundwater recharge into each of these secondary channels in order to increase the magnitude of effect.

Structure dimensions; Each structure is ~ 10-20 ft" wide (perpendicular to streamflow) and 5 ft of linear impact. However, the greater width will be installed at first construction to diminish the need for repeat entry for post pounding. Maximum anticipated future lateral expansion is an additional 15 feet at each margin. This extent is necessary because as the most upstream structures these are most likely to experience high flow impacts. Only the existing channel will have willow weaving and berming at this time.

Extent of Impoundment Upstream: 30-40 Feet

Construction:

Time Estimate for constructing (for both):

3-7 days total consisting of:

1-3 days post pounding

1 days prepping and pounding posts,
1-2 day harvesting and weaving willow
1-2 days berming and sealing (stuffing, stacking, layering cobble,
straw, gravel, and woody matrix).

Material estimates:

Posts: 15-25 (total) locally harvested, untreated posts needed for BDA 3 (a) and BDA 3 (b)

Willow: Likely sufficient material on site 15 cubic yards

Cobble/rock: No cobble immediately at site. <10 cubic yards imported material per adaptive management parameters.

Weed free straw or pasture grasses Straw: 1-3 bales

Mud: Mud: Reduction of permeability of BDA with imported fine grained silt/clay material. See attached construction and adaptive management guidelines. Fine grained material to be layered on length of BDA and /or placed into specific orifice flow points to reduce structure porosity. <10 cubic yards of imported fines.

Equipment: See attached construction and adaptive management guidelines.

Access: Established ranch access roads along side channel margin will be used, along with established or created footpaths. Temporary vehicular will be established by cutting brush from ranch road to BDA site. Total tree removal to reach both BDA 3 (a) and (b) will be: six to ten < 4" Alder tress, two-five < 11" alder tress, one fallen alder that has turned into a "nurse log" with ~ nine 1-3" sprouts. Additional tree/shrub removal necessitated by on-site implementation variables will not exceed this number by more than 100%, and largest diameter tree removal shall not exceed 11".



Photo 5: French Creek Side Channel BDA #3 looking upstream

Project Monitoring:

Project Monitoring and Measurable Performance Standards:

Quantitative monitoring will consist of pre - and post-project groundwater levels, photo-documentation from established points and surveys for geomorphic change detection. While French Creek has a flow monitoring station at the mouth, the impact of this relatively small project is not anticipated to have significant influence of flow volume at the gage location, which is 1.3 miles downstream of the project site.

Quantitative monitoring: Pre and Post Project:

- 1) Groundwater monitoring and subsurface investigations: Installation of 6-8 groundwater wells both upstream and downstream of the BDAs. WSE elevations will be recorded continuously 4/1-10/1 of each project year via continuous data loggers. Data reading will pre-project monitoring until BDA pools have become fully filled, likely after fall/winter precipitation events. In addition, the landowner has

maintained two groundwater-monitoring wells downstream of the project site over the past several years. These wells will be surveyed into the network and used for on-going WSE monitoring

- 2) Surface Water Elevations: Each BDA will be will monitored via a monitoring well with a continuous data logger in the BDA pool and downstream of the BDA (or complex of BDAs)
- 3) Water quality (dissolved oxygen and temperature) in pools of the affected instream reach through summer 2017. A pool in the affected stream reach had DO and temperature monitoring in the summer of 2012 that showed suitable water quality for juvenile salmonids (See Stapleton Pool). This data will be part of the pre-project monitoring data.

Qualitative monitoring: Pre

-Project:

- 1) Take pre

-project photos prior to a

Post-Project:

- 1) Re
post installation of any BDA.

-occupy photo

Beaver Utilization Monitoring

- 1) Pre-installation evaluation of evidence of beaver utilization of area
- 2) Twice annual monitoring for evidence of beaver utilization of BDA/BDA habitat with field notes submitted to California Department of Fish and Wildlife and the North Coast Regional Water Quality Control Board when significant findings are identified.
- 3) If beavers are identified as utilizing the structures the Department and NCRWCQB shall be notified

Geomorphic Change:

1. Pre-implementation monitoring consisting of a longitudinal profile of the channel extending 100' above the most upstream BDA and 100'

downstream of the most downstream BDA and cross-sectional profile at each BDA. These profiles will be done prior to implementation of any BDA.

2. Post-Implementation monitoring will consist of repeat surveys as above at two-year intervals until a notice of completion is filed.

Fish use of the BDA enhanced off channel habitat is an important part of BDA monitoring. SRWC and Project Scientific Lead, Dr. Michael Pollock, NOAA Fisheries Northwest Fisheries Science Center, desire to monitor this location for fish parameters utilizing methods similar to the existing Scott BDA monitoring plan (See Attachment A- "Existing Scott BDA Monitoring Plan"). If funding to do so is obtained, project partners will develop monitoring specifics for fish utilization of the BDA habitat in collaboration with other NOAA personnel and California Department of Fish and Wildlife.

Annual Reporting: 3/1/2018, 3/1/2019, 3/1/2020

Mid French Creek - Sidechannel BDAs
Monitoring Well Network



E. Yokel - 9/6/2016



0 75 150 300 Feet

Access to BDA sites:



Map 1:

Access to BDA construction sites over established Ranch Roads (marked in Red). From Ranch Road to each BDA site (black dots), temporary access routes will be cut through brush. Each access road will be < 15 ft. wide. To the greatest extent possible, willow and cottonwood will be cut because of their ability to re-sprout from root mass. We will minimize the removal of alder trees for access. Details of tree number and type noted in construction description for each BDA.

Small Habitat Impact Calculations:

The total stream bank/bed and riparian vegetation calculations are shown below. The adjacent flood plain does not have material appropriate for BDA construction (see discussion below under adaptive management), so no additional impact is anticipated from these activities. Staging will occur on Ranch Roads or other established ranch work areas and will not require ground or vegetation disturbance.

Willow harvesting is anticipated to occur on the landowner's property with access from existing Ranch Roads and without any soil disturbance. Areas of willow harvest are away from the immediate riparian corridor. If insufficient willow is available and off-site harvesting occurs, it will be from areas without stream bank/bed impacts.

Project Area Calculator

The anticipated construction activities will commence in 2017 and the SRWC is initially proposing to install six separate BDAs at four locations. These initial structures are identified in the table below as follows: BDA 1(a), BDA 1(b), BDA 1(c), BDA 2, BDA 3(a), and BDA 3(b). The SRWC estimates that the linear affect from these initial BDAs will be approximately 75 linear feet. The SRWC has also estimated an additional 40 linear feet of potential project size for construction of eight BDAs that may be constructed as project area conditions evolve. These additional BDAs will be proposed and justified to the agencies under annual work-plans during subsequent years based on site-specific conditions and monitoring results. Work plans will be submitted to the NCRWQCB and CDFW for review and approval prior to construction activities. All future management activities should be easily accommodated within the 500 linear feet and 5 acre limitations allowed for small habitat restoration projects under the SWRCB General Order for 401 Water Quality Certification.

No areas are calculated for equipment staging, these activities will take place on established ranch roads and equipment areas.

Name	Lat	Long	Height	Width (ft)	Adaptive Management Extensions (ft)	Potential Total Width (ft)	Length (linear ft)	Sq. Ft	Acreage
BDA 1 (a)	41°23'53.29"N	122°52'11.43"W	1 ft.	30	30	60	5	300	
BDA 1 (b)			2 ft.	30	30	60	5	300	
BDA 1(c)			3 ft	30	30	60	5	300	
Access to BDA 1 ^{vi}						75	15	1125	
BDA 2 ^{vii}	41°23'52.29"N	122°52'19.83"W	3 ft	30	30	60	5	300	
Access to BDA 2						80	15	1200	
BDA 3(a)	41°23'44.97"N	122°52'19.83"W	3ft.	20	30	50	5	250	
BDA 3 (b)	41°23'44.97"N	122°52'18.49"W	3 ft.	20	30	50	5	250	
Access to BDA 3 (a +b) ^{viii}						150	15	2250	
Willow Harvest 1 ^{ix}	41°24'3.91"N	122°52'8.21"W				100	75	7500	
Willow Harvest 2 ^x	41°24'1.39"N	122°52'4.50"W				120	60	7200	
Willow Harvest 3 ^{xi}	41°24'7.37"N	122°52'3.69"W				65	50	3250	

Estimated Potential future BDAs ^{xii}			3 ft.			480	40	19,200	
Fines Borrow Site	41°24'8.28"N	122°52'19.32"W				100	20	200	
Total							115 ^{xiii}	43,625	1.001

- vi. Access is defined as the Road linear ft. of stream bank impact (Length) and distance from an established, routinely utilized Ranch Road to the end of needed equipment access for a BDA. Any equipment will be able to sit on the access road and reach over for post pounding without the need for additional repositioning. Therefore no calculations for equipment use are given.
- vii. Access is defined as the Road linear ft. of stream bank impact (Length) and distance from an established, routinely utilized Ranch Road to the end of needed equipment access for a BDA. Any equipment will be able to sit on the access road and reach over for post pounding without the need for additional repositioning. Therefore no calculations for equipment use are given.
- viii. Access is defined as the Road linear ft. of stream bank impact (Length) and distance from an established, routinely utilized Ranch Road to the end of needed equipment access for a BDA. Any equipment will be able to sit on the access road and reach over for post pounding without the need for additional repositioning. Therefore no calculations for equipment use are given.
- ix. GPS coordinates are for the approx. center of willow harvest area. No access calculations are given as harvest area can be reached by established ranch roads.
- x. GPS coordinates are for the approx. center of willow harvest area. No access calculations are given as harvest area can be reached by established ranch roads.
- xi. GPS coordinates are for the approx. center of willow harvest area. No access calculations are given as harvest area can be reached by established ranch roads.
- xii. Estimated 8 (This number may vary significantly depending on adaptive management needs) additional BDAs over life of permit, each 60 ft. long x 5 ft. wide.
- xiii. Only those widths that impact stream-banks (BDAs and roads) were included in total. These are in blue font for easy identification. Borrow

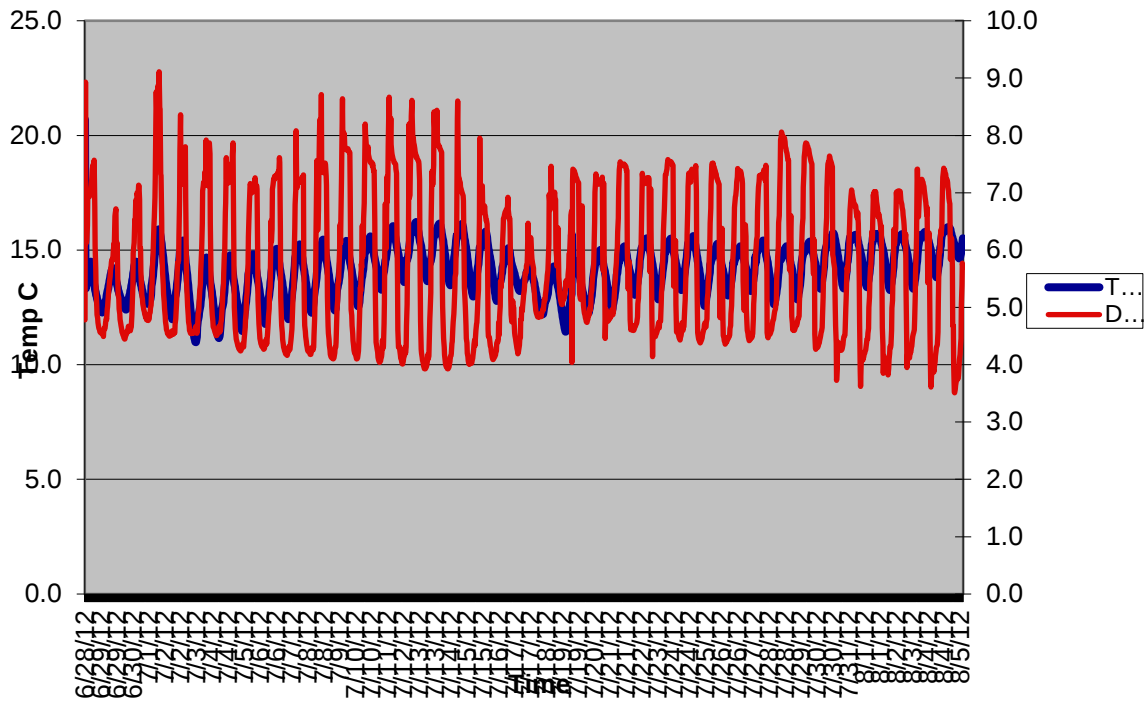
site and willow harvest widths were excluding, because they do not impact stream banks.

- xiv. The willow square footage calculations (17950) highlighted in red are included in total square footage and acreage calculations, however on the NOI form they are broken out as riparian, as differentiated from stream bank.

Location River Markers:

French Creek Site	RKM	RM
Mouth of French	0.0	0.0
DWR Flow gage @ Hwy 3	1.35	0.84
Miners Creek Rd Bridge	2.78	1.73
Off Channel Pond	3.21	2.00
BDA Reach	3.49	2.17
Mouth of Miners	4.55	2.83

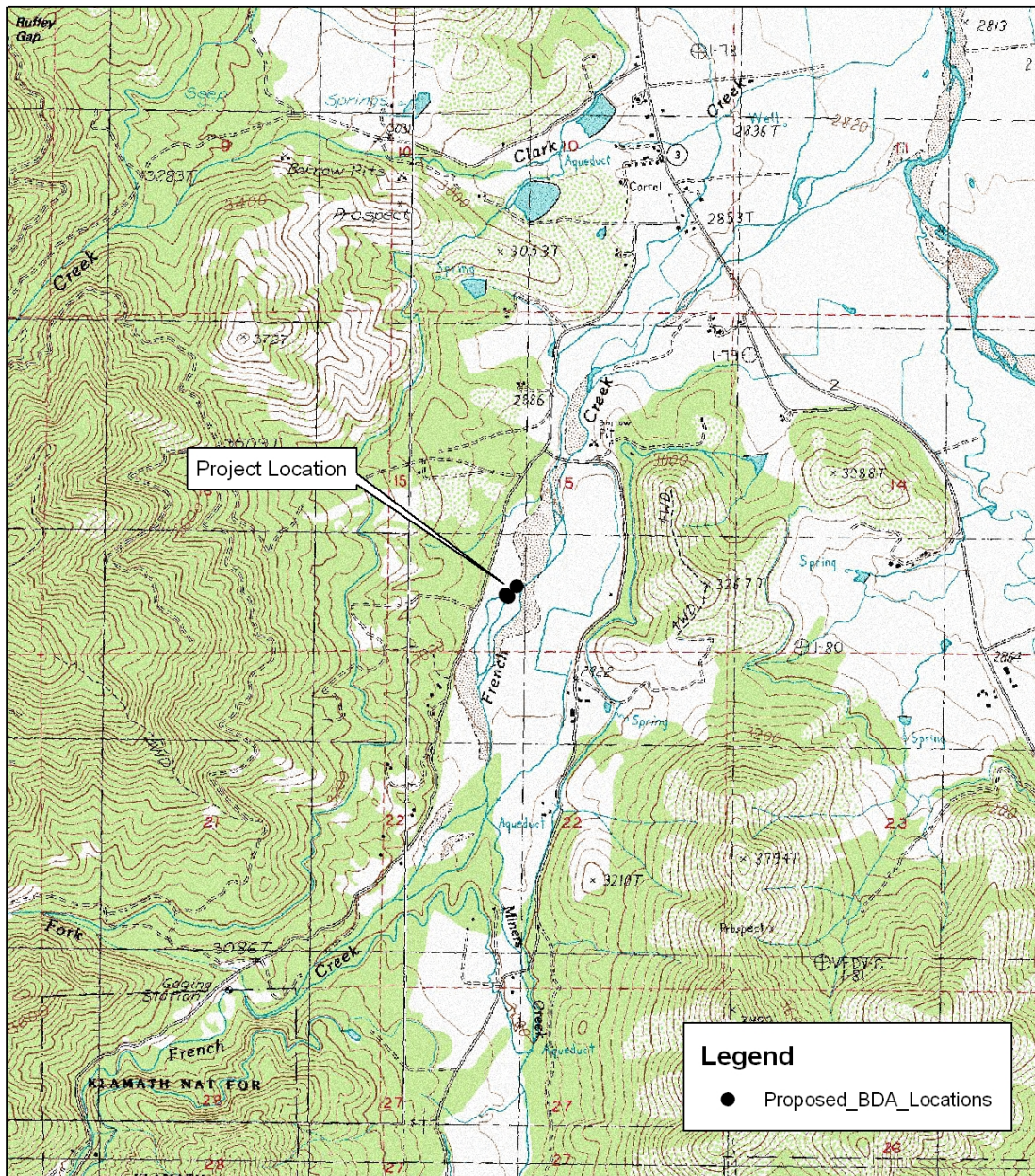
Stapleton's French Creek Coho Pool



2012 Water Quality Monitoring Side Channel "A"

Scott River BDA Program - Mid French Creek Side Channel

USGS Quad: McConaughy Gulch
PLSS: T 41N R 09W Sec 15 SW 1/4



USGS Quad Mosaic
E. Yokel - 5/11/2016



0 1,000 2,000 4,000 Feet

Scale 1:24000

1 inch equals 2000 ft

when printed on 8 1/2 x 11 inch paper

Construction and Adaptive Management Guidelines and Best Management Practices

Project Title: Mid French Side Channel BDAs

Construction, Maintenance, and Repair details are provided in Section 1, below. Best Management practices (BMPs) for Construction and Repairs of structures are provided in Section 2.

The techniques and methods for construction, maintenance and adaptive management are to found with in the “2015 Beaver Restoration Guidebook” (U.S. Fish and Wildlife Service (Janine Castro), National Oceanic and Atmospheric Administration (Michael Pollock and Chris Jordan), Portland State University (Gregory Lewallen), US Forest Service (Kent Woodruff)).

<https://www.fws.gov/oregonfwo/toolsforlandowners/RiverScience/Documents/BRG%20v.1.0%20final%20reduced.pdf>

and/or under the direction and supervision of Dr. Michael Pollock, beaver guidebook principal author.

Generally, as described in the Beaver Restoration Manual, “BDAs are intended to mimic beaver dams, they require ongoing maintenance and repair, similar to beaver dams. The amount and type of maintenance needed depends on project objectives. Typical maintenance includes extending the length of the structure as a result of end cutting, replacing sections that have been damaged (often from underscour), and raising the height of a structure, typically by constructing a new BDA on top of the sediment wedge that has accumulated upstream of an existing BDA.”

The period of adaptive management will extend 5 years from the date of first construction, anticipated to be spring 2017.

The overall project limits for adaptive management activities will extend 100 ft. laterally from the stream margin of the first terrace above channel (bank full channel), though the anticipated lateral extension of each structure is 15 ft beyond the original lateral margin. The most downstream point is the confluence of the Side Channel “A” and the mainstem French Creek and the upstream points marked in the chart below on Side Channel A East Fork and Side Channel A West Fork:

Location Name	Lat.	Long.
Confluence French And Side Channel “A”	41°23'54.59"N	122°52'7.09"W
Upstream West Fork	41°23'45.46"N	122°52'19.83"W
Upstream East Fork	41°23'44.97"N	122°52'18.49"W

The maximum height of each individual BDA from thalweg to BDA crest will be three feet. As BDAs fill with sediment additional BDAs may be placed upstream or downstream to maintain pool habitat. No BDA crest, either those in the original

construction cycle, or those built over the course of the project as adaptive management responses, will exceed the height of the incision trench banks.

Understanding beaver utilization of BDAs is an important component of this project. SRWC will include a description of the state of beaver utilization of the constructed BDA habitat when submitting requests for Major or Moderate repairs.

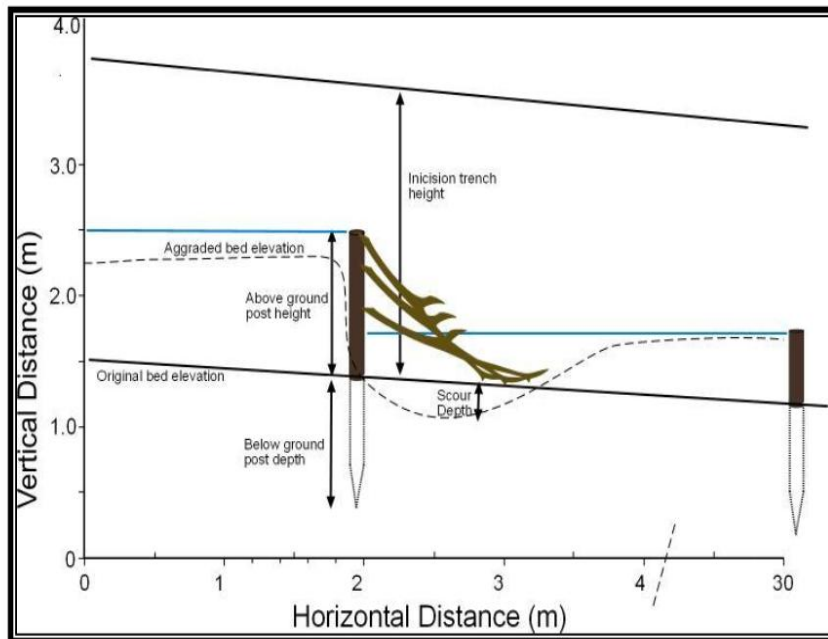
1.0 Maintenance or Repair of Existing Beaver Dam Analogous Will Consist of:

1.1.1 Major Repair Definitions

- a. Repairs needed to obtain properly functioning conditions of a structure following significant stream flow events.
- b. Ancillary structures constructed to support the properly functioning condition of the primary structure. Ancillary structures may be placed at topographic low points within the primary structure, and upstream or downstream of the primary structure. These repairs may be required to adaptively manage movement of sediment and water under high water conditions, retain pool habitat under low flow conditions, and to increase opportunities for fish passage. These ancillary structures may be placed downstream of Mid French Side Channel BDA 1 to the point of confluence with the French Creek Mainstem and upstream in Side Channel A East Fork to Lat. 41°23'44.97"N and Long. 122°52'18.49"W and Side Channel A West Fork to Lat. 41°23'45.46"N and Long. 122°52'19.83"W. The maximum lateral extent of structure adaptive management activities is 100 ft. from the edge of the side channel bank-full width. Example of first year of BDA placement with subsequent adaptive management structures.

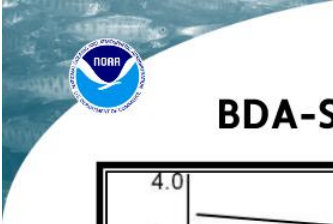


BDA-Sideview in Incision Trench-Year 1

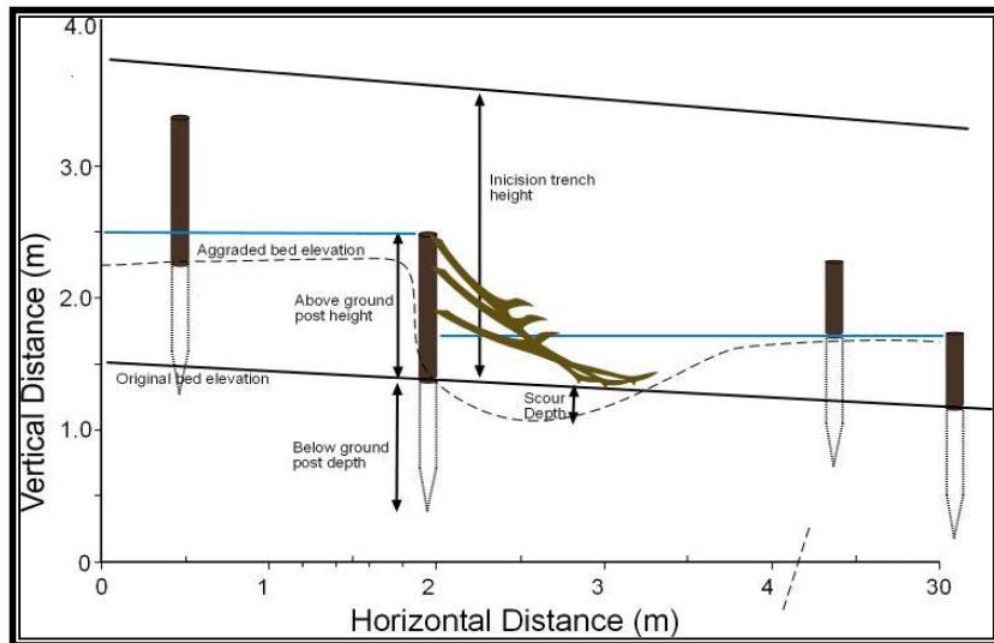


michael.pollock@noaa.gov

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BDA-Sideview-Year 2, After Aggradation



michael.pollock@noaa.gov

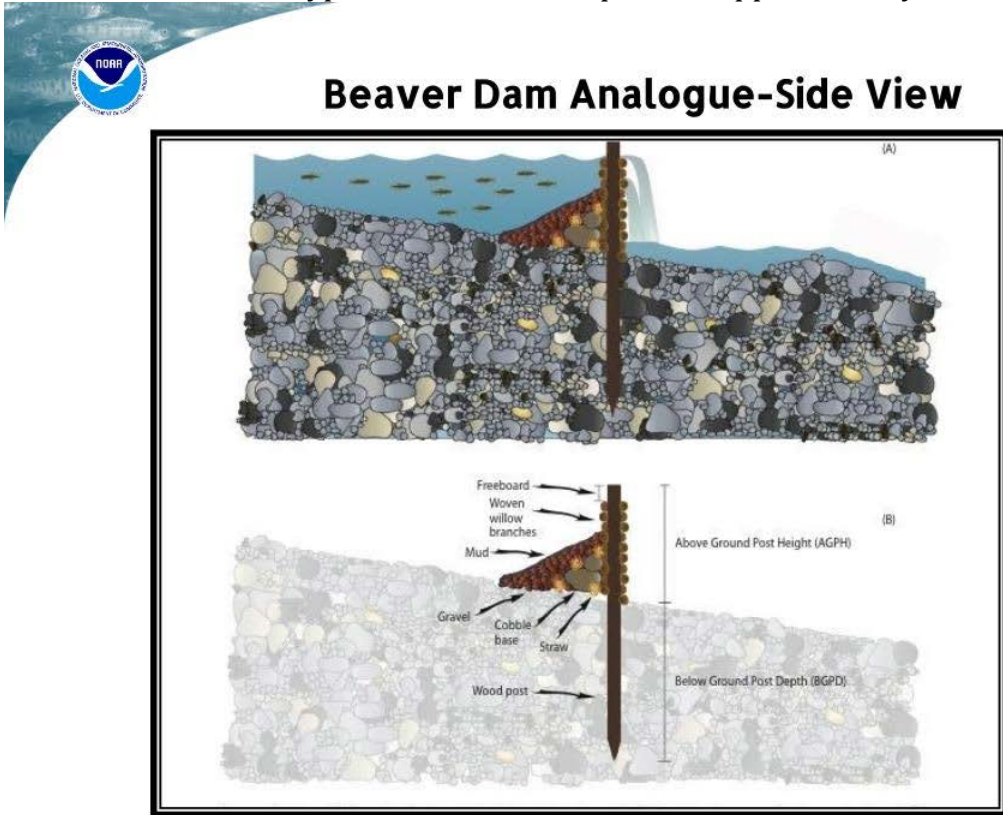
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- c. Relocation segments of a structure immediately upstream or downstream (+/- 100 ft.) to achieve properly functioning conditions. Relocation may be needed when changes due to scour, deposition or possible unforeseen conditions limit effective post placement at the original structure location.

1.1.2 Techniques and Tools for Construction and/or Major Repairs

- a. If streambed is wetted, a handheld hydraulic pounder will be used to place posts.
- b. If streambed is dry, or at baseflow conditions, a handheld hydraulic post pounder, or an excavator appropriately sized to meet project objectives and BMPs may be used to place posts within the channel. Under typical conditions, excavators with the following specifications will be used: 8 to 10 ft. track width, 18 to 22 ft. reach, < 3 to 8 psi, (≤ 4 psi per track) ground pressure. If an excavator within this size class is not available, the next smaller or larger excavator may be used.
- c. If streambed is wetted and flows are above baseflow, an excavator of above description may be used from streambank following the appropriate BMPs.
- d. If streambed is wetted and at baseflow, an excavator of the above description may operate within the wetted channel following the appropriate BMPs.

- e. Post embedment depth will be at least 1.5 times the height of the structure. Typical embedment depths are approximately 5-10 ft.



michael.pollock@noaa.gov

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- f. Posts will be placed 12-24 inches apart (center to center). An occasional variance (1/5 posts) will be allowed to account for technical difficulties of post placement causing inadvertent variation in spacing.
- g. If streambed is dry, pickup trucks or heavy equip such as a loader may enter stream channel to deliver material to the structure.
- h. Willow (or similar) of 1-5" diameter will be woven between posts and compacted.
- i. Grass, forbs, sedges or straw will be compacted and layered into the interstitial spaces between the woven material.
- j. Rock, gravel cobble to anchor and additional seal interstitial spaces.
- k. Mud, muck or other fine grained material will also be layered in to the berm.
- l. All techniques and materials defined in moderate and minor repairs are included in major repairs.

1.2 Moderate Repair Definitions

- a. Repairs needed to obtain properly functioning conditions of a structure following average stream flow events.
- b. Posts and weave will be added or replaced to repair washed out sections- < 30% total structure length.

1.2.1 Tools and techniques for Moderate Repairs

- a. Hand tools will include items such as shovels, picks, bars and chainsaws.
- b. A handheld hydraulic post pounder may be used. The power pack will be placed on streambank and follow appropriate BMPs.
- c. Post embedment depth will be at least 1.5 times the height of the structure. Typical embedment depths are approximately 5-10 ft.
- d. Posts will be placed 12-24 inches apart (center to center). An occasional variance (1/5 posts) will be allowed to account for technical difficulties of post placement causing inadvertent variation in spacing.

1.3 Minor Repair Definitions

- a. Permeability adjustment of flow through structure
- b. Patching minor holes and leaks

1.3.1 Tools and Techniques for Minor Repairs

- a. Hand tools will include items such as shovels, picks, bars and chainsaws, non-hydraulic post pounders.

1.4 Materials and techniques for construction and all types of repairs

- a. Wood posts will be locally sourced, untreated, 4-12 inch diameter, and length sized according to site conditions.
- b. Willow cuttings (or similar material) will be interwoven between the posts to create a self-supporting structure and semipermeable.
- c. Willow cuttings (or similar material) may be placed to buttresses the upstream or downstream face(s) of the structure. Willow will be obtained within the sub-watershed from the landowner's property. If inadequate amounts of willow are unavailable on site, willow will be obtained from within the Watershed.
- d. Rock and cobble may be placed to create a scour resistant berm along the upstream and downstream faces of the structure. The berm will be used to enhance structure stability as deemed necessary based on site specific conditions, including streambed sediment size, channel confinement, and streambank erosion considerations.
- e. Local or nearby alluvium such as muck, sand, and rock may be hand shoveled onto the structure for permeability adjustment. Desired soil types to adequately seal BDAs are: Sandy Loam, Clay, Clay Loam, Silty Clay. Local alluvium in channel was found to be sand and on adjacent flood plain was loamy sand. On landowner's property there is a borrow site of clay and clay loam created when a flat was excavated. Landowner has agreed to allow this material to be used for structure sealing. Material is stored above French Creek Road and disturbance of the pile will not result in any material being displaced into a stream course. Landowner will use a Kubota tractor to scoop material into a truck/dump trailer for transport. If sufficient clay or clay/loam is unavailable at landowner's source, clay will be obtained from a commercial source within the watershed (Moore's Gravel Co.). Moore's Gravel Co. excavates

clay from the hillside for admixing into a “road base material”. They have agreed to sell the straight run hillside clay.



Mid French Side Channel “A” alluvium

- f. Cobble and rock materials are not available within the channel. Obtaining these materials from the adjacent French Creek channel would result in stream bed/bank disturbance and is not felt to be beneficial. Therefore washed rock varying from 1” (minus) to large cobble 12-18” may be acquired from a locally produced commercial source (Moore’s Gravel Co.).
- g. Permeability of the structures may be adjusted by using locally sourced finer materials such as mud, grass, leaves and other plant materials. Locally sourced weed free straw, or locally sourced weed free pasture grass hay may be used to adjust permeability. Use of straw reduces the demand for locally sourced native plant materials, does not introduce non-native materials, and has the potential for positive impacts.
- h. Additional materials may be used upon request and approval by North Coast Regional Water Quality Control Board (NCRWQCB) and CDFW.

1.5 Adaptive Management

- a. This is a demonstration project and it may be beneficial for structure function and all interested parties for additional construction techniques to be trialed. These may be undertaken with the consent of regulatory authorities.

2.0 Measures to Protect Fish and Wildlife Resources

2.1 Administrative Measures

SRWC will meet each administrative requirement described below.

- A. Documentation at Project Site. SRWC will have copies of all agreements and permits available at the project site and provide them upon request to any representative of a regulatory agency.
- B. Providing Agreement to Persons at Project Site: SRWC will provide copies of all agreements and permits to all persons working at the project site, including contractors and subcontractors
- C. Notification of Conflicting Provisions: If SRWC determines that permits from any regulatory agency are in conflict with those of another agency, SRWC shall notify the appropriate agencies for resolution of the conflict.
- D. Project Site Entry: SRWC and landowner will allow access to project site for regulatory authorities provided they provide 24 hours advance notice and allow project permittee, or representative, to be present.
- E. Other Permitting Requirements. SRWC and project partners will abide by all project permits.

2.2 Work Plan Coordination

2.2.1 Seasonal Work Plan

SRWC will submit a work plan for construction of ancillary structures or major repair activities to NCRWCQB and CDFW at least 30 days prior to the proposed work window. The work plan will provide details on specific construction activities for each project site, including equipment type, materials, access and BMPs. NCRWCQB and CDFW will work with SRWC to provide a notice to proceed (NTP) within 30 business days of receiving the work plan. Construction will not commence until the NTP is received and the BMPs are in place.

2.2.2 Major Repairs and Construction of Ancillary Structures

Major repairs and construction of ancillary structures will occur during the period commencing June 15 and ending Oct. 15, provided that the stream is dry or at base flow, defined here as the normal work window for new construction and major repairs. If weather conditions allow and stream is dry or at base flow, new construction or major repair work may be preformed within the stream bed or banks outside of the normal work window, provided SRWC has obtained written permission from the appropriate agencies and the activities are conducted in accordance with the BMPs described herein and any additional requirements deemed necessary by the regulatory agencies.

2.2.3 Minor Repairs and Maintenance

Minor repair and maintenance work to any constructed or reinforced instream structure may occur on an on-going basis as long as the activities are conducted in accordance with the BMPs described herein. These activities may occur throughout the year and in the wetted channel without specific authorization as needed to maintain structure stability and fish passage. Such work will employ the same type of materials used in the original construction and occur in the location of existing features unless otherwise specified in a written workplan amendment.

2.2.4 Moderate Repairs and Maintenance

Moderate repairs and maintenance work to any constructed or reinforced instream structure may occur on an on-going basis as long as the activities are conducted in accordance with the BMPs described herein. These activities may occur throughout the year and in the wetted channel with five day written notification to NCRWQCB and CDFW for review and written approval and as needed to maintain structure stability and fish passage. Such work will employ the same type of materials used in the original construction and occur in the location of existing features unless otherwise specified in a written workplan amendment.

2.3 Avoidance and Minimization Measures

To avoid or minimize adverse impacts to fish, wildlife and water resources The SRWC will implement each measure listed below.

2.3.1 Weather Considerations

For any ground disturbing work SRWC shall do all of the following:

- a. Stage appropriate erosion and sediment control materials at the work site prior to ground disturbing activities.
- b. Complete all required work and implement erosion control measures prior to the onset of significant precipitation (greater than 2.0 inches) over the succeeding 7-day period or by October 15th, which ever comes first.
- c. Ground disturbing work outside the normal work window may be conducted if it can be completed on a day-to-day basis and all ground disturbance is storm-proofed prior to the onset of significant precipitation (greater than 2.0 inches) over the succeeding 5-day period.
- d. The California Nevada River Forecast Center (CNRFC) forecasts for the Scott River at Fort Jones will be used as the primary weather guidance for BMP implementation. This website is available at:
<http://www.cnrfc.noaa.gov/graphicalRVF.php?id=FTJC1>

2.3.2 Worksite Notification and Compliance

SRWC will instruct all persons conducting any ground disturbing activities at the worksite to comply with the conditions set forth herein and will inspect each worksite before, during, and after the completion of any ground disturbing activity at the work site.

2.3.3 Water Quality Management

Work that causes instream turbidity levels to rise above background conditions will be suspended or managed to avoid or minimize short- and long-term impacts to aquatic life and water quality. Turbidity levels will be visually monitored in four consecutive pools downstream of the work area. If turbidity levels rise above background in the fourth downstream most pool, work will be suspended until water clarity improves and there is no further downstream progression of a turbidity plume. In practice, work that causes turbidity will be managed or other

measures used to minimize changes in water clarity within the third downstream most pool. This BMP will be referred to as the “Four Pool Rule”, herein.

If work requires heavy equipment to work directly within channels where flowing water is present, the equipment will work on a series of posts laid out as a temporary corduroy road. The posts will be placed to minimize disturbance of the wetted streambed and removed as the work is completed.

2.3.4 Habitat Protection

Instream work will be conducted to avoid disturbing or interfering with spawning fish or redds. During regular inspections, qualified SRWC staff will identify the location of spawning grounds that are within the project site, and avoid disturbance to any identified redds or fish.

2.3.5 Site Access and Staging

The SRWC will conduct all activities involving site access and staging in a manner to avoid or minimize disturbance to riparian vegetation and ground surfaces. Key BMPs include:

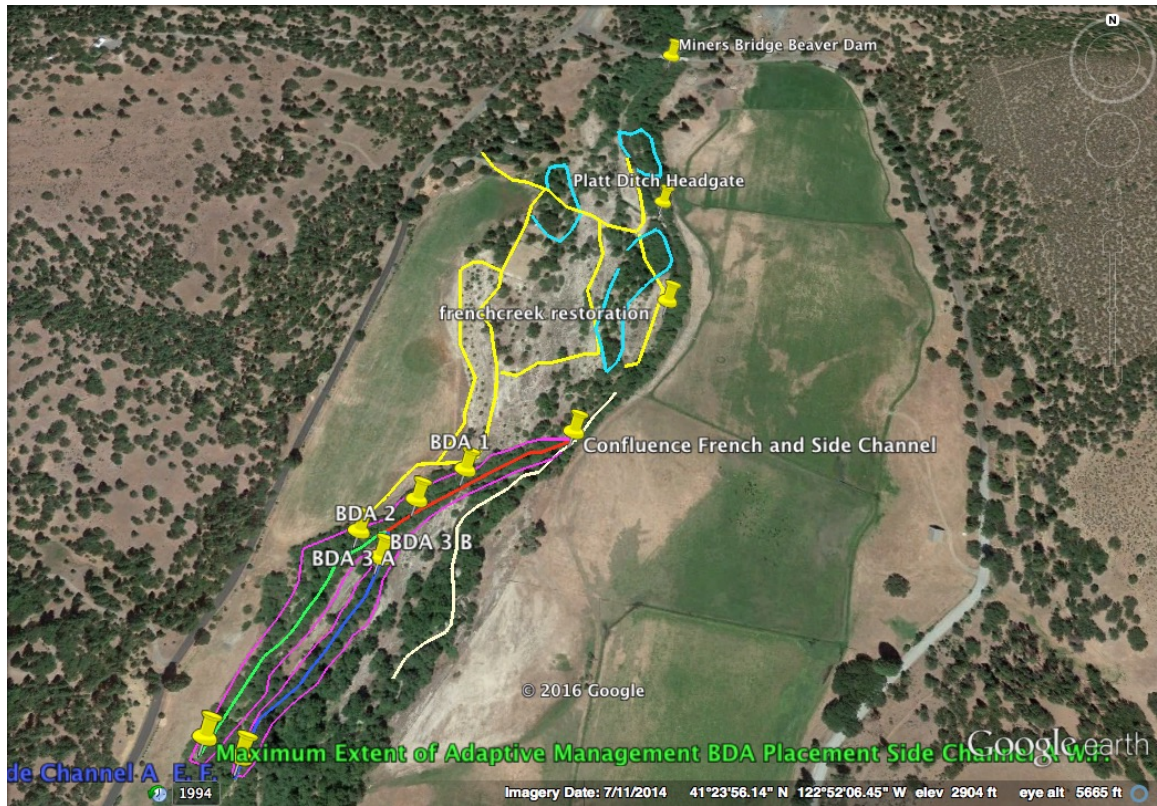
- a. Existing roads, trails, landings and areas of disturbed ground will be used for access and staging of materials and equipment to the greatest extent feasible.
- b. Temporary access trails will be oriented to approach the streambank with a perpendicular alignment. This BMP has two objectives: 1) minimize the length and area of disturbance immediately adjacent to the stream, and 2) reduce the potential for the stream to flow or avulse down the length of a trail, which is more likely with bank parallel alignments.
- c. Disturbance or removal of riparian vegetation, related to trail construction and use, will be avoided or minimized to greatest extent feasible. Temporary trails will preferentially avoid removal of larger vegetation that provides shade on the bed and banks of the stream. Any trees removed during project implementation activities will be utilized onsite to increase habitat complexity. At the end of each work season crews will: 1) mulch established access routes with organic, seed-free straw to a minimum depth of two inches to prevent erosion; and 2) plant two native trees in the project area for each tree removed

2.3.8 Willow Flycatcher Protection and other nesting bird protection.

All willow harvest sites, whether at actual structure site, or at alternative harvest sites, will be identified for review by CDFW Biology qualified biologist staff prior to the start of willow harvest. The Biographic Information and Observation System (BIOS) Habitat Suitability Model will be used to determine if the site needs to be considered as potential Willow Flycatcher habitat. If determined to be Willow Flycatcher habitat the following protection measures will be employed:

- a) Conduct vegetation removal and other ground disturbing activities associated with construction from September 1 through January 31, when birds are not nesting; or
- b) Conduct pre-construction surveys for nesting birds if vegetation removal or ground disturbance activities are to take place during the nesting season (February 1 through August 31). These surveys shall be conducted by a qualified biologist no more than one week prior to vegetation removal or construction activities during the nesting season. If an active nest is located during the pre-construction surveys, a non-disturbance buffer shall be established around the nest by a qualified biologist in consultation with the Department. No vegetation or construction activities shall occur within this non-disturbance buffer until the young have fledged, as determined through additional monitoring by the qualified biologist. The results of pre-construction surveys shall be sent to the Department at: California Department of Fish and Wildlife, Attn: CEQA, 601 Locust Street, Redding, CA, 96001.
- c) For other nesting birds a qualified biologist shall examine areas during willow collection to ensure that no nests are present . If an active nest is located during the pre-construction surveys, a non-disturbance buffer shall be established around the nest by a qualified biologist. The buffer shall be established in consultation with the Department prior to vegetation removal. No vegetation or construction activities shall occur within this non-disturbance buffer until the young have fledged, as determined through additional monitoring by the qualified biologist.

Willows may be harvested without concern about Willow Flycatcher between Sept 1 and April 15th of any year. Willow will be harvested at a rate of > 30% of the vegetative coverage at any site. This may consist of removal of 30% of an individual clump, or entire clumps at not > 30% of the number of clumps based on the density, age and vigor of the plants. It is anticipated that Willow can be harvested on the Stapleton property- see Google Earth file below.



Ranch Roads in yellow.

Willow harvest sites outlined in pale blue.

2.3.9 Coho Salmon Protection Measures

- a. BDA locations and vehicular access routes will be surveyed for the presence of coho salmon or any salmon redds. If coho are found to be present at the time of construction, fish will be excluded from area by block nets upstream and downstream. If redds are found, construction will be delayed until fish have hatched and juveniles are > 50 mm in size.
- b. Prior to the summer/early fall Project implementation interval, fish exclusion netting will be placed during the preceding winter/early spring, as soon as flows recede sufficiently - to ensure that all salmonids are precluded entry to the Project work site. Once exclusion netting is in place, wetted portions of the side channel within the Project work area will be dived, to ensure that no SONCC coho salmon are present. If SONCC coho salmon are observed within the Project work area, exclusion netting will be removed to allow volitional movement of fish throughout the area. When habitat conditions in the side channel have changed sufficiently, exclusion netting will again be placed to preclude salmonid access to the Project work area, and dived to confirm that no SONCC coho salmon are present. This procedure will be repeated until either there are no SONCC coho present in the Project work site, or the Project work site is dry. All snorkel surveys will be conducted by staff from

NMFS, the Scott River Watershed Council, and/or the Siskiyou Resource Conservation District.

- c. Fish passage considerations: No specific measures are needed to ensure adult passage in the side channel as fish passage is maintained in the mainstem of French Creek. If juvenile coho are found above the BDAs after construction they will have demonstrated their ability to pass the structure on a volitional basis and no specific management will be required.
- d. In low flow conditions and/or if temperature increases, monitoring will be conducted to determine number of fish and if adaptive management such as ensuring fish passage and/or condition are not compromised, which should be in consultation with CDFW.

2.3.10 General Habitat Protection Measures

- a. Vehicles operating in the wetted channel will operate in accordance with all BMPs listed in this document and specifically with in Provisions 2.3.1, 2.3.3, 1.3.4, 2.3.5, and 2.3.11.
- b. Structures and associated materials not designed to withstand high seasonal flows shall be removed to areas above the high water mark before such flows occur.
- c. No alteration of the streambed, bank or channel shall occur, except as otherwise permitted in this Agreement. The removal of soil, native vegetation and vegetative debris from the streambed or stream banks is prohibited, except as described in work activities and/or to gain access to a project location.
- d. Hand tools (e.g., trimmer, chain saw, etc.) will be the preferred method to trim vegetation to the extent necessary to gain access to the work sites. Larger equipment may be used to remove vegetation along temporary access trails following the BMP describe in Section 4.3.5.
- e. Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations.
- f. Stream bank modifications to facilitate project construction operations shall be performed in a manner that will not cause negative impacts upstream and downstream in the stream channel, such as accelerated bank erosion or loss of vegetation.
- g. SRWC may conduct maintenance activities to any constructed or reinforced instream structure authorized by this workplan, provided the SRWC obtains written approval from CDFW and NCWRCB prior to commencing any activities. Such work shall employ the same type of materials used in the original

construction and shall occur only in the locations of existing features unless otherwise specified in the written approval.

- h. SRWC shall ensure that the spread or introduction of invasive exotic plants will be avoided to the maximum extent possible. When practicable, invasive exotic plants at the work site will be removed.
- i. SRWC will ensure, through the monitoring program, that the structures at no time present impediments to migration to any salmonid species at all life stages.
- j. SRWC will follow all provision of permit holders Scientific Collection Permit and ESA Section 4D permits for fish handling activities.

2.3.11 Petroleum, Chemical and Other Pollutants

- a. Staging, storage, and re-fueling areas for machinery, equipment, and materials shall be located outside of the stream a minimum distance of 150 feet from the channel.
- b. All equipment or vehicles driven and/or operated within or adjacent to the stream channel shall be checked and maintained daily to prevent leaks of materials that, if introduced to water, could be deleterious to aquatic life, wildlife, or riparian habitat.
- c. Stationary equipment such as motors, pumps, generators, and welders that contain hazardous materials, located within or adjacent to a stream shall be positioned over drip pans.
- d. All activities performed in or near a stream shall have absorbent materials designated for spill containment and clean up activities on-site for use in an accidental spill. The Permittee shall immediately notify the California Emergency Management Agency at 1-800-852-7550 and immediately initiate the clean up activities. CDFW shall be notified by the Permittee and consulted regarding clean-up procedures.
- e. No debris, soil, silt, sand, bark, slash, sawdust, rubbish, cement or concrete or washings thereof, asphalt, paint or other coating material, oil or petroleum products or other organic or earthen material from any construction, or associated activity of whatever nature shall be allowed to enter into, or placed where it may be washed by rainfall or runoff into, waters of the State. When operations are completed, any excess materials or debris shall be removed from the work area. No rubbish shall be deposited within 150 feet of the high water mark of any stream.

2.3.12 Erosion and Sediment Control

- a. SRWC will maintain adequate erosion and sediment control devices to prevent the degradation of water quality.

- b. SRWC will prevent discharge of sediment, and/or muddy, turbid, or silt-laden waters, resulting from the project, into the stream channel following the BMPs described in Section 4.3.3.
- c. Soils exposed by project operations shall be mulched to prevent sediment runoff and transport. Mulches shall be applied so that not less than 90% of the disturbed areas are covered. All mulches (except hydro-mulch) shall be applied in a layer not less than two inches deep. All exposed soils and fills, shall be reseeded with a mix of native grasses common to the area, free from seeds of noxious or invasive weed species, and applied at a rate which will ensure establishment.
- d. Soils adjacent to the stream channel that are exposed by project operations shall be adequately stabilized when rainfall has a 30% chance of occurring during construction, and immediately upon completion of construction, to prevent the mobilization of such sediment into the stream channels or adjacent wetlands. The 72 hour National Weather Service forecasts shall be monitored by the Permittee to determine the chance of precipitation.
- e. Upon CDFW determination that turbidity/siltation levels resulting from project related activities constitute a threat to aquatic life, activities associated with the turbidity/siltation, shall be halted until effective CDFW approved control devices are installed, or abatement procedures are initiated.
- f. All bare mineral soil exposed in conjunction with project activities shall be treated for erosion prior to the onset of precipitation capable of generating run-off or the end of the normal work window, whichever comes first. Erosion control will include seeding and mulching of bare soil with weed-free, organic straw mulch and native grass seed mix.

REPORTING MEASURES

The SRWC will submit annual monitoring reports to NCRWCQB as required by the monitoring plan, no later than April 1 for each year that the monitoring plan is in place.

Project monitoring as described starting on page 18 is required by USFWS, who is providing funding for this project. These activities will be undertaken as described. The monitoring plan below is that which is attached to the existing SRWC BDAs. It will be extended to the BDAs to be implemented under this NOI if additional funds are obtained. This monitoring plan maybe revised by the consent of all interested parties: SRWC, Scientific Lead, Dr. Michael Pollock, CDFW, NCRWQCB, USFWS and funders NFWF, and Coho Enhancement Fund.

Fish use of the BDA enhanced off channel habitat is an important part of BDA monitoring. SRWC and Project Scientific Lead, Dr. Michael Pollock, NOAA Fisheries Northwest Fisheries Science Center, desire to monitor this location for fish parameters utilizing methods similar to the existing Scott BDA monitoring plan (See Attachment A- "Existing Scott BDA Monitoring Plan"). If funding to do so is obtained, project partners will develop monitoring specifics for fish utilization of the BDA habitat in collaboration with other NOAA personnel and California Department of Fish and Wildlife.

Attachment A:
Existing Scott River BDA Monitoring Program

Monitoring Parameter Adult Fish Passage Across BDAs:

Annual spawning surveys (carcass and redd counts) performed by the Siskiyou RCD will be used by the SRWC to assess adult fish passage over Post-Assisted Wood Structures (PAWS). The RCD provides the spawner survey data to the SRWC at the end of each spawning season (March). After a structure is installed, the spatial distribution of redds and carcasses upstream and downstream of each structure will be quantified and compared to distributions in previous years to assess whether the structures are affecting spawning patterns within the watershed, and specifically, if there are any indications that structures are reducing upstream spawner densities (preliminary analysis from the 2014-2015 survey suggests a spawner distribution consistent with previous years). When adult Chinook and coho salmon are present (November – January) the SRWC will visit each BDAs 2x/wk to ensure they are passable. If fish are present below a structure, ie: "kegged up", the structure will be breached sufficiently to allow fish movement. CDFW Fisheries also estimates adult returns on the Scott River using a video counting system near the mouth of the Scott Valley. The USGS also maintains a streamflow monitoring station that measures discharge and stage height on the Scott River near Fort Jones (USGS #11519500). These data will be used to place the spatial distribution of redds relative to BDA's locations in the context of total run size and hydrologic regime during the spawning season, since year-to-year variation in the spatial distribution of spawning is affected by these variables.

Juvenile Fish Passage Across BDAs: Juvenile fish passage will be assessed at BDAs through placement of PIT tag monitoring station with two antennae, one upstream and one downstream of a structure. The PIT tag infrastructure (hardware, power supply and antennae) will be provided by CDFW. The SRWC will visit PIT monitoring stations 1x/wk to perform a systems check to ensure that they are functioning properly and to download and analyze data. There is currently a PIT tag monitoring station at the PAWS at the mouth of Sugar Creek that is being

maintained and operated by CDFW. Routine maintenance of the station and data downloading will transfer to SRWC this spring. Coho and steelhead juveniles, minimum size 60mm, will be tagged above and below the PAWS until a minimum sample size of 50-100 salmonids above and 50-100 salmonids below each structure is reached during a tagging event, though ideally thousands of fish can be tagged, as this will greatly improve the chances for obtaining statistically meaningful results. SRWC monitoring supervisor, Erich Yokel, under supervision by CDFW personnel this coming year, will perform tagging. Similar numbers will be tagged at the control sites, if possible, so that relative movement patterns can be compared. As many juveniles as is reasonably possible should be PIT tagged because previous studies have shown that high numbers of PIT tagged juveniles often move away from study areas and are no longer observed. At a minimum, tagging events should occur twice/year, once in the spring/summer and once in the fall/winter. Additional tagging events may be needed if fish move off site or otherwise disappear such that sample sizes become too small to make reasonable statistical inferences in regards to juvenile fish passage. (see Lotkeff 2012 for a similar study). Juvenile fish passage will be assessed at the site through placement of portable PIT tag antennae, which will be provided by CDFW. Placement of PIT tag antennae upstream and downstream of the structures will enable us to better quantify the number and frequency with which juveniles cross beaver dams or BDAs. We do not have enough antennae sufficient to monitor movement at all sites all the time, so antennae will be rotated through the treatments and control sites, with efforts concentrated at locations where juvenile salmon are most abundant (i.e., we are not going to expend a lot of effort measuring fish movement in places where there are few fish). An alternate, acceptable method to access juvenile movement is use of a portable Pit Tag wand both upstream and downstream of the structures in lieu of more permanent arrays. Use of the wand would reduce cost in comparison to purchase of arrays, and also reduce expense as compared taking down and setting up arrays in a rotational system. CDFW will be responsible for major repairs or replacement of the Pit Tag Arrays when notified of need by SRWC. SRWC will download data from arrays and/or portable wand, submit it to CDFW who will be responsible for data entry, data management and analysis. Juvenile Salmonid Use of BDA Habitat One of our project partners, CDFW operates a juvenile outmigrant trap at the mouth of the Scott River to estimate annual outmigrant production of the watershed. At the trap, outmigrants are captured and scanned for PIT tags. These CDFW data, in combination with the data provided by SWRC, will be explored and analyzed by NOAA, another of our project partners, to determine if estimates of the outmigrant production of the habitat restored by this project can be compared to overall outmigrant production in the Scott River.

Stream Temperature: The SRWC has 50 Onset tidbit dataloggers (accuracy + 0.2 oC) provided by one of our project partners (NOAA), that will be used to measure stream temperatures above and below PAWS. Because of the high spatial variability of temperature in the complex habitat surrounding PAWS, we will employ multiple data loggers at each site during the summer. We will measure the spatial variation in stream temperatures for the purposes of identifying the extent of “thermally available” habitat, relative to control sites. Forty dataloggers will be used in a

rotating panel design to measure spatial variability at control and treatment sites, while the remaining ten dataloggers will be used to continuously monitor stream temperatures at each of the sites throughout the year. Groundwater and Surface Water Monitoring The SRWC has 26 Onset Hobo U20 water level dataloggers (range 0-9 m, accuracy 0.5 cm) provided by NOAA, that are being used to measure groundwater and surface water elevations and temperatures. These dataloggers have been placed in wells at 40 control and treatment sites, upstream and downstream of the structures (see figure xx for locations, see figure xx for an example of an installed well). A total of 32 monitoring wells have been installed, including 26 groundwater wells, four surface water stations, and two surface/flow stations at the control sites. Some wells do not have water level loggers installed and these wells are being measured on weekly basis using a Solinst (model 101) P7) water level tape. The data will be analyzed to assess the spatial extent to which elevated surface water tables upstream of PAWS also increase groundwater levels relative to control sites. Temperature data can be used as a “tracer” to assess the extent of groundwater-surface water connectivity, but those data will not be analyzed as part of this monitoring plan.

Dissolved Oxygen: The SWRC has four Hobo DO dataloggers (U26-001) which have been provided by two of our project partners, USFWS and NOAA, that will be used to monitor dissolved oxygen levels. Because of the high spatial variability of temperature in the complex habitat surrounding PAWS, it is reasonable to expect that there will also be a certain amount of spatial variation in dissolved oxygen levels. We will measure the spatial variation in dissolved oxygen for the purposes of identifying the extent of “oxygen available” habitat, relative to control sites and to determine the variation in the extent of oxygen available habitat on a seasonal and diurnal basis. The four data loggers will be used in a modified rotating panel design to measure spatial variation in dissolved oxygen at control and treatment sites. Additionally, we will utilize a YSI handheld DO meter to spot check DO at locations where data loggers are not present. Juvenile Coho Salmon Habitat Capacity The abundance of juvenile coho salmon habitat will be measured at control and treatment sites. The extent of velocity, depth and cover conditions favorable to juvenile salmon during the summer and winter seasons will be approximated by taking a series of cross-sectional measurements at each of the treatment and control sites. Such measurements will be used to quantify the increases in juvenile coho salmon habitat capacity resulting from the restoration action (For details, see Beechie et al. 2015. Comparison of potential increases in juvenile salmonid rearing habitat capacity among alternative restoration scenarios, Trinity River, California. *Restoration Ecology*: 323:75-84). Assessment of increased rearing capacity for juvenile coho salmon is particularly important in places such as the Scott River and elsewhere throughout the Klamath basin, where populations are currently depressed. This is because direct measurement of fish response to the restoration treatment may not necessarily be a viable means of quantitatively assessing the benefits of the restoration action simply because there are a limited number of fish currently available to use the habitat.

Beaver: The SRWC will survey treatment and control sites for beaver habitat potential and usage, using a modified version of a survey form used by the Methow

Valley Beaver project (unpublished). We will perform such surveys no less than 2x/yr, once in the summer and once in the fall. Features indicative of beaver use include constructed dams, areas flooded, stick lodges, bank lodges, canals, feeding stations, food caches, scent mounds, sticks with beaver teeth marks, and live trees and stumps with beaver teeth marks.

Vegetation: The extent of vegetative cover will be approximated by comparing pre- and postproject aerial surveys provided at regular intervals using remotely-sensed data, such as the (2102) aerial LiDAR and orthophoto surveys provided by one of our project partners, USFWS. One of our other project partners, NOAA, will be responsible for all aspects of any vegetation surveys, but SRWC may assist as time allows. We may also obtain inexpensive high resolution aerial photographs from local UAV flights, as that technology becomes available. Because years may pass in between such aerial surveys, the effects of the treatments on vegetative cover may not be known for some time (i.e. years). Therefore, we will also establish a series of monumented photo points at each of the sites so that qualitative assessments of the effect of the treatments on riparian vegetation can be assessed. The standard of success will be a quantifiable increase in the coverage of riparian vegetation, as measured by aerial photographs, or a qualitative increase in the amount of riparian vegetation as measured by photopoints.

Measuring Hydrogeomorphic Changes in Habitat: The restoration treatments are expected to create general hydrogeomorphic changes that benefit salmon, such as side channel formation, floodplain connectivity, aggradation that elevates water levels and increases inundation duration for offchannel habitat, and scour pool formation. These changes will be measured by comparing pre-treatment (2012) digital elevation models derived from aerial LiDAR surveys and companion color orthophotos (provided by USFWS), with similar posttreatment surveys, if these data become available. Approximately \$25,600 is needed for another aerial LiDAR survey along the mainstem of the Scott River, from the mouth of Sugar Creek to the mouth of Etna Creek, and another \$20,300 is needed for a simultaneous aerial orthophoto survey of the same area. Currently, funding is not available for a 2015 aerial LiDAR/color orthophoto survey. If funding becomes available and aerial LiDAR/color orthophoto survey data are obtained, the data will be analyzed by NOAA using GIS-based geomorphic change detection tools, which in combination with orthophoto interpretation and groundbased habitat surveys will enable a quantitative assessment of the improvements in aquatic and riparian habitat that have occurred as a result of the restoration treatments. Up-to-date aerial LiDAR and orthophoto surveys are also very useful for planning and design of future restoration projects, and are much more cost-effective than ground surveys for restoration planning and design over large areas. Thus data 42 acquired from such surveys has multiple applications and future restoration projects will benefit from these data being available. Reporting Annually by April 1 to NFWF, USFWS, CDFW and NOAA. We request that the annual report due date be moved to be April 1, so that the spawner survey data from the RCD can be incorporated into the report. SRWC will be responsible for routine grant compliance reporting. Project partner, NOAA, will be responsible for April 1 monitoring reports.

Citations:

- i California Department of Fish and Game. Recovery Strategy for California Coho Salmon. Sacramento Ca. 2004. Section 10.14
- ii California Department of Fish and Game. Recovery Strategy for California Coho Salmon. Sacramento Ca. 2004. Section 10.16
- iii National Oceanic and Atmospheric Administration. Final SONCC Recovery Plan. Arcata, Ca. NOAA Fisheries 2014 p. 36-14
- iv Castro et al. Beaver Restoration Guidebook. U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, Portland State University and U.S. Forest Service (2015). pp 82-97
- v Shapovalov, L., and A. C. Taft. 1954. The life histories of the steelhead rainbow trout (*Salmo gairdneri gairdneri*) and silver salmon (*Oncorhynchus kisutch*) with special reference to Waddell Creek, California, and recommendations regarding their management. California Department of Fish and Game, Fish Bulletin 98:1-375.