
North Coast Regional Water Quality Control Board

December 3, 2015

In the Matter of Water Quality Certification

for

Benbow Dam Removal Project 40.066, -123.801¹ WDID No. 1B15096WNHU

APPLICANT: California Department of Parks and Recreation
RECEIVING WATER: South Fork Eel River
HYDROLOGIC AREA: Benbow Hydrologic Sub Area No. 111.32
COUNTY: Humboldt
FILE: ECM PIN No. CW-816823

FINDINGS BY THE EXECUTIVE OFFICER:

1. On July 24, 2015, the North Coast Regional Water Quality Control Board (Regional Water Board) received an application from the California Department of Parks and Recreation (CDPR), requesting Federal Clean Water Act (CWA), section 401, Water Quality Certification (certification) for activities related to the proposed Benbow Dam Removal Project (Project).
2. **Receiving Waters:** The proposed Project would cause disturbances to the South Fork Eel River in the Benbow Hydrologic Subarea (Basin Plan Hydrologic Planning Area No. 111.32). The South Fork of the Eel River supports three special-status salmonid

¹ WGS84 datum

species: federally- and state-threatened Southern Oregon/Northern California Coast (SONCC) Evolutionary Significant Unit (ESU) coho salmon (*Oncorhynchus kisutch*); federally-threatened California Coastal (CC) ESU Chinook salmon (*Oncorhynchus tshawytscha*); and federally-threatened Northern California (NC) ESU steelhead trout (*Oncorhynchus mykiss*).

3. **Public Notice:** The Regional Water Board provided public notice of the application pursuant to title 23, California Code of Regulations, section 3858 on October 6, 2015, and posted information describing the Project on the Regional Water Board's website. No comments were received.
4. **Project Description:** The purpose of the Project is to facilitate fish passage and improve aquatic habitat by removing the Benbow Dam from the South Fork Eel River. The dam is located in the Benbow Lake State Recreation Area, approximately 2 miles south of the town of Garberville.

The Benbow Dam is approximately 60-feet-wide, by 300-feet-long, by 20-feet-high, and spans the width of the South Fork Eel River. During the summer months of June through September, prior to 2007, approximately 40 steel I-beams would be inserted into vertical sockets in the dam spillway. Wooden flashboards would then be placed between the I-beams to add an additional nine feet of height above the spillway crest. An approximately 123-acre recreational lake would form behind the dam after the flashboards were installed, typically between mid-June and mid-September.

The Benbow dam is a fish passage impediment. Dam removal would improve access to approximately 100 river miles (437 square miles) of upstream aquatic habitat.

Construction would be completed in two phases. Construction Phase I activities include, but are not limited to:

- Relocation of fish and amphibians;
- Demolition and removal of the cableway anchorage system, utilizing the existing gravel access road on the slope above the north bank;
- Construction staging;
- Construction access road construction. An approximately 2,000-foot-long by twelve-foot-wide construction access road would be constructed at a minimum of 50 feet away from the wetted South Fork Eel River perimeter at the time of construction, except at crossings. The road and construction entrance would start at the east, approximately where Benbow Lake Road meets the southbound Highway 101 on- and off-ramps, and would continue west between the Benbow Lake State Recreation Area parking area and South Fork Eel River, before continuing onto the gravel bar where the East Fork of the South Fork Eel River (EFSF) empties into the South Fork Eel River. The access road would then cross the EFSF, continue west to the end of the gravel bar before crossing the South

- Fork Eel River to a gravel bar on the left bank of the South Fork Eel River, immediately upstream of the dam;
- Installation of temporary bridges and/or culverts at the EFSF and on the South Fork Eel River, both upstream of the dam;
 - Day use area boat ramp removal;
 - Installation of pumping/dewatering facilities to remove water from the work area and to provide water for dust control;
 - Construction of a siltation basin downstream of the work area to handle water from the work area;
 - Diversion of the South Fork Eel River to the north, around the work area;
 - Excavation and removal of buried concrete along the left bank upstream of the dam;
 - Removal of cableway and anchorage systems from both banks to ground surface;
 - Removal of the winch house and storage building from the top of the left bank;
 - Excavation and demolition of the southern dam section; and
 - River bank grading and installation of erosion control.

Construction Phase II activities include, but are not limited to:

- Relocation of fish and amphibians;
- Diversion of the South Fork Eel River to the south, around the work area;
- Installation of pumping/dewatering facilities to remove water from the work area and to provide water for dust control;
- Construction of a siltation basin downstream of the work area to handle water from the work area;
- Installation of a temporary flatcar bridge across the diversion channel;
- Excavation and demolition of the northern dam section;
- Grading and re-contouring of the river channel after dam removal;
- Removal of the construction access road, including de-compaction; and
- Invasive plant removal and riparian vegetation planting along the South Fork Eel River left bank upstream of the Benbow dam, and to the east of the EFSF.

The concrete dam would be broken apart using explosives, a hydro-expansive grout, or other appropriate material. The exact material and method would not be chosen until after the construction contract is awarded. The Regional Water Board requires a dam fracturing plan for review and approval prior to commencement of dam removal, as a condition of the certification (see condition #3, below). The Regional Water Board will review the plan to ensure that the material proposed is the least environmentally damaging practicable alternative, that appropriate best management pollution prevention practices are proposed, and that an appropriate water quality monitoring program is in place to identify any pollutants that may be generated by dam fracturing activities.

According to CDPR, a high degree of geomorphic continuity up and downstream of the dam has been maintained due to the seasonal dam operation and the presence of dam fish passage slots. Sediment accumulations upstream of the dam are limited to an approximately 9,700 cubic yard gravel bar on the left bank, which would be used to fill the scour hole formed below the dam. Lowering of flood waters due to dam removal would reduce upper-river bank saturation and increase bank stability.

5. **Construction Timing:** Project construction is proposed to begin June 15, 2016, and be completed by October 31, 2016. Riparian planting would occur between fall 2016, and spring 2017.
6. **Project Impacts:** The proposed Project would result in approximately 9.4 acres (3,660 linear feet) of temporary impacts to the South Fork Eel River as a result of dam removal, construction access, riparian planting, river diversion, and river grading activities.

One alder and one willow would be removed in the riparian area of the South Fork Eel River to provide room for the construction access road.

Diversion channels utilizing native cobble, gravel berms, and plastic sheeting would be constructed each construction season to divert river flows around the work area. Channels would be constructed to accommodate flows of 700 cubic feet per second.

7. **Mitigation for Project Impacts:** Temporarily impacted areas shall be restored to pre-project or enhanced conditions. Invasive plant removal and planting of native species shall occur on the left bank at the location of dam removal. Willows and alders shall also be planted along the left bank, across from the EFSF/South Fork Eel River confluence to help stabilize the eroding bank.
8. **Avoidance and Minimization for Aquatic Species:** Construction would not occur prior to June 15 in either construction season to avoid and minimize impacts to salmonids. In the spring prior to construction, yellow-legged frog egg masses would be relocated where discovered within 500 feet of the proposed work areas. Exotic plants on the left bank of the dam would also be removed by hand prior to ground disturbance.
9. **Disturbed Soil Area:** Project implementation would result in greater than one acre of disturbed soil area. CDPR would apply for coverage under the National Pollutant Discharge Elimination System General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009-DWQ) and prepare a Stormwater Pollution Prevention Plan detailing best management practices to control pollution within the Project area during construction.

10. **Other Agency Actions:** CDPR has applied to the United States Army Corps of Engineers for an Individual Permit, pursuant to CWA, section 404. CDPR has applied for a Section 1600 Streambed Alteration Agreement from the California Department of Fish and Wildlife. CDPR has requested a Project Biological Opinion from the National Oceanic and Atmospheric Administration (NOAA).
11. **CEQA Compliance:** As lead agency, CDPR prepared an Initial Study/Mitigated Negative Declaration for the Project (SCH 2015092025) in order to comply with the California Environmental Quality Act. CDPR signed a Notice of Determination approving the Mitigated Negative Declaration on November 20, 2015.
12. **Total Maximum Daily Load:** The South Fork Eel River is identified as impaired for sediment and temperature under Clean Water Act section 303(d). The United States Environmental Protection Agency established a Total Maximum Daily Load (TMDL) for the South Fork Eel River in 1999. CDPR would utilize appropriate erosion control, sediment control, and site management best management practices to control pollutants during construction and the drainage improvements would result in a net reduction in sediment contributions. Project implementation would not reduce effective shade nor cause an increase in stream temperatures. This certification would not certify any activities that would contribute to the Eel River sediment or temperature impairment, and would be consistent with and implement the South Fork Eel River TMDL.
13. **Antidegradation Policy:** The federal antidegradation policy requires that State water quality standards include an antidegradation policy consistent with the federal policy. The State Water Board established California's antidegradation policy in State Water Board Resolution No. 68-16. Resolution No. 68-16 incorporates the federal antidegradation policy where the federal policy applies under federal law. Resolution No. 68-16 requires that existing quality of waters be maintained unless degradation is justified based on specific findings. The Regional Water Board's Basin Plan implements, and incorporates by reference, both the State and federal antidegradation policies. This certification is consistent with applicable federal and State antidegradation policies, as it does not authorize the discharge of increased concentrations of pollutants or increased volumes of treated wastewater, and does not otherwise authorize degradation of the waters affected by this Project.
14. This discharge is also regulated under State Water Resources Control Board [Order No. 2003-0017-DWQ](#), "General Waste Discharge Requirements for Dredge and Fill Discharges That Have Received State Water Quality Certification," which requires compliance with all conditions of this certification. A weblink to this Order is included at the end of this certification.

Receiving Water:	South Fork Eel River (Benbow Hydrologic Sub Area No. 111.32)	
Filled and/or Excavated Areas:	Permanent – jurisdictional waters	none
	Temporary – jurisdictional waters	3,660 linear feet (9.4 acres)
Dredge Volume:	none	
Latitude/Longitude:	40.066, -123.801	

Accordingly, based on its independent review of the record, the Regional Water Board certifies that the Benbow Dam Removal Project (WDID No. 1B15096WNHU), as described in the application will comply with sections 301, 302, 303, 306 and 307 of the Clean Water Act, and with applicable provisions of state law, provided that CDPR complies with the following terms and conditions:

All conditions of this certification apply to CDPR (and all its employees) and all contractors (and their employees), sub-contractors (and their employees), and any other entity or agency that performs activities or work on the Project as related to this Water Quality Certification.

Project-Specific Condition

1. CDPR shall implement the *October 2015, Benbow State Recreation Area Dam Removal Project Vegetation Monitoring Plan*, included as an Attachment to this certification.

Project-Specific Conditions Requiring Reports

2. Prior to Project dewatering, CDPR shall submit a work area dewatering and diversion plan for Regional Water Board staff prior review and acceptance. The plan shall detail the proposed work area dewatering pollution prevention and avoidance measures, as well as the river diversion design and installation procedures.
3. Prior to use of chemical or explosive agents for demolition, CDPR shall submit a chemical or explosive agent workplan for prior Regional Water Board staff review and acceptance. The workplan shall detail the manner and method of chemical or explosive use as well as pollution prevention measures to prevent discharge of pollutants to State waters.

Standard Conditions

4. This certification does not authorize drafting of surface waters. Any drafting of surface waters shall be in compliance with State water rights law and diversion requirements overseen by the State Water Resources Control Board’s Division of Water Rights.
5. Herbicides and other pesticides shall not be used within the Project limits. If CDPR has a compelling case as to why pesticides should be used, then a request for pesticide use and a BMP plan may be submitted to the Regional Water Board staff for review and acceptance.

Standard Conditions (continued)

6. All Project activities and BMPs shall be implemented according to the submitted application package and the findings and conditions of this certification. Subsequent changes to the Project that could significantly impact water quality shall first be submitted to Regional Water Board staff for prior review, consideration, and written concurrence.
7. CDPR is prohibited from discharging waste to waters of the State, unless explicitly authorized by this certification. For example, no debris, soil, silt, sand, bark, slash, sawdust, rubbish, cement or concrete or concrete washings, welding slag, 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 State waters.
8. Except for temporary stockpiling of waste generated during demolition operations ("temporary" in this instance means generated and removed during the same working day), waste materials shall not be placed in a manner where the materials may be transported into waters of the State. Waste materials shall not be placed within 100 linear feet of State waters. Exceptions to the 100-foot limit may be granted on a case-by-case basis provided CDPR first submits a proposal that is found acceptable by Regional Water Board staff. Proposals may be detailed within the Stormwater Pollution Prevention Plan included in the Notice of Intent for coverage under the Statewide Construction General Permit.
9. CDPR is liable and responsible for the proper disposal, reuse, and/or recycling of all Project-generated waste in compliance with applicable State and Federal laws and regulations.
10. Fueling, maintenance, storage and staging of vehicles and equipment shall be prohibited within waters of the State (e.g., gravel bars, seeps, ephemeral streams) and riparian areas. Fueling, maintenance, and/or staging of individual equipment types within waters of the State or riparian areas may be authorized if CDPR first prepares a plan for review and approval by Regional Water Board staff that:
 - i) Identifies the specific piece of machinery that may require fueling, maintenance, and/or staging within waters of the State or riparian areas;
 - ii) Provides justification for the need to refuel, maintain, or stage within State waters or riparian areas. The justification shall describe why conducting the activity outside of jurisdictional waters is infeasible; and
 - iii) Includes a narrative of specific BMPs that shall be employed to prevent discharges to State waters and riparian areas;

Standard Conditions (continued)

11. CDPR shall not use leaking vehicles or equipment within State waters or riparian areas. Vehicles and equipment used within State waters shall be checked for leaks at the beginning of each work day.
12. Only 100-percent biodegradable erosion and sediment control products that will not entrap or harm wildlife shall be used. Photodegradable synthetic products are not considered biodegradable. If CDPR finds that erosion control netting or products have entrapped or harmed wildlife, personnel shall remove the netting or product and replace it with wildlife-friendly biodegradable products. This condition does not prohibit the use of plastic sheeting used in water diversion or dewatering activities. CDPR shall request approval from the Regional Water Board if an exception to this requirement is needed for a specific location.
13. Work in flowing or standing surface waters, unless otherwise proposed in the project description and approved by the Regional Water Board, is prohibited.
14. Gravel bags used within State waters shall:
 - i) Be made of geosynthetic material;
 - ii) Have a bound opening to keep gravel. The opening must be sewn with yarn, bound with wire, or secured with a closure device;
 - iii) Be immediately removed and replaced if the bags have developed or are developing holes or tears; and
 - iv) Be filled only with clean washed gravel.

Exceptions to these criteria are subject to the review and acceptance of Regional Water Board staff.

15. Clean washed gravel shall:
 - i) Consist of mechanically-rounded and washed, and/or river run gravel legally obtained from a river or creek bed;
 - ii) Be clean, hard, sound, durable, uniform in quality, and free of disintegrated material, organic matter, and deleterious substances;
 - iii) Have a cleanliness value of at least 85, using the Cleanness Value Test Method for California Test No. 227; and

Exceptions to these criteria are subject to the review and acceptance of Regional Water Board staff.

16. CDPR shall provide access to the Project construction site upon request by Regional Water Board staff.

Standard Conditions (continued)

17. If an unauthorized discharge to surface waters (including wetlands, rivers or streams) occurs, or any other threat to water quality arises as a result of Project implementation, the associated Project activities shall cease immediately until the threat to water quality is otherwise abated. If there is a discharge to State waters, the Regional Water Board shall be notified no more than 24 hours after the discharge occurs.
18. CDPR shall provide a copy of this certification and State Water Resources Control Board (SWRCB) Order No. 2003-0017-DWQ (web link referenced below) to the contractor and all subcontractors conducting the work, and require that copies remain in their possession at the work site. CDPR shall be responsible for work conducted by its contractor and subcontractors.
19. The validity of this certification is conditioned upon total payment of any fee required under title 23, California Code of Regulations, section 3833. The total application fee is \$200. The Regional Water Board received \$200 from CDPR on July 24, 2015.
20. This certification will be subject to annual billing during the construction phase ("Annual Active Discharge Fee") and during the monitoring phase of the Project ("Annual Post Discharge Monitoring Fee"), per the current fee schedule, which can be found on our website:
http://www.swrcb.ca.gov/northcoast/water_issues/programs/water_quality_certification.shtml. These fees will be automatically invoiced to CDPR.
21. CDPR shall notify the Regional Water Board upon Project construction completion to request termination of the Annual Active Discharge Fee and to receive a "Notice of Completion of Discharges Letter." If the Project is subject to the Annual Post Discharge Monitoring Fee, then CDPR shall also notify the Regional Water Board at the end of the monitoring period to request termination of the fee and receive a "Notice of Project Complete Letter." CDPR may be required to submit completion reports at the end of each of these phases. Regional Water Board staff may request site visits at the end of each Project phase to confirm Project status and compliance with this certification.
22. This certification action is not intended and shall not be construed to apply to any discharge from any activity involving a hydroelectric facility requiring a Federal Energy Regulatory Commission (FERC) license or an amendment to a FERC license unless the pertinent certification application was filed pursuant to title 23, California Code of Regulations, section 3855, subdivision (b) and the application specifically identified that a FERC license or amendment to a FERC license for a hydroelectric facility was being sought.

Standard Conditions (continued)

23. In the event of any violation or threatened violation of the conditions of this certification, the violation or threatened violation shall be subject to any remedies, penalties, process or sanctions as provided for under applicable state or federal law. For the purposes of section 401(d) of the Clean Water Act, the applicability of any state law authorizing remedies, penalties, process or sanctions for the violation or threatened violation constitutes a limitation necessary to assure compliance with the water quality standards and other pertinent requirements incorporated into this certification. In response to a suspected violation of any condition of this certification, the State Water Board may require the holder of any federal permit or license subject to this certification to furnish, under penalty of perjury, any technical or monitoring reports the State Water Board deems appropriate, provided that the burden, including costs, of the reports shall bear a reasonable relationship to the need for the reports and the benefits to be obtained from the reports. In response to any violation of the conditions of this certification, the Regional Water Board may add to or modify the conditions of this certification as appropriate to ensure compliance.
24. This certification action is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to Water Code section 13330 and title 23, California Code of Regulations, section 3867.
25. This certification is not transferable. In the event of any change in control of ownership of land presently owned or controlled by CDPR, CDPR shall notify the successor-in-interest of the existence of this certification by letter and shall forward a copy of the letter to the Regional Water Board. The successor-in-interest must send to the Regional Water Board Executive Officer a written request for transfer of this certification to discharge dredged or fill material under this certification. The request must contain the following:
 - i) Requesting entity's full legal name;
 - ii) The state of incorporation, if a corporation;
 - iii) The address and phone number of contact person; and
 - iv) A description of any changes to the Project or confirmation that the successor-in-interest intends to implement the Project as described in this certification.
26. Except as may be modified by any preceding conditions, all certification actions are contingent on:
 - i) The discharge being limited, and all proposed revegetation, avoidance, minimization, and mitigation measures being completed, in strict compliance with CDPR's project description and CEQA documentation, as approved herein;

Standard Conditions (continued)

- ii) CDPR shall construct the Project in accordance with the Project described in the application and the findings above; and
- iii) Compliance with all applicable water quality requirements and water quality control plans including the requirements of the Water Quality Control Plan for the North Coast Region (Basin Plan), and amendments thereto.

Any change in the design or implementation of the Project that would have a significant or material effect on the findings, conclusions, or conditions of this certification must be submitted to the Executive Officer of the Regional Water Board for prior review, consideration, and written concurrence. If the Regional Water Board is not notified of a significant alteration to the Project, it will be considered a violation of this certification, and CDPR may be subject to Regional Water Board enforcement actions.

27. The authorization of this certification for any dredge and fill activities expires five years from the date of this certification. Conditions and monitoring requirements outlined in this certification are not subject to the expiration date outlined above, and remain in full effect and are enforceable.

Conditions 2 and 3 are requirements for information and reports. Any requirement for a report made as a condition to this certification is a formal requirement pursuant to California Water Code section 13267, and failure or refusal to provide, or falsification of such required report is subject to civil liability as described in California Water Code, Section 13268.

The Regional Water Board may add to or modify the conditions of this certification, as appropriate, to implement any new or revised water quality standards and implementation plans adopted or approved pursuant to the Porter-Cologne Water Quality Control Act or section 303 of the Clean Water Act.

Please contact our staff Environmental Scientist, Brendan Thompson at (707) 576-2699, or via e-mail, at Brendan.Thompson@waterboards.ca.gov, if you have any questions.

Matthias St. John
Executive Officer

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Original to: Mr. Roger Goddard, California State Parks, PO Box 2006, Eureka, CA 95502
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cc: Cameron Purchio, U.S. Army Corps of Engineers Cameron.R.Purchio@usace.army.mil
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Environmental Protection Agency, Region 9 R9-WTR8-Mailbox@epa.gov
Leah Mahan, NMFS Leah.Mahan@noaa.gov

Attachment

**October 2015 Benbow State Recreation Area Dam Removal Project
Vegetation Monitoring Plan**

Benbow State Recreation Area Dam Removal Project

Vegetation Monitoring Plan

Prepared by Michelle Forys, Environmental Scientist, October 2015

This document is the vegetation monitoring plan for the Benbow Dam Removal Project at Benbow State Recreation Area (BSRA). California State Parks (CSP) will be removing the Benbow Dam in the summer of 2016 (Figure 1). As part of the project design and permitting requirements, three areas along the banks of the South Fork of the Eel River and its East Branch (Dam Removal Site and Bank Restoration Sites 1 and 2, Figure 1) will be revegetated with native plants, per California State Park genetic integrity guidelines. Bank Restoration Sites 1 and 2 will be vegetated with native tree species (Table 1). Native tree species, seed and transplants will be used to revegetate the newly graded channel bank and terrace at the Dam Removal Site (total of 0.906 acre - 0.445 acre for the graded bank and 0.461 acre for terrace surface) (Tables 2 and 3).

The graded bank will be hydroseeded before receiving an erosion control blanket and will subsequently be planted with trees and transplants. The terrace surface at the Dam Removal Site will have exotic plants removed and receive broadcast seeding with a spreader. Revegetation areas will be irrigated and watered twice a month between May and October or as conditions require. For transplants and trees “dri-water” pellets will be used in conjunction with irrigation.

A total of 20 pounds per acre of seed (all species) will be applied on the terrace surface and 38 pounds per acre (all species) applied to the hydroseeded, graded slope. A “sterile” variety of barley (*Hordeum vulgare*) will be used as an initial erosion control cover at the Dam Removal Site. If native seed collection proves insufficient to comprise a significant portion of the needed seed, the “sterile” barley will comprise a larger fraction. Naked sedge plants (*Carex nudata*) will also be collected from the Dam Removal Site and transplanted in the same general location.

All native species listed are confirmed to be within the park or South Fork of the Eel sub-basin and are acceptable at the project site, though initial native seed collection rates did not show a high recovery rate in terms of weight. Existing native collections will be augmented during the spring before the dam removal and may be re-collected and broadcast in subsequent years if initial cover proves inadequate.

Table 1. Planting palette for the Bank Restoration Sites 1 and 2.

Scientific Name	Common Name	Number of Plants
<i>Salix melanopsis</i> , <i>S. laevigata</i> , and/or <i>S. lasiolepis</i>	sandbar willow, smooth red willow, and/or arroyo willow	175
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood	150
<i>Alnus rubra</i> and/or <i>Alnus rhombifolia</i>	red alder and/or white alder	75
<i>Sequoia sempervirens</i>	coast redwood	5

Table 2. Planting palette for the Dam Removal Site.

Scientific Name	Common Name	Number of Plants
<i>Salix melanopsis</i> , <i>S. laevigata</i> , and/or <i>S. lasiolepis</i>	sandbar willow, smooth red willow, and/or arroyo willow	100
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood	50
<i>Alnus rubra</i> and/or <i>Alnus rhombifolia</i>	red alder and/or white alder	100
<i>Sequoia sempervirens</i>	coast redwood	5
<i>Carex barbarae</i>	Santa Barbara sedge (transplant)	25

Table 3. Seeding palette for the Dam Removal Site (note total application rates in text).

Scientific Name	Common Name
<i>Melica harfordii</i>	Harford's melic
<i>Festuca californica</i>	California fescue
<i>Hordeum brachyantherum</i>	northern meadow barley
<i>Elymus glaucus</i>	blue wild rye
<i>Danthonia californica</i>	California oatgrass
<i>Stipa pulchra</i>	purple needlegrass
<i>Carex nudata</i>	naked sedge
<i>Hordeum vulgare</i>	common barley
<i>Baccharis pilularis</i>	coyote brush
<i>Artemisia douglasiana</i>	California mugwort

Adaptive management practices will be utilized during the implementation of the revegetation. This management approach will be used to attain the highest level of resource protection. The adaptive management approach utilizes existing conditions to drive restoration efforts. To be successful restoration efforts must continually respond to new information. Monitoring results will be analyzed on a yearly basis and efforts will be adjusted to best meet the project's overall goals and objectives.

GOALS AND OBJECTIVES

Monitoring will provide information describing the success of the native plant restoration activities associated with the dam removal. This monitoring will be conducted in areas where restoration activities have been implemented. The monitoring objectives are:

- Detect temporal changes in plant community composition and species cover.
- Measure success of restoration activities (i.e. evaluate revegetation efforts associated with the dam removal).
- Provide feedback for adaptive management to guide management actions necessary to ensure the recovery of the native vegetation at the dam removal site.

The sampling methods outlined in this monitoring plan are designed to meet the following objectives as it relates to the restoration of the project area:

- **Restoration Objective 1:** Increase cover of native plant species at the Dam Removal Site to a total area cover of 70% or more.
 - **Sampling Objective 1:** Obtain 90% confidence that native plant species cover at the Dam Removal Site is within 10% of the estimated true value.
- **Restoration Objective 2:** Decrease cover of non-native plant species at the Dam Removal Site to a total area cover of 10% or less.
 - **Sampling Objective 2:** Obtain 90% confidence that non-native plant species cover at the Dam Removal Site is within 10% of the estimated true value.

RESTORATION MONITORING

In order to respond appropriately to restoration results, one must monitor environmental factors before, during, and after project restoration activities. Restoration monitoring will consist of vegetation and photo monitoring.

VEGETATION MONITORING

Vegetation sampling will be conducted at the Dam Removal Site to determine restoration success (Figure 1). Quadrat sampling will be used to estimate the percent cover of native and non-native plant species at the Dam Removal Site. After the dam infrastructure has been removed and the newly graded channel bank slope and terrace have been revegetated three 110 meter (m) (360 foot) transects will be placed on the left bank of the river and will follow the contour of the project site (Figure 1). The exact placement of the three transects will be determined in the field and Global Positioning Unit (GPS) points will be taken at both ends of the three transects. The percent cover of individual plant species will be recorded along each transect within 1 m² quadrats. Measurements will be taken every 5 m for a total of 22 samples per transect. Within each plot, the following metrics will be estimated:

- Percent cover of each vascular plant species present
- Percent cover of:
 - plant litter/thatch
 - bare ground

The following cover classes will be used for quantifying cover in the field:

- 0 - 1%
- 2 - 5%
- 6 - 25%
- 26 - 50%
- 51 - 75%
- 76 - 95%
- 96 - 100%

The initial vegetation monitoring will be conducted after the dam has been removed and the project area has been revegetated. Monitoring will be conducted annually for 3 years following the initial vegetation monitoring. With the exception of the initial vegetation sampling, transect monitoring will be conducted during the most appropriate floristic period (spring/summer).

PHOTO DOCUMENTATION

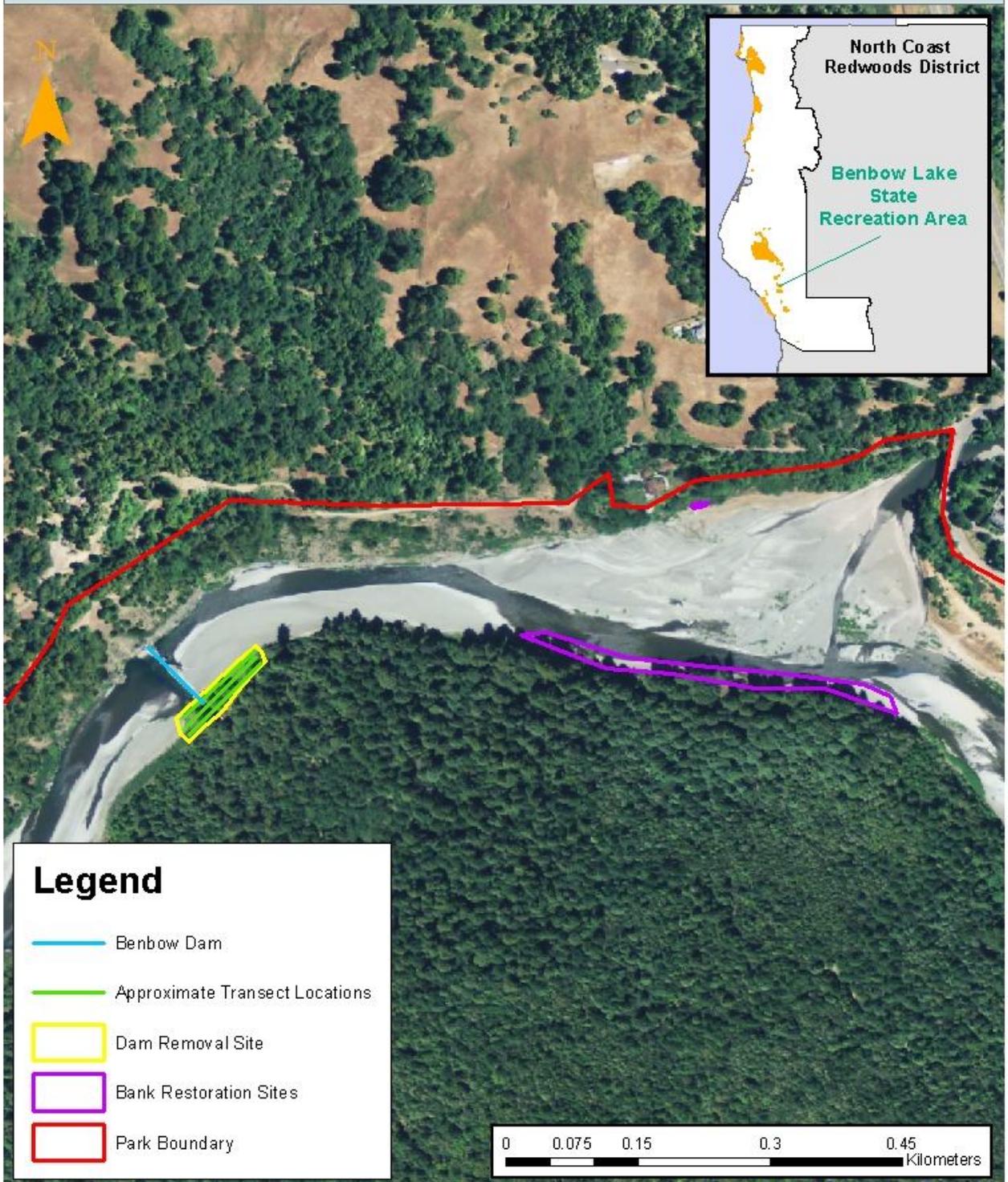
Photo documentation is a valuable tool for assessing project success by documenting evidence of vegetation growth and colonization of native plant species. Photo documentation will occur twice a year (summer and winter) at the three revegetation sites (Dam Removal Site and Bank Restoration Sites 1 and 2) and will be paired with vegetation sampling, when possible. The photographs will be taken from established GPS points throughout the project area and at both ends of the three vegetation sampling transects.

PROJECT REPORTING

Data analysis and project reporting are important for the overall success of the project and to guide adaptive management. An annual monitoring report will be prepared summarizing the revegetation success at the Dam Removal Site and the two Bank Restoration Sites. The report will provide a description of revegetation work completed, monitoring methods used, results obtained, and the biological and ecological status of the treated area. In the event that final proposed results are not obtained after the initial 3-year period a revised restoration and monitoring plan will be developed by CSP employing new restoration techniques. The report will be provided to the California Department of Fish and Wildlife, NOAA Fisheries, and the North Coast Regional Water Quality Board.

Benbow Lake State Recreation Area

California State Parks
North Coast Redwoods District



Benbow Dam Removal Project

Figure 1. Vegetation and Photo Monitoring Plan