

Strawberry Creek Restoration in Redwood National Park Monitoring and Management Plan (revised)

3/24/2014

Overview

The Strawberry Creek Restoration project is located on national park lands within Redwood National and State Parks. Project goals are to re-establish a free-flowing stream and side channel, re-establish a riparian corridor with native vegetation to assist in the control of invasive plants in and adjacent to the stream channel, replace a fish barrier culvert, and eliminate sources of potential sediment delivery to the stream. The park is committed to long-term management and stewardship of the restoration project area and will be responsible for facilitating monitoring and project maintenance to assure project goals are met.

The project area will be monitored regularly by NPS staff. Monitoring will include evaluating plant survival, control of non-native and invasive plant species, changes in wetland condition, performance of engineered structures, fence integrity, and overall ecological changes. Monitoring will consist of periodic site inspections, photo points, vegetation plots, wetland analyses, topographic channel surveys, fish trapping, water quality sampling and water level recording.

The project site has educational opportunities and classes and individual students are already visiting the site. For example, HSU's "Applied Ecological Restoration" course professor is partnering with the park to develop class projects to study the site for many years following project completion. The findings of these studies could contribute to shaping future management of the restoration area.

General Monitoring

As built drawings - Drawings will be prepared at the completion of the project to provide a basis for comparing possible changes in the project area due to channel or structure adjustments or vegetation mortality. The drawings will also document channel complexity.

Photo Points – Photo points will be established to document before and after conditions of the project to capture the evolution of the project area. Photo points will document riparian vegetation establishment and growth, and condition of channel form, channel structures, and culvert inlet and outlet.

Fish distribution monitoring – Fish monitoring will document salmonid presence in the project area where presently there are none. Strawberry Creek has been monitored using minnow traps at six to seven locations since 2006. The fish monitoring stations throughout 1.4 miles of Strawberry Creek have ranged from upstream of the project reach to the confluence of

Strawberry Creek at Redwood Creek estuary south slough. An additional three or more sites will be added within the project area (Figure 1) to monitor fish usage. Monitoring is presently a joint effort of Redwood National Park and NOAA Fisheries Restoration Center.



Figure 1. Locations of fish distribution trapping sites on Strawberry Creek. Presently (2014), sites from the SOC Culvert to the County Waste Transfer Station below the Beaver Dam as indicated by red dots are sampled. Yellow triangles indicate approximate locations where post-project trapping will occur.

Water Quality – Dissolved oxygen (mg/l), water temperature (°C), salinity (ppt), and specific conductivity (µS) are presently being measured, and will continued to be measured, at the same time and locations as fish trapping.

Water Surface Elevation and Groundwater Monitoring

Two recording stage gages record stage level at half-hour increments at the downstream end of the project area. One gage is located in the main channel and another is located approximately 150 feet away within the adjacent wetland. The gages have been in operation since 2010 and data from the gages were used in the design of the planting mounds. Fifteen additional monitoring wells were established in 2013 to assess the effects of this project on surface water and shallow ground water levels, and plant communities in the surrounding wetland. The NPS will monitor

the area for five years.

Riparian Planting Monitoring and Maintenance

The goal of the riparian planting is to maintain adequate shading to prevent re-establishment of invasive grass. Initially, the site will be planted with 3-year old native Sitka spruce and red alder above seasonal high water levels, with willow planted in lower wetter areas. Trees will be planted with 2-foot spacing to achieve dense canopy cover as quickly as possible to prevent re-encroachment of invasive grasses. The intent is to create an overly dense riparian stand immediately after project completion and to thin trees as growth occurs and canopy spacing changes.

Since some tree mortality is expected, trees may not be replaced if in the park's judgment, adjacent trees will fill in gaps to provide sufficient shade. Tree gaps in coastal, wet environments are often filled in quickly by fast-growing trees and natural regeneration. Large scale failure of planted trees that compromise the goal of providing sufficient shade to reduce growth of reed canary grass (RCG) in the channel will require the park to determine the cause and seek remedies before trees are replanted.

A second planting phase will be planned in about ten to twenty years that will include a diversity of understory shrubs if these plants have not already naturally colonized the understory riparian area. The understory shrubs will contribute to a structurally diverse and complex riparian zone as might be expected to occur in more naturally occurring riparian stands.

Vegetation monitoring plots will be established to monitor canopy cover of planted trees. Monitoring will be more frequent during the first few years after completion of construction and planting and be reduced as plantings demonstrate success.

Success criteria for riparian planting

The metric for achieving and maintaining the riparian planting goal will be the presence of adequate shade or cover that minimizes growth of RCG within the new channel to less than 10% cover 10 years after completion of construction. RCG cover will be estimated visually through repeated photography at photo point locations.

Success of the planted trees will target maintenance of 100% canopy cover in the first 10 years, and 80% thereafter, to allow some light intrusion for understory planting. We are purposefully planting very heavily to effect dense shade rapidly, but this will also allow for some mortality early on. Additional mortality is expected as the trees grow and overcrowd. The NPS anticipates removing trees as needed to maintain adequate shade while providing sufficient space for trees to continue optimal growth and diversification. Mortality of some trees may occur due to the water table persisting at levels not anticipated by the designers, by shifts in rainfall amounts or from influences downstream. RNSP will evaluate if water table elevation has played a role in any tree mortality and will replant areas accordingly, if necessary.

Wetland Ecosystem Function Monitoring

Wetland monitoring will be achieved by using the California Rapid Assessment Method (CRAM). CRAM is a streamlined, diagnostic tool used to assess overall wetland condition. A

pre-project CRAM assessment was completed for the project area in 2012 and provides the basis for comparison of post-project conditions. Post-project CRAM assessments will be completed in 2016 and 2019 following project implementation (year 2 and year 5 following implementation).

Fence Monitoring and Management

The high-tensile, six strand electric fence constructed around the perimeter of the project area will require periodic maintenance for as long as the fence is in place. The NPS will monitor and maintain the fencing until plants are of sufficient size to survive elk browsing and rubbing. Presently, funding is available for a California Conservation Corps crew to provide maintenance for the first two seasons following construction. The NPS has experience with maintaining electric fencing in similar settings in the park. Maintenance will include regular brushing along the fence line to prevent electricity loss to vegetation, replacement of damaged wires, posts, and solar chargers. We anticipate the fence to be in place at least 10 years and potentially longer. The NPS will monitor the riparian tree vigor and when trees are of sufficient size to withstand elk browsing, fencing will be removed.

West Tributary Pipe Arch Culvert Monitoring and Management

The pipe arch culvert information will be entered into the NPS facility management database and included in routine park facility monitoring to assess condition and function. The culvert is expected to last a minimum of 25 years, and feasibly 40 -50 years, with no maintenance other than periodic cleaning following large flow events. The pipe has been properly sized for a 100-year discharge and to allow passage of sediment and large wood debris. The road is traveled daily by park service staff, and park maintenance staff will address any trapped wood debris.

In-channel Wood Structures Monitoring and Management

All in-channel wood structures are designed to survive large flows and are expected to slowly decay over many decades. Channel adjustments are expected on the decade time scale and are not expected to jeopardize project success. In the event of catastrophic channel-adjusting flows, a team of NPS geologists, botanists, biologists, and other specialists and project partners will identify any needs for repairs to assure the project is meeting stated goals. The NPS and partners will work together to identify funds for implementing any critically needed repairs.

Reporting

Summary reports will cover the first five years.

References

- Brown, C and N. Hancock. 2012. CRAM Assessment the Strawberry Creek wetland with a floating vegetation mat dominated by *Phalaris arundinacea*. Environmental Sciences Capstone Project. Humboldt State University, Fall 2012. 18 pp.
- California Wetlands Monitoring Workgroup (CWMW) 2009. Using CRAM (California Rapid Assessment Method) to Assess Wetland Projects as an Element of Regulatory and Management Programs. 46 pp.
- California Wetlands Monitoring Workgroup (CWMW). 2012. California Rapid Assessment Method (CRAM) for Wetlands and Riparian Areas, Version 6.0 pp. 95