Red Clover/McReynolds Creek Restoration Project Monitoring Report 2010

Ryan Nupen fly fishing in project area June 2010. (Photo G. Martynn)

Feather River Coordinated Resource Management
Plumas Corporation
Spring 2011

Background

This Annual Monitoring Report, for the Red Clover/McReynolds Creek Restoration Project, covers monitoring and results from 2010 for a few select metrics. This report tiers to the 2007 – 2009 Monitoring Reports. Past monitoring reports, which display data from all metrics, are available at the Plumas Corporation office and at www.feather-river-crm.org on the Red Clover McReynolds project page.

Due to a lack of on-going funding for project monitoring, the Feather River Coordinated Resource Management group (FRCRM) was only able to continue monitoring water temperature, stream flow, turbidity, and fish for this project in the 2010 water year. In 2010 avian monitoring was conducted by PRBO Conservation Science, Plumas National Forest, and Plumas Audubon and is included in this report. Monitoring from on-going watershed monitoring efforts by the FRCRM, helped to answer some of the monitoring questions as discussed below.

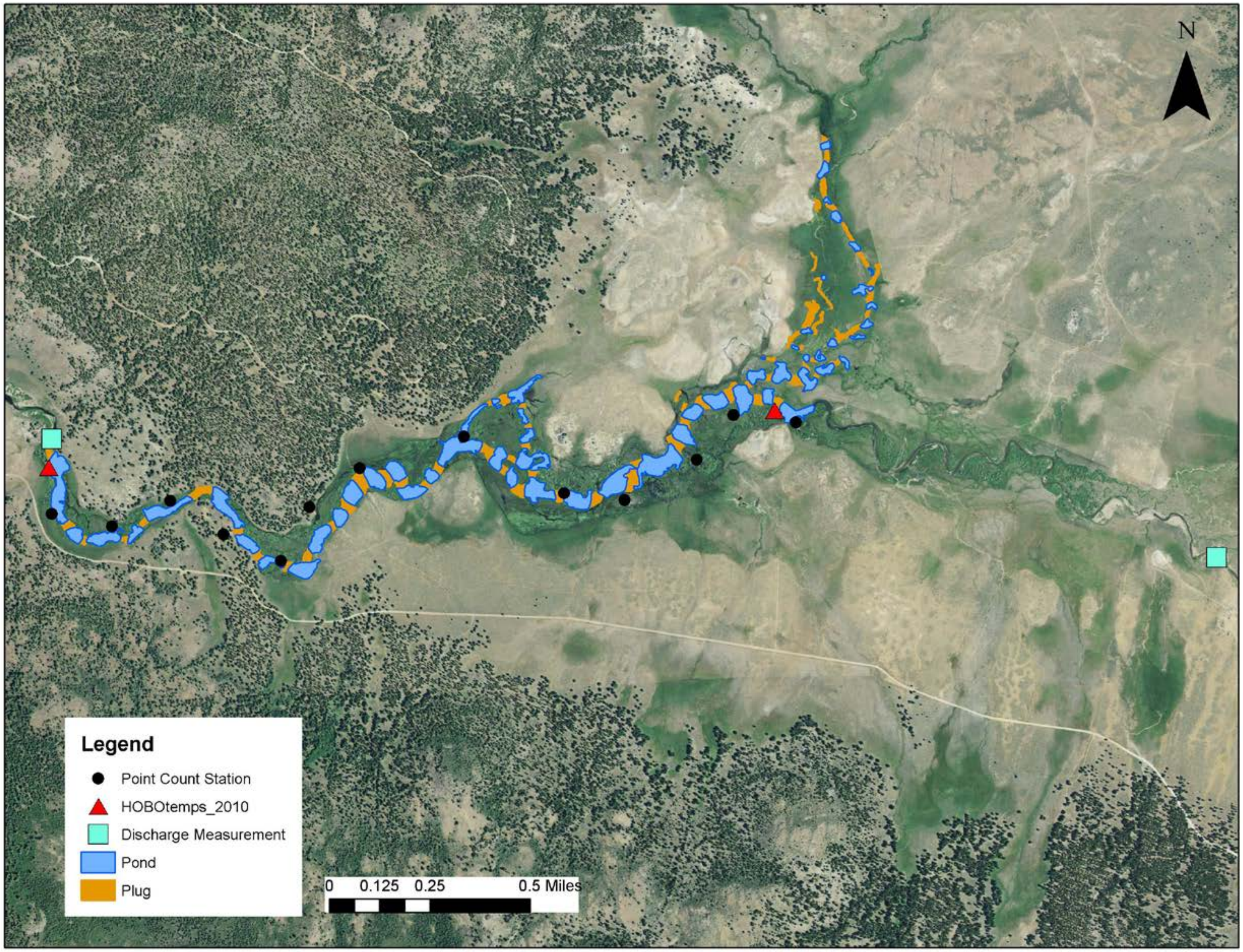
The purpose of this document is to report the results of a fourth year of project effectiveness monitoring, as implemented according to the Project Monitoring Plan. The project was constructed in 2006, from July through November. Most pre-project monitoring was completed in 2005. Post-project monitoring reported herein was conducted in 2007-2010.

The Red Clover McReynolds project area is just downstream of, and partially within, a check dam project implemented by the FRCRM in 1985. Results of the 1985 monitoring effort can be found at www.feather-river-crm.org.

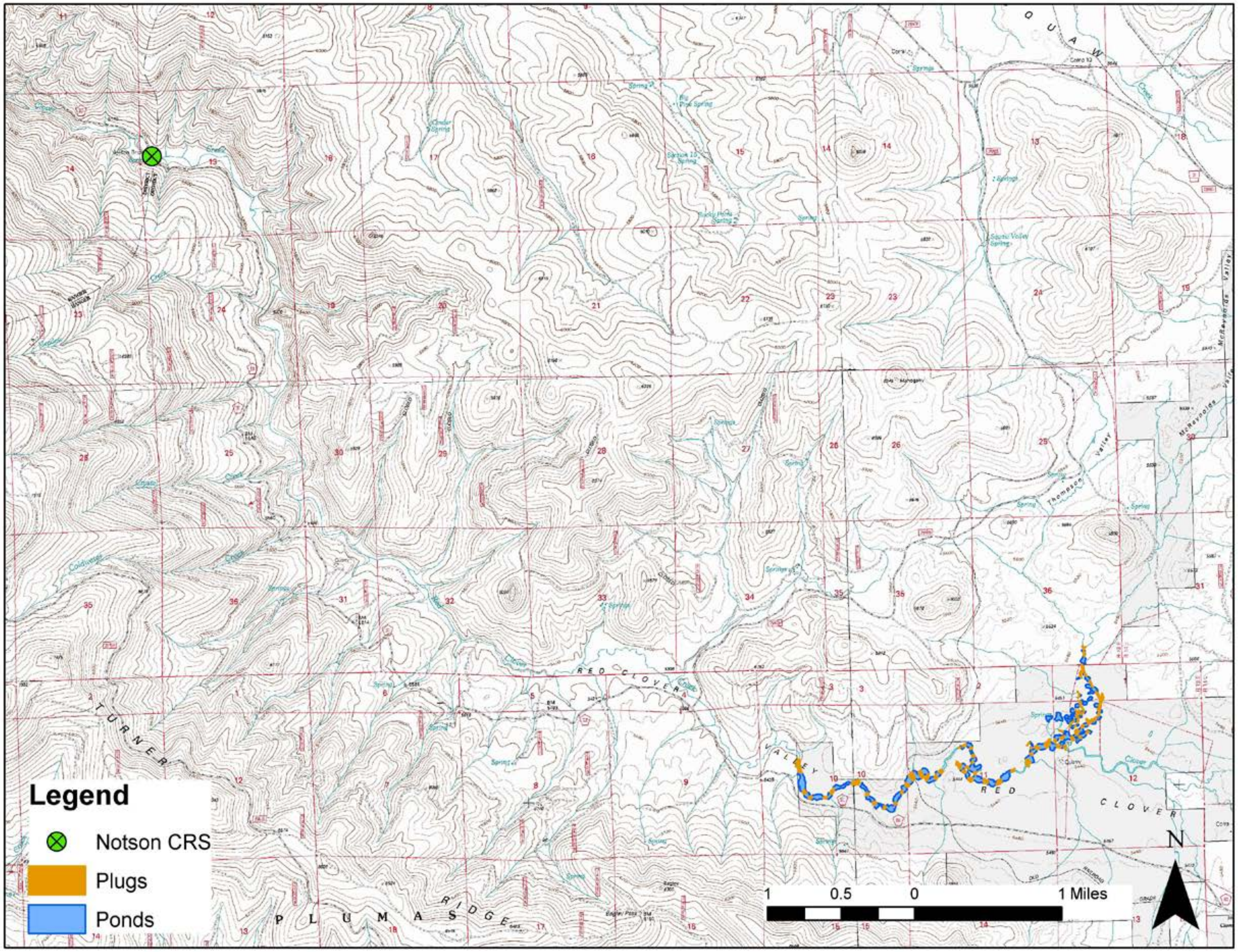
Project Overview

In 2006, 3.3 miles of gullied stream channel immediately downstream of the 1985 project was eliminated. Stream flows were returned to remnant channels at original meadow/channel elevations utilizing the "pond and plug" technique, restoring the functionality of 400 acres of floodplain within Red Clover Valley, along Red Clover and McReynolds Creeks on both private and public lands. Pond and plug is a technique that obliterates a gullied channel by replacing it with a series of earthen plugs and ponds. The excavation of the ponds provided the fill material for the plugs. The Red Clover/McReynolds Creek Restoration Project consists of 59 ponds and 66 plugs. The primary project goal was to improve the water and sediment retention functions of the watershed, with objectives focusing on reduced bank erosion, improved water quality, improved fish and wildlife habitat, reduced flood flows, and increased base flows. Primary funding ($1,101,000) was provided through the State Water Resources Control Board Proposition 13 CALFED Watershed Program, with contributions from Department of Water Resources, Natural Resources Conservation Service, U.S. Forest Service-Plumas National Forest, the landowner, and volunteers.

Map 1: Monitoring Locations in the Red Clover/McReynolds Creek Restoration Project



Map 2: Notson Bridge in relation to Red Clover/McReynolds Creek Project Area



Base Flow

Stream discharge measurements, to analyze the project's effect on base flow, are taken at two spatial scales. The watershed scale is measured at Notson Bridge, located nine miles downstream of the project area at the FR-CRM's continuous recording station, which has been operating since 1999. This station collects stream stage, air temperature, and water temperature every 15 minutes with a Campbell CR10X data logger. The stage and temperature readings are stored as hourly averages and then summarized into daily files at the end of each water year. The FR-CRM staff are responsible for capturing discharge measurements over the range of flows to maintain/update a rating table. The rating table is reviewed and updated annually by Sagraves Environmental Services.

Project scale base flows are also measured 1.5 miles above the McReynolds Creek confluence and below the project grade control structure. Flows at the Notson Bridge station also include several tributary channels, and project effects on flow may be diluted by the time flows reach this station.

Results:
Figure 1 displays pre- and post-project base flows at Notson Bridge in 2000 and 2010. 2000 and 2010 were compared because of the similarity in amount of precipitation (101% of normal precipitation) between these water years. The baseflow discharge in both years is very similar, though 2000 was the end of a wet decade and 2010 was the end of a dry decade. Data are missing from July 5 to August 10, 2000 due to problems with the equipment. The normal historic average precipitation is from the California Department of Water Resources' (DWR) California Data Exchange Center website (http://cdec.water.ca.gov/).

Figure 1. Pre-project vs. Post-project hydrograph at Notson Bridge.

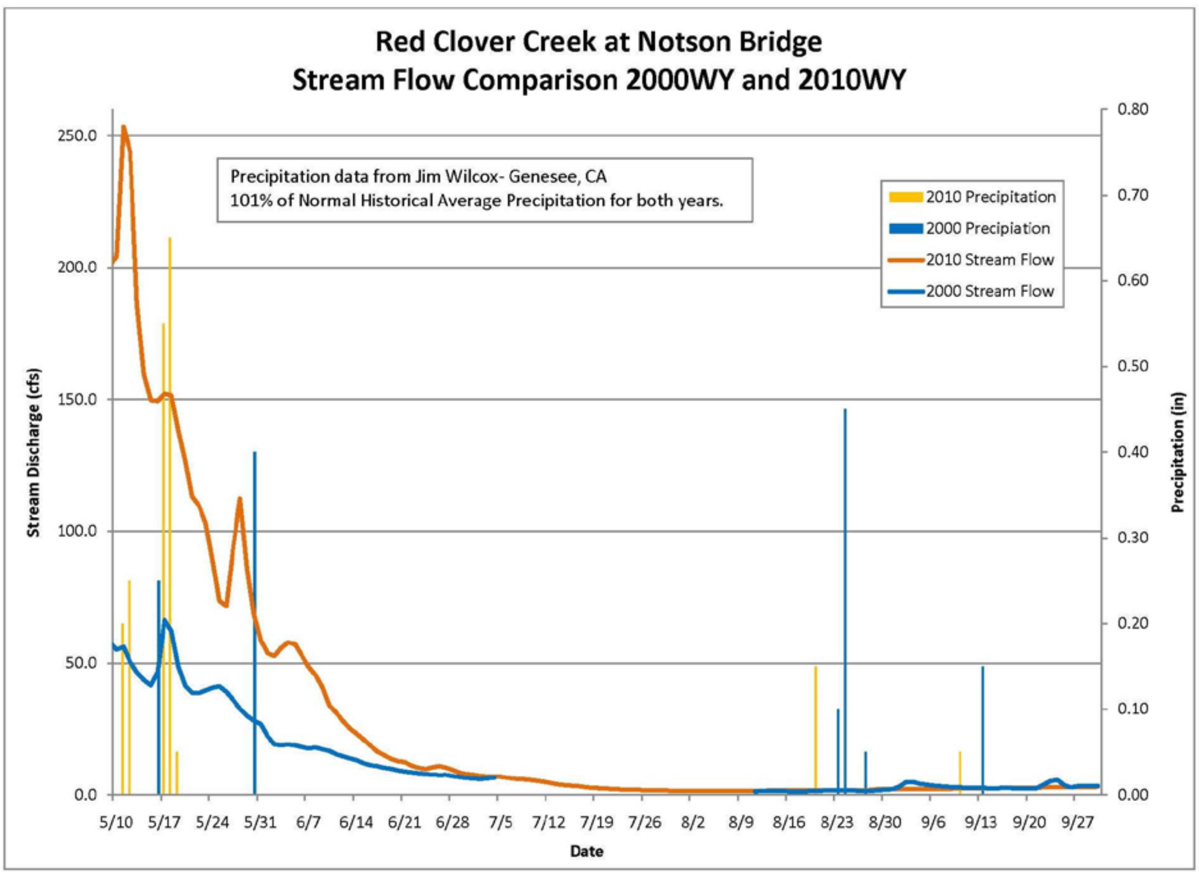


Table 1 shows precipitation totals at Doyle Crossing and Genesee Valley for water years 2001, 2002, 2006-2010 to provide context for Figure 1 and Table 2.

Table 1. Precipitation totals at Doyle Crossing and Genesee Valley

Water Year (10/1-9/30)	2000	2005	2006	2007	2008	2009	2010
Doyle X-ing Precip (in)	Not available	14.56	29.47	11.07	11.49	17.11	14.55
Genesee Precip (in)	43.3	45.50	66.25	31.05	25.40	38.05	33.85

Monthly flow measurements from June through September are taken at the top of the project above McReynolds Creek, and at the bottom of the project just below the rock grade control structure. Flows are measured with a Marsh-McBirney FLO-MATE following the USGS stream discharge measurement protocol. Table 2 on page 6 shows the results of these measurements.

Discussion:
The expectation is that the 2010 data in Figure 1 would show an increase in base flow compared to 2000 due to the project, despite the fact that 2000 was the end of a wet decade and 2010 was the end of a dry decade. However, starting in July the base flows from both years are almost identical. There are small increases in base flow as the season progresses in 2000, due to precipitation events.

In Table 2 (pg 6) the rapid decline in flows from June to July (>90% decrease) seen in pre-project conditions indicates the poor condition of the watershed, and the lack of seasonal storage and release in the project area. It is also interesting to note that there is less water at the bottom of the project area than at the top for every measurement pre- and post-project, except June 2005. The loss may be due to evapotranspiration, or it may be lost into a deep aquifer. The increase of flow in September suggests that the loss is due, at least in part, to evapotranspiration.

The major decline in flows between pre- and post-project conditions was most likely due to three years of drought after project completion. However, in 2007 through 2009, despite the lack of precipitation, there was a less dramatic decline in flows from June to July. The 2010 water year had 20-40% more precipitation than the past few water years and surface water flowed through the project area all year.

It should also be noted that there is a significant difference between the flows at the top of the project between 2007 and 2008-2010. The flow at the top of the project drops to zero during August and September of 2007, while during the same months of 2008-2010 the flows are about 1.5 cfs. It is unclear why inflow dropped to zero in 2007. The measurement cross-section at the top of the project was moved in 2008 to above the 1985 check dam project. Measurement location was moved due to changes in flow at the top of the project area caused by beaver.

Table 2. Pre- and Post- project monthly flow measurements at top of project (above (abv) McReynolds Cr) and below (blw) project area (in cubic feet per second).

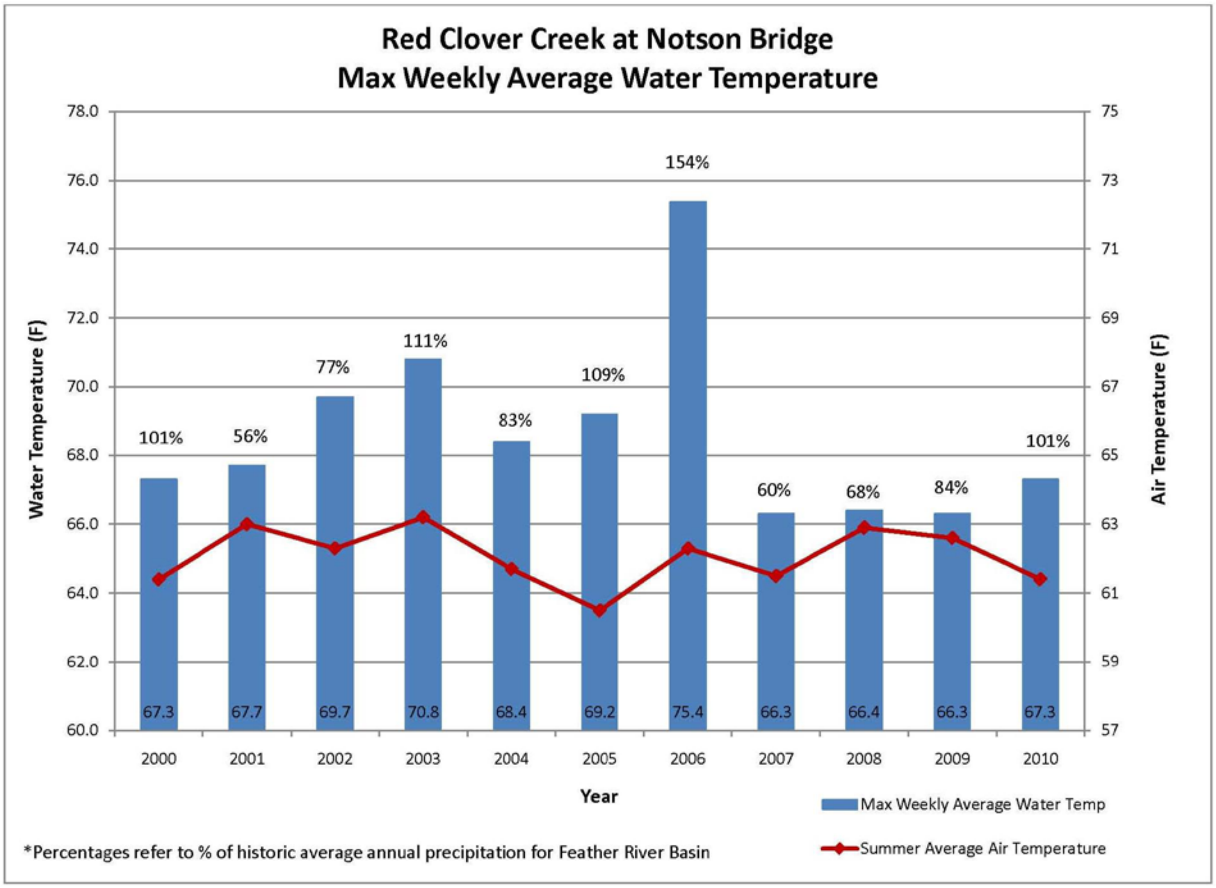
Month	June					July					August					September				
	pre 2005	post 2007	post 2008	post 2009	post 2010	pre 2005	post 2007	post 2008	post 2009	post 2010	pre 2005	post 2007	post 2008	post 2009	post 2010	pre 2005	post 2007	post 2008	post 2009	post 2010
Abv McReynolds	15.3	3.8	2.36	6.88	16.46	1.4	1.2	2.14	1.62	3.2	1.4	0	1.37	1.49	1.88	1.8	0	1.51	1.39	1.6
Blw project	17.8	2.6	1.64	6	16.14	1	0.1	0.49	0.61	1.36	1.1	0	0.002	0.01	0.04	1.6	0	0	0	0.6

Water Temperature

All stream and pond water temperatures are recorded using a HOBO Temp® water temperature logger. Water temperature at the bottom of the project area is only available through July 2010, due to loss of the temperature logger at the bottom of the project area once the Red Clover Poco project construction commenced. The HOBO will be picked up hopefully summer 2011. Until then late summer water temperature data are not available.

Figure 2 shows the maximum weekly average water temperature at Notson Bridge, compared with summer average air temperature and historic average annual precipitation for the Feather River Basin. Summer average air temperature is an average of DWR weather stations at Antelope Lake, Doyle Crossing, Quincy, and Grizzly Ridge from June 1 through September 30. This graph shows that even though 2007 through 2010 were some of the lowest water years in the past 10 years of monitoring at Notson Bridge, they had the lowest maximum weekly average water temperatures. A comparison between 2000 and 2010, both with 101% normal annual precipitation and 61.4 °F summer average air temperature, shows that both years have the same maximum weekly average water temperature (67.3°F).

Figure 2. Maximum (max) Weekly Average Water Temperature at Notson Bridge.



Fisheries

To remediate difficulties with sampling technique in the past, the FRCRM has made use of volunteer fishing days. There have been two volunteer days since project construction, one in June 2008 and one in June 2010. See Table 3 and Map 3 for data from volunteer fishing efforts. Pre-project electroshocking found very few trout. Only one trout (3.5 inches long) was found out of the three sampling areas (please reference past monitoring reports for complete electroshocking data). Despite the lack of comparable pre- and post- project sampling techniques, it appears that the fishery continues to improve in the project area.

Map 3. Red Clover McReynolds Volunteer Fishing Locations

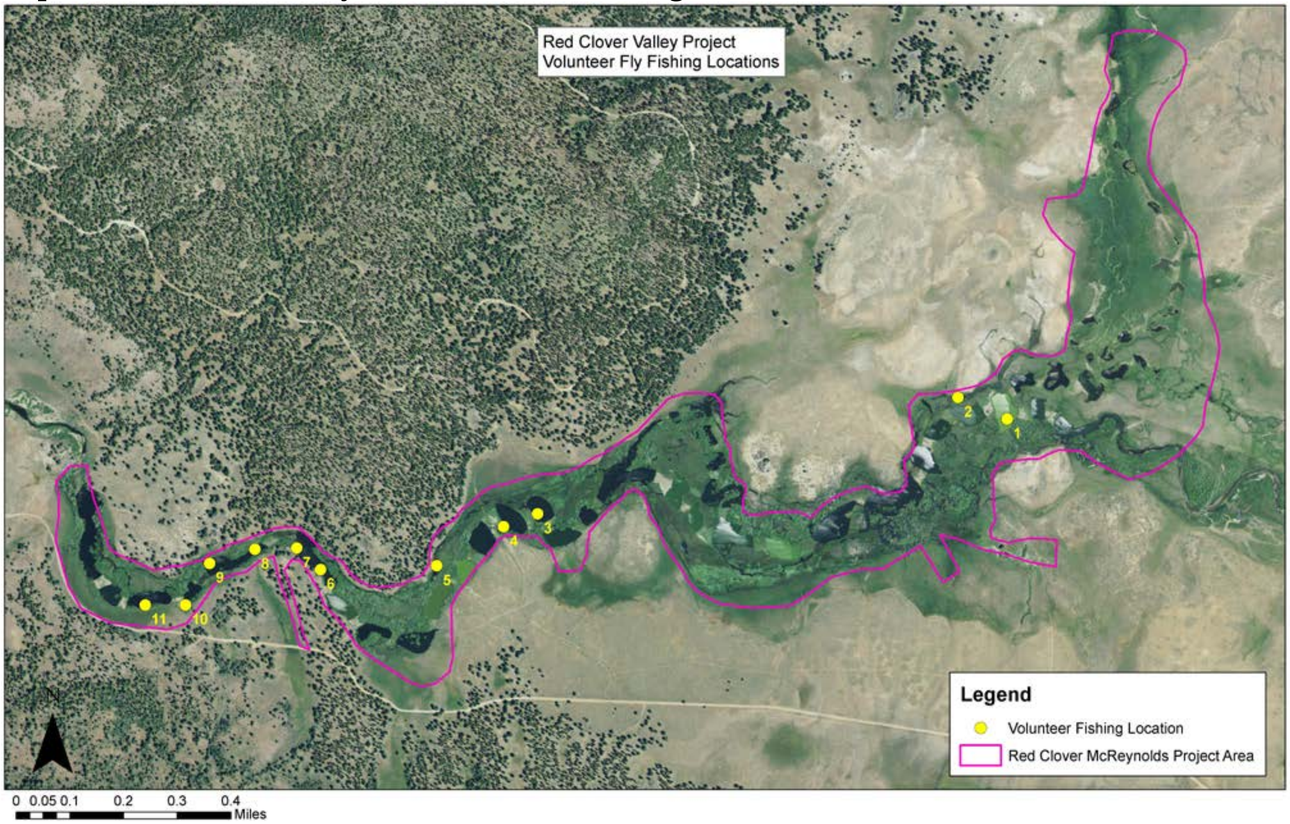


Table 3. Red Clover Creek post-project volunteer fishing days.

June 2008				June 2010			
Location**	Species (Trout)	Size (In)	Visual Only	Location**	Species (Trout)	Size (In)	Visual Only
1	Rainbow	13	✓	3	Rainbow	12	✓
1	Rainbow	15		4	Rainbow	15	
1	Rainbow	16					
2	Rainbow	12	✓	4	Rainbow	12	
6	Rainbow	13	✓	5	Rainbow	16	
6	Brown	16		7	Rainbow	5	✓
6	Rainbow	13		8	Rainbow	8	
				8	Rainbow	11	
				8	Rainbow	12	
				9	Rainbow	12	
				10	Rainbow	16	
				10	Rainbow	13	
				10	Rainbow	13	
				11	Rainbow	12	
				11	Rainbow	14	✓
				11	Rainbow	12	
				11	Rainbow	18	

**Fishing locations are number 1-11 starting at the top of the project

Photo 1. Volunteer Fishing Day. Craig Martynn and Trout- photo by G. Martynn, 2008

What is the project's effects on wildlife?

In 2010, avian point count monitoring was initiated by PRBO Conservation Science, Plumas National Forest, and Plumas Audubon. Results were analyzed by comparing all points in unrestored sections of Red Clover Valley (pre-project Red Clover Poco and unrestored Red Clover Confluence and Red Clover Dotta project areas) to post-project Red Clover McReynolds and 1985 Red Clover Demonstration project areas. Figure 3 compares indices of species richness, total bird abundance, and the richness and abundance of riparian focal species. The riparian focal species included in this analysis are Red-breasted Sapsucker, Willow Flycatcher, Warbling Vireo, Swainson's Thrush, Black-headed Grosbeak, Yellow Warbler, MacGillivray's Warbler, Wilson's Warbler, Song Sparrow, and Lincoln's Sparrow. Species richness is the total number of species detected at the point that are adequately sampled using the point count method Total bird abundance is the sum of total individuals detected per visit.

Figure 3 shows that the Red Clover/McReynolds project area is significantly higher than the unrestored sites for all of the metrics. The 1985 Red Clover Demonstration project shows increase in all the metric from the unrestored sites, but due to the small sample size these differences are not statistically significant. This point count analysis was restricted to a subset of the species encountered. Species that do not breed in the study area, as well as those species that are not adequately sampled using the point count method (e.g. waterfowl, raptors, and wading birds), were not included in the analysis.

In 2007-2009 CA Dept. of Water Resources conducted avian monitoring in the Red Clover McReynolds project area using line transect surveys. Data from these efforts are available in the 2007-2009 monitoring reports. Both methods of survey show increased riparian focal species, however point counts do not take into account waterbirds.

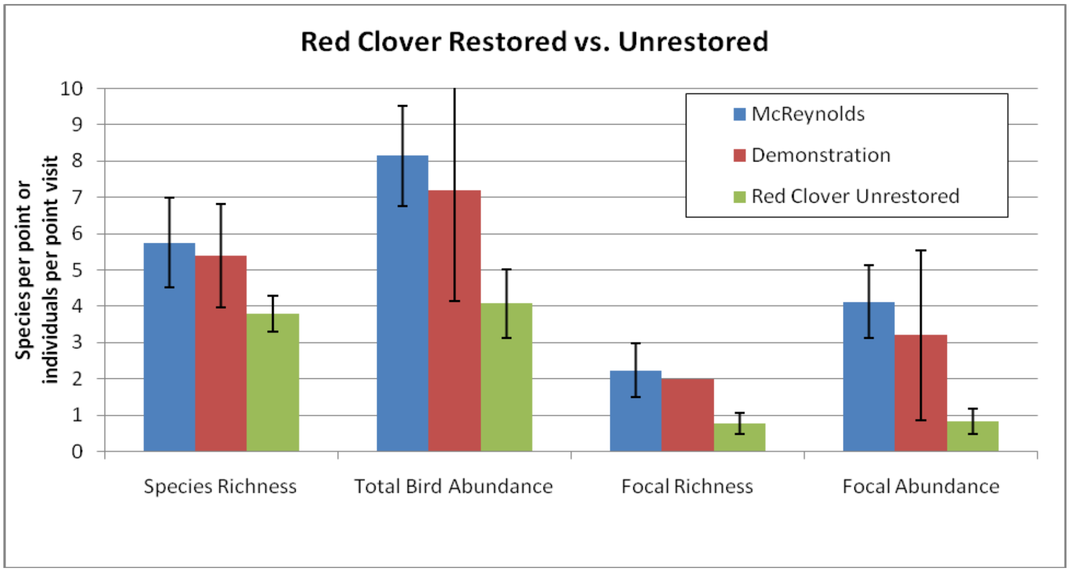


Figure 3. Red Clover McReynolds Point Count Summary: Point Richness and Abundance

Photo 2 and 3. Photo point monitoring of Red Clover Creek at cross-section 19 pre-project June 2006 and post-project June 2008.

Erosion/Sedimentation

The Red Clover/McReynolds Creek Restoration project has re-established the depositional function in the project area with net erosion expected to be near zero. Restoring this function affects erosion rates in two ways: 1) the source of sediment from gully walls is eliminated; 2) spreading high flows over the vegetated floodplain filters sediment delivered from upstream sources. This was demonstrated through turbidity samples taken during high water events in 2007 through 2010. Turbidity is an indicator of sediment transport levels; it does not take into account settleable solids or bedload. Turbidity is measured using an HF Scientific, Inc. DRT-15CE Turbidimeter.

Turbidity samples were taken at the top of the project area above the confluence with McReynolds Creek and just below the bottom of the project area. Samples are taken during most accessible storm events. Throughout 2007 to 2010, turbidity levels were higher entering the project than exiting the project during high flow events. The outflow turbidity is 50% less than the inflow turbidity for 15 sampling periods during the runoff seasons from 2007-2010 for the Red Clover McReynolds project area. Turbidity samples were collected during one accessible storm event in 2010 and show an 8% decrease in turbidity through the project area.