

## **Stone Dairy Creek (Fall, 2001)**

**Background:** The Stone Dairy Creek Project was brought to the FR-CRM by the Plumas National Forest (PNF), Beckwourth Ranger District for inclusion in the Proposition 204 grant proposal and subsequent contract. Stone Dairy Creek drains a 4.0 mi<sup>2</sup> watershed that receives 20" of annual precipitation, predominately as snow. The project area is at the confluence of Stone Dairy and Last Chance Creeks. Geomorphic and archaeological reconstruction of the history of this site indicates that both the Stone Dairy and Last Chance Creek channel systems were subject to local channel incision from historic overgrazing. However, the severe systemic incision present today resulted from the construction of the Clover Valley Railroad for logging purposes. The railroad building, started in Sierra Valley in 1905, reached the Last Chance watershed in the late 1920's and remained active until 1940. The railroad grade was constructed up the middle of the Last Chance meadow system as an elevated grade, built of fill excavated from the adjacent meadow. This channel capture resulted in almost 25 miles of severe (14' to 20') downcutting with a concurrent lowering of the shallow meadow water table and subsequent conversion from mesic site plants to a xeric site vegetative community.

**Implementation:** Stone Dairy Creek survey and data collection began in the summer of 1999. Groundwater monitoring wells had been installed in 1998 under a grant from the Regional Council of Rural Counties (RCRC) in anticipation of future project work. The final design was completed in early 2000 and investigations for archaeological, wildlife and T & E species were undertaken. Ample evidence of a multi-component (prehistoric/historic) archaeological site was identified immediately adjacent to the remnant channel of Stone Dairy Creek. The apparent age and density of the site artifacts necessitated a more intensive analysis of the site, including test excavation. This was because the project had the potential to seasonally inundate the lower margin of the site. This excavation and analysis is required as part of Section 106 of the NEPA process regarding cultural resources. The Beckwourth Ranger District funded the \$20,000 cost of the excavation and analysis in order for the project to move forward. Project clearance was obtained in September 2001. Mitigations were limited to minor changes in plug location in order to not disturb the site. The site was determined to have been occupied as early as 7,000 years before the present and was also the location of the first dairy homestead (1865) in the Last Chance Creek watershed. Construction began in October 2001 and was completed in early November 2001. The budget for the project was \$117,105, including all final design, permitting and construction costs.

Last Chance Creek at the confluence with Stone Dairy Creek has downcut into the meadow 16 feet, with numerous vertical banks. These banks exhibit a well defined series of depositional lenses that lend to analysis of the chronology of meadow building in this part of the Sierra Nevada, in particular the expansive meadows of the Feather River watershed. CRM staff, and geomorphologist Laurel Collins, conducted a stratigraphic analysis of three vertical banks above and below the confluence. This consisted of mapping the defined layers, a general description of the soil layer properties and collection of relic charcoal for radiocarbon dating. The charcoal was prepared and sent to BetaAnalytics, a testing laboratory in Florida. The results indicate that in the last 100 years Last Chance Creek and its tributaries have downcut to sediments that were deposited +7,000 ago. A layer of ash was also sampled near the bottom of the gully wall. This ash was analyzed by the U. S. Geological Survey in Menlo Park, Ca. That analysis identified the source as Mt. Mazama (now Crater Lake) in Oregon, from a precursor eruption ~ 7,015 years ago, just before the eruptive event that created the lake. A preliminary extrapolation of depth vs. years gives a meadow building rate of 0.1 inch/year. This would indicate that sediment supply from the watershed, prior to European influence, was very low. Further ash samples have been collected in upstream reaches of Last Chance Creek. If these are the same event, then a gross

extrapolation of sediment supply by watershed area may be possible. This may be valuable information in developing baseline information in the event that the Feather River becomes subject to Section 303d listing.

The Stone Dairy Creek final design was a collaborative effort between Forest Service resource specialists and the FR-CRM Technical Advisory Committee (TAC). The grazing allotment for this area is vacant and will be managed for resource benefits until the project is fully recovered. The initiation of this project also influenced the Beckwourth Ranger District to address other problem areas further up the Stone Dairy watershed as part of a ecosystem project called the Last Chance Defensible Fuel profile Zone (DFPZ). Approximately \$70,000 worth of road and transitory headcut work has been performed by the Forest Service in addition to the Proposition 204 project in this watershed.

The contract was advertised by the Plumas County Dept. of Public Works (DPW) and awarded to Kingdon Backhoe of Greenville, Ca. The project entailed obliteration of 2,300 feet of gully, while redirecting streamflow into a well defined remnant channel throughout the meadow. The gully obliteration resulted in the excavation and placement of approximately 12,000 yds<sup>3</sup>, creating seven ponds and seven plugs. Several hundred meadow sod mats were transplanted out of the gully prior to excavation or inundation. These transplants were placed in around the margins of the ponds and on to newly-constructed plugs. This transplanting was nearly 100% successful. The project proceeded smoothly with little unforeseen technical difficulty. As a consequence, the project was completed well under budget.

### **Monitoring/Results:**

#### Wells:

Groundwater monitoring data were collected from 1998 through 2002. No other project monitoring data were collected for Stone Dairy. Construction of the pond-and-plug project was completed in November 2001, hence there is just one year of post-project monitoring data. The winter of 2001 (before the project) and 2002 (after the project) were both mild (about 40% normal precip for water year 2001, and 70% of normal for water year 2002.) No appreciable surface runoff occurred in 2002, hence the ponds did not fully fill, nor was the new channel subject to streamflow.

Groundwater was monitored at this project with two wells placed along cross-section 6 (a cross-section of Last Chance Cr that extends up into Stone Dairy meadow), which was surveyed and monumented as part of project design data collection. Figure 6 shows the location of the monitoring wells, both of which are located at about the mid-axis of the juncture of Stone Dairy and Last Chance meadows. Well 1 is closest to Last Chance Creek, along the enclosure fence. Well 2 is about 250 feet to the east.

Each well is constructed of perforated ½” galvanized pipe, with a cap on the bottom and a cap on the top. The depth of each well varies with the ability to drive the well in with a slide-hammer. All wells are driven in using the same protocol- the hammer is placed at the top section of the well, four feet up, and dropped. The number of blows and depth of each well is displayed in Table 4.

Table 4. Stone Dairy well depths and installation.

Well #	Depth (ft) from ground surface	# blows
1	18	935
2 (original)	13.6	680
2 (replaced)	13.6	----

Wells are monitored by dropping a probe down the pipe, which buzzes when it hits water. The depth of water is recorded. Wells were read about once every 2-3 months.

Discussion:

Again, it should be noted that there was only about 40% of normal precipitation for water year 2001, and 70% of normal for water year 2002. Prior to that, there was a flood in January 1997, and more or less normal water years in 1998, '99, and '00.

Figure 7 shows the results of well monitoring from late summer 1998 to fall 2002. The first noticeable difference between the graphs in Figure 4 is the discontinuous line on the well 2 graph. Well 2 broke in late summer 1999, and was not replaced until after project construction in fall 2001. It is unfortunate to not have more pre-project data for well 2, because it responded more dramatically post-project than did well 1.

The groundwater elevation peaks for the three pre-project winters reflect the normal water year of 2000, and the low water years of 2001 and 2002. Post project data show a longer, flatter peak in groundwater elevation. In other words, in 1999, groundwater elevation declined 2.6 feet from March 4 (peak) to April 1. In 2000, groundwater elevation declined 1.6 feet from April 10 (peak) to May 17. In 2001, groundwater elevation declined 2.6 feet from March 21 (peak) to May 21. However, after the project, groundwater only declined 0.3 feet from March 1 (peak) to May 16. And, despite the low precipitation in winter 2002, the post-project peak was about the same as it was in 2001. The limited data at well 2 show low groundwater elevations of almost 9-11 feet, however, after the project, the lowest groundwater elevation was 8.3 feet (Nov 1), similarly, groundwater was only 6-7 feet below the surface until the end of August. The duration and volume of groundwater being held in the meadow was a project objective, and the data indicate that it was successful.