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NATURAL RESOURCE ASSESSMENT AND RESTORATION SERVICES

Horse Creek Dam Removal - Post Project Survey

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Background

Following the successful removal of Horse Creek Dam in October, 2006 Stoecker Ecological returned to the former dam site on June 26, 2007 to assess channel configuration changes and specifically fish passage effectiveness. The following brief summary and accompanying photographs describe conditions encountered approximately 9 month after the dam was removed. In addition, large adult *O. mykiss* were observed in the mainstem Sisquoc River upstream of Horse Creek and are described.

Channel Configuration Changes

On May 11, 2007 Kevin Cooper, LPNF Biologist, sent an e mail informing project participants that he and Tom Murphey had returned to the dam site to remove remaining culvert pieces and pull tamarisk. In addition Kevin noted " the creeks and rivers hardly responded to the small amount of rain this year, so we did not expect to see much (at the dam), and we did not. Rancho Sisquoc reported 7 inches for the year and the river did not (reportedly) flow on the surface at the ranch. On the way up, we noticed that the river looked even lower than it did last fall, and that even the finest sediments were not transported. As soon as we stepped into Horse Canyon creek, we saw a skiff of black ash that had been transported down from the wildfire that burned in upper Horse Canyon watershed, so there was some movement of water and sediment, probably only because the area had burned. At the dam itself, there was about a 4 foot nick at the water course that had walked back about 20 meters (likely intended to be feet not meters) into the dam sediments, and above that, nothing appears to have changed."

Attached photographs from Kevin showed the notch in the deposited sediment and the remains of a piece of the former dam's concrete footing that was perched approximately 2.5 feet above the downstream substrate.

Upon returning to the dam site on June 26th, we observed similar conditions as described by Kevin, with a wedge measuring 7.5 feet wide and 4 feet deep extending 21 feet upstream to heavily mineralized pre-dam channel substrate. The mobilized sediment wedge had deposited immediately downstream of the dam creating a mound of substrate where the former scour pool occurred. The concrete footing was undercut with approximately 0.15 c.f.s. flowing underneath it. Using heavy boulders nearby, we were able to break the remaining concrete footing in half and remove it from the channel that was incising upstream through the sediment. Following removal of the footing, the

wedge-shaped notch was measured to be 6.5 feet tall at the site of the former dam with the same width and upstream incision lengths stated above.

Using these measurements (21 x 6.5 x 7.5), we find that the amount of sediment mobilized in the first winter is approximately 512 cubic feet or just under 19 cubic yards. This amount of sediment represents only 0.12% of the total estimated sediment to be mobilized (15,400 cubic yards) with removal of the dam.

The following photographs show the channel incising through the deposited sediment behind the former dam.

Looking upstream at incising channel from below former dam site.

Looking across incision from river right side.

Looking downstream from the top of the incising channel.

Fish Passage

Due to the low rainfall year following dam removal and lack of connectivity between the Sisquoc River and the ocean there was no opportunity for adult steelhead to migrate to the former dam site. It appears that limited surface flow on Horse Creek allowed at least four Arroyo chub to migrate upstream from the Sisquoc River or downstream from upper Horse Creek to where they were observed 70 feet below the former dam site. Only one Arroyo chub, which was much larger than these 1-2 inch fish was observed in the downstream channel prior to dam removal.

Prior to removal of the remaining concrete footing slab, surface flow was forced under the slab and down a steep cascade with no fish passage opportunities during low to moderate flows. While the overall slope up the notch measured just over 3%, a large boulder in the middle of the notch half way up the slope caused a steeper slope at the downstream end that measured 6%. The upstream 12 feet of the incised channel had a mild slope of 1%. During the survey fish passage was not possible due to lack of water depth and excessive velocity down the steep incising slope of sediment deposits. However, there are numerous impassable riffles and cascades naturally at this time of year and with observed low flows. With the next significant rain and flow event the incising channel is expected to "lay down" upstream and quickly establish a slope of around 2-3% and allow for unimpeded upstream steelhead migration.

Adult steelhead and other wildlife observations

While hiking from Manzana Schoolhouse downstream to Horse Creek several large *O. mykiss* were observed in the Sisquoc River. During previous surveying efforts through this reach in 2001 and 2005 no *O. mykiss* were observed. Immediately downstream from the Manzana Schoolhouse campground outhouse and where the dry Manzana Creek channel enters the Sisquoc River, two *O. mykiss* with estimated lengths of 7 and 15 inches were observed while snorkeling in an isolated pool. The boulder scour pool measured over 7 feet deep with no surface inflow or outflow. Thousands of Arroyo chub were also present in this pool in addition to three Southwest pond turtles.

Pool with 7 and 15 inch *O. mykiss*.

An additional 1000 feet downstream from the above mentioned scour pool surface flows resumed and a small pool measuring 4 feet deep occurred upstream of a small beaver dam and in association with adjacent undercut banks. Four *O. mykiss* ranging from 11 to 17 inches in length were observed while snorkeling this pool.

11 and 14 inch *O. mykiss* in beaver dam pool plus small Arroyo chub.

One additional *O. mykiss* with an estimated length of 13 inches was observed from the bank approximately 2000 feet downstream from the Manzana Creek confluence. This fish disappeared into a thick root mass and could not be observed underwater.

Thousands of Arroyo chub were observed in all stream reaches with surface flow and isolated pool between Manzana Creek and Horse Creek. Two golden eagles were observed flying down the Sisquoc valley past the mouth of Horse Creek.

Three red-legged frogs were observed within the 1200 feet upstream of the former dam site on Horse Creek while investigating upstream.