PRELIMINARY CROSS SECTION OF ENGLEBRIGHT LAKE SEDIMENTS

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CROSS SECTION METHODOLOGIES

OVERVIEW

The Upper Yuba River Studies Program is a CALFED-funded, multi-disciplinary investigation of the feasibility of introducing anadromous fish species to the Yuba River system upstream of Englebright Dam. Englebright Lake (Figure 1) is a narrow, 14-km-long reservoir located in the northern Sierra Nevada, northwest of Marysville, CA. The dam was completed in 1941 for the primary purpose of trapping sediment derived from mining operations in the Yuba River watershed. Possible management scenarios include lowering or removing Englebright Dam, which could release the stored sediments and associated contaminants, such as mercury, used extensively in 19th-century hydraulic gold mining. Transport of released sediment to downstream areas could increase existing problems including flooding and mercury bioaccumulation in aquatic fish. To characterize the extent, grain size, and chemistry of this sediment, a coring campaign was done in Englebright Lake in May and June 2002. More than twenty holes were drilled at 7 different locations along the longitudinal axis of the reservoir (Figure 4), recovering 6 complete sequencess of post-reservoir deposition and progradation. Here, a longitudinal cross section of Englebright Lake is presented (Figure 5), including pre-dam and present-day topographic profiles, and sedimentologic sections for each coring site. This figure shows the depth of the reservoir floor, with a thick upper section consisting of sand and gravel overlain by silts, a lower section characterized by a thin (6-10 m) and a lower section dominated by silt. The methodologies used to create the reservoir cross section are discussed in the lower part of this poster.

LONGITUDINAL PROFILES

1939 River Bed Elevation

The pre-dam reservoir topography was created using digitized contours from the U.S. Army Corps of Engineers map of the study area (Figure 7). The contours were then interpolated to create a digital grid.

2001 Lake Bed Elevation

The present-day lake-floor surface was mapped during an acoustic fathometer survey in May 2001 (Figure 8). These data points were then interpolated to a continuous digital grid.

ENGLEBRIGHT LAKE SEDIMENTOLOGY AND STRATIGRAPHY

Englebright Lake Coring Project

In May and June 2002, scientists from the USGS and the University of Minnesota joined a crew from the DOSECC (Drilling, Observation and Sampling of the Earth's Continental Crust) research drilling company for a campaign on Englebright Lake. Most of the cores were taken using hydraulic piston coring equipment.

SUMMARY

• Englebright Dam is on the Yuba River, the site of extensive hydraulic gold mining in the 19th century.
• The goal of the UYRSP is to assess the feasibility of restoring anadromous fish passage to the upper Yuba River system.
• To map and characterize the sediments stored behind Englebright Dam, the USGS has done extensive surveying and sampling of the impounded material.

Figure 1. Elevation and hillshade map showing Englebright Lake and the surrounding Yuba River watershed. The Yuba River is a major tributary of the Feather River in the Sacramento River system. Also included in the Upper Yuba River Studies Program (UYRSP) study area boundary. The red box shows the region found in Figure 4.

Figure 2. Hydraulic mining of gold-bearing Economic grade deposits was done in the northern Sierra Nevada from about 1852 until the Sawyer Dam was built across the Yuba River in 1939. The dam reduced mining activity in 1884. One of the largest mines was Malakoff Diggins in the South Yuba watershed (Figure 1). This mining activity introduced a large quantity of sediment into the rivers of the Sierra Nevada and San Francisco Bay (Gillen, 1977). This picture was taken circa 1860 (Alpers and others, 1985).

Figure 3. Englebright Dam was built on the Yuba River in 1941 by the California Division of Reclamation, Construction and Operations (Cal Div). The dam was constructed to Mitigate flood risk around Marysville by impounding hydraulic mining sediment in the Sierra Nevada foothills and to provide water for hydroelectric generation in the recreation area and a source of hydroelectric power generation.

Figure 4. Hillshade and elevation map of Englebright Lake. The seven drilling sites of the 2002 coring campaign are shown as well as the main channel (or thalweg) of the pre-dam river digitized from topographic maps. Figure 5 profile transects follow the main channel from A to A'.

Figure 5.Englebright Lake cross section: longitudinal topographic profiles and vertical grain-size distribution sections.

Figure 6. Cross section of Englebright Lake (A), and lake-floor elevation grid overlain with the acoustic fathometer survey lines (B).

Figure 7. The pre-dam reservoir topography was created using digitized contours from the U.S. Army Corps of Engineers map of the study area (Figure 7). The contours were then interpolated to create a digital grid.

Figure 8. May 2001 acoustic fathometer survey on Englebright Lake (A), and lake-floor elevation grid overlain with the acoustic fathometer survey lines (B).

Figure 9. The DOSECC drilling rig on Englebright Lake in May 2002 (A), and the coring operation at night (B). During the coring campaign more than 300 m of sediment was collected from 7 locations in the reservoir (Figure 4).

Figure 10. Hillshade and elevation map of Englebright Lake. The seven drilling sites of the 2002 coring campaign are shown as well as the main channel (or thalweg) of the pre-dam river digitized from topographic maps. Figure 5 profile transects follow the main channel from A to A'.

Figure 11. (right) shows examples of typical silt and clay (A), and sand and gravel (B) dominated cores, respectively.

Cores were analyzed in the USGS Coastal and Marine Geology Team facility in Menlo Park, CA starting in June 2002. Processing began with multi-sensor logging (P-wave velocity, bulk density, magnetic susceptibility) and splitting. The cores were then photographed and described (Figure 11, left).

After splitting, the cores were subsampled at various intervals for grain size, water and organic content, mercury and methylmercury concentration, and geochronology (not reported separately). Figure 12 (left) shows a technician placing a prepared grain-size subsample into the laser particle-size analyzer. Some of the results of this analysis are shown in the sediment sections on Figure 5.

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CROSS SECTION METHODOLOGIES

OVERVIEW OF THE STUDY


Bathymetric and geophysical surveys of Englebright Lake, Yuba-Nevada Counties, CA Please refer to photograph (B), both from 1939. These figures show the region just upstream of Englebright Dam. Englebright Lake is a narrow, 14-km-long reservoir located in the northern Sierra Nevada, northwest of Marysville, CA. The dam was completed in 1941 for the primary purpose of trapping sediment derived from mining operations in the Yuba River watershed. Possible management scenarios include lowering or removing Englebright Dam, which could release the stored sediments and associated contaminants, such as mercury, used extensively in 19th-century hydraulic gold mining. Transport of released sediment to downstream areas could increase existing problems including flooding and mercury bioaccumulation in aquatic fish. To characterize the extent, grain size, and chemistry of this sediment, a coring campaign was done in Englebright Lake in May and June 2002. More than twenty holes were drilled at 7 different locations along the longitudinal axis of the reservoir (Figure 4), recovering 6 complete sequencess of post-reservoir deposition and progradation. Here, a longitudinal cross section of Englebright Lake is presented (Figure 5), including pre-dam and present-day topographic profiles, and sedimentologic sections for each coring site. This figure shows the depth of the reservoir floor, with a thick upper section consisting of sand and gravel overlain by silts, a lower section characterized by a thin (6-10 m) and a lower section dominated by silt. The methodologies used to create the reservoir cross section are discussed in the lower part of this poster.