



CALFed Progress Questionnaire
California Sea Grant College Program

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Project Information

ProjectNo\_2C R/SF-6
StartDate\_3a 12/01/02
EndDate\_3b 11/30/04
ProjectTitle\_4 Using stratigraphic and hydrologic data from the Yuba River system to develop reliable sediment transport predictions

CALFed Fellow contact information

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Additional Research Mentors and Community Mentors

Additional Research Mentors\_8

Form with text: Loraine Flint, Same address as above, email: lflint@usgs.gov

Additional Community Mentors\_9

Empty form box for additional community mentors

**Project Objectives: Please type your responses, and answer the questions in a style appropriate for laymen.**

**ProjectObjectives\_10**

1. Correlate the stratigraphic record preserved in Lake Englebright with the time series of river discharge into and out of the lake.
2. Calculate the volume and mass of sediment deposited in Lake Englebright during individual flood events.
3. Extend the Yuba River sediment rating curve (the empirical relationship between discharge and sediment load) to higher discharges than previously sampled using the correlated flood deposits.
4. Reduce the scatter in the Yuba River sediment rating curve by investigating the influence of changes in bed grain size on sediment transport rate.
5. Test and quantify the hypothesis that Yuba River sediment transport rates are declining since the end of 19th century hydraulic gold mining.
6. Make improved predictions of future sediment transport out of the Yuba River system.

**Summary of progress in meeting each of these goals and objectives**

**ProgressSummary\_11**

- Oversaw analysis of 561 subsamples from Englebright Lake cores and grab samples for grain-size distribution, loss on ignition (organic content), geochronology.
- Estimated that Englebright Lake is 25.5% full with  $2.6 \times 10^7$  metric tons of sediment, which is about 2/3 sand and gravel.
  - Produced a USGS report (in the form of a poster) visualizing the reservoir stratigraphy.
  - Helped with production of a USGS report on the reservoir sediment volumes.
  - Presented a poster on the reservoir stratigraphy at the CALFED Science Conference in January 2003.
  - Gave presentations at the UYRSP Technical Review Panel meeting and the Geological Society of America annual meeting.

The first year of my CALFED Science Fellows Program postdoctoral project was dominated by laboratory sample processing and data analysis. I worked with sediment from more than 300 m of cores and other samples collected from Englebright Lake during 2002 as part of the CALFED-funded Upper Yuba River Studies Program (UYRSP). Analysis techniques of the 561 subsamples included: grain size distribution, loss on ignition (organic content), and  $^{137}\text{Cs}$  and  $^{210}\text{Pb}$  geochronology. I used some of the resulting data to calculate that the reservoir is 25.5% full with  $2.6 \times 10^7$  metric tons of sediment, of which about 2/3 is sand and gravel. I produced a USGS report (in the form of a poster) visualizing the reservoir stratigraphy from the grain-size analyses of the cored sediments. I also helped with production of a USGS report on the volume of sediment deposited in the reservoir. This work forms the basis for correlating the reservoir stratigraphy to the river discharge record, and calculating flood transport quantities. At the end of the year, the first two objectives were approximately half completed.

I presented a poster with preliminary findings from the coring project at the CALFED Science Conference in Sacramento in January 2003. In October 2003, I gave presentations on sediment storage in Englebright Lake at the UYRSP Technical Review Panel meeting in Nevada City, and in a session on management of western U.S. forestlands at the annual meeting of the Geological Society of America in Seattle.

how they were resolved. Describe any ancillary research topics developed.

**Modifications\_12**

I am leaving my postdoctoral research geologist position with U.S. Geological Survey(USGS) at the end of April 2004. This summer, I am starting a new position as an assistant professor with Department of Geology and Geophysics at Boston College (BC). I have submitted a revised budget for year two to California Sea Grant.

During the period of year two while I am with the USGS (December 1, 2003 to April 30, 2004), I will submit a manuscript titled "Estimating rates and properties of sediment accumulation behind a dam: Englebright Lake, Yuba River, northern California," to the journal Water Resources Research. In addition, I will publish two USGS reports on the coring and grain-size analysis from Englebright Lake. These materials were completed with collaborators on the CALFED Upper Yuba River Studies Program (UYRSP). I will also begin work on a second manuscript tentatively titled "Reconstructing depositional history and processes from reservoir stratigraphy." I plan to have this article ready for submission to a journal by the end of year two (November 2004) by continuing to work on it during the summer and fall at BC. I will also present my results at the CALFED Science Conference in October. These articles and reports represent the completion of **tasks 1** (Correlate the stratigraphic record with the discharge record) and **2** (Calculate sediment volumes and grain sizes for each event), and objectives 1, 2 and 5. Because I will not have a third year as a postdoctoral researcher, I will be unable to complete **tasks 3** (Extend the sediment rating curve to higher discharges using flood deposits) and **4** (Investigate the roles of flow and supply limitation on sediment transport rates) as part of the fellowship. However, I anticipate that by continuing to work on task 3 with my UYRSP collaborators over the next year or two, and will publish these results. This plan will result in completion of the projected accomplishments and core goals of the project, with significant contributions to all of the objectives from my original proposal.

Several issues related to data collection have come up during the fieldwork components of the project. The Englebright Lake deep coring project in May-June 2002 encountered problems recovering sediment in the coarse, upstream part of the reservoir. Also, UYRSP collaborators have been unable to image the reservoir stratigraphy seismically, which limits our ability to correlate between the deep coring sites. These difficulties make some of the work proposed more challenging, but the goals of the project remain essentially unchanged.

**BENEFITS AND APPLICATIONS:** Suggest the relevance of these new findings to management. Describe any accomplishment, that is significant effects your project has had on resource management or user group behavior. CALFED is looking for "management cue" (see <http://science.calwater.ca.gov/pdf/soemgmtcues.pdf>).

**BenefitsApplic\_13**

During the first year of the project, I focused on calculations of the overall quantities of sediment deposited in Englebright Lake. The techniques I developed to do this will be useful to other scientists studying reservoir deposits in general. Moreover, these quantities have direct implications to the UYRSP goal of restoration of anadromous fish passage upstream of Englebright Dam. A change in dam management may result in downstream retransportation of stored sediments (and associated contaminants), and my initial work provides a boundary condition for modeling the effects of various dam-management scenarios. My future work will use the record of floods preserved in the reservoir deposit to improve our ability to predict sediment transport in the Yuba River. This history will also aid in understanding sediment movement in the Sacramento River-San Francisco Bay-Delta system in general, and how transport rates have changed since the gold rush mining period of the 19th century.

**PUBLICATIONS:** List any publications, presentations, or posters that have resulted from this funded research. Give as many details as possible, including status of paper (e.g., in review; in press), journal name, conference location and date of presentation. Please note (as outlined in the conditions of the award) that each fellow is required to submit an abstract for an oral or poster presentation at each State of the Estuary conference and CALFED Science Conference during the duration of the fellowship.

**Publications\_14**

**Reports**

Snyder, Noah P., and Hampton, Margaret A., 2003, Preliminary cross section of Englebright Lake sediments: U.S. Geological Survey Open-File Report 03-397, <http://geopubs.wr.usgs.gov/open-file/of03-397/>, 1 plate.

Childs, Jonathan R., Snyder, Noah P., Hampton, Margaret A., 2003, Bathymetric and geophysical surveys of Englebright Lake, Yuba-Nevada Counties, California: U.S. Geological Survey Open-File Report 03-383, <http://geopubs.wr.usgs.gov/open-file/of03-383/>, 20 p.

**Presentations and abstracts**

Snyder, Noah P., Childs, J.R., Hampton, M.A., Rubin, D.M., Alpers, C.N., Flint, L.E., Curtis, J.A., Wright, S.A., Topping, D.J., 2003, The history and future of sediment deposition behind Englebright Dam, Yuba River, northern California: Annual Meeting Expanded Abstracts, Geological Society of America, Seattle, WA, November 2-5, 2003.

Snyder, Noah P., 2003, UYRSP sediment studies: sediment deposited in Englebright Lake: Upper Yuba River Studies Program Technical Review Panel meeting, Nevada City, CA, September 30-October 2, 2003.

Snyder, Noah P., Rubin, D.M., Alpers, C.N., Flint, L.E., Curtis, J.A., Childs, J.R., and Haskell, B.J., 2003, Preliminary results from the 2002 Englebright Lake coring project: a record of rapid sedimentation in the Yuba River system: CALFED Science Conference, Sacramento, CA, January 14-16, 2003.



**COOPERATING ORGANIZATIONS:** List those agencies and/or persons who provided financial, technical or other assistance to your project since inception. Describe the nature of their collaboration.

CoopOrganiz\_15

A central goal of this project is to add to the scientific and decision-making value of the Upper Yuba River Studies Program (UYRSP), which is funded by the CALFEDEcosystem Restoration program. I collaborate directly with Charles Alpers and Lorraine Flint (principal investigators of the UYRSP, from the USGS in Sacramento) on the sediment and water-quality studies of the program. The UYRSP funded the sampling campaigns in Englebright Lake used for this study, and many of the laboratory analyses. I also work with other members of the UYRSP Agency Team: participating in meetings; sharing figures, data, and interpretations. I gave a presentation at the UYRSP Technical Review Panel public meeting in Nevada City in October 2002.

**AWARDS:** List any special awards or honors that you, or mentor or members of the research team, have received during the duration of this project.

Awards\_16

None

**KEYWORDS:** List keywords that will be useful in indexing your project.

Keywords\_17

sediment transport, reservoir sedimentation, habitat restoration, EnglebrightLake, Yuba River

**PATENTS:** List any patents associated with your project.

Patents\_18

None



