CALFED Quarterly Progress Report

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CALFED Project #: ERP-01-NO1
Period ending: March 2004

Subtask 1: Restoration (J. Quinn)

Our group is currently in the process of acquiring and analyzing ecological monitoring data from previous studies in the Cosumnes River floodplain. In particular, we are collaborating with ecologist Mandy Tu to make available riparian plot surveys from the years 1995-1998. These data are not geo-referenced, nor are they digital; however, they do provide a unique opportunity to gauge trajectory of restoration efforts within the Cosumnes River floodplain and the Cosumnes River Preserve. Serving as a benchmark, we will revisit these sites during the upcoming field season to replicate key field measures. These temporal data will then be incorporated into developing and analyzing methods to determine overall restoration success within the study site.

Additionally, we are in the process of evaluating a new database structure developed by The Nature Conservancy to track restoration activities and wee eradication efforts. We will determine its efficacy and, if acceptable, will incorporate key pieces into our own data collection efforts. These ongoing data collection efforts also include photographic documentation of early spring flooding, floodplain condition, vegetation response to flooding, and key riparian vegetation species for the development of field guide materials.

Subtask 2a: Hydrologic Analysis (G. Fogg)

The largest flow event during our data collection period occurred in February, 2004. Sediment below the floodplain became saturated between the regional groundwater table and land surface (Figure 1). This may be a fortunate hydrologic occurrence for the young cottonwood trees that have sprouted on the floodplain, whose roots have not penetrated deep enough to reach the shallowest regional or perched groundwater. Geographic locations of newly generated cottonwood trees on the floodplain were recorded for comparison to past vegetation maps and future vegetation surveys.

During the large flood event in February, a log jam was created just downstream of one of the data loggers and a wave of water penetrated a data logger enclosure and damaged the electronic equipment. This data logger was dismantled and brought back to the laboratory for repairs. All other equipment collected data throughout the flood event. In response to the wetting of sediment out on the floodplain, dense networks of desiccation fractures have formed. If another flood event occurs this year, water flowing over fractures will infiltrate at a much greater rate than compared to that of the last prior flood event. Sediment fractures offer a fast pathway for infiltrating water until the clay swells and the fractures seal. From a management perspective, these densely fractured areas may offer an effective pathway for artificial recharge. Furthermore, recharge activities may be most effectively carried out within a few months following a large flood event, after the sediment has drained but while fractures are still present.

We are continuing to develop models of the study reach just upstream from the Highway 99 Bridge. This modeling is providing insight into variably saturated flow beneath the Cosumnes River that is hydraulically disconnected from the regional groundwater. This modeling will provide estimates of the seasonal variation in sediment water availability to the riparian vegetation in this area. Preliminary results suggest that year-to-year climatic variations affect

sediment water availability more than seasonal variations. That is, seasonal variations in sediment water content are much smaller than the changes brought on by a five or ten year flood event.

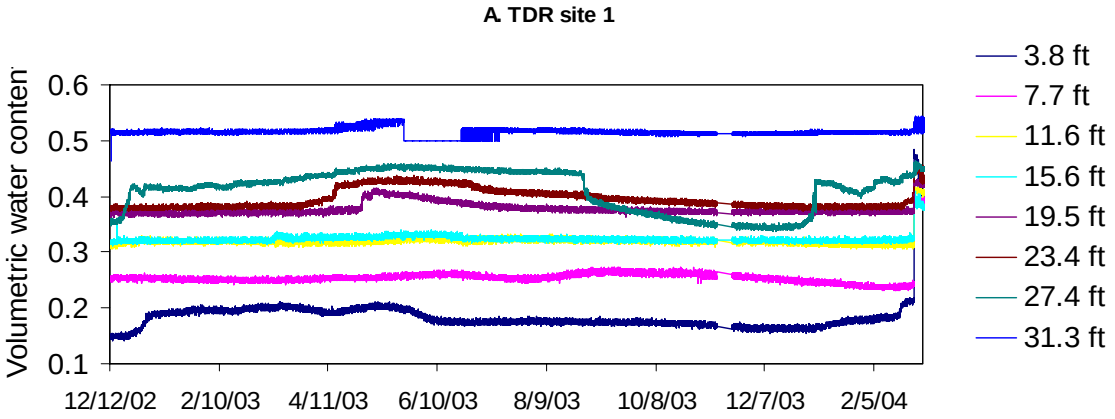

Figure 1. Sediment water content below riparian vegetation on the river bank. Notice the end of the plot (after Feb 28th) sediment water content became greater than during the previous two years.

Subtask 2b: Evapotranspiration Analysis (K. T. Paw U)

The UC Davis biometeorology team, led by Professor Paw U and graduate student J. Kochendorfer, completed the installation of the 21 meter eddy-covariance tower within the Accidental Forest. We began collecting carbon flux and evapotranspiration data using the eddy-covariance technique in mid-January. Soon thereafter, during a storm, a tree fell on one set of the guy wires, causing the guy wires to fail and the tower to lean. Fortunately, none of the sensors were damaged. Despite the half-meter of water in the flooded forest, we succeeded in lowering the tower, replacing the guy wires, and re-erecting the tower. Eighteen days of data were lost due to this unforeseen problem. However, the micrometeorological instrumentation was running again with ample time to collect baseline data in preparation for the return of spring climatological conditions and heightened photosynthesis levels within the forest. While replacing the damaged guy wires, we also installed a microphone for the bat

sensor operated by Dr. W. Rainey in Professor Power's group. The aquatic and terrestrial linkages group is now studying bat activity above the Cottonwood tree canopy due in large part to the presence of the tower in the forest. Data collection and data analysis also continues at the Deer Creek/Costello site, upstream of the Cosumnes River Preserve. At this site, there have been sporadic problems with the net radiation sensor, which is one critical component in the estimation of evapotranspiration from the narrow riparian vegetation zone. We replaced an apparently malfunctioning sensor with another net radiometer, and are currently testing the original sensor for mechanical failure.

Now that both towers are operational, we estimate that the project's accomplishments are approximately 33% towards achieving the project's final objectives. A fairly length dataset exists for the Deer Creek/Costello site, but there are data gaps for some sensors, and the data need further quality control and analysis. Further enhancements to the instrumentation are expected in the near future, which will result in some equipment expenditures. The Accidental Forest site is just recently complete, so we plan to gather data for the next year and beyond until close to the end of the project, with concentration on analyzing the data by the end of this calendar year. Our budgetary expenditures are approximately $93,000 out of the $290,000 allocated to us, and we expect this to be fully depleted by the extended termination of the project (12/2005). Labor costs for additional personnel being recruited to assist with both the field experiments and data analysis, and travel expenditures to a conference in August 2004 will be incurred.

Subtask 3a: (M. Power, UC Berkeley)

We continued to sample aerial insects with aquatic emergence traps and sticky traps while sampling bat acoustic activity at the series of stations on the Cosumnes floodplain and adjacent channels. On several sampling sessions, a

higher resolution GPS was used to improve station location data previously logged using personal consumer GPS units. In Berkeley, laboratory work also continued on prior insect sample analyses. Similarly, software and manual screening, graphical summarization and offline archiving of accumulating bat acoustic data continued. A major task this quarter was partial redesign and reconstruction of the bat ultrasound monitor enclosures and microphone shrouds with improved seals based on failures observed in December and extensive consultations with colleagues testing similar monitoring methods elsewhere. This is complete, but reinstallation of some units as floating monitors (maintaining a constant relationship to the highly dynamic water level) on persistent floodplain ponds awaits arrival of some components.

The 21m floodplain observation tower of the Evapotranspiration Analysis subtask offers an access system to examine the vertical distribution of flying insects within the Accidental Forest and to conduct continuous monitoring of bat foraging activity over this forest canopy block. A long lead monitoring bat ultrasound monitor system was designed, again following consultation with other bioacoustic technology colleagues, and, with generous cooperation from K. T. Paw U and John Kochendorfer, installed on the tower to test for interactions with their active instrumentation. Initial difficulties with electromagnetic interference in this high gain system were resolved through iterative modification and retesting over several field sessions, so that the detection system was working well before cottonwood leaf-out began.

Last quarter we observed dramatic red bat (*Lasiurus blossevillii*) acoustic activity spikes which are reasonably interpreted as the southward passage of migratory aggregations. Limited evidence from observations in Sacramento River riparian areas indicate that the Central Valley axis is also a fall migration corridor for a larger related species, the hoary bat (*Lasiurus cinereus*). The timing and landscape pattern of the northward spring migration of both species is essentially

unknown, but, since they preferentially roost in deciduous tree foliage, close linkage to riparian tree leaf phenology might be expected. However, acoustic monitoring along the Slough through the Tall Forest demonstrates nightly hoary, but not red bat, activity through March, prior to any substantial leaf development that would provide sheltered roost sites.

Subtask 3b: (Grosholz, UC Davis)

This quarter marked the beginning of the last remaining field season for this project. In January we completed preparations for this field season and conducted some pre-flood sampling. In February and March, we responded to two major flood events by implementing our 2004 monitoring plan. We sampled seston and zooplankton nutritional characteristics as well as zooplankton, insect distributions, and periphyton with new sampling techniques to document primary production and secondary production along the residence time gradient. We conducted sampling on transects across the forest-unvegetated boundary in the lower floodplain as well across the residence time transect in the upper triangle floodplain. The sampling was paired with laboratory bioassays, which measured the bioavailability of dissolved and particulate organic carbon across both transects. First results indicate significant differences in DOC concentrations and bioavailability between the upper flood plain sites: the low residence time - low vegetation site near the inflow had the lowest DOC concentration and DOC bioavailability in 5-day assays. DOC concentration and DOC bioavailability were higher at a low residence time – high vegetation and highest at a high-residence time - high vegetation site, corroborating the higher production potential found in our previous zooplankton feeding experiments and in field observations of lower trophic level organism biomass at such vegetated, backwater sites. Zooplankton samples from the high residence time sites indicate the presence of higher densities and larger taxa at sites with low residence time. In addition to our field work, we also gave a talk about our findings to date and our plans for

the remainder of this project to UCD colleagues and submitted an abstract for an oral presentation about results from this project for the 2004 ASLO Summer Meeting.

Subtask 4: PRBO (N. Nur)

PRBO Staff prepared for breeding season monitoring which will start March 29, 2004. This included the project supervisor, Julian Wood, hiring three interns to conduct songbird monitoring at five sites on the Preserve. Humboldt State Graduate student and PRBO biologist, Jeanne Hammond reviewed video of song sparrow (*Melospiza melodia*) nesting during the first quarter. Of the seven predation events captured on video, three were by black rat (R*attus rattus*), and four were by brown-headed cowbird (*Molothrus ater*). In addition, nest success for 2000 through 2003 was calculated for several common breeders on the Cosumnes River Preserve.

Julian Wood and Jeanne Hammond arrived at the Preserve on March 13 to begin preparations for interns arriving March 27-29. This included gathering necessary field supplies and planning the weeklong training sessions to take place March 29 through April 5. Jeanne began collecting data on Tall Forest and Orr Forest starting March 22. PRBO staff attended Cosumnes Research Group meetings and Nadav Nur and Julian Wood presented PRBO's songbird monitoring project to the group. Julian presented "Nest Predators and Predation Risk At the Cosumnes River Preserve: Is an Introduced Predator, the Black Rat (*Rattus rattus*), Limiting Songbird Breeding Productivity?" A pre-season meeting was held at PRBO headquarters where Julian, Nadav, Geoff Geupel, and other senior PRBO biologists discussed project objectives, methods, products and logistics. We approximate that the following deliverables are progressing toward completion:Species Diversity Distribution and Success Report (40% complete); analysis of metapopulation model (15% complete).

Subtask 5: Data Management (J. Quinn)

Our activities included the ongoing development, maintenance, and addition to the Cosumnes Research Group photograph, data, and metadata catalog, which is housed online (http://watershed.ucdavis.edu/photographs/index.php). Data standardization and metadata development were key components to these activities. Other activities included the migration of existing Cosumnes Research Group spatial data holdings from the older data library structure to an ESRI personal geodatabase. The ESRI personal geodatabase standard is now considered the future data storage format, in that it consists of a single data container. This approach will allow for better organization, improved data management capabilities, and easier data sharing. With this migration, all geodatasets were re-projected and clipped to share a common spatial reference; that is, a common geographic extent, coordinate system and precision, compatible with regional imagery and statewide comprehensive geographic data. In addition to providing an extremely stable editing environment, the geodatabase permits simple and efficient export of selected datasets to investigators and other data requestors in a number of formats. Because it is also a functional database, it also allows the inclusion of non-geographic data. It is anticipated that we will be importing such data from our cooperators in the next quarter.

The geodatabase is the foundation for continued editing of the "common names" datasets instituted in the first quarter of project work. It will greatly expedite on-demand cartographic tasks performed for investigators, and will provide the basis for the generation of a set of field and wall maps that will be made available through a modified version of the photographic image catalog.

Subtask 6: Coordination (J. Mount)

Science support activities for this quarter were particularly intense due to seasonal flooding and associated research activities. The Field Coordinator maintained liaison with all the investigators, provided a variety of field assistance services at particularly busy periods, and coordinated use and maintenance of equipment such as ATVs and canoes. In addition to these support services, the Field Coordinator: continued to maintain a baseline dataset for the fishes of the floodplain by sampling during flood events with a beach seine; has continued to prepare the floodplain for integration into the REMOTE program, which will provide real-time hydrologic and weather data for the researchers on the floodplain; and has downloaded the network of temperature sensors on the floodplain for the thermal model, which will be used by many of the researchers. He also made a presentation at the semi-annual meeting of the Cosumnes River Preserve Partners (which includes agency representatives and stakeholders) about the research that is taking place on the Cosumnes River floodplain.