CALFED Quarterly Progress Report

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

Task 1 -- Restoration (J.Quinn)

For the fourth quarter of 2004, we analyzed field data from restored riparian areas, maintained and updated information in our geodatabase, and cross-walked observed species to a refined regional geodatabase of plant species, CalJep – a geospatial database of *Calflora* and *Jepson*. We are also preparing a manuscript for peer review based on our observational studies at the Cosumnes River Preserve.

We are initiating a comparative approach, between local vs. regional observations of species pools, to identify environmental characteristics and restoration actions that will increase total diversity within riparian vegetation. Subsequent analyses and model verification in the coming field season will determine if the restored floodplain at the Cosumnes River Preserve is an appropriate, scaleable replicate for this comparison to CalJep species pools. If so, the combined data and comparative analysis will allow resource managers to determine the available riparian plant species from the naturally occurring pool for a given area and, most importantly, the expected level of diversity within the pool. These *a priori* expectations are critical for future riparian restoration efforts, as it will help guide policy and implementation within the CALFED region.

Task 2 - Groundwater - Vegetation Interactions (G. Fogg and K.T. Paw U)

Subtask 2a: Hydrologic Analysis (G. Fogg)

We have collected temperature data from probes placed in the channel throughout the valley portion of the Cosumnes. These data show the onset of flow at several locations along the river. Preliminary analysis of the data show that much more water is required to initially open up the river than is required to maintain flow continuously. It required more than 100 cfs of flow at Michigan bar for an eight hour period before flow extended beyond the intermittent section of the river, whereas the river continued to reach its confluence even after the flow subsided to 45 cfs. We expected this result since the dry sediment surrounding the river must be saturated before the river can flow. This information will be very useful for future instrumentation during the flow diversion experiment that is planned for next fall. Temperature probes that were installed this fall were removed after the river flowed continuously. We plan to re-install the probes again next fall to be used during the flow diversion experiment.

Work on the reach-based analysis has consisted of further development of a numerical model to simulate surface groundwater interaction. We are presently in the model calibration phase, which consists of matching simulated temperature and water content data to measured data. After this phase is completed, numerical experiments will be conducted to perform a water balance of the system. The model will also be used to evaluate the relationship between perched groundwater, streamflow and vegetation.

Subtask 2b: Evapotranspiration Analysis (P.I. K. T. Paw U & graduate student John Kochendorfer)

In the last three months evapotranspiration measurement and analysis continued at our two field sites. The 500 gallon water tank and the pump at the Deer Creek Costello site were disconnected from the irrigation system on the tower and have been removed from site for the duration of the wet season. Ongoing improvements are being made to the program used to evaluate fluxes from the 10 hertz Accidental Forest eddy-covariance data. Due to the roosting of vultures and damage caused by them to our instruments this Fall we have lowered the Accidental Forest tower several times in order to improve the humane bird deterrents we have in place on the tower. In preparation for estimating above-ground biomass at the Accidental Forest site we also performed a literature review of available allometric equations and their applications. We have been evaluating instrumentation to be purchased for further field work as well.

Budgetary and Logistic Situation

Substantial progress has been made in the past quarter; we estimate that the project's accomplishments are approximately 65-70% towards achieving the project's final objectives. As before, continued enhancements to the instrumentation are expected in the near future, this should entail equipment expenditures within a few days of this report. We plan to gather data for this year (2005) at both of our sites, and perhaps beyond until the end of the project, with concentration on analyzing the data by the end of this calendar year.

Task 3 - Aquatic and Terrestrial Linkages (M. Power and T. Grosholz)
Subtask 3a: (W.E. Rainey, M. E. Power, UC Berkeley)

Field activities this quarter focused on the acoustic monitoring systems for bat foraging activity. For much of the period, surface water remained only in the river channel, Wood Duck Slough and a small remnant of the Triangular Pond. The Lower Floodplain Pond dried in July, an event presumably accompanied by a large pulse of escaping emergent insects. However, the resulting exposed pond bottom did not support the extensive growth of terrestrial plants, which seasonally covers much the Triangular Pond, as the wetted area there contracts (Figs 1, 2). Water levels in the Slough continue to change substantially over short intervals, so that insect emergence traps vary from floated, to stranded on mud, to re-floated within a few hours.

Figure 1. Mud crack blocks in lower floodplain pond center veneered with desiccated aquatic insects on 7/27/2004.

Figure 2. Lower floodplain pond on 11/27/2004, largely unchanged since observation above.

Acoustic monitoring showed low levels of bat foraging activity at all stations (with or without surface water adjacent) after mid-October (coincident with an early rain storm). Declining insolation, the impact of falling temperatures on battery capacity, and biofouling lead to some data gaps and monitor refits. Based on uncertain risks from the substantial flood expected that night, most of the monitors were removed from the floodplain 30 December. New monitors in production during the quarter will replace or supplement the borrowed systems previously employed. The new monitors include controller loggers for more efficient power management and have an anemometer to provide local wind speed, an important covariate for insect abundance, activity, and

availability. Analysis of accumulating acoustic data continued this quarter, as did identification and analysis of insect emergence trap samples collected earlier in the year. Variability between replicate transects and over time remains high (Figure 3).

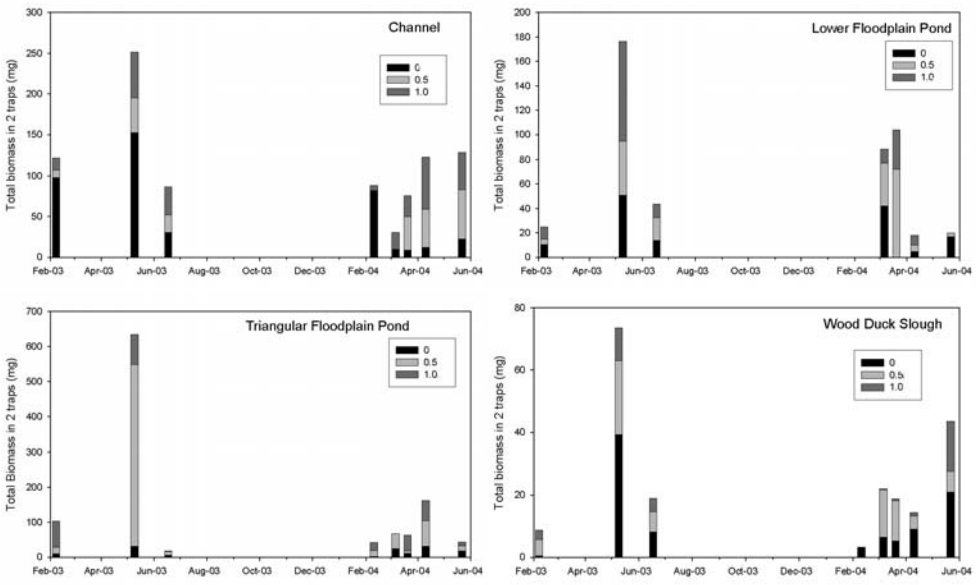

Figure 3. Biomass of emerging aquatic insects at floodplain pond and channel stations. Values are summed from two transects of three 0.25m^2 traps extending from the shore. Bar color indicates traps placed at shoreline (0 depth), and offshore at points that were 0.5X the maximum depth, and 1X the maximum accessible depth of the water body. For safety the maximum depth sampled is ca 1.6m

Subtask 3b: (Grosholz, UC Davis)

This quarter, we presented results from our Cosumnes work at the CALFED Science Conference in Sacramento. Our group presented several talks: Mueller-Solger et al, Grosholz et al., Gallo et al. and a poster (Janusch et al). We are currently preparing manuscripts for publication of these results in peer-reviewed journals as the result of completing this work. We completed all phytoplankton samples from 2004 except for the microscopic enumeration of phytoplankton taxa. We have also worked through much of

the zooplankton and benthic samples from 2004 in addition to what was presented in the talks and posters. We have spent time preparing for the 2005 field season, which is now upon us. We will continue our floodplain monitoring program including high temporal resolution sampling to document changes during all flood phases. In addition focus on measuring phytoplankton, periphyton and microbial production and respiration.

Task 4 - Avian Studies component (N. Nur, G.R. Geupel, J Wood PRBO)

No data were collected in the field during the fourth quarter. Julian Wood PRBO staff Julian Wood, Nadav Nur, Geoff Geupel, Reneé Cormier, and other PRBO staff met to discuss presenting Cosumnes and other Central Valley data at the Western Section Wildlife Society Conference in Sacramento on January 19-20, 2005. Reneé Cormier, PRBO Staff Biologist on the San Joaquin Project, will be presenting. We discussed plans to analyze 2004 point count data from Cosumnes for the upcoming conference. PRBO staff Andrea Pfeffer presented to Cosumnes River Preserve volunteers on October 20. She spoke about the natural history of birds on the Preserve and about PRBO's current collaborative research. Julian Wood and other PRBO staff finalized proofing data (point count, nest, and vegetation) from the 2004 field season.

Task 5 -- Data Management (J. Quinn)

We continued utilizing and refining our Open Source code to support the data management needs of the Cosumnes Research Group. We are in the process of

transferring all web-based services to the new configuration. We continued to add to our Open Source data archive, which integrates photographic images, spatial location, and core metadata, serves as a relevant and timely framework from which to capture restorative science in the Cosumnes River floodplain. Current activities also include the updating and operation of our custom mapping application utilizing the University of Minnesota's MapServer software.

Task 6 – Coordination/Science Support (J. Mount)

All the sensors with telemetry capabilities on the floodplain are now communicating with a central data collection platform. The next step in this process is to stream the data via the internet back to the UC Davis campus. In preparation for the new water year thermistors were installed at 50 locations across the floodplain and hydrological sensing equipment was checked and maintained. With the onset of the new year, flood discharge measurements were taken at all the breaches in the upper triangle in a continuing effort to calculate water flux through the restored floodplain.

Task 7 – Continued Floodplain Monitoring (J. Mount)

In late Spring of 2004, additional funds were added to this project, “Cosumnes II” (ERP#01-NO1), to maintain and refine floodplain monitoring regimes initiated under the “Cosumnes I” project (ERP#99-NO6). The objective of the augmentation is to establish long-term data sets that will improve understanding of the response of lowland floodplain ecosystems to management activities and hydrologic change. Parameters being monitored include hydrology, water quality and aquatic species. During Fall 2004

planning began for the coordination of aquatic species monitoring and for the enhancement of water quality and hydrology monitoring during the 2004-05 flood season. In November and December new hydrology and water quality monitoring devices were deployed and tested.

In an effort to create a mass balance for chemical fluxes moving through the upper triangle on the preserve, three autosamplers were deployed at the three primary breaches. Additionally, YSI continuous water quality monitoring sondes were deployed at the Corps breach, the upper pond, and the western exit breach of the upper triangle. These sondes measure chlorophyll-a (Chl-a), turbidity, temperature, and total dissolved solids (TDS) every 10 minutes. Having such data in real-time adds considerable power to our analysis.

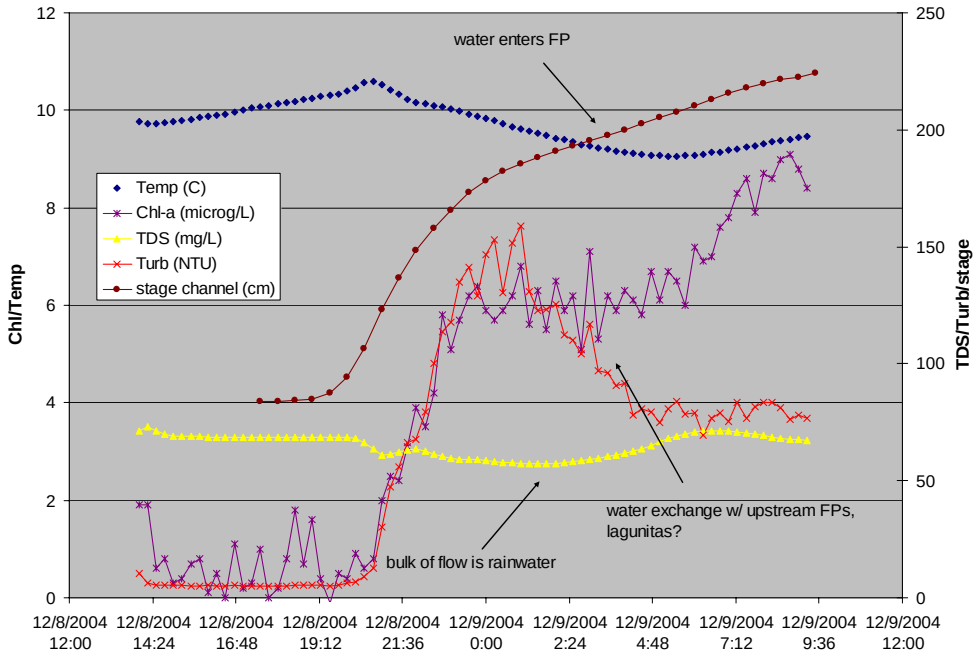

Figure 4. This graph displays data collected from the YSI sonde installed at the Corps breach.

This, the first flood of 2005, was a minor event which only partially filled the floodplain. Figure 4 characterizes several aspects of the storm. The nadir of the TDS data indicate when the majority of the water in the storm pulse is composed of rainwater. Secondly, the divergence of the turbidity and Chl-a data either indicates the continuing entrainment of upstream periphyton after sediment-source exhaustion, or upstream exchange with floodplains – a potential source of Chl-a and sink for sediment. The latter phenomenon is something we plan on quantifying in the upper triangle in the next quarter.