

Project BIO 6.R1.07: Vegetation Mapping: large scale change detection on the effects of dam operations on vegetation

and

Project BIO 6.R2.07: Vegetation Transects: local scale and annual monitoring of vegetation cover and species diversity as related to dam operations.

Schedule of review and data collection for FY07.

November, 2006 - Terrestrial PEP review. Panel convened in Flagstaff and include previous PEP panel members, new panel participants, terrestrial cooperators from 2001 to present and stakeholders.

February 2007 - Release RFP for vegetation transect cooperative agreement.

May 2007 – Convene peer review panel of proposals and identify awardee.

May 2007 – September – Field work and in office work for mapping project

September 2007 – Field work for vegetation dynamics.

Methods

Vegetation mapping – Automated classification and ground truth.

Vegetation transects – Probabilistic sampling of 140 transects that are tied to river surface elevations.

Project BIO 6.R.07 Vegetation Synthesis

GCRMC recognizes that there is a large amount of information in the gray literature associated with riparian vegetation for the Colorado River. The synthesis is intended to utilize the results of these data to construct a synthesis for riparian vegetation. The synthesis would evaluate vegetation change, interactions and ecosystem function at local, geomorphic and system-wide scales. The synthesis will incorporate data from other disciplines, most notably the physical science program, as it has completed a synthesis in 2005. The synthesis should result in several papers that would be submitted for publication in peer-review journals.

The synthesis would consist of two phases with the first phase representing a summary of information and hypotheses generation from review of the material and incorporation of other studies from other rivers. The second phase would be model development to test hypotheses for riparian vegetation change along the river corridor. The model would contribute to our conceptual model of carbon cycling within the CRE.

Schedule of review and data collection for FY07

November, 2006 - Terrestrial PEP review. Panel convened in Flagstaff and include previous PEP panel members, new panel participants, terrestrial cooperators from 2001 to present and stakeholders.

January, 2007 – Initiate review and develop RFP for modeling cooperator

February 2007 - Release RFP for vegetation transect cooperative agreement.

May 2007 – Convene peer review panel of proposals and identify awardee.

July-September 2007 – work with cooperator on model development.

September 2007 – Provide draft /progress report.

Addendum: Information that has come from vegetation monitoring and data collection around experiments since 1996.

BHBF and vegetation: Immediate affect was burial of herbaceous vegetation (grasses, forbs) and a loss of the seedbank (Kearsley and Ayers 1996, 1998, 1999, Stevens et al. 2001).

Marshes located adjacent to backwaters experience burial by up to 2 m of soil rather than scoured (Kearsley and Ayers 1996, Parnell et al. 1999)

Change areal extent of woody vegetation after six months was not significant (Kearsley and Ayers 1996).

High flows that followed in summer of 1996 increased cover and density of species (Austin et al 1996), and the Gooding's willow at RM 209 exhibited good growth (Phillips and Jackson 1997).

Wind reworked newer, higher elevation deposits and prevented plant establishment (Phillips and Jackson 1996).

Literature cited

- Kearsley, M.J.C. and T.J. Ayers 1996. Effects of the 1996 Beach/Habitat Building Flows on Riparian Vegetation in Grand Canyon. Final Report. U.S. Dept. of Interior, Bureau of Reclamation Cooperative Agreement CA 1425-96-FC-81-05006. 65 p.
- _____. 1998. Terrestrial vegetation work for the 1997 steady low and high flows. Final report. U.S. Dept. of Interior, Grand Canyon Monitoring and Research Center. Cooperative Agreement 1425-97-FC-40-20850. 47 p + figs.
- _____. 1999. Riparian vegetation responses: snatching defeat from the jaws of victory and *vice versa*. In Web, R.H., Schmidt, J.C., Marzolf, G.R., and Valdez R. A., eds. The controlled flood in Grand Canyon. Geophysical Monograph 110. American Geophysical Union, Washington, D.C.
- Parnell, R.A., Jr., Bennet, J.B., and Stevens, L.E. 1999. Mineralization of riparian vegetation buried by the 1996 controlled flood. In Web, R.H., Schmidt, J.C., Marzolf, G.R., and Valdez R. A., eds. The controlled flood in Grand Canyon. Geophysical Monograph 110. American Geophysical Union, Washington, D.C. pp. 225-240.
- Phillips, A.M., III and Jackson L. 1996. Evaluation and mitigation efforts for the March 1996 Colorado River test flow experiment. Final report. Hualapai Tribe Cultural Resources Division, Peach Springs, AZ. 10p. + figures.
- _____. 1997. Monitoring Hualapai ethnobotanical resources along the Colorado River, 1997. Final Report. Hualapai Tribe Cultural Resources Division, Peach Springs, AZ. 10 p + figs.
- Stevens, L.E., Ayers, T.J., Bennett, J.B., Christensen, K., Kearsley, M.J.C., Meretsky, V.J., Phillips, A.M.III., Parnell, R.A., Spence, J., Sogge, M.K., Springer, A.E., and Wegner, D.L. 2001. Planned flooding and Colorado River riparian trade-offs downstream from Glen Canyon Dam, Arizona. Ecological Applications 701-710.

High flows (1997) and vegetation: Total areal extent did not change during the year, in spite of inundation of some sample sites (Kearsley and Ayers 1998). Structural density increased, but overall increase in foliar density was not significant. Herbaceous species like horsetail and camelthorn exhibited a flush of growth and density but only above inundation elevations (Phillips and Jackson 1997).

Ecosystem in Grand Canyon. U.S. Geological Survey Circular 1282. pp. 103-122.

Papers In Preparation resulting from TEM project.

Yard, H. K., and Blake, J. *in prep.* Riparian bird ecology of the Colorado River in Grand Canyon from 1980 to present. (Synthesis of bird data since GCES to present.)

Lightfoot, D., Brantley, S. and Kearsley, M.J. *in prep.* The effects of dam operation on terrestrial riparian plants and animals in Grand Canyon. (Synthesis of vegetation, arthropods and invertebrates.)

Lightfoot, D., Cobb, N., and Brantley, S. *in prep.* The effects of dam operation on terrestrial riparian plants and arthropods in Grand Canyon

Vegetation Map 2002

Vegetation along the corridor is represented in percentages for dominant species or vegetation classes below the 97k cfs surface elevation line (Fig. 2, Ralston et al. *in prep.*).

Vegetated areas for each vegetation class appear in Fig. 3 (Ralston et al. *in prep.*). These data establish a baseline for vegetation along the corridor for future change detection by vegetation class.

Map has been used to determine standing biomass and annual terrestrial vegetation inputs for surface elevations to 20k cfs (Ralston and Kennedy, *in prep.*), and similar estimates made for a portion of the river during the Fall High Flow test of 2004 (Yard and Ralston, *in prep.*).

Mapping accuracy meets Federal Geographic Data Committee mapping standards and vegetation classes follow National Vegetation Classification System.

Draft copies of GIS coverages of vegetation map provided to Western Area Power Authority and U. of Nevada (Weisberg and Stevens) for separate research needs. GCMRC is working with GCNP in their park mapping effort (Ralston, pers. com.).

Papers In Preparation resulting from Vegetation Map Project

Ralston, B.E. and Kennedy, T.A. *in prep* Estimates of Above ground biomass and annual terrestrial plant inputs for the Colorado River ecosystem: contributions to a carbon mass balance budget. *Submitting to River Research and Applications in August/September 2006*

Yard, M.D., and Ralston, B.E. *in prep.* Transport of suspended organics and drifting invertebrates during and experimental flood: Colorado River, Grand Canyon, AZ. *Submitting to. River Research and Applications in August/September 2006*

Ralston, B.E., Davis, P.A., Weber, R.M. and Rundall, J.M., *in prep.* A Vegetation base map for the Colorado River in Grand Canyon: Mapping riparian vegetation in an arid climate. *Journal to be determined.*

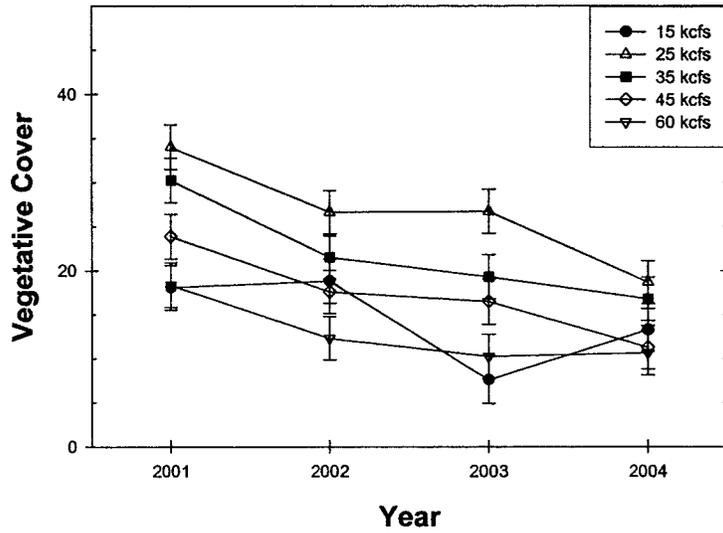


Figure 1. Change in vegetative cover across all four years of sampling in the five stage elevation zones. Vertical bars represent ± 1 standard error (from Kearsley et al 2006).

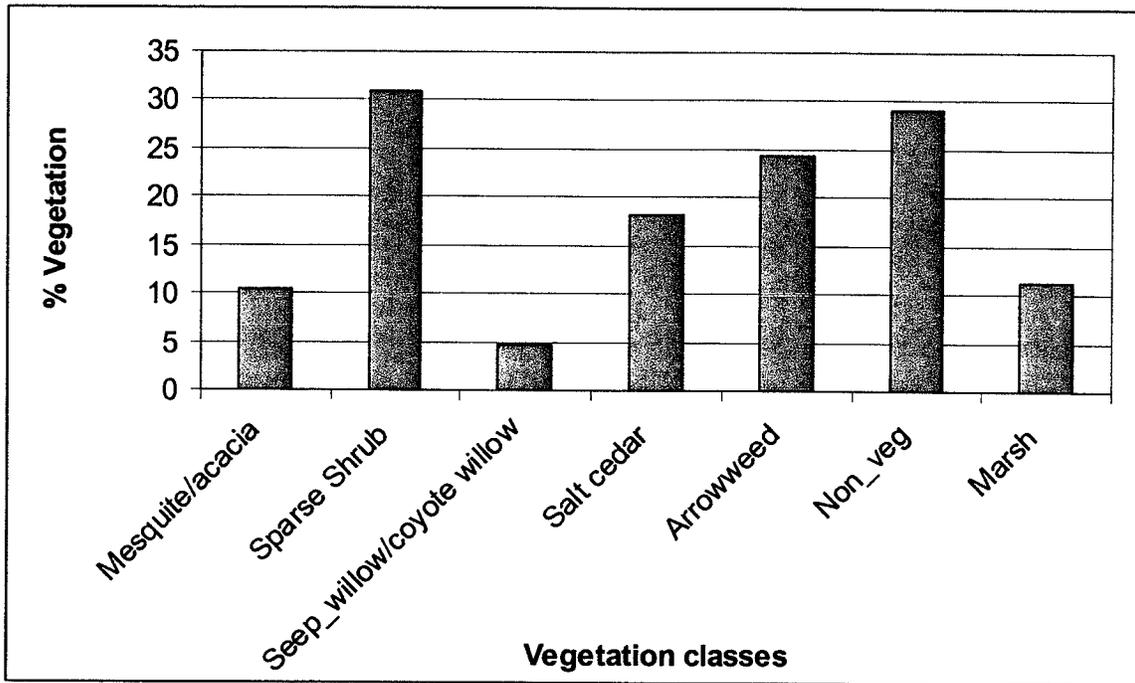


Figure 2. Percentage of six vegetation classes found within the Colorado River ecosystem from Glen Canyon Dam to the western boundary of Grand Canyon National Park (from Ralston et al., *in prep.*).

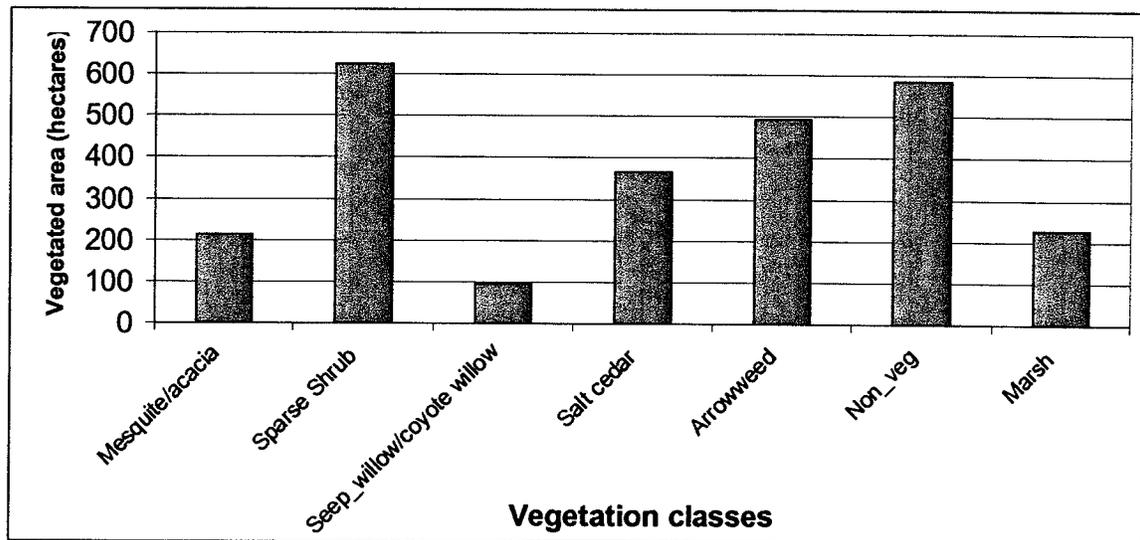


Figure 3. Area of covered by six vegetation classes found within the Colorado River ecosystem from Glen Canyon Dam to the western boundary of Grand Canyon National Park (from Ralston et al., *in prep.*).