

MESM 2005 Group Project Proposal:

Use of Bioassessment to Evaluate Aquatic Ecosystem Conditions and Responses to Anthropogenic Activity in Los Padres National Forest

PROPOSER

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FACULTY SPONSERS

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STATEMENT

Monitoring aquatic biological response to land use practices can provide valuable insight to land management strategies that minimize human impact on streams and rivers. One method for measuring aquatic ecosystem health evaluates benthic macroinvertebrate (BMI) assemblages and their variance from regionally relevant reference indices. In many situations, monitoring of BMIs is preferable to traditional physical and chemical constituents because these organisms are (1) sensitive to different types of stressors, (2) have variable responses to different perturbations, (3) integrate multiple stressors over time and space, and (4) have a closer association with many important beneficial uses of water (e.g., fish).

In recent years, state and federal agencies have become increasingly involved in developing and implementing bioassessment methods to monitor the health of streams and rivers (SWRCB 2003). The most common method used in the United States is the multi-metric, benthic index of biotic integrity (IBI, Karr and Chu 2000). A second approach, which employs multivariate statistical River Prediction and Classification System (RIVPACS) models, is used more extensively in the United Kingdom¹ and other parts of Europe, Australia², and Canada. The U.S. Forest Service (USFS) and its partners have funded development of both types of bioassessment models for use in California. These quantitative BMI methods can enable identification of areas of potential biological impairment and possible causes (grazing, roads, recreation, etc.) and provide information regarding restoration and conservation needs and priorities.

OBJECTIVES

The objectives of this study are to use existing BMI data, bioassessment models, and other relevant watershed data to:

- Assess stream conditions at each of 20 monitored sites in 5 watersheds on the Los Padres National Forest (Monterey to Ventura counties).
- Evaluate conditions of the watersheds as a whole.
- Identify activities that may be responsible for any observed impairments of BMI populations.
- Recommend and prioritize additional sampling, analysis, and restoration activities.

¹ http://www.dorset.ceh.ac.uk/River_Ecology/River_Communities/Rivpacs_2003/rivpacs_introduction.htm

² <http://ausrivias.canberra.edu.au/Bioassessment/Macroinvertebrates>

- Critically evaluate the two prominent methods for macroinvertebrate bioassessment.

SIGNIFICANCE

An assessment of the condition of aquatic biota the indicated water bodies using both the RIVPACS and IBI methods would:

- Help prioritize restoration and conservation efforts by the USFS and partnership agencies.
- Provide information for immediate management application, as well as the foundation for future evaluations of remediation efforts and continuous monitoring over time.
- Compare the discriminatory power of two distinct approaches to bioassessment.
- Be among the first to apply recently developed IBI and RIVPACS models (Ode et. Al 20003, Hawkins 2003) on National Forests in CA.

BACKGROUND

In 1999 and 2000, as part of a program to begin evaluating stream conditions and the possible effects of various management activities on anadromous fish, the USFS collected BMI data from several areas on the Los Padres National Forest. Samples were taken at potentially impacted sites and relatively undisturbed but otherwise fairly similar reference sites. Samples were processed at the Utah State University BugLab and raw BMI data is available for each of these sites, but this data has not yet been analyzed. With recent development of two separate bioassessment models, a more robust analysis than previously envisioned is now possible.

STAKEHOLDERS

- U.S. Forest Service
- CA Department of Fish and Game
- National Marine Fisheries Service
- U.S. Fish and Wildlife Service
- CA Regional Water Quality Control Boards
- Conservation agencies
- Forest land users (rangeland permittees, general public)
- Adjacent landowners
- Downstream water users

APPROACH AND AVAILABLE DATA

Approach

Use existing BMI data, bioassessment models, and other relevant watershed data to assess the health of selected streams and watersheds on the Los Padres National Forest. This will involve comparisons of measured BMI data from all sites with modeled reference conditions and comparisons between potentially impacted and selected reference sites. This information will be integrated with other analysis of existing GIS layers, aerial photographs, and other relevant data. Short site visits will ensure that this information is analyzed in the proper context. GIS will be used to designate areas of ecological impairment and Forest activities that may be causing observed impacts. By implementating both RIVPACS and IBI mehtods, this project will provide a critical evaluation of these aquatic ecosystem assessment techniques that is valuable to the broader community as a whole.

Data

- Macroinvertebrate data from 20 different reference and potentially disturbed sites.

- USFS Corporate and Resource Group GIS layers (e.g., Diblee geology, soils, 10-m DEMs, streams, road networks, recreation sites, grazing allotments, stream water chemistry and flow monitoring).
- Aerial photographs.

DELIVERABLES

A final report and presentation will provide an evaluation of the biological health of streams and watershed conditions in Los Padres forest and indicate water bodies that may have been impaired by human activity. This assessment will include management recommendations to minimize anthropogenic disturbance.

REFERENCES

Hawkins, Charles P. (2003). *Summary of Initial Development and Testing of a RIVPACS-type Model for Assessing the Biological Condition of Streams in Region 5 USDA Forest Service*. Presentation to the California Aquatic Bioassessment Working Group, December 2003.

Karr, J. and Chu, E. (2000). Sustaining living rivers. *Hydrobiologia*, 422/423, 1-14.

Ode, P., Rehn, A. and May, J. (2003). *A Benthic Macroinvertebrate Index of Biotic Integrity for Southern Coastal California*. Draft Manuscript.

State Water Resources Control Board (2003). *The Status and Future of Biological Assessment for California Streams*.

CLIENT

United States Forest Service

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ANTICIPATED FINANCIAL NEEDS AND SOURCES OF SUPPORT

(See included letter of support from Brian Staab)

- Modest supervision of the project in coordination with Bren students and faculty.
- Training session covering BMI bioassessment methods, sampling procedures, model development and their application.
- Possible summer internship for 1 or 2 project members.