Saint Mary's College School of Science
Summer Research Proposal:

In-stream leaf Decomposition rates along a seasonal tributary of Lagunitas creek

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Preface:

The research proposal outlined here is part of a larger research objective originating from collaborative research between Dr. Marchetti and Dr. Stephanie Carlson at UC Berkeley. Dr. Marchetti provided guidance in the scope and direction of this project so that it would be congruent with the larger research agenda between St. Marys and Berkeley. I will have some amount of independence with my project, but will also be working under the guidance of both Dr. Marchetti and Dr. Carlson.

Background:

This experiment addresses the Riparian nutrient deposits in seasonal tributaries of Lagunitas Creek. Understanding of the temporal dynamics of allochthonous (derived from outside the stream) energy sources may provide essential information for identifying the functions of these Riparian streams. The management and conservation efforts of these important riparian areas is reliant on detailed life history information. It has been shown that leaf litter is often the major source of energy in small shaded streams, and aquatic organisms' life cycles have been shown to be synchronized with the annual input of organic matter after leaf abscission occurs (Peterson and Cummins, 1974).

These seasonal Riparian streams, which annually become isolated pools due to temporal fragmentation, are a unique habitat whose benefits to the local ecology are under-appreciated. The study of leaf decomposition rates in stream systems is important for further discovering the stages of the decomposition process and understanding the annual patterns of nutrient cycling in moving water. Potential threats to riparian watersheds are numerous and include climate change and habitat destruction. Energy input at the base of the food web is a limiting factor in habitat health and species survival within the habitat. Leaf decomposition represents the majority of the alochthonus energy sources of seasonal tributaries of Lagunitas Creek, as such it is a good representation of energy input and nutrient cycle of these aquatic ecosystems. A more thorough understanding of how energy enters and cycles within these systems will contribute to conservation and management efforts in the future. Individual species may be shown as key nutrient givers at specific times, or reliant on a specific pool depth to complete decomposition.

Hypothesis:

Sections of streams that become isolated early in the summer will show different decomposition rates than those that are isolated later, due to the nature of the decomposition process.

Methodology:

The objectives are to assess and compare the over summer decomposition rates of leaves from, red alder (*Alnus rubra*), bigleaf maple (*Acer macrophyllum*), pacific willow (*Salix c. lucida*), and California poplar (*Populus trichocarpa*) in pools that isolate at various times in Lagunitas Creek. The decomposition rate of each leaf type will be assessed using leaf pack methods described by E. F. Benfield (1996). Leaves of each species will be collected, dried and weighed and then placed in leaf pack bags along the shore bed. Over a ten week period the bags will be collected at weekly intervals, dried and weighed to quantify the change in leaf volume due to decomposition.

Volume of the individual pools will be measured over the ten week period to monitor the change in habitat quantity and quality. Water temperature, PH, and dissolved oxygen content will also be recorded weekly at the time of the leaf collection because of their potential to affect decomposition. While oxygen content and temperature are not being directly studied in this experiment these factors will be observed to help direct future research and to help describe the temporal variance in stream conditions.

Leaf-pack decomposition experiments are common in aquatic ecology and we will follow the methodology standardized in Benfield (1996) to establish more variable control and repitition in our methods . Leaf packs, duplicated and separated by leaf type, will be spread out along the stream bed at varying locations. At each collection time period bags will be removed in order to capture inherent system variability. Several control leaf packs, which are not put in the stream bed, will be made to address loss of leaf mass during transportation due to fragility of the leaves. At the end of the experiment, average decomposition rates (k) among time periods will be statistically compared using analysis of variance (ANOVA). The significance of the variation of (k) will be determined by a multi-comparison technique outlined by Zar (1984) and Sokal and Rohlf (1995).

Works Cited:

Benfield, F. Richard Hauer and Gary A Lamberti 1996. Methods in Stream Ecology. AcademicPress, 579 pp.

Petersen, R.C. and KW Cummins 1974. Leaf processing in a woodland stream. Freshwater Biology. 4:345-368

Sokal, R.R. and F.J. Rohlf 1995. Biometery, 3rd ed. Freeman, New York, NY.

Zar, J.H. 1984. Biostatistical Analysis, 2nd ed. Prentice-Hall, Englewood Cliffs, NJ