

Working group report to LTER Network Office:

The importance of consumer-driven nutrient recycling in streams across a climatic gradient

Alonso Ramírez¹ and Wyatt Cross²

¹Institute for Tropical Ecosystem Studies, University of Puerto Rico

²Institute of Ecology, University of Georgia

Summary

The LTER Network Office supported our proposal to form a working group about the importance of consumer-driven nutrient recycling in streams across a climatic gradient. The goal of the group was to develop a plan to write a cross-site LTER proposal to the National Science Foundation. The group was composed of eight members that are familiar with the subject of nutrient recycling or with different types of stream ecosystems. The group met in September 2005 in Puerto Rico and developed a plan to produce a competitive proposal. This initial meeting was followed by a series of phone and video conferences. Our meeting and subsequent discussions helped focus our ideas, and led to important changes in the scope of the proposal. Most notably, we agreed that a primary focus of the proposal will be to tease out the relative importance of (1) consumer biomass, (2) consumer identity, and (3) community size structure in controlling the importance of consumer-driven nutrient recycling in streams. Understanding these basic driving factors will help predict how human-induced changes to community composition (e.g., brought on by harvesting, extinctions, disturbances) will alter whole-ecosystem nutrient fluxes. We plan to submit a proposal to NSF by the July 2006 deadline.

Meeting report

We proposed a cross-site LTER and ILTER working group to develop a research proposal examining the relative importance of nutrient recycling by stream consumers across a natural gradient of precipitation, hydrology, and stream longitudinal connectivity. This topic was initially selected because consumer-driven nutrient recycling (CNR) can be critically important for determining whole-system productivity and the relative balance of essential dissolved elements such as nitrogen and phosphorus. We initially aimed to quantify how the importance of CNR varied across a broad climatic conditions.

Our meeting and subsequent discussions revealed that very little is known about the basic drivers of CNR importance in benthic aquatic ecosystems in terms of both rates and ratios of nutrient delivery. Although the trophic roles of consumers are relatively well known, consumer contributions via excretion and recycling, relative to nutrient demand, are known for very few systems. Quantification of the role of CNR relative to whole-ecosystem uptake across a wide

variety of systems that vary in consumer biomass, identity, and size structure will be essential for predicting the effects of species harvesting, extinction, or invasions on stream nutrient cycling.

Our initial working hypothesis was modified to reflect the state of knowledge on CNR in stream ecosystems. We are now framing the proposal in terms of separating the relative importance of biomass, species identity, and size structure as key drivers of the importance of CNR in stream ecosystems. We will test hypotheses across a diversity of stream ecosystems where different landscape characteristics give rise to large variation in community composition across large spatial and climatic scales. Site choice capitalizes on unique characteristics in each location of determinants of consumer biomass. For example, in Puerto Rico sites can be located above and below waterfalls and in Coweeta along a longitudinal gradient in consumer biomass.

At the end of the meeting, each participant was assigned with a series of tasks to gather appropriated site information and to write or lead the writing in different proposal sections.

Participants

- A. Ramírez, University of Puerto Rico and LUQ LTER
- W. Cross, University of Georgia and LUQ LTER
- J.P. Benstead, University of Alabama, will be leading the proposal
- A. Rosemond, , University of Georgia and Coweeta LTER
- M. Springer, University of Costa Rica
- M. Mass, Universidad Autonoma de Mexico and Chamela Reserve, Mexico
- C. Matthuriau, Universidad Autonoma de Mexico and Chamela Reserve, Mexico
- J. March, Washington & Jefferson College

Timetable

The group will continue interacting via telephone and video conferences to produce a proposal that will be submitted to NSF by the summer deadline.

The meeting

