(*Fragilaria ssp.*) dominated mat. The experiments thus provided a template to examine the effect of bed composition (sandy or clean gravel), bed topography (plane or alternate bar), and transport rate (moderate or high), on surface and subsurface grain sorting, surface and subsurface water storage and flow paths, autotrophic and heterotrophic biomass accumulation, metabolic rates, and the uptake and retention of ecologically important nutrients.

In order to maintain the grain-scale resolution needed to track size sorting and the dynamics of sediment and algal patches, the traversing cart was designed to provide automated bed elevation surveys at millimeter resolution. High-resolution observations of bed topography and grain size, flow, and transport were combined with integral measures of water biochemistry to evaluate the effect of channel complexity on sediment transport and sorting, hyporheic exchange, nutrient retention, and biotic community respiration. This cross-scale information was needed to resolve local mechanisms and the manner in which their variability was expressed at the section and reach scale.

Future Experiments

In many ways, predictive stream geomorphology and ecology are in their infancy. Forecasting the response of streambed composition, stream morphology, nutrient flux, and biotic community to changes in water and sediment supply, or to engineered channel designs, is typically more narrative than quantitative. At best, quantitative estimates are based on approximate calculations of the mean condition and do not incorporate detail from biologically relevant smaller scales. Field-scale laboratory experiments with high-resolution instrumentation allow us to investigate how physical and biological processes in streams operate across scales and are essential in developing and testing predictive models of the integrative dynamics of streams. In order to support future StreamLab experiments, NCED and SAFL are building two outdoor channels (18 × 36 meters and 10 × 120 meters) that will be used for field-scale experiments and will be wide enough to incorporate riparian zones.

Full-scale multidisciplinary experiments with millimeter-resolution measurement are an expensive collaborative venture. StreamLab06 involved a 20-member research team of engineers, geologists, and ecologists drawn from NCED faculty, postdoctoral associates, and graduate students, as well as visiting scientists, environmental consultants, undergraduate assistants, and research staff. The need for such experiments exceeds the capability of any one facility, which places a premium on coordination across projects. We encourage potential collaborators to contact us regarding future StreamLab experiments and to work to more broadly coordinate the implementation of field-scale experiments in ecogeomorphology.

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MEETINGS

Mitigating Climate Change in the American Southwest

New Mexico Climate Change Ecology and Adaptation Workshop; Albuquerque, New Mexico, 22 October 2007

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Climate change has had greater impacts on the American Southwest than perhaps anywhere else in the contiguous United States. The future likely holds even more dramatic impacts for the region's ecosystems. Managers of deserts, forests, grasslands, rivers, and streams in this vast and scenic region are under pressure to respond to the unprecedented wildfires, forest dieback, and insect outbreaks that have resulted from years of record warm temperatures and drought. Already faced with urban encroachment and water shortages, managers need to better understand the regional implications of global climate change in order to take informed action to build the adaptive capacity of the landscapes that provide ecosystem services to our communities and habitat for a great diversity of species.

The Nature Conservancy in New Mexico, in collaboration with the Climate Assessment for the Southwest and the Institute for the Study of Planet Earth (both associated with the University of Arizona), convened the Conservancy's first-ever statewide climate change ecology and adaptation summit. This daylong event brought together key local, state, tribal, and federal natural resource managers with agency and academic scientists to review climate change science, identify management concerns, share management strategies, and spotlight opportunities for climate change adaptation. Invited speakers and resource people, including four members of the Nobel Prize–winning Intergovernmental Panel on Climate Change, provided science and management perspectives as a foundation for problem solving. Then participants brainstormed and sorted through a wide variety of options, ultimately identifying four key strategies for buffering natural ecosystems from climate change:

1. Develop a small number (two to four) of intensive landscape-scale climate change adaptation pilot projects, including at least one in a forested landscape and another in a landscape dominated by grassland and/or shrubland.

2. Identify a suite of practical adaptation options and best climate change management practices for natural resource managers. Share, apply, and test these ideas collaboratively across the southwestern United States and northern Mexico.

3. Develop a regional climate change adaptation network and training program for information sharing, networking, professional development, and capacity building.

4. Develop a regional monitoring and data management framework that facilitates development and sharing of scientific information about climate change and its ecological effects.

The participants identified several other needs, including community outreach and education, and policy and administrative reform (particularly with respect to environmental regulation). Attendees also noted that the community as a whole must address the root cause of climate change by reducing emissions of greenhouse gas both within and outside New Mexico.

The Nature Conservancy's New Mexico chapter and Global Climate Change Team (GCCT) are already taking action on these recommendations. They recently selected the Jemez Mountains as a pilot adaptation site based on the results of the chapter's recently completed statewide vulnerability analysis. Moreover, the GCCT is developing a global data management framework that the chapter plans to contribute to at the state level.

For more information on this innovative workshop, the first in a series that the New Mexico chapter plans to organize, see http://www.nmconservation.org.

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