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SEDIMENT MOVEMENT AT [illegible]TER SITES: MECHANICS, MEASUREMENT, AND INTEGRATION WITH HYDROLOGY

Compiled by
J. Rodger Adam
Illinois State Water Survey

Contributors
Susan B. Bolin
Nel Caine
Donn G. DeCoursey
Donald Doehring
Gordon Grant
James K. Koelliker
Tim J. Ward

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LTER Steering Committee

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1. INTRODUCTION

J. Rodger Adams

LTER Program

The Long-Term Ecological Research (LTER) program was designed by the National Science Foundation Division of Biotic Systems and Resources to support research which addresses the 10- to 100-year periods of ecological change, long-term trends in ecosystems, annual variability, and a wider scope of research than that of many previous ecological studies. Eleven project sites form the first LTER program which began in 1981 and 1982. All sites are required to address five core areas: 1) primary production; 2) populations describing trophic structure; 3) accumulation of organic matter in surface layers and sediment; 4) inorganic inputs and movement of nutrients through soils, ground water, and surface water; and 5) pattern of disturbance. One of the key concepts in the LTER program is the integration of data and results from the various sites to produce research results which span several habitats. In the hydrology and sediment components, the opportunity to extend results from small streams to the much larger Illinois and Upper Mississippi Rivers is one chance for substantial development in our understanding of the hydrology of complete river systems. Other LTER sites range from estuarine to alpine to desert with associated differences in erosion and sediment transport processes. A need for a workshop on sediment movement became apparent at a meeting of the LTER streams group and at an all-scientists meeting. The workshop and site reports presented here are the outcome of this desire for a meeting focused on sediment movement and its measurement.

Intersite Workshop on Sediment Movement and Measurement

An LTER intersite workshop on sediment movement and measurement was held on September 16-18, 1985, at Pere Marquette State Park near Grafton, Illinois. Investigators from all LTER sites were invited to prepare presentations on their sites' sediment component design, data collection, and current results. Representatives from six sites participated (see figure 1.1). Several experts from non-LTER sites and agencies were also invited to participate, though none accepted the invitation.

The first full day of the workshop included presentations by the keynote speaker and each investigator. The second day was devoted to discussions of measurements, intersite comparability, and future collaboration, and to an oral summary of the workshop. The workshop agenda and list of participants are included in the appendix.

Several questions were pertinent to this workshop. The impact of extreme events is important at all sites, but differs depending on the frequency of the extreme events and the relationship between extreme events and average conditions. The estimation of soil loss by methods such as the Universal Soil Loss Equation and its comparison with actual soil erosion is important at most sites. The ratio of instream sediment to watershed

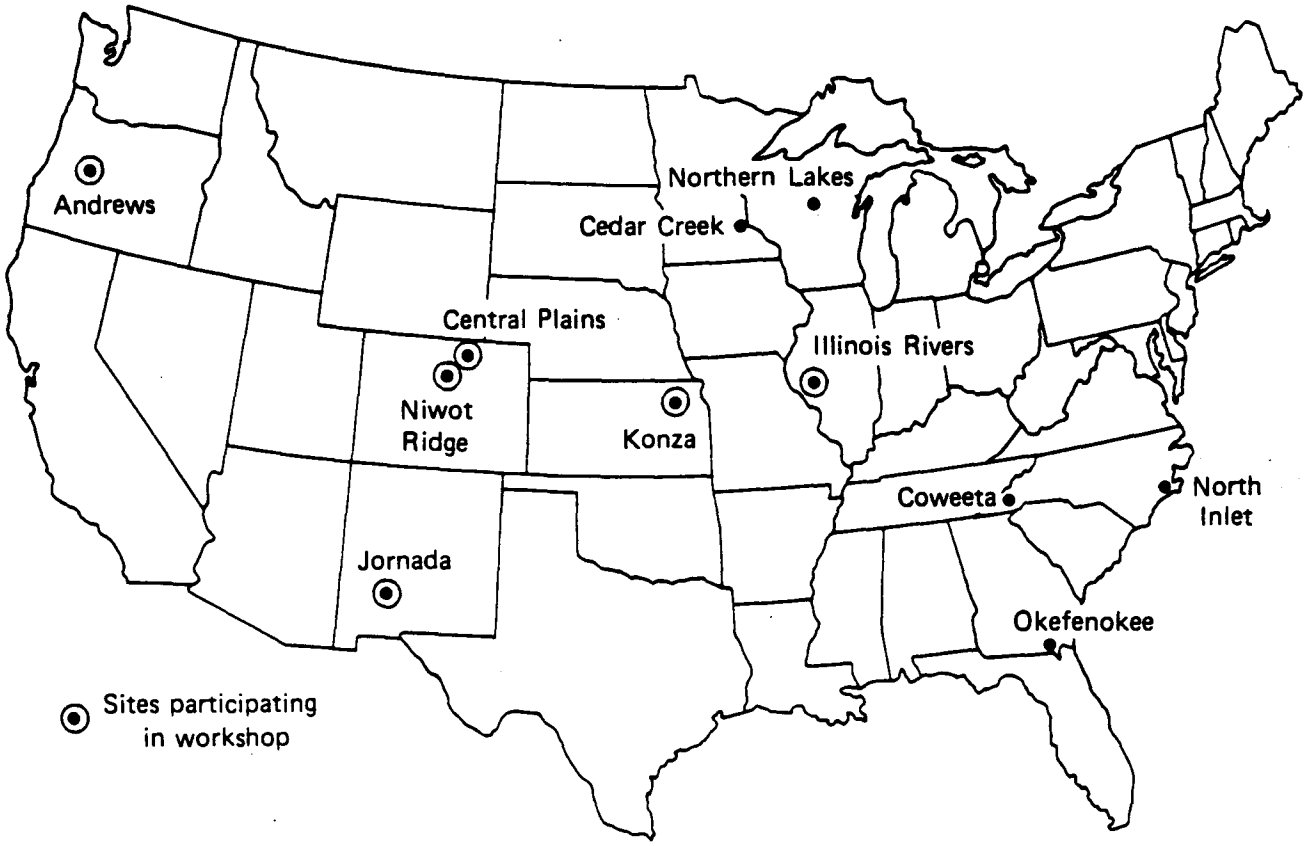

Figure 1.1. Long-Term Ecological Research sites

erosion is important to the geomorphology of a system. The accuracy of sediment measurement depends on sampling techniques and frequency and on the division of sediment transport between bed load and suspended load. Thus, agreement on methods is necessary for valid intersite comparisons. Other considerations such as water chemistry and mixing, annual flow regimes, water temperature during major transport periods, the characteristics of the material available for transport, and the relative importance of wind erosion make intersite comparisons difficult. Another consideration is organic debris, which is transported and deposited by aeolian and fluvial action and ranges in size from tiny particles to large tree trunks.

Workshop Objectives

The workshop was intended to achieve two objectives:

1. To develop coordination, cooperation, and exchange of information among the LTER sites.

2. To result in published proceedings that would include the site reports and a summary of the discussion of the presentations.

Outline of Report

This report includes the six site reports prepared by the workshop participants. It then presents a summary of the group discussions, a list of intersite hypotheses, and suggested goals for intersite cooperation and improved integration of hydrologic and erosion-sedimentation components into the LTER projects and program.

The site reports are presented in alphabetical order according to site: Andrews, Central Plains, Illinois Rivers, Jornada, Konza Prairie, and Niwot Ridge. These reports have been edited and retyped for uniformity of style.

Acknowledgments

The workshop was supported by the LTER Coordination Grant from NSF. Jerry Franklin of the Andrews Experimental Forest is chairman of the Coordinating Committee. Administrative matters were handled by Judy Brenneman, Department of Forestry, Oregon State University, Corvallis. Richard E. Sparks, Project Director for the Illinois and Mississippi Rivers site, encouraged us to plan and convene this intersite meeting. Kenneth S. Lubinski of the Illinois Natural History Survey Grafton Laboratory did an excellent job of making local arrangements. Douglas Blodgett and Frank Dillon helped with transportation between the St. Louis airport and Grafton, demonstrated the sediment sampling equipment used to measure suspended sediment transport, and assisted with other details. Nani Bhowmik spoke in place of Dr. Daryl Simons, who was unable to attend, and gave a commendable opening talk and assisted in the final summary and plan of action. The report was typed by Becky Howard and edited by Gail Taylor.