



Strategic Plan 2013 – 2018

Great Rivers Cooperative Ecosystems Studies Unit

Introduction

The Great Rivers Cooperative Ecosystems Studies Unit (GR CESU) was established in July 2003 as a partnership among 21 universities and 8 federal agencies to conduct cooperative ecosystem studies focusing on the Great Rivers region. The University of Missouri- Columbia is the host institution for the Great Rivers CESU. Other university partners as of 2013 are: Audubon - Mississippi River Initiative, Audubon Missouri, Conservation Federation of Missouri, Drake University (IA), Indiana University, Iowa State University, Lewis and Clark Community College (IL), Lincoln University (MO), Missouri Botanical Garden, Missouri State University, National Great Rivers Research and Education Center, National Mississippi River Museum and Aquarium, Southern Illinois University, St. Mary's University of Minnesota, University of Illinois, University of Iowa, University of Kansas, University of Memphis, University of Notre Dame, and Winona State. The federal partners as of 2013 are the Bureau of Land Management, National Park Service, and U.S. Geological Survey. Bureau of Land Management, Department of the Army: Army Corps of Engineers: Civil Works, Department of Defense, Natural Resources Conservation Service, National Park Service, US Geological Survey, US Fish & Wildlife Service, and US Forest Service. Additional nonfederal and federal partners may be added following an established protocol that involves a formal application, voting by partners on membership and an Amendment to the CESU 5-Year Agreement.

The objectives of the CESU Network are to: (1) provide resource managers with high-quality scientific research, technical assistance, and education; (2) deliver research and technical assistance that is timely, relevant to resource managers, and needed to develop and implement sound adaptive management approaches; (3) ensure the independence and objectivity of research; (4) create and maintain effective partnerships among federal agencies and universities to share resources and expertise; (5) take full advantage of university resources while benefiting faculty and students; (6) encourage professional development of federal scientists; and (7) manage federal science resources efficiently. The multiple partners for each CESU work cooperatively to apply natural, social and cultural sciences to wide-ranging ecosystem issues and problems.

Mission and Vision

The mission of the GR CESU is to partner with federal agencies in an effort to better understand and adaptively manage biophysical, cultural, economic and social resources and issues, especially those pertaining to large river and terrestrial ecosystems. Pursuit of this mission entails developing research, educational and technical assistance programs based on interdisciplinary, multi-scale, systems-oriented approaches that engage affected communities and stakeholders.

GR CESU partner organizations develop interdisciplinary, multi-scale, systems-oriented, collaborative approaches for adaptively managing natural, cultural and other resources on public and private lands in the GR region and other CESU regions. Emphasis is placed on developing innovative models of collaborative decision making.

Management Challenges in the Great Rivers Region

The GR region contains abundant and diverse human, cultural and natural resources. Human and cultural diversity stems from the region's large metropolitan areas, many of which are located near large rivers, such as Minneapolis-St. Paul, Minnesota and St. Louis, Missouri along the Mississippi River, and Kansas City, Missouri and Sioux City, Iowa along the Missouri River. Natural resource diversity in the region is reflected in thousands of crop and livestock farms scattered throughout the western and southern Corn Belt, and forests in the western portion of the Central Hardwood Region. The Natural Resources Conservation Service provides technical assistance to many of the region's landowners on conservation and protection of soil, water, air, plants, wildlife and other natural resources. While most of the region's land base is privately owned, the Bureau of Land Management, National Park Service, and Department of Defense manage federal public lands, including federal mineral resources, national battlefields, national monuments, historic sites and trails, military installations and others. The National Park Service manages lengthy reaches of the Mississippi River through the Twin Cities in Minnesota, the Current and Jacks Fork Rivers in Missouri, and the Buffalo River in Arkansas. The U.S. Geological Survey conducts scientific research and provides information related to water, biological and mineral resources, and natural hazards on both private and public lands.

The region's growing population combined with reduced federal budgets and the growing complexity of human-natural resource interactions is straining the ability of governmental agencies to manage natural and environmental resources, provide technical assistance to landowners, and conduct research aimed at sustainable management of the region's natural and cultural resources. Natural resource and environmental problems facing the region include air and water pollution from point and nonpoint sources, habitat loss- fragmentation and associated decline in biodiversity from conversion of farmland, forests and wetlands to residential-commercial developments, competition among uses and values of large rivers, and ecosystem-wide impacts of global climate change.

In light of these challenges, the primary goal of the GR CESU is to improve the capacity of the federal partners to manage natural and cultural resources in a sustainable manner. Meeting this goal will require the GR CESU to develop strong programs supporting the research, technical assistance and educational needs of the federal partners, and society in general.

Strategic Themes

During the period 2013-2018, the GR CESU will continue to concentrate on the following five themes:

1. Adaptive Ecosystem Management of Public Lands and Rivers
2. Sustainable Farming, Forestry, Grazing and Land Management Systems
3. Assessing and Conserving Biodiversity
4. Protection of Cultural Values and Resources
5. Socioeconomic and Ecological Consequences of Landscape Change

The order in which the themes are listed does not reflect their relative importance. Themes reflect the strengths, capabilities and interests of the partners, address the natural and cultural resource challenges facing the GR region, contribute to the research, technical assistance and educational needs and opportunities facing the federal partners and the region, engage affected communities and stakeholders, and support the mission and value of the GR CESU. A detailed explanation of the themes follows.

Theme 1. Adaptive Ecosystem Management of Public Lands and Rivers

Management of public lands and rivers is complex and challenging for several reasons. They include: (1) competing demands for land and water resources, (2) drought conditions and loss in biodiversity due to global climate change, (3) greater public interest and involvement in natural resource and environmental management, (4) lack of institutional arrangements and/or conflicting jurisdictional arrangements for managing natural and cultural resources, and (5) uncertainty regarding ecosystem responses to management actions and policies. The latter challenge can be met by employing an adaptive ecosystem management approach, which attempts to manage ecosystems at large spatial scales and long timeframes (ecosystem management) in a collaborative decision-making framework that embraces uncertainty. Active adaptive management handles uncertainty by: (1) treating management actions as experiments, (2) employing research, monitoring and modeling to test alternative hypotheses about ecosystem responses to alternative management actions and policies, and (3) using experimental results to design corrective management actions and policies. An adaptive management approach is being used in the Everglades, Columbia River System, Lower Colorado River, Chesapeake Bay, Banff National Park and Elk Island National Park in Alberta, Canada, and Yellowstone National Park.

The thrust of this theme is to identify opportunities for adaptively managing land and water resources in the GR region with the goal of improving understanding of how ecosystems are likely to respond to management actions and social, economic and environmental forces. Implementation of adaptive management will be done in an ecosystem management framework that incorporates collaborative decision-making principles. Our goal is to become a leader in providing scientifically sound, unbiased information for adaptive management of land and water resources.

Theme 2. Sustainable Farming, Forestry, Grazing and Land Management Systems

Conventional farming, forestry, grazing and land management systems result in high rates of soil erosion, pollution of surface and ground water, and impairment of ecological services provided by

watersheds, wetlands and riparian areas. Adverse impacts of conventional farming systems are the product of planting highly erosive crops, use of conventional tillage, and the timing, rate and method of application of nutrients and pesticides. Sustainable agricultural systems attempt to reduce soil erosion and water pollution by planting less acreage in highly erosive crops, increasing acreage planted in perennials and cover crops, employing minimum tillage or no-till practices, installing riparian buffer strips and grass waterways, enrolling highly erodible fields in the Conservation Reserve Program and wetland areas in the Wetlands Reserve Program, altering the method, rate and timing of nutrient (including manure) and pesticide application, re-engineering the artificial hydrology in upland areas and streams/rivers, and others. Sustainable farming practices that reduce nitrogen loading in runoff from farmland and conversion of cropland to wetland in the GR region would diminish the adverse ecosystem impacts of hypoxic (low oxygen) conditions in the Gulf of Mexico. Conventional timber harvesting methods cause soil erosion and pollute water by exposing large areas of the landscape to the erosive forces of rain and wind, and constructing roads in steep terrain. Sustainable forestry systems attempt to reduce soil erosion and water pollution by altering the management of timberland and riparian areas and timber harvesting methods. Conventional grazing systems have similar conservation impacts, which can be reduced by employing sustainable grazing practices.

The goal of this theme is to identify sustainable farming, forestry and livestock grazing systems that significantly reduce soil erosion, sediment transport and water pollution in the GR region. Another goal is to evaluate the social, economic and ecological consequences of sustainable farming/forestry systems and reduce barriers to their adoption by landowners. Achievement of these goals requires the integration of several disciplines, including agricultural economics, agronomy, biology, engineering, hydrology, rural sociology and soil science, and application of integrated watershed management approaches and geospatial technologies (geographic information systems, remote sensing and global positioning systems). An example of a program designed to improve sustainable use of natural resources is the National Park Service's Inventory and Monitoring Program. The goal of this program is to acquire the information and expertise needed by park managers in their efforts to maintain ecosystem integrity (including biodiversity) in the units of the National Park System that contain significant natural resources.

Theme 3. Assessing and Conserving Biodiversity

Conserving biodiversity enhances the functioning and resilience of ecosystems. It is accomplished by protecting all forms of life, including species and genetic variants within species, and all ecosystems that contain and sustain those diverse forms of life. Agricultural production, timber harvesting, urban and commercial development, barge navigation and other human activities have reduced ecosystem health and biodiversity in the GR region.

This theme will assess the nature, extent and location of losses in biodiversity, quantify socioeconomic and ecological impacts of those losses, and develop and evaluate land and water resource management policies for conserving biodiversity. Of particular interest is assessing impacts of human and natural disturbances on biodiversity, particularly threatened and endangered species, and the efficacy of alternative policies for conserving biodiversity. Policies of interest include land purchases, land donations, land trusts, land exchanges, conservation easements, land zoning and modification of flow regimes in regulated rivers. Since NGOs play an important role in biodiversity conservation, this theme

will examine the role of NGOs in protecting conservation values, and evaluating the tradeoffs between conservation and economic development.

Theme 4. Protecting Cultural Values and Resources

Individual and social attitudes and behaviors toward the natural world are transmitted through culture, which is the product of complex interactions among ethnicity or race, language/dialect, religion, political ideology, natural resource endowments, social mobility, idioms and local traditions. Uses and values of natural resources can be understood only within the context of a particular culture, hence the notion of cultural landscapes. Many resource management agencies, including three GR CESU federal partners (Bureau of Land Management, Department of Defense and National Park Service), are required to manage public lands so as to protect natural and cultural resources. For example, the National Park Service is committed to developing management policies that “safeguard cultural and natural resources while reflecting informed concern for the contemporary peoples and cultures traditionally associated with them.”

GR CESU partners will work collaboratively to identify ways to increase information and knowledge about: (1) how natural resource management influences cultural values/resources, (2) how best to incorporate cultural values in resource management decisions, (3) how to achieve the full potential of cultural landscape management, (4) the role of non-traditional communities in resource protection, and (5) identifying methods and new programs for improving the relationships between people and parks that go beyond the National Park Service’s traditional interpretive programs. To the extent possible, this goal will be implemented through existing programs.

Theme 5. Socioeconomic and Ecological Consequences of Landscape Change

Economic and population growth have dramatically altered land cover and land use in the GR region. Forestland has been converted to agricultural land, cropland and forestland have been converted to residential and commercial uses, and wetlands have been drained to allow agricultural production and residential/commercial development. On a national basis, more than 90 percent of the land in the Lower 48 states has been logged, plowed, mined, overgrazed, paved or otherwise modified from pre-settlement conditions. Land cover/use changes have altered the availability of energy, water and nutrients to ecosystems, increased the spread of exotic species, accelerated natural processes of ecosystem change and reduced the functioning and resilience of ecosystems.

A major goal for this theme is to quantify the socioeconomic and ecological impacts of past landscape changes, and develop databases and models for making conditional projections of future landscape changes and associated impacts for selected areas in the GR region, and elsewhere. A related goal is to improve the capacity of planners and managers to develop and evaluate conservation and development policies for alleviating potentially adverse ecological consequences of future economic growth and development in the GR region. Achievement of these goals will require integration of methods and disciplines, including geographic information systems, remote sensing, landscape ecology, economic impact analysis, alternative futures analysis and spatial decision support systems.

Project Design

Projects and activities undertaken by the GR CESU will be designed so as to achieve one or more of the following benefits:

1. Enhance the capacity for sustainable management of land and water resources on private and public lands.
2. Improve communication and cooperation between university/private partners and federal partners.
3. Increase collaborative research, technical assistance and educational efforts among university and private partners.
4. Foster ecosystem-based approaches to natural and cultural resources management.
5. Provide a basis for adaptive management.

Emphasis will be placed on engaging students and new scientists in the research process, as well as on improving communication within the network about funding opportunities and project outcomes.