



# Science along the Lewis and Clark Trail: Changes through Time – Challenges for the Future

The Lewis and Clark Expedition was the first of many government surveys of natural resources in the American West. In 1879, four such surveys were combined into a new agency called the U.S. Geological Survey (USGS). The USGS continues to serve the nation as an independent fact-finding agency that provides scientific understanding about natural-resource conditions, issues, and problems. Because of its origin in natural resource surveys and the similarity of the USGS mission to Thomas Jefferson's charge to Lewis and Clark, the USGS can be seen as the organizational successor to Lewis and Clark.

The Bicentennial Anniversary of the Lewis and Clark expedition in 2003 through 2006 is an opportune time for a 21st century, scientific

**Table 1. Science Questions**

- How and why have areas and rivers along the Lewis and Clark Route changed in the last 200 years and what are today's interpretations of the natural features observed by Lewis and Clark?
- What are the key physical, chemical, geological, and biological processes that have the largest effects on human use and ecological functions of large-river corridors? How do these processes interact?
- How does improved understanding of natural processes provide for resource management alternatives?
- How can new technologies and methods be used in earth and biological science investigations?

## Lewis and Clark Route



investigation of the three large river corridors; the Ohio, the Missouri, and the Columbia; that compose the majority of the Lewis and Clark route. The management and condition of these three river corridors are presently under review by several resource-management agencies and are, thus, the focus of much interest and debate. Several large-river stakeholder groups have pointed out that a scientific basis is not available for many of the decisions and resource management policies that will determine the use and condition of these large river systems in the future.

## Scientific Investigations

The two broad goals of the USGS Lewis and Clark Science Plan are: 1) to provide natural resource managers with scientific tools and data needed to make sound policy and 2) to increase public awareness of the critical role of science in providing a sound basis for resource-management decisions. These goals would be achieved by addressing more specific scientific questions and outreach goals listed in tables 1 and 2. The USGS Lewis and Clark Science Plan consists of two comprehensive surveys of

natural resources along the three river corridors: 1) a **river survey** focused on aquatic processes “between the river banks”, and 2) a **land survey** focused on natural resources in or near riparian zones.

The river survey primarily will be conducted from a small flotilla of boats outfitted for core scientific measurements (much like the Lewis and Clark expedition) with modern equipment such as acoustic-doppler velocity measurements, water and sediment sampling, fish and invertebrate sampling, bathymetric soundings, and global-positioning-system measurements for mapping floodplains and bedforms. Investigations primarily will identify and relate upstream/downstream changes in water quality, channel geometry and bedforms, velocity fields, species location and abundance, food-web character, and habitat. A few

**Table 2. Outreach Objectives**

- Increase public awareness about the value of science to address multiple and conflicting river and land-use issues facing the United States.
- Demonstrate the difference between today's technologies used to investigate earth and biological science and those used by Lewis and Clark.
- Provide information to the public on the character of American rivers before European settlement, today, and future possibilities.
- Provide interpretations of geologic, hydrologic, and ecological characteristics of rivers and other natural features described by Lewis and Clark to the public in easily-accessible and highly-visible forums.

short reaches will be chosen for detailed study.

The land survey will focus on investigations of geographic and geologic features, as well as wildlife and vegetation that Lewis and Clark observed during their journey. Studies of geomorphology in relation to channel migration, evaluation of techniques to control invasive species, and assessment of habitat availability for endangered species are anticipated.

Both the river and land surveys will consist of core and extended projects. Core projects would be funded by a Lewis and Clark project that would cover investigations of the core topics listed in table 3, outreach activities, and project administration. Extended projects would be supported by funds from programs outside the Lewis and Clark project, but would take advantage of the equipment, data, scientists, technicians, and exposure that would be created by the core projects. Extended projects would be welcomed from outside as well as within the USGS.

**Table 3. Core investigations**

- Biological responses to flood-plain hydroperiods
- Relations between habitat, hydrology, geomorphology, and ecological characteristics
- Relations between channel migration and alluvial deposition
- Interconnections between ground water, river stage, and wetland hydroperiods
- Water quality interactions with aquatic biota
- Characterization of paleoclimates with data from windblown deposits
- Geologic mapping of surficial deposits
- Water quality characterization

## Outreach Activities and Products

Federal, state, and local agencies are looking to the USGS to convey natural-history interpretations of the Lewis and Clark expedition to the public. This is a role uniquely suited to the USGS. These public interpretations would be conveyed through exhibits in museums and visitor centers, web pages, and participation in the National Park Service Corps of Discovery II Project. The Corps of Discovery II Project will retrace the Lewis and Clark expedition day-by-day with a traveling classroom housed in trailer trucks that will house exhibits, daily Internet presentations of the Corps of Discovery II activities, live interpretive programs, naturalist and historian presentations, and hands-on/role-playing educational programs for school age children. At key stops along the route, USGS scientists will give presentations about ongoing investigations, as well as changes in these river systems that have occurred during the last 200 years. When USGS science surveys are apart from the Corps of Discovery II, web and telecommunications technologies will permit a live, "virtual" presence in the traveling classroom from time to time while the scientists are actually out collecting data. A scientist will give live audio and video explanations of what viewers at the traveling classroom are seeing and explain why it is significant. Corps of Discovery II and the large-river studies undertaken in the USGS Lewis and Clark project will likely find interest in large public venues such as public television, cable science channels, and/or popular magazines with scientific content.

The primary product of the USGS Lewis and Clark Science Project would be a foundation of scientific understanding that will help optimize human use and minimize ecological damage of large river corridors. Reports, books, articles, maps, databases, assessments, and other literature published in both scientific and popular venues will create a permanent legacy of science from the Bicentennial that will be valuable to resource managers and the public for centuries to come.

## River Survey using boat equipped to collect samples and make river measurements.



## Land Survey study using global positioning system to measure bank erosion.



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