



Integrated Riparian Monitoring

Importance

Riparian ecosystems are potentially sensitive indicators of landscape-level change because they are linked to both aquatic and upland systems, perform important ecological functions, and are biologically diverse. Riparian systems face a number of anthropogenic threats, including streamflow damming or diversion, channel-stabilization structures, invasive exotic species, livestock grazing, timber harvesting, agricultural clearing, groundwater pumping, and trail creation. These disturbances can alter watershed conditions and indirectly influence downstream riparian ecosystems. Developing credible, efficient monitoring approaches will help in assessing riparian-system health and provide early warning of system degradation.

Long-term Monitoring

Integrated riparian monitoring involves the collection of both biological and physical measures. The NCPN monitors vegetation, hydrology, and geomorphology in wadeable streams at Arches, Capitol Reef, and Zion NPs, and Natural Bridges NM; and big rivers at Black Canyon of the Gunnison and Canyonlands NPs, Curecanti NRA, and Dinosaur NM.

For wadeable streams, repeat sampling of permanent transects tracks changes in the cover and species richness of riparian vegetation, including the relative abundance of native and non-native species. Measures of physical drivers, including streamflow, alluvial groundwater dynamics, and changes in channel form, are used to assess whether observed changes are primarily the result of natural variability or anthropogenic stressors.

For big rivers, the NCPN is working with the U.S. Geological Survey to test three different methodologies. The first, using traditional geomorphology and vegetation measurements, will provide information on sites determined to be most susceptible to change. The second method uses ground-based LiDAR to provide site-specific, detailed information on geomorphology and species-nonspecific information on vegetation types. The third method uses aerial LiDAR and multi-spectral imaging to obtain coarse-scale measurements on geomorphology and vegetation for the entire length of a river within a park.

Information gathered from this protocol will provide park managers with (1) a baseline against which to gauge the long-term status and trends of riparian resources relative to natural processes and anthropogenic stressors; and (2) information for evaluating the effectiveness of management interventions aimed at protecting or restoring these ecosystems.



NATIONAL PARK SERVICE

Laddie Park, Yampa River.

Status and Trends

Wadeable streams: In 2009, three reaches were established and sampled on the Fremont River in Capitol Reef NP, with shallow groundwater-monitoring wells installed at one reach. Monitoring continued at Zion NP, and a monitoring plan was developed for Natural Bridges NM. Four reaches were surveyed for geomorphology: the three reaches at Capitol Reef NP, and one reach at Zion NP.

In 2010, riparian monitoring will be implemented in Arches NP, when two reaches will be established in Courthouse Wash. Implementation will also begin on two reaches of Armstrong Canyon at Natural Bridges NM. Implementation will continue at Capitol Reef and Zion NPs.

Big rivers: At Dinosaur NM, two sites, Laddie Park and Whirlpool Canyon, were selected and visited for methods-testing in 2009. In 2010, those sites will be revisited, and a site-analysis trip is planned for Black Canyon of the Gunnison NP.

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Network park units where integrated riparian monitoring will occur

Arches NP	Curecanti NRA
Black Canyon of the Gunnison NP	Dinosaur NM
Canyonlands NP	Natural Bridges NM
Capitol Reef NP	Zion NP

NP = National Park; NM = National Monument; NRA = National Recreation Area