Case Study 15:
Rehabilitating Stream Crossings on Historic Roads, *Acadia National Park, Maine*

Contributing Author: Rebecca Cole-Will (Acadia National Park)

Hurricane Irene produced storm surge at Thunder Hole viewing platform, a popular visitor facility. Image credit: Rebecca Cole-Will.

Headwall and culvert after rehabilitation at Sieur de Monts Spring site. Image credit: Rebecca Cole-Will.

Goals

Acadia National Park in Maine is working to rehabilitate historic road systems and culverts that have been damaged by increasingly frequent flooding and erosion events that were causing maintenance and visitor use closures.

Challenges and Needs

Acadia National Park contains three historic circulation systems listed in the National Register of Historic Places (200 km/120 mi of hiking trails, 90 km/56 mi of carriage roads, and 50 km/33 mi of paved motor roads, with associated bridges and drainage structures). The drainage features are undersized for current conditions, as average annual precipitation has increased by 11.9 cm (4.7 in) in the past 100 years.

Over the past 10 years, the park has experienced flooding and erosion events that appear to relate to storm events that are increasing in both number and severity. Erosion has damaged roads and trails and caused redeposition of gravel into adjacent wetlands, requiring increasingly frequent maintenance cycles and closure of popular visitor sites. Resource management staff also documented sedimentation into wetlands and impaired natural processes in stream systems restricting access for migratory fish and amphibians. Coastal storm surges have flooded and damaged historic sites and roads. With climate model scenarios generally anticipating increased frequency of intense rainfall events, we anticipate that these problems will worsen and substantially affect visitor access and use of the park. Information regarding probable future flood streamflows is needed to help the National Park Service (NPS) properly size new hydraulic structures to accommodate the expected increased flows under the projected range of climatic conditions.

Responsive Actions

The park began a multi-pronged effort of inventory, monitoring, mitigation, and rehabilitation along the historic road systems. Consulting engineers and hydrologists inventoried all culverts, headwalls, and bridges. Using hydro-geomorphic data, they re-engineered the structures to be suitable for projected stream hydrology changes while maintaining the character-defining features of the historic structures. Information used in planning includes climate change scenarios (US Geological Survey [USGS] climate data models for the northeast) and hydrologic modeling data (USGS). The rehabilitated crossings have the added benefit of restoring aquatic animal passages (primarily migratory fishes and amphibians), and restoring natural hydrological processes for impaired stream systems. Rehabilitated crossings are monitored for streamflow dynamics and erosion. Watersheds renovated for fish passage are monitored and inventoried by fisheries biologists.

To develop a better understanding of how climate change will impact future stream flood flows, the park has requested technical assistance for hydrological analyses. In order to address other anticipated climate impacts, the park has also submitted a number of NPS funding proposals that would allow the park to conduct climate change scenario planning, manage archeological sites, restore subalpine vegetation on Cadillac Mountain, replace stream culverts, model streamflow hydrology, and restore fish habitat in coastal streams.

This project is ongoing. This case study is an example of the following adaptation strategies:

- Incorporating climate change into policies, plans, and regulations
- Conducting/gathering additional research, data, or products
- Conducting vulnerability assessments and studies
- Making infrastructure resistant or resilient to climate change

For more information:

Rebecca Cole-Will, Chief, Division of Resource Management
Acadia National Park
(207) 288-8728
Rebecca_Cole-Will@nps.gov