

## Climate Change Adaptation Demonstration

# Chequamegon-Nicolet National Forest *Twentymile Creek and Marengo River Watersheds*

Forests and water are defining features of the Northwoods landscape, providing forest products, jobs, and other environmental benefits to local communities. These ecosystems, along with others, are expected to undergo many changes as a result of a changing climate. The Chequamegon-Nicolet National Forest in northern Wisconsin has created real-world examples of how climate change can be incorporated into sustainable forest and natural resource management. As part of a series of adaptation demonstrations that show how natural resource management actions can enhance the ability of ecosystems to cope with changing conditions while meeting a variety of management goals, the Chequamegon-Nicolet has taken a special look at the resources of the Twentymile Creek and Marengo River watersheds.

### CLIMATE CHANGE AND PRIORITY WATERSHEDS

A changing climate is already having effects on northern Wisconsin, and many of these impacts are expected to intensify in the future. Many of the most important factors that influence the area's forests are expected to change, including seasonal temperatures, the timing and type of precipitation, the frequency and severity of natural disturbances, and the range of pests and diseases<sup>1</sup>.

The potential effects of changing conditions on the Chequamegon-Nicolet's Twentymile Creek and Marengo River watersheds include:

- Warmer temperatures and changing precipitation patterns could have a number of effects on these water bodies. More frequent or intense rainfall or changes in spring snow melt could increase run-off and lead to greater risk of erosion and sedimentation.
- Warmer water temperatures, more severe rainfall events, or other changes in hydrology could affect habitat for cold-water species such as brook trout. While both watersheds may be vulnerable, the greater influence of cold groundwater in Twentymile Creek may increase its resilience to warmer conditions.
- Increases in storm events may have effects on the forests in the watersheds. More windthrow events could result in younger forests and increase the amount of downed wood in forests and streams.
- More frequent or intense flood events could also result in greater damages to infrastructure, such as bridges, culverts, and roads.
- Future conditions may be less suitable to important riparian tree species, such as balsam fir, and black and white spruce. Other species, such as white pine, may be less susceptible to decline.

### Chequamegon-Nicolet Priority Watersheds

**SIZE:** 28,445 (acres within National Forest)

The Chequamegon-Nicolet National Forest contains Twentymile Creek and the headwaters of the Marengo River. These two watersheds, which provide clean water that flows to Lake Superior, have been identified by the Forest as the highest priority watersheds for restoration activities.



Several watershed restoration activities have been identified by the Forest, and this adaptation project was designed to evaluate how these actions could be carried out in a way that increases the resilience of the watersheds, including the waters and adjacent forests, to changing conditions.



### A TEAM EFFORT

A variety of partners are helping to carry out this demonstration:

- The **Northern Institute of Applied Climate Science (NIACS)** leads the Northwoods Climate Change Response Framework project, and has worked to develop a diverse set of resources to help resource managers incorporate climate change considerations into forest management planning and decision-making. This includes a vulnerability assessment<sup>1</sup> for northern Wisconsin that summarizes anticipated changes in northern Wisconsin forests, as well as a set of forest adaptation resources<sup>2</sup> that helps managers identify climate change concerns and management actions that facilitate adaptation.
- The **Chequamegon-Nicolet National Forest** covers more than 1.5 million acres of Wisconsin's Northwoods. The Chequamegon-Nicolet has been a key partner in the Climate Change Response Framework effort since its inception. The adaptation demonstration described here is just one of several demonstrations in development on the National Forest to show the wide variety of ways in which climate change considerations can be incorporated into sustainable forest and natural resource management activities.
- The **Shared Landscapes Initiative**, launched in 2010, provides a forum for the forestry community in northern Wisconsin to discuss climate change impacts on ecosystems, management responses, and cooperative activities across a variety of public and private organizations. The Shared Landscapes Initiative is convening a set of adaptation demonstrations across a variety of landownerships in the area surrounding Chequamegon Bay, including this demonstration.

For more information, visit:  
[www.sharedlandscapes.org](http://www.sharedlandscapes.org)



## INCORPORATING CLIMATE CHANGE INTO FOREST MANAGEMENT

A team of natural resource professionals from the Chequamegon-Nicolet used the Adaptation Workbook from *Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers* to evaluate the potential impacts of climate change on the two watersheds and suggest a variety of actions that could enhance forest resilience to climate change under a wide range of future conditions. Examples of actions include:

WATERSHED	PLANNED RESTORATION ACTION	RELATED ADAPTATION BENEFITS
<b>Twentymile Creek</b>	<ul style="list-style-type: none"> <li>Several stream crossings currently have culverts that are undersized, poorly placed and deteriorated, increasing the risk of failure and negative impacts on water and stream channels.</li> <li>These culverts will be replaced with larger, better aligned culverts that will maintain fish passage and restore channel morphology.</li> <li>Forest management activities will be performed in 15 acres of riparian forest within portions of the watershed.</li> <li>One site will be planted with pine seedlings under the forest canopy to shade streams and eventually serve as a source of woody material for aquatic habitat.</li> </ul>	<ul style="list-style-type: none"> <li>The new culverts will improve stream connectivity and reduce the impact of climate-related and non-climatic stressors on fish.</li> <li>The larger culvert size will withstand greater stream flows that may occur more frequently in the future, reducing negative impacts from erosion and sedimentation.</li> <li>Planned harvest activities will diversify the riparian areas. This will reduce the risk of the forest being negatively affected if one or a few species are especially susceptible to climate change-related stressors or declines.</li> <li>Pine species are expected to be better-adapted to climate change than many other native tree species. Conifer trees will also help to cool stream water throughout the year.</li> </ul>
<b>Headwaters of the Marengo River</b>	<ul style="list-style-type: none"> <li>Three eroding banks will be stabilized to reduce impacts on water quality.</li> <li>Forest management activities will be performed in some areas of riparian forest within the watershed to promote long-lived tree species.</li> <li>Older and larger trees will provide a greater source of woody material for aquatic habitat.</li> </ul>	<ul style="list-style-type: none"> <li>The risk of erosion and sedimentation during severe rain or snowmelt events will be reduced</li> <li>Planned harvest activities will reduce the amount of aspen in these areas and also increase the amount and diversity of tree species that are expected to be more suitable to future conditions.</li> <li>These areas may become less suitable for beaver, which would help to discourage beaver activity, maintain cold water habitat and reduce stress on native brook trout.</li> </ul>

## NEXT STEPS

The Chequamegon-Nicolet National Forest will continue to consider how a changing climate may affect natural resources in these watersheds and elsewhere on the forest. Future activities include:

- Restoration activities will be carried out in the two watersheds beginning in 2013. More details are online at:
  - [www.fs.fed.us/nepa/fs-usda-pop.php/?project=38840](http://www.fs.fed.us/nepa/fs-usda-pop.php/?project=38840)
- A set of monitoring metrics will be developed to evaluate the effectiveness of adaptation actions.
- Natural resource professionals from the Chequamegon-Nicolet will provide feedback to improve adaptation resources and identify land manager needs for additional scientific information, adaptation resources, or communication efforts.
- The Chequamegon-Nicolet will work with the Shared Landscapes Initiative and others to communicate the outcomes and lessons from this project to a wide variety of land owners, resource managers, and others.

## REFERENCES & ADDITIONAL RESOURCES

<sup>1</sup>Swanston, C., M. Janowiak, L. Iverson, L. Parker, D. Mladenoff, L. Brandt, P. Butler, M. St. Pierre, A. Prasad, S. Matthews, M. Peters, D. Higgins, and A. Dorland. 2011. Ecosystem Vulnerability assessment and Synthesis: A Report from the Climate Change Response Framework Project in Northern Wisconsin. Gen. Tech. Rep. NRS-82. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station, 142 p. [www.nrs.fs.fed.us/pubs/38255](http://www.nrs.fs.fed.us/pubs/38255)

<sup>2</sup>Swanston, C. and M. Janowiak (editors). *Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers*. 2012. Gen. Tech. Rep. NRS-87. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station, 121 p. [www.nrs.fs.fed.us/pubs/40543](http://www.nrs.fs.fed.us/pubs/40543)

For more information, visit [www.sharedlandscapes.org](http://www.sharedlandscapes.org) or contact Linda Parker ([lrparker@fs.fed.us](mailto:lrparker@fs.fed.us)) or Maria Janowiak ([mjanowiak02@fs.fed.us](mailto:mjanowiak02@fs.fed.us)).



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