

# Climate Change Adaptation Project

## Bad River Natural Resources

Working forests are an integral part of the Northwoods landscape, providing forest products, jobs, and other environmental benefits to local communities. Climate change introduces new challenges to the integrity and productivity of these forests over the long-term. The Natural Resources Department of the Bad River Band of Lake Superior Chippewa Indians in northern Wisconsin is developing a real-world example of how climate change considerations can be incorporated into sustainable forest management. This is one of multiple efforts in the area that show how forest management actions can enhance the ability of forests to cope with changing conditions while meeting a variety of management goals.

### CLIMATE CHANGE AND THE BAD RIVER RESERVATION

The Bad River Tribe is concerned about changing climatic and environmental conditions that have already affected key cultural resources, such as wild rice. A changing climate is expected to aggravate existing stressors on ecosystems, as well as introduce new challenges to management. Many of the most important factors that influence forest ecosystems 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>.

Climate change is expected to have a variety of impacts on the Bad River Tribal lands, including:

- Changing precipitation patterns may have an especially large impact on the lands surrounding the Bad River because of the unique red clay plain soils. More intense storms could increase issues related to erosion, sedimentation, and flooding. At the same time, it is uncertain whether potentially drier summer conditions would create conditions more or less suitable for tree growth.
- Changes in precipitation patterns may also affect the amount of water present in forested wetlands. Reduced water levels, or water levels that fluctuate greatly between seasons, could increase the amount of stress on forests and reduce their ability to provide clean water and wildlife habitat.
- Many northern tree species may experience declines due to warmer temperatures and changing climatic conditions. Aspen, black spruce, balsam fir, and other species are expected to have greater declines.
- Future conditions may also be favorable for some desirable tree species, such as white pine.

### Bad River Adaptation Sites

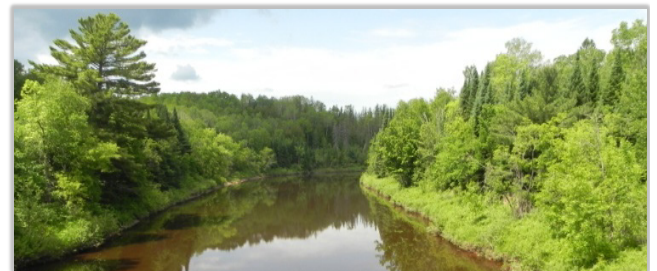
**SIZE:** 164 acres

**FOREST TYPES:** Two stands of aspen-dominated forest on red clay plain soils, with mixed hardwoods and pine in the understory, and one stand of large white pine over mixed hardwoods.



The adaptation project sites are near the Bad River and less than 10 miles from the Kakagon/Bad River Sloughs—16,000 acres of wild rice, grasses, sedges, trees, streams, and open water located on Tribal lands along the southern shore of Lake Superior. The Sloughs are part of the largest and healthiest full-functioning freshwater estuarine system remaining in the upper Great Lakes region and is culturally significant to the Bad River Tribe.

Much of the management on Tribal lands worked to maintain the integrity of the Bad River watershed. Forestry activities also strive to enhance tree species that have cultural importance, including white pine, paper birch, and northern white-cedar.



### A TEAM EFFORT

A variety of partners are helping to carry out this adaptation project:

- The **Northern Institute of Applied Climate Science (NIACS)** leads the Northwoods Climate Change Response Framework project, a collaborative effort that helps natural 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 **Natural Resources Department of the Bad River Band of Lake Superior Chippewa Indians (Bad River NRD)** works to maintain and improve the health of ecosystems within the Bad River Reservation for at least the next seven generations, while providing the sustainable provision of resources. This includes over 124,000 acres of land, primarily owned by the Tribe or held in trust. The Bad River NRD will use the lessons learned from this adaptation project to incorporate climate change into its next Integrated Resource Management Plan.
- The **Shared Landscapes Initiative** is 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 project across a variety of landownerships in the area surrounding Chequamegon Bay, including this effort at the Bad River Reservation.

For more information, visit:

[www.sharedlandscapes.org](http://www.sharedlandscapes.org)

[www.climateframework.org](http://www.climateframework.org)



## INCORPORATING CLIMATE CHANGE INTO FOREST MANAGEMENT

A team of scientists and forest managers from the Bad River Natural Resources Department, the Bureau of Indian Affairs, and NIACS 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 Bad River project sites (see previous page) and suggest a variety of actions that could enhance forest resilience to climate change under a wide range of future conditions.

STAND	CURRENT MANAGEMENT	POSSIBLE ADAPTATION ACTIONS
<b>All Stands</b>	<ul style="list-style-type: none"> <li>Take actions that reduce the spread of invasive species</li> <li>Timber harvests restricted to winter based on soils</li> </ul>	<ul style="list-style-type: none"> <li>Maintain or increase activities to reduce the spread of invasive species</li> <li>Implement actions that minimize impacts to the surface waters and the soils</li> <li>Evaluate culverts when present and improve to accommodate larger storms</li> <li>Consider the use of more temporary stream crossings to reduce impacts on soils and water</li> <li>Evaluate BMPs to protect water quality to address a range of climate change impacts</li> </ul>
<b>Aspen</b>	<ul style="list-style-type: none"> <li>Regenerate aspen</li> </ul>	<ul style="list-style-type: none"> <li>Diversify stands to include a greater mix of species that are expected to fare better under future conditions by transitioning stands away from aspen to a mix of hardwood and conifer species</li> <li>Retain trees that are expected to be better adapted to future conditions during harvest, including red and white pine, red maple, and bur oak. This also will help to increase the diversity of tree species and stand structure</li> <li>Include supplemental plantings with white pine and red pine to enhance long-lived conifer component and encourage species that are expected to fare better under future conditions</li> <li>Try unique management techniques in the adaptation project area to provide a comparison with more typical management in similar nearby stands</li> </ul>
<b>White Pine</b>	<ul style="list-style-type: none"> <li>No actions planned for near term in this stand</li> <li>The Integrated Resource Management Plan includes goals for increasing the conifer component across the Reservation</li> </ul>	<ul style="list-style-type: none"> <li>Encourage white pine regeneration by thinning overstory white pine and reducing competition from the hardwoods trees below the white pine</li> <li>Use prescribed fire to reintroduce low-intensity fires into the ecosystem and create conditions favorable for white pine to seed</li> <li>Plant additional white pine if needed to ensure the presence of that species</li> <li>Develop plans to treat the site in the event that windthrow removes the existing white pine overstory before white pine is established in the understory</li> </ul>

### NEXT STEPS

The climate change adaptation project will fully integrate climate change into forest management in these stands. Future activities include:

- Continued collaboration between the Bad River Natural Resources Department and the Bureau of Indian Affairs to develop the stand prescriptions and implement the adaptation actions.
- A set of monitoring metrics will be developed to evaluate the effectiveness of adaptation actions.
- Lessons learned from this effort will be used to help incorporate climate change into the next Bad River Integrated Resource Management Plan.
- NIACS and the Bad River Natural Resources Department will work with the Shared Landscapes Initiative to communicate the outcomes and lessons from this project to land owners, natural 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)

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