



The Cross-Pollinator

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Learning from the Ojibwe: Combining Culture and Dendrochronology Tools



Federal, academic, and tribal groups are collaborating to understand the historic use of fire based on research conducted on Windigoominis, also known as Star Island, in northern Minnesota. Courtesy photo by Vern Whitten, used with permission.

SUMMARY

Chippewa National Forest staff are working with the Leech Lake Band of Ojibwe, the Leech Lake Tribal College, and the University of Minnesota to research and understand the historic use of fire in regional land management. By analyzing tree rings from a culturally significant island and sharing related knowledge, the partnership is deepening their understanding of the land, strengthening relationships, and laying the groundwork for further collaboration. Using this knowledge to inform present day land management may help ensure the region's mixed pine woodlands are resilient into the future.

Literary Voyagers

In 1820, an Ojibwe community in what is today known as northern Minnesota welcomed an unusual group of visitors. These visitors, including the scientist-explorer Henry Rowe Schoolcraft, were making their way through northern Minnesota on an expedition to map what was then called the western Michigan Territory. The meeting of these two groups, on an island called Windigoominis, marked the beginning of an extended cultural exchange. In the coming decades, Schoolcraft would work with the Ojibwe

and various other tribal groups to raise national awareness and appreciation of Native American culture.

Today, as part of the Star Island Fire History Partnership, scientists with the USDA Forest Service and the University of Minnesota are still learning from the Ojibwe.

According to Chippewa National Forest Heritage Program Manager Sean Dunham, a partnership made up of the University of Minnesota, the Leech Lake Band of Ojibwe, Leech Lake Tribal College, and the Chippewa National

Forest is collaborating on a fire history project on Star Island in Cass Lake. The partnership, supported by a grant from the Minnesota Historical Society Heritage Partnership Program, “brings together diverse perspectives and knowledge that will enhance shared understanding of the island from ecological, cultural, and historical contexts,” Dunham explains, adding, “We’re considering how the fire history relates to Ojibwe stewardship and use of the island. This research may help us better understand the broader cultural relationship with the landscape in northern Minnesota. We hope that we can bring that improved understanding into our ongoing conversation with the Ojibwe about how best to manage the Chippewa National Forest from a cultural and environmental perspective.”



Named after the Ojibwe Tribe, the Chippewa National Forest is located on the ancestral lands of the Ojibwe and Dakota Tribes. USDA Forest Service photo.

Shared Goals at Chippewa National Forest

It's not just appropriate but a legal requirement that this collaboration is taking place at Chippewa National Forest. Located in the heart of northern Minnesota and established in 1908, the National Forest is on the ancestral land of the Dakota and Ojibwe peoples, who lived in this region for generations before the Chippewa National Forest was created. Today, nearly half of the National Forest lies within the boundaries of the Leech Lake Band of Ojibwe Reservation. Under this arrangement, Forest Service staff and the Leech Lake Band of Ojibwe share goals and responsibility for the land and its cultural, natural, and economic resources.

These resources include Windigoominis, also known as Star Island. The island has more than 8 miles of shoreline that surround almost 1,000 acres of land. With high banks and deep woods, Star Island is known for its hiking, camping, and nature study opportunities—and for Lake Windigo, the only spring-fed lake within a river-fed lake in the northern hemisphere.

Star Island was chosen for this study for several reasons, including its old-growth red pine (*Pinus resinosa*) stands, its historical and archaeological evidence of thousands of years of human habitation, and the island's likely isolation from larger, regional fire events on the mainland.

Archaeological excavations in this area have found stone tools and fish bones that indicate a human presence for as many as 10,000 years. But in much of the past century or more, management actions largely ignored the role of Ojibwe fire use in maintaining open forest conditions, and there have been rapid and continuing changes to the area's fire-dependent pine communities. These changes include failure of natural red pine reproduction, reduced jack pine (*P. banksiana*) presence, low productivity of culturally important plants such as blueberry (*Vaccinium* spp.), and infilling of open forest with understory shrubs and shade-tolerant trees. According to Dunham, "These vegetation changes necessitate a thoughtful approach to the restoration of fire on the Chippewa National Forest."

A Window to the Past

Dunham explains that the island's fire history is being reconstructed by examining tree rings preserved in fire-scarred red pine stumps and core samples collected from living red pine. This tree-ring research, or dendrochronology, provides a window to past climate, fire, and cultural activity. Fifty-five remnant red pine trees have been collected from the island in the past 3 years and more than half have been processed and dated so far. With a dendrochronological record that extends to the 1670s, researchers have found evidence for 13 unique fire

years between 1747 and 1902, with no fire evidence before or after this period. Most striking is a cluster of four fires between 1790 and 1813 that were recorded on most of the sampled stumps throughout the western part of the island.

This fire history pattern, particularly between 1790 and 1866, is believed to be the result of intentional and local human ignitions as opposed to lightning or climate-driven events. "Considering the heavy use of the land for Native Americans living within the time period of these fire events, it is more than likely the fires were used as land management practices by the Ojibwe," Dunham says. Historical records suggest burns for berry cultivation and for clearing brush as a safety management practice.



Dendrochronology from Star Island indicates a fire history pattern that coincides with cultural knowledge from present-day Ojibwe tribal members. Courtesy photo by Kurt Kipfmüller, used with permission.

The Ojibwe Perspective

These possibilities have been confirmed by present-day Ojibwe research partners such as Daniel DeVault, an instructor at Leech Lake Tribal College. According to DeVault, “I was brought up in a lot of the old ways—what we today call subsistence living and cultural immersion. Both my parents’ first language was Ojibwe and I’ve retained a lot of information about my culture and my heritage. For example, I know that we’d burn small areas and that would get the blueberries back up. We also didn’t cut trees down unless we had to—and the ones that we cut down were dying.”

In comparing the tree rings with known history, the fire activity increased with the easing of tensions with the Dakota tribe in the late 18th century and ended following State and Federal efforts to relocate Ojibwe to the White Earth Reservation in the late 19th century. DeVault’s tribal knowledge has also helped to confirm archaeological and historical evidence of an Ojibwe community on Star Island, often referred to as Ozaawindib’s village, during the period of high fire activity. Ozaawindib, incidentally, was a prominent Ojibwe leader who guided the 1832 Schoolcraft expedition to Lake Itasca, the headwaters of the Mississippi River.

Of course, Star Island and the overall region have a highly personal meaning for DeVault. “It’s our ancestral lands and I’d love to see more Native American involvement in land management—that’s why I’m involved,” he explains. “I want to see Native people being able to express their culture on the land. I’d like to see more Native Americans on the island, whether for recreation or education. I’d like to see large gardens there with sugarbushing (maple sugar production).”

Working with the University of Minnesota

Faculty and students at the University of Minnesota and Leech Lake Tribal College are also helping with this research, particularly using dendrochronology. According to Kurt Kipfmüller, a University of Minnesota associate professor of geography, environment, and society, the key takeaway is that there were a lot of fire events starting in 1747 and especially in the 1770s and in 1790 to 1813. “It’s really unlikely that the last period in particular was all natural,” he says, as the fire



Tree ring samples collected on Star Island provide insights into the island’s history of human-fire interactions. Courtesy image created using Esri ArcGIS, by Kurt Kipfmüller, used with permission.

intervals are much shorter than lightning ignitions alone might support. He adds, “If you can correlate that period with Ojibwe occupation and use, you can confirm human intervention and understand why the fire was needed. By engaging in conversations with our Leech Lake Band of Ojibwe partners, you get insights into forest composition, climate, and cultural uses, plus insights on goals for the land and the role that prescribed fire plays.”

University of Minnesota students and staff took cross sections, partial cross sections, and core samples from stumps and live

red pine trees around the island. These samples were taken to a University of Minnesota laboratory and processed using fine sanding until individual tracheid cells (long cells that help transport water and minerals) were visible under magnification. To visually cross-date annual rings, researchers used a technique called skeleton plotting to emphasize narrow rings and other ring characteristics. This approach allowed them to date fire-scarred lesions based on their placement within annual rings. Cores and cross sections were then compared to help confirm dates.



With its high banks and deep woods, the island has long been known for its cultural importance to the Ojibwe, as well as for hiking, camping, and nature study opportunities. USDA Forest Service photo, 1938.

Along with Lane Johnson, a research forester at the University of Minnesota Cloquet Forestry Center, Kipfmueller and their students continue to learn about the island and, by extension, the area, its fire history, and the Ojibwe's role in both. "In hindsight it seems obvious that you can learn about land and resource management in this way and that the Ojibwe wanted to keep the land open by setting fire every 10 years or so," Kipfmueller says, adding, "At the end of the day I'm really an interpreter, finding out the story that these trees and these people have to tell."

Support from the Ojibwe

The partnership also validates an important cultural connection. According to Amy Burnette, the Leech Lake Band of Ojibwe's tribal historic preservation officer, "The area's fire history isn't something that's been forgotten, but it's been suppressed. For us to be able to reclaim that and make an informed decision about how to proceed is incredibly important to our people."

Burnette sees the Star Island project as a way of connecting to the past, to indigenous culture, and of recognizing sovereign Native American tribes' role in terms of land management. As Burnette observes, "For Star Island and really any project in the National Forest, we want to be getting all data relevant to our tribe and our members' lives. This study is able to show how Ojibwe people were managing the land to take care of their families. It shows that we knew what we were doing and that we were closely involved in management of our cultural lands, just as we are today."

Burnette describes the work as a partnership with the goal of productive long-term relationships with various government agencies and local community influencers. "When we started this project there was no inkling that a pandemic was coming," Burnette explains, adding, "I



The Star Island research project is part of wider cultural exchange by Chippewa National Forest and Leech Lake Band of Ojibwe. USDA Forest Service photo.

was hoping that we'd get interested tribal and nontribal stakeholders outside, where people might be at ease and comfortable. I'm still hopeful that that level and style of interaction will be possible for this project and others in the future. We're trying to build lasting relationships and come up with new ideas, especially with the input of the Tribal College." To support this effort, Kipfmueller is working with Leech Lake Tribal College faculty and students to teach others how to interpret the tree rings and what they mean to the history of the island.

Next Steps and Implications

The partnership's next steps include processing and dating the remaining fire-scar samples, discussing with Leech Lake Band of Ojibwe elders the history and cultural significance of Star Island and the Cass Lake area, and developing educational and interpretive materials for the project. "The project will facilitate

longer-term engagement and interaction," Dunham says, adding, "The relationships will benefit all participants by forging new pathways toward improving cross-cultural and interdisciplinary understandings of Minnesota's complex cultural and ecological history."

Citing a movement to incorporate cultural knowledge and include Native Americans in the conversation about fire management, there's excitement among the team regarding how this approach can be used elsewhere around the country. As Kipfmueller explains, "This is a place we can confirm tree-ring fire evidence with oral tradition from a tribe that's still very connected to the local land area. Although many tribes have been relocated, I'm hopeful that there's a lot of cultural awareness that can be improved and applied in other state and federally managed areas."

NEW RESEARCH REVEALS OLD TRUTHS

For over a century, most scientists and foresters had viewed red pine forests of the western Great Lakes region as structurally simple, single-cohort stands of red pine originating after stand-replacement fire. Management has largely emulated this perceived model by growing even-aged plantations of red pine. Research is now showing what the Ojibwe knew all along. Using stand reconstructions in old-growth forests, along with historical evidence, Northern Research Station scientist Brian Palik and others have demonstrated that these forests were more structurally complex and tree-species rich than generally reflected in timber-focused management approaches. This diversity is the result of a mixed-severity, spatially patchy natural disturbance regime, largely from fire, and yields ecosystem services far beyond timber production. Such findings also reinforce the importance of partnering with, listening to, and reviving and developing new knowledge and practices with Tribes. Future management may consider variable retention harvest in combination with prescribed fire or surrogate silvicultural approaches to more closely mimic previous natural disturbance regimes. While climate change poses a significant future challenge, re-introducing more species, age, and ecosystem complexity will inevitably add to the landscape's resilience.

KEY POINTS

- Development of tree-ring-based fire history from remnant red pine stumps is helping to tell the story of people and fire at Star Island in Cass Lake, Minnesota, a culturally important place for Ojibwe descendant communities.
- Scientific and historical research, combined with cultural knowledge, indicates regular local use of fire for land and vegetation management by the Ojibwe people, prior to Ojibwe land dispossession and subsequent fire suppression in northern Minnesota.
- Sharing knowledge between project partners has led to thoughtful dialogue regarding fire's importance as an ecological and cultural practice.
- Blended knowledge from this partnership may be applied to collaborative restoration of fire to fire-dependent landscapes in the Chippewa National Forest.
- Dendrochronological training of Leech Lake Tribal College and University of Minnesota students and other community members can transfer important knowledge and skills to enable direct participation in rediscovering cultural history.

MANAGEMENT IMPLICATIONS

- As traditional cultural lands came under federal and state management during the past two centuries, traditional cultural and land-management practices were often suppressed.
- In some cases, changes to land-management approaches, such as widespread fire suppression, caused undesirable changes to natural areas, including many with tribal cultural implications.
- The Chippewa National Forest, which shares land with the Leech Lake Band of Ojibwe Reservation, is working with local scientists and Ojibwe cultural experts, using dendrochronology, historical research, and improved communication to reestablish cultural and ecological connections.
- These efforts can be a model for other federal and state managed lands in deepening cultural and historical understanding and strengthening stakeholder involvement in project planning, implementation, and monitoring.

FURTHER READING

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CONTRIBUTOR PROFILES

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SEAN DUNHAM is an archaeologist and heritage program manager for the Chippewa National Forest in Cass Lake, Minnesota. His current research interests focus on the relationship between people, their culture, and their environment. Dunham received a bachelor's degree in history and anthropology from Michigan State University, a master's degree in ancient studies from the University of Minnesota, and a PhD in anthropology from Michigan State University.



MARCIE GOTCHIE is an archaeologist for the Chippewa National Forest in Cass Lake, Minnesota. Her current research focuses on indigenous archaeology. She received her bachelor's degree in tribal historic preservation from Salish Kootenai College.



LANE JOHNSON is a research forester with the University of Minnesota's Cloquet Forestry Center. With his interest in applied historical ecology, Johnson uses tree rings paired with other historical records to better understand the fire ecology of native plant communities in the western Great Lakes. Johnson holds a bachelor's degree in environmental studies from the University of Minnesota-Duluth and a master's degree in geography from the University of Minnesota-Twin Cities. Additional information on Lane at cfc.cfans.umn.edu/people/lane-johnson.



KURT KIPFMUELLER is an associate professor of geography, environment, and society at the University of Minnesota-Twin Cities. His research explores the intersection of climate variability and forest vegetation patterns, particularly with respect to disturbance regimes. Kipfmüller teaches courses in climate variability, biogeography, dendrochronology, and fire ecology. He received a bachelor's degree in geography and earth science from Central Michigan University, a master's degree in geography from the University of Wyoming, and a PhD in geography from the University of Arizona. Additional information on Kipfmüller can be found at <https://cla.umn.edu/about/directory/profile/kurt>.



MELINDA NEVILLE leads the Leech Lake Tribal College (LLTC) Earth Systems Science program and serves as chair in the Department of Natural Science and Technology. She teaches courses in environmental science, geology, limnology, and environmental research methods and coordinates student research and internship programs at LLTC. Her research interests include microplastics in surface waters and sediments, and prescribed fire for native plant community restoration and its effects on soil. Additional information on Neville and LLTC's STEM program can be found at www.lltc.edu/academics/natural-sciences-and-technology.



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PURPOSE

The Cross-Pollinator is a science synthesis publication produced quarterly in cooperation between the Northern Research Station, the Urban Field Station Network, State and Private Forestry, and the Urban Forest Technology and Science Delivery Team. It spotlights transdisciplinary collaborations among researchers and practitioners that “cross” forest research with urban and community forests at a landscape scale.

ABOUT US

The mission of the Urban Field Station Network is to improve the quality of life in urban and urbanizing areas by conducting and supporting research and science exchange about social-ecological systems and urban-to-rural resource management. The mission of the Urban Forest Technology & Science Delivery Team is to work collaboratively to deliver quality urban natural resources science, technology, and information to improve the long-term sustainability of urban ecosystems and the broader watershed, for wildlife and people. Find out more at <https://www.nrs.fs.fed.us/ufs/>; <https://www.fs.fed.us/research/urban-science-delivery-team.php>; and <https://www.vibrantcitieslab.com/>

CONTACT INFORMATION

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