



Reference benchmark mixed-pine stand in the Seney Wilderness Area, Seney NWR.

INNOVATIVE FOREST MANAGEMENT

Seney National Wildlife Refuge and Kirtland's Warbler Wildlife Management Area

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established in 1903 when President Roosevelt created Pelican Island (Florida) as a preserve and breeding ground for migratory birds, the US Fish and Wildlife Service National Wildlife Refuge System (NWRS) represents our nation's attempt to conserve, preserve, and restore lands for the wildlife they support. Just over a century later, the NWRS currently consists of 548 refuges that comprise nearly 100 million acres.

Historically, many refuges were established for conserving single species (including endangered and threatened species) or species groups. During the 1930s and 1940s, for instance, many refuges were established for the production of waterfowl through wetland conservation and restoration. Although wetlands still dominate the NWRS, in the Lake States a number of forested refuges are also found, including Necedah National Wildlife Refuge (NWR) (Wisconsin); Tamarac NWR, Sherburne NWR, and Rice Lake NWR (Minnesota); and Shiawassee NWR, Seney NWR, and Kirtland's Warbler Wildlife Management Area (Michigan). However, most of the forest ecosystems of these refuges are considerably altered relative to their pre-European settlement conditions. Fortunately, our national conservation philosophy has developed, and advancements have been made in the fields of conservation biology, landscape ecology, and forest ecology. A new era of ecologically based conservation and restoration now characterizes forest management on these and other refuges. Here we use Seney NWR in the Upper Peninsula of Michigan and Kirtland's Warbler

Wildlife Management Area (WMA) in the northern Lower Peninsula as two examples of current approaches to forest management on refuges in the Lake States.

Seney NWR

At nearly 96,000 acres, Seney NWR (est. 1935) is one of the larger refuges east of the Mississippi River. Due to landscape position, surrounding land uses, and its relative remoteness, Seney is considered one of the more ecologically intact refuges of the lower 48 states. Although many of its forests are altered from their pre-European settlement condition, Seney benefits from having most pre-European-settlement land-cover types represented, a forested matrix that is primarily in public ownership, and few invasive species.

Successional trajectories for the majority of upland forest ecosystems at Seney led to fire-maintained mixed-pine forest type, with an overstory dominated by red pine (*Pinus resinosa*) and white pine (*P. strobus*), and scattered jack pine (*P. banksiana*). High-grading during turn-of-the-century logging, catastrophic wildfires fed by logging slash, and other management actions for early successional tree species, however, have altered many (but not all) of these stands. In some areas where catastrophic wildfires burned very hot, "stump fields" dominated by grasses, sedges, and other perennial ground-flora now persist. Other areas where the natural fire regime has been altered are now jack pine dominated. Slowly decaying white pine stumps provide a glimpse of the mixed-pine forests that once characterized these sites. Both conditions are considerably less structurally and compositionally diverse and require restoration.

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Altered stand formerly comprised of mixed pine, but now dominated by jack pine, Seney NWR. Note white pine stump in foreground.

“Whereas forest ecosystems within the NWRS were once either ignored or viewed as habitat for single species or game species, land managers are now beginning to grasp how forests on refuges can function in a broader spatial and temporal context.”

In conjunction with colleagues at The Ohio State University (OSU), the USDA Forest Service (USFS) Northern Research Station, and MTU, research funded by the federal Joint Fire Science Program is being conducted to better characterize the variability in the pre-European-settlement, post-settlement, and post-Seney establishment fire regimes and their impacts on mixed-pine forest structure and composition. Isolated mixed-pine stands that repre-

sent the pre-European-settlement condition in the 25,150-acre Seney NWR and the associated Strangmoor Bog National Natural Landmark allowed for comparisons across a gradient of altered forest conditions. Results suggest strong linkages among fire history, management intensity, and stand structure, composition, and fuel loadings. Currently these results are being analyzed to help develop more ecologically based restoration guidelines.

Kirtland's Warbler WMA

Whereas the primary goal of forest management at Seney is to restore composition and structure in many stands to pre-European condition, forest management at Kirtland's Warbler WMA (est. 1980) primarily provides early successional jack-pine breeding habitat for the endangered Kirtland's warbler (*Dendroica kirtlandii*). The Kirtland's warbler is a ground-nesting, neotropical migrant whose primary breeding range encompasses the sandy outwash plains associated with the Kirtland's Warbler WMA. Although most management actions are in concert with a multi-agency recovery plan for the warbler, habitat management on the 125 tracts totaling nearly 6,900 acres can also be conducted for broader, multi-species and ecosystem benefits. In fact a recent study conducted with OSU demonstrated that each of three different age classes of jack pine provide benefits for many bird species of conservation priority, from openland species in recently harvested stands to species of mature, close-canopy forests in older stands. Along with

timber harvesting and the re-planting of jack pine, research and management is now looking at methods for better emulating other stand structural attributes that develop following the natural disturbance regime—wildfire—in these forest ecosystems. For example, research conducted with Central Michigan University involves documenting the efficacy of mechanically creating snags and quantifying the multi-species use of this enhanced structure.

To guide land-management decisions within the NWRS, the 1997 Refuge Improvement Act calls for refuges to manage within an ecological context and restore habitats to historic conditions where and when possible. Whereas forest ecosystems within the NWRS were once either ignored or viewed as habitat for single species or game species, land managers are now beginning to grasp how forests on refuges can function in a broader spatial and temporal context. Increasingly, forests on refuges in the



Aerial view of Kirtland's Warbler habitat. Note intensively planted and relatively uniform jack pine with small canopy openings to the right, and the heterogeneous habitat produced by prescribed fire to the left.

Lake States are being managed for a broader spectrum of stand conditions to provide wildlife habitat and accomplish broader ecosystem goals and objectives. ■

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Focus on Regions: Lake States

This issue of Forest Wisdom explores a cross section of the challenges facing Guild practitioners in the Lake States and examples of strategies they are successfully pursuing on the ground.

The Lake States: Leaders in Utilizing and Advancing Ecological Classification Systems

related to natural communities and habitat, Ecological Classification Systems (ECSs) are used to categorize the environment into small units containing relatively uniform patterns and processes. ECSs help foresters and other natural resource managers understand, manage, and communicate about diverse ecosystems. While the ideas behind them extend back to the 1940s or earlier, ECSs are currently gaining momentum as tools for ecological forestry.

Using ECSs allows land stewards to be more specific about local conditions than relying on a basic forest type or dominant species identification. In this way, ECSs are similar to measures of site index; but more importantly, ECSs focus on the whole ecosystem, not just timber trees. The concept is straightforward, and most people who spend time in the woods intuitively grasp an ECS for their region. The challenge is taking the complex ecological attributes of an area and simplifying them into categories that translate into management possibilities. In fact, this may be the most difficult hurdle to overcome to realize the value of ECSs in forest management. Once linked into management, additional opportunities arise to use ECSs: for instance, to identify preservation priorities or to meet certification standards.

Although ECSs exist for various regions across the U.S. and Canada, the Lake States offer excellent examples of their utility and power. Most of the ECSs in the Great Lakes region are based on common data and analytic methods and share the concept that the groundlayer is a better indicator of site conditions than the overstory because it is more tightly tied to the nutrition and moisture regimes of forest soils. Also implicit in ECSs are the beliefs that trees behave differently from one community to another

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