

## **A Strategy to Improve the Kirtland's Warbler Breeding Distribution**

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### **Part I. Framing the Issue; Statement of Management Problem – DRAFT2**

#### **Purpose**

An interdisciplinary work-group was formed to collaboratively develop a strategy to increase the distribution of Kirtland's warbler (KW) habitat and population across the breeding range, to reduce the risk from catastrophic events and climate change in the core habitat (Objective #2, Kirtland's Warbler Breeding Range Conservation Plan, page-23). The goal is to provide a climate change adaptation strategy for KW that establishes at least 100 breeding pair (10% of the 1,000 pair recovery goal) across a broad distribution of 10,000 acres of suitable habitat, outside of the Northern Lower Peninsula (NLP) of Michigan. Additional peripheral habitat could allow the KW population to grow, even as the core habitat reaches carrying capacity or experiences habitat reduction. In the last full census (2015), there were 2,365 total singing male KW counted. The peripheral portion was about 3% of the total population in 2016, with 53 pair counted in the UP of Michigan, 17 pair found in Wisconsin and 2 pair in Canada.

#### **Spatial and Temporal Scope**

The Breeding Range Conservation Plan (page-32) discusses expanding the KW breeding range into the UP of Michigan, Wisconsin and Canada. It also describes a concern with a clumped and highly concentrated distribution in the core habitat (NLP). And it suggests there may be opportunities for KW populations to expand into new jack pine habitat within the NLP, but outside the core. It appears there is a highly concentrated "core" population (50% of the population in 5 townships of the NLP), a less dense "core-peripheral" in the NLP, and the even sparser "periphery" of the range in the UP of Michigan, Wisconsin and Canada. In 2016, 50% of the UP population was found in 2 counties (Chippewa and Delta).

Due to the uncertainty of bird response to habitat created outside the core, it is assumed that 100 acres of suitable habitat would be required for each breeding pair (Breeding Range Conservation Plan, table 2, page 22). The Hiawatha National Forest provides sustained suitable habitat on approximately 6,700 acres of jack pine in the appropriate age-class, which is dedicated to ecosystem management and a KW habitat goal (Hiawatha Forest Plan, 2006). Wisconsin has a goal of maintaining 5,805 acres of suitable habitat, but have not yet created the partnerships and mechanisms for implementing this across multiple partners. The Michigan Department of Natural Resources (MDNR) has recently begun internal discussions to assess the possibility of managing KW as a featured species in several outwash plain systems in the Upper Peninsula (UP) of Michigan. The Ottawa National Forest and Canada have started KW management efforts, but have unspecified KW management goals.

The workgroup speculated that the core KW population may be reaching carrying capacity. However, similar to the UP and Wisconsin, some core-peripheral DNR habitat in the NLP does not have as high KW density as the nearby core. A census was not conducted on DNR land in the NLP in 2016. If the core population is

nearing carrying capacity, could that help explain the 43% increase in the UP in 2016? There may be a lag time between population dynamics in the core and colonization of peripheral habitats. Suitable habitat is available and unused in the UP and Wisconsin. Maintaining unused peripheral habitat in an age range suitable for KW occupancy may be useful as an adaptation strategy for climate change, as overflow habitat if core habitat reaches carrying capacity, or as a buffer in the event that core habitat is reduced by disease, insect, fire or other processes.

The Forest Service's Northern Research Station is studying the potential impact of climate change on jack pine establishment and growth rates under various environmental variables (temperature, precipitation, etc.). This research seeks to address two important questions: 1) will a warming climate exceed jack pine heat tolerance and force the species out of existing outwash sand-plains, and 2) will climate change affect the growth rate of jack pine on current sites? The xeric soils upon which KW habitat is generally found will not move with the vegetation, and impacts to KW from shifting jack pine and understory vegetation are uncertain.

Ultimately, this strategy will need to incorporate a long range strategic planning scope that includes climate change adaptation approaches for impacts that may be 60 to 100 years (or more) away. We suggest creating a 5 year adaptive management strategy using the KWCT template outline to develop short and long term goals, actions, monitoring plans, research projects and budgets.

Due to the uncertainty of the exact impacts from climate change, the spatial scope will include all breeding range partners that are currently engaged in KW conservation (Michigan, Wisconsin and Canada).

### **Threats and Opportunities**

Climate change has the potential to decrease and shift suitable breeding habitat outside of its current range, decrease the extent of wintering habitat, and decouple the timing of migration from food resource peaks that are driven by temperature and are necessary for migration and feeding offspring. Continued increases in temperature and evaporation will likely reduce jack pine forest acreage, as well as increase the susceptibility of current jack pine forests to pests and diseases. Warmer weather and increased levels of carbon dioxide could also lead to an increase in tree growth rates on marginal forestlands that are currently temperature-limited. Additionally, higher air temperatures will cause greater evaporation and in turn, reduce soil moisture, resulting in conditions conducive to forest fires that favor jack pine propagation. Under different greenhouse gas emission scenarios, there may be a reduction of suitable Kirtland's warbler breeding habitat in Michigan, as well as an expansion of suitable habitat in western Wisconsin and Minnesota (USFWS 5 year review of KW (2012)).

### **Threats**

1. A principle threat to the KW population, relative to expanding breeding distribution, is climate change and the related impacts to habitat and population dynamics.
2. A narrow range distribution makes KW vulnerable to many possible scenarios (disease, insect, non-native species, large wildfire, etc.).
3. Over time there will be potential economic threats to perpetual KW management including funding, marketability, new and conflicting agency priorities, etc.
4. Adopting a single species management approach if the KW population is seen as "recovered" will threaten perpetual management. Managers may need to incorporate KW goals into a broader

ecosystem management approach that addresses biodiversity, multiple species and sustainable pine harvest levels to continue to provide KW habitat.

5. Jack pine outside of the core may not be managed for suitable KW habitat due to land managers not being familiar with KW habitat creation techniques or lacking reforestation equipment.
6. Several additional threats are described in the KW 5 year review (USFWS, 2012).

### **Opportunities**

1. Experimental habitat management: The experimental habitat work group are discussing an experiment to deliberately add red pine to jack pine planting stock, to see if red pine value can increase economic sustainability. They are also considering an experiment to adjust the size and configuration of small openings and jack pine stocking density to address biodiversity (fire ecology and multiple species) and marketability. For example, Dan Kashian's work at Mio's "No Pablo" wildfire showed wildfire produced jack pine, with varying stocking densities and opening distribution, in contrast to the traditional opposing wave pattern. Phil Huber said that the wildfire stand had about ½ the density of KW (40 acres per pair), compared to the opposing wave.
2. MDNR considering KW management in the UP (scale of habitat unit may be most important?)
3. Ottawa National Forest
4. Canada
5. Field trip/workshop with Biologists, Foresters, Silviculturalist and Equipment Operators.
6. Develop ecosystem management guidelines (best-management practices) to mimic natural disturbance ecology while creating habitat for KW and associated species outside the core.
7. Create and document climate change adaptation strategies; maintain refugia, increase ecosystem redundancy across landscape, promote landscape connectivity, anticipate and respond to species declines, etc. (Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers – Gen Tech Report NRS-87, 2012).
8. Continue the success achieved in the core and maintain or expand the KW population by providing suitable peripheral habitat if the core reaches carrying capacity.
9. In order to help plan future habitat management expansion consider conducting a review of the historical distribution of KW and habitat, focused primarily on outwash plains and jack pine.

### **Research Needs**

1. Jack Pine establishment and growth, related to climate change environmental variables (DonnerWright, in progress).
2. Core-periphery population dynamics (dispersal behavior, population dynamics, site quality, ground cover relationship, unoccupied habitat vs colonial behavior, minimum patch size in peripheral habitats, etc.). Is there something here to understand in relation to range expansion?
3. Why are KW using smaller than typical (knee-high) jack pine in the core? Is it related to carrying capacity in the core? Are they nesting and how successful is offspring production there?
4. What are the most cost-effective ways to create appropriate KW habitat structure?
5. KW use of red pine and volunteer jack pine (VanDyke, in progress). Is habitat structure more important than tree species? Are these red pine on dryer jack pine sites? Can red pine and jack pine compatibly occupy the same site and produce KW habitat and improve marketability?
6. What are the risks and benefits of using playback recorded song to establish new occupied habitats or colonies? Research completed for KW in Wisconsin and Nick is working on a publication. Wisconsin continuing to use the method. Should the method be expanded? If method does work to create new

colonies, could we draw birds into sinks? Can results from playback experiments help inform core-periphery population dynamics?

7. Expand on Deahn's previous research on longer term (27 year period) population dynamics before, during and after Mack Lake Fire?
8. Is Wisconsin, UP or Canada becoming new "core" or source habitat?
9. Review literature or conduct research to develop best management practices for fire ecology and ecosystem management of dry-northern forest and Pine Barrens that includes KW and associated species habitat goals.