Technical Guide
Kirtland's Warbler Habitat Management
Hiawatha National Forest
January 2010

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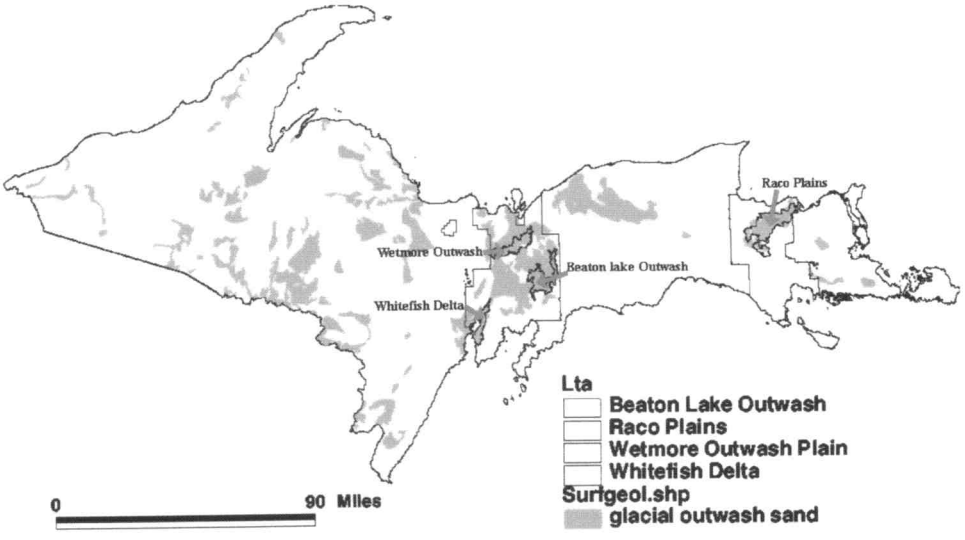
Introduction

This document provides the technical information needed to create and sustain Kirtland's Warbler (KW) breeding habitat, and meet Hiawatha Forest Plan goals, objectives and guidelines. Multi-scale planning and coordination is needed to maintain a balanced age-class-distribution of jack pine that will ensure a sustained flow of KW habitat. This technical guide will help the Forest prioritize and prepare Environmental Assessments for jack pine habitat management activities. Technical direction and coordination is needed to identify where, when and how jack pine harvest and reforestation for KW will occur. Additional information pertaining to other key aspects of KW management (i.e., cowbird control, human disturbance, census, etc.) is provided in the KW Management Strategy (Huber et. al, 2001), The KW Recovery Plan, the Forest Plan programmatic BA, and associated files.

The Hiawatha NF goal (Forest Plan 2-19) is to harvest and reforest an average of 670 acres of jack pine per year, to provide a minimum of 6,700 acres of sustained suitable KW habitat per decade. Approximately 33,700 acres of jack pine, managed on a 50 year rotation, is needed to meet this habitat goal. Four KW Management Areas (KWMA) have been mapped to encompass the dry sand 10 and 20 Ecological Land types (ELT) within Management Areas 4.4 and 4.2 (Forest Plan 2-19).



Kirtland's warbler breed in jack pine stands 6-16 years of age and greater than 80 acres in size, with several scattered small openings, and a minimum stocking density of 1,089 trees per acre. Stands of 1,000 acres and larger have been found to improve nesting density and duration of stand use. Whitefish Delta, Beaton Lake Outwash (now called Indian River), and Raco Plains all provide occupied KW breeding habitat. The 4 mapped KWMA's consist of a variety of forest types and are currently growing approximately 40,300 acres of jack pine. The 4 KWMA's would be the most likely areas for KW occupancy. However, there are other areas of suitable KW habitat that fall within other land types (i.e., Interior Wetlands), and outside the mapped KWMA's.

Management for Kirtland's warbler has both temporal and spatial aspects. This Technical Guide for Kirtland's Warbler Habitat Management is a working document that emphasizes a ten-year time period. This permits us to incorporate the spatial aspects of KW management through the first decade of the Forest Plan. Based on the HNF timber sale program, direction in the Forest Plan and other resource considerations, we can reasonably determine the locations of KW breeding habitat on the Forest.

We recognize that a long-term management perspective is required to ensure the viability of the species. Dynamic processes, both natural and human-induced, such as disease, weather, seedling availability and survival, market conditions and other resource concerns will likely determine the locations of future projects, making it difficult to provide details regarding stands that will function as Kirtland's warbler breeding habitat much beyond a 10-year period. We have incorporated 100-year jack pine modeling into the guide (Appendix 1), a feature that will permit continuous tracking of habitat to help the Forest manage towards the goal of a minimum of 6,700 acres of continuous breeding habitat on the Hiawatha. Modeling information can be updated as needed.

There is still much uncertainty and much to learn about KW management on the Hiawatha. For example, differing reforestation methods (plant vs. seed or natural regeneration), uncertain availability of seed and planting stock, effects of insect (budworm) and disease (scleroderris and 2-needle cast), will all have an impact on how KW habitat is developed. The primary difference between KW habitat and traditional managed jack pine habitat (non-KW) is the stocking density of the trees. Interdisciplinary coordination will be needed to develop new and innovative approaches to jack pine management on the Hiawatha. Stewardship contracting and adaptive management should be used to test new approaches and increase efficiency. Field inventory and monitoring should be used to make informed decisions.

Forest Plan Direction for KW Management

2006 Hiawatha Forest Plan Goals, Objectives and Guidelines for KW management;

Goals:

- *Provide for Kirtland's warbler management within forest-wide vegetation goals.*
- *Provide a minimum of 6,700 acres of jack pine in the appropriate size class, as determined in consultation with the U. S. Fish and Wildlife Service (FWS), striving to achieve desired Kirtland's warbler stocking levels on ELT 10/20 in Management Areas 4.4 or 4.2.*

Objectives:

- *Regenerate an average of 670 acres of jack pine per year in Management Areas 4.4 or 4.2 on ELT 10/20 to provide Kirtland's warbler habitat.*

Guidelines:

- *For Kirtland's warbler management, strive to regenerate jack pine stands with the appropriate stem density and non-forested openings, as determined in consultation with the FWS.*

- *Pre-commercial thinning or release of jack pine should not occur in areas managed for Kirtland's warbler prior to vegetation achieving the suitable size criterion or until vegetation exceeds the suitable size criterion for Kirtland's warbler breeding, unless such activity maintains or enhances Kirtland's warbler habitat on the forest, as determined in consultation with the FWS.*
- *The maximum size of temporary openings for sharp-tailed grouse and Kirtland's warbler management should not exceed 1,100 acres. In KW management areas the 1,100-acre temporary opening guideline may be exceeded by harvesting adjacent blocks after the appropriate stocking density (determined in consultation with the FWS) is achieved, and after the third-year stocking review*
- *Two to ten snags per acre should be reserved, except where additional snags would be beneficial to rare species or unless they present a safety concern or interfere with mechanical site preparation.*

Kirtland's Warbler Management Areas (Landscape Scale)

There are currently about 68,000 acres (7.2%) of jack pine on the Forest. The total land area of native jack pine fluctuates over time because this tree species is fire-dependent and linked to fire regimes, drought cycles and jack pine budworm population dynamics. The focus of this document is on the 40,300 acres of jack pine within the 4 KWMA's. The 670 acre annual KW habitat objective is based on the USFWS recommendation that KW use jack pine for a 10 year period (age 6-16 years). 670 acres per year is an average; actual yearly outputs will vary depending on budworm salvage, wild-fire, etc. A decade average of 6,700 acres of KW habitat created is useful for monitoring purposes. The 6,700 acre minimum suitable habitat goal would require the regulation of about 33,700 total acres of jack pine, or nearly all (84%) of the jack pine in the 4 KWMA's (Table 1).

Following a process used on the Huron-Manistee, each KWMA was assigned a weighted annual harvest goal based on the proportion of jack pine in that KWMA (Table 1). The mathematical regulation suggested in Table 1 will need to be flexible and modified for local conditions and interdisciplinary considerations. For example, Whitefish Delta is a relatively small KWMA at 3,560 acres, which would require just 59 acres of harvest per year for 50 year regulation. However, since 59 acres is far too small for effective KW management, if block size were set at 335 acres, 5.7 years would pass between harvests (Table 1).

It is important to provide habitat connectivity and continuity, within each KWMA, since many KW return to the same habitat each year. On a small area like Whitefish Delta, it may be better to provide quality habitat for 30 years, and no habitat for 20 years, out of each 50 year cycle so that larger, well connected and KW-occupied blocks can be maintained. In other words, it is better to provide high quality habitat (large connected blocks) for 30 years, rather than marginal habitat (small spread-out blocks) for 50 years.

Table 1. KWMA regulation with two hypothetical Jack Pine Harvest Scenarios (335 acre stands and 550 acre stands).

Name of KWMA	Acres of jack pine in KWMA	Percent of total jack pine in 4 KWMA's *(JP / 40,300)*	Acres of weighted ave annual harvest *(670 X %)*	Acres of max annual harvest *(JP / 50yrs)*	Years between 335 acre harvests *(335 / weighted ave annual)*	Years between 550 acre harvests *(550 / weighted ave annual)*	Acres of regulated harvest per decade *(10 yrs X weighted ave annual)*
Indian River (Manistique)	7,997	19.8	133	160	2.5	4.1	1,330
Raco (Soo)	20,204	50.1	336	404	1.0	1.6	3,360
Wetmore Outwash (Munising)	8,539	21.2	142	171	2.4	3.9	1,420
Whitefish Delta (Rapid River)	3,560	8.8	59	71	5.7	9.3	590
Totals	40,300	100%	670	806	n/a	n/a	6,700

The Forest also has the latitude to provide for Kirtland's warbler management within forest-wide vegetation goals, but outside KWMA's (MA 4.2 and 4.4 and ELT 10/20). This flexibility is important since some large blocks of jack pine do exist outside KWMA's, and are close to, or include occupied habitat (i.e., Interior Wetlands). By contrast, some areas currently inside KWMA's are planned for jack pine harvest, but follow-up treatments do not include KW stocking densities. Flexibility and an interdisciplinary approach will be needed to address these situations.

It is important to recognize that nearly all the jack pine (84%) within the 4 KWMA's will need to be harvested and reforested with a KW objective, in order to meet the Forest Plan KW goal. Approximately 4,836 acres (72%) of the Decade 1 Forest Plan KW goal is through the NEPA process and in the process of implementation. An additional 1,648 acres is included in the proposed actions for the pending West Unit budworm salvage EA's, bringing the total estimated Decade 1 accomplishment to about 6,511 acres (97%). Based on these numbers, the Forest should de-emphasize jack pine management in KWMA's until Decade 2 (after 2015), since the Decade 1 KW goal has been met. Since 84% of the jack pine in KWMA's is needed for long term sustainability and viability of KW, any future jack pine harvests during this first decade, while not recommended for jack pine regulation, should have a KW management objective.

Habitat Blocks (Stand Scale)

Clear cutting, with reserve trees and snags to simulate wildfire, is the optimal management method for regenerating jack pine for KW and multi-species benefits. KWMA's are divided into blocks, or timber sale units, which become stands. KW

habitat regulation and accomplishment tracking is based primarily on acres of jack pine sold (chart 2) and acres of jack pine reforested (chart 3) to KW stocking levels.

Table 1 shows the number of years between harvest to regulate each KWMA, based on 2 different and hypothetical block size scenarios; 1) number of years between 550 acre harvest blocks, and 2) number of years between 335 acre harvest blocks. However, Forest Plan guidelines allow for KW-jack pine harvest units up to 1,100 acres, or more after stocking surveys.

Large blocks provide the best KW habitat because they offer the best chance for colonization, are occupied for longer periods, support denser KW colonies, are beneficial to other species (i.e., sharp-tail), and more closely simulate wild-fire conditions. However, in many KWMA's the existing landscape structure does not permit large contiguous blocks. Smaller block size will allow management flexibility to spread out the harvest over several occupied KWMA's, and meet Forest Plan vegetation goals. Whenever possible, large blocks should be created by placing several smaller harvest blocks adjacent to each other, even though they may be in different timber sales, and sold in different years (as long as the sold-date is within a few years). Jack pine fragmentation can be reduced by creating larger KW habitat blocks (stands). This can be done by including younger (sub-merchantable) jack pine inclusions, and/or by converting inclusions of other forest types to jack pine, with the timber sale and reforestation.

Ideally, 80 acres would be the smallest block size to consider for KW management. However, due to the fragmented nature of the existing jack pine on the Forest, blocks smaller than 80 acres should be identified and reforested for KW if they are in suitable landscapes (i.e., ELT 10/20 in Management Areas 4.4 or 4.2), and have other stands of pine or open land in the vicinity. These smaller, separated blocks should be evaluated on a case by case basis to determine if they would be suitable for KW habitat, and can be used to reduce fragmentation, especially in the long term.

The KW Management Strategy (Huber et. al, 2001, page 12) states that; "Treatment blocks within a management area should be sequentially scheduled....for regeneration close to other blocks in space and time. New blocks will be developed adjacent or in close proximity to recently developed blocks to better mimic the effects of large crown fires. Generally, smaller treatment blocks can be used to build future larger treatment blocks if they are adjacent to one another and regenerated no more than 5 years apart.

Reforestation

Jack pine reforestation is typically funded by KV dollars and various silvicultural methods are available such as, natural regeneration (chop and chain slash), supplemental seeding, planting and seed tree burning. KW habitat standards suggest an average stocking density of at least 1,089 trees per acre including small non-forest inclusions (approximately 25% open per acre), or approximately 5'X 6' spacing. Due to the open-land, the actual tree density (outside the openings) would be about 1,450 trees/ac, if there were no opening.

Natural regeneration is much less expensive than planting and has been shown to be successful in regenerating dense stands of jack pine, even on well drained soils on the Hiawatha. Natural regeneration works best if the soil is scarified before the jack pine cones open (generally in July following harvest); so that seeds falling off the logging slash germinate on mineral soil. If seeds fall and germinate on unsuitable ground (i.e., an unscarified grass mat) they will not survive.

In some cases seeding or planting jack pine may be prescribed, for example if budworm has reduced the number of cones on mature jack pine, or if natural regeneration has failed. If planting jack pine for KW is prescribed there are methods available that can help fund, reduce the cost, or improve the quality of the plantation. For example, the Hiawatha and Huron-Manistee include red pine, hardwood or aspen products in some KW timber-sales to provide a species mix and help fund reforestation with KV dollars. They have successfully designed and sold timber-sales with payment units separated by several miles, allowing more flexibility for using KV funds. Partnerships can also help fund KW habitat work; on the Hiawatha, the National Arbor Day Foundation provided $68,000 to fund fill-in planting for KW in 2006, and has continued to provide significant funding for KW related tree planting.

Adaptive management should be used to refine techniques and reduce reforestation costs, as the Hiawatha continues to seek best management approaches for KW reforestation. Other options to explore include; 1) trenching followed by hand planting, without chop and chain, which has increased survival, lowered cost, and provided better habitat for other grassland birds (due to slash retention), on KWMA's in the Lower Peninsula; 2) use seed-tree methods with burning as planned for KW regeneration in Raco; 3) experiment with seed-tree methods without burning, just light scarification resulting from harvest operations or site prep; 4) instead of immediate planting, site prep for natural regeneration (chop and chain same as for free planting) then wait 1-3 years and use a fall stocking survey to determine next spring's fill-in planting, if needed.

KW's frequently nest on the ground, beneath jack pine branches, near the edge of small grass openings. During site-prep, it will be important to incorporate a ¼ acre opening on each acre of KW habitat. It is not necessary to site-prep (chop-chain or brake) the entire acre for regeneration since the objective is to reforest just ¾ of the acre. A 60 foot radius around a flag or leave tree on each acre will provide the ¼ acre opening per acre required by KW. One experimental method to provide these openings would be to reserve large diameter red or white pine, individually or in clumps, to mark the center of the 60' radius-openings, and also help maintain the opening by discouraging regeneration. These techniques still need to be tested on the Hiawatha, since natural regeneration and hand-planting are not typically used in the Lower Peninsula for KW reforestation. Consider these openings before reforestation starts, to avoid the extra effort and cost of unnecessary site prep, or creating openings later. Additional interdisciplinary discussion and cooperation will occur during the NEPA process to finalize silvicultural treatments for reforestation.

Thinning, Release, Timber Stand Improvement

Many Hiawatha stands are typed as red pine plantation but have dense volunteer jack pine reproduction and thus are suitable for, and occupied by, KW. Timber Stand Improvement treatments in red pine plantations that are located in or near KWMA's and that remove jack pine, or reduce the stem density, will have an adverse impact on KW habitat, and should be discussed by an interdisciplinary team. Interdisciplinary discussions should include timing of treatments and how treatments will improve KW habitat.

Additional interdisciplinary discussion and cooperation will occur during the NEPA process to finalize silvicultural treatments for stand improvement that benefit, and do not adversely impact, the suitability of KW habitat.

Snags and Wildfire Simulation

Snags, individual live trees and reserve islands help simulate wildfire and provide components of a fire ecosystem (i.e., standing and down coarse-woody-debris found after wildfires). The KW Management Strategy (Huber et. al, 2001) states that "All dead trees should be left in the sale area. An overall objective of 15-25 dead trees per acre is desirable" (pg 15). If hazard trees are felled for safety, they should be left on the site.

To simulate wildfire, in addition to snags, reserve a one to two acre linear green pine island per 80 acres of clear-cut (1 island per 80 acres). This can help meet objectives for den and snags and will maintain components of a fire ecosystem (i.e., horizontal-roll strips found after hot wildfires). Additionally, leave at least 1 large white, red or jack pine tree per acre in clear cuts to provide stand diversity and maintain components of a fire ecosystem (i.e., large red pine trees frequently survive wildfire). These live trees can also be used to manage openings during reforestation.

Additional interdisciplinary discussion and cooperation will occur during the NEPA process to finalize silvicultural treatments to provide this important structural component during sale layout, administration and site preparation.

Stewardship Contracting

The Hiawatha should continue to use stewardship contracting to reduce costs and increase efficiency. Stewardship contracting allows a Forest to trade wood products for services. For example, it was recently used on the Huron-Manistee NF to accomplish KW reforestation work using funds generated in another, non-KW, Timber Sale. On the Hiawatha it was successfully used to facilitate timely natural regeneration and reduce reliance on Forest skidders. In exchange for jack pine wood products, a Timber Sale operator completed site prep skidder work on green slash, immediately after harvest. This stewardship work assured a scarified seed bed suitable for germination, reduced dry slash fuel loads, reduced potential for weed establishment (no equipment moving) and reduced reforestation cost.

Monitoring

Monitoring will be conducted annually to evaluate progress in meeting Forest Plan goals and KW population recovery. The ultimate goal of the habitat program is to increase KW populations and as such the Forest will continue to participate in the census (chart 1). Other key monitoring efforts will include;

1. Annual acres of jack pine sold and reforested with a KW objective (chart 2 and 3)
2. Stocking density of suitable habitat
3. Silvicultural treatments and time between harvest and reforestation
4. Small openings in jack pine reforestation
5. Snags, green-tree islands and habitat structure

In 2009, the UP wide KW census counted 33 male and 12 female KW. They were found in stands with a variety of silvicultural treatments as listed in the following table.

Summary of stand history, 2009 census

Treatment	# of male KW	# of female KW
Natural regeneration then plant	3	2
Natural regeneration	16	7
Natural regeneration then seed	6	2
Red pine plant with vol jack pine	5	1
Jack pine plant	3	0

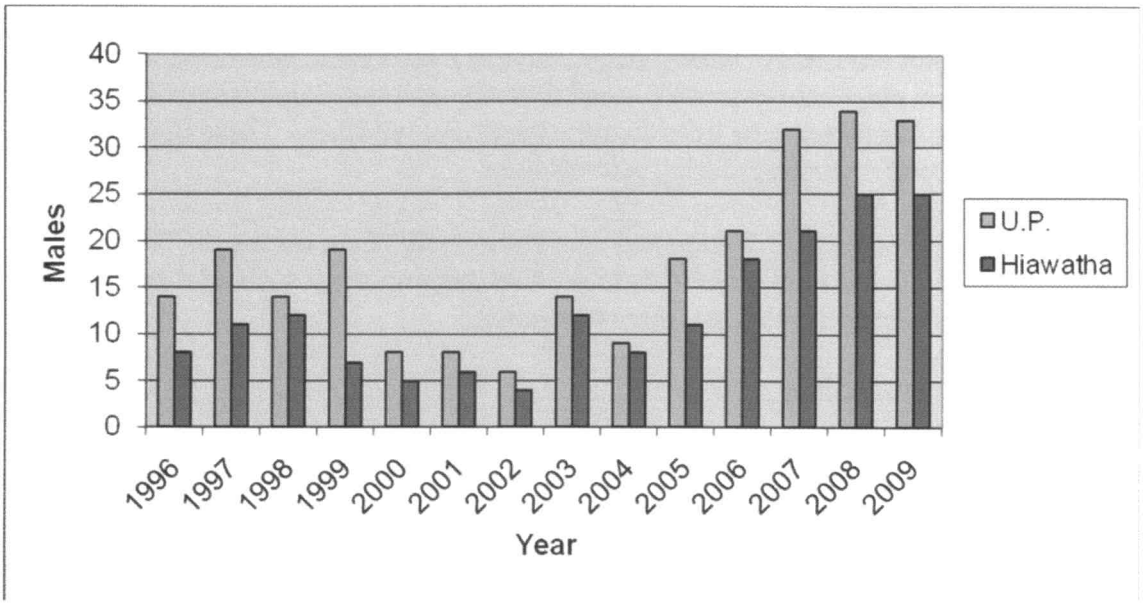


Chart 1. KW population in the U.P. and on the Hiawatha NF 1996-present.

In 2009 the Hiawatha sold 477 acres of jack pine with a KW habitat goal while 1,472 acres were reforested for KW. The Forest's 6 year average (2004-present) is 1,061 acres sold for KW, and 886 acres reforested, which is 216 ac above our Forest Plan objective of 670 ac reforested per year, on average.

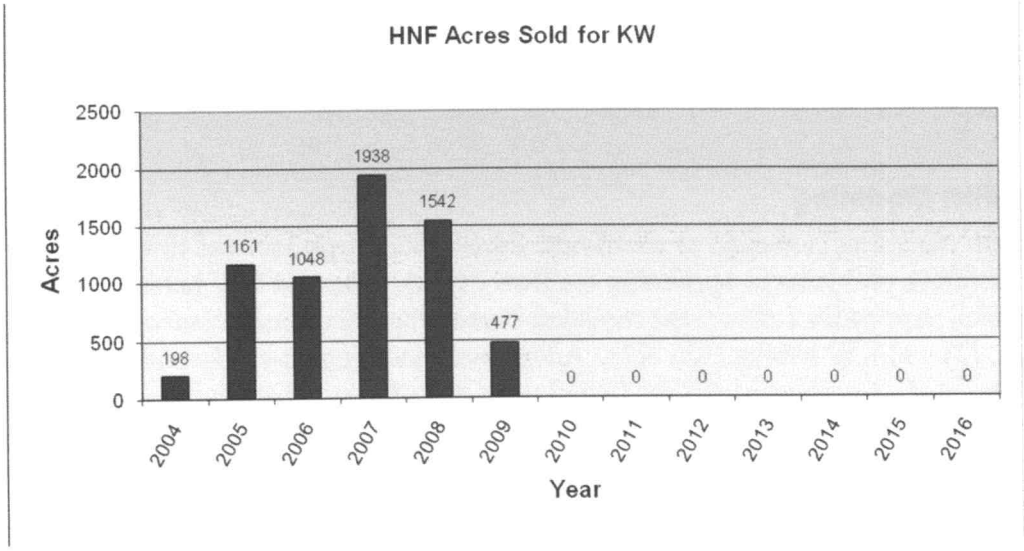


Chart 2; acres sold with a KW habitat objective 2004-present

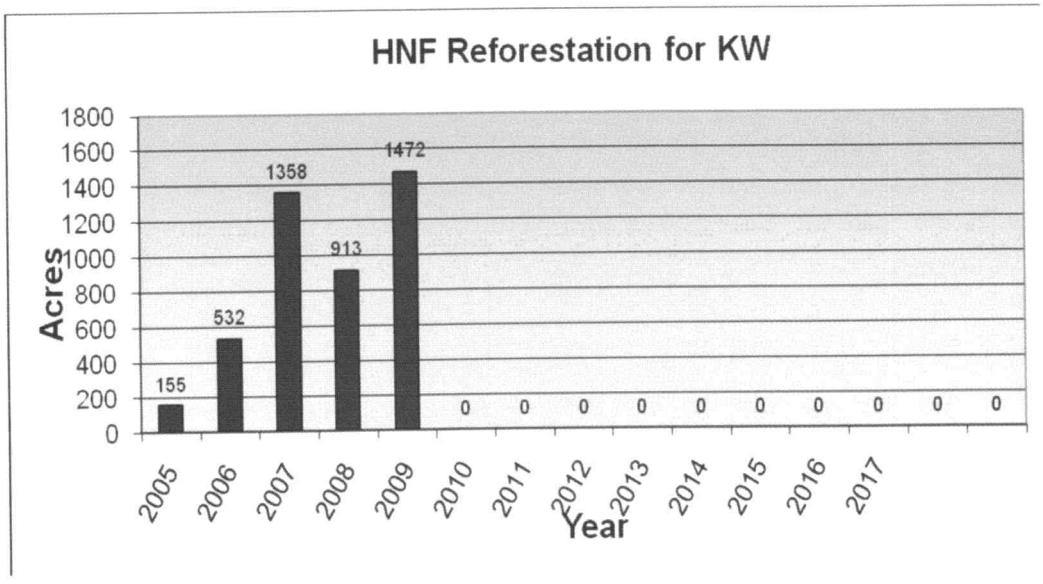


Chart 3; acres reforested with a KW habitat objective 2004-present

Maps and existing habitat condition of the 4 primary KWMA's.

Additional information such as MA and ELT boundaries, annual KW accomplishment records, graphs, this tech guide, and maps are filed at;

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Long-term Modeling

Long term modeling is needed to coordinate Forest Planning goals and to address potential future problems in regulating the flow of jack pine, and KW habitat in sufficient size blocks. Appendix 1 shows the modeled Forest Plan relationship between young jack pine (J1, J2) and KW habitat (K1, K2). Additional modeling currently under development (E. Henderson) will be linked to a GIS, with stand attributes and age-class distribution, showing the long-term sustainability of jack pine and KW habitat outputs.

Appendix 1 Modeled relationship between jack pine (J1, J2), KW habitat (K1, K2) and Forest Plan outputs

Relationships of K1 and J1 under the Revised Plan

In the model: J1=jp<1,089/stems per acre age 1-10; J2=jp<1,089/ac age 11-25 or K2>age 16-25.

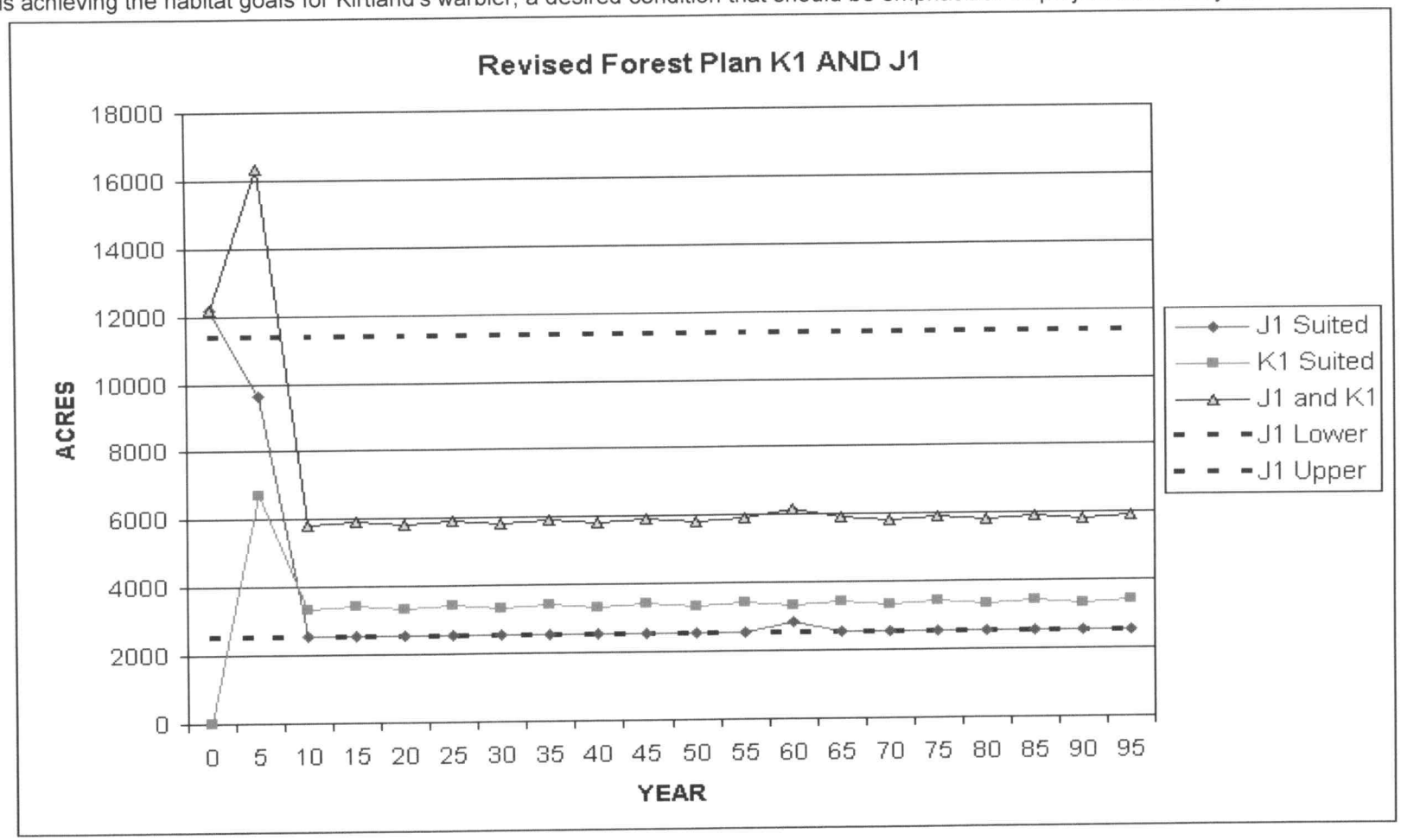
In the model: K1=jp>1,089/ac age 1-5; K2=jp>1,089/ac age 6-15.

To reach desired conditions over the long term, J1 and K1 combined will exceed the upper goal for J1 over the first 5-10 years.

J1/K1 levels in excess of the upper revised plan goals may be required to reach the sustainable quantity of K1(and ultimately K2) over the long term.

It is permissible (implied) to exceed the upper goal for J1 in the short-term, since desired condition will be met and sustained over time.

The Forest responsibilities for managing KW habitat are explicit in the BA and sustantiated in the BO. There is an emphasis achieving the habitat goals for Kirtland's warbler, a desired condition that should be emphasized at project level analysis.



Relationships of K2 and J2 under the Revised Plan

Vegetation composition goals for J2 were set independently of minimum K2 goals. Therefore, when K2 acres are combined with J2 acres, the J2 maximum appears to be exceeded (i.e. year 15 - 30).

J2 and K2 are linked (i.e. K2 becomes J2 at year 16 and stays in J2 through year 25).

The Forest's responsibilities for managing KW habitat (K2) are explicit in the BA and substantiated in the BO.

To reach desired conditions over the long term for K2 (6,700 acres), the combined acres for J2 and K2 will slightly exceed the J2 upper goal.

This condition is required to reach the sustainable quantity of K2 over the long term.

It is permissible to exceed the upper goal for J2, since desired condition for K2 will be met and sustained over time.

There is an emphasis achieving the habitat goals for Kirtland's warbler, a desired condition that should be emphasized at project level analysis.

However, it should be noted that the period, year 30 through year 95, the model shows combined J2 **at** the maximum goal.

Rather than deviating from the published maximum, the graphed combined J2/K2 is within model accuracy for the upper goal.