

REPORT TO THE KIRTLAND'S WARBLER RECOVERY TEAM

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Habitat Quantity

Jerry Weinrich has documented a decline in suitably-aged Kirtland's warbler habitat in recent historical times, based on the stand age data he and Dave Sorenson have assembled. Therefore, it is informative to view the annual census as a result of the balance between the amount of declining habitat and the amount of developing, or optimal habitat. For a first approximation, we have combined the census results for contiguous sections of similar date of origin. The number of singing males in these discrete locations were compared from year to year, and the annual gains or losses assigned to either declining habitat or "other" habitat, according to the population trends for that area. The proportions of losses or gains that occur in declining or "other" habitat can then be tabulated for a given year. When this is done, the graph and table show that most of the losses occur in the old, declining habitat and almost all the gains are in the "other" category. This suggests that the ~~static warbler population over the last nine years may be related to a rough balance between old habitat being abandoned and new habitat being colonized, despite successful cowbird control and excellent nesting success.~~ The main barrier to a more objective and less circular age definition for the two types of habitat is the scarcity of information on warbler numbers for the entire period of occupancy for a given area. In the future, we hope to refine and correct this analysis, prepare a graph of Kirtland's warbler numbers versus age for the major areas, and attempt acreage estimates for each area.

Kirtland's Warbler Density Estimates

For relative comparisons of habitat quality of selected areas, we have calculated maximum densities. When census data becomes available for the complete occupation period by warblers, we expect the average densities to be  $1/2 - 2/3$  the maximum value. Although the sample is small, we have grouped the areas according to history of development. The average for all areas considered is 4.7 singing males per 100 acres. Six wildfire areas averaged 3.9/100 acres, but this figure includes two areas that are still developing (sub-optimal) and a gross, unrefined estimate of the Damon acreage. (Sub-areas of the wildfires could have Kirtland's warbler densities in the range of  $10 - 15/100$  acres.) The average of all managed habitats is 5.4, but the unburned stand was ~~1.6~~ and most such areas are unoccupied. ~~The total Kirtland's warbler population divided by all occupied acreage is about 2 - 3 males per 100 acres.~~

In the 1980's, overall habitat quality should decrease due to the scarcity of developing prescribed burn or wildfire habitat. Given the current acreage projections, and a percent occupancy of 1/3 - 2/3, the annual census could fall to about 100 birds by the end of the decade. When the goal of 27,000 acres of suitable habitat is reached, a 2/3 percent occupancy and average density four males/100 acres should yield 500 - 800 Kirtland's warbler males. (This is somewhat less than the goal of 1,000 established in the Recovery Plan.) ~~If developing habitat is of sufficient quality to hold 2 - 4 males/100 acres, then we should need 6,000 - 10,000 acres of wildfire and Kirtland's warbler managed habitat to maintain a population of 200 males.~~

The few positive notes do not nearly offset the projected loss of habitat. Several occupied areas have some younger patches that could carry a reduced colony beyond the normal 10 - 12 years, until about 1990. There should be increased use of sub-optimal habitat such as red pine and unburned jack pine stands of suitable age, especially in stands proximate to existing colonies. Even if reproduction drops in this poorer habitat, it should support some birds and cause some lag in any decline due to lack of habitat. Conversely, if there is reduced reproduction in the next decade, there could also be a time lag in the utilization of habitat when it becomes available in greater quantity. As more Kirtland's warbler managed habitat becomes available, we would hope that the percent occupancy of suitably-aged stands would increase.

#### Habitat Quality

A data table of selected vegetation characteristics was presented for low and high density areas, declining areas, abandoned (overmature) habitat, and unburned areas with little use. Percent cover is more useful for evaluating habitat than stocking frequency or stem density. ~~It appears that 30 - 60 percent cover is about optimal,~~ and fire-regenerated stands generally have stem densities in excess of 3,000 per acre. Since the planting program can distribute the trees more evenly, the optimal tree densities can be much less, but stands of less than 1,000 stems/acre will probably not be used appreciably, and those less than 1,500/acre are questionable in unplanted areas especially. In any stand, the stocking should be equivalent to at least 20 - 25 percent cover to have a good chance of occupancy. Warbler habitat declines when average tree height reaches 13 - 14 feet (16 - 17 feet in plantations) and lower foliage is lost up to waist level.

The limits to suitable habitat can be expressed as an ordination of tree height versus percent cover, with new habitat in the lower left and abandoned in the upper right. In the future, we will be able to add isoclines around similar warbler densities that occur in 1) marginal, 2) developing, 3) optimal, and 4) declining habitat.

Recommendations: 1) It would be advantageous to plant at a density of 1,500 - 1,800 stems/acre until research on occupied plantations is initiated this field season. Ultimately, we seek to maximize cumulative numbers for the entire period of Kirtland's warbler stand occupancy, but for the present we recommend planting that exceeds minimum levels in order to permit the earliest possible

colonization by warblers at the end of the 1980's. 2) We have suggested a specific area in the McKinley Area for fill-in hand planting to prescribed densities. This is because of the large extent of young habitat at McKinley, its recent intermittent use, and the age and tree density of the stands adjacent to the 1977 planting. 3) We should also consider planting some habitat with fewer or smaller openings than the present scheme--immediately adjacent to a conventionally planting cutting block.

#### Habitat Quality Limitations

Not all patterns of avian spatial utilization can be explained by differential habitat quality. Based on over 60 breeding-bird censuses in a wide variety of habitats, it is unusual for even the most abundant species to use all available space--even in uniform, optimal habitat. Home range maps were presented for two of the most abundant birds of the eastern deciduous forest (ovenbird and red-eyed vireo) to illustrate maximum packing versus typical use. While some distributions can be explained by habitat factors, subtle disadvantageous factors are unlikely. As evidence, maps were presented showing annual shifts in spatial use, and clumping due to social systems. The Kirtland's warbler patterns of spatial utilization are not unlike those of other species, but the scale is expanded by about ten times for home range size and spaces between territories.

