# KIRTLAND"S WARBLER RESEARCH MASTER PLAN

The principal goal of the Kirtland's Warbler research effort is to identify the natural and man-made factors operating to suppress population expansion of the species. The following is a description of specific goals and individual research plans (IRP's) that should be developed to arrive at answers needed by management to make informed decisions about Kirtland's Warblers future survival. Schedules for initiating and terminating IRP's, budget and FTE requirements and proposed principal investigators are shown in Table 1.

## THE NESTING GROUNDS

1. Evaluation of radio transmitter attachments on small birds - This research will determine the degree of feather wear and changes in behavior of surrogate bird species carrying radio transmitters. Data gathered will be used to evaluate the effectiveness of each of several transmitter attachment methods prior to instrumenting Kirtland's Warblers.

2. Mortality and movements of Kirtland's Warbler during the post-fledging period - Mounting evidence suggests that mortality among recently-fledged Kirtland's Warblers may be operating to suppress population expansion. Up to six recently fledged warblers will be instrumented with radio transmitters and their movements, daily activities, mortality, and habitat use monitored. Each bird will be recaptured near the end of the transmitter's life, and the bird will be re-fitted with a fresh transmitter. The data will be used to determine to relation of the post-fledging period to survivability among Kirtland's Warblers.

3. Impact of nest predation on reproductive success among Kirtland's Warblers. - The published literature suggests that nest predation by blue jays and thriteen lined ground squirrels is a serious problem for Kirtland's Warbler; current nest success, calculated by the Mayfield Method is 0.333. This research effort will determine populations of warbler nest predators in and out of warbler nesting habitat, and predator movements. The impact of nest predators on warbler reproductive success will be evaluated.

4. Colonization of newly developed jack pine habitats by Kirtland's Warbler - The Mack Lake fire in 1980 burned nearly 27,000 acres near the center of the Kirtland's Warbler breeding range. Considerable weight is being placed on the importance of this habitat block to the future survival of the warbler. This research effort will examine the rate of colonization of newly developed habitats through observation of Kirtland's Warblers that have been color-banded at varying distances away from the Mack Lake area. NOTE: This is a cooperative research project involving the U.S. Fish and Wildlife Service, U.S. Forest Service, and the Michigan Department of Natural Resources.

5. Relationship of habitat succession to habitat occupancy by Kirtland's Warbler - This study will examine the temporal relation of habitat use by Kirtland's Warbler in newly developed habitats of the Mack Lake burn area. Permanent vegetation plots will be established throughout the area, and the number of Kirtland's Warblers associated with the various stages of habitat succession will be determined. Data will be used to identify the optimal habitat characters that suppport maximum densities of nesting warblers. NOTE: This is a cooperative research project involving the U.S. Fish and Wildlife Service, U.S. Forest Service, and Michigan DNR.

6. Development of cooperative censuses of Kirtland's Warbler across the Jack Pine area of the Great Lakes region - Mayfield hypothesized recently that an important factor affecting Kirtland's Warbler population expansion was that young warblers returning for their first nesting season were unable to locate the traditional nesting grounds because of the small area of habitat available. The presence of yearling Kirtland's warblers in adjacent areas of the Michigan Upper Peninsula, Wisconsin, and Ontario, adds to this hypothesis. This research effort would involve development of a census technique that cooperators could use to identify locations occupied by Kirtland's Warbler away from northern lower Michigan.

WINTER

1. Determination of Kirtland's Warbler winter range in the Caribbean - Historical records indicated that Kirtland's Warbler was restricted to the Bahamas Archipelago during winter. Recent evidence suggests that the bulk of the birds probably winter in the southern one-third of the archipelago. The presence of one bird in March in the Dominican Republic rasies speculation about the species; presence there and in adjacent Haiti. Two warblers on the Bahamian island of Inagua suggest that the species may also be in Cuba. This research effort will involve searches for Kirtland's Warbler throughout the Bahamas and in adjacent regions of the Caribbean. Results will be used to further refine our knowledge of warbler winter range and to concentrate other aspects of the warbler winter ecology research.

2. Quantification of Kirtland's Warbler winter habitat - There have been no quantitative studies of winter habitat use by Kirtland's Warbler. This research effort will involve a use and availability study of habitats occupied by wintering Kirtland's Warblers and habitats not occupied, to determine preferential characteristics. Habitats will be characterized wherever Kirtland's warblers are found in the Caribbean.

3. The extent of winter habitat suitable for supporting Kirtland's Warbler - One issue related to the ability of Kirtland's Warbler to survive during the winter months is the extent and quality of suitable winter habitat. This research will involve delineation of the total area of available habitats from existing satellite imagery. Ground-truthing will be accomplished during field surveys for Kirtland's Warbler throughout the Caribbean. Results will be used to examine trends in the availability of suitable habitat, and for determining areas that should be preserved to ensure the species continued survival.

4. Time budget of wintering Kirtland's Warbler - Knowledge of activity patterns among Kirtland's Warblers is necessary for understanding interspecific interactions, predation, and feeding ecology during the winter period. This research will involve continuous observation of color-marked individuals as well as mapping of daily movements obtained by following radio-marked birds throughout the winter period.