

PROGRESS REPORT - 1986

PROJECT:                    Analysis of the Ecosystem Structure  
                              and Vegetation of the Mack Lake Burn:  
A Framework for Understanding the Occurrence  
                              and Behavior of Kirtland's Warbler

SPONSOR:                    Wildlife Division  
                              Michigan Department of Natural Resources

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ECOSYSTEM STRUCTURE AND VEGETATION OF THE MACK LACK BURN  
PROGRESS REPORT -- FIELD SEASON 1986

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Overview of Objectives

The general objective, as stated in the proposal, was "to establish a framework of landscape ecosystems as the basis for understanding warbler occurrence and behavior." Primary emphasis was placed on this objective, and a tentative ecosystem classification was developed. Two major landforms, outwash plain and ice-contact terrain, characterize the burned area. Ecosystem types were identified and sampled on each of these major zones. Kirtland's warblers began colonization of the Mack Lake burn in June 1986, and they showed a high preference for ecosystems of ice-contact terrain. Thus, it was demonstrated early in the study that colonization is strongly related to ecosystem type, especially physiography and soil and their effects on jack pine (Pinus banksiana Lamb.) growth.

The specific objectives of the study, as stated in the proposal, were:

- (1) To determine the major landscape ecosystems of the Mack Lake burn by their physiographic, soil, and vegetative components;
- (2) To identify and map the openings and the structure of young jack pine communities (occurrence, density, patchiness) by remote sensing techniques and field sampling within one or two major ecosystem types;
- (3) To determine the tree structure and composition of jack pine communities; and
- (4) To determine the composition and coverage of ground-cover vegetation in openings and in jack pine stands.

Research was directed to all four of these objectives, the primary ones being numbers 1 and 3.

Objective 1:

Nine different landscape ecosystem types were identified in the area, four on outwash terrain and five on ice-contact terrain. Forty-four ecosystem plots were established, sampled, and permanently located. Two approximations of the ecosystem classification were made -- one at the end of June, and one at the end of August. Taller jack pine trees and typically denser stands occur in the ice-contact zone. These factors, in part, may explain why Kirtland's warblers preferred this zone to that of the outwash plain.

Objective 2:

Considerable time was devoted to studying by reconnaissance and plot studies the size and occurrence of openings and the patchiness of jack pine regeneration. Four sections were identified for low-level aerial photography using a technique pioneered by Dr. Charles E. Olson, Jr. However, after considerable effort, Dr. Olson was unable to obtain the needed camera for the flights, and so we were unable to take the aerial photographs.

Objective 3:

The tree structure, composition, and density of jack pine seedlings were investigated on the ecosystem plots. Plots for determining the density and patchiness of jack pine were also established. Enormous differences in jack pine density were observed and recorded. The range of density was from 0 stems to 62,324 stems per acre, depending on sample plot size and the particular area sampled.

Objective 4:

The composition and ground-cover was determined in each ecosystem plot and density plot. The common and dominant shrubs and herbs of the area were present on most plots. Reconnaissance throughout the field season and plot sampling indicated that the coverage, density, and vigor of jack pine and northern pin oak (Quercus ellipsoidalis E. J. Hill) are probably more important factors in the recolonization of recent burns than differences in ground-cover vegetation. Marked differences occur in ground-cover vegetation between areas dominated by jack pine in the northern part of burn and those dominated by hardwoods (northern pin oak, red oak (Quercus rubra L.), red maple (Acer rubrum L.), bigtooth aspen (Populus grandidentata Michx.)) in the southern part of burn.

New objective:

Reconnaissance and examination of infrared photographs indicated that large scale salvage operations had apparently severely reduced the jack pine regeneration in many trees. Salvaged areas were examined, and a limited survey was conducted in salvaged and unsalvaged areas.

### Procedure

#### Landscape ecosystems

Reconnaissance of the area was initiated May 20. The marked difference in physiography between the northern and southern parts of the burn became immediately apparent through reconnaissance coupled with study of topographic and soil maps. A relatively gradual transition separated the flat to gently sloping outwash plain of the northern part from the hilly ice-contact area of the south part. The identification of ecosystem types within each of these landform zones was accomplished by further reconnaissance and plot sampling. The soil map of the area, provided by Dave Clelland (Huron-Manistee N.F.), was particularly useful in our work. A first approximation of the ecosystem types was made in late June. Species-area curves, located away from roads, were used to help determine the size of sample plots. 200 m<sup>2</sup> was found to be an acceptable size for sampling ground-cover vegetation. 10 x 20-m plots were used to sample ecosystem types. A stratified-random system of plot location was used, i.e., the landscape was stratified into our hypothesized ecosystem types and sample plots established randomly within the types. A 5 x 20-m strip in the center of the plot was used to determine the coverage of ground-cover species. We attempted to determine the species and size (diameter breast height if standing and stump height at 5 cm if the tree was fallen or cut) of all pine trees. All understory species were measured at dbh in the entire plot. A soil pit was dug to about 130 cm and profile characteristics of texture, structure,

