

Kirtland's Warbler: Results of 1989 survey work in Minnesota

prepared by

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## INTRODUCTION

The Kirtland's Warbler is a federally endangered species that is known to breed in only a few counties in northern lower Michigan. Preferred breeding habitat is dense jack pine stands of wildfire origin in which trees are 1.7 to 5.0 m tall (Probst 1986). Dispersal of young birds is adaptive in species occupying such ephemeral habitat. The fate of dispersing birds is of interest; their failure to acquire mates might account for the failure of the population on the traditional nesting area in Michigan to grow despite high fledging success in recent years (Probst 1985).

Occasional singing males observed outside the traditional breeding area may represent dispersing individuals. The Kirtland's Warbler recovery plan (Byelich et. al 1985) recommends a search of adjacent states and Canada to locate, quantify, and band these "wanderers" in an attempt to determine their importance to the population biology of the species. Recent survey work in Wisconsin in 1988 yielded sightings of eight singing males in 3 counties, including Washburn and Douglas counties in the western part of the state (Anon. 1988). The proximity of these sightings to Minnesota prompted interest in conducting a similar survey in the east-central region. A detailed account of methods used to identify suitable habitat in Minnesota may be found elsewhere (Eliason 1989). This report summarizes the 1989 field survey work in Minnesota, during which 75 sites comprising approximately 7000 acres in 5 counties were

surveyed, and no Kirtland's warblers were located.

## METHODS

### Criteria for identifying suitable habitat

The first step in the process of identifying suitable habitat in Minnesota was defining critical habitat variables. An analysis of habitat variables from 21 stands occupied by the species in Michigan (Probst 1988) revealed the following range of characteristics:

- 1) Tree height: 1.7 to 5.0 m; trees of this height are usually 5 to 23 years old.
- 2) Tree density: initially 15-20% cover (more than 2000 stems/ha) up to 60% cover at peak occupancy; the latter translates to about 5000 stems/ha in fire regenerated stands and 3000 stems/ha in seeded areas.
- 3) Stand size: density in suitable habitat on the breeding grounds is 1 male/20 ha (50 acres). Stands less than 80 acres in size are rarely used by breeding birds (Byelich et al. 1985). This stand size limitation may not apply to extralimital wanderers, especially in landscape regions that contain many pines (Probst, pers. comm.).
- 4) Lower height of live foliage on the jack pine: less than 1 m off the ground.
- 5) Ground cover: low, light cover of shrubs and/or grass-sedge interspersed with moss, lichen and bare ground.
- 6) Soil: Grayling sands underlie the habitat in Michigan; these

are deep, noncalcareous sands that are derived from former lake beds or sandy glacial outwash.

- 7) Fire history: In 1984, 73% of males censused in Michigan were in habitat regenerated from wildfire or prescribed burning.

The characteristics listed above define what might be considered "prime" habitat for the species. Birds actually occur in stands that exhibit a more diverse array of size and density characteristics; for example, older, sparser stands that are adjacent to young, dense stands may be used. Densely stocked plantations with no recent fire history may be used. Norway pine may also be used. It seems reasonable to assume that dispersing birds, most or all of which are assumed to be unmated, may be particularly likely to be found in sub-optimal habitat.

#### Areas to be surveyed

Procedures for identifying potential habitat for Kirtland's Warblers in Minnesota are explained in detail elsewhere (Eliason 1989); they are summarized only briefly here.

Forest inventory data from the Division of Forestry, Minnesota Department of Natural Resources, proved to be the primary source of information on the availability of potential habitat. Phase 2 forest inventory is a intensive timber inventory conducted by the MnDNR Division of Forestry on state-owned and county-owned forest land in Minnesota (excluding Itasca and St. Louis counties). The inventory involved vegetative cover-type mapping based on air photo interpretation, followed by

ground reconnaissance to determine size and density of stands (Grand Rapids Forest inventory staff 1983). Data were input into a computerized database, with the intent that the data would be updated when stands are cut or destroyed by fire.

The variables available from Phase 2 inventory that were deemed to be most important in identifying habitat suitable for Kirtland's Warblers were tree species (jack pine), size (age) of trees (5-25 y.o.), tree density (minimum 2500 trees/ha), stand size (greater than 50 acres).

A search of the Phase 2 forest inventory database was done for all stands meeting the criteria listed above. The following stands were identified in 5 areas of the state (Fig. 1):

- 1) Pine county: 3 stands
- 2) So. Hubbard, Cass, Wadena and Becker counties: 12 stands
- 3) No. Hubbard, Beltrami, and Clearwater counties: 8 stands
- 4) Lake of the Woods and Roseau counties: 12 stands
- 5) No. St. Louis, Lake and Koochiching counties: 34 stands

Isolated stands were also located in Cook (2), southern St. Louis (1), and Aitkin (1) counties.

Funding constraints made it impossible to survey all these areas. Several factors, including soils (deep, noncalcareous sand), proximity to Wisconsin, fire history, extent of potential habitat, and amount of pine in the general landscape resulted in the selection of the first 2 areas listed above for survey.

Potlatch Corporation is a major forest industry landowner of jack pine in these 2 regions of the state. Their forest

inventory staff provided information on the location, age and size of jack pine stands on their lands, but they could provide information about stand density for only a few stands.

There is not an equivalent database of forest inventory information that is comprehensive of all privately-owned land in the state. Letters were sent to 9 DNR area forest supervisors in the 2 areas of the state selected for survey, asking for their help in identifying dense jack pine stands on privately-owned lands that were 5-25 years old, and greater than 50 ac in size.

Using these sources of information, I selected 91 stands for survey (Tb. 1). Of these, 68 were owned by the state or county, 22 were owned by Potlatch, and one was owned by a private individual.

#### Field personnel

Two individuals were hired to conduct the field work. Skip Mott, who has an M.S. in Ecology from the Univ. of Minnesota, did the survey work in Pine county. Skip has spent many years in Michigan and is very familiar with the breeding habitat of Kirtland's Warblers. Gary Swanson, an experienced bird watcher with field experience throughout the state, worked in Cass, Hubbard, Wadena and Becker counties.

#### Survey protocol

Field work was scheduled to be conducted from 22 May to 16 June, from sunrise to 11:00 a.m. No surveys were to be done during heavy rain, or winds greater than 20 mph.

A 7 minute listening and playback period was done in the

middle of each 40 acre block of potential habitat as follows: 2 minute listening period, 30 second of playback, 2 minutes of listening, 30 seconds of playback and 2 minutes of listening.

Two minute loop tapes of Kirtland's Warbler vocalizations were supplied by the U.S. Fish and Wildlife Service. Playback was done using Panasonic cassette recorders attached to Lectronics speaker/amplifiers.

Playback stops were mapped on cover type maps of the survey sites. Date, time, and a description of important habitat characteristics at each stop were recorded on a data sheet.

After the 7 minute survey period, an additional 5 minute listening period was done at each stop, during which all bird species seen or heard were recorded on checklists.

Field personnel were provided with log sheets showing the location and characteristics of each site. Sites were assigned to four priority classes for survey based on how closely their stand characteristics (determined from forest inventory information) matched prime Kirtland's Warbler breeding habitat (Tb. 1). Sites that were judged during the initial field survey to contain the best potential habitat were to be surveyed again 2-3 weeks later. Survey personnel were also instructed to be alert for other potentially suitable habitat as they travelled around the survey counties.

Detailed instructions that explained how to prepare for and conduct surveys were also provided (Appendix 1), as were copies of a letter of introduction to give to landowners. This letter

explained the likely consequences for the landowner in the event that a Kirtland's Warbler was found on privately owned land (Appendix 2).

## RESULTS

Seventy-five sites were surveyed using 188 playback stops in the 2 areas of the state (Tb. 2). These included 2 sites located by Gary Swanson in the course of his travels through Hubbard and Cass counties that were not originally targeted for survey. The total area surveyed was approximately 7,000 acres. Eighteen of the sites initially targeted were not surveyed, either because when visited they appeared to be totally unsuitable (e.g. recently cut or impenetrably dense), or because permission to cross privately owned land for access could not be obtained. No Kirtland's Warblers were observed on any of the sites visited.

Field work in Pine county was conducted from 23 to 31 May. Field work in west-central Minnesota was conducted from 22 May to 7 June. In order to survey as many sites as possible, the original plan to survey some sites more than once was dropped; all sites were therefore visited only once.

Characteristics that are considered important in breeding habitat selection by the species that could not be determined in advance from forest inventory information included distribution of trees, ground cover, and existence of live branches near the ground. During field survey, sites were judged to be unsuitable for Kirtland's Warblers if they exhibited any combination of the



following characteristics: trees were uniformly distributed with no openings, trees were so dense that lower branches were all dead, or the stand had a dense understory of deciduous shrubs.

Based on the criteria listed above, no sites in Pine county contained suitable breeding habitat for Kirtland's warblers. Fourteen sites in Cass, Hubbard, and Wadena counties were judged to contain potential breeding habitat (Tb. 3). Ten of these were in the area burned by the 1976 Huntersville fire (Fig. 2).

## DISCUSSION

### Presence of suitable habitat

The 1989 survey work established that there is apparently suitable habitat for Kirtland's Warblers in west-central Minnesota, particularly in the area of the 1976 Huntersville fire, but that there is little or no suitable habitat in Pine county. In both regions, planted stands of suitable age and density usually did not have the necessary tree spacing to provide scattered forest openings and trees with live branches near the ground. Although fire-regenerated stands were more likely to exhibit suitable habitat, some of these were also unsuitable because they were impenetrably dense, with few or no openings.

In Pine county, there have been no recent fires, and forest lands are not being managed for jack-pine regeneration. Given that 10 of 14 suitable sites were located on forest industry lands, future changes in land management practices by the

industry in response to economic pressures may strongly influence the amount of suitable habitat for Kirtland's Warblers in the state. As it seems unlikely that Minnesota forests will be managed with Kirtland's Warblers in mind, the creation of suitable habitat for the species in both of the areas surveyed will probably continue to depend on wildfires.

#### Evaluation of methods

Identification of sites for survey: Private non-industrial lands contained little or no suitable habitat in the two survey areas. If this can be applied state-wide, then time spent contacting area foresters for information about these lands is probably not worthwhile. Any future work in west-central Minnesota might be focused only on fire-regenerated areas. In particular, the Huntersville burn area appears to provide some of the best potential habitat in the state. An intensive survey in this area aimed at covering as much of this habitat as possible would be a logical plan. In other areas of the state not surveyed in 1989 a focus on fire-regenerated stands might also be most productive.

Survey protocol: The survey protocol should have resulted in the detection of Kirtland's Warblers had they been present. However, the majority of the survey work was done earlier than originally planned, because of limited availability of field staff, and because Gary chose to work 7 days/ week beginning on 22 May, rather than 5 days/week as I had anticipated. One way of increasing confidence in negative evidence would be to

concentrate on a smaller number of sites and survey each site more than once, with repeat visits occurring in mid-June.

#### LITERATURE CITED

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Table 1. Numbers of stands selected for survey in 1989, listed by county and survey priority. Column 1 shows the number of highest priority sites and column 4 the lowest priority sites in each county.<sup>1</sup>

County	1	2	3	4	Total
Becker	0	0	0	1	1
Cass	7	6	3	9	25
Hubbard	6	6	2	16	30
Wadena	4	0	0	9	13
Subtotal	17	12	5	35	69
Pine	0	9	0	13	22
Total	17	21	5	48	91

<sup>1</sup> The term "stand" is used here to indicate a survey unit; it may comprise several Phase 2 stands, as indicated on the site logs.

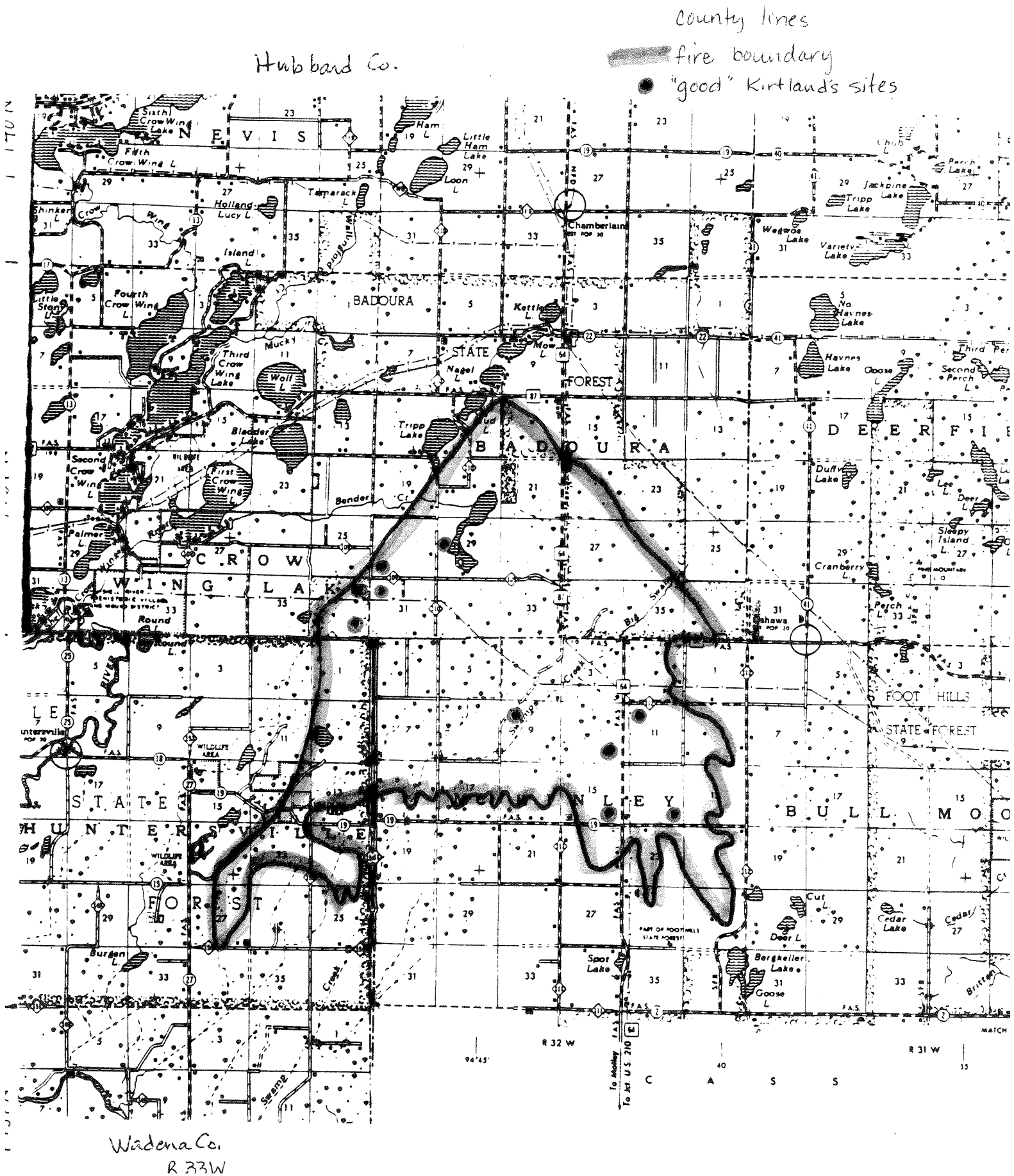
Table 2. Numbers of sites, acres surveyed, playback stops, and sites judged to contain potential habitat by county.

County	Sites surveyed	Approx. acres	Playback stops	Sites with potential habitat
Becker	1	70	3	0
Cass	16	2300	62	5
Hubbard	21	2200	40	6
Wadena	16	800	33	3
Pine	21	1600	50	0
Total	75	6970	188	14

Table 3. Information about sites judged during field surveys to contain potential breeding habitat for Kirtland's Warblers.

County	Twp	Rg	sec.	acres	ht.(ft.)	Owner	Comments
Cass	138	32	NW09	48	5-15	county	few live low branches
	138	32	SE10	87	8-18	Potlatch	not ideal; SSE best
	138	32	NW11	160	8-15	Potlatch	NWNW & SENW best
	138	32	SE14	160	8-15	Potlatch	character variable
	138	32	SE15	160	6-15	Potlatch	so. central best
Hubbard	139	32	NW11	40	6-20	Potlatch	SENW is best
	139	32	W29	80	5-18	Potlatch	ideal habitat
	139	32	SW30	90	4-25	Potlatch	character variable
	139	32	NW31	53	7-18	Potlatch	character variable
	139	33	SE36	68	15-20	state	
	139	33	NE36	23	10-20	state	SENE is best
Wadena	136	33	SESW33		28	7-18	state
	137	34	W09	80	2-7	Potlatch	good in a few years
	137	34	SWSW09	36	10-20	Potlatch	

Figure 2. Boundaries of 1976 Hunterville fire in Hubbard, Wadena and Cass Counties.



Appendix 1. Information for field personnel about 1989 Minnesota Kirtland's Warbler survey.

### KIRTLAND'S WARBLER IDENTIFICATION

Plumage: bluish gray above, streaked with black (streaking may not be visible in dim light); yellow below with black streaking confined to sides; broken white eyering; white tail spots, faint white wing bars; male has blackish mask

Size: 6"; one of the largest warblers, comparable to an ovenbird or waterthrush

Song: (listen to tape); loud and low-pitched, reminiscent of Louisiana Waterthrush, audible up to 1/4 mile on still days

Behavior: Persistently jerks tail; this is diagnostic (no other gray backed warbler does so). Nests on the ground, so be careful where you walk, particularly if you see a female.

Similar species: Canada Warbler has yellow spectacles and dark streaking restricted to upper breast (sometimes faint or absent); no dark streaking on back and no white in wings and tail. Magnolia Warbler has yellow rump and broad white band in wings and tail.

### HABITAT

In Michigan, Kirtland's warbler prefer young jack pine stands usually at least 80 acres in size, but may use stands as small as 30 acres. Trees are usually 5-20 feet tall (8-22 years old), but sometimes taller stands adjacent to stands with shorter trees are used. Trees tend to be in dense clumps interspersed with many open areas, and to have live branches within one meter of ground. Sometimes Norway pine are used. Sites are dry and well-drained, sparse ground cover of grass, moss, and ericaceous shrubs (blueberries, bearberry, etc.).

### SURVEY PROCEDURE

- 1) Time: sunrise to 11:00 a.m., 22 May - 16 June  
Weather: don't attempt to survey in high winds (>20 mph) or heavy rain
- 2) Location of survey stops: A 7 minute listening and playback period should be done in the middle of each 40 acre block of potential habitat. The simplest way to do this would be to move through the habitat in a fairly straight line, and stop about every 1/4 mile (determined by pacing) to do a playback. If travelling through the stand is impossible because of dense trees or shrubs, do the best you can. Walk along logging roads or trails if possible; use caution when driving on them as they can



be impassable, especially in wet weather. When striking out on foot off a road, be sure to have a compass.

- 3) Survey protocol: after arriving at a survey spot
  - 1) Listen for at least 2 minutes before beginning
  - 2) Do 30 sec. playback and listen for 2 minutes.
  - 3) Repeat #2
  - 4) Spend 5 additional minutes doing a bird checklist, including rough estimates of numbers of birds of each species observed.
- 4) If a Kirtland Warbler is heard, make every effort to visually identify the bird. Positive identification is very important. On the back of the survey form, make detailed notes of the sort you would make when trying to document any rare bird sighting. Refer to the key characters given in the "Identification" section at the beginning of these instructions.
 

Mark the location with flagging tape so that the spot can be readily relocated.

After positively identifying the bird, contact the Nongame Wildlife program at (612) 297-2276 or 296-8324 as soon as possible; if you can't reach either Lee or Bonita at the DNR, leave a message. On weekends call Bonita at home (483-9746). The USFWS is very interested in color-banding any Kirtland's Warblers observed; to facilitate this we must let them know the bird's location as soon as possible.
- 5) These "wanderers" may not stay put. If more than one bird is observed, take reasonable precautions to make sure different birds are involved. This may involve returning to the area of an earlier sighting to verify that the bird is still there.

#### SITE LOGS

- 1) For each of the survey counties, the stands I have selected for survey are listed on a site log sheet. Each line gives information for one "survey unit", which may sometimes be composed of 2 or 3 small but contiguous stands. Included are general location, density and size information. As I describe below, you will need to consult the cover-type maps to get precise locations. You will complete the entry by filling in the blanks on the right at the time the unit is surveyed. The date and time are self-explanatory. In the comments sections, indicate the number of stops, and note relevant habitat characteristics, including tree spacing (regular or clumped), ground cover (e.g. grass or moss, tall dense shrubs or short, scattered ones), height of lowest live branches from the ground. Mark stands that seem to best fit the description of preferred Kirtland's warbler

habitat with an asterisk in the right margin.

- 2) **Priorities:** The symbols in the left margins of the log give a rough guide to the priority you should place on surveying that particular site. Entries marked "F\*" should be surveyed first, since they have "prime" characteristics, and appear to have been regenerated after fire. Next in priority are entries marked with just "\*", and below these are entries marked with "?\*". The last sites to be surveyed should be those with no symbols in the left margin.
- 3) **Revisiting sites:** It was difficult to assess in advance how closely each stand fit the habitat criteria listed above, in particular, we had no information on such important characteristics as tree spacing, presence of live branches near the ground, and ground vegetation. If time permits, stands that you feel come the closest to the preferred habitat should be visited twice, once early in the survey period, and once towards the end. If you run out of time to do this, DNR staff will do the revisits.
- 4) **Additional sites that you identify:** If you finish all the sites before your time commitment is up, please survey any additional suitable habitat that you may have encountered as you travel around in the survey counties. Do this work from the road only unless you know the land is owned by the state, county, or Potlatch Corp., or you have contacted the landowner for permission. See below under "recording information" for how to document this work.

### MAPS

- 1) **County maps:** you have been supplied with county maps for each of the counties in which you will be working. These are to help in finding your way around.
- 2) **Plat books or copies of plat maps for townships in which survey sites are located have been provided.** Use these to determine ownership of any land you have to cross to reach survey sites. For privately owned land, make every effort to contact the landowner before going on the land. If you can't find out who owns the land, or where they live, ask at any nearby house. If you have time to survey additional sites of your own choosing as described under 4) above, use the plat books to determine ownership. Land owned by Potlatch is open to hiking so they have told me that we don't need to get permission to go on their land.
- 3) **Forest cover type maps:** There are two general categories: those based on DNR Phase 2 forest inventory information

(some computer-generated, some hand-drawn), and those provided by Potlatch for their lands. Each of the larger Phase 2 maps represent a township. In cases where there were only one or two stands that appeared to be suitable in a township, a smaller map was made showing the cover types in this section only. All Potlatch maps are of single sections. Refer to the attached sheet for an explanation of the codes used in Phase 2 mapping.

The stands that are listed on the site log are shaded on the maps. Use them to see the shape of the stand, to determine access, and to plan the locations of stops. While conducting the survey, mark the approximate locations of survey stops directly on the map.

- 4) **Blueline photoquads:** These maps have been made from air photos and are the same scale as topographic maps. You may or may not find them useful in determining access and planning locations of stops. If you don't find them useful, ignore them. The sheet fastened to the outside of the map packet indicates which photoquads you have for each county. I have also provided you with a reference sheet that will allow you to determine which photoquad you need for each township.

## RECORDING INFORMATION

### Data sheets:

- 1) Make sure that you write legibly, and that your writing is dark enough to xerox clearly.
- 2) Use the blank site log sheets provided to record any additional locations you have time to survey. Under "age", estimate tree height, and estimate size of stand, if possible. Leave "code" and "N/P" blank. Supply "owner", if possible by checking a plat book.

### Bird checklists:

Checklists of Minnesota birds with space for five stops have been provided. In the notes section of the checklist, list the township, range, section, stand number, date, and time. One checklist form can contain data for more than one site; just be sure to indicate which column numbers pertain to each site.

Maps:

- 1) As noted above, for each stand surveyed, mark the approximate location of your listening stops. If a bird is observed, mark and label its approximate location as well.
- 2) Label on the same maps any stops in incidental stands that are surveyed, and reference them by numbers on the incidental data sheet. If you find suitable stands in townships for which you did not receive a cover type map, plot their approximate location on the county map.

**ADVANCE PLANNING**

I am leaving the pace totally up to you, because I can't predict how long it will take to survey each stand. You will obviously need to spend some time planning each day's work (selecting stands to survey, determining access, contacting landowners or forestry managers if necessary). Because of this, I recognize that you may not be able to begin survey work on Monday, 22 May.

**SAFETY**

- 1) Always carry a compass.
- 2) Be informed about Lyme's disease and take steps to minimize the risk of deer tick bites.
- 3) Have a first aid kit in your car.
- 4) Working alone has its own hazards. Make regular contact with someone, preferably daily, but at least every other day to let them know the general area where you will be working.

**STAYING IN TOUCH**

Check in with me once a week by phone, just to let me know how things are going. You can use this credit card number: 726-067-0196-2289. Don't hesitate to call me if you have any questions, or any problems implementing the procedures described above. Home: 612/483-9746 or Office: 612/296-8324

## SUMMARY OF INSTRUCTIONS

- 1) Use a field guide to review the key characters of Kirtland's Warbler, and note diagnostic features of species with which it might be confused.
- 2) Be familiar with the habitat characteristics of the breeding population in Michigan.
- 3) Use maps to plan out the day's work in advance.
- 4) Use a compass for orientation when walking off defined trails.
- 4) Follow survey procedure consistently.
- 5) Be sure to clearly and legibly record necessary information on data sheets and maps so that all survey work is properly documented. This is important even if no birds are found.
- 6) Notify Lee or Bonita as soon as possible if a bird is found.
- 7) Don't trespass.
- 8) Phone me once a week, or anytime you have problems or questions. Home: 612/483-9746 or Office: 612/296-8324

APPENDIX 2.

May 22, 1989

Dear Landowner,

This letter has 2 purposes: 1) to introduce Gary Swanson, an employee of the Minnesota Department of Natural Resources (DNR), who is conducting surveys for the endangered Kirtland's Warbler in your area, and 2) to address any concerns you might have regarding potential survey work on your land. The Kirtland's Warbler survey is a cooperative project between the Nongame Wildlife Program of the DNR and the U.S. Fish and Wildlife Service (FWS). The FWS is furnishing part of the funding for the surveys and will be involved in any follow-up that is necessary.

Breeding by Kirtland's Warblers has been documented in only a few counties in northern lower Michigan, but sightings of singing males have been reported from adjacent states and Canada. Eight males were observed in Wisconsin in 1988, including several in western Wisconsin. The proximity of these sightings to Minnesota has prompted an interest in conducting surveys in suitable habitat here. In Michigan, Kirtland's Warblers occupy dense jack pine stands of 80 acres or more in size, and from 6 to 22 years old. Birds seen outside Michigan have sometimes been in older stands. Your land appears to provide potential habitat, and that is why we would like to check it for the presence of the species.

The primary purpose of the survey is to give the FWS a better idea of the number of Kirtland's warblers that don't return in the spring to the "traditional" nesting areas in Michigan. It is assumed that there are very few of these "wandering" birds, and for that reason they are unable to find mates and reproduce. Thus they don't contribute to the long-term survival of the species. Because we don't know much about the size of the "wandering" population, we can't be sure if this aspect of the species' behavior might be limiting its population growth.

Our best guess is that no Kirtland's Warblers will be located in Minnesota, but the surveys must be conducted to find out for sure. Similar surveys are being carried out in Wisconsin, the Upper Peninsula of Michigan, and Ontario.

In the event that birds are observed, the surveys will also give us the opportunity to mark each Kirtland's warbler so that we can learn whether these "wanderers" will return to their Minnesota location or move back to Michigan in subsequent years. This marking will be done by capturing the birds in mist nets and placing individually unique combinations of plastic bands on their legs. In dense vegetation, using mist nets requires the clearing of a narrow net lane, roughly 3 ft x 40 ft, for each net. Several nets are usually operated simultaneously. We have arranged for a retired FWS employee to do the netting and banding if any warblers are found.

We would next like to address some potential concerns you might have about the survey work on your land. First, regarding liability, we stress that workers involved in the surveys, mist netting, and banding activities will be state or federal employees, or will be documented volunteers of these agencies. As such, they are included in workers' compensation coverage of

the agencies, so you need not be concerned about liability problems arising from these individuals working on your land.

Second, regarding any publicity associated with finding Kirtland's Warblers on your land, if birds are found it will be in our best interest to keep the location confidential to minimize the possibility of human disturbance to the birds. At the end of the nesting season we will issue a news release concerning the warblers. The release will be very vague regarding the location of the birds. We will not mention your name. If the location does somehow become known prematurely and disturbance by birding enthusiasts is seen to be a problem, we will consult with you and the FWS on the advisability of posting the area as closed to public entry.

Thirdly, regarding the potential for conflicts between your plans for the land and the provisions of the federal Endangered Species Act, please accept our assurance that the Endangered Species Act has only limited authority over your activities. Specifically, the law states that you cannot "take" or "harass" endangered species. "Harass" is defined to include altering the normal behavior of the individual.

We hope this has served to address any concerns you might have regarding this project. Your cooperation in allowing Mr. Swanson to conduct a survey on your land, or to cross your land so that he can reach adjacent land, will be very much appreciated. Any additional questions may be referred to Lee Pfannmuller, Nongame Research Coordinator, DNR (612/296-2276), or James Engel, Chief, Division of Endangered Species, FWS (612/725-3276).

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Figure 1. Numbers and general locations of publicly-owned jack pine stands in Minnesota that are 50 acres or greater in size, 5-25 years old and have densities greater than or equal to 2500 trees/ha.

