THIRD DECENNIAL CENSUS OF KIRTLAND'S WARBLER

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KIRTLAND'S WARBLER (*Dendroica kirtlandii*) was discovered in 1851, and since that time has always been considered a rare bird. The discovery of the nesting ground in 1903 revealed habitat so specialized and restricted that I doubt the population was much larger at any time in recent centuries. A momentary upsurge may have occurred in the period 1870–1900 when collectors took a number of specimens on the wintering ground in the Bahama Islands. Significantly this was the time of most active lumbering and most extensive forest fires in the breeding range, when optimal nesting habitat was probably the greatest in hundreds of years.

Until 1951 no one knew even approximately how many Kirtland's Warblers existed, because no one had visited more than a fraction of all the nesting areas. Then, on the hundredth anniversary of the discovery of the species, I organized a group effort to seek out every nesting location and count all the singing males; we repeated the count in 1961 (Mayfield, 1953, 1962). These two censuses 10 years apart showed no essential change, suggesting the population was holding steady at about 500 pairs, but my data on individual nests, heavily weighted with information from the 1950s, showed an ominously low production of fledglings (Mayfield, 1960).

Now in the census of 1971 my worst predictions have been realized. The total count of singing males sank to 201, a decrease of 60 percent in 10 years. Table 1 summarizes the results of all three censuses.

METHODS

The methods in all the censuses were similar.

Most of the participants were people with long experience with Kirtland's Warbler. Some took part in all three counts. They worked mainly in small groups in a part of the region they knew well, each assigned to an area of moderate size. Many of them, particularly the state and national forest people, know the region intimately. In each instance the number of cooperators has been adequate to assure thorough coverage: 1951, 32 people; 1961, 48; 1971, 49.

All counts were taken in June. Each party selected a time within the month at its own convenience. Some sites were visited several times for verification, and several were reconnoitered in May. The limits on the period were set in view of the fact that most males are on nesting territories by 20 May and continue singing into July, with a few still singing into early August. My data on singing frequency have shown that the probability of hearing a male in any 5 minutes of a June morning is about 85 percent. With a longer listening period, the probability rises, and a singing bird or a group of them is not likely to be missed by a person within hearing for 30 minutes or more. Actually the chance of missing warblers is reduced by the circumstance that they rarely occur as singles, but almost always in clusters or "colonies."

At least two people in 1971 used tape recorders to play back song and stimulate males into voice. One isolated male was found this way.

TABLE 1
RESULTS OF THREE CENSUSES

County	1951		1961		1971	
	Males	Sections	Males	Sections	Males	Sections
Alcona	4	1	0	0	0	0
Crawford	142	19	52	19	101	9
Iosco	74	20	30	6	1	1
Kalkaska	28	6	32	4	0	0
Montmorency	43	11	61	15	1	1
Ogemaw	0	0	114	5	47	3
Oscoda	103	19	152	22	48	11
Otsego	0	0	14	4	3	2
Presque Isle	34	13	34	9	0	0
Roscommon	4	2	13	2	0	0
TOTALS	432	91	502	86	201	27

In preparation for the census, promising areas were pinpointed on maps. This was possible because Kirtland's Warbler nests only in a part of northern Lower Michigan extending less than 100 miles from east to west and 85 miles from north to south (Figure 1). Even here it nests only in scattered "jack pine barrens" where large tracts are covered by pure stands of young pines (Christmas-tree size). Under natural conditions this situation occurs only on the poorest of dry sandy soils some 7 to 20 years after forest fire. Usually the warblers are found only among jack pines (*Pinus banksiana*), but occasionally they occupy stands of red pines (*Pinus resinosa*) where forestry plantings have produced a similar configuration.

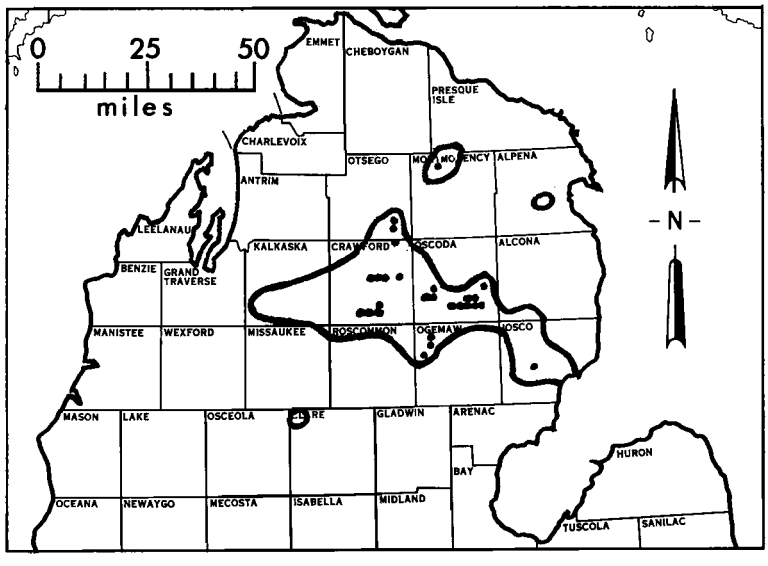

Figure 1. Northern Lower Michigan showing known Kirtland's Warbler breeding grounds in history; black dots show locations of singing males in 1971.

Habitats of this type make up only a small part of the region. Most of it consists of older pine, deciduous forest, and farmlands. So censusers can concentrate attention on a comparatively few locations revealed by the following clues: places where warblers were reported on the last census or since, habitat judged suitable by government forestry men in the region, and locations of forest fires and pine plantings of the last 25 years in the files of the Michigan Department of Natural Resources and of the United States Forest Service. These clues allowed me to mark for special attention 300 square miles spotted on the maps of 15 counties. (Fewer than one-tenth of the marked sections proved to have warblers.) In addition the censusers cruised their assigned regions alertly and sought information from residents about tracts of this distinctive kind. Fire lanes at 1-mile intervals in this sandy country allow penetration of the forest areas by car nearly everywhere.

Reassuring evidence of the completeness of the coverage by this method in the previous censuses is provided by the fact that in only one instance was a cluster of warblers found subsequently but not during a census, and these birds amounted to less than 1 percent of that year's count.

Discussion

We do not know why this sharp reduction in Kirtland's Warblers has occurred. Possibly this is just a downturn in a normally fluctuating population and other similar declines have passed unnoticed, but our information on the reproductive success of the bird over a period of years does not encourage such optimism.

One hypothesis to account for the reduction is that the amount of suitable habitat is at a low ebb. Many experienced observers believe so. Unfortunately we have no precise measurement of the habitat, because no one can be sure from inspection that a given tract of land is suitable. Yet we know forest fires are better controlled with each passing year, and the "cabin sprawl" continues to push back the forest everywhere in the region. On the other hand it seems to the human eye that Kirtland's Warbler does not use more than a small part of the suitable habitat available to it. This has been remarked by every student of the bird from the discoverer of the first nest in 1903 down to the present. Perhaps the bird's requirements include subtle factors we still do not understand.

Another hypothesis to account for the reduction in warblers is the unremitting pressure of the Brown-headed Cowbird (*Molothrus ater*). I believe the cowbird expanded its range from the grasslands of the central continent with the clearing of the eastern forests for agriculture, and reached the nesting ground of Kirtland's Warbler for the first time in about the 1870s (Mayfield, 1960, 144–147). It found the warbler a perfect host, convenient and tolerant. My study sample in the 1940s and 1950s showed that Kirtland's Warblers lost 36 percent of the fledglings they would have produced if there had been no cowbirds in the region (Mayfield, 1961). This is a severe, perhaps unprecedented, pressure from one predatory agent on an entire species of birds year after year. The effect is particularly

ominous, because the relationship between the cowbird and the warbler does not seem to be density dependent. Thus the pressure need not relent when the warbler dwindles, for if the warbler were not available the cowbird population should be maintained adequately by numerous other hosts. At least we have no evidence that any subset of cowbirds specializes on Kirtland's Warblers.

Many people suspect the cowbird has become more numerous here in recent decades, favored perhaps by mowed clearings around cabins and along highway shoulders. Some evidence suggests the cowbird pressure on Kirtland's Warbler may have been increasing in recent years. A sample of 109 nests found before 1950 (1903–1949), shows 53 nests or 48 percent parasitized by cowbirds. A recent sample of 140 nests from the period 1963–1971 shows 94 nests or 67 percent parasitized by cowbirds. This most recent sample is drawn from the separate work of B. E. Radabaugh and L. H. Walkinshaw (MS). This comparison should be viewed with caution because the samples are derived mainly from two areas, and other variables beside the points in time could affect the rate of parasitism. For example the stage of growth of the pines or some other local circumstance may have worked to the warblers' disadvantage in these two locations.

The significance of control measures has been demonstrated by the studies of N. L. Cuthbert and Radabaugh (MS). In a sample of 117 nests from 1965 to 1971 in areas from which many cowbirds had been removed by trapping and shooting, they found 25 nests or 21 percent parasitized by cowbirds. In a sample of 88 nests from 1963 to 1971 where cowbirds were not molested, they found 58 nests or 66 percent parasitized by cowbirds.

The warblers have not declined uniformly throughout the nesting range. The remaining population has collapsed back toward the center, leaving the peripheral areas virtually empty. The density of nesting birds in the core areas remains as high as in other years, up to 15–30 pairs per section. The total population now nests within a circle 35 miles in diameter at the heart of the historic range, with the possible exception of two isolated instances in Iosco and Montmorency counties where single males were found, perhaps unmated.

In the counties just west of the present warbler range, substantial acreages are now devoted to Christmas-tree farms. Superficially these look suitable for Kirtland's Warblers, although the natural ground cover has been severely disturbed by plowing. Several of us have looked unsuccessfully for Kirtland's Warblers in these plantations.

The concentration of the species in the center of the range gives new significance to the Kirtland's Warbler management areas set aside on state and national forest lands (Radtke and Byelich, 1963; Mayfield, 1963). Eighty males, 40 percent of the total, now occupy lands managed for the

benefit of the warbler by the Huron-Manistee National Forests and by the Michigan Department of Natural Resources. One of the three tracts designated by the State of Michigan, consisting of four sections in northwestern Oscoda County, has no warblers at present but has a vigorous growth of young pines expected to attract them within 2 or 3 years.

One of the reasons for establishing these management areas was to guarantee in perpetuity some prime habitat and other protective measures to preserve the bird if its numbers should drop dangerously low at some time in the future. That time may be nearer than expected.

The Wintering Ground

Puzzled by the decline of Kirtland's Warbler on its nesting ground where it is well-known, we are prompted to wonder about its survival problems on the wintering ground where it is virtually unknown. It spends more than half of each year in the Bahama Islands, but it is hard to find there. Although it has been reported at some time on nearly all the larger islands, it has been found nowhere regularly, and we have no inkling of any special winter habitat niche.

Most of these islands are covered with broad-leaved scrub, but the northernmost of them also have extensive pinelands. Still, most of the specimens collected in the last century and sight records in this century have come from places where there were no pines.

It is my impression that conditions in the interior of most of these islands have not changed materially in the present century. The considerable resort development in recent years has taken place mainly at shore locations on a few islands. The interiors remain almost empty of people and less used for agriculture than 100 years ago. The pinelands have been cut and burned piecemeal throughout history.

Acknowledgments

This census would have been impossible without the help of many enthusiastic cooperators. I am particularly grateful to the Michigan Department of Natural Resources and to the staff of the Huron-Manistee National Forests who provided detailed information on localities of the right forest type. The participants in the count, in alphabetical order with group leaders marked with asterisk, were as follows:

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FUTURE STEPS

More than 20 people met in Ann Arbor, Michigan on 30 October 1971 to discuss possible steps to aid the bird. The group was assembled by John Byelich of the Michigan Department of Natural Resources and G. William Irvine of the Huron-Manistee National Forests, the two public agencies with management areas already dedicated to Kirtland's Warbler. Other public and private agencies were represented, including the federal Office of Endangered Species, Nature Conservancy, Michigan Natural Areas Council, the University of Michigan, and the Audubon Societies of Michigan, Detroit, and Pontiac.

The group designated a steering committee to carry forward, and it was formally constituted as the Kirtland's Warbler Advisory Committee by action of president William L. Thompson and the board of the Michigan Audubon Society. The members were Byelich, Cuthbert, Irvine, Radabaugh, Shake, Storer, Thompson, and Mayfield, chairman. The committee met on 9 November in Ann Arbor to consider further steps in detail and to estimate needs of manpower and money.

Immediate recommendations were as follows:

1. Take measures to control the Brown-headed Cowbird at all major nesting locations on public land.
2. Place reasonable limits on the activities of visitors on management areas.
3. Census the population again in 1972.
4. Encourage continued research on the species.
5. Urge all students of the bird to publish promptly the data they have gathered.

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