
Kirtland's Warbler

Dendroica kirtlandii

Federal Status:	Endangered (March 11, 1967)
Critical Habitat:	None Designated
Florida Status:	Endangered
Recovery Plan Status:	Contribution (May 1999)
Geographic Coverage:	South Florida

Kirtland's warbler is one of our rarest warblers. This species has an extremely limited nesting range in a relatively small area of central Michigan. It nests in young jack-pine (*Pinus banksiana*) forests exclusively. It is also the first bird species to have a monument (Terres 1980). Its migratory pattern brings it to the east coast of Florida in the fall and spring.

This account represents South Florida's contribution to the range-wide recovery plan for the Kirtland's warbler (FWS 1985).

Description

Kirtland's warbler is a large insectivorous warbler (149-153 mm in length) with a finely pointed bill. It is blue-gray above with black streaks on the back. The male has a black mask and is yellow below with distinct dark spots on the sides and possibly the breast. The bird has a broken white eye-ring and black lores with black legs, feet, and bill. White spots may be found on the outer tail feathers or retrices. Bluish-grey and white markings on the wing coverts form obscure wing bars. The female is duller and lacks the black lores and mask. In non-breeding plumage, the face, sides, and upper parts of the male are duller and similar to the female's coloration. Immatures have plumage similar to non-breeding adults. Fledglings are identified in the field by their shorter tail length up to 16 days post-fledging. Kirtland's warbler also has a habit of constantly bobbing its tail (Mayfield 1992, Curson *et al.* 1994, Sykes 1996).

The Kirtland's warbler's song is a clear *chip-chip-che-way-o* and resembles the northern waterthrush (*Seiurus novebracensis*). Females and immature males do not normally sing (Mayfield 1992).

Taxonomy

Kirtland's warbler is in the Order Passeriformes, Family Emberizidae. This species was originally described in 1852

by Spencer Baird and named *Sylvicola kirtlandii*. It was named for Jared Kirtland, a naturalist from Cleveland, Ohio (Terres 1980). Taxonomists place Kirtland's warbler between the pine warbler (*D. pinus*) and the prairie warbler (*D. discolor*). It may be related to the yellow-throated warbler (*D. dominica*) although there is some uncertainty of this taxonomic link (Mayfield 1992).

Distribution

Kirtland's warbler breeds in upper and lower Michigan in 13 counties from Lake Huron west to Kalkaska County, and from Presque Isle County south to Ogemaw County. This area is principally in the watershed of the AuSable River. Male Kirtland's warblers have been sighted in Wisconsin, Ontario, and Quebec, although no breeding in these areas has been noted or confirmed (Miller and Conroy 1990, Mayfield 1992, Craves 1994).

This species is migratory, and winters throughout the Bahama Islands, although there have been additional sightings in the Turks and Caicos Islands. Although the known wintering islands in the Bahamas are relatively close, Kirtland's warblers have never been reported wintering in Florida, Cuba or Hispaniola. Additional records for Mexico and the Dominican Republic have not been confirmed (Miller and Conroy 1990, Mayfield 1988, 1992).

Habitat

Kirtland's warbler is a habitat specialist on its breeding grounds, preferring young jack-pine (*Pinus banksiana*) forests on flat or gently rolling landscapes. The age of the pine stand can vary from 6 to 22 years of age, and should be at least 34 ha in size (Mayfield 1960; Walkinshaw 1983; Probst 1986, 1988; Mayfield 1992). Larger areas of 200 ha or more are preferred. Other plant species associated with Kirtland's habitat are northern pin oaks (*Quercus ellipsoidalis*), blueberry (*Vaccinium augustifolium*, *V. myrtilloides*), bearberry (*Arctostaphylos uva-ursi*), sweet-fern (*Comptonia peregrina*), sedge (*Carex pennsylvanica*), grasses, and bracken fern (*Pteridium aquilinum*). The soils are sandy and well-drained (Mayfield 1960, Smith 1979, Walkinshaw 1983, Zou *et al.* 1992).

Jack pine stands 6 years post-burn with tree heights of 1.5 to 2.0 m are preferred for nesting, and these stands will continue to be used for approximately 15 years. When these trees become 3 to 5 m in height and the lower branches, which shade and conceal the nests, die the warblers begin to abandon the site. As an area becomes less suitable, all birds except unmated males leave the area (Mayfield 1992, Craves 1994, Sykes 1996).

Migrating Kirtland's have been observed in a variety of habitats including woodlands, scrub, fencerows, and vegetated yards but prefer dense vegetation less than 1.5 m in height (Stevenson and Anderson 1994). A migrating juvenile Kirtland's warbler was banded and recaptured twice in an 11-day period during fall migration in 1971 in a dense hawthorn (*Crataegus* spp.) crabapple (*Pyrus coronaria*) thicket (Clench 1973).

The Bahamian winter habitat has been described as pine woods, broad-leaved scrub, and Australian pine (*Casuarina* spp.). Although specific winter

habitat requirements are not known, this species seems to prefer dense scrub vegetation. They have also been sighted in the dense understory of tall pines as well as in early successional habitat dominated by lantana (*Lantana* spp.) (Mayfield 1972, 1992; Miller and Conroy 1990).

Behavior

Reproduction

Kirtland's warblers are loosely colonial and breed in their second year. Adult males return to their breeding colonies although first year birds disperse widely. These birds are normally monogamous, however, some polygyny has been noted. Approximately half of all returning birds mate with the same individual in subsequent years (Mayfield 1992, Craves 1994, Sykes 1996).

Males are the first to arrive on the breeding grounds, and pair bonding begins within a week of the females' arrival. Nests are constructed between mid-May and early June. Female Kirtland's warblers construct a shallow cup nest directly on the ground over a 4 to 8 day period. Nests are usually well concealed by ground cover or low hanging branches. Nests are only used once (Sykes 1996, Mayfield 1992).

Egg laying occurs from late-May to mid-July with a clutch size of three to five eggs. Incubation is undertaken by the female, begins the day before the clutch is complete, and takes 13 to 16 days. The male feeds the female during incubation (Terres 1980). Hatching is fairly synchronous, with all chicks emerging within 24 hours. Females mainly brood the chicks, and the male brings food to both the female and the young. Fledging occurs 9 days after hatching, with the entire clutch fledging almost simultaneously. Parents care for the young up to 44 days after fledging, however the young appear to be capable of survival at 23 days post-fledging. This species may occasionally double brood, however, survival rate of the second brood is low (Mayfield 1992, Curson *et al.* 1994, Sykes 1996).

The number of fledglings produced per pair, per year, varies, but is usually 2.2 in good years. The probability of survival from egg to fledging is 0.32 under ideal conditions (e.g. without cowbird parasitism). Adult survivorship from year to year has been estimated at 65 percent. The average lifespan for adult birds is 2 years; the oldest recorded ages are 8 and 9 years for a female and male, respectively (Mayfield 1992).

Both the parents and the young apparently leave the jack pine habitat after July, as few of the birds have ever been observed there in August (Sykes 1996).

Foraging

Kirtland's warbler is a gleaner that forages primarily on the ground and at midlevels in vegetation. Probing and hover-gleaning are other methods employed by this species for foraging (Sykes 1989, Mayfield 1992).

While on the breeding grounds, the Kirtland's warbler has been observed feeding on moths, caterpillars, adult ant lions, sawfly adults and larvae, grasshopper nymphs, spanworms, horseflies, deerflies, crickets, centipedes, and numerous other insects and larvae (Terres 1980, Mayfield 1992). It feeds on the

ground or in the tops of pines or scrub oaks. Later in the breeding season, ripe blueberries are consumed by adults and fed to young birds (Mayfield 1992, Sykes 1996). During the winter months, the diet consists mainly of small fruits with some arthropods (Sykes 1989, 1996; Mayfield 1992).

Migration

The entire Kirtland's warbler population migrates between Michigan and the Bahamas, possibly without any stops. Other authors as well as museum records indicate at least some birds make stopovers during migration. Departure from the Bahamas in spring probably occurs in late April or early May. The route taken, most likely, follows a narrow band that crosses South and North Carolina, Virginia, West Virginia, and Ohio before reaching Michigan. It is extremely rare in Florida during migration, with records between mid-April and early May from Palm Beach, Alachua, and Duval Counties although Clench (1973) discounts many of these sightings since there are no photos or specimens to corroborate the record (Mayfield 1988, 1992; Sykes 1996).

Fall migration takes the same route, with birds departing the breeding grounds between August and October. The first arrival of Kirtland's warblers to the Bahamas was recorded in August. Those birds which occasionally reach Florida have probably been blown off course (Robertson and Woolfenden 1992). Birds observed in Florida have been seen between early September and late November in Miami-Dade, Escambia, Collier, Martin, Palm Beach, St. Lucie, St. John's, and Wakulla Counties (Sykes 1996).

Relationship to Other Species

Kirtland's warbler appears to have little threat from mammalian predators and appears quite tame on the breeding grounds. Avian predators may include sharp-shinned hawks (*Accipiter striatus*), northern harrier (*Circus cyaneus*), great-horned owl (*Bubo virginianus*), and domestic cats (*Felis domesticus*). Egg predators include blue jays (*Cyanocitta cristata*), garter snakes (*Thamnophis* spp.), possibly American crows (*Corvus brachyrhynchos*), thirteen-lined ground squirrels (*Citellus tridecemlineatus*), and red squirrels (*Tamiasciurus hudsonicus*) (Mayfield 1992).

Perhaps the most important relationship to the survival and recovery of this species is its relationship to the brown-headed cowbird (*Molothrus ater*). This nest parasite expanded its nesting range into northern Michigan in the late 1800's. Cowbird presence is correlated with the desertion of approximately one-third of all nests during incubation when left uncontrolled. Fledgling production in parasitized nests decreases by 40 to 55 percent in nests with one cowbird egg, and to zero percent in nests with two cowbird eggs (Mayfield 1992, Sykes 1996). Although many bird species have adapted to cowbird nest parasitism by learning to eject cowbird eggs from the nest, Kirtland's warbler has learned no such defense. With such a small population, it is unlikely the Kirtland's warbler will ever adapt to such predation (Craves 1994).

Status and Trends

Evolution of the Kirtland's warbler most likely began with the end of the Wisconsin glaciation 6,000 to 8,000 years ago, when it began to develop traits which allowed the species to exploit jack pine habitat and avoid competition with other warbler species. This narrow ecological niche increases the warbler's vulnerability to extinction (Craves 1994).

Prior to 1951, no attempt was made to estimate the Kirtland's warbler population. However, it is generally believed that large fires in the late 1800s converted white pine (*P. strobus*) forests to suitable jack pine forest. This event resulted in an increase in this species' numbers. Collectors were able to take birds in areas where they were rarely seen in the winter range prior to the fire event. The first complete population census, performed in 1951, resulted in an estimate of 1,000 individuals. A census in 1961 again yielded a population estimate of 1,000, but the population dwindled to an estimated 300 pairs in 1967. This decline, as well as the 60 percent decline in the number of singing males documented in the 1971 census, led to its listing as an endangered species (32 FR 4001; 35 FR 8495).

Since the population lows between 167 and 242 males from 1971 to 1989, Kirtland's warbler populations have increased to a maximum of 766 males in the 1995 10-day breeding season census. A wildfire in 1980 may have enabled this population increase by creating large tracts of suitable habitat (Sykes 1996).

This species is vulnerable to many threats due to its small numbers, limited distribution in breeding and wintering areas, exacting breeding habitat requirements, and nest parasitism by brown-headed cowbirds. The level of nest parasitism in Kirtland's warblers was over 50 percent until recently (Curson *et al.* 1994).

Although minimal human disturbance does not appear to be detrimental to nesting Kirtland's warblers, human residential development usually results in the loss of habitat and the introduction of domestic predators. From the information available, it would seem that residential and commercial development of breeding sites is not an issue. However, proposed recreational and commercial uses of Kirtland's nesting habitat during the breeding season, as well as efforts to suppress natural fire threaten this species (FWS 1985, Sykes 1996).

Habitat available to wintering Kirtland's warblers appears to be stable and abundant. Agricultural endeavors in the Bahamas that fail and become fallow provide suitable habitat for this species. However, loss of coastal, forested communities in the continental U.S. could affect this species during migration by eliminating important stopover areas (FWS 1985, Sykes 1996).

Management

Kirtland's warbler is a low-ranging species, preferring stands of young jack pine (*P. banksiana*) (Stevenson and Anderson 1994). The nesting habitat is restricted to these young jack pine stands, ideally 81 ha or larger, with thick ground cover. Management efforts for this species began in 1957 when three areas encompassing 1,036 ha were set aside and managed for different age stands of jack pine. An additional 1,600 ha tract was set aside by the U.S. Forest Service in 1962. After passage of the Endangered Species Act of 1973,

recovery actions were increased and management for Kirtland's warblers was proposed for 21,646 ha of the Huron-Manistee National Forest and an additional 30,005 ha of the AuSable, Mackinac, and Pere Marquette State Forests (FWS 1985, Mayfield 1992, Curson *et al.* 1994).

In addition to habitat preservation and management, cowbird trapping programs have been initiated. These programs have been successful in minimizing parasitism and reestablishing normal fledging success rates for the species (FWS 1985, Sykes 1996). The current cowbird control program must continue in order to reduce this threat further. Despite the success of trapping efforts, the Kirtland's warbler population has not significantly increased (Curson *et al.* 1994).

A technique for transferring Kirtland's warbler chicks or eggs into other species' nests may be a useful tool to establish breeding colonies in suitable, unoccupied sites away from the breeding center, possibly in Wisconsin or Ontario. When attempted with surrogate species, a single, returning bird settled in characteristic habitat, and behaved territorially toward others of its species (Brewer and Morris 1984).

Sykes (1996) recommends that a prescribed burning program be implemented. He also states that research on post-breeding activities such as movements, dispersal, and over-winter survival should be undertaken. Satellite imagery analysis of preferred winter habitat may be helpful in this endeavor (Miller and Conroy 1990). Such information would allow us to determine what threats, if any, originate during migration or on the winter range of this species and how we may ameliorate those threats.

The recovery plan provides the following basic recommendations: (1) maintain and develop suitable nesting habitat for the warbler throughout its former known range; (2) protect this bird on its wintering grounds and along the migration route; (3) reduce key factors adversely affecting reproduction and survival; (4) monitor breeding populations of the warbler to evaluate responses to management practices and environmental changes; and, (5) reintroduce the birds into areas in the upper peninsula of Michigan or in other states in an attempt to establish independent self-sufficient populations. The ultimate recovery plan objective is to develop a stable wild population of 1,000 pairs, which is approximately the same number estimated to exist at the time of the 1951 and 1961 population censuses.

Since Kirtland's warblers do not frequent, and are not dependent upon, reserves in South Florida, management actions specific to this species are not needed. However, management actions that benefit neotropical migratory birds should benefit any Kirtland's warblers that reach Florida.

Literature Cited

- Brewer, R. and K.R. Morris. Cross-fostering as a management tool for the Kirtland's warbler. *Journal of Wildlife Management* 48(3):1041-1045.
- Clench, M.H. 1973. The fall migration route of Kirtland's warbler. *Wilson Bulletin*. 85(4):417-428.
- Craves, J.A. 1994. The natural history of Kirtland's warbler. *Jack-Pine Warbler* 71(3):13-14.
- Curson, J., D. Quinn, and D. Beadle. 1994. *Warblers of the Americas*. Houghton Mifflin Company Publishers; New York, New York.
- Mayfield, H.F. 1960. The Kirtland's warbler. *Cranbrook Institute of Science*; Bloomfield Hills, Michigan.
- Mayfield, H.F. 1972. Winter habitat of Kirtland's warbler. *Wilson Bulletin* 84(3):347-349.
- Mayfield, H.F. 1988. Do Kirtland's warblers migrate in one hop? *Auk* 105(1):204-205.
- Mayfield, H.F. 1992. Kirtland's warbler. No. 19 in A. Poole, P. Stettenheim, and F. Gill, eds., *The birds of North America*. The Academy of Natural Sciences, Philadelphia, Pennsylvania, and the American Ornithologists' Union; Washington, DC.
- Miller, K.V. and M.J. Conroy. 1990. SPOT satellite imagery for mapping Kirtland's warbler wintering habitat in the Bahamas. *Wildlife Society Bulletin* 18(3):252-257.
- Probst, J.R. 1986. A review of factors limiting the Kirtland's warbler on its breeding grounds. *American Midland Naturalist* 116:87-100.
- Probst, J.R. 1988. Kirtland's warbler breeding biology and habitat management. Pages 23-35 in *Integrating forest management for wildlife and fish*. W. Hoekstra and J. Capp, comp. U.S. Department of Agriculture General Technical Report NC-122.
- Robertson, W.B. and G.E. Woolfenden. 1992. *Florida bird species*. Florida Ornithological Society. Gainesville, Florida.
- Smith, E. 1979. Analysis of Kirtland's warbler breeding habitat in Ogemaw and Roscommon counties, Michigan. M.S. thesis, Michigan State University. East Lansing, Michigan.
- Stevenson, H.M. and B.H. Anderson. 1994. *The birdlife of Florida*. University Press of Florida; Gainesville, Florida.
- Sykes, P.W., Jr. 1989. Kirtland's warblers on their wintering grounds in the Bahamas Archipelago--a preliminary report. 9-11 February 1989 Proceedings of Kirtland's warbler symposium for the U.S. Forest Service; Lansing, Michigan.
- Sykes, P.W., Jr. 1996. Kirtland's warbler. Pages 113-123 in J.A. Rodgers, Jr., H.W. Kale II, and H.T. Smith, eds., *Rare and endangered biota of Florida*, volume V: Birds. University Press of Florida, Gainesville, Florida.
- Terres, J.K. 1980. *The Audubon Society encyclopedia of North American birds*. Alfred A. Knopf; New York, New York.
- U.S. Fish and Wildlife Service [FWS]. 1985. Kirtland's warbler recovery plan, revised. U.S. Fish and Wildlife Service, Twin Cities, Minnesota.
- Walkinshaw, L.H. 1983. Kirtland's warbler: the natural history of an endangered species. *Cranbrook Institute of Science*, Bloomfield Hills, Michigan.
- Zou, X., C. Theiss, and B.V. Barnes. 1992. Pattern of Kirtland's warbler occurrence in relation to landscape structure in its summer habitat northern lower Michigan. *Landscape Ecology* 6:221-231.

Recovery for the Kirtland's Warbler

Dendroica kirtlandii

Recovery Objective: RECLASSIFY to threatened

South Florida Contribution: CONDUCT SURVEYS during migration

Recovery Criteria

The best scientific information available raises questions about whether the Kirtland's warbler still migrates through South Florida. Unless new information demonstrates that the Kirtland's warbler continues to migrate in South Florida, no recovery criteria will be developed or proposed as part of this recovery plan.

Species-level Recovery Actions

S1. Determine the distribution and status of the Kirtland's warbler in South Florida.

S1.1. Conduct surveys for the Kirtland's warbler after identifying potentially suitable migratory habitat for this species.

