

Kirtland's Warbler (*Setophaga kirtlandii*) Species Guidance

Family: Parulidae – the wood-warblers

Species of Greatest Conservation Need (SGCN)

State Status: [Endangered](#) (2014)

State Rank: [S1](#)

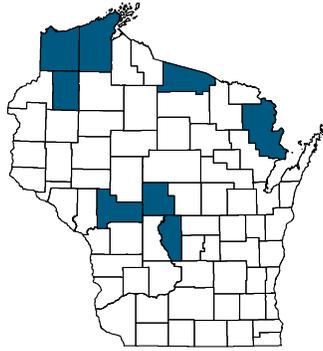
Federal Status: [None](#)

Global Rank: [G1](#)

Wildlife Action Plan

Mean Risk Score: [4.7](#)

Wildlife Action Plan Area of Importance Score: [1](#)



Counties with documented locations of Kirtland's Warbler breeding or breeding evidence in Wisconsin. Source: Natural Heritage Inventory Database, October 2018.



Photo by Joel Trick, USFWS

Species Information

General Description: The Kirtland's Warbler is a large warbler (14cm [5.5 in]) with bluish-gray upperparts, yellow underparts, and dark streaks on back, sides and flanks. All individuals have white eye crescents, white under-tail coverts, and inconspicuous white wing bars. This species frequently pumps its tail. Sexes are dimorphic in basic and alternate plumages. Adult males have black coloration that extends from the loreal area to behind the eye and down through the malar area. Adult females are similar to males but lack black markings on the head. Plumages are similar throughout the year. Immature males closely resemble adult females but streaking on the sides and flanks is less bold. Immature females have a browner head and upperparts, buffier underparts, and less distinct streaking on sides than other plumages (Mayfield 1992, Dunn and Garrett 1997).

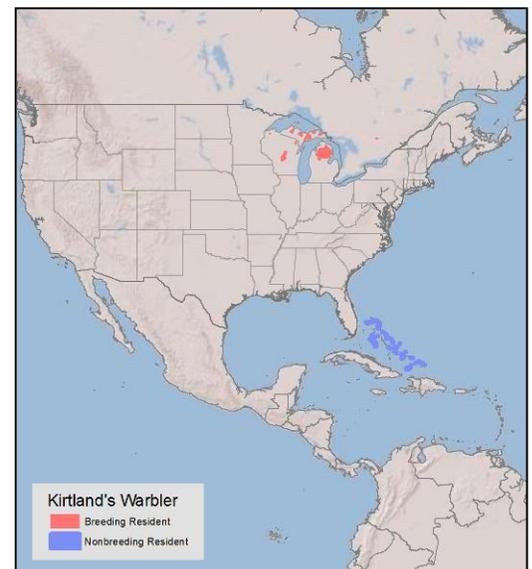
The Kirtland's Warbler song is a series of bubbly, clear notes that steadily rise in pitch, tempo, and volume: *chip-chip-che-way-o*. On a still day, the Kirtland's Warbler song can be heard from >400m (1300 ft) away (Mayfield 1992). The call is a low *chip* (Mayfield 1992, Dunn and Garrett 1997). An example of a typical song can be heard here: http://www.allaboutbirds.org/guide/kirtlands_warbler/sounds

Definitive Identification: The Kirtland's Warbler's size, indistinct white wing bars, and tail-pumping habit help to distinguish it from other similar species.

Similar Species: Immature female Magnolia Warblers (*Setophaga magnolia*) resemble Kirtland's Warblers but have bolder wing bars, a yellow rump, and lack the tail-pumping habit. Prairie Warblers (*Setophaga discolor*) and Palm Warblers (*Setophaga palmarum*) pump their tails but differ in appearance from Kirtland's Warblers. Prairie Warblers are smaller and have a more complex facial pattern than Kirtland's Warblers. Palm Warblers differ by having yellow undertail coverts and a bold supercilium (Dunn and Garrett 1997).

Associated Species: Within appropriate northern dry forest community types, Kirtland's Warblers could occur with the following Species of Greatest Conservation Need: Spruce Grouse (*Falcipecten canadensis*), Sharp-tailed Grouse (*Tympanuchus phasianellus*), Upland Sandpiper (*Bartramia longicauda*), Brown Thrasher (*Toxostoma rufum*), Field Sparrow (*Spizella pusilla*), Vesper Sparrow (*Pooecetes gramineus*), Clay-colored Sparrow (*Spizella pallida*) and Red Crossbill (*Loxia curvirostra*).

State Distribution and Abundance: The Kirtland's Warbler is a newly established breeding species in Wisconsin and, thus, is extremely localized in the state. Nesting is known only in Adams and Marinette counties, but individuals have been detected during the breeding season in Bayfield, Douglas, Washburn, Vilas, and Jackson counties (USFWS 2012). The primary breeding site in Adams County is



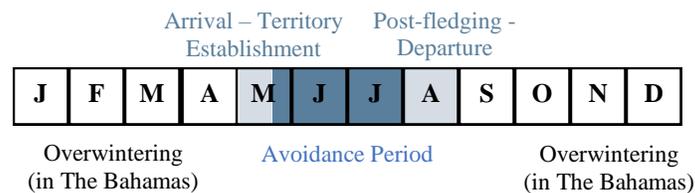
Global range map for Kirtland's Warbler. (Data provided by Chris Mensing, U.S. Fish & Wildlife Service)

located on private land owned by the Plum Creek Timber Company (USFWS 2012). Distribution information for this species may not reflect its full extent in Wisconsin, because many areas of the state have not been thoroughly surveyed.

Global Distribution and Abundance: The Kirtland’s Warbler’s summer range is currently restricted to scattered localities in Wisconsin, Ontario, and the northern Lower Peninsula and Upper Peninsula of Michigan (Anich et al. 2011). Singing males have also been documented in Quebec. Highest densities occur in the northern Lower Peninsula county of Ogemaw and the Upper Peninsula counties of Marquette and Delta (MNFI 2007). Kirtland’s Warblers winter almost exclusively in The Bahamas (Dunn and Garrett 1997).

Diet: Kirtland’s Warblers are primarily insectivorous during the breeding season and prefer adult and larval (caterpillar) forms of moths (*Lepidoptera*), grasshoppers (*Orthoptera*), sawflies (*Hymenoptera*), and flies (*Diptera*). They also feed on jack pine budworm (*Choristoneura pinus*) and small seasonal fruits such as blueberries (*Vaccinium* spp.; Mayfield 1992).

Reproductive Cycle: Kirtland’s Warblers arrive in Wisconsin from early to mid-May. Nest building begins in late May and nestlings are present from mid-June to late July (USFWS 2012). This species departs the breeding grounds from mid-September to early October (Mayfield 1992).



Ecology: The Kirtland’s Warbler breeds in young jack pine stands interspersed with dense thickets and grassy openings (Mayfield 1992, Anich et al. 2011). Minimum patch size ranges from 12-32 ha (30-79 acres), depending on landscape context (Mayfield 1992, Donner et al. 2008). Small patches (<12 ha) positioned within larger complexes of early-successional jack pine forest can provide suitable breeding habitat for Kirtland’s Warblers (Donner et al. 2008). Occupied patches are often clustered within suitable habitat so that males are within hearing distance of another singing male (Mayfield 1992). Males exhibit high site fidelity to suitably aged jack pine forest (Mayfield 1992). At the Adams County, Wisconsin breeding site, for example, 14 of the 20 color-banded males present in 2011 returned in 2012 (USFWS 2012). At >20 years of age, jack pine stands become less suitable and Kirtland’s Warblers abandon previously occupied sites in favor of younger stands (Donner et al. 2008).

Female Kirtland’s Warblers build ground nests in porous, sandy soils that may help prevent flooding during summer downpours (USFWS 1985). These poor-quality soils also encourage jack pine dominance and maintain the low-stature ground cover important for nest concealment (Donner et al. 2009). Ground cover includes a mixture of low shrubs such as blueberry, sand cherry (*Prunus pumila*), bearberry (*Arctostaphylos uva-ursi*), and sweet-fern (*Comptonia peregrina*), as well as grasses, sedges, and forbs (Mayfield 1992, Donner et al. 2009, Anich et al. 2011). The lower live branches of jack pine also help to conceal nest access (Donner et al. 2009, Anich et al. 2011). Nests are simple depressions lined with sedges, pine needles, oak leaves, fibers, and hair. Female Kirtland’s Warblers typically lay and incubate three to six eggs, with an average clutch size of four (Mayfield 1992). Incubation lasts 14 days, and chicks fledge 8-10 days after hatching and remain with parents for an additional three to six weeks (Mayfield 1992, Baicich and Harrison 1997). This species may re-nest following nest failure and may attempt a second nest if the first brood fledges by late June (Mayfield 1992).

Kirtland’s Warblers are rarely observed during migration, so migratory routes are not well known. The few available fall migration records suggest that individuals depart the breeding grounds and follow a southeasterly route through southern Michigan, Ohio, West Virginia, Virginia, North Carolina, South Carolina, Georgia, Florida, and on to The Bahamas (Mayfield 1992, Dunn and Garrett 1997, eBird 2011). This pattern is likely reversed during spring migration (Dunn and Garrett 1997, eBird 2011).

Natural Community Associations (WDNR 2005, WDNR 2009):

Significant: [northern dry forest](#), [pine barrens](#)

Moderate: none

Minimal: none



Kirtland’s Warbler breeding site in Wisconsin in 2007.

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Habitat: The Kirtland’s Warbler is a habitat specialist of dense, patchy jack pine forests (Mayfield 1992, Probst and Donnerwright 2003, Anich et al. 2011). Most occupied stands have a limited hardwood component that may include northern pin oak (*Quercus*

ellipsoidalis), black oak (*Q. velutina*) aspen (*Populus* sp.), and black cherry (*Prunus serotina*; Nelson and Buech 1996, Anich et al. 2011). Although Kirtland's Warblers typically favor stands dominated by jack pine, the primary breeding site in Wisconsin is a red pine plantation. Red pine is not a common breeding habitat for Kirtland's Warblers, but the extensive die-off of planted red pine and substantial natural jack pine recruitment at the Adams county site has produced suitable Kirtland's Warbler habitat (Anich et al. 2011).

Probst and Donnerwright (2003) characterized optimum Kirtland's Warbler breeding habitat as having openings interspersed amongst dense thickets of jack pine (7500 stems/ha; 3035 stems/acre) with 35% to 65% canopy cover. Kirtland's Warblers will colonize sites with lower tree cover and stem densities, however, as long as the following habitat requirements are met: 1) tree age seven to 21 years; 2) tree height 1.5-5m (5-16 ft); 3) total tree density >2000 trees/ha (>809 trees/acre); 4) low live green branch height 10-30cm (4-12 in); 5) large stand size, preferably >40 ha (100 acres); and 6) hardwood stems numbering fewer than jack or red pine stems (USFWS 1985, Probst 1988, Nelson and Buech 1996, Anich et al. 2011). These conditions were created in pre-settlement times by repeated forest fires, but forest fragmentation and fire suppression have severely reduced the extent of wildfire-regenerated jack pine habitat in Wisconsin (Mayfield 1992). Although wildfire habitat provides optimal conditions for this species (Donner et al. 2008, 2009), most occupied habitat now occurs on plantations either managed specifically for this species or for timber (USFWS 1985, Anich et al. 2011).

Threats: Factors limiting Kirtland's Warbler populations include their highly specialized habitat requirements, narrow geographic range, and cowbird parasitism. Early-successional jack pine forest, the preferred breeding habitat, is an uncommon fire-dependent community type that is becoming rare because of fire suppression and conversion to other forest types (USFWS 1985, WDNR 2005). The loss of young jack pine forest has been detrimental to Kirtland's Warblers (USFWS 1985, Mayfield 1992). Jack pine volume has decreased dramatically in Wisconsin since the early 1980s, with over one-half of the acreage converting to other forest types (WDNR 2010). More than 70% of the young jack pine forests that would be suitable to Kirtland's Warblers at the time of this writing were in private or county ownership, based on Forest Inventory and Analysis (FIA) data (Herrick 2012). Cowbird parasitism has had disastrous consequences to the reproductive success of this species. Unnaturally high cowbird parasitism is a consequence of forest fragmentation (Robinson 1995, Howell et al. 2007), and the viability of managed Kirtland's Warbler populations is dependent on annual cowbird control measures (Mayfield 1992). The loss of early-successional habitats is also a concern on the Bahamas wintering grounds, where the primary causes are residential and commercial development and altered fire regimes (Wunderle et al. 2010).

Climate Change Impacts: The Kirtland's Warbler is not considered vulnerable to climate change west of Lake Michigan. Jack pine is adapted to the predicted effects of climate change in Wisconsin: higher temperatures, drier soils, and more frequent droughts and wildfires (Swanston et al. 2011, WICCI 2011). Habitat models indicate an expansion in the distribution of suitable environmental conditions for jack pine forests in northern Wisconsin (Swanston et al. 2011), western Wisconsin and west-central Minnesota (USFWS 2009) but a reduction in the current distribution and quality of jack pine forests in Michigan (USFWS 2009). Based on these projections, Kirtland's Warblers may be expected in the long term to shift their distribution westward to match the jack pine shift; however, increases in jack pine in Wisconsin would be largely influenced by cultural factors such as land uses. Although habitat models indicate no change in suitable habitat for red pine forests, younger red pine stands may be more vulnerable to pests due to increased water stress (Swanston et al. 2011). The resulting loss of productivity or mortality of red pine stands would potentially benefit Kirtland's Warblers by increasing the total amount of suitable habitat available on the landscape.

Survey Guidelines: Persons handling Kirtland's Warblers must possess a valid [Endangered and Threatened Species Permit](#). If surveys are being conducted for regulatory purposes, survey protocols and surveyor qualifications must first be approved by the Endangered Resources Review Program (see *Contact Information*). Area searches are an effective technique for surveying Kirtland's Warblers on breeding territories. Survey the entire area that contains suitable nesting habitat for Kirtland's Warblers by walking slowly throughout the area and stopping every 1/8 mile (200m) to listen for Kirtland's Warbler vocalizations. Remain at each stop for one to five minutes. Call playback may be used in areas without known breeding populations but must be avoided in known occupied habitat to avoid disturbance. Once a bird is detected, cease playing any recordings of Kirtland's Warbler's songs. If Kirtland's Warblers are detected, record the following data: date, location (GPS waypoint in datum WGS84, Decimal Degrees), all Kirtland's Warblers seen or heard, color band combinations, numbers of pairs and juveniles, behavioral observations such as courtship displays or food carries, and presence of other Species of Greatest Conservation Need at the site. Whenever possible, also map the approximate territory boundaries.

Carry out surveys between May 25 and July 1, preferably 10 days apart, including at least one survey less than one week prior to any proposed project activity that may impact Kirtland's Warblers (see *Screening Procedures*). Begin surveys within 15 minutes of sunrise and complete them within 4 hours, or no later than 10 am. Conduct surveys during appropriate weather (i.e., no fog, rain, or wind >10 mph; Ralph et al. 1993). Personnel conducting surveys must be able to identify Kirtland's Warbler by sight and sound. At least three surveys conducted with the above protocol and yielding negative results are needed to determine that the species is not present at a site for the purposes of these guidelines.

Summarize results, including survey dates, times, weather conditions, number of detections, detection locations, and behavioral data and submit via the WDNR online report: <<http://dnr.wi.gov>, keyword "rare animal field report form">.

Management Guidelines

The following guidelines typically describe actions that will help maintain or enhance habitat for the species. These actions are not mandatory unless required by a permit, authorization or approval.

Kirtland's Warblers are extremely sensitive to management impacts, and efforts to maintain or enhance Kirtland's Warbler habitat should be carefully planned in consultation with a species expert to minimize negative short-term impacts (see *Contact Information*). Kirtland's Warbler conservation in Wisconsin requires protection, restoration, and management of large blocks of jack pine forest in conjunction with annual control of Brown-headed Cowbirds. Suitable breeding habitat has the following components: 1) large jack pine stand, preferably >40 ha (100 acres); 2) tree age 7-21 years; 3) tree height 1.5-5m (5-16 ft); 4) total tree density >2000 trees/ha; 5) low live green branch height 10-30cm (4-12 in); and 6) hardwood stems numbering fewer than jack or red pine stems. Focus conservation efforts within appropriate ecological landscapes, including [central sand plains](#), [northeast sands](#), [northern highland](#), and [northwest sands](#) (WDNR 2005). Within these landscapes, potential conservation sites include the jack pine forests scattered throughout Adams County as well as the following locations:

- Black River State Forest in Jackson County
- Chequamegon National Forest in Bayfield County
- Nicolet National Forest in eastern Oconto County
- Marinette County Forest in western Marinette County
- Vilas County Forest
- Northern Highland State Forest in Oneida and Vilas counties

Appropriate management decisions will depend on landscape context and site-specific considerations. Landscapes that provide the highest reproductive potential for Kirtland's Warblers contain aggregations of large patches of jack pine forest (>1000 ha [2500 acres]) with potential for active management. In such landscapes, conservation areas need to be established and intensively managed according to Kirtland's Warbler requirements. Establish a minimum of five management units >240 ha within each conservation area and manage on a 45- to 50-year rotation (Probst 1988). Clustering stands into management units and staggering the schedule of stand regeneration will ensure that suitably aged stands are always available on the landscape (Probst 1988).

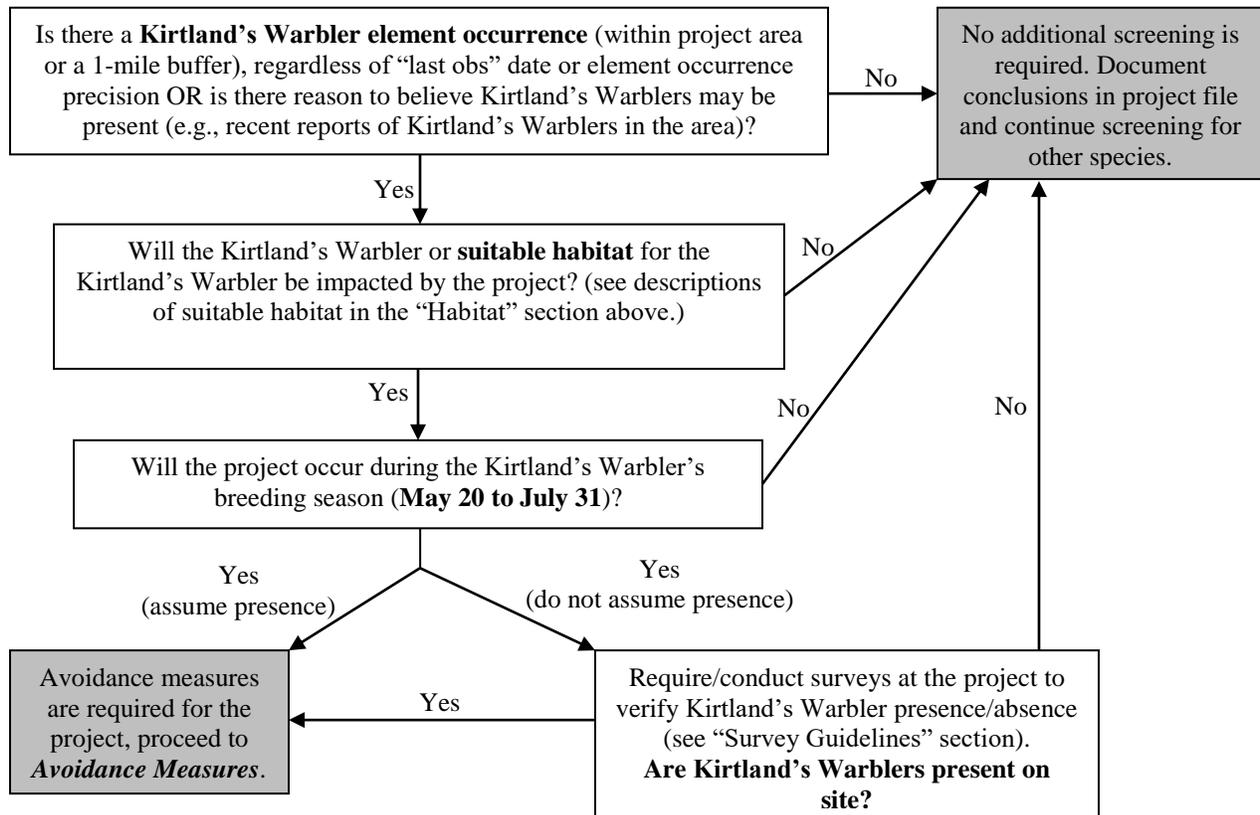
Historically, fire was critical in regenerating early-successional, even-aged jack pine needed by Kirtland's Warbler (USFWS 2009). Prescribed fire can still be a valuable tool for restoring barrens and dry forest communities. Supplemental tree regeneration through seeding or planting of seedlings can also be important, especially when it results in openings, dense (>7500 stems/ha) thickets, and a minimum 25% tree cover (Probst 1988, Anich et al. 2011). In areas where prescribed fire is not feasible, mechanical treatments that emulate stand-replacing conditions resulting from wildfire and other natural disturbances may be needed (USFWS 2009). Such treatments can include a clear-cut or shelter-wood cut followed by supplemental planting of jack pine seedlings. Managers should also consider improving existing jack pine stands by removing overstory pines and hardwoods to create small openings and to achieve the desired 35-65% canopy coverage (USFWS 1985). Careful consideration is warranted when planning site preparation methods prior to tree planting, as herbicides and other techniques can greatly simplify the understory, negatively impacting bird nesting and reducing many plant species and their associated invertebrate fauna.

Annual Brown-headed Cowbird control is essential for Kirtland's Warbler management units located in the [central sand plains](#) ecological landscape. Control measures may not be needed in the [northeast sands](#), [northern highland](#), and [northwest sands](#) because of low cowbird occurrence (K. Grveles pers. comm.). Trapping begins approximately one month before Kirtland's Warblers arrive (i.e., mid-April) and continues through June. The most effective trapping method involves using decoy traps containing live Brown-headed Cowbirds (USFWS 2009).

Screening Procedures

The following procedures must be followed by DNR staff reviewing proposed projects for potential impacts to the species.

Follow the “Conducting Endangered Resources Reviews: A Step-by-Step Guide for Wisconsin DNR Staff” document (summarized below) to determine if Kirtland’s Warbler will be impacted by a project (WDNR 2012):



Avoidance Measures

The following measures are specific actions required by DNR to avoid take (mortality) of state threatened or endangered species per Wisconsin’s Endangered Species law (s. 29.604, Wis. Stats.). These guidelines are typically not mandatory for non-listed species (e.g., special concern species) unless required by a permit, authorization or approval.

According to Wisconsin’s Endangered Species Law (s. 29.604, Wis. Stats.), it is illegal to take, transport, possess, process, or sell any wild animal on the Wisconsin Endangered and Threatened Species List (ch. NR 27, Wis. Admin. Code). Take of an animal is defined as shooting, shooting at, pursuing, hunting, catching or killing. Kirtland’s Warblers are further protected by the Federal Migratory Bird Treaty Act of 1918, which established a prohibition, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention... for the protection of migratory birds... or any part, nest, or egg of any such bird." (16 U.S.C. 703). Contact the US Fish and Wildlife Service directly for any permits related to the Federal Migratory Bird Treaty Act (see *Contact Information*).

The following avoidance measures have been approved by the U.S. Fish and Wildlife Service. If *Screening Procedures* above indicate that avoidance measures are required for a project, follow the measures below. If you have not yet read through *Screening Procedures*, please review them first to determine if avoidance measures are necessary for the project.

1. The simplest and preferred method to avoid take of Kirtland’s Warblers is to avoid directly impacting individuals, known Kirtland’s Warbler locations, or areas of suitable habitat (described above in the “Habitat” section and in *Screening Procedures*).

2. If Kirtland's Warbler impacts cannot be avoided entirely, avoid impacts during the **breeding season (May 20 to July 31)**. Kirtland's Warblers are extremely rare in Wisconsin and sensitive to management impacts, so impacts even outside the breeding season should be carefully planned in consultation with a species expert (see *Contact Information*).
3. If Kirtland's Warbler impacts cannot be avoided, please contact the Natural Heritage Conservation Incidental Take Coordinator (see *Contact Information*) to discuss possible project-specific avoidance measures. If take cannot be avoided, an [Incidental Take Permit or Authorization](#) is necessary. (Any restoration project or management activity that follows the Grassland and Savanna Protocols for this species [<http://dnr.wi.gov/topic/erreview/Documents/GspBellsVireo2011.pdf>], is covered for any unintentional take that may occur, provided that the required [Incidental Take Permit or Authorization](#) is issued.)

Additional Information

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Linked Websites:

- USFWS Endangered Species Website: <<http://www.fws.gov/midwest/Endangered/birds/Kirtland/>>
- Cornell Lab of Ornithology All About the Birds: <http://www.allaboutbirds.org/guide/Kirtlands_Warbler/id>
- Wisconsin Bird Conservation Initiative All Bird Conservation Plan: <<http://www.wisconsinbirds.org/plan/species/kiwa.htm>>
- Wisconsin Wildlife Action Plan: <<http://dnr.wi.gov>, key word "Wildlife Action Plan">
- Natural Communities of Wisconsin: <<http://dnr.wi.gov>, key word "natural communities">
- Rare Animal Field Report Form: <<http://dnr.wi.gov>, key word "rare animal field report form">
- Wisconsin Endangered and Threatened Species: <<http://dnr.wi.gov>, key word "endangered resources">
- Wisconsin Endangered and Threatened Species: <<http://dnr.wi.gov>, key word "endangered species permit">
- Wisconsin Natural Heritage Inventory Working List Key: <<http://dnr.wi.gov>, key word "Natural Heritage Working List">

Funding

- Natural Resources Foundation of Wisconsin: <<http://www.wisconservation.org/>>
- USFWS State Wildlife Grants Program: <<http://wsfrprograms.fws.gov/subpages/grantprograms/swg/swg.htm>>
- Wisconsin Natural Heritage Conservation Fund
- Wisconsin DNR Division of Forestry

Contact Information (Wisconsin Species Experts for Kirtland's Warbler)

- Refer to the Bird contact on the [Rare Species and Natural Community Expert List](#)

Endangered Resources Review Program Contacts

- General information (DNRERReview@wisconsin.gov)
- [Rori Paloski](#), Incidental Take Coordinator, Wisconsin DNR, Bureau of Natural Heritage Conservation (608-264-6040, rori.paloski@wi.gov)

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