Done in Washington, DC, this 9th day of April 2018.

Kevin Shea,

Administrator, Animal and Plant Health Inspection Service.

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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR 17

[Docket No. FWS–R3–ES–2018–0005; FXES11130900000]

RIN 1018–BC01

Endangered and Threatened Wildlife and Plants; Removing the Kirtland's Warbler From the Federal List of Endangered and Threatened Wildlife

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: Under the authority of the Endangered Species Act of 1973, as amended (Act), we, the U.S. Fish and Wildlife Service (Service), propose to remove the Kirtland's warbler (*Setophaga kirtlandii*) from the Federal List of Endangered and Threatened Wildlife (List) due to recovery. This determination is based on a thorough review of the best available scientific and commercial information, which indicates that the threats to the species have been eliminated or reduced to the point that the species has recovered and no longer meets the definition of endangered or threatened under the Act.

DATES: We will accept comments received or postmarked on or before July 11, 2018. We must receive requests for public hearings, in writing, at the address shown in **FOR FURTHER INFORMATION CONTACT** by May 29, 2018.

ADDRESSES: *Written comments:* You may submit comments by one of the following methods:

(1) *Electronically:* Go to the Federal eRulemaking Portal: *http://www.regulations.gov.* In the Search box, enter FWS–R3–ES–2018–0005, which is the docket number for this rulemaking. Then, click on the Search button. On the resulting page, in the Search panel on the left side of the screen, under the Document Type heading, click on the Proposed Rules link to locate this document. You may submit a comment by clicking on ''Comment Now!''

(2) *By hard copy:* Submit by U.S. mail or hand-delivery to: Public Comments Processing, Attn: FWS–R3–ES–2018–0005, U.S. Fish and Wildlife Service, MS: BPHC; 5275 Leesburg Pike, Falls Church, VA 22041–3803.

We request that you send comments only by the methods described above. We will post all comments on *http://www.regulations.gov.* This generally means that we will post any personal information you provide us (see Information Requested, below, for more information).

Document availability: This proposed rule and supporting documents are available on *http://www.regulations.gov.* In addition, the supporting file for this proposed rule will be available for public inspection, by appointment, during normal business hours, at the Michigan Ecological Services Field Office, 2651 Coolidge Road, Suite 101, East Lansing, MI 48823; telephone 517–351–2555.

FOR FURTHER INFORMATION CONTACT: Scott Hicks, Field Supervisor, Michigan Ecological Services Field Office, 2651 Coolidge Road, Suite 101, East Lansing, MI 48823; telephone 517–351–2555; facsimile 517–351–1443. If you use a telecommunications device for the deaf (TDD), please call the Federal Relay Service at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

Purpose of Regulatory Action

This action proposes to remove the Kirtland's warbler from the Federal List of Endangered and Threatened Wildlife in title 50 of the Code of Federal Regulations (50 CFR 17.11(h)) based on the species' recovery. Removing a species from the List (''delisting'') can only be completed by issuing a rule.

Basis for Action

We may delist a species if the best scientific and commercial data indicate the species is neither an endangered species nor a threatened species for one or more of the following reasons: (1) The species is extinct; (2) the species has recovered; or (3) the original data used at the time the species was classified were in error (50 CFR 424.11). Here, we have determined that the species may be delisted based on recovery. A species may be delisted based on recovery only if the best scientific and commercial data indicate that it is no longer endangered or threatened.

The threats that led to the species being listed under the Act (primarily loss of the species' habitat and effects of brood parasitism by brown-headed cowbirds) have been removed, ameliorated, or are being appropriately managed by the actions of multiple conservation partners over the past 50 years.

Information Requested

Public Comments

Any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate as possible. Therefore, we request comments or information from other concerned governmental agencies, Native American Tribes, the scientific community, industry, or other interested parties concerning this proposed rule. The comments that will be most useful and likely to influence our decisions are those supported by data or peer-reviewed studies and those that include citations to, and analyses of, applicable laws and regulations. Please make your comments as specific as possible and explain the basis for them. In addition, please include sufficient information with your comments to allow us to authenticate any scientific or commercial data you reference or provide. In particular, we seek comments concerning the following:

(1) Reasons we should or should not delist the Kirtland's warbler.

(2) New information on the historical and current status, range, distribution, and population size of the Kirtland's warbler.

(3) New information on the known and potential threats to the Kirtland's warbler on its breeding grounds, on its wintering grounds, and during migration, including brood parasitism, and habitat availability.

(4) Information on the timing and extent of the effects of climate change on the Kirtland's warbler.

(5) New information regarding the life history, ecology, and habitat use of the Kirtland's warbler.

(6) Current or planned activities within the geographic range of the Kirtland's warbler that may impact or benefit the species.

(7) The adequacy of conservation agreements that would be implemented if the species is delisted.

Please note that submissions merely stating support for or opposition to the action under consideration without providing supporting information, although noted, will not be considered in making a determination, as section 4(b)(1)(A) of the Act (16 U.S.C. 1531 *et seq.*) directs that determinations as to whether any species is an endangered or threatened species must be made ''solely on the basis of the best scientific and commercial data available.''

Prior to issuing a final rule on this proposed action, we will take into consideration all comments and any additional information we receive. Such information may lead to a final rule that differs from this proposal. All comments and recommendations, including names and addresses, will become part of the administrative record.

You may submit your comments and materials concerning the proposed rule by one of the methods listed in **ADDRESSES**. Comments must be submitted to *http://www.regulations.gov* before 11:59 p.m. (Eastern Time) on the date specified in **DATES**. We will not consider hand-delivered comments that we do not receive, or mailed comments that are not postmarked, by the date specified in **DATES**.

We will post your entire comment—including your personal identifying information—on *http://www.regulations.gov.* If you provide personal identifying information in your comment, you may request at the top of your document that we withhold this information from public review. However, we cannot guarantee that we will be able to do so.

Comments and materials we receive, as well as supporting documentation we used in preparing this proposed rule, will be available for public inspection on *http://www.regulations.gov,* or by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Michigan Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Public Hearing

Section 4(b)(5)(E) of the Act provides for one or more public hearings on this proposed rule, if requested. We must receive requests for public hearings, in writing, at the address shown in **FOR FURTHER INFORMATION CONTACT** by the date shown in **DATES**. We will schedule public hearings on this proposal if any are requested, and announce the details of those hearings, as well as how to obtain reasonable accommodations, in the **Federal Register** at least 15 days before the first hearing.

Peer Review

In accordance with our policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), we will seek the expert opinions of at least three appropriate and independent specialists regarding this proposed rule. The purpose of peer review is to ensure that our determination is based on scientifically sound data, assumptions, and analyses. We will send peer reviewers copies of this proposed rule immediately following publication in the **Federal Register**. We will invite these peer reviewers to comment during the public comment period. We will consider all comments and information we receive from peer reviewers during the comment period on this proposed rule, as we prepare a final rule.

Previous Federal Actions

The Kirtland's warbler was listed as endangered under the Endangered Species Preservation Act on March 11, 1967 (32 FR 4001), primarily due to threats associated with limited breeding habitat and brown-headed cowbird (*Molothrus ater*) brood parasitism. The species is currently listed as endangered under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*). We developed a recovery plan in 1976 (USFWS 1976) and revised the plan on September 30, 1985 (USFWS 1985).

On June 29, 2012, we published a document in the **Federal Register** (77 FR 38762) announcing that we were conducting a 5-year review of the status of Kirtland's warbler under section 4(c)(2) of the Act. In that document, we requested that the public provide us any new information concerning this species. The 5-year status review, completed in August 2012 (USFWS 2012), resulted in a recommendation to change the status of this species from endangered to threatened. The 2012 5-year status review is available on the Service's website at *https://www.fws.gov/midwest/endangered/birds/Kirtland/index.html,* and via the Service's Environmental Conservation Online System (ECOS) (*https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B03I*).

On November 14, 2013, we published a rule in the **Federal Register** (78 FR 68370) revising the taxonomy to reflect the scientifically accepted taxonomy and nomenclature of this species (*Setophaga kirtlandii* (= *D. kirtlandii*)).

On April 17, 2017, we published a document in the **Federal Register** (82 FR 18156) announcing initiation of 5-year status reviews for eight endangered animal species, including Kirtland's warbler, and requested information on the species' status. This proposed rule constitutes completion of that 5-year status review.

Species Information

Taxonomy

The Kirtland's warbler is a songbird classified in the Order Passeriformes, Family Parulidae. Spencer Baird originally described this species in 1852, and named it *Sylvicola kirtlandii* after Dr. Jared P. Kirtland of Cleveland, Ohio (Baird 1872, p. 207). The American Ornithologists' Union Committee on Classification and Nomenclature—North and Middle America recently changed the classification of the Parulidae, which resulted in three genera (*Parula, Dendroica,* and *Wilsonia*) being deleted and transferred to the genus *Setophaga* (Chesser *et al.* 2011, p. 606). This revision was adopted by the Service on February 12, 2014 (see 78 FR 68370; November 14, 2013).

Distribution

The Kirtland's warbler is a neotropical migrant that breeds in jack pine (*Pinus banksiana*) forests in northern Michigan, Wisconsin, and Ontario. This species has one of the most geographically restricted breeding distributions of any mainland bird in the continental United States. Breeding habitat within the jack pine forest is both highly specific and disturbance-dependent, and likely was always limited in extent (Mayfield 1960, pp. 9–10; Mayfield 1975, p. 39). Similarly, the known wintering range is primarily restricted to The Bahamas (Cooper *et al.* 2017, p. 213).

Kirtland's warblers are not evenly distributed across their breeding range. More than 98 percent of all singing males have been counted in the northern Lower Peninsula of Michigan since population monitoring began in 1951 (Michigan Department of Natural Resources (MDNR), Service (USFWS), U.S. Forest Service (USFS), unpubl. data). The core of the Kirtland's warbler's breeding range is concentrated in five counties in northern lower Michigan (Ogemaw, Crawford, Oscoda, Alcona, and Iosco), where nearly 85 percent of the singing males were recorded between 2000 and 2015, with over 30 percent counted in Ogemaw County alone and over 21 percent in just one township during that same time period (MDNR, USFWS, USFS, unpubl. data).

Kirtland's warblers have also been observed in Ontario periodically since 1900 (Samuel 1900, pp. 391–392), and in Wisconsin since the 1940s (Hoffman 1989, p. 29). Systematic searches for the presence of Kirtland's warblers in States and provinces adjacent to Michigan, however, did not begin until 1977 (Aird 1989, p. 32; Hoffman 1989, p. 1). Shortly after these searches began, male Kirtland's warblers were found during the breeding season in Ontario (in 1977), Quebec (in 1978), Wisconsin (in 1978), and the Upper Peninsula of Michigan (in 1982) (reviewed in Aird 1989, pp. 32–35). Nesting was confirmed in the Upper Peninsula in 1996 (Weinrich 1996, p. 2; Weise and Weinrich 1997, p. 2), and in Wisconsin and Ontario in 2007 (Richard 2008, pp. 8–10; Trick *et al.* 2008, pp. 97–98).

Systematic searches to confirm nesting in states and provinces adjacent to Michigan have not been consistent across years. Female Kirtland's warblers are often observed with singing males, however, and nesting is generally assumed to occur at most sites where singing males are present (Probst *et al.* 2003, p. 369; MDNR, USFWS, USFS, unpubl. data). Singing males have been observed in the Upper Peninsula since 1993, with the majority of observations in the central and eastern Upper Peninsula (MDNR, USFWS, USFS, unpubl. data). In Wisconsin, nesting has been confirmed in Adams County every year since 2007, and has recently expanded into Marinette and Bayfield Counties (USFWS 2017, pp. 2–4). Scattered observations of mostly solitary birds have also occurred in recent years at several other sites in Douglas, Vilas, Washburn, and Jackson Counties in Wisconsin. Similarly, in Ontario, nesting was confirmed in Renfrew County from 2007 to 2016 (Richard 2013, p. 152; Tuininga 2017, pers. comm.), and reports of Kirtland's warblers present during the breeding season have occurred in recent years in both northern and southern Ontario (Tuininga 2017, pers. comm.).

The current distribution of breeding Kirtland's warblers encompasses the known historical breeding range of the species based on records of singing males observed in Michigan's northern Lower Peninsula, Wisconsin, and Ontario (Walkinshaw 1983, p. 23). In 2015, the number of singing males confirmed during the formal census period in Wisconsin (19), Ontario (20), and the Upper Peninsula (37) represented approximately 3 percent of the total singing male population (Environment Canada, MDNR, USFWS, USFS, Wisconsin DNR (WNDR), unpubl. data), demonstrating the species' reliance on their core breeding range in Michigan's northern Lower Peninsula. The number of Kirtland's warblers that could ultimately exist outside of the core breeding range is unknown; however, these peripheral individuals do contribute to a wider distribution.

Given the geographical extent of the warbler's historical range, peripheral Kirtland's warblers and habitat (outside the northern Lower Peninsula of Michigan) may help maintain the breadth of environmental diversity within the species, and increase the species' adaptive diversity (ability to adapt to changing environmental conditions over time) (Shaffer and Stein 2000, pp. 308–311). In Michigan's northern Lower Peninsula, the Kirtland's warbler's breeding habitat is spread over an approximately 15,540 square kilometer (km) (6,000 square mile) non-contiguous area. Therefore, within Michigan's northern Lower Peninsula, the Kirtland's warbler's breeding habitat is unlikely to uniformly experience catastrophic events (*e.g.,* wildfire) over that large an area. Although the number of Kirtland's warblers in Michigan's Upper Peninsula, Wisconsin, and Ontario currently represent a small percentage of the total population, Kirtland's warblers are successfully reproducing in these areas. The Kirtland's warbler's expansion into Michigan's Upper Peninsula, Wisconsin, and Ontario (Canada), therefore, could represent a future potential for the establishment of additional breeding territories outside of northern lower Michigan and would further increase the ability of the species to withstand catastrophic events by reducing the risk of such an event effecting the entire population over an even larger spatial scale.

Kirtland's warblers are more difficult to detect during the winter and are infrequently observed. The warblers appear to be unevenly distributed across the landscape; they tend to hide in low-lying, dense vegetation; and males do not generally sing during the winter (Currie *et al.* 2003, pp. 1–2; Currie *et al.* 2005a, p. 97). Extensive searches in the past produced few sightings of wintering Kirtland's warblers (Mayfield 1996, pp. 36–38; Lee *et al.* 1997, p. 21). A long-standing body of evidence dating to 1841, when the very first specimen was collected off the coast of Abaco Island (Stone 1986, p. 2), indicates that Kirtland's warblers winter largely within The Bahamas. The Bahamas is an archipelago of approximately 700 low-lying islands stretching more than 1,046 km (650 miles) from near the eastern coast of Florida to the southeastern tip of Cuba. Eleuthera and Cat Islands support the largest known population of wintering Kirtland's warblers (Sykes and Clench 1998, pp. 249–250; Cooper unpubl. data), although other islands have not been studied as intensively and potentially support substantial numbers. Within The Bahamas, Kirtland's warblers have been observed on several islands including The Abacos, Andros, Cat Island, Crooked Island, Eleuthera, The Exumas, Grand Bahama Island, Long Island, and San Salvador (Blanchard 1965, pp. 41–42; Hundley 1967, pp. 425–426; Mayfield 1972, pp. 347–348; Mayfield 1996, pp. 37–38; Haney *et al.* 1998, p. 202; Sykes and Clench 1998; Cooper unpubl. data). Haney *et al.* (1998, p. 205) found that only 3 of 107 reports originated from outside of The Bahamas: Two sightings from northern Dominican Republic, and one sighting from coastal Mexico. In addition, recent winter reports of solitary individuals have originated from Bermuda (Amos 2005, p. 3) and Cuba (Isada 2006, p. 462; Sorenson and Wunderle 2017). Cooper *et al.* (2017, p. 209) used geolocators to track Kirtland's warblers to determine distribution for 27 birds on the wintering grounds. The estimated wintering ranges of 18 tracked males overlapped primarily the central Bahamas (Eleuthera, Cat Island, The Exumas, Long Island, Rum Cay, San Salvador), 4 males overlapped primarily the western Bahamas (Grand Bahama, The Abacos, Nassau, Andros Island), and 4 males overlapped primarily the eastern Bahamas (Acklins Islands, Mayaguana, Great Inagua) or Turks and Caicos. One male appeared to winter in central Cuba (Cooper *et al.* 2017, p. 211).

Although the known wintering range appears restricted primarily to The Bahamas, many of the islands in the Caribbean basin are uninhabited by people or have had limited avian survey efforts, which may constrain our ability to comprehensively describe the species' wintering distribution. Kirtland's warblers readily shift sites on the wintering grounds based on habitat availability and food resources, and colonize new areas following disturbance (Wunderle *et al.* 2007, p. 123; Wunderle *et al.* 2010, p. 134; Wunderle *et al.* 2014, p. 44). Suitable habitat exists on other islands, both within The Bahamas and elsewhere in the Caribbean basin, potentially providing habitat and buffering against the effects of catastrophic events such as hurricanes.

Breeding Habitat

The Kirtland's warbler's breeding habitat consists of jack pine-dominated forests with sandy soil and dense ground cover (Walkinshaw 1983, p. 36), most commonly found in northern lower Michigan, with scattered locations in the Upper Peninsula of Michigan, Wisconsin, and Ontario. Jack pine-dominated forests of the northern Great Lakes region historically experienced large, frequent, and catastrophic stand-replacing fires (Cleland *et al.* 2004, p. 313). These fires occurred approximately every 60 years, burned approximately 85,420 hectares (ha) (211,077 acres (ac)) per year, and resulted in jack pine comprising 53 percent of the total land cover (Cleland *et al.* 2004, pp. 315–317). Modern wildfire suppression has since increased the average fire return interval within this same landscape to approximately

775 years, decreased the amount of area burned to approximately 6,296 ha (15,558 ac) per year, and reduced the contribution of jack pine to 37 percent of the current land cover (Cleland *et al.* 2004, p. 316). The overall effect has been a reduction in the extent of dense jack pine forest, and in turn, the Kirtland's warbler's breeding habitat.

Kirtland's warblers generally occupy jack pine stands that are 5 to 23 years old and at least 12 ha (30 ac) in size (Donner *et al.* 2008, p. 470). The most obvious difference between occupied and unoccupied stands is the percent canopy cover (Probst 1988, p. 28). Stands with less than 20 percent canopy cover are rarely used for nesting (Probst 1988, p. 28). Tree canopy cover reflects overall stand structure, combining individual structural components such as tree stocking, spacing, and height factors (Probst 1988, p. 28). Tree canopy cover, therefore, may be an important environmental cue for Kirtland's warblers when selecting nesting areas.

Occupied stands usually occur on dry, excessively drained, nutrient-poor glacial outwash sands (Kashian *et al.* 2003, pp. 151–153). Stands are structurally homogeneous with trees ranging 1.7 to 5.0 meters (m) (5.5 to 16.4 feet (ft)) in height, and are generally of three types: Wildfire-regenerated, planted, and unburned-unplanted (Probst and Weinrich 1993, p. 258). Wildfire-regenerated stands occur naturally following a stand-replacing fire from serotinous seeding (seed cones remain closed on the tree with seed dissemination in response to an environmental trigger, such as fire). Planted stands are stocked with jack pine saplings after a clear cut. Unburned-unplanted stands originate from clearcuts that regenerate from non-serotinous, natural seeding, and thus do not require fire to release seeds.

Optimal habitat is characterized as large stands (more than 32 ha (80 ac)) composed of 8 to 20-year-old jack pines that regenerated after wildfires, with 27 to 60 percent canopy cover, and more than 5,000 stems per hectare (2,023 stems per acre) (Probst and Weinrich 1993, pp. 262–263). The poor quality and well-drained soils reduce the risk of nest flooding and maintain low shrubs that provide important cover for nesting and brood-rearing. Yet as jack pine saplings grow in height, percent canopy cover increases, causing self-pruning of the lower branches and changes in light regime, which diminishes cover of small herbaceous understory plants (Probst 1988, p. 29; Probst and Weinrich 1993, p. 263; Probst and Donnerwright 2003, p. 331). Bocetti (1994, p. 122) found that nest sites were selected based on higher jack pine densities, higher percent cover of blueberry, and lower percent cover of woody debris than would be expected if nests were placed at random. Due to edge effects associated with low area-to-perimeter ratios, predation rates may be higher for Kirtland's warblers nesting in small patches bordered by mature trees than in large patches (Probst 1988, p. 32; Robinson *et al.* 1995, pp. 1988–1989; Helzer and Jelinski 1999, p. 1449). Foraging requirements may also be negatively influenced as jack pines mature (Fussman 1997, pp. 7–8).

Conversely, marginal habitat is characterized as jack pine stands with at least 20 to 25 percent tree canopy cover and a minimum density of 2,000 stems per hectare (809 stems per acre, Probst and Weinrich 1993, pp. 261–265; Nelson and Buech 1996, pp. 93–95), and is often associated with unburned-unplanted areas (Donner *et al.* 2010, p. 2). Probst and Hayes (1987, p. 237) indicate that the main disadvantage of marginal habitat is reduced pairing success. Evidence from Wisconsin and Canada, however, has shown an ability of Kirtland's warblers to successfully reproduce in areas with smaller percentages of jack pine and with significant components of red pine (*Pinus resinosa*) and pin oak (*Quercus palustris*) (Mayfield 1953, pp. 19–20; Orr 1975, pp. 59–60; USFWS 1985, p. 7; Fussman 1997, p. 5; Anich *et al.* 2011, p. 201; Richard 2013, p. 155; Richard 2014, p. 307). Use of these areas in Michigan is rare and occurs for only short durations (Huber *et al.* 2001, p. 10). In Wisconsin, however, breeding has occurred primarily in red pine plantations that have experienced extensive red pine mortality and substantial natural jack pine regeneration (Anich *et al.* 2011, p. 204). Preliminary investigation (Anich *et al.* 2011, p. 204) suggests that in this case, a matrix of openings and thickets has produced conditions suitable for Kirtland's warblers, and that the red pine component may actually prolong the use of these sites due to a longer persistence of low live branches on red pines. Habitat conditions in documented Kirtland's warbler breeding areas in Ontario had similar ground cover to breeding sites in Michigan and Wisconsin, although tree species composition was more similar to Wisconsin sites than Michigan sites (Richard 2014, p. 306). The tree species composition at the Canadian sites also had high levels of red pine (up to 71 percent), similar to the plantations in Wisconsin (Anich *et al.* 2011, p. 201; Richard 2014, p. 307).

Habitat management to benefit Kirtland's warblers began as early as 1957 on State forest land and 1962 on Federal forest land (Mayfield 1963, pp. 217–219; Radtke and Byelich 1963, p. 209). Efforts increased in 1981, with the establishment of an expanded habitat management program to supplement wildfire-regenerated habitat and ensure the availability of relatively large patches of early successional jack pine forest for nesting (Kepler *et al.* 1996, p. 16). In the 1981 Management Plan for Kirtland's Warbler Habitat (USFS and MDNR 1981, p. 23), approximately 29,987 ha (74,100 ac) of Michigan State forest lands and about 21,650 ha (53,500 ac) of Federal forest lands were identified as lands suitable and manageable for Kirtland's warbler breeding habitat. That plan also provided prescriptions and guidelines to be used in protecting and improving identified nesting habitat. Contiguous stands or stands in close proximity were grouped into 23 areas referred to as Kirtland's Warbler Management Areas (KWMAs). KWMAs are administrative boundaries that describe parcels of land dedicated to and managed for Kirtland's warbler breeding habitat. The KWMAs were further subdivided into cutting blocks containing 200 or more acres of contiguous stands. These acreages were determined by factoring an average population density of one breeding pair per 12 ha (30 ac) into a 45 to 50 year commercial harvest rotation, which would produce suitable habitat as well as marketable timber (USFWS 1985, p. 21). At the time the recovery plan was updated, there were 51,638 ha (127,600 ac) of public forest lands designated for Kirtland's warbler habitat management in order to meet Kirtland's warbler recovery program objectives (USFWS 1985, p. 18). Data collected from the annual singing male census from 1980 to 1995 indicated that a breeding pair used closer to 15 ha (38 ac) within suitably aged habitat (Bocetti *et al.* 2001, p. 1). Based on these data, the Kirtland's Warbler Recovery Team recommended increasing the total amount of managed habitat to 76,890 ha (190,000 ac) (Ennis 2002, p. 2).

Wintering Habitat

On the wintering grounds, Kirtland's warblers occur in early successional scrublands, characterized by dense, low, broadleaf shrubs of varied foliage layers with small openings, resulting from natural or anthropogenic disturbances (locally known as low coppice) (Maynard 1896, pp. 594–595; Challinor 1962, p. 290; Mayfield 1972, p. 267; Mayfield 1992, p. 3; Mayfield 1996, pp. 38–39; Radabaugh 1974, p. 380; Lee *et al.* 1997, p. 23; Haney *et al.* 1998, p. 207; Sykes and Clench 1998, p. 256;

Wunderle *et al.* 2007, p. 123; Wunderle *et al.* 2010, p. 133).

Clearing vegetation by bulldozers, wildfires, hurricanes, and local agricultural practices, such as ''slash and burn,'' can create suitable habitat on Eleuthera Island (Wunderle *et al.* 2007, p. 124), and the Kirtland's warbler likely benefited from local declines in agriculture as fallow lands reverted to early successional scrublands (Sykes and Clench 1998, p. 247). Kirtland's warblers typically occupy wintering sites 3 to 28 years (mean is approximately 14 years) after human disturbance (Wunderle *et al.* 2010, p. 127). As local food resources diminish in abundance, these sites may not be sufficient to sustain an individual for an entire winter; therefore, individuals must move widely from patch to patch, tracking changes in fruit abundance (Wunderle *et al.* 2007, p. 123; Wunderle *et al.* 2010, p. 134; Wunderle *et al.* 2014, p. 44).

Migration and Stopover Habitat

Spring departure from the wintering grounds is estimated to occur from late-April to early May, and arrival on the breeding grounds approximately 15 days later based on data from geolocators attached to 27 male Kirtland's warblers in 2012 and 2014 (Cooper *et al.* 2017, p. 212). These dates are similar to direct observations of color-banded birds arriving on the breeding grounds (Rockwell *et al.* 2012, p. 746) and when comparing the latest observation of birds present on the wintering grounds with the date first resighted on their breeding grounds (Ewert *et al.* 2012, p. 11). Male Kirtland's warblers have been observed arriving on the breeding grounds between May 1 and June 5 (Petrucha 2011, p. 17; Rockwell *et al.* 2012, p. 747), with a mean range between May 14 and May 15, and with the first females arriving a week or so after the first males (Mayfield 1960, pp. 41–42; Rockwell 2013, pp. 48–49).

Cooper *et al.* (2017, p. 212) determined that fall migration of adult males began with departure dates in late September through late October and arrival on the wintering grounds in mid-October to early November. The earliest recorded sighting in The Bahamas was August 20 (Robertson 1971, p. 48). Data from recovered geolocators showed that most Kirtland's warblers exhibited a loop migration, with fall migration occurring farther east than spring migration (Cooper *et al.* 2017, p. 214). Nearly all males departed the breeding grounds and flew in an easterly direction, spending time in southeastern Ontario or in the eastern Great Lakes region of the United States (Cooper *et al.* 2017, pp. 211, 213). Fall migration proceeded in a general southern direction, departing the mainland United States along the Carolina coastline (Cooper *et al.* 2017, pp. 211, 213). Spring migration followed a more westerly path, with landfall occurring in Florida and Georgia (Cooper *et al.* 2017, pp. 213, 216). An additional stopover site was identified in the western Lake Erie basin (Cooper *et al.* 2017, p. 216). Petrucha *et al.* (2013, p. 383) analyzed 562 records of Kirtland's warblers observed during migration and found that migration records were spread over most of the United States east of the Mississippi River, clustered around the Great Lakes and Atlantic Ocean coastlines.

Migrating Kirtland's warblers have been observed in a variety of habitats, including shrub/scrub, residential, park, orchard, woodland, and open habitats (Petrucha *et al.* 2013, p. 390). There is some evidence that dense vegetation less than 1.5 m (4.9 ft) in height may be important to migrating Kirtland's warblers (Stevenson and Anderson 1994, p. 566). The majority of migration records (82 percent) described the habitat as shrub/scrub, similar in structure to that on the breeding and wintering grounds (Petrucha *et al.* 2013, p. 384).

Biology

Diet and Foraging

On the breeding grounds, Kirtland's warblers are primarily insectivorous and forage by gleaning (plucking insects from) pine needles, leaves, and ground cover, occasionally making short sallies, hover-gleaning at terminal needle clusters, and gathering flying insects on the wing. Kirtland's warblers have been observed foraging on a wide variety of prey items, including various types of larvae, moths, flies, beetles, grasshoppers, ants, aphids, spittlebugs, and blueberries (Mayfield 1960, pp. 18–19; Fussman 1997, p. 33). Deloria-Sheffield *et al.* (2001, p. 385) identified similar taxa from fecal samples collected from Kirtland's warblers, but also observed that from July to September, homopterans (primarily spittlebugs), hymenopterans (primarily ants) and blueberries were proportionally greater in number than other taxa among samples. Deloria-Sheffield *et al.* (2001, p. 386) suggested that differences in the relative importance of food items between spring foraging observations and late summer fecal samples were temporal and reflected a varied diet that shifts as food items become more or less available during the breeding season. Within nesting areas, arthropod numbers peak at the same time that most first broods reach the fledging stage (Fussman 1997, p. 27). Planted and wildfire-regenerated habitats were extremely similar in terms of arthropod diversity, abundance, and distribution, suggesting that current habitat management techniques are effective in simulating the effects that wildfire has on food resources for Kirtland's warblers (Fussman 1997, p. 63).

On the wintering grounds, Kirtland's warblers rely on a mixed diet of fruit and arthropods. During foraging observations, 69 percent of Kirtland's warblers consumed fruits, such as snowberry (*Chiococca alba*), wild sage (*Lantana involucrata*), and black torch (*Erithalis fruticosa*), with wild sage being the overwhelmingly predominant food choice (Wunderle *et al.* 2010, pp. 129–130). Despite variation in food availability among sites and winters, the proportion of fruit and arthropods in fecal sample of Kirtland's warblers was consistent (Wunderle *et al.* 2014, p. 25). Food abundance was a reliable predictor of site fidelity, with birds shifting location to sites with higher biomass of ripe fruit and ground arthropods during the late winter (Wunderle *et al.* 2014, p. 31).

Demographics

The average life expectancy of adult Kirtland's warblers is approximately 2.5 years (Walkinshaw 1983, pp. 142–143). The oldest Kirtland's warbler on record was an 11-year old male, which, when recaptured in the Damon KWMA in 2005, appeared to be in good health and paired with a female (USFS, unpubl. data).

Overall, Kirtland's warbler annual survival estimates are similar to those of other wood warblers (reviewed in Faaborg *et al.* 2010, p. 12). Reported survival rates of the Kirtland's warbler varied by sex and age classes (Mayfield 1960, pp. 204–207; Walkinshaw 1983, pp. 123–143; Bocetti *et al.* 2002, p. 99; Rockwell *et al.* 2017, p. 723; Trick, unpubl. data). Rockwell *et al.* (2017, pp. 719–721) analyzed mark-recapture data from 2006–2010 on breeding grounds in Michigan and from 2003–2010 on the wintering grounds in The Bahamas, and determined the mean annual survival estimates for adults and yearlings were 0.58 and 0.55, respectively. Rockwell *et al.* (2017, p. 722), also found that monthly survival probabilities were relatively high when birds were stationary on the wintering and breeding grounds, and were substantially lower during the migratory period, which has the highest mortality rate out of any phase of the annual cycle, accounting for 44 percent of annual mortality. Survival probability was positively correlated to March rainfall in the previous year, suggesting the effects of rain on the wintering grounds carried over to affect annual survival in subsequent seasons. Reduced rain can result in lower available food resources for Kirtland's warblers, which could result in poorer body condition; has been shown to make them less likely to survive the subsequent spring migration (Rockwell *et al.* 2017, pp. 721–722); and lowers reproductive success during the breeding season (Rockwell *et al.* 2012, p. 745).

Genetics

From the information available, it appears that Kirtland's warblers display winter and breeding-ground panmixia (mixing of individuals across locations within the population). In 2007, eight birds examined from six different wintering sites on Eleuthera Island were found on breeding territories in the Damon KWMA in Ogemaw County, Michigan (Ewert, unpubl. data). Additionally, four other birds banded from one wintering site on Eleuthera Island were found on breeding territories across four counties in northern lower Michigan. Kirtland's warblers are also known to regularly move between KWMAs in northern lower Michigan during the breeding season (Probst *et al.* 2003, p. 371). This suggests that the warbler's population exhibits panmictic (a group of interbreeding individuals where all individuals in the population are potential reproductive partners) rather than metapopulation (groups of interbreeding individuals that are geographically distinct) demographic characteristics (Esler 2000, p. 368).

King *et al.* (2005, p. 569) analyzed blood samples from 14 wintering Kirtland's warblers on Eleuthera Island, isolated and characterized 23 microsatellite DNA markers specific to the species, and found moderate to high levels of allelic diversity and heterozygosity that demonstrate the potential variability of the individual loci that were developed. Wilson *et al.* (2012, pp. 7–9) used 17 microsatellite loci (12 were developed by King *et al.* 2015, p. 570) to measure and compare the genetic diversity from breeding Kirtland's warblers in Oscoda County, MI. Wilson *et al.* (2012, pp. 7–9) tested for genetic bottlenecks, temporal changes in genetic diversity, and effective population size using samples from 3 time periods (1903–1912, 1929–1955, and 2008–2009). Their results showed no evidence of a bottleneck in the oldest (1903–1912) sample, indicating that any population declines prior to that point may have been gradual. Although population declines have been observed since then, there was only weak genetic evidence of a bottleneck in the two more recent samples (no bottleneck detected in two of three possible models for each sample). The study showed a slight loss of allelic richness between the oldest and more recent samples (estimated to be 1.7 alleles per locus), but no significant difference in heterozygosity between samples and no evidence of inbreeding. Effective population size estimates varied depending on the methods used, but none were low enough to indicate that inbreeding or rapid loss of genetic diversity were likely in the future. Based on the available data, genetic diversity does not appear to be a limiting factor for the Kirtland's warbler, or indicate the need for genetic management at this time.

Abundance and Population Trends

Prior to 1951, the size of the Kirtland's warbler population was extrapolated from anecdotal observations and knowledge about breeding and wintering habitat conditions. The Kirtland's warbler population may have peaked in the late 1800s, a time when conditions across the species' distribution were universally beneficial (Mayfield 1960, p. 32). Wildfires associated with intensive logging, agricultural burning, and railroads in the Great Lakes region burned hundreds of thousands of acres, and vast portions were dominated by jack pine forests (Pyne 1982, pp. 199–200, 214). Suitable winter habitat consisting of low coppice (early-successional and dense, broadleaf vegetation) was also becoming more abundant, due to a decrease in widespread commercial agriculture in The Bahamas after the abolition of slavery in 1834, resulting in former croplands converting to scrub (low coppice) (Sykes and Clench 1998, p. 245). During this time, Kirtland's warblers were found in greater abundance throughout The Bahamas than were found in previous decades, and reports of migratory strays came from farther north and west of the known migratory range, evidence of a larger population that would produce more migratory strays (Mayfield 1993, p. 352).

Between the early 1900s and the 1920s, agriculture in the northwoods was being discouraged in favor of industrial tree farming, and systematic fire suppression was integrated into State and Federal policy (Brown 1999, p. 9). Mayfield (1960, p. 26) estimated the amount of jack pine on the landscape suitably aged for Kirtland's warblers had decreased to approximately 40,470 ha (100,000 ac) of suitable habitat in any one year. This reduction in habitat amount presumably resulted in fewer Kirtland's warblers from the preceding time period, and Kirtland's warblers were not observed in all stands of suitable conditions (Wood 1904, p. 10). Serious efforts to control forest fires in Michigan began in 1927, and resulted in a further reduction of total acres burned, as the number of wildfires decreased and the size of forest tracts that burned decreased (Mayfield 1960, p. 26; Radtke and Byelich 1963, p. 210).

By this time, brown-headed cowbirds had expanded from the short grass plains and become common within the Kirtland's warbler's nesting range due to clearing of land for settlement and farming in northern Michigan (Wood and Frothingham 1905, p. 49; Mayfield 1960, p. 146). Brown-headed cowbirds are obligate brood parasites; females remove an egg from a host species' nest and lay their own egg to be raised by the adult hosts, and the result usually causes the death of the remaining host nestlings (Rothstein 2004, p. 375). Brood parasitism by brown-headed cowbirds contributed to the decline of Kirtland's warblers, and a brown-headed cowbird trapping program was initiated in 1972, to reduce the impact of brood parasitism (see Factor E discussion, below).

Comprehensive surveys (censuses) of the entire Kirtland's warbler population began in 1951. Because of the warbler's specific habitat requirements and the frequent, loud and persistent singing of males during the breeding season, it was possible to establish a singing male census (Ryel 1976, p. 2). The census consists of an extensive annual survey of all known and potential breeding habitat to count singing males. The census protocol assumes that there is a breeding female for each singing male, so the number of singing males is assumed to equate to the number of breeding pairs. Although this may not be true in some cases, the census provides a robust, relative index of the Kirtland's warbler population change over time (Probst *et al.* 2005, p. 51). Censuses were conducted in 1951, 1961, each year from 1971 to 2013, and in 2015 (Figure 1, below). The 1951 census documented a population of 432 singing males confined to 28 townships in eight counties in northern lower Michigan (Mayfield 1953, p. 18). By 1971, the Kirtland's warbler population declined to approximately 201 singing males and was restricted to just 16 townships in six counties in northern lower Michigan (Probst 1986, pp. 89–90). Over the next 18 years, the Kirtland's warbler population level remained relatively stable at approximately 200 singing males but experienced record lows of 167 singing males in 1974 and again in 1987. Shortly after 1987, the population began a dramatic increase, reaching a record high of 2,383 singing males in 2015 (MDNR, USFS, USFWS unpubl. data).

Due in part to the increase in population numbers and distribution, and significant effort and cost associated with monitoring for the Kirtland's warbler, the census in Michigan's northern Lower Peninsula has shifted to a less intensive survey protocol (Kennedy 2017, pers. comm.; Williams *et al.* 2016, p. 1). Starting in 2017, surveys for Kirtland's warblers in northern lower Michigan will occur every other year in a portion of the known occupied habitat. This less intensive survey is designed to detect population trends (Kennedy 2017, pers. comm.).

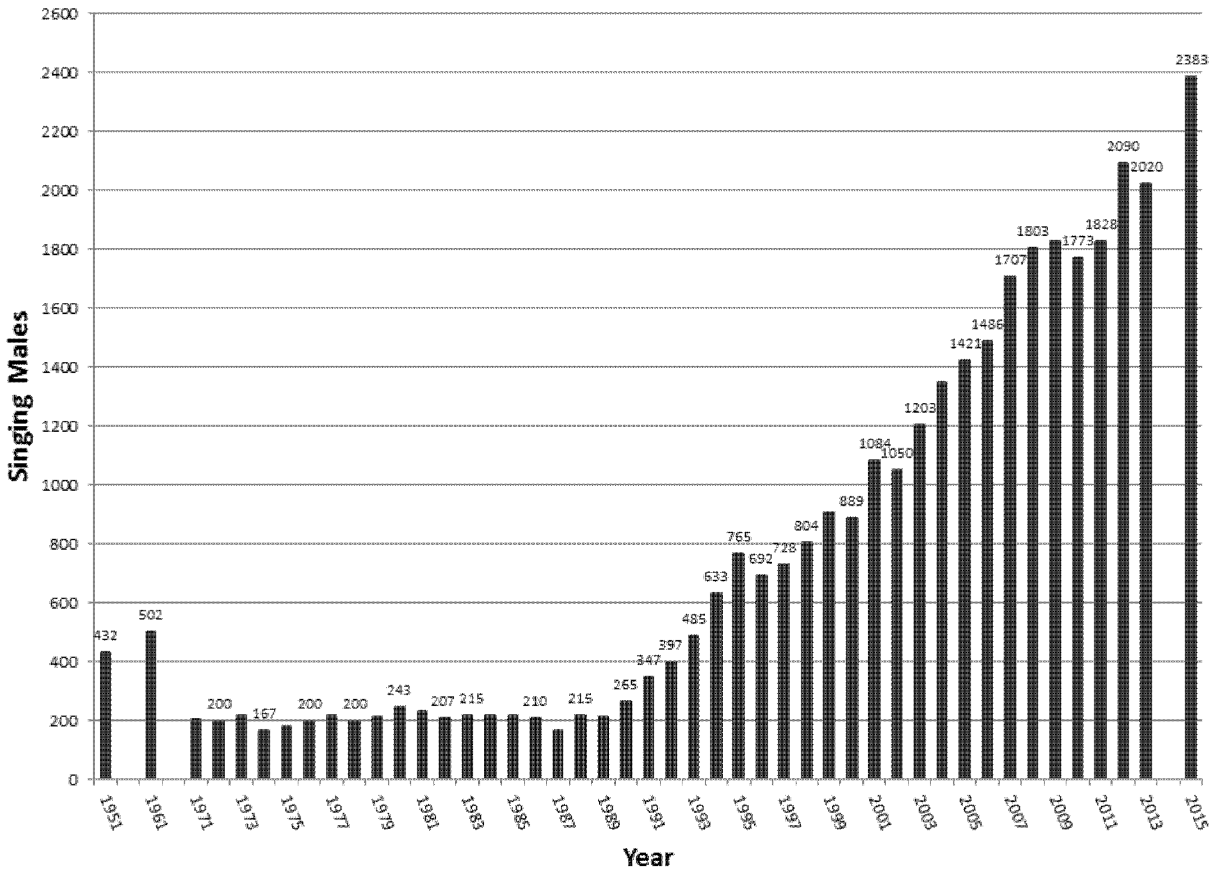

Figure 1: Kirtland's warbler census results for each year in which a full census was completed (1951, 1961, 1971–2013, and 2015) (MDNR data). *Note: the census was not conducted in the years 1952–1960, 1962–1970, 2014, or 2016–2017.*

Since implementation of the brown-headed cowbird control program began in 1972, the Kirtland's warbler population size closely tracked with the amount of suitable habitat on the landscape in northern lower Michigan at least through 2004 (Donner *et al.* 2008, p. 478). Overall, the amount of suitable habitat increased by nearly 150 percent from 1979 to 2004. The source of suitable habitat began to shift during this time as well. In the late 1980s, maturation of habitat generated through wildfire composed a higher percentage of the total suitable habitat available to the Kirtland's warbler compared to other types of habitat (Donner *et al.* 2008, p. 472). By 1992, artificially regenerated plantation habitat was nearly twice as abundant as wildfire habitat, and increased to triple that of wildfire habitat by 2002 (Donner *et al.* 2008, p. 472). From 1979 to 1994, the majority of singing males were found in wildfire-generated habitat (Donner *et al.* 2008, p. 474). By 1994, responding to a shift in available nesting habitat types, males redistributed out of habitat generated by wildfire and unburned-unplanted habitat and into plantation (planted) habitat. From 1995 to 2004, males continued redistributing into plantations from wildfire habitat, and 85 percent of males were found in plantation habitat by 2004 (Donner *et al.* 2008, p. 475). This redistribution of males into plantations also resulted in males being more evenly distributed across the core breeding range than in previous years. Artificial regeneration of suitable breeding habitat, along with brown-headed cowbird control (as discussed under Factor E, below), have been critical to the warbler's recovery, allowing for a dramatic increase in population numbers and wider distribution across the landscape. In general, increasing the amount, quality, and distribution of available habitat results in larger, more genetically diverse populations that are more resilient and can more readily withstand perturbations (Shaffer and Stein 2000, pp. 308–312).

Population Viability

Brown *et al.* (2017a, p. 443) incorporated full annual cycle (breeding and wintering) dynamics into a population viability model to assess the long-term population viability of the Kirtland's warbler under five management scenarios: (1) Current suitable habitat and current cowbird removal; (2) reduced suitable habitat and current cowbird removal; (3) current suitable habitat and reduced cowbird removal, (4) current suitable habitat and no cowbird removal; and (5) reduced suitable habitat and reduced cowbird removal. The model that best simulated recently observed Kirtland's warbler population dynamics included a relationship between precipitation in the species' wintering grounds and productivity (Brown *et al.* 2017a, pp. 442, 444) that reflects our understanding of carry-over effects (Rockwell *et al.* 2012, pp. 748–750; Wunderle *et al.* 2014, pp. 46–48).

Under the current management conditions, which include habitat management and brown-headed cowbird control at existing levels, the model predicts that the Kirtland's warbler population will be stable over a 50-year simulation period. When simulating a reduced brown-headed cowbird removal effort by restricting cowbird trapping activities to the central breeding areas in northern lower Michigan (*i.e.,* eastern Crawford County, southeastern Otsego County, Oscoda County, western Alcona County, Ogemaw County, and Roscommon County) and assuming a 41 percent or 57 percent reduction in Kirtland's warbler productivity, the results showed a stable or slightly declining population, respectively, over the 50-year simulation period (Brown *et al.* 2017a, p. 447). Other scenarios, including reduced habitat suitability and reduced Kirtland's warbler productivity due to experimental jack pine management on 25 percent of available breeding habitat, had similar results with projected population declines over the 50-year simulation period, but mean population numbers remained above the population goal of 1,000 pairs (Brown *et al.* 2017a, p. 446), the numerical criterion identified in the Kirtland's warbler recovery plan (USFWS 1985).

Brown *et al.* (2017a, p. 447) assumed that future reductions to the Kirtland's warbler's productivity rates under two reduced cowbird removal scenarios would be similar to historical rates. This assumption would overestimate the negative effects on Kirtland's warbler productivity if future parasitism rates are lower than the rates modeled (see Factor E discussion, below, for additional information on contemporary parasitism rates). Supplementary analysis (Brown *et al.* 2017b, unpub. report) using the model structure and assumptions of Brown *et al.* (2017a) simulated the impacts of a 5, 10, 20, and 30 percent reduction in productivity to take into consideration a wider range of possible future parasitism rates. Even small reductions in annual productivity had measurable impacts on population abundance, but there were not substantial differences in mean population growth rate up to a 20 percent reduction in productivity (Brown *et a*l. 2017b, p. 3). Even with annual reductions in productivity of up to 5 percent for 50 years, the population trend (growth rate) projected for the final 30 years of the model simulations was 0.998 (range from the 5 simulations 0.993 to 1.007) or nearly the same as that projected in the simulations with no reduction in productivity at 0.999 (range of 0.995 to 1.008) (Brown *et al.* 2017b, p. 3). It is reasonable to infer that the Kirtland's warbler population can support relatively small reductions in productivity over a long period of time (*e.g.,* the 50-year timeframe of the simulations), providing a margin of assurance as management approaches are adaptively managed over time, and the species may be able to withstand as great as a 20 percent reduction in annual productivity, provided it does not extend over several years.

It is important to acknowledge that the results of the model simulations are most helpful to indicate the effect of various management decisions relative to one another, rather than provide predictions of true population abundance. In other words, we interpreted the model output to provide us with projections of relative trends, rather than to apply specific population abundance thresholds to each future projection. Although there are limitations to all population models based on necessary assumptions, input data limitations, and unknown long-term responses such as adaptation and plasticity, data simulated by Brown *et al.* (2017a and 2017b, entire) provide useful information in assessing relative population trends for the Kirtland's warbler under a variety of future scenarios and provide the best available analysis of population viability.

In summary, Kirtland's warbler population numbers have been greatly affected by brown-headed cowbird parasitism rates and the extent and quality of available habitat on the breeding grounds. The best available population model predicts that limited non-traditional habitat management and continued low brood parasitism rates will result in sustained population numbers above the recovery goal. Monitoring population numbers and brood parasitism rates will be important in evaluating population viability in the future, and will be considered as part of the post-delisting monitoring plan.

Recovery and Recovery Plan Implementation

State and Federal efforts to conserve the Kirtland's warbler began in 1957, and were focused on providing breeding habitat for the species. The Kirtland's warbler was federally listed as an endangered species in 1967, under the Endangered Species Preservation Act of 1966 (Pub. L. 89–669). By 1972, a Kirtland's Warbler Advisory Committee had been formed to coordinate management efforts and research actions across Federal and State agencies, and conservation efforts expanded to include management of brown-headed cowbird brood parasitism (Shake and Mattsson 1975, p. 2).

Efforts to protect and conserve the Kirtland's warbler were further enhanced when the Endangered Species Act of 1973 became law and provided for acquisition of land to increase available habitat, funding to carry out additional management programs, and provisions for State and Federal cooperation. In 1975, the Kirtland's Warbler Recovery Team (Recovery Team) was appointed by the Secretary of the Interior to guide recovery efforts. A Kirtland's Warbler Recovery Plan was completed in 1976 (USFWS 1976), and updated in 1985 (USFWS 1985), outlining steps designed to protect and increase the species' population.

Recovery plans provide important guidance to the Service, States, and other partners on methods of minimizing threats to listed species and measurable objectives against which to measure progress towards recovery, but they are not regulatory documents. A decision to revise the status of or remove a species from the List is ultimately based on an analysis of the best scientific and commercial data available to determine whether a species is no longer an endangered species or a threatened species, regardless of whether that information differs from the recovery plan.

The Kirtland's warbler recovery plan (USFWS 1985) identifies one ''primary objective'' (hereafter referred to as ''recovery criterion'') that identifies when the species should be considered for removal from the List, and ''secondary objectives'' (hereafter referred to as ''recovery actions'') that are designed to accomplish the recovery criterion. The recovery criterion states that the Kirtland's warbler may be considered recovered and considered for removal from the List when a self-sustaining population has been re-established throughout its known range at a minimum level of 1,000 pairs. The 1,000-pair demography-based standard was informed by estimates of the amount of the specific breeding habitat required by each breeding pair of Kirtland's warblers, the amount of potential habitat available on public lands in Michigan's northern Lower Peninsula, and the ability of State and Federal land managers to provide suitable nesting habitat on an annual basis. The recovery criterion was intended to address the point at which the ultimate limiting factors to the species had been ameliorated so that the population is no longer in danger of extinction or likely to become so within the foreseeable future.

The recovery plan, however, does not clearly articulate how meeting the recovery criterion will result in a population that is at reduced risk of extinction. The primary threats to the Kirtland's warbler are pervasive and recurring threats, but threat-based criteria specifying measurable targets for control or reduction of those threats were not incorporated into the recovery plan. Instead, the recovery plan lists actions focused on specific actions, in order to accomplish the recovery criterion. These included managing breeding habitat, protecting the Kirtland's warbler on its wintering grounds and along the migration route, reducing key factors such as brown-headed cowbird parasitism from adversely affecting reproduction and survival of Kirtland's warblers, and monitoring the Kirtland's warbler to evaluate responses to management practices and environmental changes.

At the time the recovery plan was prepared, we estimated that land managers would need to annually maintain approximately 15,380 ha (38,000 ac) of nesting habitat in order to support and sustain a breeding population of 1,000 pairs (USFWS 1985, pp. 18–20). We projected that this would be accomplished by protecting existing habitat, improving occupied and developing habitat, and establishing approximately 1,010 ha (2,550 ac) of new habitat each year, across 51,640 ha (127,600 ac) of State and Federal pine lands in the northern Lower Peninsula of Michigan (USFWS 1985, pp. 18–20). We also prioritized development and improvement of guidelines that would maximize the effectiveness and cost efficiency of habitat management efforts (USFWS 1985, p. 24). The MDNR, USFS, and Service developed the Strategy for Kirtland's Warbler Habitat Management (Huber *et al.* 2001, entire) to update Kirtland's warbler breeding habitat management guidelines and prescriptions based on a review of past management practices, analysis of current habitat conditions, and new findings that would continue to conserve and enhance the status of the Kirtland's warbler (Huber *et al.* 2001, p. 2).

By the time the recovery plan was updated in 1985, the brown-headed cowbird control program had been in effect for more than 10 years. The brown-headed cowbird control program had virtually eliminated brood parasitism and more than doubled the warbler's productivity rates in terms of fledging success (Shake and Mattsson 1975, pp. 2–4). The Kirtland's warbler's reproductive capability had been successfully restored, and the brown-headed cowbird control program was credited with preventing further decline of the species. Because management of brown-headed cowbird brood parasitism was considered essential to the survival of the Kirtland's warbler, it was recommended that the brown-headed cowbird control program be maintained for ''as long as necessary'' (USFWS 1985, p. 27).

Although the recovery plan identifies breeding habitat as the primary limiting factor, with brood parasitism as a secondary limiting factor, it also suggests that events or factors outside the breeding season might be adversely affecting survival (USFWS 1985, pp. 12–13). At the time the recovery plan was updated, little was known about the Kirtland's warbler's migratory and wintering behavior, the species' migratory and wintering habitat requirements, or ecological changes that may have occurred within the species' migration route or on its wintering range. This lack of knowledge emphasized a need for more information on the Kirtland's warbler post fledging, during migration, and on its wintering grounds (Kelly and DeCapita 1982, p. 365). Accordingly, recovery efforts were identified to: (1) Define the migration route and locate wintering areas, (2) investigate the ecology of the Kirtland's warbler and factors that might be affecting mortality during migration and on its winter range, and (3) provide adequate habitat and protect the Kirtland's warbler during migration and on its wintering areas (USFWS 1985, pp. 24–26).

In correspondence with the Service's Midwest Regional Director, and based on more than 20 years of research on the Kirtland's warbler's ecology and response to recovery efforts, the Recovery Team helped clarify recovery progress and issues that needed attention prior to reclassification to threatened status or delisting (Ennis 2002, pp. 1–4; Ennis 2005, pp. 1–3). From that synthesis, several important concepts emerged that continued to inform recovery including: (1) Breeding habitat requirements, amount, configuration, and distribution; (2) brood parasitism management; (3) migratory connectivity, and protection of Kirtland's warblers and their habitat during migration and on the wintering grounds; and (4) establishment of credible mechanisms to ensure the continuation of necessary management (Thorson 2005, pp. 1–2).

Our understanding of the Kirtland's warbler's breeding habitat selection and use and the links between maintaining adequate amounts of breeding habitat and a healthy Kirtland's warbler population has continued to improve. As the population has rebounded, Kirtland's warblers have become reliant on artificial regeneration of breeding habitat, but have also recolonized naturally regenerated areas within the historical range of the species and nested in habitat types previously considered non-traditional or less suitable. As explained in more detail below, recovery efforts have expanded to establish and enhance management efforts on the periphery of the species' current breeding range in Michigan's Upper Peninsula, Wisconsin, and Canada, and reflect the best scientific understanding of the amount and configuration of breeding habitat (see Factor A discussion, below). These adjustments improve the species' ability to adapt to changing environmental conditions, withstand stochastic disturbance and catastrophic events, and better ensure long-term conservation for the species.

The brown-headed cowbird control program has run uninterrupted since 1972, as recommended in the recovery plan, and the overall methodology has remained largely unchanged since the program was established. Along with habitat management, brown-headed cowbird control has proven to be a very effective tool in stabilizing and increasing the Kirtland's warbler population. To ensure survival of the Kirtland's warbler, we anticipate that continued brown-headed cowbird brood parasitism management may be needed, at varying levels depending on parasitism rates, to sustain adequate Kirtland's warbler productivity. As explained in more detail below, brown-headed cowbird control techniques and the scale of trapping efforts have adapted over time and will likely continue to do so, in order to maximize program effectiveness and feasibility (see Factor E discussion, below).

We now recognize that the Kirtland's warbler persists only through continual management activities designed to mitigate recurrent threats to the species. The Kirtland's warbler is considered a conservation-reliant species, which means that it requires continuing management to address ongoing threats (Goble *et al.* 2012, p. 869). Conservation of the Kirtland's warbler will continue to require a coordinated, multi-agency approach for planning and implementing conservation efforts into the future. Bocetti *et al.* (2012, entire) used the Kirtland's warbler as a case study on the challenge of delisting conservation-reliant species. They recommended four elements that should be in place prior to delisting a conservation-reliant species, including a conservation partnership capable of continued management, a conservation plan, appropriate binding agreements (such as memoranda of agreement (MOAs)) in place, and sufficient funding to continue conservation actions into the future (Bocetti *et al.* 2012, p. 875).

The Kirtland's warbler has a strong conservation partnership consisting of multiple stakeholders that have invested considerable time and resources to achieving and maintaining this species' recovery. Since 2016, the Recovery Team is no longer active, but instead new collaborative efforts formed to help ensure the long-term conservation of the Kirtland's warbler regardless of its status under the Act. These efforts formed to facilitate conservation planning through coordination, implementation, monitoring, and research efforts among many partners and across the species' range. A coalition of conservation partners lead by Huron Pines, a nonprofit conservation organization based in northern Michigan, launched the Kirtland's Warbler Initiative in 2013. The Kirtland's Warbler Initiative brings together State, Federal, and local stakeholders to identify and implement strategies to secure funds for long-term Kirtland's warbler conservation actions given the continuous, recurring costs anticipated with conserving the species into the future. The goal of this partnership is to ensure the Kirtland's warbler thrives and ultimately is delisted, as a result of strong public-private funding and land management partnerships. Through the Kirtland's Warbler Initiative, a stakeholder group called the Kirtland's Warbler Alliance was developed to raise awareness in support of the Kirtland's warbler and the conservation programs necessary for the health of the species and jack pine forests.

The second effort informing Kirtland's warbler conservation efforts is the Kirtland's Warbler Conservation Team. The Kirtland's Warbler Conservation Team was established to preserve institutional knowledge, share information, and facilitate communication and collaboration among agencies and partners to maintain and improve Kirtland's warbler conservation. The current Kirtland's Warbler Conservation Team is comprised of representatives from the Service, USFS, MDNR, Wisconsin DNR, U.S. Department of Agriculture's Wildlife Services (USDA–WS), Canadian Wildlife Service, Huron Pines, Kirtland's Warbler Alliance, The Nature Conservancy, and California University of Pennsylvania.

Since 2015, conservation efforts for the Kirtland's warbler have been guided by the Kirtland's Warbler Breeding Range Conservation Plan (Conservation Plan) (MDNR *et al.* 2015, *https://www.michigan.gov/documents/dnr/Kirtlands_Warbler_CP_457727_7.pdf*). The Conservation Plan outlines the strategy for future cooperative Kirtland's warbler conservation and provides technical guidance to land managers and others on how to create and maintain Kirtland's warbler breeding habitat within an ecosystem management framework. The scope of the Conservation Plan currently focuses only on the breeding range of the Kirtland's warbler within the United States, although the agencies involved (MDNR, USFS, and USFWS) intend to cooperate with other partners to expand the scope of the plan in the future to address the entire species' range (*i.e.,* the entire jack pine ecosystem, as well as the migratory route and wintering range of the species). The Conservation Plan will be revised every 10 years to incorporate any new information and the best available science (MDNR *et al.* 2015, p. 1).

In April 2016, the Service, MDNR, and USFS renewed a memorandum of understanding (MOU) committing the agencies to continue collaborative habitat management, brown-headed cowbird control, monitoring, research, and education in order to maintain the Kirtland's warbler population at or above 1,000 breeding pairs, regardless of the species' legal protection under the Act (USFWS, MDNR, and USFS 2016, entire). In addition, Kirtland's warbler conservation actions are included in the USFS's land and resource management plans (Forest Plans), which guide management priorities for the Huron-Manistee, Hiawatha, and Ottawa National Forests.

Funding mechanisms that support long-term land management and brown-headed cowbird control objectives are in place to assure a high level of certainty that the agencies can meet their commitments to the conservation of the Kirtland's warbler. MDNR and USFS have replanted approximately 26,420 ha (90,000 ac) of Kirtland's warbler habitat over the past 30 years. Over the last 10 years, only a small proportion of the funding used to create Kirtland's warbler habitat is directly tied to the Act through the use of grant funding (*i.e.,* section 6 funding provided to the MDNR). Although there is the potential that delisting could reduce the priority for Kirtland's warbler work within the MDNR and USFS, as noted in the Conservation Plan (MDNR 2015, p. 17), much of the forest management cost (*e.g.,* silvicultural examinations, sale preparation, and reforestation) is not specific to maintaining Kirtland's warbler breeding habitat and would likely be incurred in the absence of the Kirtland's warbler. The MDNR and USFS have successfully navigated budget shortfalls and changes in funding sources over the past 30 years and were able to provide sufficient breeding habitat to enable the population to recover, and have agreed to continue to do so through the MOU. Additionally, the Service and MNDR developed an MOA to set up a process for managing funds to help address long-term conservation needs, specifically brown-headed cowbird control (USFWS and MDNR 2015, entire). If the annual income generated is greater than the amount needed to manage brown-headed cowbird parasitism rates, the remaining portion of the annual income may be used to support other high priority management actions to directly benefit the Kirtland's warbler, including wildlife and habitat management, land acquisition and consolidation, and education. The MOA requires that for a minimum of 5 years after the species is delisted, MDNR consult with the Service on planning the annual brown-headed cowbird control program and other high priority actions. In addition, MDNR recently reaffirmed their commitment to the MOA and confirmed their intent to implement and administer the brown-headed cowbird control program, even if the Kirtland's warbler is delisted (MDNR 2017).

In summary, the general guidance of the recovery plan has been effective, and the Kirtland's warbler has responded well to active management over the past 50 years. The primary threats identified at listing and during the development of the recovery plan have been managed, and commitments are in place to continue managing the threats. The status of the Kirtland's warbler has improved, primarily due to breeding habitat and brood parasitism management provided by MDNR, USFS, and the Service. The population has been above the 1,000 pair goal since 2001, above 1,500 pairs since 2007, and above 2,000 pairs since 2012. The recovery criterion has been met. Since 2015, efforts for the Kirtland's warbler have been guided by a Conservation Plan that will continue to be implemented if the species is delisted.

Since the revision of the recovery plan (USFWS 1985), decades of research have been invaluable to refining recovery implementation and have helped clarify our understanding of the dynamic condition of the Kirtland's warbler, jack pine ecosystem, and the factors influencing them. The success of recovery efforts in mitigating threats to the Kirtland's warbler are evaluated below.

Summary of Factors Affecting the Kirtland's Warbler

Section 4 of the Act and its implementing regulations (50 CFR part 424) set forth the procedures for listing species, reclassifying species, or removing species from listed status. The term ''species'' includes ''any subspecies of fish or wildlife or plants, and any distinct population segment [DPS] of any species of vertebrate fish or wildlife which interbreeds when mature'' (16 U.S.C. 1532(16)). A species may be determined to be an endangered species or threatened species because of any one or a combination of the five factors described in section 4(a)(1) of the Act: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. We must consider these same five factors in delisting a species. We may delist a species according to 50 CFR 424.11(d) if the best available scientific and commercial data indicate that the species is neither endangered nor threatened for the following reasons: (1) The species is extinct; (2) the species has recovered and is no longer endangered or threatened; and/or (3) the original scientific data used at the time the species was classified were in error.

For species that are already listed as endangered or threatened, this analysis of threats is an evaluation of both the threats currently facing the species and the threats that are reasonably likely to affect the species in the foreseeable future following delisting or downlisting (*i.e.,* reclassification from endangered to threatened) and the removal or reduction of the Act's protections. A recovered species is one that no longer meets the Act's definition of endangered or threatened. A species is ''endangered'' for purposes of the Act if it is in danger of extinction throughout all or a ''significant portion of its range'' and is ''threatened'' if it is likely to become endangered within the foreseeable future throughout all or a ''significant portion of its range.'' The word ''range'' in the ''significant portion of its range'' phrase refers to the range in which the species currently exists. For the purposes of this analysis, we will evaluate whether the currently listed species, the Kirtland's warbler, should be considered endangered or threatened throughout all of its range. Then we will consider whether there are any significant portions of the Kirtland's warbler's range where the species is in danger of extinction or likely to become so within the foreseeable future.

The Act does not define the term ''foreseeable future.'' For the purpose of this proposed rule, we defined the ''foreseeable future'' to be the extent to which, given the amount and substance of available data, we can anticipate events or effects, or reliably extrapolate threat trends, such that we reasonably believe that reliable predictions can be made concerning the future as it relates to the status of the Kirtland's warbler. Based on the history of habitat and brown-headed cowbird management and the established commitment by State and Federal partners to continue the necessary management that has been conducted over the past 50 years, as well as the predictions of the population viability model (Brown *et al.* 2017a, entire) that considers a 50-year timeframe into the future, it is reasonable to define the foreseeable future for the Kirtland's warbler as 50 years. Beyond that time period, the future conditions become more uncertain, such that we cannot make predictions as to how they will affect the status of the species.

In considering what factors might constitute threats, we must look beyond the exposure of the species to a particular factor to evaluate whether the species may respond to the factor in a way that causes actual impacts to the species. If there is exposure to a factor and the species responds negatively, the factor may be a threat, and during the status review, we attempt to determine how significant a threat it is. The threat is significant if it drives or contributes to the risk of extinction of the species, such that the species warrants listing as endangered or threatened as those terms are defined by the Act. However, the identification of factors that could impact a species negatively may not be sufficient to compel a finding that the species warrants listing. The information must include evidence sufficient to suggest that the potential threat is likely to materialize and that it has the capacity (*i.e.,* it should be of sufficient magnitude and extent) to affect the species' status such that it meets the definition of endangered or threatened under the Act. The following analysis examines all five factors currently affecting or that are likely to affect the Kirtland's warbler in the foreseeable future.

A. The Present or Threatened Destruction, Modification or Curtailment of Its Habitat or Range

Breeding Habitat

Historically, wildfires were the most important factor in the establishment of natural jack pine forests and Kirtland's warbler breeding habitat. However, modern wildfire suppression greatly altered the natural disturbance regime that generated Kirtland's warbler breeding habitat for thousands of years (USFWS 1985, p. 12; Cleland *et al.* 2004, pp. 316–318). Prior to the 20th century, the historic fire recurrence in jack pine forests averaged 59 years; although it is now estimated to occur in cycles as long as 775 years (Cleland *et al.* 2004, pp. 315–316).

In the absence of wildfire, land managers must take an active role in mimicking natural processes that regularly occurred within the jack pine ecosystem, namely stand-replacing disturbance events. This is primarily done through large-scale timber harvesting and human-assisted reforestation. Although planted stands tend to be more structurally simplified than wildfire-regenerated stands (Spaulding and Rothstein 2009, p. 2610), land managers have succeeded in selecting Kirtland's Warbler Management Areas that have landscape features of the natural breeding habitat and have developed silvicultural techniques that produce conditions within planted stands suitable for Kirtland's warbler nesting. In fact, over 85 percent of the habitat used by breeding Kirtland's warblers in 2015 in the northern Lower Peninsula of Michigan (approximately 12,343 ha (30,500 ac)) had been artificially created through clearcut harvest and replanting. The planted stands supported over 92 percent of the warbler's population within the Lower Peninsula during the breeding season (MDNR, USFS, USFWS, unpubl. data). The effectiveness of these strategies is also evident by the reproductive output observed in planted stands, which function as population sources (Bocetti 1994, p. 95). Thus, in a landscape where natural fire disturbance patterns have been reduced, threats to natural breeding habitat are being mitigated through large-scale habitat management. Therefore, the status of the Kirtland's warbler depends largely on the continued production of managed breeding habitat.

The Conservation Plan (MDNR *et al.* 2015) identifies continued habitat management needs and objectives to maintain sufficient suitable breeding habitat for Kirtland's warblers. Habitat management is currently conducted on approximately 88,626 ha (219,000 ac) of jack pine forest within MDNR, USFS, and Service lands throughout the northern Lower Peninsula and Upper Peninsula of Michigan (MDNR *et al.* 2015, pp. 22–23). The Conservation Plan incorporates some conservative assumptions about the area needed to support a breeding pair of Kirtland's warblers, as well as how long a stand will be used by the species. The density and duration of use estimates were developed by data gathered over the last decade. Lands within the Lower Peninsula averaged 8 to 9 ha (19 to 22 ac) per pair and had a duration of use between 9 and 10 years. Lands within the Upper Peninsula on the Hiawatha National Forest required an average of 40 ha (100 ac) per pair and had a duration of use averaging 10 years (Huber *et al.* 2013 cited in MDNR *et al.* 2015, p. 22). Using those measures of average hectares per pair and duration of use, 14,593 ha (36,060 ac) of suitable breeding habitat would need to be available at all times to maintain a minimum population of 1,300 pairs, requiring land management agencies to jointly manage 1,550 ha (3,830 ac) of habitat annually (631 ha (1,560 ac) on MDNR land and 918 ha (2,270 ac) on USFS land) through wildfire-regenerated jack pine or managed reforestation (MDNR *et al.* 2015, pp. 22–23). It is important to recognize that the more recent observations concerning density of Kirtland's warblers in breeding habitat and duration of stand use are often greater than the assumptions used for planning purposes and explain why the Kirtland's warbler population that is actually observed is higher than would be predicted based on the planning assumptions.

The Conservation Plan identifies a goal to develop at least 75 percent of the Kirtland's warbler's breeding habitat acreage using traditional habitat management techniques (opposing wave planting with interspersed openings), and no more than 25 percent of habitat using non-traditional habitat management techniques (*e.g.,* reduced stocking density, incorporating a red pine component within a jack pine stand, prescribed burning) (MDNR *et al.* 2015, p. 23). Non-traditional techniques will be used to evaluate new planting methods that improve timber marketability, reduce costs, and improve recreational opportunities while sustaining the warbler's population above the recovery criterion of 1,000 pairs. The majority of managed breeding habitat is created through clear cutting and planting jack pine seedlings. However, managing jack pine for Kirtland's warbler breeding habitat typically results in lower value timber products due to the overall poor site quality in combination with the required spacing, density, and rotation age of the plantings (Greco 2017, pers. comm.). Furthermore, the demand for jack pine products has fluctuated in recent years, and long-term forecasts for future marketability of jack pine are uncertain. Commercially selling jack pine timber on sites where reforestation will occur is critical to the habitat management program. Timber receipts offset the cost of replanting jack pine at the appropriate locations, scales, arrangements, and densities needed to support a viable population of nesting Kirtland's warblers that would not otherwise be feasible through conservation dollars. The Kirtland's Warbler Conservation Team is currently working on developing techniques through adaptive management that increase the marketability of the timber at harvest while not substantially reducing Kirtland's warbler habitat suitability (Dan Kennedy 2017, pers. comm.).

The land management agencies have maintained adequate breeding habitat despite times when their budgets were flat or declining, even while costs related to reforestation continue to increase. For example, over the last 30 years, the MDNR replanted over 20,000 ha (50,000 ac) of Kirtland's warbler habitat, averaging over 680 ha (1,700 ac) per year. They took this action voluntarily, and within the past 10 years, they used funding from sources other than those available under the Act. Section 6 grants under the Act have helped support MDNR's Kirtland's warbler efforts, but that funding has largely been used for population census work in recent years and reflects only a small percentage of the funding the State of Michigan spends annually to produce Kirtland's warbler breeding habitat.

Shifting agency priorities and competition for limited resources have and will continue to challenge the ability of land managers to fund reforestation of areas suitable for Kirtland's warblers. Low jack pine timber sale revenues, in conjunction with reduced budgets, increased Kirtland's warbler habitat reforestation costs, and competition with other programs, are challenges the land management agencies have met in the past and will need to continue addressing to meet annual habitat development objectives. Commitments by land managers and the Conservation Team are in place, as described previously, to ensure recovery of the Kirtland's warbler will be sustained despite these challenges.

A regulatory mechanism that aids in the management of breeding habitat is Executive Order (E.O.) 13186, ''Responsibilities of Federal Agencies to Protect Migratory Birds'' (66 FR 3853), which directs Federal agencies to develop a memorandum of understanding (MOU) with the Service to promote the conservation of migratory bird populations. The USFS and the Service signed an MOU (FS Agreement #08–MU–1113–2400–264) pursuant to E.O. 13186 with the purpose of strengthening migratory bird conservation by identifying and implementing strategies that promote conservation and avoid or minimize adverse impacts on migratory birds through enhanced collaboration. Additionally, USFS Forest Plans have been developed in compliance with the provisions of section 7 of the Act and the Healthy Forest Restoration Act of 2003 (Pub. L. 108–148). These plans emphasize management that maintains and develops essential breeding habitat for the Kirtland's warbler (USFS 2006a, p. 82; USFS 2006b, p. 35).

We reviewed available information on the effects from expanded development adjacent to occupied habitats in both breeding and wintering areas, and impacts from recreational activities on the breeding grounds. Although these factors and those discussed above do affect Kirtland's warblers and their habitat, land management agencies have been successful in maintaining sufficient amounts of suitable habitat to support historically high numbers of Kirtland's warblers. Although activities that affect breeding habitat may still have some negative effects on individual Kirtland's warblers, the population of Kirtland's warblers appears resilient to these activities within the context of the current management regime. Furthermore, to date, management efforts have been adaptive in terms of the acreage and spatial and temporal configuration of habitat needed to mitigate the effects associated with natural breeding habitat loss and fragmentation. The land management agencies have shown a commitment to Kirtland's warbler habitat management through signing the 2016 MOU, agreeing to continue habitat management, and developing and implementing the Conservation Plan.

Migration Habitat

Although Kirtland's warblers spend a relatively small amount of time each year migrating, the migratory period has the highest mortality rate out of any phase of the annual cycle, accounting for 44 percent of annual mortality (Rockwell *et al.* 2017, p. 722). Migratory survivorship levels are, however, above the minimum needed to sustain the population (Mayfield 1960, pp. 204–207; Berger and Radabaugh 1968, p. 170; Bocetti *et al.* 2002, p. 99; Rockwell *et al.* 2017, pp. 721–723; Trick, unpubl data). Recent research is refining our knowledge of spring and fall migration timing and routes for the Kirtland's warbler. Little is currently known about the importance of specific stop-over sites and any factors affecting them, although coastal areas along the Great Lakes and Atlantic Ocean (*e.g.,* western Lake Erie basin and the Florida and Georgia coasts) that appear important to migrating Kirtland's warblers are also areas where natural habitats have been highly fragmented by human development. At stopover sites within these highly fragmented landscapes, competition for food sources among long-distance passerine migrants is expected to be high, especially in fallout areas (when many migrating birds land to rest, usually due to weather events or long flights over open water, Moore and Yong 1991, pp. 86–87; Kelly *et al.* 2002, p. 212; Németh and Moore 2007, p. 373), and may prolong stopover duration or increase the number of stopovers that are needed to complete migration between breeding and wintering grounds (Goymann *et al.* 2010, p. 480).

The quantity and quality of migratory habitat needed to sustain Kirtland's warbler numbers above the recovery goal of 1,000 pairs appears to be sufficient, based on a sustained and increasing population since 2001. If loss or destruction of migratory habitat were limiting or likely to limit the population to the degree that maintaining a healthy population may be at risk, it should be apparent in the absence of the species from highly suitable breeding habitat in the core breeding range. In fact, we have seen just the opposite: Increasing densities of breeding individuals in core areas and a range expansion into what would appear to be less suitable habitat elsewhere. This steady population growth and range expansion has occurred despite increased development and fragmentation of migratory stopover habitat within coastal areas; therefore, loss or degradation of migratory habitat is not a substantial threat to the species now or in the foreseeable future.

Wintering Habitat

The quantity and quality of wintering habitat needed to sustain Kirtland's warbler numbers above the recovery goal of 1,000 pairs appears to be sufficient, based on a sustained and increasing population since 2001. Compared to the breeding grounds, less is known about the wintering grounds in The Bahamas. Factors affecting Kirtland's warblers on the wintering grounds, as well as the magnitude of the impacts, remain somewhat uncertain. Few of the known Kirtland's warbler wintering sites currently occur on protected land. Rather, most Kirtland's warblers appear to winter more commonly in early successional habitats that have recently been or are currently being used by people (*e.g.,* abandoned after clearing, grazed by goats), where disturbance has set back plant succession (Wunderle *et al.* 2010, p. 132). Potential threats to wintering habitat include habitat loss caused by human development, altered fire regime, changes in agricultural practices, and invasive plant species. The potential threats of rising sea level, drought, and destructive weather events such as hurricanes on the wintering grounds are discussed below under Factor E.

Tourism is the primary economic activity in The Bahamas, accounting for 65 percent of the gross domestic product, and The Bahamas' Family Islands Development Encouragement Act of 2008 supports the development of resorts on each of the major Family Islands (part of The Bahamas) (Moore and Gape 2009, p. 72). Residential and commercial development could result in direct loss of Kirtland's warbler habitat, especially on New Providence and Grand Bahama, which together support 85 percent of the population of Bahamian people (Moore and Gape 2009, p. 73; Wunderle *et al.* 2010, p. 135; Ewert 2011, pers. comm.). This loss could occur on both private and commonage lands (land held communally by rural settlements), as well as generational lands (lands held jointly by various family members).

Local depletion and degradation of the water table from wells and other water extraction and introduction of salt water through human-made channels or other disturbances to natural hydrologies may also negatively impact Kirtland's warblers by affecting fruit and arthropod availability (Ewert 2011, pers. comm.).

Fire may have positive or negative impacts on winter habitat, depending on the frequency and intensity of fires, and where the fires occur. Fires are relatively common and widespread on the pine islands in the northern part of the archipelago, and have increased since settlement, especially during the dry winter season when Kirtland's warblers are present (The Nature Conservancy 2004, p. 3). Human-made fires may negatively impact wintering Kirtland's warblers if they result in reduced density and fruit production of understory shrubs in Caribbean pine (*Pinus caribaea*) stands (Lee *et al.* 1997, p. 27; Currie *et al.* 2005b, p. 85). On non-pine islands, fire may benefit Kirtland's warblers when succession of low coppice to tall coppice is set back (Currie *et al.* 2005b, p. 79).

Invasive plants are another potential factor that could limit the extent of winter habitat in The Bahamas. Brazilian pepper (*Schinus terebinthifolius*), jumbie bean (*Leucaena leucocephala*), and Guinea grass (*Panicum maximum*) may be the most important invasive species of immediate concern (Ewert 2011, pers. comm.). These aggressive plants colonize patches early after disturbances and may form monocultures, which preclude the establishment of species heavily used by Kirtland's warblers. Some invasive species, such as jumbie bean, are good forage for goats. By browsing on these invasive plants, goats create conditions that favor native shrubs and may increase the density of native shrubs used by Kirtland's warblers (Ewert 2011, pers. comm.). Goat farming could play a role in controlling the spread of some invasive species at a local scale, while aiding in the restoration of native vegetation patches. Still, many plants such as royal poinciana (*Delonix regia*), tropical almond (*Terminalia catappa*), and morning glory (*Ipomoea indica*) are commonly imported for landscaping and have the potential to escape into the wild and become invasive (Smith 2010, pp. 9–10; Ewert 2011, pers. comm.).

The Bahamas National Trust administers 32 national parks that cover over 809,371 ha (2 million ac) (Bahamas National Trust 2017, p. 3). Although not all national parks contain habitat suitable for Kirtland's warblers, several parks are known to provide suitable wintering habitat, including the Leon Levy Native Plant Preserve on Eleuthera Island, Harrold and Wilson Ponds National Park on New Providence Island, and Exuma Cays Land and Sea Park on Hawksbill Cay (The Nature Conservancy 2011, p. 2). Hog Bay Island, a national park in Bermuda, also provides suitable Kirtland's warbler wintering habitat (Amos 2005).

Caribbean pine, a potentially important component of wintering Kirtland's warbler habitat, is protected from harvest in The Bahamas under the Conservation and Protection of the Physical Landscape of The Bahamas (Declaration of Protected Trees) Order of 1997. The Bahamas National Trust Act of 1959 and the National Parks Ordinance of 1992 established non-government statutory roles to the Bahamas National Trust and the Turks and Caicos Islands National Trust, respectively. These acts empower these organizations to hold and manage environmentally important lands in trust for their respective countries.

Simply protecting parcels of land or important wintering habitat, however, may be insufficient to sustain adequate amounts of habitat for the Kirtland's warbler because of the species' dependence on early successional habitat (Mayfield 1972, p. 349; Sykes and Clench 1998, pp. 256–257; Haney *et al.* 1998, p. 210; Wunderle *et al.* 2010, p. 124), which changes in distribution over time. In addition, food availability at any one site varies seasonally, as well as between years, and is not synchronous across all sites (Wunderle *et al.* 2010, p. 124). In the face of changes in land use and availability, sustaining sufficient patches of early-successional habitat for Kirtland's warbler in The Bahamas will likely require a landscape-scale approach (Wunderle *et al.* 2010, p. 135).

Although threats to Kirtland's warblers on the wintering grounds exist as a result of habitat loss due to succession or development, the current extent and magnitude of these threats appears not to be significantly limiting Kirtland's warbler population numbers based on the species' continuous population growth over the last two decades. This indicates that loss or degradation of winter habitat is not a substantial threat causing population-level effects to the species now or in the foreseeable future.

Habitat Distribution

The Kirtland's warbler has always occupied a relatively limited geographic range on both the breeding and wintering grounds. This limited range makes the species naturally more vulnerable to catastrophic events compared to species with wide geographic distributions, because having multiple populations in a wider distribution reduces the likelihood that all individuals will be affected simultaneously by a catastrophic event (*e.g.,* large wildfire in breeding habitat, hurricane in The Bahamas). Since the species was listed, the geographic area where the Kirtland's warbler occurs has increased, reducing the risk to the species from catastrophic events. As the population continues to increase and expand in new breeding and wintering areas, the species will become less vulnerable to catastrophic events. The Conservation Plan, which land management agencies agreed to implement under the 2016 MOU, includes a goal to improve distribution of habitat across the breeding range to reduce this risk by managing lands in the Upper Peninsula of Michigan and in Wisconsin in sufficient quantity and quality to provide breeding habitat for 10 percent (100 pairs) or more of the 1,000 pairs goal (MDNR *et al.* 2015, p. 23).

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The Kirtland's warbler is a non-game species, and there is no known or potential commercial harvest in either the breeding or wintering grounds. Utilization for recreational, scientific, or educational purposes appears to be adequately regulated by several State, Federal, and international wildlife laws, based on a sustained and increasing population since 2001. Land management agencies within the Kirtland's warbler's breeding range have the ability to implement seasonal closures to specific areas for a variety of reasons and, when necessary, could limit access outside of designated roads and trails to further protect the species.

The Kirtland's warbler is protected by the Migratory Bird Treaty Act of 1918 (MBTA; 16 U.S.C. 703–712). The MBTA prohibits take, capture, killing, trade, or possession of Kirtland's warblers and their parts, as well as their nests and eggs. The regulations implementing the MBTA further define ''take'' as to ''pursue, hunt, shoot, wound, kill, trap, capture, or collect'' or attempt those activities (50 CFR 10.12).

The States of Florida, Georgia, Indiana, Michigan, North Carolina, Ohio, Virginia, and Wisconsin list the Kirtland's warbler as endangered, under their respective State endangered species regulations. In Michigan, where the majority of the population breeds, part 365 of Public Act 451 of 1994 prohibits take, possession, transportation, importation, exportation, processing, sale, offer for sale, purchase, or offer to purchase, transportation or receipt for shipment by a common or contract carrier of Kirtland's warblers or their parts. The Kirtland's warbler is listed as endangered under Ontario's Endangered Species Act of 2007.

The Kirtland's warbler was declared federally endangered in Canada in 1979. Canada's Species at Risk Act of 2003 (SARA) is the primary law protecting the Kirtland's warbler in Canada. Canada's SARA bans killing, harming, harassing, capturing, taking, possessing, collecting, buying, selling, or trading of individuals that are federally listed. In addition, SARA also extends protection to the residence (habitat) of individuals that are federally listed.

Canada's Migratory Bird Convention Act of 1994 also provides protections to Kirtland's warblers. Under Canada's Migratory Bird Convention Act, it is unlawful to be in possession of migratory birds or nests, or to buy, sell, exchange, or give migratory birds or nests, or to make them the subject of commercial transactions.

In The Bahamas and the Turks and Caicos Islands, the Kirtland's warbler is recognized as a globally Near Threatened species, but has no federally listed status. In The Bahamas, the Wild Birds Protection Act (chapter 249) allows the Minister of Wild Animals and Birds Protection to establish and modify reserves for the protection of any wild bird. The species is also protected in The Bahamas by the Wild Animals (Protection) Act (chapter 248) that prohibits the take or capture, export, or attempt to take, capture, or export any wild animal from The Bahamas. The Bahamas regulates scientific utilization of the Kirtland's warbler, based on recommendations previously provided by the Kirtland's Warbler Recovery Team (Bocetti 2011, pers. comm.).

The species remains protected from pursuit, wounding, or killing that could potentially result from activities focused on the species in breeding, wintering, and migratory habitat (*e.g.,* wildlife photography without appropriate care to ensure breeding birds can continue to feed and care for chicks and eggs normally and without injury to their offspring). Overutilization for recreational, scientific, or educational purposes does not constitute a substantial threat to the Kirtland's warbler now or in the foreseeable future.

C. Disease or Predation

There is no information of any disease impacting the Kirtland's warbler on either the breeding or wintering grounds.

For most passerines, nest predation has the greatest negative impact on reproductive success, and can affect entire populations (Ricklefs 1969, p. 6; Martin 1992, p. 457). Nest predation may be particularly detrimental for ground-nesting bird species in shrublands (Martin 1993, p. 902). Predation rates of Kirtland's warbler nests have ranged from 3 to 67 percent of nests examined (Mayfield 1960, p. 204; Cuthbert 1982, p. 1; Walkinshaw 1983, p. 120); however, few predation events have been directly observed, and in general, evidence regarding the importance of certain nest or adult predators lack quantitative support (Mayfield 1960, p. 182; Walkinshaw 1972, p. 5; Walkinshaw 1983, pp. 113–114).

Overall, nest predation rates for Kirtland's warblers are similar to non-endangered passerines and are below levels that would compromise population replacement (Bocetti 1994, pp. 125–126; Cooper *et al.,* unpubl. data). The increasing numbers of house cats in the breeding and wintering habitats is recognized (Lepczyk *et al.* 2003, p. 192; Horn *et al.* 2011, p. 1184), but there is not sufficient evidence to conclude at this time that predation from cats is currently having population-level impacts to the Kirtland's warbler. Therefore, we conclude that disease and predation do not constitute substantial threats to the Kirtland's warbler now or in the foreseeable future.

D. Inadequacy of Existing Regulatory Mechanisms

Under this factor, we examine the threats identified within the other factors as ameliorated or exacerbated by any existing regulatory mechanisms or conservation efforts. Section 4(b)(1)(A) of the Act requires that the Service take into account "those efforts, if any, being made by any State or foreign nation, or any political subdivision of a State or foreign nation, to protect such species." In relation to Factor D under the Act, we interpret this language to require the Service to consider relevant Federal, State, and Tribal laws, regulations, and other such binding legal mechanisms that may ameliorate or exacerbate any of the threats we describe in threat analyses under the other four factors or otherwise enhance the species' conservation. Our consideration of these mechanisms is described within each of the threats to the species, where applicable (see discussion under each of the other factors).

E. Other Natural or Manmade Factors Affecting Its Continued Existence

Brood Parasitism

Brood parasitism can depress reproduction of avian hosts in several ways, including the direct removal or predation of eggs or young, facilitating nest predation by other nest predators, reducing hatching or fledging success, altering host population sex ratios, and increasing juvenile and adult mortality beyond the nest (Elliot 1999, p. 55; Hoover 2003, pp. 928–929; Smith *et al.* 2003, pp. 777–780; Zanette *et al.* 2005, p. 818; Hoover and Reetz 2006, pp. 170–171; Hoover and Robinson 2007, p. 4480; Zanette *et al.* 2007, p. 220). The brown-headed cowbird is the only brood parasite within the Kirtland's warbler's breeding range.

Although brown-headed cowbirds were historically restricted to prairie ecosystems, forest clearing and agricultural development of Michigan's Lower Peninsula in the late 1800s facilitated the brown-headed cowbird's range expansion into Kirtland's warbler nesting areas (Mayfield 1960, p. 145). Wood and Frothingham (1905, p. 49) found that brown-headed cowbirds were already common within the Kirtland's warbler's breeding range by the early 1900s. Strong (1919, p. 181) later reported the first known instance of brood parasitism of a Kirtland's warbler nest in Crawford County, Michigan, in 1908. Shortly thereafter, Leopold (1924, p. 57) related the scarcity of Kirtland's warblers to brown-headed cowbird parasitism. Mayfield (1960, pp. 180–181) supported Leopold's hypothesis with empirical data, and further recognized that brown-headed cowbird parasitism significantly affected the survival of the Kirtland's warbler.

The Kirtland's warbler is particularly sensitive to brown-headed cowbird brood parasitism. The warbler's limited breeding range likely exposes the entire population to brown-headed cowbird parasitism (Mayfield 1960, pp. 146–147; Trick, unpubl. data). In addition, the peak egg-laying period of the brown-headed cowbird completely overlaps with that of the Kirtland's warbler, and the majority of Kirtland's warblers produce only one brood each year (Mayfield 1960, pp. 151–152; Radabaugh 1972, p. 55; Rockwell, unpubl. data). Kirtland's warblers have limited evolutionary experience with brown-headed cowbirds compared to other hosts and have not developed effective defensive behaviors to thwart brood parasitism (Walkinshaw 1983, pp. 157–158).

Between 1903 and 1971, researchers observed parasitism rates of Kirtland's warbler nests ranging from 48 percent to 86 percent (reviewed in Shake and Mattson 1975, p. 2). Brown-headed cowbirds also appear to exert greater pressure on Kirtland's warbler nests than other passerines within the same breeding habitat. Walkinshaw (1983, p. 154) reported that 93 percent of all the brown-headed cowbird eggs he found in jack pine habitat were located in Kirtland's warbler nests compared to all other host species combined. Kirtland's warbler fledging rates averaged less than 1 young per nest prior to the initiation of brown-headed cowbird control (Walkinshaw 1972, p. 5).

The effect of brown-headed cowbird parasitism exacerbated negative impacts associated with habitat loss in the decline of the Kirtland's warbler population (Rothstein and Cook 2000, p. 7). Nicholas Cuthbert and Bruce Radabaugh (Cuthbert 1966, pp. 1–2) demonstrated that trapping brown-headed cowbirds within Kirtland's warbler nesting areas decreased parasitism rates and increased Kirtland's warbler nesting success. Accordingly, intensive brown-headed cowbird removal was recommended on major Kirtland's warbler nesting areas as one of the necessary steps for the recovery of the Kirtland's warbler (Shake and Mattsson 1975, p. 2).

Since 1972, the Service, in conjunction with the USDA–WS, MDNR, and USFS, has implemented an intensive brown-headed cowbird control program within major Kirtland's warbler nesting areas in Michigan's Lower Peninsula. On average, the control program annually removes approximately 3,573 brown-headed cowbirds from occupied Kirtland's warbler habitat in northern lower Michigan (USDA–WS 2016, unpubl.

report). Recent trap rates, however, have been below 1,500 brown-headed cowbirds per year (USDA–WS, unpubl. data). Brown-headed cowbird trapping is also conducted in selected Kirtland's warbler breeding areas in Wisconsin. The trapping program in Wisconsin started in 2008, and is run using similar methods to the program in Michigan, with an average of 238 brown-headed cowbirds captured per year (USDA–WS, USFWS unpub. data).

Following the initiation of brown-headed cowbird control in northern lower Michigan in 1972, brood parasitism rates decreased to 6.2 percent, and averaged 3.4 percent between 1972 and 1981 (Kelly and DeCapita 1982, p. 363). Kirtland's warbler fledging rates simultaneously increased from less than 1 per nest to 2.8 per nest, and averaged 2.78 young fledged per nest between 1972 and 1981 (Kelly and DeCapita 1982, pp. 364–365). Had brown-headed cowbird parasitism not been controlled, Mayfield (1975, p. 43) calculated that by 1974, the Kirtland's warbler population may have been reduced to only 42 pairs.

Brood parasitism of Kirtland's warbler nests also occurs in Wisconsin. In 2007, two of three Kirtland's warbler nests were parasitized (USFWS unpubl. data). After the initiation of brown-headed cowbird control in 2008, brood parasitism rates in Wisconsin have fluctuated substantially among years, from 10 percent to 66 percent (USFWS unpubl. data; Trick unpubl. data). However, in the same time period (2008–2017), overall nest success has ranged from 19 to 80 percent, and the average fledge rate was estimated to be between 1.51 to 1.92 chicks per nest (USFWS 2017, pp. 2–3).

Limited studies on the effectiveness of the brown-headed cowbird control program in relation to Kirtland's warbler nest productivity in Michigan have been conducted since the early 1980s. De Groot and Smith (2001, p. 877) found that brown-headed cowbirds were nearly eliminated in areas directly adjacent to a trap, and brown-headed cowbird densities decreased 5 km (3 miles) and greater from brown-headed cowbird removal areas. Brown-headed cowbird densities significantly increased at distances greater than 10 km (6 miles) from brown-headed cowbird removal areas, further demonstrating the localized effect of brown-headed cowbird control (De Groot and Smith 2001, p. 877). Although brown-headed cowbird density increased with distance beyond 5 km (3 miles) of brown-headed cowbird traps, brown-headed cowbird densities were still low in those areas compared to other parts of North America (De Groot and Smith 2001, p. 877). Anecdotal observation of brood parasitism rates have also indicated very low levels of brood parasitism within Kirtland's warbler nesting areas (Bocetti 1994, p. 96; Rockwell 2013, p. 93).

A study is currently underway in Michigan to evaluate the effective range of a brown-headed cowbird trap and to determine the brood parasitism rate of Kirtland's warbler nests when traps are not operated during the warbler's breeding season. Beginning in 2015, 12 brown-headed cowbird traps (out of 55 total) were closed for two breeding seasons, and Kirtland's warbler nests were searched to determine the rate of parasitism (Cooper *et al.,* unpubl. data). In 2015, only one nest out of 150 was parasitized, approximately 8 km (5 miles) away from the nearest brown-headed cowbird trap. In 2016, similar low rates of parasitism were observed, with only two parasitized nests out of 137. Due to the low levels of brood parasitism observed, an additional 6 traps were closed in 2017, and none of the 100 nests observed in 2017 was parasitized (Cooper *et al.,* unpubl. data). These preliminary data corroborate similar findings that the effective range of a brown-headed cowbird trap is likely much larger than the range (1.6 km (1 mile) radius) traditionally used in planning and implementing the brown-headed cowbird control program.

Additionally, point count surveys were conducted during 2015 and 2016, in Kirtland's warbler nesting areas in Michigan's northern Lower Peninsula where brown-headed cowbird traps were not being operated. Only 13 brown-headed cowbirds were observed during 271 point count surveys (Cooper *et al.,* unpubl. data). Trend estimate data from Breeding Bird Survey routes between 2005 and 2015 have also shown decreased brown-headed cowbird population trends in Michigan and the Upper Great Lakes (Sauer *et al.* 2017, p. 169).

However, in similar experiments where brown-headed cowbird trapping was reduced or brought to an end following a lengthy period of trapping, brood parasitism rates elevated or returned to pre-trapping rates. Research at Fort Hood Military Reservation in Texas showed that after 3 years of decreased brown-headed cowbird trapping levels, parasitism rates increased from 7.9 percent to 23.1 percent and resulted in black-capped vireo (*Vireo atricapilla*) nest survival decreasing to unsustainable levels (Kostecke *et al.* 2009, p. 1). Kosciuch and Sandercock (2008, p. 546) found similar results with parasitism frequency and host bird productivity returning to pre-trapping levels quickly upon discontinuing cowbird removal.

After 45 years of brown-headed cowbird trapping in Michigan, the threat of brood parasitism on the Kirtland's warbler has been greatly reduced, but not eliminated. Brown-headed cowbirds are able to parasitize more than 200 host species (Friedmann *et al.* 1977, p. 5), and the effect of brown-headed cowbird parasitism is therefore not density-dependent on any one host. Brown-headed cowbirds remain present in jack pine habitat away from brown-headed cowbird traps, even if that area had been trapped in previous years, but potentially in lower numbers (DeGroot and Smith 2001, p. 877; Bailey 2007, pp. 97–98; Cooper *et al.,* unpubl. data). Female brown-headed cowbirds are highly prolific, estimated to produce up to 40 eggs in a breeding season (Scott and Ankney 1980, p. 680). Successful brown-headed cowbird reproduction outside of trapped areas may maintain a population of adult brown-headed cowbirds that could return in subsequent years with the ability to parasitize Kirtland's warbler nests. It is unclear if reduced parasitism rates are a permanent change to the landscape of northern lower Michigan. The best available information, however, indicates that cowbird removal efforts can be reduced without adversely impacting Kirtland's warbler productivity rates. Given the historical impact that the brown-headed cowbird has had on the Kirtland's warbler, and the potential for the brown-headed cowbird to negatively affect the warbler, a sustainable Kirtland's warbler population depends on monitoring the magnitude and extent of brood parasitism and subsequently adjusting the level of cowbird trapping appropriately.

The MOA (see Recovery and Recovery Plan Implementation discussion, above) established in 2015 between the Service and MDNR addresses the commitment and long-term costs associated with future efforts to control cowbirds. The MOA established a dedicated account from which income can be used to implement cowbird management and other conservation actions for the Kirtland's warbler. To date, the account has greater than one million dollars invested for long-term growth, and income generated will be used to ensure sufficient cowbird management to adequately reduce nest parasitism of the Kirtland's warbler.

Thus, we conclude that with the expected continued management, the threat of brood parasitism by brown-headed cowbirds to the Kirtland's warbler has been ameliorated to sufficiently low levels and will continue to remain at these acceptable levels in the foreseeable future.

Effects of Changes to Environmental Conditions

The effects of projected changes in temperature, precipitation, and sea level on Kirtland's warblers were not identified in the listing rule (32 FR 4001; March 11, 1967) or in the updated recovery plan (USFWS 1985, entire), yet the potential impact of climate change has gained widespread recognition as one of many pressures that influence the distributions of species, the timing of biological activities and processes, and the health of populations. Potential effects to the Kirtland's warbler include a decrease in productivity rates, a decrease and shift in suitable breeding habitat outside of the species' current range (Prasad *et al.* 2007, unpaginated), a decrease in the extent of wintering habitat, and decoupling the timing of migration from food resource peaks that are driven by temperature and are necessary for migration and feeding offspring (van Noordwijk *et al.* 1995, p. 456; Visser *et al.* 1998, pp. 1869–1870; Thomas *et al.* 2001, p. 2598; Strode 2003, p. 1142).

There are a multitude of anticipated changes to the extent and availability of suitable Kirtland's warbler habitat within jack pine forests on the breeding grounds based on projected changes to temperature and precipitation that range from expansion to contraction of habitat. Continued increases in temperature and evaporation will likely reduce jack pine forest acreage (NAST 2000, pp. 116–117), as well as increase the susceptibility of current jack pine forests to pests and diseases (Bentz *et al.* 2010, p. 609; Cudmore *et al.* 2010, pp. 1040–1041; Safranyik *et al.* 2010, p. 433). Competition with deciduous forest species is also expected to favor an expansion of the deciduous forest into the southern portions of the boreal forest (USFWS 2009, p. 14) and affect interspecific relationships between the Kirtland's warbler and other wildlife (Colwell and Rangel 2009, p. 19657; Wiens *et al.* 2009, p. 19729). However, warmer weather and increased levels of carbon dioxide could also lead to an increase in tree growth rates on marginal forestlands that are currently temperature-limited (NAST 2000, p. 57). Additionally, higher air temperatures will cause greater evaporation and, in turn, reduce soil moisture, resulting in conditions conducive to forest fires (NAST 2000, p. 57) that favor jack pine propagation. Under different greenhouse gas emission scenarios, there may be a reduction of suitable Kirtland's warbler breeding habitat in Michigan, as well as an expansion of suitable habitat in western Wisconsin and Minnesota (Prasad *et al.* 2007, unpaginated).

On the wintering grounds, effects to the Kirtland's warbler could occur as a result of changing temperature, precipitation, rising sea levels, and storm events. For migratory species, unfavorable changes on the wintering grounds can result in subsequent negative effects on fitness later in the annual cycle (Marra *et al.* 1998, p. 1885; Rockwell *et al.* 2012, pp. 747–748; Rockwell *et al.* 2017, p. 721; Sillett *et al.* 2000, pp. 2040–2041). For the Kirtland's warbler, wintering habitat condition has been shown to affect survival and reproduction (Rockwell *et al.* 2017, p. 721; Rockwell *et al.* 2012, pp. 747–748). This likely results from limited resource availability on the wintering grounds that reduces body condition and fat reserves necessary for successful migration and reproduction (Wunderle *et al.* 2014, pp. 47–49). The availability of sufficient food resources is affected by the extent of habitat for arthropods and fruiting plants, temperature, and precipitation (Brown and Sherry 2006, pp. 25–27; Wunderle *et al.* 2014, p. 39).

Temperatures in the Caribbean have shown strong warming trends across all regions, particularly since the 1970s (Jones *et al.* 2015, pp. 3325, 3332), and are likely to continue to warm. Climate models predict an increase in temperature of almost 2.5 to 3.0 degrees Celsius (4.5–6.3 degrees Fahrenheit) above the mean temperatures of 1970–1989 by the 2080s (Karmalkar *et al.* 2013, p. 301). In addition to higher mean daily temperatures, Stennett-Brown *et al.* (2017, pp. 4838–4840) predict an increase in the number of warm days and nights, and a decrease in the frequencies of cool days and nights, for 2071–2099 relative to 1961–1999. Increased temperatures could affect food availability by altering food supply (arthropod and fruit availability), although it is unknown to what extent the predicted increases in temperature would increase or decrease food supply for the Kirtland's warbler. Other effects of increasing temperature related to sea level and precipitation are described below.

Increasing temperatures can contribute to sea level rise from the melting of ice over land and thermal expansion of seawater. A wide range of estimates for future global mean sea level rise are found in the scientific literature (reviewed in Simpson *et al.* 2010, pp. 55–61). The Intergovernmental Panel on Climate Change (IPCC) (2013, p. 25) predicted a likely range in the rise in sea level of 0.26 m (0.85 ft) to almost 1 m (3.3 ft, IPCC 2013, p. 25; Church *et al.* 2013, p. 1186); other estimates in sea level rise for the same timeframe ranged from a minimum of 0.2 m (0.7 ft) to a maximum of 2.0 m (6.6 ft) (Parris *et al.* 2012, p. 12). Increase in sea level could reduce the availability of suitable habitat due to low-elevation areas being inundated, resulting in a reduction in the size of the islands on which Kirtland's warblers winter (Amadon 1953, p. 466; Dasgupta *et al.* 2009, pp. 21–23). The Bahamas archipelago is mainly composed of small islands, and more than 80 percent of the landmass is within 1.5 m (4.9 ft) of mean sea level (The Bahamas Environment, Science and Technology Commission 2001, p. 43). This makes The Bahamas particularly vulnerable to future rises in sea level (Simpson *et al.* 2010, p. 74), which could result in reduction of the extent of winter habitat and negatively impact the Kirtland's warbler. Simpson *et al.* (2010, p. 77) estimated a loss of 5 percent of landmass in the Bahamas due to a 1 m rise in sea level, whereas Dasgupta *et al.* (2007, p. 12; 2009, p. 385) estimates 11.0 percent of land area in The Bahamas would be impacted by a 1 m (3.3 ft) sea level rise. Wolcott *et al.* (in press, unpaginated) analyzed the amount of Kirtland's warbler habitat that would be lost due to a 1 m (3.3 ft) and 2 m (6.6 ft) rise in sea level on north and north-central islands in The Bahamas, using high resolution land cover data for Eleuthera and ''open land'' (nonforest, urban, or water) within available GIS land cover data for the other islands. On Eleuthera, the island with the greatest known density of overwintering Kirtland's warblers, the amount of available wintering habitat was reduced by 0.8 percent and 2.6 percent due to a 1 m (3.3 ft) and 2 m (6.6 ft) rise in sea level, respectively (Wolcott *et al.* in press, unpaginated). Loss of habitat was greater for northern islands of The Bahamas where elevations are lower, and where there have historically been few observations of Kirtland's warblers (Wolcott *et al.* in press, unpaginated).

Generally, climate models predict a drying trend in the Caribbean, but there is considerable temporal and spatial variation and often disagreement among models regarding specific predictions that make it difficult to determine the extent to which reduced rainfall or timing of rainfall may affect the Kirtland's warbler in the future. We reviewed available literature examining precipitation trends and projections in the Caribbean, and specifically The

Bahamas, to assess the potential effects of changes in precipitation.

Jones *et al.* (2016, p. 10) found that precipitation trends in the Caribbean from 1979–2012 did not show statistically significant century-scale trends across regions, but there were periods of up to 10 years when some regions were drier or wetter than the long-term averages. In the northern Caribbean (which includes The Bahamas, Cuba, Jamaica, Haiti, Dominican Republic, and Puerto Rico), some years were more wet than the average, and other years were more dry across all seasons (Jones *et al.* 2016, p. 3314), with higher precipitation totals since about 2000. Within The Bahamas, precipitation trends during the dry season (November through April) showed a significant drying trend for 1979–2009 (Jones *et al.* 2016, pp. 3328, 3331).

Karmalkar *et al.* (2013, entire) used available climate model data to provide both present-day and scenario-based future predictions on precipitation and temperature for the Caribbean islands. Projected trends in The Bahamas by the 2080s show relatively small changes in terms of wet season precipitation, with a small decrease in precipitation in the early part of the wet season (May through July) and a slight increase in the late wet season (August through October) in the northern parts of The Bahamas (Karmalkar *et al.* 2013, p. 297). In one model, the dry season was predicted to remain largely the same, except for a small increase in precipitation in November, whereas an alternate model projected The Bahamas would experience wetter conditions in the dry season, including during March (Karmalkar *et al.* 2013, pp. 298, 299).

Finally, Wolcott *et al.* (in press, unpaginated) modeled projected changes in precipitation under two scenarios with varying future carbon dioxide (CO_2) emissions and found that the projected precipitation varied seasonally and spatially throughout the islands of The Bahamas, both in the mid-term (2050) and long-term (2100). The northern and north-central islands are likely to have increased precipitation in March (compared to baseline conditions), whereas the central islands are likely to become drier.

Accurately projecting future precipitation trends in the Caribbean is difficult due to the complex interactions between sea surface temperatures, atmospheric pressure at sea level, and predominant wind patterns. Further, some models have difficulty accurately simulating the semi-annual seasonal cycle of precipitation observed in the Caribbean. Recent models using statistical downscaling techniques have improved resolution, but still show limitations for predicting precipitation. Thus, rainfall projections where Kirtland's warblers overwinter have limited certainty and should be interpreted with caution. Understanding the likely projected precipitation in the Bahamas and Caribbean is important because of the strong link between late winter rainfall and fitness of Kirtland's warblers. A drying trend on the wintering grounds will likely cause a corresponding reduction in available food resources (Studds and Marra 2007, pp. 120–121; Studds and Marra 2011, pp. 4–6). Rainfall in the previous month was an important factor in predicting fruit abundance (both ripe and unripe fruit) for wild sage and black torch in The Bahamas (Wunderle *et al.* 2014, p. 19), which is not surprising given the high water content (60–70 percent) of their fruit (Wunderle unpubl. data, cited in Wunderle *et al.* 2014, p. 4). Carry-over effects of weather on the wintering grounds, particularly late-winter rainfall, have been shown to affect spring arrival dates, reproductive success, and survival rates of Kirtland's warblers (reviewed in Wunderle and Arendt 2017, pp. 5–12; Rockwell *et al.* 2012, p. 749; Rockwell *et al.* 2017, pp. 721–722).

Decreases in rainfall and resulting decreases in food availability may also result in poorer body condition prior to migration. The need to build up the necessary resources to successfully complete migration could, in turn, result in delays to spring departure in dry years (Wunderle *et al.* 2014, p. 16) and may explain observed delays in arrival times following years with less March rainfall in The Bahamas (Rockwell *et al.* 2012, p. 747). Delays in the spring migration of closely related American redstarts (*Setophaga ruticilla*) have also been directly linked to variation in March rainfall and arthropod biomass (Studds and Marra 2007, p. 120; Studds and Marra 2011, p. 4) and have also resulted in fewer offspring produced per summer (Reudinck *et al.* 2009, p. 1624). These results strongly indicate that environmental conditions modify the phenology of spring migration, which likely carries a reproductive cost. If The Bahamas experience a significant winter drying trend, Kirtland's warblers may be pressured to delay spring departures, while simultaneously contending with warming trends in their breeding range that pressure them to arrive earlier in the spring. Projection population modeling (Rockwell *et al.* 2017, p. 2) estimated a negative population growth in Kirtland's warbler as a result of a reduction (by more than 12.4 percent from the current mean levels) in March rainfall.

Extreme weather events such as tropical storms and hurricanes will continue to occur with an expected reduction in the overall frequency of weaker tropical storms and hurricanes, but an increase in the frequency of the most intense hurricanes (category 4 and 5 hurricanes), based on several dynamical climate modeling studies of Atlantic basin storm frequency and intensity (Bender *et al.* 2010, p. 456; Knutson *et al.* 2010, pp. 159–161; Murakami *et al.* 2012a, pp. 2574–2576; Murakami *et al.* 2012b, pp. 3247–3253; Knutson *et al.* 2013, pp. 6599–6613; Knutson *et al.* 2015, pp. 7213–7220). Although very intense hurricanes are relatively rare, they inflict a disproportionate impact in terms of storm damage (*e.g.,* approximately 93 percent of damage resulting from hurricanes is caused by only 10 percent of the storms Mendelsohn *et al.* 2012, p. 3). Hurricanes have the potential to result in direct mortality of Kirtland's warblers during migration and while on the wintering grounds (Mayfield 1992, p. 11), but the more significant effects generally occur following the hurricane due to altered shelter and food (Wiley and Wunderle 1993, pp. 331–336). Because Kirtland's warblers readily shift sites on the wintering grounds based on food availability, Kirtland's warblers would likely be able to shift locations within and possibly between nearby islands as an immediate post-hurricane response (Wunderle *et al.* 2007, p. 124). Further, hurricanes likely produce new wintering habitat for Kirtland's warblers by opening up closed canopy habitat of tall coppice, and may also help set back succession for existing suitable habitat (Wunderle *et al.* 2007, p. 126).

Because of the uncertainties in modeling the projected changes in precipitation, both spatially and temporally, there is a great level of uncertainty in how precipitation is likely to change in the foreseeable future and thereby affect Kirtland's warbler. There is more confidence that temperatures are likely to increase, and it is possible that there will be a drying trend over much of the Caribbean. However, it is not clear whether all islands will be equally affected by less precipitation. As a long-distance migrant, the Kirtland's warbler is well suited, in terms of its movement patterns and dispersal ability, to reach other locations outside of their current winter range where suitable winter habitat and food resources may be more available under future temperature and precipitation conditions. Individuals have been reported wintering outside of The Bahamas (see Distribution discussion above), though the extent of behavioral plasticity and adaptive capacity at the species level to shift locations in response to future, long-term precipitation and temperature conditions in the Caribbean remains unknown.

Collision With Lighted and Human-Made Structures

Collision with human-made structures (*e.g.,* tall buildings, communication towers, wind turbines, power lines, heavily lighted ships) kills or injures millions of migrating songbirds annually (reviewed in Drewitt and Langston 2008, p. 259; Longcore *et al.* 2008, pp. 486–489). Factors that influence the likelihood of avian collisions with human-made structures include size, location, the use of lighting, and weather conditions during migratory periods (reviewed in Drewitt and Langston 2008, p. 233). The presence of artificial light at night and plate-glass windows are the most important factors influencing avian collisions with existing human-made structures (Ogden 1996, p. 4).

There are five confirmed reports of Kirtland's warblers colliding with human-made structures, all of which resulted in death. Two of these deaths resulted from collisions with windows (Kleen 1976, p. 78; Kramer 2009, pers. comm.), and three resulted from collisions with a lighted structure, including a lighthouse (Merriam 1885, p. 376), an electric light mast (Jones 1906, pp. 118–119), and a lighted monument (Nolan 1954). Another report of a Kirtland's warbler that flew into a window and appeared to survive after only being stunned by the collision (Cordle 2005, p. 2) was not accepted as an official documented observation of a Kirtland's warbler (Maryland Ornithological Society 2010, unpaginated).

Some bird species may be more vulnerable to collision with human-made structures than others due to species-specific behaviors. Particularly vulnerable species include: Night-migrating birds that are prone to capture or disorientation by artificial lights because of the way exposure to a light field can disrupt avian navigation systems; species that habitually make swift flights through restricted openings in dense vegetation; and species that are primarily active on or near the ground (reviewed in Ogden 1996, p. 8; Gauthreaux and Belser 2006, p. 67). Of the avian species recorded, the largest proportion of species (41 percent) that suffer migration mortality at human-made structures belong to the wood warbler subfamily (Parulinae), of which many species exhibit the above-mentioned behaviors (Ogden 1996, p. 14).

The Kirtland's warbler belongs to the Parulinae subfamily and exhibits many of the behaviors characteristic of other birds considered vulnerable to collision with human-made structures, yet little is known regarding how prone this species is to collision. The majority of bird collisions go undetected because corpses land in inconspicuous places or are quickly removed by scavengers postmortem (Klem 2009, p. 317). Additionally, while most avian collisions take place during migration, detailed information about Kirtland's warbler migration is still limited. The Kirtland's warbler population is also small, reducing the probability of collision observations by chance alone, compared to other species. These factors have inhibited the gathering of information, and in turn, a more comprehensive understanding of the hazards human-made structures pose to the Kirtland's warbler. It is reasonable to presume, however, that more Kirtland's warblers collide with human-made structures than are reported.

Solutions to reduce the hazards that cause avian collisions with human-made structures are being implemented in many places. Extinguishing internal lights of buildings at night, avoiding the use of external floodlighting, and shielding the upward radiation of low-level lighting such as street lamps are expected to reduce attraction and trapping of birds within illuminated urban areas, and in turn, injury and mortality caused by collision, predation, starvation, or exhaustion (reviewed in Ogden 1996, p. 31). The Service's Urban Conservation Treaty for Migratory Birds program has worked with several cities to adopt projects that benefit migrating birds flying through urban areas in between breeding and wintering grounds. For example, some cities within the Kirtland's warbler's migration corridor, such as Chicago, Indianapolis, Columbus, Detroit, and Milwaukee, have ''Lights Out'' or similar programs, which encourage the owners and managers of tall buildings to turn off or dim exterior decorative lights as well as interior lights during spring and fall migration periods (*http://www.audubon.org/conservation/existing-lights-out-programs*). These programs are estimated to reduce general bird mortality by up to 83 percent (Field Museum 2007, p. 1).

Additionally, migrating birds are not equally attracted to various lighting patterns, and modifying certain types of lighting systems could significantly reduce collision-related mortality. Gehring *et al.* (2009, p. 509) reported that by removing steady-burning, red L–810 lights and using only flashing, red L–864 or white L–865 lights on communication towers and other similarly lit aeronautical obstructions, mortality rates could be reduced by as much as 50 to 70 percent. On December 4, 2015, the Federal Aviation Administration revised its advisory circular that prescribes tower lighting to eliminate the use of L–810 steady-burning side lights on towers taller than 107 m (350 ft) (AC 70/7460–1L), and on September 28, 2016, released specifications for flashing L–810 lights on towers 46–107 m (150–350 ft) tall. These lighting changes should significantly reduce the risk of migratory bird collisions with communication towers.

As noted previously concerning potential threats to migratory habitat, if mortality during migration were limiting or likely to limit the population to the degree that maintaining a healthy population may be at risk, it should be apparent in the absence of the species from highly suitable breeding habitat in the core breeding range. In fact, we have seen just the opposite, increasing densities of breeding individuals in core areas and a range expansion into what would appear to be less suitable habitat elsewhere. This steady population growth and range expansion occurred while the potential threats to the species during migration were all increasing on the landscape (*e.g.,* new communication towers and wind turbines); therefore, we conclude that collision with lighted and human-made structures does not constitute a substantial threat to the Kirtland's warbler now or in the foreseeable future.

Synergistic Effects of Factors A Through E

When threats occur together, one may exacerbate the effects of another, causing effects not accounted for when threats are analyzed individually. Many of the threats to the Kirtland's warbler and its habitat discussed above under Factors A through E are interrelated and could be synergistic, and thus may cumulatively impact Kirtland's warbler beyond the extent of each individual threat. For example, increases in temperature and evaporation could reduce the amount of jack pine habitat available and increase the level of brood parasitism. Historically, habitat loss and brood parasitism significantly impacted the Kirtland's warbler and cumulatively acted to reduce its range and abundance. Today, these threats have been ameliorated and adequately minimized such that the species has exceeded the recovery goal. The best available data show a positive population trend over several decades and record high population levels. At a high enough population level, the Kirtland's warbler can withstand certain threats and continue to be resilient. Continued habitat management and brown-headed cowbird control at sufficient levels, as identified in the Conservation Plan and at levels consistent with those to which management agencies committed in the MOU and MOA, will assure continued population numbers at or above the recovery criteria with the current magnitude of other threats acting on the Kirtland's warbler.

Proposed Determination of Species Status

Section 4 of the Act (16 U.S.C. 1533), and its implementing regulations at 50 CFR part 424, set forth the procedures for determining whether a species is an endangered species or threatened species and should be included on the Federal Lists of Endangered and Threatened Wildlife and Plants. The Act defines an endangered species as any species that is ''in danger of extinction throughout all or a significant portion of its range'' and a threatened species as any species ''that is likely to become endangered throughout all or a significant portion of its range within the foreseeable future.''

On July 1, 2014, we published a final policy interpreting the phrase ''significant portion of its range'' (SPR) (79 FR 37578). Aspects of that policy were vacated for species that occur in Arizona by the U.S. District Court for the District of Arizona (*CBD* v. *Jewell,* No. CV–14–02506–TUC–RM (March 29, 2017), clarified by the court, March 29, 2017). Since the Kirtland's warbler does not occur in Arizona, for this finding we rely on the SPR policy, and also provide additional explanation and support for our interpretation of the SPR phrase. In our policy, we interpret the phrase ''significant portion of its range'' in the Act's definitions of ''endangered species'' and ''threatened species'' to provide an independent basis for listing a species in its entirety; thus there are two situations (or factual bases) under which a species would qualify for listing: A species may be in danger of extinction or likely to become so in the foreseeable future throughout all of its range; or a species may be in danger of extinction or likely to become so throughout a significant portion of its range. If a species is in danger of extinction throughout an SPR, it, the species, is an ''endangered species.'' The same analysis applies to ''threatened species.''

Our final policy addresses the consequences of finding a species is in danger of extinction in an SPR, and what would constitute an SPR. The final policy states that (1) if a species is found to be endangered or threatened throughout a significant portion of its range, the entire species is listed as an endangered species or a threatened species, respectively, and the Act's protections apply to all individuals of the species wherever found; (2) a portion of the range of a species is ''significant'' if the species is not currently endangered or threatened throughout all of its range, but the portion's contribution to the viability of the species is so important that, without the members in that portion, the species would be in danger of extinction, or likely to become so in the foreseeable future, throughout all of its range; (3) the range of a species is considered to be the general geographical area within which that species can be found at the time the Service or the National Marine Fisheries Service makes any particular status determination; and (4) if a vertebrate species is endangered or threatened throughout an SPR, and the population in that significant portion is a valid DPS, we will list the DPS rather than the entire taxonomic species or subspecies.

The SPR policy applies to analyses for all status determinations, including listing, delisting, and reclassification determinations. The procedure for analyzing whether any portion is an SPR is similar, regardless of the type of status determination we are making. The first step in our assessment of the status of a species is to determine its status throughout all of its range. We subsequently examine whether, in light of the species' status throughout all of its range, it is necessary to determine its status throughout a significant portion of its range. If we determine that the species is in danger of extinction, or likely to become so in the foreseeable future, throughout all of its range, we list the species as an endangered (or threatened) species and no SPR analysis will be required. As described in our policy, once the Service determines that a ''species''—which can include a species, subspecies, or distinct population segment (DPS)—meets the definition of ''endangered species'' or ''threatened species,'' the species must be listed in its entirety and the Act's protections applied consistently to all individuals of the species wherever found (subject to modification of protections through special rules under sections 4(d) and 10(j) of the Act).

Under section 4(a)(1) of the Act, we determine whether a species is an endangered species or threatened species because of any of the following factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. These same factors apply whether we are analyzing the species' status throughout all of its range or throughout a significant portion of its range.

Determination of Status Throughout All of the Kirtland's Warbler's Range

We conducted a review of the status of the Kirtland's warbler and assessed the five factors to evaluate whether the species is in danger of extinction, or likely to become so in the foreseeable future, throughout all of its range. The size of the Kirtland's warbler population is currently at its known historical maximum, which is nearly 10 times larger than it was at the time of listing and close to 2.5 times larger than the recovery goal. The population's breeding range also expanded outside of the northern Lower Peninsula to areas in Michigan's Upper Peninsula, Wisconsin, and Ontario. This recovery is attributable to successful interagency cooperation in the management of habitat and brood parasitism. The amount of suitable habitat has increased by approximately 150 percent since listing, primarily due to the increased amount of planted habitat generated from adaptive silvicultural techniques. Brown-headed cowbird control has been conducted on an annual basis within the majority of Kirtland's warbler nesting areas since 1972, and has greatly reduced the impacts of brood parasitism.

During our analysis, we found that impacts believed to be threats at the time of listing have been eliminated or reduced, or are being adequately managed since listing, and we do not expect any of these conditions to substantially change after delisting and into the foreseeable future. Population modeling that assessed the long-term population viability of Kirtland's warbler populations showed stable populations over a 50-year simulation period with current habitat management and maintaining sufficient cowbird removal (see *Population Viability* discussion, above). Brood parasitism and availability of sufficient suitable breeding habitat are adequately managed through the Kirtland's Warbler Breeding Range Conservation Plan and the 2016 MOU. The Conservation Plan and the MOU acknowledge the conservation-reliant nature of the Kirtland's warbler and the need for continued habitat management and brown-headed cowbird control, and affirm that the necessary long-term management actions will continue. The species is resilient to threats including changing weather patterns and sea level rise due to climate change, collision with lighted and human-made structures, impacts to wintering and migratory habitat, and cumulative effects, and existing information indicates that this resilience will not change in the foreseeable future. These conclusions are supported by the available information regarding species abundance, distribution, and trends. Thus, after assessing the best available information, we conclude that the Kirtland's warbler is not in danger of extinction throughout all of its range, nor is it likely to become so within the foreseeable future.

Determination of Status Throughout a Significant Portion of the Kirtland's Warbler's Range

Consistent with our interpretation that there are two independent bases for listing species, as described above, after examining the status of the Kirtland's warbler throughout all of its range, we now examine whether it is necessary to determine its status throughout a significant portion of its range. Per our final SPR policy, we must give operational effect to both the ''throughout all'' of its range language and the SPR phrase in the definitions of ''endangered species'' and ''threatened species.'' As discussed earlier and in greater detail in the SPR policy, we have concluded that to give operational effect to both the ''throughout all'' language and the SPR phrase, the Service should conduct an SPR analysis if (and only if) a species does not warrant listing according to the ''throughout all'' language.

Because we determined that the Kirtland's warbler is not in danger of extinction or likely to become so within the foreseeable future throughout all of its range, we will consider whether there are any significant portions of its range in which the species is in danger of extinction or likely to become so. To undertake this analysis, we first identify any portions of the species' range that warrant further consideration. The range of a species can theoretically be divided into portions in an infinite number of ways. However, there is no purpose in analyzing portions of the range that have no reasonable potential to be significant or in analyzing portions of the range in which there is no reasonable potential for the species to be in danger of extinction or likely to become so in the foreseeable future in that portion. To identify only those portions that warrant further consideration, we determine whether there are any portions of the species' range: (1) That may be ''significant,'' and (2) where the species may be in danger of extinction or likely to become so within the foreseeable future. We emphasize that answering these questions in the affirmative is not equivalent to a determination that the species should be listed—rather, it is a step in determining whether a more-detailed analysis of the issue is required.

If we identify any portions (1) that may be significant and (2) where the species may be in danger of extinction or likely to become so within the foreseeable future, we conduct a more thorough analysis to determine whether both of these standards are indeed met. The determination that a portion that we have identified does meet our definition of significant does not create a presumption, prejudgment, or other determination as to whether the species is in danger of extinction or likely to become so within the foreseeable future in that identified SPR. We must then analyze whether the species is in danger of extinction or likely to become so within the SPR. To make that determination, we use the same standards and methodology that we use to determine if a species is in danger of extinction or likely to become so within the foreseeable future throughout all of its range (but applied only to the portion of the range now being analyzed).

In practice, one key part of identifying portions appropriate for further analysis may be whether the threats are geographically concentrated. If a species is not in danger of extinction or likely to become so within the foreseeable future throughout all of its range and the threats to the species are essentially uniform throughout its range, then there is no basis on which to conclude that the species may be in danger of extinction or likely to become so within the foreseeable future in any portion of its range. Therefore, we examined whether any threats are geographically concentrated in some way that would indicate the species may be in danger of extinction, or likely to become so, in a particular area. Kirtland's warblers occupy different geographic areas throughout their annual life cycle (breeding grounds, migratory routes, wintering grounds). Although there are different threats during time spent in each of these areas, the entire population moves through the full annual cycle (breeding, migration, and wintering) and functions as a single panmictic population (see Genetics discussion above). Because all individuals move throughout all of these geographic areas, these different geographic areas do not represent biologically separate populations that could be exposed to different threats. The entire population and all individuals move through each of these geographic areas and are exposed to the same threats as they do; thus, no portion could have a different status.

Although there are different threats acting on the species on the breeding grounds, migratory routes, and wintering grounds (see discussion under Factors A through E, above), the entire Kirtland's warbler population experiences all of these threats at some point during their annual cycle and those threats, in combination, have an overall low-level effect on the species as a whole. Threats throughout the species' range are being managed or are occurring at low levels, as is evident in the species' continued population growth over the last two decades. Commitments by management agencies through the MOA and MOU provide assurances that habitat management and brown-headed cowbird control will continue at sufficient levels to ensure continued stable population numbers. We conclude that there are no portions of the species' range that are likely to be both significant and be in danger of extinction or likely to become so in the foreseeable future. Therefore, no portion warrants further consideration to determine whether the species is in danger of extinction or likely to become so in a significant portion of its range. For these reasons, we conclude that the species is not in danger of extinction, or likely to become so within the foreseeable future, throughout a significant portion of its range.

Conclusion

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the Kirtland's warbler. The threats that led to the species being listed under the Act (primarily loss of the species' habitat (Factor A) and effects of brood parasitism by brown-headed cowbirds (Factor E)) have been removed, ameliorated, or are being appropriately managed by the actions of multiple conservation partners over the past 50 years. These actions include habitat management, brown-headed cowbird control, monitoring, research, and education. Given commitments shown by the cooperating agencies entering into the Kirtland's warbler MOU and the long record of engagement and proactive conservation actions implemented by the cooperating agencies over a 50-year period, we expect conservation efforts will continue to support a healthy, viable population of the Kirtland's warbler post-delisting and into the foreseeable future. Furthermore, there is no information to conclude that at any time over the next 50-year window (as we define the foreseeable future for this species) that the species will be in danger of extinction. Thus, we have determined that none of the existing or potential threats, either alone or in combination with others, are likely to cause the Kirtland's warbler to be in danger of extinction throughout all or a significant portion of its range, nor are they likely to cause the species to become endangered within the foreseeable future throughout all or a significant portion of its range. On the basis of our evaluation, we conclude that, due to recovery, the Kirtlands warbler is not an endangered or threatened species. We therefore propose to remove the Kirtland's warbler from the Federal List of Endangered and Threatened Wildlife at 50 CFR 17.11(h) due to recovery.

Effects of This Rule

This proposal, if made final, would revise 50 CFR 17.11(h) by removing the Kirtland's warbler from the Federal List of Endangered and Threatened Wildlife. The prohibitions and conservation measures provided by the Act, particularly through sections 7 and 9, would no longer apply to this species. Federal agencies would no longer be required to consult with the Service under section 7 of the Act in the event that activities they authorize, fund, or carry out may affect the Kirtland's warbler. There is no critical habitat designated for this species. Removal of the Kirtland's warbler from the List of Endangered and Threatened Wildlife would not affect the protection given to all migratory bird species under the MBTA.

Post-Delisting Monitoring

Section 4(g)(1) of the Act requires us, in cooperation with the States, to implement a system to monitor for not less than 5 years for all species that have been recovered and delisted. The purpose of this requirement is to develop a program that detects the failure of any delisted species to sustain itself without the protective measures provided by the Act. If, at any time during the monitoring period, data indicate that protective status under the Act should be reinstated, we can initiate listing procedures, including, if appropriate, emergency listing.

We will coordinate with other Federal agencies, State resource agencies, interested scientific organizations, and others as appropriate to develop and implement an effective post-delisting monitoring (PDM) plan for the Kirtland's warbler. The PDM plan will build upon current research and effective management practices that have improved the status of the species since listing. Ensuring continued implementation of proven management strategies, such as brown-headed cowbird control and habitat management, that have been developed to sustain the species will be a fundamental goal for the PDM plan. The PDM plan will identify measurable management thresholds and responses for detecting and reacting to significant changes in the Kirtland's warbler's numbers, distribution, and persistence. If declines are detected equaling or exceeding these thresholds, the Service, in combination with other PDM participants, will investigate causes of these declines. The investigation will be to determine if the Kirtland's warbler warrants expanded monitoring, additional research, additional habitat protection or brood parasite management, or resumption of Federal protection under the Act.

Required Determinations

Clarity of This Proposed Rule

We are required by Executive Orders 12866 and 12988 and by the Presidential Memorandum of June 1, 1998, to write all rules in plain language. This means that each rule we publish must:

(a) Be logically organized;

(b) Use the active voice to address readers directly;

(c) Use clear language rather than jargon;

(d) Be divided into short sections and sentences; and

(e) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in **ADDRESSES**. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us the numbers of the sections or paragraphs that are unclearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

National Environmental Policy Act

We determined that we do not need to prepare an environmental assessment or an environmental impact statement, as defined under the authority of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*), in connection with regulations adopted pursuant to section 4(a) of the Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

Government-to-Government Relationship With Tribes

In accordance with the President's memorandum of April 29, 1994, ''Government-to-Government Relations with Native American Tribal Governments'' (59 FR 22951), Executive Order 13175, Secretarial Order 3206, the Department of the Interior's manual at 512 DM 2, and the Native American Policy of the Service, January 20, 2016, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. We will coordinate with tribes in the Midwest within the range of the Kirtland's warbler and request their input on this proposed rule.

References Cited

A complete list of all references cited in this proposed rule is available at *http://www.regulations.gov* under Docket No. FWS–R3–ES–2018–0005 or upon request from the Field Supervisor, Michigan Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this proposed rule are staff members of the Michigan Ecological Services Field Office in East Lansing, Michigan, in coordination with the Midwest Regional Office in Bloomington, Minnesota.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Proposed Regulation Promulgation

Accordingly, we propose to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

■ 1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 1531–1544; 4201–4245, unless otherwise noted.

§ 17.11 [Amended]

■ 2. Amend § 17.11(h) by removing the entry ''Warbler (wood), Kirtland's'' under ''BIRDS'' from the List of Endangered and Threatened Wildlife.

Dated: March 8, 2018.

James W. Kurth,

Deputy Director, U.S. Fish and Wildlife Service, Exercising the Authority of the Director, U.S. Fish and Wildlife Service.

[FR Doc. 2018–06864 Filed 4–11–18; 8:45 am]

BILLING CODE 4333–15–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 648

[Docket No. 180209147–8147–01]

RIN 0648–BH76

Fisheries of the Northeastern United States; 2018–2020 Small-Mesh Multispecies Specifications

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; request for comments.

SUMMARY: NMFS proposes small-mesh multispecies specifications for fishing years 2018–2020 and corrects a regulatory error from a previous rulemaking action. The specifications are intended to establish allowable catch limits for each stock within the fishery to control overfishing while allowing optimum yield. This action also informs the public of the proposed fishery specifications and regulatory correction, and provides an opportunity for comment.

DATES: Comments must be received by 5:00 p.m. local time, on April 27, 2018.

ADDRESSES: You may submit comments on this document, identified by NOAA–NMFS–2018–0031, by either of the following methods:

Electronic Submission: Submit all electronic public comments via the Federal e-Rulemaking Portal.

1. Go to *www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2018-0031,*

2. Click the ''Comment Now!'' icon, complete the required fields, and

3. Enter or attach your comments.

—OR—

Mail: Submit written comments to Michael Pentony, Regional Administrator, National Marine Fisheries Service, 55 Great Republic Drive, Gloucester, MA 01930. Mark the outside of the envelope: ''Comments on the Proposed Rule for Small-Mesh Multispecies Specifications.''

Instructions: Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered by NMFS. All comments received are part of the public record and will generally be posted for public viewing on *www.regulations.gov* without change. All personal identifying information (*e.g.,* name, address, etc.), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NMFS will accept anonymous comments (enter ''N/A'' in the required fields if you wish to remain anonymous).

A draft environmental assessment (EA) has been prepared for this action that describes the proposed measures and other considered alternatives, as well as provides an analysis of the impacts of the proposed measures and alternatives. Copies of the specifications document, including the EA and the Initial Regulatory Flexibility Analysis (IRFA), are available on request from Thomas A. Nies, Executive Director, New England Fishery Management Council, 50 Water Street, Newburyport, MA 01950. These documents are also accessible via the internet at *www.nefmc.org.*

FOR FURTHER INFORMATION CONTACT: Cynthia Hanson, Fishery Management Specialist, (978) 281–9180.

SUPPLEMENTARY INFORMATION:

Background

The New England Fishery Management Council manages the small-mesh multispecies fishery within the Northeast Multispecies Fishery Management Plan (FMP). The small-mesh multispecies fishery is composed of five stocks of three species of hakes: Northern silver hake, southern silver hake, northern red hake, southern red hake, and offshore hake. Southern silver hake and offshore hake are often grouped together and collectively referred to as ''southern whiting.'' The small-mesh multispecies fishery is managed separately from the groundfish fishery because it is conducted with much smaller mesh, and does not generally result in the catch of regulated groundfish species like cod and haddock. Amendment 19 to the FMP (April 4, 2013; 78 FR 20260) established the process and framework for setting catch specifications for the small-mesh fishery. The FMP requires that catch and landing limits for the small-mesh multispecies fishery be established through the specifications process on an annual basis for up to three years at a time.

The Whiting Plan Development Team (PDT) met in July 2017 to review the latest Stock Assessment and Fishery Evaluation (SAFE) report for the small-mesh multispecies fishery. This assessment update indicated that, in general, small-mesh multispecies stocks (whiting and hake) are increasing in the north and decreasing in the south. The Council's Scientific and Statistical Committee (SSC) conducted a final review of the PDT's recommended specifications and the SAFE report at their October 2017 meeting. On December 7, 2017, the Council approved the final recommended 2018–2020 catch limit specifications for the small-mesh multispecies fishery.

During development of these specifications, NMFS identified an error in the small-mesh multispecies regulations. In a previous action (80 FR 30379; May 28, 2015), we approved a Council-recommended reduction in the northern red hake possession limit from 5,000 lb (2,268 kg) to 3,000 lb (1,361 kg). However, when we drafted the rule implementing this change, we did not clarify that the possession limit for southern red hake remained unchanged at 5,000 lb (2,268 kg). In addition to setting new specifications for the whiting fishery for 2018 and projecting specifications for 2019 and 2020, this action would correct the error, and clarify the red hake possession limits in the regulations.

The recommended specifications would adjust the overfishing limit (OFL), allowable biological catch (ABC), annual catch limit (ACL), and total allowable landings (TAL) for the four main stocks in the small-mesh multispecies fishery (Table 1). These adjustments are based on Council recommendations, and account for the changes in stock biomass shown in the latest stock assessment update from 2017. The specification limits are intended to provide for sustainable yield and keep the risk of overfishing at acceptable levels as defined by the Council and its SSC.

Proposed Specifications

This action proposes the Council's recommended specifications for the