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Associate Administrator for Rulemaking.

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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R1–ES–2016–0057; 4500030113]

RIN 1018–BB54

Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Iiwi (Drepanis coccinea)

AGENCY: Fish and Wildlife Service, Interior.

ACTION: 12-Month petition finding; proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a 12-month finding on a petition to list the iiwi (*Drepanis coccinea*), a bird species from the Hawaiian Islands, as a threatened species under the Endangered Species Act (Act). After review of all best available scientific and commercial information, we find that listing the iiwi as a threatened species under the Act is warranted. Accordingly, we propose to list the iiwi as a threatened species throughout its range. If we finalize this rule as proposed, it would extend the Act's protections to this species. The effect of this regulation will be to add this species to the Federal List of Endangered and Threatened Wildlife.

DATES: We will accept comments received or postmarked on or before November 21, 2016. Comments submitted electronically using the Federal eRulemaking Portal (see **ADDRESSES** below) must be received by 11:59 p.m. Eastern Time on the closing date. We must receive requests for public hearings, in writing, at the address shown in **FOR FURTHER INFORMATION CONTACT** by November 4, 2016.

ADDRESSES: 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–R1–ES–2016–0057, which is the docket number for this rulemaking. Then, 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–R1–ES–2016–0057; U.S. Fish and Wildlife Service Headquarters, 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 *Public Comments* below for more information).

FOR FURTHER INFORMATION CONTACT: Mary Abrams, Field Supervisor, Pacific Islands Fish and Wildlife Office, 300 Ala Moana Boulevard, Room 3–122, Honolulu, HI 96850; by telephone (808–792–9400); or by facsimile (808–792–9581). Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION: This document consists of: (1) A 12-month petition finding that listing the iiwi under the Act is warranted; and (2) a proposed rule to list the iiwi as a threatened species under the Act.

Executive Summary

Why we need to publish a rule. Under the Endangered Species Act, 16 U.S.C. 1531 *et seq.,* a species or subspecies may warrant protection through listing if it is endangered or threatened throughout all or a significant portion of its range. Critical habitat shall be designated, to the maximum extent prudent and determinable, for any species determined to be an endangered or threatened species under the Act.

We are proposing to list the iiwi (*Drepanis coccinea*) as threatened under the Act because of current and future threats, and listing can only be done by issuing a rule. The iiwi no longer occurs across much of its historical range, and faces a variety of threats in the form of diseases and impacts to its remaining habitat.

Delineation of critical habitat requires, within the geographical area occupied by the species, identification of the physical or biological features essential to the species' conservation. A careful assessment of the biological needs of the species and the areas that may have the physical or biological features essential for the conservation of the species and that may require special management considerations or protections, and thus qualify for designation as critical habitat, is particularly complicated in this case by the ongoing and projected effects of climate change and will require a thorough assessment. We require additional time to analyze the best available scientific data in order to identify specific areas appropriate for critical habitat designation and to analyze the impacts of designating such areas as critical habitat. Accordingly, we find designation of critical habitat for the iiwi to be ''not determinable'' at this time.

What this document does. This document proposes the listing of the iiwi as a threatened species. We previously published a 90-day finding for the iiwi, and this document includes a 12-month finding and proposed listing rule, which assesses all available information regarding status of and threats to the iiwi.

The basis for our action. Under the Act, we can determine that a species is an endangered or threatened species based on any of five 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. We have determined that the primary threats to the iiwi are its susceptibility to avian malaria (Factor C) and the expected reduction in disease-free habitat as a result of increased temperatures caused by climate change (Factor E). Although not identified as primary threat factors, rapid ohia death, a disease that affects the tree species required by iiwi for nesting and foraging, and impacts from nonnative invasive plants and feral ungulates, contribute to the degradation and curtailment of the iiwi's remaining, disease-free native ohia forest habitat, exacerbating threats to the species' viability.

We will seek peer review. We will seek comments from independent specialists to ensure that our designation is based on scientifically sound data, assumptions, and analyses. We will invite these peer reviewers to comment on our listing proposal. Because we will consider all comments and information received during the comment period, our final determination may differ from this proposal.

A species status report for the iiwi was prepared by a team of Service biologists, with the assistance of scientists from the U.S. Geological Survey's (USGS) Pacific Islands Ecosystems Research Center and the Service's Pacific Islands Climate Change

Cooperative. We also obtained review and input from experts familiar with avian malaria and avian genetics. The species status report represents a compilation of the best scientific and commercial data available concerning the status of the species, including the past, present, and future threats to the iiwi. We will invite at least three scientists with expertise in Hawaiian forest bird biology, avian malaria, and climate change to conduct an independent peer review of the species status report. The species status report and other materials relating to this proposal can be found at *http://www.regulations.gov,* at Docket No. FWS–R1–ES–2016–0057, or by contacting the Pacific Islands Fish and Wildlife Office (see **FOR FURTHER INFORMATION CONTACT**).

Information Requested

Public Comments

We intend that any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate and as effective as possible. Therefore, we request comments or information from the public, including land owners and land managers, other concerned governmental agencies, the scientific community, industry, or any other interested parties concerning this proposed rule. We particularly seek comments concerning:

(1) The iiwi's biology, range, and population trends, including:

(a) Biological or ecological requirements of the species, including habitat requirements for feeding, breeding, and sheltering;

(b) Genetics and taxonomy;

(c) Historical and current range including distribution patterns;

(d) Historical and current population levels, and current and projected trends; and

(e) Past and ongoing conservation measures for the species, its habitat, or both.

(2) Factors that may affect the continued existence of the species, which may include habitat modification or destruction, overutilization, disease, predation, the inadequacy of existing regulatory mechanisms, or other natural or manmade factors.

(3) Biological, commercial trade, or other relevant data concerning any threats (or lack thereof) to this species and existing regulations that may be addressing those threats.

(4) Additional information concerning the historical and current status, range, distribution, and population size of this species, including the locations of any additional populations of the iiwi.

(5) Specific information on:

- What areas currently occupied, and that contain the necessary physical or biological features essential for the conservation of the iiwi, we should include in any future designation of critical habitat and why;
- Whether special management considerations or protections may be required for the physical or biological features essential to the conservation of the iiwi; and
- What areas not currently occupied are essential to the conservation of the iiwi and why.

Please include sufficient information with your submission (such as scientific journal articles or other publications) to allow us to verify any scientific or commercial information you include.

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 directs that determinations as to whether any species is a threatened or endangered species must be made ''solely on the basis of the best scientific and commercial data available.''

You may submit your comments and materials concerning this proposed rule by one of the methods listed in **ADDRESSES**. We request that you send comments only by the methods described in **ADDRESSES**.

If you submit information via *http://www.regulations.gov,* your entire submission—including any personal identifying information—will be posted on the Web site. If your submission is made via a hardcopy that includes personal identifying information, 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. We will post all hardcopy submissions on *http://www.regulations.gov.*

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, Pacific Islands Fish and Wildlife Office (see **FOR FURTHER INFORMATION CONTACT**).

Public Hearing

Section 4(b)(5) of the Act provides for one or more public hearings on this proposal, if requested. Requests must be received within 45 days after the date of publication of this proposed rule in the **Federal Register**. Such requests must be sent to the address shown in **FOR FURTHER INFORMATION CONTACT**. We will schedule one or more public hearings on this proposal, if any are requested, and announce the dates, times, and places of those hearings, as well as how to obtain reasonable accommodations, in the **Federal Register** and local newspapers at least 15 days before the hearing.

Peer Review

In accordance with our joint policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), we will seek the expert opinions of appropriate and independent specialists regarding this proposed rule and the accompanying draft species status report (see Status Assessment for the Iiwi, below). The purpose of peer review is to ensure that our listing determination is based on scientifically sound data, assumptions, and analyses. Peer reviewers have expertise in the iiwi's life history, habitat, physical and biological requirements, avian diseases including malaria, and climate change, and are currently reviewing the draft species status report, which will inform our determination. We invite comment from the peer reviewers during this public comment period.

Background

Section 4(b)(3)(B) of the Act requires that, for any petition to revise the Federal Lists of Threatened and Endangered Wildlife and Plants (Lists) that contains substantial scientific or commercial information indicating that listing a species may be warranted, we make a finding within 12 months of the date of receipt of the petition that the petitioned action is either: (a) Not warranted; (b) warranted; or (3) warranted, but the immediate proposal of a regulation implementing the petitioned action is precluded by pending proposals to determine whether other species are endangered or threatened, and expeditious progress is being made to add or remove qualified species from the Lists. With this publication, we have determined that the petitioned action to list the iiwi is warranted, and we are proposing to list the species.

Previous Federal Actions

On August 25, 2010, we received a petition dated August 24, 2010, from Noah Greenwald, Center for Biological Diversity, and Dr. Tony Povilitis, Life Net, requesting that the iiwi be listed as an endangered or threatened species and that critical habitat be designated under the Act. In a September 10, 2010, letter to the petitioners, we responded

that we had reviewed the information presented in the petition and determined that issuing an emergency regulation temporarily listing the species under section 4(b)(7) of the Act was not warranted. We also stated that we were required to complete a significant number of listing and critical habitat actions in Fiscal Year 2010, including complying with court orders and court-approved settlement agreements with specific deadlines, listing actions with absolute statutory deadlines, and high-priority listing actions. Our listing and critical habitat funding for Fiscal Year 2010 was committed to complying with these court orders, settlement agreements, and statutory deadlines. Therefore, we were unable to further address the petition to list the iiwi at that time.

We published a 90-day finding for the iiwi in the **Federal Register** on January 24, 2012 (77 FR 3423). Based on that review, we found that the petition presented substantial information indicating that listing the iiwi may be warranted, and we initiated a status review of the species. With the publication of this notice, we provide our 12-month finding and a proposal to list the iiwi as a threatened species under the Act.

Status Assessment for the Iiwi

A thorough review of the taxonomy, life history, and ecology of the iiwi (*Drepanis coccinea*) is presented in the draft Iiwi (*Drepanis coccinea*) Species Status Report, available online at *http://www.regulations.gov* under Docket No. FWS–R1–ES–2016–0057. The species status report documents the results of our comprehensive biological status review for the iiwi, including an assessment of the potential stressors to the species. The species status report does not represent a decision by the Service on whether the iiwi should be proposed for listing as a threatened or endangered species under the Act. It does, however, provide the scientific basis that informs our regulatory decision, which involves the further application of standards within the Act and its implementing regulations and policies. The following is a summary of the key results and conclusions from the species status report.

Summary of Biological Status

A medium-sized forest bird notable for its iconic bright red feathers, black wings and tail, and a long, curved bill (Hawaii Audubon Society 2011, p. 97), the iiwi belongs to the family Fringillidae and the endemic Hawaiian honeycreeper subfamily, Drepanidinae (Pratt *et al.* 2009, pp. 114, 122). Iiwi songs are complex with variable creaks (often described as sounding like a ''rusty hinge''), whistles, or gurgling sounds, and they sometimes mimic other birds (Hawaii Audubon Society 2011, p. 97). The species is found primarily in closed canopy, montane wet or montane mesic forests composed of tall stature ohia (*Metrosideros polymorpha*) trees or ohia and koa (*Acacia koa*) tree mixed forest. The iiwi's diet consists primarily of nectar from the flowers of ohia and mamane (*Sophora chrysophylla*), various plants in the lobelia (Campanulaceae) family (Pratt *et al.* 2009, p. 193), and occasionally, insects and spiders (Pratt *et al.* 2009, p. 193; Hawaii Audubon Society 2011, p. 97).

Although iiwi may breed anytime between October and August (Hawaii Audubon Society 2011, p. 97), the main breeding season occurs between February and June, which coincides with peak flowering of ohia (Fancy and Ralph 1997, p. 2). Iiwi create cup-shaped nests typically within the upper canopy of ohia (Hawaii Audubon Society 2011, p. 97), and breeding pairs defend a small area around the nest and disperse after the breeding season (Fancy and Ralph 1997, p. 2). An iiwi clutch typically consists of two eggs, with a breeding pair raising one to two broods per year (Hawaii Audubon Society 2011, p. 97).

Well known for their seasonal movements in response to the availability of flowering ohia and mamane, iiwi are strong fliers that move long distances following their breeding season to locate nectar sources (Fancy and Ralph 1998, p. 3; Kuntz 2008, p. 1; Guillamet *et al.* 2015, pp. EV–8—EV–9). The iiwi's seasonal movement to lower elevation areas in search of nectar sources is an important factor in the exposure of the species to avian diseases, particularly malaria (discussed below).

Although historical abundance estimates are not available, the iiwi was considered one of the most common of the native forest birds in Hawaii by early naturalists, described as ''ubiquitous'' and found from sea level to the tree line across all the major islands (Banko 1981, pp. 1–2). Today the iiwi is no longer found on Lanai and only a few individuals may be found on Oahu, Molokai, and west Maui. Remaining populations of iiwi are largely restricted to forests above approximately 3,937 feet (ft) (1,200 meters (m)) in elevation on Hawaii Island (Big Island), east Maui, and Kauai. As described below, the present distribution of iiwi corresponds with areas that are above the elevation at which the transmission of avian malaria readily occurs (''disease-free'' habitats). The current abundance of iiwi rangewide is estimated at a mean of 605,418 individuals (range 550,972 to 659,864). Ninety percent of all iiwi now occur on Hawaii Island, followed by east Maui (about 10 percent), and Kauai (less than 1 percent) (Paxton *et al.* 2013, p. 10).

Iiwi population trends and abundance vary across the islands. The population on Kauai appears to be in steep decline, with a modeled rate of decrease equivalent to a 92 percent reduction in population over a 25-year period (Paxton *et al.* 2013, p. 10); the total population on Kauai is estimated at a mean of 2,551 birds (range 1,934 to 3,167) (Paxton *et al.* 2013, p. 10). Trends on Maui are mixed, but populations there generally appear to be in decline; East Maui supports an estimated population of 59,859 individuals (range 54,569 to 65,148) (Paxton *et al.* 2013, p. 10). On Hawaii Island, which supports the largest remaining numbers of iiwi at an estimated average of 543,009 individuals (range 516,312 to 569,706), there is evidence for stable or declining populations on the windward side of the island, while trends are strongly increasing on the leeward (Kona) side. As noted above, iiwi have been extirpated from Lanai, and only a few individual birds have been sporadically detected on the islands of Oahu, Molokai, and on west Maui in recent decades. Of the nine iiwi population regions for which sufficient information is available for quantitative inference, five of those show strong or very strong evidence of declining populations; one, a stable to declining population; one, a stable to increasing population; and two, strong evidence for increasing populations. Four of the nine regions show evidence of range contraction. Overall, based on the most recent surveys (up to 2012), approximately 90 percent of remaining iiwi are restricted to forest within a narrow band between 4,265 and 6,234 ft (1,300 and 1,900 m) in elevation (Paxton *et al.* 2013, pp. 1, 10–11, and Figure 1) (See the Population Status section of the draft species status report for details).

Summary of Factors Affecting the Species

The Act directs us to determine whether any species is an endangered species or a threatened species because of any of five various factors affecting its continued existence. Our species status report evaluated many potential stressors to iiwi, particularly direct impacts on the species from introduced diseases, as well as predation by

introduced mammals, competition with nonnative birds, climate change, ectoparasites, and the effects of small population size. We also assessed stressors that may affect the extent or quality of the iiwi's required ohia forest habitat, including ohia dieback, ohia rust, drought, fires, volcanic eruptions, climate change, and particularly rapid ohia death and habitat alteration by nonnative plants and feral ungulates.

All species experience stressors; we consider a stressor to rise to the level of a threat to the species if the magnitude of the stressor is such that it places the current or future viability of the species at risk. In considering what stressors or factors might constitute threats to a species, we must look beyond the exposure of the species to a particular stressor to evaluate whether the species may respond to that stressor in a way that causes impacts to the species now or is likely to cause impacts in the future. If there is exposure to a stressor and the species responds negatively, the stressor may be a threat. We consider the stressor to be a threat 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 in the Act. However, the identification of stressors that could affect 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 these stressors are operative threats that act on the species to the point that the species may meet the definition of endangered or threatened under the Act.

Our species status report examines all of the potential stressors to iiwi in detail. Here we describe those stressors that we conclude rise to the level of a threat to the long-term viability of iiwi.

Based on our comprehensive assessment of the status of the iiwi in our species status report, we conclude that the best scientific data available consistently identifies avian malaria as the primary driver of declines in abundance and distribution of iiwi observed since the turn of the 20th century. This conclusion is supported by the extremely high mortality rate of iiwi (approximately 95 percent) in response to avian malaria, and the disappearance of iiwi from low-elevation ohia forest where it was formerly common and where malaria is prevalent today. Both the life cycle of the mosquito vector and the development and transmission of the malaria parasite are temperature-limited, thus iiwi are now found primarily in high elevation forests above 3,937 ft (1,200 m) where malaria prevalence and transmission is only brief and episodic, or nonexistent, under current conditions. Iiwi have not demonstrated any substantial sign of developing resistance to avian malaria to date and do not appear to be genetically predisposed to evolve resistance (Jarvi *et al.* 2004, pp. 2,164–2,166). As the prevalence of avian malaria increases in association with warmer temperatures (*e.g.,* LaPointe *et al.* 2012, p. 217), the extent and impact of avian diseases upon iiwi are projected to become greatly exacerbated by climate change during this century.

Additionally, on Hawaii Island where 90 percent of the iiwi currently occur, the disease rapid ohia death was identified as an emergent source of habitat loss and degradation that has the potential to exacerbate other stressors to ohia forest habitat, as well as reduce the amount of habitat remaining for iiwi in an already limited, disease-free zone contained within a narrow elevation band. Rapid ohia death, a recently discovered tree disease that leads to significant mortality of the ohia that iiwi depend upon for nesting and foraging, is quickly becoming a matter of urgent concern. If rapid ohia death continues to spread across the native ohia forests, it will directly threaten iiwi by eliminating the limited, malaria-free native forest areas that remain for the species.

Based on the analysis in our species status report, invasive, nonnative plants and feral ungulates have major, adverse impacts on ohia forest habitat. Although we did not find that the historical and ongoing habitat alteration by nonnative species is the primary cause of the significant observed decline in iiwi's abundance and distribution, the cumulative impacts to iiwi's habitat, and in particular the activities of feral ungulates, are not insignificant and likely exacerbate the effects of avian malaria. Feral ungulates, particularly pigs (*Sus scrofa*), goats (*Capra hircus*), and axis deer (*Axis axis*), degrade ohia forest habitat by spreading nonnative plant seeds and grazing on and trampling native vegetation, and contributing to erosion (Mountainspring 1986, p. 95; Camp *et al.* 2010, p. 198). Invasive nonnative plants, such as strawberry guava (*Psidium cattleianum*) and albizia trees (*Falcataria moluccana*), prevent or retard regeneration of ohia forest used by iiwi for foraging and nesting. The combined effects of drought and nonnative, invasive grasses have resulted in increased fire frequency and the conversion of mesic ohia woodland to exotic grassland in many areas of Hawaii ((D'Antonio and Vitousek 1992, p. 67; Smith and Tunison 1992, pp. 395–397; Vitousek *et al.* 1997, pp. 7–8; D'Antonio *et al.* 2011, p. 1,617). Beyond alteration of ohia forest, feral pig activities that create mosquito habitat in ohia forest where there would otherwise be very little to none is identified as an important compounding stressor that acts synergistically with the prevalence of malaria and results in iiwi mortality. Although habitat loss and degradation is not, by itself, considered to be a primary driver of iiwi declines, the habitat impacts described above contribute cumulatively to the vulnerability of the species to the threat of avian malaria by degrading the quality and quantity of the remaining disease-free habitat upon which the iiwi depends. In this regard, rapid ohia death, discussed above, is quickly becoming a matter of urgent concern as it can further exacerbate and compound effects from the suite of stressors that impact iiwi (see below).

Avian Diseases

The introduction of avian diseases transmitted by the introduced southern house mosquito (*Culex quinquefasciatus*), including avian malaria (caused by the protozoan *Plasmodium relictum*) and avian pox (*Avipoxvirus* sp.), has been a key driving force in both extinctions and extensive declines over the last century in the abundance, diversity, and distribution of many Hawaiian forest bird species, including declines of the iiwi and other endemic honeycreepers (*e.g.,* Warner 1968, entire; Van Riper *et al.* 1986, entire; Benning *et al.* 2002, p. 14,246; Atkinson and LaPointe 2009a, p. 243; Atkinson and LaPointe 2009b, pp. 55–56; Samuel *et al.* 2011, p. 2,970; LaPointe *et al.* 2012, p. 214; Samuel *et al.* 2015, pp. 13–15). Nonnative to Hawaii, the first species of mosquitoes were accidentally introduced to the Hawaiian Islands in 1826, and spread quickly to the lowlands of all the major islands (Warner 1968, p. 104; Van Riper *et al.* 1986, p. 340). Early observations of birds with characteristic lesions suggest that avian poxvirus was established in Hawaii by the late 1800s (Warner 1968, p. 106; Atkinson and LaPointe 2009a, p. 55), and later genetic analyses indicate pox was present in the Hawaiian Islands by at least 1900 (Jarvi *et al.* 2008, p. 339). Avian malaria had arrived in Hawaii by at least 1920 (Warner 1968, p. 107; Van Riper *et al.* 1986, pp. 340–341; Atkinson and LaPointe 2009, p. 55; Banko and Banko 2009, p. 52), likely in association with imported cage birds (Yorinks and Atkinson 2000, p. 731), or through the deliberate introduction of nonnative birds to replace the native birds that had

by then disappeared from the lowlands (Atkinson and LaPointe 2009a, p. 55).

Avian Malaria

As noted above, avian malaria is a disease caused by the protozoan parasite *Plasmodium relictum;* the parasite is transmitted by the mosquito *Culex quinquefasciatus,* and invades the red blood cells of birds. Birds suffering from malaria infection undergo an acute phase of the disease during which parasitemia, a quantitative measure of the number of *Plasmodium* parasites in the circulating red blood cells, increases steadily. Because the parasite destroys the red blood cells, anemia and decline of physical condition can quickly result. In native Hawaiian forest birds, death may result either directly from the effects of anemia, or indirectly when anemia-weakened birds become vulnerable to predation, starvation, or a combination of other stressors (LaPointe *et al.* 2012, p. 213). Studies have demonstrated that native Hawaiian birds that survive avian malaria remain chronically infected, thus becoming lifetime reservoirs of the disease (Samuel *et al.* 2011, p. 2,960; LaPointe *et al.* 2012, p. 216) and remaining capable of further disease transmission to other native birds. In contrast, nonnative birds in Hawaii are little affected by avian malaria and later become incapable of disease transmission (LaPointe *et al.* 2012, p. 216).

Wild iiwi infected with malaria are rarely captured, apparently because the onset of infection leads to rapid mortality, precluding their capture (Samuel *et al.* 2011, p. 2,967; LaPointe *et al.* 2016, p. 11). However, controlled experiments with captive birds have demonstrated the susceptibility of native Hawaiian honeycreepers to avian malaria; mortality is extremely high in some species, including iiwi, experimentally infected with the disease. As early as the 1960s, experiments with Laysan finches (*Telespiza cantans*) and several other species of native Hawaiian honeycreepers demonstrated 100 percent mortality from malaria in a very short period of time (Warner 1968, pp. 109–112, 118; Fig. 426). In a study specific to iiwi, Atkinson *et al.* (1995, entire) demonstrated that the species suffers approximately 95 percent mortality when infected with malaria (Atkinson *et al.* 1995, p. S65). In that study, iiwi and a nonnative control species were exposed to avian malaria through infective mosquito bites, and subjected to different dosages of infection (single vs. multiple bites). Following exposure to biting mosquitoes, food consumption, weight, and parasitemia were monitored for all test groups. None of the nonnative birds developed malarial infections, while all of the exposed iiwi developed infections within 4 days. Mortality of the high-dose iiwi reached 100 percent by day 29, and mortality of the low-dose birds reached 90 percent by day 37, an average of 95 percent mortality between the two groups (Atkinson *et al.* 1994, p. S63). A single male iiwi survived the initial infection and, following re-exposure with the same *Plasmodium* isolate, no subsequent increase in parasitemia was detected, suggesting a possible development of some immunity (Atkinson *et al.* 1995, p. S66). The authors suggested that iiwi may lack sufficient diversity in the major histocompatibility complex or genetically based immunity traits capable of recognizing and responding to malarial antigens, an important factor in iiwi's susceptibility to introduced disease (Atkinson *et al.* 1995, pp. S65–S66).

Despite extremely high mortality of iiwi from avian malaria in general, the aforementioned study as well as two other studies have demonstrated that a few individuals are capable of surviving the infection (Van Riper *et al.* 1986, p. 334; Atkinson *et al.* 1995, p. S63; Freed *et al.* 2005, p. 759). If a genetic correlation were identified, it is possible that surviving individuals could serve as a potential source for the evolution of genetic resistance to malaria, although evidence of this is scant to date. Eggert *et al.* (2008, p. 8) reported a slight but detectable level of genetic differentiation between iiwi populations located at mid and high elevation, potentially the first sign of selection acting on these populations in response to disease. Additionally, the infrequent but occasional sighting of iiwi on Oahu indicates a possible developed resistance or tolerance to avian malaria.

Despite these observations, there is, as of yet, no indication that iiwi have developed significant resistance to malaria such that individuals can survive in areas where the disease is strongly prevalent, including all potential low-elevation forest habitat and most mid-elevation forest habitat (Foster *et al.* 2007, p. 4,743; Eggert *et al.* 2008, p. 2). In one study, for example, 4 years of mist-netting effort across extensive areas of Hawaii Island resulted in the capture of a substantial number of iiwi, yet no iiwi were captured in low-elevation forests and only a few were captured in mid-elevation forests (Samuel *et al.* 2015, p. 11). In addition, the results of several studies indicate that iiwi have low genetic variability, and even genetic impediments to a possible evolved resistance to malaria in the future (Jarvi *et al.* 2001, p. 255; Jarvi *et al.* 2004, Table 4, p. 2,164; Foster *et al.* 2007, p. 4,744; Samuel *et al.* 2015, pp. 12–13). For example, Eggert *et al.* (2008, p. 9) noted that gene variations that may confer resistance appear to be rare in iiwi. Three factors—the homogeneity of a portion of the iiwi genome, the high mortality rate of iiwi in response to avian malaria, and high levels of gene flow resulting from the wide-ranging nature of the species—suggest that iiwi would likely require a significant amount of time for development of genetic resistance to avian malaria, assuming the species retains a sufficiently large reservoir of genetic diversity for a response to natural selection. Genetic studies of iiwi have also noted a dichotomy between the lack of variation in mitochondrial DNA (Tarr and Fleischer 1993, 1995; Fleischer *et al.* 1998; Foster *et al.* 2007, p. 4,743), and maintenance of variation in nuclear DNA (Jarvi *et al.* 2004, p. 2,166; Foster *et al.* 2007, p. 4,744); both attributes suggest that iiwi may have historically experienced a drastic reduction in population size that led to a genetic bottleneck. Studies have also found low diversity in the antigen-binding sites of the iiwi's major histocompatibility complex (that part of an organism's immune system that helps to recognize foreign or incompatible proteins (antigens) and trigger an immune response).

The relationship between temperature and avian malaria is of extreme importance to the current persistence of iiwi and the viability of the species in the future. The development of the *Plasmodium* parasite that carries malaria responds positively to increased temperature, such that malaria transmission is greatest in warm, low-elevation forests with an average temperature of 72 °F (22 °C), and is largely absent in high-elevation forests above 4,921 ft (1,500 m) with cooler mean annual temperatures around 57 °F (14 °C) (Ahumada *et al.* 2004, p. 1,167; LaPointe *et al.* 2010, p. 318; Liao *et al.* 2015, p. 4,343). High-elevation forests thus currently serve as disease-free habitat zones for Hawaiian forest birds, including iiwi. Once one of the most common birds in forests throughout the Hawaiian islands, iiwi are now rarely found at lower elevations, and are increasingly restricted to high-elevation mesic and wet forests where cooler temperatures limit both the development of the malarial parasite and mosquito densities (Scott *et al.*

1986, pp. 367–368; Ahumada *et al.* 2004, p. 1,167; LaPointe *et al.* 2010, p. 318; Samuel *et al.* 2011, p. 2,960; Liao *et al.* 2015, p. 4,346; Samuel *et al.* 2015, p. 14).

Temperature also affects the life cycle of the malaria mosquito vector, *Culex quinquefasciatus.* Lower temperatures slow the development of larval stages and can affect the survival of adults (Ahumada *et al.* 2005, pp. 1,165–1,168; LaPointe *et al.* 2012, p. 217). Although closely tied to altitude and a corresponding decrease in temperature, the actual range of mosquitoes varies with season. Generally, as temperature decreases with increasing elevation, mosquito abundance drops significantly at higher altitudes. In the Hawaiian Islands, the mosquito boundary occurs between 4,921 and 5,577 ft (1,500 and 1,700 m) (VanRiper *et al.* 1986, p. 338; LaPointe *et al.* 2012, p. 218). Areas above this elevation are at least seasonally relatively free of mosquitoes, thus malaria transmission is unlikely at these high elevations under current conditions.

Early on, Ralph and Fancy (1995, p. 741) and Atkinson *et al.* (1995, p. S66) suggested that the seasonal movements of iiwi to lower elevation areas where ohia is flowering may result in increased contact with malaria-infected mosquitoes, which, combined with the iiwi's high susceptibility to the disease, may explain their observed low annual survivorship relative to other native Hawaiian birds. Compounding the issue, other bird species, which overlap with iiwi in habitat, including Apapane (*Himatione sanguinea*), are relatively resistant to the diseases and carry both *Plasmodium* and avian pox virus. As reservoirs, they carry these diseases upslope where mosquitoes are less abundant but still occur in numbers sufficient to facilitate and continue transmission to iiwi (Ralph and Fancy 1995, p. 741). Subsequent studies have confirmed the correlation between risk of malaria infection and iiwi altitudinal migrations, and suggest upper elevation forest reserves in Hawaii may not adequately protect mobile nectarivores such as iiwi. Kuntz (2008, p. 3) found iiwi populations at upper elevation study sites (6,300 ft (1,920 m)) declined during the non-breeding season when birds departed for lower elevations in search of flowering ohia, traveling up to 12 mi (19.4 km) over contiguous mosquito-infested wet forest. Guillamet *et al.* (2015, p. 192) used empirical measures of seasonal movement patterns in iiwi to model how movement across elevations increases the risk of disease exposure, even affecting breeding populations in disease-free areas. La Pointe *et al.* (unpublished data 2015) found that, based on malaria prevalence in all Hawaiian forest birds, species migrating between upper elevations to lower elevations increased their risk of exposure to avian malaria by as much as 27 times. The greater risk was shown to be due to a much higher abundance of mosquitoes at lower elevations, which in turn was attributable at least in part to the higher abundance of pigs and their activities in lower elevation forests (discussed further below).

Avian Pox

Avian pox (or bird pox) is an infection caused by the virus *Avipoxvirus,* which produces large, granular, and eventually necrotic lesions or tumors on exposed skin or diphtheritic lesions on the mouth, trachea, and esophagus of infected birds. Avian pox can be transmitted through cuts or wounds upon physical contact or through the mouth parts of blood-sucking insects such as the mosquito *Culex quinquefasciatus,* the common vector for both the pox virus and avian malaria (LaPointe *et al.* 2012, p. 221). Tumors or lesions caused by avian pox can be crippling for birds, and may result in death. Although not extensively studied, existing data suggest that mortality from avian pox may range from 4 to 10 percent observed in Oahu Elepaio (*Chasiempis ibidis*) (for birds with active lesions (VanderWerf 2009, p. 743) to 100 percent in Laysan finches (Warner 1968, p. 108). VanderWerf (2009, p. 743) has also suggested that mortality levels from pox may correlate with higher rainfall years, and at least in the case of the Elepaio, observed mortality may decrease over time with a reduction in susceptible birds.

As early as 1902 native birds suffering from avian pox were observed in the Hawaiian Islands, and Warner (1968, p. 106) described reports that epizootics of avian pox ''were so numerous and extreme that large numbers of diseased and badly debilitated birds could be observed in the field.'' As the initial wave of post-European extinctions of native Hawaiian birds was largely observed in the late 1800s, prior to the introduction of avian malaria (Van Riper *et al.* 1986, p. 342), it is possible that avian pox played a significant role, although there is no direct evidence (Warner 1968, p. 106). Molecular work has revealed two genetically distinct variants of the pox virus affecting forest birds in Hawaii that differ in virulence (Jarvi *et al.* 2008, p. 347): One tends to produce fatal lesions, and the other appears to be less severe, based on the observation of recurring pox infections in birds with healed lesions (Atkinson *et al.* 2009, p. 56).

The largest study of avian pox in scope and scale took place between 1977 and 1980, during which approximately 15,000 native and nonnative forest birds were captured and examined for pox virus lesions from 16 different locations on transects along Mauna Loa on Hawaii Island (Van Riper *et al.* 2002, pp. 929–942). The study made several important determinations, including that native forest birds were indeed more susceptible than introduced species, that all species were more likely to be infected during the wet season, and that pox prevalence was greatest at mid-elevation sites approximately 3,937 ft (1,200 m) in elevation, coinciding with the greatest overlap between birds and the mosquito vector. Of the 107 iiwi captured and examined during the study, 17 percent showed signs of either active or inactive pox lesions (Van Riper *et al.* 2002, p. 932). Many studies of avian pox have documented that native birds are frequently infected with both avian pox and avian malaria (Van Riper *et al.* 1986, p. 331; Atkinson *et al.* 2005, p. 537; Jarvi *et al.* 2008, p. 347). This may be due to mosquito transmission of both pathogens simultaneously, because documented immune system suppression by the pox virus renders chronically infected birds more vulnerable to infection by, or a relapse of, malaria (Jarvi *et al.* 2008, p. 347), or due to other unknown factors. The relative frequency with which the two diseases co-occur makes it challenging to disentangle the independent impact of either stressor acting alone (LaPointe *et al.* 2012, p. 221), and we lack any indication of the degree to which pox may be a specific threat to iiwi or contributing to its decline.

Compounded Impacts—Feral Ungulates Create Habitat for Culex quinquefasciatus Mosquitoes and Exacerbate Impacts of Disease

It has been widely established that damage to native tree ferns (*Cibotium* spp.) and rooting and wallowing activity by feral pigs create mosquito larval breeding sites in Hawaiian forests where they would not otherwise occur. The porous geology and relative absence of puddles, ponds, and slow-moving streams in most Hawaiian landscapes precludes an abundance of water-holding habitat sites for mosquito larvae; however, *Culex quinquefasciatus* mosquitoes, the sole vector for avian malaria in Hawaii, now occur in great density in many wet forests where their larvae primarily rely on habitats created by pig activity (LaPointe 2006, pp. 1–3;

Ahumada *et al.* 2009, p. 354; Atkinson and LaPointe 2009, p. 60; Samuel *et al.* 2011, p. 2,971). Pigs compact volcanic soils and create wallows and water containers within downed, hollowed-out tree ferns, knocked over and consumed for their starchy pith (Scott *et al.* 1986, pp. 365–368; Atkinson *et al.* 1995, p. S68). The abundance of *C. quinquefasciatus* mosquitoes is also much greater in suburban and agricultural areas than in undisturbed native forest, and the mosquito is capable of dispersing up to 1 mile (1.6 kilometers) within closed-canopy native forest, including habitat occupied by the iiwi (LaPointe 2006, p. 3; LaPointe *et al.* 2009, p. 409).

In studies of native forest plots where feral ungulates (including pigs) were removed by trapping and other methods, researchers have demonstrated a correlation in the abundance of *Culex* spp. mosquitoes when comparing pig-free, fenced areas to adjacent sites where feral pig activity is unmanaged. Aruch *et al.* 2007 (p. 574), LaPointe 2006 (pp. 1–3) and LaPointe *et al.* (2009, p. 409; 2012, pp. 215, 219) assert that management of feral pigs may be strategic to managing avian malaria and pox, particularly in remote Hawaiian rain forests where studies have documented that habitats created by pigs are the most abundant and productive habitat for larval mosquitoes. Studies suggest that reduction in mosquito habitat must involve pig management across large landscapes due to the tremendous dispersal ability of *C. quinquefasciatus* and the possibility of the species invading from adjacent areas lacking management (LaPointe 2006, pp. 3–4). The consequences of feral pig activities thus further exacerbate the impacts to iiwi from avian malaria and avian pox, by creating and enhancing larval habitats for the mosquito vector, thereby increasing exposure to these diseases.

Avian Diseases—Summary

The relatively recent introduction of avian pox and avian malaria, in concert with the introduction of the mosquito disease vector, is widely viewed as one of the key factors underlying the loss and decline of native forest birds throughout the Hawaiian Islands. Evolving in the absence of mosquitoes and their vectored pathogens, native Hawaiian forest birds, particularly honeycreepers such as iiwi, lack natural immunity or genetic resistance, and thus are more susceptible to these diseases than are nonnative bird species (van Riper *et al.* 1986, pp. 327–328; Yorinks and Atkinson 2000, p. 737). Researchers consider iiwi one of the most vulnerable species, with studies showing an average of 95 percent mortality in response to infection with avian malaria (Atkinson *et al.* 1995, p. S63; Samuel *et al.* 2015, p. 2). Many native forest birds, including iiwi, are now absent from warm, low-elevation areas that support large populations of disease-carrying mosquitoes, and these birds persist only in relatively disease-free zones in high-elevation forests, above roughly 4,921 to 5,577 ft (1,500 to 1,700 m), where both the development of the malarial parasite and the density of mosquito populations are held in check by cooler temperatures (Scott *et al.* 1986, pp. 85, 100, 365–368; Woodworth *et al.* 2009, p. 1,531; Liao *et al.* 2015, pp. 4,342–4,343; Samuel *et al.* 2015, pp. 11–12). Even at these elevations, however, disease transmission may occur when iiwi move downslope to forage on ephemeral patches of flowering ohia in the nonbreeding season, encountering disease-carrying mosquitoes in the process (Ralph and Fancy 1995, p. 741; Fancy and Ralph 1998, p. 3; Guillaumet *et al.* 2015, p. EV–8; LaPointe *et al.* 2015, p. 1). Iiwi have not demonstrably developed resistance to avian malaria, unlike related honeycreepers including Amakihi (*Hemignathus* spp.) and Apapane. Due to the known extreme mortality rate of iiwi when exposed to avian malaria, we consider avian malaria in particular to pose a threat to iiwi. Having already experienced local extinctions and widespread population declines, it is possible that the species may not possess sufficient genetic diversity to adapt to these diseases (Atkinson *et al.* 2009, p. 58).

Climate Change

Based on the assessment of the best scientific data available in our species status report, we concluded that climate change exacerbates the impacts to iiwi from mosquito-borne disease, and this effect is likely to continue and worsen in the future. Air temperature in Hawaii has increased in the past century and particularly since the 1970s, with the greatest increases at higher elevations, and several conservative climate change models project continued warming in Hawaii into the future. As a result, the temperature barrier to the development and transmission of avian malaria will continue to move up in elevation in response to warmer conditions, leading to the curtailment or loss of disease-free habitats for iiwi. We briefly discuss below three climate studies that conservatively predict the iiwi will lose between 60 and 90 percent of its current (and already limited) disease-free range by the end of this century, with significant effects occurring by mid-century.

Climate Change Effects on Iiwi

Climate change is a stressor that is likely to significantly exacerbate the effects of avian malaria on iiwi both directly through increased prevalence and mortality, and indirectly through the loss of disease-free habitat. Air temperature in Hawaii has increased in the past century and particularly since the 1970s, with greater increases at high elevation (Giambelluca *et al.* 2008, pp. 2–4; Wang *et al.* 2014, pp. 95, 97). Documented impacts of increased temperature include the prevalence of avian malaria in forest birds at increasing elevation, including high-elevation sites where iiwi are already declining, for example, on Kauai (Paxton *et al.* 2013, p. 13). Several projections for future climate in Hawaii describe a continued warming trend, especially at high elevations. In our species status report, we analyzed in particular three climate studies (summarized below) that address the future of native forest birds, including iiwi, in the face of the interactions between climate change and avian malaria.

Benning *et al.* (2002) concluded that under optimistic assumptions (*i.e.,* 3.6 °F (2 °C) increase in temperature by the year 2100), malaria-susceptible Hawaiian forest birds, including iiwi, will lose most of their disease-free habitat in the three sites they considered in their projection of climate change impacts. For example, current disease-free habitat at high elevation within the Hakalau Forest National Wildlife Refuge (NWR) on the island of Hawaii (where the environment is still too cold for development of the malarial parasite) would be reduced by 96 percent by the end of the century.

Fortini *et al.* (2015) conducted a vulnerability assessment for 20 species of Hawaiian forest birds based on a projected increase of 6.1 °F (3.4 °C) under the A1B emissions scenario at higher elevations by 2100. Even under this relatively optimistic scenario, in which emissions decline after mid-century (IPCC 2007, p. 44), all species were projected to suffer range loss as the result of increased transmission of avian malaria at higher elevations with increasing temperature. Iiwi was predicted to lose 60 percent of its current range by the year 2100, and climate conditions suitable for the species will shift up in elevation, including into areas that are not currently forested, such as lava flows and high-elevation grasslands. Most of the remaining habitat for iiwi would be

restricted to a single island, Hawaii Island.

Liao *et al.* (2015) generated temperature and precipitation projections under three alternative emissions scenarios and projected future malaria risk for Hawaiian forest birds. Irrespective of the scenario modeled, by mid-century (roughly 2040), malaria transmission rates and impacts to bird populations began increasing at high elevations. By 2100, the increased annual malaria transmission rate for iiwi was projected to result in population declines of 70 to 90 percent for the species, depending on the emissions scenario.

All three of these studies consistently predict a significant loss of disease-free habitat for iiwi with consequent severe reductions in population size and distribution by the year 2100, with significant changes likely to be observed as early as 2040. As the iiwi's numbers and distribution continue to decline, the remaining small, isolated populations become increasingly vulnerable to loss of ohia forest habitat from other stressors such as rapid ohia death, as well as other environmental catastrophes and demographic stochasticity, particularly should all remaining iiwi become restricted to a single island (Hawaii Island), as some scenarios suggest.

Climate change will likely exacerbate other stressors to iiwi in addition to disease. Changes in the amount and distribution of rainfall in Hawaii likely will affect the quality and extent of mesic and wet forests on which iiwi depend. However, changes in the trade wind inversion (which strongly influences rainfall) and other aspects of precipitation with climate change are difficult to model with confidence (Chu and Chen 2005, pp. 4,801–4,802; Cao *et al.* 2007, pp. 1,158–1,159; Timm *et al.* 2015, p. 107; Fortini *et al.* 2015, p. 5; Liao *et al.* 2015, p. 4,345). In addition, potential increases in storm frequency and intensity in Hawaii as a result of climate change may lead to an increase in direct mortality of individual iiwi and a decline in the species' reproductive success. Currently, no well-developed projections exist for these possible cumulative effects.

Climate Change—Summary

The natural susceptibility of native forest birds to introduced diseases, in combination with the observed restriction of Hawaiian honeycreepers to high-elevation forests, led Atkinson *et al.* (1995, p. S68) to predict two decades ago that a shift in the current mosquito distribution to higher elevations could be ''disastrous for those species with already reduced populations.'' Thus, climate change has significant implications for the future of Hawaiian forest birds, as predictions suggest increased temperatures may largely eliminate the high-elevation forest currently inhospitable to the transmission of mosquito-borne diseases (Benning *et al.* 2002, pp. 14,247–14,249; LaPointe *et al.* 2012, p. 219; Fortini *et al.* 2015, p. 9). Samuel *et al.* (2015, p. 15) predict further reductions and extinctions of native Hawaiian birds as a consequence, noting that the iiwi is particularly vulnerable due to its high susceptibility to malaria. Several independent studies project consistently significant negative impacts to the iiwi as a result of climate change and the increased exposure to avian malaria as disease-free habitats shrink. As iiwi are known to exhibit 95 percent mortality on average as a result of avian malaria, the current numbers of iiwi are of little consequence should all or most of the remaining individuals become exposed to the disease in the future.

Rapid Ohia Death

Our species status report identified rapid ohia death (ROD), a type of *Ceratosystis* spp. vascular wilt (fungal) disease, as a factor with the potential to exacerbate the impacts currently affecting iiwi habitat and reduce the amount of disease-free habitat remaining by destroying high-elevation ohia forest. ROD was first detected in 2012 as ohia trees began mysteriously dying within lowland forests of the Puna Region of Hawaii Island. In June 2015, researchers identified the disease as ROD with an estimated area at the time of 15,000 ac (6,070 ha) of infected ohia trees (Keith *et al.* 2015, pp. 1–2). ROD affects non-contiguous ohia forest stands ranging in size from <1 ac (<0.4 ha) up to 247 ac (100 ha) with nearly all trees in these areas infected. At present the disease remains restricted to Hawaii island, with the largest affected area within the Puna District, where infected trees have been observed within approximately 4,000 discontinuous acres (1,619 ha) (Hughes 2016, pers. comm.). Based upon the most recent research, ROD-infected stands of ohia often initially show greater than 50 percent mortality, and within 2 to 3 years nearly 100 percent of trees in a stand succumb to the disease (College of Tropical Agriculture and Human Resources 2016 (*http://www2.ctahr.hawaii.edu/forestry/disease/ohia_wilt.html*)).

Affected trees are found at elevations ranging from sea level up to approximately 5,000 ft (1,524 m), including at Wailuku Forest near Hakalau Forest NWR (Hughes 2016, pers. comm.), which contains a stable to increasing iiwi population (Paxton *et al.* 2013, p. 12). As of March 2016, the amount of forest area affected on Hawaii Island is estimated to be approximately 34,000 ac (13,759 ha) (Hughes 2016, pers. comm.). Two different strains of the virus appear to be responsible for ROD (Hughes 2016, pers. comm.). These estimates demonstrate that the amount of ohia forest on Hawaii Island infected by ROD more than doubled between 2015 and 2016. While ROD is presently reported only from the island of Hawaii, it has spread across a large portion of the island, which is home to 90 percent of the current iiwi population. In some areas, affected trees have been observed within the range of iiwi (Hughes 2016, pers. comm.). Hawaii Island is particularly important for the future of iiwi, as iiwi are predicted to be largely if not entirely restricted to that island under some future climate change projections (Fortini *et al.* 2015, p. 9, Supplement 6).

Evaluation of Existing Regulatory Mechanisms and Conservation Measures

Our species status report evaluated several regulatory and other measures in place today that might address or are otherwise intended to ameliorate the stressors to iiwi. Our analysis concluded that forest habitat protection, conservation, and restoration has the potential to benefit iiwi by protecting and enhancing breeding and foraging areas for the species while simultaneously reducing the abundance of mosquito breeding sites, despite the disease vector's (*Culex quinquefasciatus)* 1-mi (1.6-km) dispersal ability (LaPointe *et al.* 2009, pp. 408; 411–412; LaPointe *et al.* 2012, p. 215).

Efforts to restore and manage large, contiguous tracts of native forests have been shown to benefit iiwi, especially when combined with fencing and ungulate removal (LaPointe *et al.* 2009, p. 412; LaPointe *et al.* 2012, p. 219). While forest restoration and ungulate management at the Hakalau Forest NWR on Hawaii Island are excellent examples of what is needed to increase iiwi abundance, many similar large-scale projects would be necessary rangewide to simply reduce mosquito abundance and protect the species from current habitat threats alone. However, even wide-scale landscape habitat management would be unable to fully address the present scope of the threat of disease, and sufficient high-elevation forest is not available to provide disease-free habitat for iiwi in the face

of future climate change. Even if disease-free habitat within managed areas could be restored and protected now, much of this habitat will lose its disease-free status as avian malaria moves upward in elevation in response to warming temperatures, as is occurring already within the Alakai Wilderness on the island of Kauai.

New opportunities are emerging, such as large-scale vector control using new genetics technology, that have the potential to assist Hawaiian forest birds (LaPointe *et al.* 2009, pp. 416–417; Reeves *et al.* 2014, p. e97557; Gantz *et al.* 2015, pp. E6736–E6743). These tools include the potential introduction of sterile male mosquitoes and transgenic insect techniques that introduce new genetic material into mosquito populations, including self-sustaining genes that will help drive an increase of the new desirable trait, *i.e.,* inability or decreased ability to transmit diseases throughout a mosquito population, thereby improving long-term transmission control. While promising, our report concludes that these new technologies for achieving large-scale control or eradication of mosquitoes in Hawaii are still in the research and planning stage and have yet to be implemented or proven effective.

Our species status report also evaluated several regulations and agreements pertaining to climate change. Although the United States and some other countries have passed some regulations specifically intended to reduce the emission of greenhouse gases that contribute to climate change, the scope and effect of such regulations are limited. Indeed, during the United Nations Framework Convention on Climate Change (UNFCCC) meeting in December 2015, the UNFCCC indicated that, even if all the member countries' intended contributions to greenhouse gas reductions were fully implemented and targets met, the goal of limiting the increase in global average temperature to 2 °C (3.6 °F) by the year 2100 would not be achieved.

Many of the efforts to tackle the primary stressors to iiwi are still in the research and development stage, or are implemented only on a small or limited scale. Because the primary stressor, avian malaria, continues to have negative impacts, and these impacts are exacerbated by climate change, we must conclude that no current conservation measures or regulations are sufficient to offset these impacts to the species.

Summary of Biological Status and Threats

We have reviewed the best scientific and commercial data available regarding iiwi populations and the stressors that affect the species. This information includes, notably, a recent comprehensive analysis of iiwi abundance, distribution, and population trends (Paxton *et al.* 2013); numerous studies that provide information on the particularly high mortality of iiwi in response to avian malaria; and recent models examining the current relationship between climate and malaria, as well as the likely future consequences of climate change for iiwi and other Hawaiian forest birds (including Benning *et al.* 2002, Fortini *et al.* 2013, and Liao *et al.* 2015). Our review also reflects the expert opinion of the species' status report team members, and input provided by specialists familiar with avian malaria and iiwi genetics. We direct the reader to the draft iiwi species status report for our detailed evaluation of the biological status of the iiwi and the influences that may affect its continued existence.

Once one of the most common of the native Hawaiian forest birds, the iiwi has declined across large portions of its range, has been extirpated or nearly so from some islands, and many of the few remaining populations are declining. The iiwi's range is contracting upslope in most areas, and population declines and range contraction are concurrent with increasing prevalence of avian malaria. Clear evidence exists that the iiwi is highly susceptible to avian malaria, and that the prevalence of this disease is moving upslope in Hawaiian forests correlated with temperature increases associated with global climate change. The evidence suggests this disease and its trend of increasing prevalence at increasing elevation are the chief drivers of observed iiwi population declines and range contraction. Although habitat management to reduce breeding habitat for mosquitoes may have slowed the decline of iiwi and other forest birds to some degree in a few locations, no landscape-scale plans or strategies exist for eradicating mosquitoes or otherwise reducing the risk posed by avian malaria to iiwi and other susceptible Hawaiian bird species.

The documented trend of temperature increase, which is greatest at high elevation, is projected to continue at least through the 21st century. The transmission of avian malaria is currently limited or absent at higher elevations, where temperatures are too cool for the development of the malaria parasite. However, multiple independent modeling efforts consistently project that the prevalence of avian malaria will continue to increase upslope with increasing temperature, eventually eliminating most or all remaining disease-free habitat in the islands. These models, which incorporate data on the distribution of forest birds and on disease transmission, project moderate to high avian malaria transmission at the highest elevations of the iiwi's current range by the end of this century, with some significant effects predicted within the next few decades. As a consequence, significant declines in iiwi populations are projected, on the order of 70 to 90 percent by 2100, depending on the future climate scenario.

The impacts of other stressors to iiwi, such as loss or degradation of native forest by nonnative species (disturbance or destruction by feral ungulates; invasion by nonnative plants; impacts from nonnative pathogens such as ROD), predation by rats and other nonnative predators, and small-population stressors such as demographic stochasticity and loss of genetic diversity, have not been well documented or quantified. However, any stressors that result in further degradation or fragmentation of the forests on which the iiwi relies for foraging and nesting, or result in increased mortality or reduced reproductive success, are likely to exacerbate the impacts of disease on the species. The effects of climate change are likely to exacerbate these other stressors to iiwi as well.

As the number and distribution of iiwi continue to decline, the remaining small, isolated populations become increasingly vulnerable to environmental catastrophes and demographic stochasticity; this will particularly be the case should all remaining iiwi become restricted to Hawaii Island, as some modeling scenarios suggest. Ninety percent of the rangewide iiwi population is already restricted to Hawaii Island, where ROD has recently emerged as a fast-moving threat to the already limited ohia forest habitat required by iiwi.

In consideration of all of this information, we conclude that avian malaria, as exacerbated by the ongoing effects of climate change, poses a threat to iiwi, and the action of these stressors places the species as a whole at an elevated risk of extinction. Because the vast majority of the remaining iiwi population is restricted to the island of Hawaii, we consider rapid ohia death to pose a threat to the future viability of iiwi as well, as it may result in major loss of forest within the iiwi's remaining range on that island.

Determination

Section 4 of the Act (16 U.S.C. 1533), and its implementing regulations in title 50 of the Code of Federal Regulations at 50 CFR part 424, set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, we may list a species based on (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. Listing actions may be warranted based on any of the above threat factors, singly or in combination.

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the iiwi. As described in the species status report, in considering the five listing factors, we evaluated many potential stressors to iiwi, including but not limited to: Stressors that may affect the extent or quality of the bird's ohia forest habitat (ohia dieback, ohia rust, ROD, drought, fires, volcanic eruptions, nonnative plants, and feral ungulates), introduced diseases, predation by introduced mammals, competition with nonnative birds, ectoparasites, climate change, and the effects of small population size. Based on our assessment, disease—particularly avian malaria—is the primary driver in the ongoing declines in abundance and range of iiwi, and climate change substantially exacerbates the impact of disease on the species and will continue to do so into the future.

The greatest current threat to iiwi comes from exposure to introduced diseases carried by nonnative mosquitoes (Factor C). Avian malaria in particular has been clearly demonstrated to result in extremely high mortality of iiwi; avian pox may have significant effects on iiwi as well, although the evidence is not as clear or measurable. These diseases have resulted in significant losses of the once ubiquitous iiwi, which remains highly susceptible and, as of present, shows no clear indication of having developed substantial resistance or tolerance. Exposure to these diseases is ongoing, and is expected to increase as a consequence of the effects of climate change (Factor E).

Several climate model projections predict that continued increases in temperature due to climate change will greatly exacerbate the impacts of avian diseases upon iiwi due to loss of disease-free habitat. Several iiwi populations, including those on Molokai, Kauai, West Maui, and possibly Oahu—all lower in elevation than East Maui and Hawaii Island—are already extremely small in size or are represented by only a few occasional individuals, probably owing to the loss of disease-free habitat. Iiwi may face extirpation in these places due to the inability to overcome the effects of malaria. The species is expected to first become restricted to Hawaii Island, perhaps by the year 2040. By the end of the century, the existence of iiwi is uncertain due to the ongoing loss of disease-free habitat; the potential impacts to ohia forests from ROD and other stressors could increase the risk to iiwi as well. These threats to iiwi are ongoing, most are rangewide, are expected to increase in the future, and are significant because they will likely result in increased mortality of iiwi and loss of remaining populations, as well as further decreases in the availability and amount of disease-free habitat at high elevation. As discussed above, current regulatory mechanisms are not sufficient to address these threats (Factor D).

Some of the other stressors contributed to past declines in iiwi, or negatively affect the species or its habitat today; however, of the additional stressors considered, we found no information to suggest that any is currently a key factor in the ongoing declines in abundance and range of iiwi, although they may be contributing or exacerbating factors. Habitat loss and alteration (Factor A) caused by nonnative plants and ungulates is occurring rangewide, has resulted in degraded ohia forest habitat, and is not likely to be reduced in the future. While ohia forests still comprise the majority of native forest cover on most of the main Hawaiian Islands, climate change and its likely effects, such as increased drought frequency, are expected to further affect ohia forest habitat and compound other impacts, including the spread of invasive plants and perhaps the severity and frequency of ohia diseases. In particular, the rapidly spreading and highly lethal disease, rapid ohia death, poses an increasing risk to the native forest habitat of iiwi on Hawaii Island, where 90 percent of remaining iiwi occur. This emerging factor has the potential to exacerbate avian disease and other stressors in the future by accelerating the loss and degradation of iiwi's habitat. If this disease becomes widespread, it could further increase the vulnerability of the iiwi by eliminating the native forest it requires for foraging and nesting.

We do not have any information that overutilization for commercial, recreational, scientific, or educational purposes (Factor B) poses a threat to iiwi.

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.'' We considered whether the iiwi meets either of these definitions, and find that the iiwi meets the definition of a threatened species for the reasons described below.

We considered whether the iiwi is presently in danger of extinction and determined that proposing endangered status is not appropriate. Although the species has experienced significant reductions in both abundance and range, at the present time the species is still found on multiple islands and the species as a whole still occurs in relatively high numbers. Additionally, disease-free habitat currently remains available for iiwi in high-elevation ohia forests with temperatures sufficiently cool to prevent the development of the malarial parasite. For these reasons, we do not consider the iiwi to be in imminent danger of extinction, although this formerly common species has experienced threats of such severity and magnitude that it has now become highly vulnerable to continued decline and local extirpation, such that the species is likely to become endangered within the foreseeable future, as explained below.

Based on our review of the best scientific and commercial data available, we expect that additional iiwi population declines will be observed range-wide within the next few decades, and indications are that declines are already taking place on Kauai and in some Maui and Hawaii Island populations as a result of increasing temperatures and consequent exposure to avian malaria at some elevations where the disease is uncommon or absent today. Iiwi has a very high observed mortality rate when exposed to avian malaria, and the warming effects of climate change will result in increased exposure of the remaining iiwi populations to this disease, especially at high elevation. Peer-reviewed results of modeling experiments project that malaria transmission rates and effects on iiwi populations will begin increasing at high elevations by mid-century, and

result in population declines of 70 to 90 percent by the year 2100. We thus conclude that the iiwi is likely to become in danger of extinction throughout all of its range within the foreseeable future. Because the iiwi is not in imminent danger of extinction, but is likely to become in danger of extinction within the foreseeable future, it meets the definition of a threatened species. Therefore, on the basis of the best available scientific and commercial information, we propose listing the iiwi as threatened in accordance with sections 3(20) and 4(a)(1) of the Act.

Under the Act and our implementing regulations, a species may warrant listing if it is endangered or threatened throughout all or a significant portion of its range. Because we have determined that the iiwi is threatened throughout all of its range, no portion of its range can be ''significant'' for purposes of the definitions of ''endangered species'' and ''threatened species.'' See the Final Policy on Interpretation of the Phrase ''Significant Portion of Its Range'' in the Endangered Species Act's Definitions of ''Endangered Species'' and ''Threatened Species'' (79 FR 37577; July 1, 2014).

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened species under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition from listing will result in public awareness and conservation by Federal, State, Tribal, and local agencies, private organizations, and individuals. The Act encourages cooperation with the States and other countries and calls for recovery actions to be carried out for listed species. The protection required by Federal agencies and the prohibitions against certain activities are discussed, in part, below.

The primary purpose of the Act is the conservation of endangered and threatened species and the ecosystems upon which they depend. The ultimate goal of such conservation efforts is the recovery of these listed species, so that they no longer need the protective measures of the Act. Subsection 4(f) of the Act calls for the Service to develop and implement recovery plans for the conservation of endangered and threatened species. The recovery planning process involves the identification of actions that are necessary to halt or reverse the species' decline by addressing the threats to its survival and recovery. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

Recovery planning includes the development of a recovery outline shortly after a species is listed and preparation of a draft and final recovery plan. The recovery outline guides the immediate implementation of urgent recovery actions and describes the process to be used to develop a recovery plan. Revisions of the plan may be done to address continuing or new threats to the species, as new substantive information becomes available. The recovery plan also identifies recovery criteria for review of when a species may be ready for downlisting or delisting, and methods for monitoring recovery progress. Recovery plans also establish a framework for agencies to coordinate their recovery efforts and provide estimates of the cost of implementing recovery tasks. Recovery teams (composed of species experts, Federal and State agencies, nongovernmental organizations, and other qualified persons) are often established to develop recovery plans. When completed, the recovery outline, draft recovery plan, and the final recovery plan for iiwi will be available on our Web site (*http://www.fws.gov/endangered*), or from our Pacific Islands Fish and Wildlife Office (see **FOR FURTHER INFORMATION CONTACT**). The public will have an opportunity to comment on the draft recovery plan, and the Service will consider all information presented during the public comment period prior to approval of the plan.

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, Tribes, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (*e.g.,* restoration of native vegetation), research, captive propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their range may occur primarily or solely on non-Federal lands. To achieve recovery of these species requires cooperative conservation efforts on private, State, and Tribal lands. If this species is listed, funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost-share grants for non-Federal landowners, the academic community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the State of Hawaii would be eligible for Federal funds to implement management actions that promote the protection or recovery of the iiwi. Information on our grant programs that are available to aid species recovery can be found at: *http://www.fws.gov/grants.*

Although the iiwi is only proposed for listing under the Act at this time, please let us know if you are interested in participating in recovery efforts for this species. Additionally, we invite you to submit any new information on this species whenever it becomes available and any information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as an endangered or threatened species and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with the Service.

Federal agency actions within the iiwi's habitat that may require a conference or consultation or both as described in the preceding paragraph, include but are not limited to, management and any other landscape-altering activities on Federal lands administered by the U.S. Fish and Wildlife Service, U.S. Forest Service, and National Park Service; actions within the jurisdiction of the Natural Resources Conservation Service, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and branches of the Department of Defense (DOD); and activities funded or authorized under the Federal Highway Administration, Partners for Fish and Wildlife Program, and DOD construction activities related to training or other military missions.

Under section 4(d) of the Act, the Service has discretion to issue regulations that we find necessary and advisable to provide for the conservation of threatened species. We are not proposing to issue a special rule

pursuant to section 4(d) for this species. Therefore, the provisions of 50 CFR 17.31(a) and (b) would apply. These regulatory provisions apply the prohibitions of section 9(a)(1) of the Act to threatened wildlife and make it illegal for any person subject to the jurisdiction of the United States to take (which includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt any of these) threatened wildlife within the United States or on the high seas. In addition, it is unlawful to import; export; deliver, receive, carry, transport, or ship in interstate or foreign commerce in the course of commercial activity; or sell or offer for sale in interstate or foreign commerce any listed species. It is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to employees of the Service, the National Marine Fisheries Service, other Federal land management agencies, and State conservation agencies.

We may issue permits to carry out otherwise prohibited activities involving threatened wildlife under certain circumstances. Regulations governing permits are codified at 50 CFR 17.32. With regard to threatened wildlife, a permit may be issued for the following purposes: For scientific purposes, to enhance the propagation or survival of the species, or for incidental take in connection with otherwise lawful activities. There are also certain statutory exemptions from the prohibitions, which are found in sections 9 and 10 of the Act.

It is our policy, as published in the **Federal Register** on July 1, 1994 (59 FR 34272), to identify to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of a proposed listing on proposed and ongoing activities within the range of the species proposed for listing. Based on the best available information, actions that may result in a violation of section 9 include but are not limited to:

(1) Development of land or the conversion of native ohia forest, including the construction of any infrastructure (*e.g.,* roads, bridges, railroads, pipelines, utilities) in occupied iiwi habitat;

(2) Unauthorized collecting, handling, possessing, selling, delivering, carrying, or transporting of the species, including import or export across State lines and international boundaries, except for properly documented antique specimens of this species at least 100 years old, as defined by section 10(h)(1) of the Act;

(3) Introduction of nonnative species that compete with or prey upon the iiwi, such as the new introduction of nonnative predators or competing birds to the State of Hawaii; and

(4) Certain research activities: Collection and handling of iiwi for research that may result in displacement or death of individuals.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the Pacific Islands Fish and Wildlife Office, Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Required Determinations

Clarity of the 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:

(1) Be logically organized;

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

(3) Use clear language rather than jargon;

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

(5) 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 (42 U.S.C. 4321 et seq.)

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq.*), need not be prepared in connection with listing a species as an endangered or threatened species under the Endangered Species Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

References Cited

A complete list of references cited in this rulemaking is available on the Internet at *http://www.regulations.gov* at Docket No. FWS–R1–ES–2016–0057 and upon request from the Pacific Islands Fish and Wildlife Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this proposed rule are the staff members of the Pacific Islands Fish and Wildlife Office.

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.

■ 2. In § 17.11(h), add an entry for ''Iiwi (honeycreeper)'' to the List of Endangered and Threatened Wildlife in alphabetical order under BIRDS to read as set forth below:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Common name	Scientific name	Where listed	Status	Listing citations and applicable rules
*	*	*	*	*
BIRDS				

Common name	Scientific name	Where listed	Status	Listing citations and applicable rules
* *	*	* *	*	* *
Iiwi (honeycreeper)	*Drepanis coccinea*	Wherever found	T	[**Federal Register** citation when published as a final rule].
* *	*	* *	*	* *

Dated: September 2, 2016.

Bryan Arroyo,

Acting Director, U.S. Fish and Wildlife Service.

[FR Doc. 2016–22592 Filed 9–19–16; 8:45 am]

BILLING CODE 4333–15–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 648

RIN 0648–XE888

Mid-Atlantic Fishery Management Council (MAFMC); New England Fishery Management Council (NEFMC); Public Hearings

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

ACTION: Notice of public hearings; request for comments.

SUMMARY: The Mid-Atlantic and New England Fishery Management Councils are developing an omnibus amendment to allow for industry-funded monitoring. This amendment includes omnibus alternatives that would modify all the fishery management plans managed by the Mid-Atlantic and New England Fishery Management Councils to allow for standardized and streamlined development of future industry-funded monitoring programs. Additionally, this amendment includes alternatives for new industry-funded monitoring programs for the Atlantic Herring Fishery Management Plan and the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan.

DATES: Written comments on the Industry-Funded Monitoring Omnibus Amendment (IFM Amendment) will be accepted from Friday, September 23, 2016, until Monday, November 7, 2016.

ADDRESSES: You may submit written comments by any of the following methods:

• *Electronic Submission:* Submit all electronic public comments via the Federal e-Rulemaking Portal. Go to *www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2016-0125,* click the ''Comment Now!'' icon, complete the required fields, and enter or attach your comments;

• *Mail:* John K. Bullard, Regional Administrator, NMFS, Greater Atlantic Regional Fisheries Office, 55 Great Republic Drive, Gloucester, MA 01930. Mark the outside of the envelope ''Comments on IFM Omnibus Amendment;''

• Comments may also be provided verbally at any of the five public hearings. See **SUPPLEMENTARY INFORMATION** for dates, times, and locations.

FOR FURTHER INFORMATION CONTACT: Daniel Luers, Fishery Management Specialist, (978) 282–8457. The IFM Amendment will be available on the NMFS Greater Atlantic Regional Office Web site (*www.greateratlantic.fisheries.noaa.gov*) and the Council Web sites (*www.mafmc.org, www.nefmc.org*) starting on September 23, 2016. In addition, please visit any of the Web sites for details on meeting locations, webinar listen-in access, and public hearing materials.

SUPPLEMENTARY INFORMATION: The Mid-Atlantic and the New England Fishery Management Councils have initiated an amendment to allow for industry-funded monitoring in all of the fishery management plans managed by the Councils. The industry-funded monitoring would be used to assess the amount and type of catch, more precisely monitor annual catch limits, and provide other information for management. This increased monitoring would be above coverage required under the standardized bycatch reporting methodology, the Endangered Species Act, or the Marine Mammal Protection Act. The amount of available Federal funding to support additional monitoring and legal constraints associated with sharing the costs of industry-funded monitoring between NMFS and the fishing industry have recently prevented NMFS from approving proposals for industry-funded monitoring in some fisheries.

The Omnibus Alternatives consider the following for new industry-funded monitoring programs: (1) Standard cost responsibilities associated with industry-funded monitoring for NMFS and the fishing industry; (2) a process for fishery management plan-specific industry-funded monitoring to be implemented via a future framework adjustment action; (3) standard administrative requirements for industry-funded monitoring service providers; (4) a process to prioritize industry-funded monitoring programs in order to allocate available Federal resources across all fishery management plans; and (5) a process for monitoring set-aside programs to be implemented via a future framework adjustment action.

This amendment also includes industry-funded monitoring coverage target alternatives for the Atlantic herring and mackerel fisheries. Specifically, this amendment considers a variety of monitoring types and coverage targets to address the following goals: (1) Accurate estimates of catch (retained and discarded); (2) accurate catch estimates for incidental species for which catch caps apply; and (3) effective and affordable monitoring for the herring and mackerel fisheries.

Public Hearings

The dates and locations of the public hearings are as follows.

• *Tuesday, October 4, 2016, 6–8 p.m.,* Greater Atlantic Regional Fisheries Office, 55 Great Republic Drive, Gloucester, MA 01930, telephone: (978) 281–9300;

• *Monday, October 17, 2016, 5–7 p.m.,* Internet webinar, connection information to be available at (*http://mafmc.adobeconnect.com/ifm-hearing/*) or by contacting NMFS or either Council at the above addresses.

• *Thursday, October 20, 2016, 6–8 p.m.,* Double Tree by Hilton Hotels, 363 Maine Mall Road, Portland, ME 04106, telephone: (207) 775–6161;

• *Thursday, October 27, 2016, 5–7 p.m.,* Congress Hall, 200 Congress Place, Cape May, NJ 08204, telephone: (888) 944–1816;

• *Tuesday, November 1, 2016, 6–8 p.m.,* Corless Auditorium, Watkins Building University of Rhode Island Graduate School of Oceanography, 218 Ferry Road, Narragansett, RI 02874.