Inflation Adjustment Act. This increase is not anticipated to have impacts on the quality of the human environment. The ''general penalty'' is applicable to other violations, such as a manufacturer's failure to submit pre-model year and mid-model year reports to NHTSA on whether they will comply with the average fuel economy standards. These violations are not directly related to on-road fuel economy, and therefore the penalties are not anticipated to directly or indirectly affect fuel use or emissions.

iv. Agencies and Persons Consulted

NHTSA and DOT have consulted with OMB as described earlier in this proposal. NHTSA and DOT have not consulted with any other agencies in the development of this proposal.

v. Conclusion

NHTSA has reviewed the information presented in this Draft EA and concludes that the proposed action and alternatives would have no impact or a small positive impact on the quality of the human environment. The preferred alternative is anticipated to have no impact on the quality of the human environment, as it would result in no change, as compared to current law, to the civil penalty amount for failure to meet fuel economy targets. Further, the proposed change to the ''general penalty'' is not anticipated to affect on-road emissions. Any of the impacts anticipated to result from the alternatives under consideration are not expected to rise to a level of significance that necessitates the preparation of an Environmental Impact Statement. Based on the information in this Draft EA and assuming no additional information or changed circumstances, NHTSA expects to issue a Finding of No Significant Impact (FONSI). Such a finding will not be made before careful review of all public comments received. A Final EA and a FONSI, if appropriate, will be issued as part of the final rule.

6. Executive Order 12778 (Civil Justice Reform)

This rule does not have a retroactive or preemptive effect. Judicial review of a rule based on this proposal may be obtained pursuant to 5 U.S.C. 702.

7. Paperwork Reduction Act

In accordance with the Paperwork Reduction Act of 1980, NHTSA states that there are no requirements for information collection associated with this rulemaking action.

8. Privacy Act

Please note that anyone is able to search the electronic form of all comments received into any of DOT's dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, etc.). You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (Volume 65, Number 70; Pages 19477–78), or you may visit *http://dms.dot.gov.*

9. Executive Order 13771

This proposed rule is expected to be a deregulatory action under Executive Order 13771, although NHTSA, at this point, has not been able to quantify potential cost savings.

Proposed Regulatory Text

List of Subjects in 49 CFR Part 578

Imports, Motor vehicle safety, Motor vehicles, Rubber and rubber products, Tires, Penalties.

In consideration of the foregoing, 49 CFR part 578 is proposed to be amended as set forth below.

PART 578—CIVIL AND CRIMINAL PENALTIES

■ 1. The authority citation for 49 CFR part 578 is revised to read as follows:

Authority: Pub. L. 101–410, Pub. L. 104–134, Pub. L. 109–59, Pub. L. 114–74, Pub. L. 114–94, 49 U.S.C. 30165, 30170, 30505, 32308, 32309, 32507, 32709, 32710, 32902, 32912, and 33115; delegation of authority at 49 CFR 1.81, 1.95.

■ 2. Amend § 578.6 by revising paragraph (h) to read as follows:

§ 578.6 Civil penalties for violations of specified provisions of Title 49 of the United States Code.

* * * * *

(h) *Automobile fuel economy.* (1) A person that violates 49 U.S.C. 32911(a) is liable to the United States Government for a civil penalty of not more than $41,484 for each violation. A separate violation occurs for each day the violation continues.

(2) Except as provided in 49 U.S.C. 32912(c), a manufacturer that violates a standard prescribed for a model year under 49 U.S.C. 32902 is liable to the United States Government for a civil penalty of $5.50 multiplied by each .1 of a mile a gallon by which the applicable average fuel economy standard under that section exceeds the average fuel economy—

(i) Calculated under 49 U.S.C. 32904(a)(1)(A) or (B) for automobiles to which the standard applies manufactured by the manufacturer during the model year;

(ii) Multiplied by the number of those automobiles; and

(iii) Reduced by the credits available to the manufacturer under 49 U.S.C. 32903 for the model year.

* * * * *

Issued in Washington, DC, under authority delegated in 49 CFR 1.81, 1.95, and 501.5

Heidi R. King,

Deputy Administrator.

[FR Doc. 2018–06550 Filed 3–30–18; 8:45 am]

BILLING CODE 4910–59–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R1–ES–2017–0050; FXES11130900000C6–189–FF09E42000]

RIN 1018–BC10

Endangered and Threatened Wildlife and Plants; Reclassifying the Hawaiian Goose From Endangered to Threatened With a 4(d) Rule

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: Under the authority of the Endangered Species Act of 1973, as amended (Act), we, the U.S. Fish and Wildlife Service (Service), propose to reclassify the Hawaiian goose (nene) (*Branta* (=*Nesochen*) *sandvicensis*) from endangered to threatened, and we propose a rule under section 4(d) of the Act to enhance conservation of the species through range expansion and management flexibility. This proposal is based on a thorough review of the best available scientific data, which indicate that the species' status has improved such that it is not currently in danger of extinction throughout all or a significant portion of its range. We also propose to correct the Federal List of Endangered and Threatened Wildlife to reflect that *Nesochen* is not currently a scientifically accepted generic name for this species, and to acknowledge the Hawaiian name ''nene'' as an alternative common name. We seek information, data, and comments from the public on this proposal.

DATES: We will accept comments received or postmarked on or before June 1, 2018. Please note that if you are using the Federal eRulemaking Portal (see **ADDRESSES**), the deadline for submitting an electronic comment is 11:59 p.m. Eastern Time on this date.

We must receive requests for public hearings, in writing, at the address shown in the **FOR FURTHER INFORMATION CONTACT** section by May 17, 2018.

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–2017–0050, 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!'' Please ensure that you have found the correct rulemaking before submitting your comment.

(2) *By hard copy:* Submit by U.S. mail or hand-delivery to: Public Comments Processing, Attn: FWS–R1–ES–2017–0050, U.S. Fish and Wildlife Service, MS: BPHC, 5275 Leesburg Pike, Falls Church, VA 22041–3808.

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

Document availability: The proposed rule is available on *http://www.regulations.gov.* In addition, the supporting file for this proposed rule will be available for public inspection, by appointment, during normal business hours, at the Pacific Islands Fish and Wildlife Office, 300 Ala Moana Boulevard, Room 3–122, Honolulu, HI 96850; telephone 808–792–9400.

FOR FURTHER INFORMATION CONTACT: Mary Abrams, Field Supervisor, telephone: 808–792–9400. Direct all questions or requests for additional information to: U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, 300 Ala Moana Boulevard, Room 3–122, Honolulu, HI 96850. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Relay Service at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Act, a species may warrant reclassification from endangered to threatened if it no longer meets the definition of endangered (in danger of extinction). The Hawaiian goose (nene) is listed as endangered, and we are proposing to reclassify nene as threatened because we have determined it is no longer in danger of extinction. Reclassifications can only be made by issuing a rulemaking. Furthermore, changes to the take prohibitions in section 9 of the Act, such as those we are proposing for this species under a section 4(d) rule, can only be made by issuing a rulemaking.

The basis for our action. Under the Act, we may determine that a species is an endangered or threatened species based on any one or a combination 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 nene is no longer at risk of extinction and, therefore, does not meet the definition of endangered, but is still affected by the following current and ongoing threats to the extent that the species meets the definition of a threatened species under the Act:

- Habitat destruction and modification due to urbanization, agricultural activities, nonnative ungulates, and nonnative vegetation;
- Predation by nonnative mammals such as mongooses, cats, dogs, rats, and pigs;
- Diseases such as toxoplasmosis, avian pox, avian botulism, avian malaria, omphalitis, West Nile virus, and avian influenza;
- Human activities such as motor vehicle collisions, collisions at wind energy facilities, artificial hazards (*e.g.,* fences, fishing nets, erosion control material), feeding and habituation, and recreational activities (*e.g.,* human visitation at parks and refuges); and
- Stochastic events such as drought and hurricanes.

Environmental effects from climate change are likely to exacerbate the impacts of drought and hurricanes, and flooding of nene habitat due to sea level rise may become a threat in the future. Existing regulatory mechanisms and conservation efforts do not effectively address the introduction and spread of nonnative plants and animals and other threats to the nene.

We are proposing to promulgate a section 4(d) rule. We are proposing to modify the normal take prohibitions to allow certain activities conducted on lands where nene occur or where they would occur if we were to reintroduce them to areas of their historical distribution. Under the proposed 4(d) rule, take of nene caused by actions resulting in intentional harassment that is not likely to cause direct injury or mortality, control of introduced predators, or habitat enhancement beneficial to nene would be not be prohibited. The proposed 4(d) rule identifies these activities to provide protective mechanisms to landowners and their agents so that they may continue with certain activities that are not anticipated to cause direct injury or mortality to nene and that will facilitate the conservation and recovery of nene. Federally implemented, funded, or permitted actions would continue to be subject to the requirements of section 7 of the Act and eligible for an incidental take exemption through section 7(o).

Information Requested

Public Comments

We intend that any final action resulting from this proposal will be based on the best available scientific and commercial data and will be as accurate and as effective as possible. Therefore, we invite governmental agencies, the scientific community, industry, Native Hawaiian organizations, or any other interested parties to submit comments or recommendations concerning any aspect of this proposed rule. Comments should be as specific as possible. We are specifically requesting comments on:

(1) The appropriateness of our proposal to reclassify nene from endangered to threatened.

(2) The factors that are the basis for making a reclassification determination for a species under section 4(a) of the Act (16 U.S.C. 1531 *et seq.*), which are:

(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.

(3) Biological, commercial trade, or other relevant data concerning any threats (or lack thereof) to the nene 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 this species.

(5) Any information on the biological or ecological requirements of the species and ongoing conservation measures for the species and its habitat.

(6) Any information on foreseeable changes to State land use or County land use planning within the

boundaries of the nene's range that may affect future habitat availability for the nene.

(7) The appropriateness of a rule under section 4(d) of the Act to allow certain actions to take nene, and any additional actions that should be considered for authorization.

(8) The appropriateness of a rule under section 4(d) of the Act to allow interstate commerce for nene in captivity outside Hawaii.

(9) Any additional information pertaining to the promulgation of a rule under section 4(d) of the Act to allow certain actions that may take nene.

(10) Relevant data on climate change and potential impacts to the nene and its habitat.

We will take into consideration all comments and any additional information we receive. Such communications may lead to a final rule that differs from this proposal. All comments, including commenters' names and addresses, if provided to us, will become part of the supporting record. 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 an endangered or a threatened species must be made ''solely on the basis of the best scientific and commercial data available.''

You may submit your comments and materials concerning the 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 website. 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)(E) of the Act provides for a public hearing on this proposal, if requested. We must receive a request for a public hearing, in writing, at the address shown in **FOR FURTHER INFORMATION CONTACT** by the date specified in **DATES**. We will schedule a public hearing on this proposal, if requested, and announce the date, time, and place of the hearing, as well as how to obtain reasonable accommodations, in the **Federal Register** at least 15 days before the hearing.

Peer Review

In accordance with our policy, ''Notice of Interagency Cooperative Policy for Peer Review in Endangered Species Act Activities,'' which published in the **Federal Register** on July 1, 1994 (59 FR 34270), we will seek the expert opinion of at least three appropriate independent specialists regarding scientific data and interpretations contained in this proposed rule. We will send copies of this proposed rule to the peer reviewers immediately following publication in the **Federal Register.** This assessment will be completed during the public comment period. The purpose of such review is to ensure that our decisions are based on scientifically sound data, assumptions, and analysis. Accordingly, the final decision may differ from this proposal.

Background

Previous Federal Action

On March 11, 1967, the Secretary of the Interior identified nene as an endangered species (32 FR 4001), under the authority of the Endangered Species Preservation Act of 1966 (80 Stat. 926; 16 U.S.C. 668aa(c)). On March 8, 1969, the Secretary of the Interior again identified nene as an endangered species (34 FR 5034) under section 1(c) of the Endangered Species Preservation Act of 1966. On October 13, 1970, the Director of the Bureau of Sport Fisheries and Wildlife listed nene as an endangered species (35 FR 16047) under the authority of the new regulations implementing the Endangered Species Conservation Act (ESCA) of 1969. Species listed as endangered under the ESCA of 1969 were automatically included in the List of Endangered and Threatened Wildlife when the Endangered Species Act (Act) was enacted in 1973.

On February 14, 1983, the Service released the Nene Recovery Plan (USFWS 1983). On September 24, 2004, the Service published for comment (69 FR 57356) the Draft Revised Recovery Plan for Nene (USFWS 2004). The Draft Revised Recovery Plan presented additional information on the status of the species, factors affecting species recovery, and an updated framework for species recovery.

A 5-year status review of the nene was completed on September 30, 2011 (USFWS 2011a). This review concluded that nene continued to meet the definition of an endangered species under the Act, and recommended no change in the classification of nene as endangered. However, current information indicates the species is not in danger of extinction and may warrant reclassification from endangered to threatened.

Species Information

The original rules identifying nene as an endangered species (32 FR 4001, 34 FR 5034, 35 FR 16047) listed its scientific name as *Branta sandvicensis* and its common name as ''Hawaiian goose (Nene).'' Currently the Federal List of Endangered and Threatened Wildlife (50 CFR 17.11) gives its scientific name as *Branta* (=*Nesochen*) *sandvicensis,* and its common name as ''Hawaiian goose,'' without indicating ''nene'' as an alternative common name. This species was once placed in the genus *Nesochen* by the American Ornithologists' Union (AOU) (1982); however, it was subsequently reassigned to the genus *Branta* (AOU 1993) based on analysis of mitochondrial DNA by Quinn *et al.* (1991). Thus, *Branta sandvicensis* is the only currently accepted scientific name. The common name ''Hawaiian goose'' continues to be accepted by the ornithological community (AOU 1998). However, the Hawaiian common name ''nene'' is also widely familiar to the public and is, for example, frequently referenced in governmental documents within the State of Hawaii (*e.g.,* Hawaii Department of Land and Natural Resources (DLNR) 2005). Therefore, we are including in this document a proposal to return to the scientific and common names that were used in the original listing rules, with ''nene'' as an accepted alternative common name.

The nene is a medium-sized goose with an overall length of approximately 25 to 27 inches (in) (63 to 65 centimeters (cm)) (Banko *et al.* 1999, p. 2). The plumage of both sexes is similar (Banko *et al.* 1999, p. 2). This species is

adapted to a terrestrial and largely non-migratory lifestyle in the Hawaiian Islands with limited freshwater habitat (Banko *et al.* 1999, p. 1). Adaptations to a terrestrial lifestyle include increased hindlimb size, decreased forelimb size, more upright posture, and reduced webbing between the toes compared to other species of *Branta* (Banko *et al.* 1999, p. 1; Olson and James 1991, p. 42). Compared to the related Canada goose (*Branta canadensis*), nene wings are about 16 percent smaller in size and their flight is not as strong (Banko *et al.* 1999, p. 9). Nene are capable of inter-island and high altitude flight, but they do not migrate out of the Hawaiian archipelago (Banko *et al.* 1999, p. 9).

Nene currently use shrublands, grasslands, sparsely vegetated lava flows, and human-altered habitats ranging from coastal to alpine environments (Wilson and Evans 1890–1899, p. 186; Munro 1944, pp. 41–42; Scott *et al.* 1986, p. 77; Banko *et al.* 1999, pp. 4–5). In the grassy shrublands and sparsely vegetated lava flows on the islands of Hawaii and Maui, nene nest, raise their young, forage, and molt (Banko *et al.* 1999, p. 2). Some nene populations on these islands move seasonally from montane foraging grounds to lowland or midelevation nesting areas (Banko *et al.* 1999, p. 2). On the island of Kauai, nene are primarily found using lowland habitats such as coastal wetlands at Hanalei National Wildlife Refuge (NWR), with the exception of the Na Pali Coast (USFWS 2004, pp. 15, 17).

Nene are currently known to occupy various habitat and vegetation community types ranging from coastal dune vegetation and nonnative grasslands (such as golf courses, pastures, and rural areas) to sparsely vegetated low- and high-elevation lava flows, mid-elevation native and nonnative shrubland, cinder deserts, native alpine grasslands and shrublands, and open and nonnative alpine shrubland-woodland community interfaces (Banko *et al.* 1999, pp. 4–6). On the island of Kauai, nene also use a number of coastal wetland areas including taro loi (ponds) (A. Marshall 2017a, pers. comm.). Nene are browsing-grazers; the composition of their diet depends largely on the vegetative composition of their surrounding habitats, and they appear to be opportunistic in their choice of food plants as long as they meet nutritional demands (Banko *et al.* 1999, pp. 6–8; Woog and Black 2001, p. 324). Nene may exhibit seasonal movements to grasslands in periods of low berry production and wet conditions that produce grass with a high water content and resultant higher protein content. The sites currently used by nene for nesting range from coastal lowland to subalpine zones and demonstrate considerable variability in features (Banko *et al.* 1999, pp. 4–5). However, the current distribution of nene nesting sites has been influenced by the location of release sites of captive-bred individuals (Hawaii Division of Forestry and Wildlife (DOFAW) 2012, pp. 9–10). Historical reports from the island of Hawaii indicate that nene bred and molted primarily in the lowlands during winter months and moved upslope in the hotter and drier summer months (Henshaw 1902, p. 105; Munro 1944, pp. 41–42; Banko 1988, p. 35). Reproductive success is relatively low in upland habitats on the islands of Hawaii and Maui, and higher in lowland habitat on Kauai (Banko *et al.* 1999, p. 19).

Nene have an extended breeding season with eggs being laid from August to April (Banko *et al.* 1999, p. 12). Nesting peaks in December, and most goslings hatch from December to January (Banko *et al.* 1999, p.12). On the island of Kauai, nene frequently nest earlier (A. Marshall 2017a, pers. comm.). Nene nest on the ground, in a shallow scrape in the dense shade of a shrub or other vegetation. A clutch typically contains three to five eggs, and incubation lasts for 29 to 32 days (Banko *et al.* 1999, pp. 14–15). Once hatched, the young may remain in the nest for 1 to 2 days; all hatchlings depart the nest after the last egg is hatched (Banko *et al.* 1999, p. 12). Fledging (*i.e.,* development of wing feathers large enough for flight) occurs at 10 to 12 weeks for captive birds, but may be later in the wild (Banko *et al.* 1999, p. 18). During molt, adults are flightless for a period of 4 to 6 weeks and generally attain their flight feathers at about the same time as their offspring. When flightless, goslings and adults are extremely vulnerable to predators such as cats, dogs, and mongoose. After molting and fledging, around June to September, family groups frequently congregate in post-breeding flocks, often far from nesting areas. Nene reach sexual maturity at 1 year of age, but usually do not form pair bonds until the second year. Females are highly philopatric (loyal to their place of birth) and nest near their natal area, while males more often disperse (Banko *et al.* 1999, p. 13).

Nene and one or more now extinct species of *Branta* are thought to have once been widely distributed among the main Hawaiian Islands. Fossil remains of nene have been found on Maui, Molokai, Lanai, and Kauai (Olson and James 1991, p. 43). However, nene fossils have not yet been found on Niihau (USFWS 2004, p. 6). On Oahu, all fossils appear to be of a related but extinct *Branta* form (Olson and James 1991, p. 43). The fossil record indicates the prehistoric (before 1778) range of nene was much greater than the historically observed range (Banko *et al.* 1999, p. 1). However, it is difficult to estimate original nene population numbers because the species composition and even gross structure of the vegetation before Polynesian arrival is poorly understood (USFWS 2004, p. 7). By 1960, fewer than 30 nene remained on Hawaii Island (Smith 1952, p. 1). The release of captive-bred nene, which began in 1960, helped save the species from imminent extinction (USFWS 2004, pp. 2–3). As a result of such programs, wild populations of nene now occur on four of the main Hawaiian Islands. As of 2016, the Statewide population of wild Hawaiian geese was estimated to have reached 2,855 individuals; the wild populations on the islands of Hawaii, Maui, Molokai, Kauai, and Oahu were estimated to have 1,095, 616, 35, 1,107, and 2 individuals, respectively (Nene Recovery Action Group [NRAG] 2017, unpublished). For maps of areas currently used by nene, see USFWS (2017).

Recovery Planning

Section 4(f) of the Act directs us to develop and implement recovery plans for the conservation and survival of endangered and threatened species unless we determine that such a plan will not promote the conservation of the species. Under section 4(f)(1)(B)(ii), recovery plans must, to the maximum extent practicable, include ''objective, measurable criteria which, when met, would result in a determination, in accordance with the provisions of [section 4 of the Act], that the species be removed from the list.'' However, revisions to the Lists of Endangered and Threatened Wildlife and Plants (adding, removing, or reclassifying a species) must be based on determinations made in accordance with sections 4(a)(1) and 4(b) of the Act. Section 4(a)(1) requires that the Secretary determine whether a species is endangered or threatened (or not) because of one or more of five threat factors. Section 4(b) of the Act requires that the determination be made ''solely on the basis of the best scientific and commercial data available.'' While recovery plans provide important guidance to the Service, States, and other partners on methods of enhancing conservation and minimizing threats to listed species, as well as measurable criteria against which to measure

progress towards recovery, they are not regulatory documents and cannot substitute for the determinations and promulgation of regulations required under section 4(a)(1) of the Act. A decision to revise the status of a species on, or to remove a species from, the Federal List of Endangered and Threatened Wildlife (50 CFR 17.11) is ultimately based on an analysis of the best scientific and commercial data then available to determine whether a species is no longer an endangered species or a threatened species, regardless of whether that information differs from the recovery plan.

There are many paths to accomplishing recovery of a species, and recovery may be achieved without all of the criteria in a recovery plan being fully met. For example, one or more criteria may be exceeded while other criteria may not yet be accomplished. In that instance, we may determine that the threats are minimized sufficiently and the species is robust enough to delist. In other cases, recovery opportunities may be discovered that were not known when the recovery plan was finalized. These opportunities may be used instead of methods identified in the recovery plan. Likewise, information on the species may be learned that was not known at the time the recovery plan was finalized. The new information may change the extent to which existing criteria are appropriate for recognizing recovery of the species. Recovery of a species is a dynamic process requiring adaptive management that may, or may not, follow all of the guidance provided in a recovery plan.

In 1983, the Service published the Nene Recovery Plan and concluded that the nene population in the wild was declining; however, the exact causes of the decline were not clearly understood (USFWS 1983, p. 24). The Statewide population was estimated at approximately 600 nene with 390 ± 120 nene on Hawaii Island and 112 nene on Maui. Based on the available data, the plan recommended the primary objective to delist the species was establishing a population of 2,000 nene on Hawaii Island and 250 nene on Maui, well distributed in secure habitat and maintained exclusively by natural reproduction (USFWS 1983, p. 24). The plan focused on maintenance of wild populations through annual releases of captive-reared birds to prevent further population decline, habitat management including control of introduced predators, and conducting research to determine factors preventing nene recovery and appropriate actions to overcome these factors. The plan also acknowledged that more research, biological data, and better population models would lead to a reassessment of recovery efforts and criteria for delisting the species.

On September 24, 2004, the Service published for comment (69 FR 57356) the Draft Revised Recovery Plan for Nene (USFWS 2004). The draft revised recovery plan presented additional information on the status of the species, factors affecting species recovery, and an updated framework for species recovery. At the time, the Statewide population was estimated at 1,300 nene with populations on Hawaii (349), Maui (336), Kauai (564), and Molokai (55). The primary factors affecting the nene recovery in the wild were: (1) Predation by introduced mammalian predators (Factor C), (2) inadequate nutrition (Factor E), (3) lack of lowland habitat (Factor A), (4) human-caused disturbance and mortality (Factor E), (5) behavioral issues (Factor E), (6) genetic issues (Factor E), and (7) disease (Factor C). The draft revised recovery plan recommended the following criteria for downlisting the nene from endangered to threatened: (1) Self-sustaining populations exist on Hawaii, Maui Nui (Maui, Molokai, Lanai, Kahoolawe), and Kauai (target of at least 2,000 birds distributed in 7 populations over 15 years); and (2) sufficient suitable habitat to sustain the target population levels on each island is identified, protected, and managed in perpetuity (USFWS 2004, pp. 50–52). Self-sustaining was defined as maintaining (or increasing) established population levels without additional releases of captive-bred nene, although manipulation such as predator control or pasture management may need to be continued. The draft revised recovery plan stated that consideration for delisting could occur once all of the downlisting criteria had been met, and population levels on Hawaii, Maui Nui, and Kauai had all shown a stable or increasing trend (from downlisting levels) for a minimum of 15 additional years (*i.e.,* for total of 30 years).

As noted above, substantial self-sustaining populations exist and are well distributed in multiple localities on Hawaii Island, Maui, and Kauai (NRAG 2017; USFWS 2017), totaling nearly 3,000 individuals. The species continues to be conservation-reliant (*i.e.,* dependent on long-term management commitments to active predator control and habitat management), but with ongoing management we expect these populations to continue to be self-sustaining without additional releases of captive-bred birds. As discussed below under Factor A, certain habitat stresses continue to exist, but as nene have proven adaptable to diverse native and human-modified habitats, it appears that with active management the extent and quality of existing breeding habitat is sufficient to support robust populations in multiple localities throughout the range. Additional management in seasonally occupied non-breeding habitat would improve population viability.

The 2004 draft revised recovery plan sets forth the general recovery strategy for nene (USFWS 2004, p. 47), as follows. In order for nene populations to survive they should be provided with generally predator-free breeding areas and sufficient food resources. Human-caused disturbance and mortality should be minimized, and genetic and behavioral diversity maximized. The goal of recovery stated in the draft revised recovery plan is to enable the conservation of nene by using a mix of natural and human-altered habitats in such a way that the life-history needs of the species are met and the populations become self-sustaining. While it is important to restore nene as a functioning component of the native ecosystem to ensure long-term species survival, it should be noted that nene currently successfully use a gradient of habitats ranging from highly altered to completely natural. Additionally, some populations exhibit behaviors that differ from what it is believed wild birds historically displayed. Nene are a highly adaptable species, which bodes well for recovery of the species.

Conservation needs and activities to recover nene vary among islands due to differences in factors affecting nene populations both within and among islands. For example, although mongooses occur on Hawaii, Maui, and Molokai, Kauai does not yet have an established mongoose population; thus predator control priorities there are different. In addition, elevations used by nene vary among sites and among islands, and vegetation available to nene also differs between sites and by island.

Implementation of Recovery Actions for the Nene

Nene are now more abundant than when they were federally listed as endangered in 1967, largely due to a captive propagation program that began in 1949 before the species was listed and continued through 2011. The program was initiated prior to Hawaiian statehood in collaboration between Territory of Hawaii biologists and private partners, and was operated by the Division of Fish and Game of the territorial government. The initial site of the captive propagation operation was at

Pohakuloa on Hawaii Island. Operations moved to Olinda, Maui, in 1989. In 1994, a new partnership was established between the DLNR, the Service, and The Peregrine Fund (TPF) to expand facilities and operations for captive propagation to include Hawaiian forest bird species. The Peregrine Fund established captive propagation operations at a newly built propagation facility in Keauhou on Hawaii Island in addition to the operations at Olinda. In 2000, management of the captive propagation program was transferred to the Zoological Society of San Diego. In addition, a number of zoos and private facilities in the United States and abroad continue to maintain and breed nene in captivity (Kear and Berger 1980, pp. 59–77; A. Marshall 2017b, pers. comm.). The existence of privately owned nene outside of Hawaii provides additional insurance against extinction of the species, but due to concerns about disease introduction, they are not currently used as a source for supplementation of the wild population and are not considered a significant contributor of conservation of the species. However, they are still subject to permitting requirements under the Act for interstate commerce.

Smaller operations to breed nene in open-top pens in semi-captive environments were conducted at Hawaii Volcanoes and Haleakala National Parks. In some cases, wild birds were placed into the pens where they could breed protected from predators. The young fledged from the pens to disperse to the surrounding areas. In some cases, birds were released directly into the wild farther from the pens.

In the years between 1960 and 2008, some 2,800 captive-bred nene were released into areas of their former range at more than 20 sites throughout the main Hawaiian Islands. Most releases of captive birds used open-top pens to provide protection from predators. The pens provide protection to the birds as long as they are inside the pens, and the birds frequently returned to breed in the same pens in subsequent years.

Many of the earlier releases were accompanied by little or no management of predators and habitats. Monitoring of released birds showed high mortality and low nesting success, indicating that food availability and predators had a significant impact on wild populations (Banko 1992, pp. 102–104). The highest levels of survival and reproductive success were documented at Hawaii Volcanoes and Haleakala National Parks, where more intensive management of threats was initiated, demonstrating the need and benefits of habitat management and predator control (Black *et al.* 1997, p. 1,171). Recent years have seen an increase in the capacity of conservation agencies and partners to manage habitat and control predators on larger spatial scales. Although not all release sites have supported sustained populations, areas in which predators are low or controlled and habitat is managed for native food plant species have allowed nene to fare better (Hawaii Division of Forestry and Wildlife 2012, p. 19).

Recent studies on movements of nene using satellite telemetry documented the re-establishment of traditional movement patterns in two breeding subpopulations on Hawaii Island (Hess *et al.* 2012, pp. 480–482). Nene spent the breeding and molting seasons at lower elevations from September to April, and moved to higher elevation areas during the non-breeding season in May to August. Hess *et al.* (2012, pp. 479, 482) contend that this movement pattern may be beneficial to nene for the following reasons: (1) Altitudinal migration may allow nene to track availability of food resources not otherwise seasonally available (Black *et al.* 1997, pp. 1,170–1,171); (2) migration may enhance survival during the non-breeding season by avoiding nonnative predators in (lowland) breeding areas; (3) nene may be able to reduce exposure to human activities by occupying high-elevation areas during the non-breeding season; and (4) there may be opportunities for greater genetic exchange if pair bonds are formed between individuals from separate breeding subpopulations at non-breeding locations. This movement pattern is believed to have occurred historically (Banko *et al.* 1999, pp. 3–4).

Population Viability Analyses

Black and Banko (1994) conducted a population viability analysis using the VORTEX software program to model the long-term fate of nene under three different management scenarios: (1) No further releases or management, (2) releases mirroring those of the past 30 years, and (3) increased management without further releases. The report concluded that only under the third scenario could all three populations (Hawaii, Maui, and Kauai) survive for 200 years, and that reintroduction alone as a management tool may continue to be effective in delaying extinction on Hawaii, but will not lead to a self-sustaining population. The study concluded that enhanced management efforts, which include an appropriate predator control effort, would enable nene to reach a self-sustaining level.

Another population viability analysis was conducted for nene in Hawaii Volcanoes National Park to examine management options more specific to that area (Hu 1998). First year mortality was identified as the primary limiting factor for nene in Hawaii Volcanoes National Park. From 1990 to 1996, survival of fledglings averaged 84 percent for females and 95 percent for males, while survival from laying to fledging ranged from 7 to 19.5 percent (mean 12 percent; Hu 1998, pp. 84–85). While predator control had reduced egg predation, fledging success remained low, largely due to inadequate nutrition. The study found that open-top pens cannot sustain a viable nene population in Hawaii Volcanoes National Park. The study suggests that while management techniques such as grassland management, supplemental feeding, and cultivation of native food plants may sustain nene in Hawaii Volcanoes National Park, such approaches require considerable effort and would require increasing resource expenditures. Thus, Hu (1998, pp. 107–114) suggested that nene would be more secure if they were integrated into habitat management instituted on a larger scale that would involve the creation of native-dominated, fire-adapted landscapes at low and mid-elevations in Hawaii Volcanoes National Park and more efficient, widespread predator control techniques, allowing reestablishment of their seasonal movement patterns between various locations.

Black *et al.* (1997) analyzed survival data from 1960 through 1990 for released nene on the island of Hawaii and found that the highest mortality rate was found among newly released goslings during drought years. They also found that nene at Hawaii Volcanoes National Park had the lowest annual mortality rates. The three main factors affecting mortality rates were found to be release method, age at time of release, and year of release. Releasing pre-fledged goslings with parents or foster parents from open-top pens during years with sufficient rainfall was found to be the most successful release method on the island of Hawaii (Black *et al.* 1997, p. 1,170). On Kauai, where mongooses are not yet established, protecting the nesting area from other predators, such as dogs and cats, was found to be extremely successful (T. Telfer 1998, pers. comm., as cited in USFWS 2004).

Amidon (2017) recently conducted a preliminary assessment of the short-term population trends in nene populations on the four main Hawaiian Islands where nene currently occur. This assessment used count-based and demographic models (Morris and Doak 2002, pp. 8–9) developed with readily available information on each

population (Hu 1998; Hu 1999, unpubl. as cited in Banko *et al.;* USFWS 2004; Bailey and Tamayose 2016, *in litt.;* Kendall 2016, *in litt.;* Uyehara 2016a, *in litt.*) projected over a 20-year time period assuming constant management. Count-based models (for Hawaii Volcanoes National Park, the island of Maui, Haleakala National Park, the island of Molokai, and the island of Kauai) showed an increase or leveling off around current population estimates (Amidon 2017, pp. 10–16). Demographic models variously projected level or slightly declining populations (Hakalau Forest NWR and Haleakala National Park) or continued increase (Kauai NWR Complex) (Amidon 2017, pp. 18–21). Available data did not allow modeling of nene populations on lands outside national parks and national wildlife refuges, where management and population trends are likely to differ.

Current Status Summary

In conclusion, the implementation of recovery actions for nene has significantly reduced the risk of extinction for the species. On the brink of extinction, the captive propagation and release program successfully increased the number of individuals and re-established populations throughout the species' range on Kauai, Molokai, Maui, and Hawaii Island. Studies of foraging behavior identified nene food preferences and nutritional value of food resources contributing to a greater understanding of habitat requirements during the breeding and non-breeding seasons. Current populations are sustained by ongoing management (*e.g.,* predator control, habitat management for feral ungulates and nonnative plants). On Hawaii Island, research indicates that traditional movements are being restored, which could be expected to improve survival and breeding, as well as genetic exchange between subpopulations. Recent population modeling data suggest that certain key populations are expected to maintain current levels or increase into the future if the current level of management is continued.

Summary of Factors Affecting the Species

Section 4 of the Act and its implementing regulations (50 CFR part 424) set forth the procedures for listing species, reclassifying species, or removing species from listed status. ''Species'' is defined by the Act as including any species or subspecies of fish or wildlife or plants, and any distinct vertebrate population segment of vertebrate fish or wildlife that interbreeds when mature (16 U.S.C. 1532(16)). A species may be determined to be an endangered or threatened species because of any of one or a combination of the five factors described in section 4(a)(1) of the Act: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. We must consider these same five factors in reclassifying a species from endangered to threatened (*i.e.,* downlisting). We may downlist a species if the best available scientific and commercial data indicate that the species no longer meets the definition of endangered, but instead meets the definition of threatened because the species' status has improved to the point that it is not in danger of extinction throughout all or a significant portion of its range, but the species is not fully recovered.

Determining whether a species has improved to the point that it can be downlisted requires consideration of whether the species is endangered or threatened because of the same five categories of threats specified in section 4(a)(1) of the Act. A species is ''endangered'' for purposes of the Act if it is in danger of extinction throughout all or a ''significant portion of its range'' and is ''threatened'' if it is likely to become endangered within the foreseeable future throughout all or a ''significant portion of its range.''

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

In the following analysis, we evaluate the status of the nene throughout all of its range as indicated by the five-factor analysis of threats currently affecting, or that are likely to affect the species within the foreseeable future.

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

The draft revised recovery plan identified the lack of lowland habitat and inadequate nutrition as two habitat-related stressors limiting nene recovery (USFWS 2004, pp. 29–30). Nene continue to be affected by historic and ongoing habitat destruction and modification caused by urbanization, agricultural activities, drought, feral ungulates, and nonnative plants. These factors limit suitable breeding and flocking habitat, constraining the recovery of nene populations.

Historical habitat loss was largely a result of human activities such as urban development and land conversion for agricultural activities, particularly in lowland areas. Degradation of lowland habitats used by nene began with Polynesian colonization (around 1,600 years ago) and has continued since European arrival over the past 200 years (Kirch 1982, pp. 7–10). Impacts to lowland habitat included clearing of land for settlements and agriculture; increased frequency of fire; heavy grazing, browsing, and soil disturbance by introduced deer, cattle, goats, sheep, and pigs; and the spread of nonnative plants (Cuddihy and Stone 1990, pp. 103–107).

The threat of destruction and modification of habitat, particularly in lowland areas, by urbanization and land use conversion, including agriculture, is ongoing and expected to continue to limit the amount of nene foraging and nesting habitat. Past land use practices have resulted in great reduction or loss of native vegetation below 2,000 feet (ft) (600 meters (m)) throughout the Hawaiian Islands (TNC 2006). Hawaii's agricultural industries (*e.g.,* sugar cane, pineapple) have been declining in importance, and large tracts of former agricultural lands are being converted into residential areas or left fallow (TNC 2007). In addition, Hawaii's population has increased almost 10 percent in the past 10 years, further increasing demands on limited land and water resources in the islands (Hawaii Department of Business, Economic Development and Tourism 2013, *in litt.*). While breeding habitat has some level of protection in the national parks, national wildlife refuges, and some

State lands, there is little to no protection for habitat that nene use outside the breeding season. Nene are vulnerable at this time as well as during the breeding season as they are moving around to different areas, exposing them to additional predation in unprotected habitat, poor availability of suitable foraging habitat, and interactions with humans and human structures (wind towers, vehicles, etc). Human activities associated with the development and urbanization of lowland habitat will continue to impact nene. For example, nene collide with trees, fences, and particularly motor vehicles (Banko and Elder 1990; Banko *et al.* 1999). Nene are attracted to feeding opportunities provided by mowed grass, weeds, and human handouts. Feeding, in particular, makes nene vulnerable to collisions along roadsides as they frequently become tame and unafraid of human activity (Banko *et al.* 1999). Mortality is high in human-modified habitats due to increased predation, collisions, and human-caused accidents (Banko *et al.* 1999).

The alteration of lowland areas and increasing pressure from human activities (including hunting; see Factor B discussion, below) led to the extirpation of nene on Kauai and Molokai, and the loss of seasonally important lowland breeding habitat in leeward regions of islands with elevations above 5,000 ft (1,524 m) (Maui and Hawaii) (Baldwin 1945). From the time of European arrival (in the late 1700s) until the late 1800s, nene were thought to be all but extirpated, except for a widely distributed population on the island of Hawaii (Baldwin 1945, pp. 27–30). By the 1940s, Baldwin (1945, p. 35) estimated a reduction in the range of nene on Hawaii Island from 2,475 square miles (mi^2) (6,410 square kilometers (km^2)) to 1,150 mi^2 (2,979 km^2), a loss of over half of its remaining range on Hawaii Island since European contact. At the time the captive propagation program began in the late 1950s, the remaining wild nene were restricted to montane habitats in the ''saddle area'' between Mauna Loa and Mauna Kea on Hawaii Island (Baldwin 1945, p. 33).

Feral ungulates and nonnative plants led to further degradation of nene habitat by negatively impacting forage quality, shelter, and potential nest sites. Grazing and browsing by introduced cattle, goats, and sheep converted significant portions of native montane forest and shrubland between 1,640 and 6,562 ft (500 and 2,000 m) to wild grassland and managed pastureland dominated by nonnative species (Cuddihy and Stone 1990, pp. 59–63, 63–67). Effects of nonnative ungulates have been somewhat less severe above 6,562 ft (2,000 m) because nonnative weeds are less prevalent (Banko *et al.* 1999, p. 6). Nonnative plants adversely affect native habitat in Hawaii by: (1) Modifying the availability of light, (2) altering soil-water regimes, (3) modifying nutrient cycling, and (4) altering fire regimes of native plant communities (*i.e.,* the ''grass/fire cycle'' that converts native-dominated plant communities to nonnative plant communities) (Smith 1985, pp. 180–181; Cuddihy and Stone 1990, p. 74; D'Antonio and Vitousek 1992, p. 73; Vitousek *et al.* 1997, p. 6).

Studies indicate that inadequate nutritional quality is a limiting factor on nene reproduction and gosling survival, especially on Hawaii and Maui (USFWS 2004, pp. 29–30). Proper nutrition is critical for successful reproduction. Breeding females require carbohydrates and protein to increase fat reserves for egg laying and incubation; goslings require high-protein foods for growth and development (Ankney 1984, pp. 364–370; Banko *et al.* 1999, p. 7). Banko (1992, pp. 103–104) suggested that low breeding rates (20 to 63 percent) and low nest success (44 percent) at several sites on Maui and Hawaii from 1979 to 1981 were likely attributable to poor quality or low availability of foods. Baker and Baker (1995, p. 2; 1999, p. 12) found that the high rates of gosling mortality (57 to 81 percent) in Haleakala National Park during the mid-1990s were due to starvation and dehydration. Between 1989 and 1999, lack of adequate food or water also appeared to be a factor limiting nene recruitment in Hawaii Volcanoes National Park (Rave *et al.* 2005, p. 14). In many instances of gosling mortality, the actual cause of death may be exposure because goslings are weakened by malnutrition (at hatching) and were unable to keep up with parents, and therefore got chilled or overheated and died (Baker and Baker 1999, p. 13). Emaciation was the most common cause of death diagnosed in 71 out of 300 adult and gosling mortalities submitted to the National Wildlife Health Research Center between 1992 and 2013 for which a cause of death was identified (Work *et al.* 2015, p. 692). More cases of emaciation were diagnosed on Hawaii Island (32), and to a lesser extent Kauai (21) and Maui (13), perhaps reflecting the rates of hatching and fledgling success and nutritional quality of habitats on the respective islands. Habitat also continues to be reduced due to the spread of unpalatable alien grasses (*e.g.,* guinea grass (*Megathyrsus maximus*), sword grass (*Miscanthus floridulus*)) and other weeds (*e.g.,* koa haole (*Leucaena leucocephala*), lantana (*Lantana camara*)), as this spread diminishes foraging opportunities (Banko *et al.* 1999, p. 23). Therefore, inadequate nutritional quality due to the lack of suitable foraging opportunities in and around current breeding areas, particularly at higher elevations on Maui and Hawaii Island, coupled with the loss of lowland breeding areas across its range, is expected to continue as a threat to the nene.

Drought has been identified as a factor contributing to nene mortality. Drought reduces the amount and quality of available forage, thereby increasing the risk of nene mortality due to starvation and dehydration; thus, for example, nene exhibited higher rates of mortality in drought years during the prolonged island-wide drought between 1976 and 1983 on Hawaii Island (Black *et al.* 1997, pp. 1,165–1,169). Drought was also thought to have contributed to the population decline (10 percent) at Hawaii Volcanoes National Park in the late 1990s (Rave *et al.* 2005, p. 12). Numerous and recurrent droughts have been historically documented throughout the Hawaiian Islands (Giambelluca *et al.* 1991, pp. 3–4; Hawaii Civil Defense 2011, ch. 14, pp. 1–12), with the most severe events often associated with the El Niño phenomenon (Hawaii Civil Defense 2011, p. 14–3). Based on the frequency of drought and its population-level impacts to nene, we conclude that the threat of drought is ongoing and likely to continue periodically into the foreseeable future.

Recovery efforts initially focused on the establishment of populations with the majority of releases of captive-bred nene at high-elevation native shrublands (above 5,000 ft (1,524 m)) on Hawaii Island and Maui. High-elevation nesting areas are less modified than lowlands (Banko *et al.* 1999, p. 6), but may provide poorer quality habitat for nene foraging and nesting, due to drier conditions and phenology of food plants, which limit available food resources during critical pre-breeding and breeding periods (Black *et al.* 1994, pp. 101–103; Black *et al.* 1997, p. 1,170). Black *et al.* (1997, p. 1,169) found that nene that remained at high-elevation sites year-round exhibited lower rates of reproductive success and survival than those that dispersed from release sites. Nene survival and breeding success improved by moving away from dry upper montane volcanic scrubland to managed grasslands or managed ranchland, or if they were provided supplemental feed and water,

particularly in drought years (Black *et al.* 1994, p. 103; Black *et al.* 1997, pp. 1,169–1,170). Subsequent reintroductions at low- and mid-elevation sites, first on Kauai and Hawaii Island, and more recently on eastern Molokai and western Maui, demonstrated the ability of nene to successfully become re-established in these areas.

Currently, nene are found in a range of habitats from sea level to subalpine zones on Kauai, Oahu, Molokai, Maui, and Hawaii Island. Populations are centered around release sites and rely on continued land use protections and habitat management (including predator control) to sustain populations in these areas. On Maui Nui and Hawaii Island, the majority of the nene nest in managed areas at mid- to high-elevation habitats, including Haleakala National Park, Hawaii Volcanoes National Park, and Puu Oo Ranch/Puu 6677; and at lower elevation sites, including Hanaula, Piiholo Ranch, Haleakala Ranch (Waiopae), and Puu O Hoku Ranch (Molokai). On Kauai, most nene nest and live year-round in areas below 984 ft (300 m), where large expanses of managed grasslands (including golf courses) and low levels of predation (mostly due to the absence of a mongoose population) have led to a stable and increasing nene population. The majority of the Kauai population is centered in and around the Hanalei and Kilauea Point NWRs.

Many of the areas where nene occur in the wild are afforded some level of habitat enhancement that focuses on increasing the survival and reproduction of nene. Habitat enhancement can include predator control, mowing, outplanting, and supplemental feeding. Hawaii Volcanoes National Park has areas where many of these types of enhancement occur. For instance, park staff maintain two predator-resistant open-topped pens, 4 and 5 hectares (10 and 13 acres) in size, as safe-breeding sites with supplemental feed and occasional mowing. In addition, predator control is conducted at key brooding sites, and some areas may be closed to human use during the nene breeding season. The Hawaii Division of Forestry and Wildlife also provides supplemental food for nene populations on Hawaii Island. Haleakala National Park has controlled ungulate populations and horses intermittently grazing in Paliku pasture. Kauai DOFAW also has predator control programs and may provide supplemental feed during drought years. Mowing, grazing, and irrigating grass can improve its attractiveness to geese by increasing the protein content (Sedinger and Raveling 1986, p. 302; Woog and Black 2001, pp. 324–328).

Highly altered landscapes and nonnative vegetation also can significantly affect nene recovery. For example, nene on Kauai primarily use lowland areas in highly altered, human-impacted habitats such as pastures, agricultural fields, golf courses, and highly degraded waste areas (USFWS 2004, pp. 41–42). Nene have been very successful in these areas, indicating their adaptability to a variety of habitats. Lowlands, however, are often unsuitable because of intense human activity or dense predator populations placing nene at greater risk of predation, and hazardous situations such as habituation to human feeding, vehicle collisions, and golf ball strikes (Natural Resources Conservation Service [NRCS] 2007, p. 7). The recovery of nene is dependent on a variety of habitats ranging from highly altered, managed habitats to habitats consisting of primarily native species, and it may not be feasible to restore habitats to native species in all areas used by nene. It is believed that nene currently require availability of a diverse suite of food resources that may include both nonnative and native vegetation (Baldwin 1947, pp. 108 − 120; Black *et al.* 1994, pp. 103–105; Banko *et al.* 1999, pp. 6–7). However, the current amount and distribution of suitable breeding, foraging, and flocking habitat continues to be a limiting factor for the nene.

Our analyses of Factor A under the Act include consideration of ongoing and projected changes in climate, and the impacts of global climate change and increasing temperatures on Hawaii ecosystems, all of which are the subjects of active research. Analysis of the historical record indicates surface temperature in Hawaii has been increasing since the early 1900s, with relatively rapid warming over the past 30 years. The average increase since 1975 has been 0.48 degrees Fahrenheit (°F) (0.27 degrees Celsius (°C)) per decade for annual mean temperature at elevations above 2,600 ft (800 m) and 0.16 °F (0.09 °C) per decade for elevations below 2,600 ft (800 m) (Giambelluca *et al.* 2008, pp. 3–4). Based on models using climate data downscaled for Hawaii, the ambient temperature is projected to increase by 3.8 to 7.7 °F (2.1 to 4.3 °C) over the 21st century, depending on elevation and the emissions scenario (Liao *et al.* 2015, p. 4344). Environmental conditions in tropical montane habitats can be strongly influenced by changes in sea surface temperature and atmospheric dynamics (Loope and Giambelluca 1998, pp. 504–505; Pounds *et al.* 1999, pp. 611–612; Still *et al.* 1999, p. 610; Benning *et al.* 2002, pp. 14,246–14,248; Giambelluca and Luke 2007, pp. 13–15). On the main Hawaiian Islands, predicted changes associated with increases in temperature include a shift in vegetation zones upslope; a similar shift in animal species' ranges; changes in mean precipitation with unpredictable effects on local environments; increased occurrence of drought cycles; and increases in intensity and numbers of hurricanes (tropical cyclones with winds of 74 miles per hour or higher) (Loope and Giambelluca 1998, pp. 514–515; U.S. Global Change Research Program (US–GCRP) 2009, pp. 10, 12, 17–18, 32–33; Giambelluca 2013, p. 6). The effect on nene of these changes associated with temperature increase is detailed in the following paragraphs.

The forecast of changes in precipitation is highly uncertain because it depends, in part, on how the El Niño–La Niña weather cycle (an episodic feature of the ocean-atmosphere system in the tropical Pacific having important global consequences for weather and climate) might change (State of Hawaii 1998, pp. 2–10). The historical record indicates that Hawaii tends to be dry (relative to a running average) during El Niño phases and wet during La Niña phases (Chu and Chen 2005, pp. 4809–4810). However, over the past century, the Hawaiian Islands have experienced a decrease in precipitation of just over 9 percent (US National Science and Technology Council 2008, p. 61) and a decreasing trend (from the long-term mean) is evident in recent decades (Chu and Chen 2005, pp. 4802–4803; Diaz *et al.* 2005, pp. 1–3). Models of future rainfall downscaled for Hawaii generally project increasingly wet windward slopes and mild to extreme drying of leeward areas in particular during the middle and late 21st century (Timm and Diaz 2009, p. 4262; Elison Timm *et al.* 2015, pp. 95, 103–105). Altered seasonal moisture regimes can have negative impacts on plant growth cycles and overall negative impacts on native ecosystems (US–GCRP 2009, pp. 32–33). Long periods of decline in annual precipitation result in a reduction of moisture availability; an increase in drought frequency and intensity; and a self-perpetuating cycle of nonnative plant invasion, fire, and erosion (US–GCRP 2009, pp. 32–33; Warren 2011, pp. 221–226). Overall, more frequent El Niño events are predicted to produce less precipitation for the Hawaiian Islands. These

projected decreases in precipitation are important stressors for nene because they experience substantially higher mortality from starvation in drought years (Hess 2011, p. 59). In addition, the drying trend, especially on leeward sides of islands, creates suitable conditions for increased invasion by nonnative grasses and enhances the risk of wildfire.

Tropical cyclone frequency and intensity are projected to change as a result of increasing temperature and changing circulation associated with climate change over the next 100 to 200 years (Vecchi and Soden 2007, pp. 1068–1069, Figures 2 and 3; Emanuel *et al.* 2008, p. 360, Figure 8; Yu *et al.* 2010, p. 1371, Figure 14). In the central Pacific, modeling projects an increase of up to two additional tropical cyclones per year in the main Hawaiian Islands by 2100 (Murakami *et al.* 2013, p. 2, Figure 1d). In general, tropical cyclones with the intensities of hurricanes have been an uncommon occurrence in the Hawaiian Islands. From the 1800s until 1949, hurricanes were only rarely reported from ships in the area. Between 1950 and 1997, 22 hurricanes passed near or over the Hawaiian Islands, and 5 of these caused serious damage (Businger 1998, *in litt.*). A recent study shows that, with a projected shift in the path of the subtropical jet stream northward, away from Hawaii, more storms will be able to approach and reach the Hawaiian Islands from an easterly direction, with Hurricane Iselle in 2014 being an example (Murakami *et al.* 2013, p. 751). At high-elevation nesting sites, frequent heavy precipitation may affect gosling survival during the cooler months (Hess *et al.* 2012, p. 483). More frequent and intense tropical storms are likely to increase the number of nest failures and gosling mortalities in mid- and high-elevation habitats on Maui and Hawaii where nene are already at risk of exposure and starvation due to inadequate nutrition (Baker and Baker 1995, p. 13; K. Misajon 2016, pers. comm.; J. Tamayose 2016, pers. comm.). In addition, projected warmer temperatures and increased storm severity resulting from climate change are likely to exacerbate other threats to nene, such as by enhancing the spread of nonnative invasive plants into these species' native ecosystems in Hawaii.

Finally, sea level rise resulting from thermal expansion of warming ocean water; the melting of ice sheets, glaciers, and ice caps; and the addition of water from terrestrial systems (Climate Institute 2011, *in litt.*) has the potential for direct effects on nene habitat. Rise in global mean sea level (GMSL) is ongoing and expected to continue for the foreseeable future (*i.e.,* centuries) (Meehl *et al.* 2012, p. 576; Golledge *et al.* 2015, pp. 421, 424; DeConto and Pollard 2016, pp. 1, 6) due to warming that has already occurred and an uncertain amount of additional warming caused by future greenhouse gas emissions (Sweet *et al.* 2017, p. 1). Six risk-based scenarios describing potential future conditions through 2100 project lower and upper bounds of GMSL rise between 0.3 and 2.5 m (1 and 8 ft) (Sweet *et al.* 2017, pp. vi–vii, 1–55, and Appendices A–D).

Sea level rise is not expected to be uniform throughout the world, due to factors including, but not limited to: (1) Variations in oceanographic factors such as circulation patterns; (2) changes in Earth's gravitational field and rotation, and the flexure of the crust and upper mantle due to melting of land-based ice; and (3) vertical land movement due to postglacial rebound of topographically depressed land, sedimentation compaction, groundwater and fossil fuel withdrawals, and other non-climatic factors (Spada *et al.* 2013, p. 484; Sweet *et al.* 2017, pp. vi–vii, 9, 19). Sea level rise in the Hawaiian Islands is expected to be greater than rise in GMSL (Spada *et al.* 2013, p. 484; Polhemus 2015, p. 7; Sweet *et al.* 2017, p. 9). In Hawaii, long-term sea level rise adds to coastal erosion, impacts from seasonal high waves, coastal inundation due to storm surge and tsunami, and drainage problems due to the convergence of high tide and rainfall run-off (SOEST 2017, *in litt.*). Flooding related to sea level rise would result in the additional loss of lowland habitat occupied by nene in low-lying coastal areas at Huleia NWR on Kauai, Ukumehame on Maui, and Keeau on Hawaii Island.

Thus, although we cannot predict the timing, extent, or magnitude of specific events, we expect effects of climate change (changes in tropical cyclone frequency and intensity, drought frequency, and sea level rise) to exacerbate the current threats to this species such as predation, inadequate nutrition, and habitat loss and degradation.

Summary of Factor A

Habitat destruction and modification from urbanization, agricultural activities, drought, feral ungulates, and invasive plant species remain threats to nene. These factors contribute to an ongoing lack of suitable breeding and flocking habitat, limiting nene population expansion. Historical habitat loss was largely a result of human activities such as urban development and land conversion for agricultural activities, particularly in lowland areas, contributing to the extirpation of nene on Kauai and Molokai, and the loss of seasonally important leeward, lowland breeding areas on islands with elevations above 5,000 ft (1,524 m) (Maui and Hawaii). Feral ungulates and invasive plant species led to further degradation of nene habitat by negatively impacting forage quality, shelter, and potential nest sites.

Recovery efforts initially focused on the establishment of populations with the majority of releases of captive-bred nene at high-elevation sanctuaries (above 5,000 ft (1,524 m)) on Maui and Hawaii Island. Despite supplemental food and water and localized predator control efforts, nene at these sites experienced high rates of adult mortality and low rates of gosling survival attributed to inadequate nutrition caused by habitat factors such as poor forage quality, drought, and exposure. Research showed that access to managed grassland habitats and habitat enhancement during the breeding season improved foraging opportunities and resulted in increased survival and breeding success. Control of feral ungulate populations in areas such as Hawaii Volcanoes National Park and Haleakala National Park reduced their impacts on native vegetation and likely improved nene foraging and breeding habitat. Subsequent reintroductions at low- and mid-elevation sites, first on Kauai and Hawaii Island, and more recently on eastern Molokai and western Maui, demonstrated the ability of nene to successfully become established in these areas.

Currently, nene are found in a range of habitats from sea level to subalpine areas on Kauai, Oahu, Molokai, Maui, and Hawaii Island. Populations are centered around release sites and rely on continued land use protections and habitat management (including predator control) to sustain successful breeding and population numbers in these areas.

Overall, the expansion of existing populations is limited by the lack of suitable breeding and flocking habitat due to continuing urbanization, agricultural activities, and potential conflicts with human activities. Periods of drought are expected to continue and are likely to be exacerbated by the effects of climate change. To minimize the effects of drought on the food availability and adequate nutrition, habitat enhancement activities to provide foraging opportunities, especially during the breeding season, will need to be maintained. The rise in sea level projected by climate change models may threaten any low-lying

habitats used by nene. Although the effects of climate change do not constitute a threat to nene now, we do expect them to exacerbate the effects of drought and tropical storms, and to constitute a threat in the foreseeable future.

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

Overuse for commercial, recreational, scientific, or educational purposes is not a threat to the nene. The exploitation of nene for food by Hawaiians and non-Polynesian settlers is believed to have been responsible for substantial population declines in lowland areas, and hunting was a major limiting factor until a hunting ban was passed and enforced in 1907 (Banko *et al.* 1999, p. 23). Human visitation for recreational activities at parks and refuges where nene occur often results in human interactions with nene. Habituation to humans and feeding of nene at these recreational areas create the potential for injury or mortality of nene by attracting nene to hazardous areas where collisions, predation, and accidents frequently occur (Banko *et al.* 1999, p. 24). For discussion and analysis of the population-level impacts to nene caused by direct and indirect human impacts, see our discussion under Factor E, below. While the historical effects of overuse were factors that led to the original listing of nene as federally endangered in 1967, current regulations and enforcement are in place to protect nene from overuse. Therefore, overuse does not constitute a threat to nene now or in the foreseeable future.

Factor C. Disease or Predation

Disease

Numerous parasites and diseases have been documented in captive and wild nene (van Riper and van Riper 1985, pp. 308, 312, 333; Bailey and Black 1995, p. 62; Work *et al.* 2002, p. 1,040). Recent data attributing the primary causes of death in nene to disease have identified parasites, bacterial and fungal infection, and, less commonly, avian pox (virus) and avian botulism (Work *et al.* 2015, pp. 690–694). Avian influenza and West Nile Virus (WNV), if established, also have the potential to affect the nene population.

Toxoplasma gondii is a protozoan parasite transmitted by domestic cats (*Felis catus*) that has historically caused mortality in native Hawaiian birds, and is the most commonly encountered infectious disease in nene, primarily affecting adult birds (Work *et al.* 2015, p. 691). As herbivores, nene are likely exposed by eating transport hosts such as insects or ingesting oocysts (reproductive phase of the parasite) in contaminated water, soil, or vegetation (Work *et al.* 2016, p. 255). For mortalities attributed to *T. gondii,* the cause of death is typically diagnosed as inflammation or lesions on multiple organs. The detection of *T. gondii* in over 30 percent of feral cats sampled (n=67) at 2 locations on Mauna Kea, Hawaii Island (Danner *et al.* 2007, p. 316) suggests that exposure to and infection by *T. gondii* is likely to continue and to play a role in mortality of nene. This parasite may also have non-lethal effects on nene, making them more susceptible to trauma caused by vehicle collisions, as a high prevalence of *T. gondii* was observed in road kills of other species (Work *et al.* 2016, p. 256). Widespread exposure to *T. gondii* was detected in wild birds from Kauai, Maui, and Molokai (21 to 48 percent of birds examined) (Work *et al.* 2016, p. 255). However, the parasite is implicated as the cause of death in a relatively low proportion (4 percent) in the number of nene mortalities submitted to the U.S. Geological Survey National Wildlife Health Center (USGS–NWHC) between 1992 and 2013 (Work *et al.* 2015, pp. 690–694). This suggests that although exposure to *T. gondii* is widespread and ongoing, the threat of disease caused by *T. gondii* is expected to be low in magnitude and is not likely to have significant population-level impacts on nene.

Omphalitis, a bacterial infection of the umbilical stump, has been found to cause mortality in both wild and captive nene goslings (USFWS 2004, p. 34). Work *et al.* (2015, supplemental material) recently diagnosed omphalitis at low levels (2 percent, 7 of 300) in a number of nene mortalities submitted to the USGS–NWHC.

Avian pox is caused by a virus that causes inflammation of the skin, and in severe cases may result in large scabs that block circulation and lead to the loss of digits or entire limbs or lead to blindness, the inability to eat, or death (USGS–NWHC 2017a, *in litt.*). Pox-like lesions have been reported in adult birds in captivity (Kear and Brown 1976, pp. 133–134; Kear and Berger 1980, pp. 42, 86, 138), and pox scars on many birds in the wild on Hawaii and Maui indicate that avian pox is common, but generally not fatal to nene (Banko *et al.* 1999, pp. 20–21). Avian pox was recently found in an emaciated bird, but was judged to be a secondary finding (Work *et al.* 2015, p. 693).

Avian malaria is caused by the microscopic parasitic protozoan, *Plasmodium relictum.* Avian malaria was diagnosed as the cause of death in only 1 out of 300 nene mortalities submitted to the USGS–NWHC for which the cause of death was identified (Work *et al.* 2015, supplemental material). Avian malaria has also been reported in at least one wild bird on Maui, but it does not appear that avian malaria is causing significant declines of nene populations (Banko *et al.* 1999, pp. 20–21). However, concern about the potential to transfer unique regional strains of avian malaria between islands has resulted in quarantine testing of any nene to be moved inter-island to ensure they are not infected; during the recent Nene Relocation Project, birds from Kauai in which *Plasmodium* was detected were kept on Kauai and not translocated to Maui or Hawaii Island (Kauai Lagoons 2015, *in litt.*).

Avian botulism is a paralytic disease caused by the ingestion of a natural toxin produced by the bacteria, *Clostridium botulinum.* Birds either ingest the toxin directly or may eat invertebrates (*e.g.,* non-biting midges, fly larvae) containing the toxin (USGS–NWHC 2017b, *in litt.*). Botulism outbreaks may occur year-round with distinct seasonal patterns based on location (Uyehara 2016b, *in litt.*).

Botulism has been found on Kauai, Oahu, Molokai, Maui, and Hawaii Island (USGS–NWHC 2017b, *in litt.*). Avian botulism was diagnosed as the cause of death in only 4 out of 300 nene mortalities submitted to the USGS–NWHC for which the cause of death was identified (Work *et al.* 2015, supplemental material). Also, between 2011 and 2015, only 1 percent of the 866 cases of botulism involved nene in the Kauai NWR Complex (Uyehara 2016b, *in litt.*). Avian botulism is thought to pose a minor threat to nene because they tend to forage on grasses rather than aquatic invertebrates (Work *et al.* 2015, p. 693).

The spread of avian influenza and West Nile Virus (WNV) in North America has serious implications if either arrives in Hawaii. West Nile Virus is transmitted by adults of various species of *Culex* mosquitoes, some of which are present in Hawaii (USGS–NWHC 2017c, *in litt.*). When an infected mosquito bites an animal, the virus enters the animal and infects the central nervous system. West Nile Virus causes mortality in domestic geese, with goslings more susceptible than adults (Austin *et al.* 2004, p. 117). In experimentally infected young domestic geese, the New York strain of WNV caused reduced activity, weight loss, abnormal neck and spine posture, and death with accompanying encephalitis

and myocarditis (Swayne *et al.* 2001, p. 753). Of the three known cases of nene infected with WNV on the U.S. mainland, all were adults and one died (Jarvi *et al.* 2008, p. 5,339).

Avian influenza has been reported to cause mortality in naturally infected Canada geese in Asia and Europe (Ellis *et al.* 2004, p. 496; Teifke *et al.* 2007, p. 138). Additional studies have shown that immunologically naïve, juvenile birds are particularly susceptible (Pasick *et al.* 2007, p. 1,827). Migratory birds have been implicated in the long-range spread of highly pathogenic avian influenza (HPAI), a virus (H5N1) from Asia to Europe and Africa. In 2006, the U.S. Departments of the Interior (DOI) and Agriculture (USDA) conducted surveillance for the presence of highly pathogenic avian influenza H5N1 in wild birds in the Pacific islands (American Samoa, Guam, Hawaii, Marshall Islands, Northern Mariana Islands, and Palau) (USGS–NWHC 2017d, *in litt.*). Over 4,000 specimens were collected from waterfowl, shorebirds, and other species from throughout the Pacific, and no highly pathogenic avian influenza was detected (Work and Eismueller 2007, p. 2).

The Hawaii Field Station of the USGS–NWHC continues to work with wildlife managers to monitor the impact of diseases and other mortality factors on nene and other wildlife populations. Cats are the sole known lifecycle host for the protozoan that causes toxoplasmosis. Reduction in the number of feral cats will reduce the likelihood of exposure of nene to the disease. Ongoing conservation measures in nene breeding areas, such as predator control and predator-proof fences that exclude cats, reduce, but do not eliminate, the risk of exposure to toxoplasmosis due to the abundance and range of feral cat populations.

Predation

Predation by introduced mammals continues to be a major factor limiting nene breeding success and survival. Predators known to take nene eggs, goslings, or adults include dogs (*Canis familiaris*), feral pigs (*Sus domesticus*), feral cats, small Indian mongooses (*Herpestes auropunctatus*), and black, Norway, and Pacific rats (*Rattus, R. norvegicus,* and *R. exulans,* respectively) (Hoshide *et al.* 1990, pp. 153–154; Baker and Baker 1995, p. 8; Banko *et al.* 1999, pp. 11–12; Hilton 2016, *in litt.*). In addition, cattle egrets (*Bubulcus ibis*) and barn owls (*Tyto alba*) are suspected to occasionally take goslings. When flightless and during molt, goslings and adults are extremely vulnerable to predation by any of these predators (USFWS 2004, p. 21). Yellow crazy ants (*Anoplolepis gracilipes*) and little fire ants (*Solenopsis papuana*) also have the potential to disturb incubating females and goslings (Plentovich 2017, *in litt.*).

The small Indian mongoose was introduced to the Hawaiian archipelago in 1883, and quickly became widespread on Oahu, Molokai, Maui, and Hawaii Island, from sea level to elevations as high as 7,000 ft (2,130 m) (Tomich 1986, pp. 93–94). Kauai remained mongoose-free when a planned introduction was aborted; however, there have been almost 350 reported sightings since 1968, and in 1976, a road-killed, lactating female was found on the island near Eleele (KISC 2016a, *in litt.;* Phillips and Lucey 2016). In 2012 and 2016, a total of three mongooses were captured in Lihue, Kauai, at air cargo and harbor facilities, as well as a resort adjacent to airport property (KISC 2016b, *in litt.*). The numerous sightings and four confirmed individuals have led to the perception that mongoose are now established on Kauai. While the recent arrivals of mongoose are troubling, there remains scant biological evidence that a breeding population of mongoose occurs on Kauai.

Mongooses are believed to be the most serious egg predator and are responsible for the most nene nest failures on Hawaii and Maui (Hoshide *et al.* 1990, p. 154; Banko 1992, pp. 101–102; Black and Banko 1994, p. 400; Baker and Baker 1995, p. 20). Mongoose also prey upon goslings and adults (Kear and Berger 1980, p. 57; Banko and Elder 1990, p. 122; K. Misajon 2016, pers. comm.). The success of the nene on Kauai demonstrates that mongooses may constitute the most significant predator elsewhere (Banko *et al.* 1999, p. 25). Despite relying on limited data, recent estimates of nest success on Kauai for private lands (75 percent) and the Kauai NWR Complex (82 percent) are far greater than estimates for both Haleakala National Park (62 percent) and Hawaii Volcanoes National Park (58 percent) (Hu, unpublished as cited in Banko *et al.* 1999; Bailey and Tamayose 2016, *in litt.;* Uyehara 2016a, *in litt.*).

Introduced European pigs hybridized with smaller, domesticated Polynesian pigs; became feral; and invaded forested areas, especially mesic and wet forests, from low to high elevations, and are present on all the main Hawaiian Islands except Lanai and Kahoolawe, where they have been eradicated (Tomich 1986, pp. 120–121; Munro 2007, p. 85). Pigs may roam over nearly the entire extent of the range of nene. Pigs are known to take eggs, goslings, and possibly adults (Kear and Berger 1980, p. 57; Banko and Elder 1990, p. 122; Baker and Baker 1995, p. 20; K. Misajon 2016, pers. comm.). The presence of pigs can also attract feral dogs that may then prey upon nene (NPS 2016, p. 2).

Three species of introduced rats occur in the Hawaiian Islands. Studies of Pacific rat DNA suggest they first appeared in the islands along with emigrants from the Marquesas Islands (French Polynesia) in about 400 A.D., with a second introduction around 1100 A.D. (Ziegler 2002, p. 315). The black rat and the Norway rat arrived in the islands more recently, as stowaways on ships sometime in the late 19th century (Atkinson and Atkinson 2000, p. 25). The Pacific rat and the black rat are primarily found in rural and remote areas of Hawaii, in dry to wet habitats, while the Norway rat is typically found in urban areas or agricultural fields (Tomich 1986, p. 41). The black rat is widely distributed throughout the main Hawaiian Islands and can be found in a range of ecosystems and as high as 9,000 ft (2,700 m), but it is most common at low- to mid-elevations (Tomich 1986, pp. 38–40). Sugihara (1997, p. 194) found both black and Pacific rats up to 7,000 ft (2,000 m) on Maui, but found the Norway rat only at lower elevations. Rats are known to prey upon nene eggs and goslings (Kear and Berger 1980, p. 57; Hoshide *et al.* 1990, p. 154; Baker and Baker 1995, p. 20).

Cats were introduced to Hawaii in the early 1800s, and are present on all the main Hawaiian Islands (Tomich 1986, p. 101). Although cats are more common at lower elevations, there are populations in areas completely isolated from human presence, including montane forests and alpine areas of Maui and Hawaii Island (Lindsey *et al.* 2009, p. 277; Scott *et al.* 1986, p. 363). Cats take nene goslings and adults, and have been observed moving eggs in nests, so they may also prey upon eggs (Kear and Berger 1980, p. 57; Banko and Elder 1990, p. 122; Baker and Baker 1995, p. 20; Zaun 2008, *in litt.*).

Dogs in Hawaii are products of animals brought by Polynesians and later introductions of mixed or selected breeds from all over the world (Tomich 1986, p. 52). Nene are particularly vulnerable to dogs because they have little instinctive fear of them. Along with mongooses, dogs are a significant predator of adult nene, and may also take goslings (Kear and Berger 1980, p. 57; Banko and Elder 1990, p. 122).

Cattle egrets and barn owls were both introduced into Hawaii in the late 1950s, in an attempt to address agricultural pests on farms and ranches.

In Hawaii, cattle egrets are now widespread on all the main islands, as well as on the islands and atolls of the Northwestern Hawaiian Islands. Barn owls occur on all of the main Hawaiian Islands in all habitat types, from sea level to upper elevation forests, and in recent years have been sighted with increasing frequency on offshore islets. Barn owls and cattle egrets may also take goslings occasionally (Banko *et al.* 1999, p. 11; S. Franklin 2016, pers. comm.).

The yellow crazy ant occurs in low- to mid-elevations (less than 2,000 ft (600 m)) in rocky areas of moderate rainfall (less than 100 in (250 cm) annually) (Reimer *et al.* 1990, p. 42). The tropical fire ant (*Solenopsis geminata*) is found in drier areas of all the main Hawaiian islands (Wong and Wong 1988, p. 175). Both species are nonnative and are known to cause significant injuries and developmental problems in adults and chicks of ground-nesting seabirds, and are expected to have similar effects on nene (S. Plentovich 2017, pers. comm.).

A variety of predator control programs have been initiated in areas where nene currently reside. Since 1994, Haleakala National Park has conducted intensive control of introduced predators using trapping and toxicants (Bailey and Tamayose 2016, *in litt.*). Ongoing efforts on the different islands include predator control programs aimed at mongooses, dogs, feral cats, rodents, and pigs. Some open-top pens previously used to rear captive nene on National Park Service lands are now often used to provide predator-free nesting and brooding habitat for free-flying pairs or as temporary holding pens for sick or injured birds (Hawaii Volcanoes National Park 2016, *in litt.*).

Nene population numbers at Hawaii Volcanoes National Park increased during a 10-year period (1989 to 1999), probably in part because of intensive predator control (Rave *et al.* 2005, p. 14). Since then, ongoing predator trapping focused in the primary breeding and brooding areas at Hawaii Volcanoes National Park during the breeding season has likely contributed to the overall increase in nene observed. The general increase in population at Haleakala National Park over the last 25 years is likely a response to increased habitat management—first, the removal of feral ungulates and control to ''near zero'' populations; later, the additional intensive control of introduced predators (Bailey and Tamayose 2016, *in litt.*). At Hawaii Volcanoes National Park, various fence designs have been used successfully to exclude mongooses, cats, dogs, and pigs. Predator control programs are currently conducted in most areas where nene nest, including Hanalei, Kilauea Point, and Hakalau Forest NWRs; Haleakala and Hawaii Volcanoes National Parks; and Piiholo Ranch, Haleakala Ranch (Waiopae), and Puu O Hoku Ranch on Molokai.

While the predator control programs have proven effective in localized areas, recovery of nene is dependent on more aggressive and widespread control of introduced predators. Despite documentation of the impact of mongooses, dogs, feral cats, rodents, and pigs on nene, there are relatively few predator control programs, and they are not being implemented over areas large enough to elicit a population response by native species (Scott *et al.* 2001, p. 11). Known control techniques should be applied at all habitats needed to recover nene (USFWS 2004, p. 41).

Summary of Factor C

Diseases such as toxoplasmosis, omphalitis, avian pox, avian malaria, and avian botulism cause low levels of mortality in nene populations. Avian influenza and WNV are not currently established in Hawaii, but could cause mortality of nene should they become established in the future. Measures to control feral cat populations will reduce the risk of exposure of nene to toxoplasmosis. Monitoring the occurrence of disease in nene populations, as well as early detection of avian botulism outbreaks or cases of avian influenza or WNV should minimize the impacts of these threats. Based on the above analysis, we conclude that disease will continue to affect nene now and in the foreseeable future, but it is not a significant threat because, at current and future levels, disease is not likely to cause population-level impacts.

Predation by introduced mammals is the most serious threat to nene. Predation by mongooses, dogs, cats, rats, and feral pigs continues to affect all life stages of nene (eggs, goslings, or adults), negatively impacting breeding success and survival. Predator control measures have improved survival and reproductive success and contributed to population increases in managed areas. However, these efforts are localized and overall predator populations are not being reduced; therefore, predators can readily recolonize an area. In addition, as nene populations expand into areas in their former historical range, such as lowland areas, they will likely encounter higher predator populations in and around human-occupied urban, suburban, and agricultural areas. Predation by cattle egrets and barn owls, and disturbance by ants, may result in injury or mortality of nene; however, this does not constitute a threat to nene, as such predation/disturbance occurs infrequently and is not known to have population-level impacts. Based on our analysis of the available information, we conclude that predation by introduced mammals is a threat to nene now and in the foreseeable future.

Factor D. The Inadequacy of Existing Regulatory Mechanisms

The following section includes a discussion of Federal, State, and local laws, regulations, or treaties that apply to nene. It includes laws and regulations for Federal land management agencies and State and Federal regulatory authorities affecting land use or other relevant management.

Federal Laws and Regulations

National Wildlife Refuge System Improvement Act of 1997. The National Wildlife Refuge System Improvement Act of 1997 (Pub. L. 105–57, October 9, 1997) established the protection of biodiversity as the primary purpose of the National Wildlife Refuge (NWR) System. This has led to various management actions to benefit federally listed species, including development of comprehensive conservation plans (CCPs) on NWRs. The CCPs typically set goals and list needed actions to protect and enhance populations of key wildlife species on NWR lands. Where nene occur on NWR lands (Hanalei, Kilauea Point, Hakalau Forest, Kealia Pond, and James Campbell NWRs), their habitats in these areas are protected from large-scale loss or degradation due to the Service's mission ''to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans'' (16 U.S.C. 668dd(2)). National Wildlife Refuges must also conduct section 7 consultations under the Act (discussed below) for any refuge activity that may result in adverse effects to nene.

Hanalei NWR was established in 1972, to aid in the recovery of the four endangered Hawaiian waterbirds and nene (Endangered Species Conservation Act of 1969; 16 U.S.C. 668aa *et seq.*). Kilauea Point NWR, originally established in 1985 to enhance seabird nesting colonies, was later expanded to include adjacent lands to be managed for the protection and recovery of endangered waterbirds and nene (The Kilauea Point National Wildlife Refuge Expansion Act of 2004, Pub. L. 108–481, December 23, 2004; 16 U.S.C. 668dd

note). Approximately two-thirds of the Kauai nene population is supported by the Hanalei and Kilauea NWRs. The Kilauea Point CCP includes the following goals: (1) Protect, enhance, and manage the coastal ecosystem to meet the life-history needs of migratory seabirds and threatened and endangered species; (2) restore and/or enhance and manage populations of migratory seabirds and threatened and endangered species; and (3) gather scientific information (surveys, research, and assessments) to support adaptive management decisions (USFWS 2016, pp. 2:19–31). Both Hanalei and Kilauea Point NWRs conduct ongoing predator control and habitat improvement and enhancement actions.

At Hakalau Forest NWR, a new population was created with the reintroduction of 33 captive-bred nene between 1996 and 2003. Since then, Hakalau Forest NWR has supported approximately 20 to 25 percent of the nene population on Hawaii Island. The Hakalau Forest CCP includes the following goals: (1) Protect and maintain grassland habitat to support nene population recovery; and (2) collect scientific information (inventories, monitoring, research, assessments) necessary to support adaptive management decisions on both units of the Hakalau Forest NWR (USFWS 2010, pp. 2:30–37).

Kealia Pond NWR, on the south-central coast of Maui, was established in 1992, to conserve habitat for the endangered Hawaiian stilt (*Himantopus mexicanus knudseni*) and Hawaiian coot (*Fulica alai*). Nene are occasionally observed at Kealia Pond NWR (USFWS 2011b, p. 4:14).

James Campbell NWR on the northern shore of Oahu was created in 1976, also for the conservation of endangered Hawaiian waterbirds, and later expanded in 2005, to include conservation of additional threatened and endangered species, migratory birds, and their habitats (USFWS 2011c, p. 1:1). In 2014, a pair of nene arrived on Oahu, nested at James Campbell NWR, and produced three offspring. Both parents and one of the offspring have since died, leaving the two remaining offspring on NWR and adjacent lands.

Hawaii National Park Act of 1916. Congress established Hawaii National Park (later to become, separately, Hawaii Volcanoes National Park and Haleakala National Park) on August 1, 1916 (39 Stat. 432), ''for the benefit and enjoyment of the people of the United States'' and to provide for, ''the preservation from injury of all timber, birds, mineral deposits, and natural curiosities or wonders within said park, and their retention in their natural condition as nearly as possible'' (16 U.S.C. 394). Since that time, the enabling legislation of the park has been modified several times, both to establish the national parks on the islands of Hawaii and Maui as separate parks and to expand the boundary of Hawaii Volcanoes National Park. In 1960, Congress authorized the establishment of the Haleakala National Park (Pub. L. 86–744, September 13, 1960); the park was established the following year. Haleakala National Park, on the eastern side of Maui, encompasses 33,222 acres (ac) (13,444 hectares (ha)), of which 24,719 ac (10,003 ha) are designated wilderness (74 percent of the park). Hawaii Volcanoes National Park protects 330,086 ac (133,581 ha) of public land on Mauna Loa and Kilauea volcanoes on the southeastern side of Hawaii Island. Haleakala National Park and Hawaii Volcanoes National Park have supported nene recovery actions since the 1960s and 1970s, respectively. Past and ongoing actions include releases of captive-bred nene, habitat management (*e.g.,* predator control, feral ungulate control, nonnative plant species control), provision of supplemental food and water, monitoring, and outreach and education.

Migratory Bird Treaty Act (MBTA). Nene are a protected species under the MBTA (16 U.S.C. 703–712, 50 CFR 10.13), a domestic law that implements the U.S. commitment to four international conventions (with Canada, Japan, Mexico, and Russia) for the protection of shared migratory bird resources.

State Laws and Regulations

The Hawaii Endangered Species law (Hawaii Revised Statutes (HRS) 195D) prohibits take, possession, sale, transport, or commerce in designated species. This State law also recognizes as endangered or threatened those species determined to be endangered or threatened pursuant to the Federal Endangered Species Act. This Hawaii law states that a threatened species (under the Act) or an indigenous species may be determined to be an endangered species under State law. Protection of these species is under the authority of Hawaii's DLNR, and under administrative rule (Hawaii Administrative Rules (HAR) 13–124–11). Incidental take of threatened and endangered species may be authorized through the issuance of a temporary license as part of a safe harbor agreement (SHA) or habitat conservation plan (HCP) (HRS 195D–21, HCPs; 195D–22, SHAs). Although this State law can address threats such as habitat modification, collisions, and other human-caused mortality through HCPs that address the effects of individual projects or programs on nene, it does not address the pervasive threats to the nene posed by introduced mammalian predators. DLNR also maintains HAR 13–124–3, which protects indigenous and introduced wildlife.

The importation of nondomestic animals, including microorganisms, is regulated by a permit system (HAR 4–71) managed through the Hawaii Department of Agriculture (HDOA). The list of nondomestic animals (HAR 4–71) is defined by providing a list of those animals considered domestic: Dog, cat, horse, ass (burro or donkey), cattle and beefalo, sheep, goat, swine, pot-bellied pig, alpaca, llama, rabbit, chicken, turkey, pigeon, duck, geese, and their hybrids. The HDOA's Board of Agriculture maintains lists of nondomestic animals that are prohibited from entry, animals without entry restrictions, or those that require a permit for import and possession. The HDOA requires a permit to import animals, and conditionally approves entry for individual possession, businesses (*e.g.,* pets and resale trade, retail sales, and food consumption), or institutions.

Under statutory authorities provided by HRS title 12, subtitle 4, 183D Wildlife, the DLNR maintains HAR title 13, chapter 124 (2014), which defines, at section 13–124–2, ''injurious wildlife'' as ''any species or subspecies of animal except game birds and game mammals which is known to be harmful to agriculture, aquaculture, indigenous wildlife or plants, or constitute a nuisance or health hazard and is listed in the exhibit entitled Exhibit 5, Chapter 13–124, List of Species of Injurious Wildlife in Hawaii''. Under HAR section 13–124–3(c), ''no person shall, or attempt to: (1) Release injurious wildlife into the wild; (2) transport live injurious wildlife to islands or locations within the State where they are not already established and living in a wild state; or (3) export any such species, or the dead body or parts thereof, from the State.'' Permits for these actions may be considered on a case-by-case basis. The small Indian mongoose, a serious predator of nene, is included in Exhibit 5, chapter 13–124, List of Species of Injurious Wildlife in Hawaii. While this HAR may address intentional attempts to transport or release mongooses, there is evidence that inspection and biosecurity measures at inter-island ports may not adequately address their unintentional introduction (*e.g.,* as

stowaways in cargo) to islands such as Kauai and Lanai that are thought to be mongoose-free. Currently, there is no biosecurity at Honolulu ports focused on mongoose. At Nawiliwili Harbor (Kauai), low-level interdiction was conducted until about 2015, but has since been discontinued (B. Phillips 2017, pers. comm.). There are plans to reinitiate this in the coming months. Similarly, there is no interdiction being conducted on Lanai for mongoose.

Predation by mongooses is a serious threat to nene (see Factor C discussion, above). Currently, the nene population on Kauai represents approximately 43 percent of the total Statewide population. Establishment of a breeding population of mongoose on Kauai would significantly reduce the survival and reproduction of nene on Kauai, and as a result, significantly increase the risk of extinction of nene. Although based on limited data, nene nesting success estimates on unmanaged lands on Kauai (*i.e.,* no predator control) are higher than managed lands on Maui and Hawaii; this difference may indicate the additional impact of nest predation by mongoose, which are not found on Kauai (Amidon 2017).

Critical biosecurity gaps that reduce the effectiveness of animal introduction controls include inadequate staffing, facilities, and equipment for Federal and State inspectors devoted to invasive species interdiction (Hawaii Legislative Reference Bureau 2002; USDA–APHIS–PPQ 2010; Coordinating Group on Alien Pest Species (CGAPS) 2009). In recognition of these gaps, a State law has been passed that allows the HDOA to collect fees for quarantine inspection of freight entering Hawaii (Act 36 (2011) HRS 150A–5.3). Hawaii legislation enacted in 2011 (House Bill 1568) requires commercial harbors and airports to provide biosecurity and inspection facilities to facilitate the movement of cargo through ports. This bill is a significant step toward optimizing biosecurity capacity in the State, but only time will determine its effectiveness. The Hawaii Interagency Biosecurity Plan (2017) is a 10-year strategy that addresses Hawaii's most critical biosecurity gaps and provides a coordinated interagency path that includes policies and implementation tasks in four main areas: (1) Pre-border; (2) border; (3) post-border; and (4) education and awareness. Overall, there is an ongoing need for all civilian and military port and airport operations and construction to implement biosecurity measures in order to prevent the introduction or inter-island transportation of additional predators and diseases that could impact nene.

Feral pigs pose the threat of predation to nene (see Factor C discussion, above). The State provides opportunities to the public to hunt game mammals (ungulates, including feral pigs) on 91 State-designated public hunting areas (within 45 units) on all the main Hawaiian Islands except Kahoolawe and Niihau (HAR–DLNR 2010; see HAR title 13, chapter 123; DLNR 2009, pp. 28–29). The State's management objectives for game mammals range from maximizing public hunting opportunities (*i.e.,* ''sustained yield'') in some areas to removal by State staff or their designees from other areas (HAR–DLNR 2010; see HAR title 13, chapter 123; DLNR 2009, pp. 28–29). Nene populations exist in areas where habitat is used for game enhancement and game populations are maintained at levels for public hunting (HAR–DLNR 2010; see HAR title 13, chapter 123; see Nene Use Area Maps in USFWS 2017). Public hunting areas are defined, but not fenced, and game mammals have unrestricted access to most areas across the landscape, regardless of underlying land-use designation. While fences are sometimes built to protect certain areas from impacts of game mammals, the current number and locations of fences are not adequate to address the threat of habitat degradation and predation on the nene in unfenced areas throughout its range. There are no other State regulations than those described above that address protection of nene and their habitat from feral pigs.

Local Mechanisms

Local groups are working to implement actions urgently needed to address the importation of nonnative, invasive species. We discuss the primary groups below.

CGAPS, a partnership of managers from Federal, State, County, and private agencies and organizations involved in invasive species work in Hawaii, was formed in 1995, in an effort to coordinate policy and funding decisions, improve communication, increase collaboration, and promote public awareness (CGAPS 2009). This group facilitated the formation of the Hawaii Invasive Species Council (HISC), which was created by gubernatorial executive order in 2002, to coordinate local initiatives for the prevention of introduction and for control of invasive species by providing policy-level direction and planning for the State departments responsible for invasive species issues (CGAPS 2009). In 2003, the Governor signed into law Act 85, which conveys statutory authority to the HISC to continue to coordinate approaches among the various State and Federal agencies, and international and local initiatives, for the prevention and control of invasive species (DLNR 2003, p. 3–15; HISC 2009, *in litt.;* HRS 194–2). Reduced funding beginning in 2009 restricted State funding support of HISC, resulting in a serious setback of conservation efforts (HISC 2009, 2015, *in litt.*) and increasing the likelihood of new invasive plants and animals becoming established in nene habitat.

The Hawaii Association of Watershed Partnerships (HAWP) comprises 11 separate partnerships on 6 Hawaiian Islands. These partnerships are voluntary alliances of public and private landowners, ''committed to the common value of protecting forested watersheds for water recharge, conservation, and other ecosystem services through collaborative management'' (*http://hawp.org/partnerships*). Funding for the partnerships is provided through a variety of State and Federal sources, public and private grants, and in-kind services provided by the partners and volunteers. However, since 2009, decreases in available funding have limited the positive contributions of these groups to implementing the laws and rules that can protect and control threats to nene.

These three partnerships, CGAPS, HISC, and HAWP, are collaborative measures that attempt to address issues that are not resolved by individual State and Federal agencies. The capacity of State and Federal agencies and their nongovernmental partners in Hawaii to provide sufficient inspection services, enforce regulations, and mitigate or monitor the effects of nonnative species is limited due to the large number of taxa currently causing damage (CGAPS 2009). Many invasive, nonnative species established in Hawaii currently have limited but expanding ranges, and they cause considerable concern. Resources available to reduce the spread of these species and counter their negative effects are limited. Control efforts are focused on a few invasive species that cause significant economic or environmental damage to commercial crops and public and private lands. Comprehensive control of an array of nonnative species and management to reduce disturbance regimes that favor them remain limited in scope. If current levels of funding and regulatory support for control of nonnative species are maintained, the Service expects existing programs to continue to exclude, or, on a very limited basis, control these species only in the highest priority areas. Threats from established nonnative species to nene are ongoing and are expected to continue into the future.

Summary of Factor D

Based on our analysis of existing regulatory mechanisms, there is a diverse network of laws and regulations that provide some protections to the nene and its habitat. Nene habitat that occurs on NWRs is protected under the National Wildlife Refuge System Improvement Act of 1997 and section 7 of the Endangered Species Act. Nene habitat is similarly protected on lands owned by the National Park Service. Additionally, nene receive protection under State law in Hawaii.

As a conservation reliant species, nene are expected to require ongoing management to address the ongoing threat of predation by introduced mammals such as mongooses, dogs, cats, rats, and pigs (Factor C). Although State and Federal regulatory mechanisms have not prevented the introduction into Hawaii of nonnative predators or their spread between islands, with sustained management commitments, these mechanisms could be an important tool to ameliorate this threat.

On the basis of the information provided above, existing State and Federal regulatory mechanisms are not preventing the introduction of nonnative species and pathogens into Hawaii via interstate and international pathways, or via intrastate movement of nonnative species between islands and watersheds. These mechanisms also do not adequately address the current threats posed to the nene by established nonnative species. Therefore, we conclude State and Federal regulatory mechanisms do not adequately address the threats to nene and their habitats from potential new introductions of nonnative species or continued expansion of existing nonnative species populations on and between islands and watersheds. However, with sustained management commitment, these mechanisms could be tools to ameliorate these threats.

Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence

Low Genetic Variation

Studies have shown that nene went through a prehistoric population bottleneck and have very low genetic diversity (Paxinos *et al.* 2002, p. 1,827; Rave *et al.* 1999, p. 40; Veillet *et al.* 2008, pp. 1,158—1,160). Low levels of genetic diversity have been found in wild and captive nene populations, and there is some evidence that fertility and gosling survival have declined in captivity as inbreeding has increased (Rave *et al.* 1994, p. 747; Rave 1995, p. 87, Rave *et al.* 1999, p. 40). A condition known as ''hairy-down'' caused by a recessive gene, which creates a cottony appearance and impairs cold resistance in goslings, has been observed in captive and wild nene (USFWS 2004, pp. 33–34); such goslings observed in the wild at Hawaii Volcanoes National Park have not survived (K. Misajon 2017, pers. comm.).

Rave (1995, p. 87) found that nene on Kauai had a significantly higher genetic similarity coefficient distribution (*i.e.,* the lowest level of genetic variation) of all birds sampled from six wild populations on Hawaii, Maui, and Kauai. Despite low genetic diversity and high levels of inbreeding, nene numbers have increased dramatically on Kauai. Thus, low genetic variation may not be a factor limiting reproductive success of the nene on Kauai (Rave 1995, p. 88).

Wind Energy Facilities

A significant number of nene mortalities have been reported at wind energy facilities. Nene collide with the towers or collide with or are struck by blades of wind turbine generators (WTGs). The diameter of rotor blades (approximately 330 ft (100 m)) and combined height of WTGs (up to 428 ft (131 m)) create large obstacles for nene during flight. On Maui, 3 facilities with a total of 40 WTGs are in operation, Kaheawa Wind Power I (20 WTGs) and Kaheawa Wind Power II (12 WTGs) in western Maui, and Auwahi Wind (8 WTGs) in southeastern Maui. From 2006 to 2016, a total of 26 nene fatalities and an adjusted take of 50 nene have been reported at the three Maui wind energy facilities (DOFAW 2016, *in litt.*). Take is adjusted by adding estimates of take undetected by search efforts, indirect take (*e.g.,* eggs or goslings taken by parental deaths in the current year), and lost productivity in future years. All three Maui facilities have approved habitat conservation plans (HCPs) and have received Federal incidental take permits and State incidental take licenses authorizing the total combined take of 95 nene during the 20-year period of operation for each project. The HCPs include the following conservation measures to offset the amount of authorized take: (1) Establish an additional population of 75 nene at an off-site location (Haleakala Ranch), (2) conduct predator control and habitat enhancement at the additional population site, (3) conduct on-site habitat restoration, (4) conduct on-site monitoring of nene, and (5) fund nene conservation actions at Haleakala National Park (DOFAW 2016, *in litt.*).

On Hawaii Island, two facilities with a total of 30 WTGs are in operation in Hawi (16 WTGs) and South Point (14 WTGs); however, there are no reports of nene being killed at these facilities (D. Sether 2017, pers. comm.). Based on the proximity of these facilities to areas used by nene, there is the potential for collisions. On Oahu, a total of 42 WTGs are in operation at Kawailoa Wind Power (30 WTGs) and Kahuku Wind Power (12 WTGs), and an additional 9 to 10 WTGs are proposed at the Na Pua Makani project in the Kahuku area. Na Pua Makani has submitted a draft HCP and requested incidental take for nene due to the proximity of the proposed wind energy project to James Campbell NWR, where the nene have been frequently observed. Based on the recent occurrence of only two individuals, which failed to breed successfully in 2016, wind energy facilities on Oahu are not a current threat, but represent a potential future threat should a breeding population of nene become established. On Maui and Hawaii Island, we expect that collisions at wind energy facilities will continue to result in take of nene now and in the foreseeable future; however, conservation measures in approved and permitted HCPs are expected to offset any population-level impacts to the species.

Human Activities

Nene are attracted to feeding opportunities provided by mowed grass and human handouts, and can become tame and unafraid of human activity, making them vulnerable to the impacts of various human activities. These activities include direct harm, such as that caused by vehicles and golf ball strikes, as well as possible disturbance by hikers, hunters, and other outdoor recreationists (Banko *et al.* 1999, pp. 23–24; Rave *et al.* 2005, p. 12; USFWS 2011a, p. 11; Hawaii Volcanoes National Park 2015, *in litt.;* Mello 2017, *in litt.*). Nene may also be impacted by human activities through the application of pesticides and other contaminants, ingestion of plastics and lead, collisions with stationary or moving structures or objects, entanglement in artificial hazards (*e.g.,* fences, fishing nets, erosion control material), disturbance at nest and roost sites, and mortality or disruption of family groups through direct and indirect human activities (Banko *et al.* 1999, pp. 23–24; USFWS 2004, pp. 30–31; Work *et al.* 2015, pp. 692–693).

Vehicle Collisions

Vehicle collisions have been an ongoing cause of nene mortality (Hoshide *et al.* 1990, p. 153; Rave *et al.* 2005, p. 15; Work *et al.* 2015, pp. 692–693). In many areas, nene habitat is

bisected by roads, with nesting and roosting on one side, foraging on the other side. This poses a serious threat, particularly during the breeding season, when adults walk goslings across roads. The greatest number of vehicle collisions occurs between December and April, during the peak of the breeding and molting season. It is during this time of year that both adults and goslings are flightless for a period of time and are especially vulnerable. The problem is worse in some areas because birds are attracted to handouts by visitors and the young shoots of recently manicured or irrigated lawns of roadsides and golf courses. Nene are often seen foraging along the edges of highways and ditches as a result of regular mowing and runoff from the pavement creating especially desirable grass in these areas. The impact is further exacerbated when, after a nene is killed on a road, the remaining family members are often unwilling to leave the body, resulting in multiple birds being killed over a short period of time (DLNR 2016, *in litt.*) and potential loss of future reproductive output from breeding pairs.

In the past, a number of mortalities caused by vehicle collisions were reported in Hawaii Volcanoes National Park (41) and in Haleakala National Park (14) (USFWS 2004, pp. 30–31; Rave *et al.* 2005, p. 12). More recent data indicate this is an ongoing issue both inside and outside park boundaries on Maui and Hawaii Island; the average annual number of nene killed by cars at Haleakala National Park was 1.2 ± 1.2 (from 1988 to 2011), and occurred at an average annual rate of 3 ± 2.39 at Hawaii Volcanoes National Park and an adjacent State highway (from 2009 to 2016) (Bailey and Tamayose 2016, *in litt.;* Misajon 2017, *in litt.*). Mortality of nene due to vehicle collisions has also been a continual problem on Kauai (Uyehara 2016c, *in litt.*). Over 50 nene were struck and killed by cars across the roadways of Kauai in 2 years (Kauai DOFAW 2016, *in litt.*). On Kauai, typically the majority of vehicle strikes occur in Hanalei and Kilauea, where the largest proportion of the Kauai population occurs; however, the most recent strikes are occurring on the western side of the island.

The National Park Service (NPS) is actively implementing aggressive traffic-calming measures (Haleakala National Park 2014, *in litt.;* USFWS 2016, *in litt.*). A press release is sent out at the beginning of the nesting season, asking park visitors to drive carefully. Posters are displayed at car rental agencies asking visitors to drive carefully when visiting the park. ''Nene Crossing'' postcards with ''Slow Down'' messages in different languages are handed out to vehicles entering the park. Cones, signs, and a radar trailer are placed along roadsides where nene are frequently seen. Permanent ''Nene Crossing'' signs alert drivers to the potential for birds in the primary area(s) of concern, and temporary crossing signs are deployed when birds are observed frequenting specific road side sites. The NPS conducts regular outreach and education to raise visitor awareness of nene near roads. The Kauai DOFAW conducts educational outreach and has signs placed to encourage driving at reduced speeds. The conservation measures reduce but do not eliminate the threat of vehicle collisions. Based on the available information, we conclude vehicle collisions are an ongoing cause of nene injury and mortality on Kauai, Maui, and Hawaii.

Natural and Artificial Hazards

Nene can become entangled or trapped in artificial hazards (*e.g.,* old grass-covered fence wire; fishing line, predator traps; spilled tar) and some natural hazards (lava tube openings or deep depressions in ash deposits) (Banko *et al.* 1999, p. 24). Goslings occasionally drown in stock ponds, water troughs, and other water sources where exit to land is difficult (Banko *et al.* 1999, p. 24). Predator traps outfitted with protective guards have been effective at reducing the incidence of injury to goslings (NRCS 2007, p. 6).

The use of certain fencing and erosion control materials has resulted in entanglement of nene with the potential to cause impaired movement, injury, and in some cases mortality. Over 2 years, a total of 44 nene (27 adults and 17 hatch-year birds) in the Poipu/Koloa population on Kauai have been observed with woven threads from erosion control slope matting wrapped around their legs at a single construction site (Kauai DOFAW 2016, *in litt.*). Once the material is wrapped around their legs, nene have an increased risk of becoming entangled with other objects, experiencing skin lacerations, and having the circulation cut from their legs leading to infection and the death of the limb (Kauai DOFAW 2015, *in litt.*). Not all instances of entanglement result in harm to nene, as birds may free themselves from threads. Nine of the 44 entangled nene have been observed with constriction or swelling on their legs; 3 have received rehabilitation and been released; and 1 was euthanized due to injuries sustained from the material. Kauai DOFAW is working with the landowners to minimize impacts and has recommended that the use of this type of erosion control matting be discontinued.

Summary of Factor E

As nene populations continue to recover and increase in number and range, they will be subject to increased human interactions in and around urban, suburban, agricultural, and recreational areas. Vehicle collisions are an ongoing cause of nene injury and mortality; however, we do not have evidence that this factor is limiting population sizes. We acknowledge that increasing nene population sizes could result in increased mortality rates in the future, especially for those populations near areas with human presence. While vehicle collisions could potentially impact certain populations, they do not constitute a threat to the entire species now, and we do not expect them to be a threat in the foreseeable future. Artificial hazards that result in entanglement or drowning occur at low frequency and thus are not expected to result in population-level impacts. Collisions at wind energy facilities will result in take of nene now and in the foreseeable future; however, conservation measures in approved and permitted HCPs are expected to offset any population-level impacts to the species. While nene exhibit low levels of genetic variation, this does not appear to be a factor limiting reproductive success. Thus, low genetic variation is not a threat to nene now or in the foreseeable future.

Overall Summary of Factors Affecting Nene

The current Statewide nene population estimate is 2,855 (NRAG 2017). The population on Kauai, estimated at 1,107 birds, is stable and increasing, sustained by ongoing predator control and habitat management (NRAG 2017). Nene on Kauai exhibit successful breeding, likely due to abundant food in managed grasslands and the absence of mongooses, which are a significant nest predator on other islands. Between 2011 and 2016, 640 nene were relocated from Kauai to Maui and Hawaii Island. The Kauai population is expected to continue to exhibit an increasing trend. On Maui, the current population estimate is 616, with approximately half of the population in Haleakala National Park, and the remainder is distributed across areas of western Maui, southern Maui, and the northwestern slopes of Haleakala. The population at Haleakala National Park shows a general increasing trend with numbers consistently above 200 birds since

intensive habitat management (feral ungulate and predator control) measures were initiated in the 1990s. On Hawaii Island, the current population estimate is 1,095, which includes 592 birds relocated from Kauai (NRAG 2017). Prior to the addition of nene from Kauai, population estimates on Hawaii Island ranged between 331 and 611, and in general show an increasing trend during the previous 10-year period since the last major release of 53 birds in 2001. For many years, the largest population of nene on Hawaii Island has occurred in Hawaii Volcanoes National Park. Over the last 10 years, population estimates at Hawaii Volcanoes National Park have remained relatively constant (ranging between 200 and 250 birds), sustained by ongoing predator control and habitat management. On Molokai, the current population estimate of 35 (NRAG 2017), down from an estimate of 78 in 2015, is likely due to predation (Franklin 2017, *in litt.*). While nene on Molokai have bred successfully, periodically low fledging success has been reported due to the high mortality of nestlings, possibly due to overcrowding at the release site. Estimates of the population on Molokai have fluctuated widely since the reintroduction of 74 birds was completed in 2004. Nene are considered a conservation-reliant species, especially on Maui and Hawaii Island, where populations are spread across a large area and exposed to ongoing threats of predation, habitat loss (development, feral ungulates, nonnative plants), and disease (Reed *et al.* 2012, p. 888). At a minimum, current management levels must be continued to sustain current population trends.

Threats to nene from habitat destruction or modification (Factor A) remain and will likely continue into the foreseeable future in the form of urbanization, agricultural activities, habitat alteration by feral ungulates and nonnative plants, and drought. These factors contribute to a lack of suitable breeding and flocking habitat and, in combination with predation (Factor C) and human activities (Factor E), continue to threaten nene and limit expansion of nene populations. Some habitats are expected to be affected by habitat changes resulting from the effects of climate change (Factor A). Overutilization (Factor B) is not a threat. Diseases (Factor C) such as toxoplasmosis, avian malaria, omphalitis, and avian botulism are not currently known to contribute significantly to mortality in nene. Thus, we do not consider disease to be a threat. Predation (Factor C) by introduced mammals, including mongooses, dogs, cats, rats, and pigs, is a significant limiting factor for nene populations now and into the foreseeable future. Therefore, we consider predation to be a threat. Existing regulatory mechanisms, including those to prevent predation will be an important component of ongoing management of nene as a conservation reliant species, but do not currently adequately ameliorate threats and will require continuing commitment to implementation (Factor D). Human activities such as vehicle collisions, artificial hazards, and other human interactions (Factor E) continue to result in injury and mortality; while the individual impacts of these hazards do not constitute threats with population-level impacts to nene, they collectively and in combination with other factors (Factors A, C, and D) constitute an ongoing threat.

Proposed Determination of Species Status

Introduction

Section 4 of the Act (16 U.S.C. 1533), and its implementing regulations at 50 CFR part 424, set forth the procedures for determining whether a species is an endangered species or threatened species and should be included on the Federal Lists of Endangered and Threatened Wildlife and Plants (listed). The Act defines an endangered species as any species that is ''in danger of extinction throughout all or a significant portion of its range'' and a threatened species as any species ''that is likely to become endangered throughout all or a significant portion of its range within the foreseeable future.'' On July 1, 2014, we published a final policy interpreting the phrase ''significant portion of its range'' (SPR) (79 FR 37578). In our policy, we interpret the phrase ''significant portion of its range'' in the Act's definitions of ''endangered species'' and ''threatened species'' to provide an independent basis for listing a species in its entirety; thus there are two situations (or factual bases) under which a species would qualify for listing: A species may be in danger of extinction or likely to become so in the foreseeable future throughout all of its range; or a species may be in danger of extinction or likely to become so throughout a significant portion of its range. If a species is in danger of extinction throughout an SPR, the species, is an ''endangered species.'' The same analysis applies to ''threatened species.''

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

Determination of Status Throughout All of Its Range

As required by the Act, we considered the five factors in assessing whether nene is endangered or threatened throughout all of its range. We carefully examined the best scientific and commercial information available regarding the past, present, and future threats faced by nene. We reviewed the information available in our files and other available published and unpublished information, and we consulted with recognized experts and State agencies. The current statewide nene population estimate is 2,855 individuals, with the wild populations on the islands of Hawaii, Maui, Molokai, Kauai, and Oahu estimated to have 1,095, 616, 35, 1,107, and 2 individuals, respectively. Populations on Kauai, Maui, and Hawaii are exhibiting a stable or increasing trend, while the nene population on Molokai is experiencing a fluctuation in population numbers. Continuation of current population trends into the future is dependent on, at a minimum, maintaining current levels of management (*e.g.,* predator control and habitat enhancement). Nene are still affected by predation (Factor C), loss and degradation of habitat (Factor A), and effects of human activities (Factor E); and some subpopulations may potentially be affected in the future by habitat changes resulting from the effects of climate change such as increases in drought, hurricanes, or sea level rise (Factor A). Regulatory mechanisms do not adequately address these threats. While threat intensity and management needs vary somewhat across the range of the species (for example, the current lack of an established mongoose population on Kauai influences predator control strategies there), nene populations on

islands throughout the range of the species continue to be reliant on active conservation management and require adequate implementation of regulatory mechanisms, and all remain vulnerable to threats that could cause substantial population declines in the foreseeable future. Despite the existing regulatory mechanisms and conservation efforts (Factor D), the factors identified above continue to affect the nene such that it is likely to become in danger of extinction within the foreseeable future throughout all of its range. Thus, after assessing the best available information, we conclude that the nene is not currently in danger of extinction, but is likely to become in danger of extinction within the foreseeable future throughout all of its range.

Determination of Status Throughout a Significant Portion of Its Range

Because we have determined that the nene is likely to become in danger of extinction in the foreseeable future throughout all of its range, per the Service's 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 37578, July 1, 2014) (SPR Policy), no portion of the species' range can be ''significant'' for the purposes of the definitions of endangered and threatened species. Therefore, we do not need to conduct an analysis of whether there is any significant portion of its range because the species is likely to become in danger of extinction in the foreseeable future.

Proposed Determination of Status

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the nene. Based on the analysis above and given increases in population numbers due to recovery efforts, we conclude the nene does not currently meet the Act's definition of an endangered species in that it is not in danger of extinction throughout all of its range. Although population numbers have increased, our analysis indicates that because of significant remaining threats, the species remains likely to become in danger of extinction in the foreseeable future throughout all of its range. Because the species is likely to become in danger of extinction in the foreseeable future throughout all of its range, the species meets the definition of a threatened species. Therefore, we propose to reclassify the nene from an endangered species to a threatened species.

This proposal, if made final, would revise 50 CFR 17.11(h) to reclassify nene from endangered to threatened. Reclassification of nene from endangered to threatened is due to the substantial efforts made by Federal, State, and local government agencies and private landowners to recover the species. Adoption of this proposed rule would formally recognize that this species is no longer in danger of extinction throughout all or a significant portion of its range and, therefore, does not meet the definition of endangered, but is still impacted by predation, habitat loss and degradation, and inadequacy of regulatory mechanisms to the extent that the species meets the definition of a threatened species under the Act.

Proposed 4(d) Rule

Whenever a species is listed as threatened, the Act allows promulgation of a rule under section 4(d). Section 4(d) of the Act states that ''the Secretary shall issue such regulations as he deems necessary and advisable to provide for the conservation'' of species listed as threatened species. Conservation is defined in the Act to mean ''to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to [the Act] are no longer necessary.'' The purposes of the Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in the Act. For any threatened fish and wildlife species, the Secretary has the discretion to prohibit by regulation any action prohibited under section 9(a)(1) of the Act. Exercising this discretion, the Service has by regulation (50 CFR 17.31) applied the prohibitions in section 9(a)(1) to all threatened wildlife species except for those for which a rule has been promulgated under section 4(d) of the Act. A 4(d) rule may include some or all of the prohibitions under section 9(a)(1), as set out at 50 CFR 17.21, but also may be less or more restrictive than those general provisions.

Section 9 of the Act prohibits the taking of any federally listed endangered species, including nene. Section 3(19) defines ''take'' to mean ''to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.'' Service regulations (50 CFR 17.3) define ''harm'' to include significant habitat modification or degradation which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined at 50 CFR 17.3 as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Section 9 also prohibits import, export, and sale of endangered species in interstate or foreign commerce. The Act provides for civil and criminal penalties for the unlawful taking of listed species or other violations of section 9.

Under 50 CFR 17.32, permits may be issued for certain actions affecting threatened fish and wildlife species that would otherwise be prohibited under the Act. The processes and criteria for such permit issuance are governed by 50 CFR 17.32, unless otherwise provided in a 4(d) rule. If an activity that may affect the nene is not covered in this proposed 4(d) rule and the activity would result in an act that would be otherwise prohibited, authorization under 50 CFR 17.32 would be required. In addition, nothing in this 4(d) rule affects in any way other provisions of the Act, such as the designation of critical habitat under section 4, recovery planning provisions of section 4(f), and consultation requirements under section 7.

For the nene, the Service has determined that a 4(d) rule is appropriate. We propose to issue a rule for this species under section 4(d) of the Act as a means to provide continued protection from take and to facilitate conservation of nene and expansion of their range by increasing flexibility in management activities. This proposed 4(d) rule would apply only if and when the Service finalizes the reclassification of the nene as threatened. We propose a 4(d) rule for nene, as described below.

Anyone taking, attempting to take, or otherwise possessing a nene, or parts thereof, in violation of section 9 of the Act would still be subject to a penalty under section 11 of the Act, except for the actions that would be covered under the proposed 4(d) rule. Under section 7 of the Act, Federal agencies must ensure that any actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of nene.

Under the proposed 4(d) rule, take will generally continue to be prohibited, but the following forms of take would be allowed under the Act:

- Take by landowners or their agents conducting intentional harassment in

the form of hazing or other deterrent measures not likely to cause direct injury or mortality;

- Take that is incidental to conducting lawful control of introduced predators or habitat management activities for nene; and
- Take by authorized law enforcement officers for the purposes of aiding or euthanizing sick, injured, or orphaned nene; disposing of dead specimens; and salvaging a dead specimen that may be used for scientific study.

The proposed 4(d) rule targets activities to facilitate conservation and management of nene where they currently occur and may occur in the future through increased flexibility by eliminating the Federal take prohibition under certain conditions. These activities are intended to encourage support for the occurrence of nene in areas with land use practices compatible with the conservation of nene, and to redirect nene use away from areas that do not support the conservation of nene (see *Justification,* below).

As nene increase in number and range, they are facing increased interaction and potential conflict with the human environment. In addition, the nene recently translocated from Kauai to Maui and Hawaii Island have expanded into new areas on these islands, often in close proximity to human populations. Nene are known to use and interact with human-modified environments (such as wind farms, airports, resorts, golf courses, agricultural operations, residential areas, parks, public recreation areas, and transportation routes) during feeding, breeding, molting, and sheltering activities, as well as during seasonal intra-island movements. In these environments, nene may be subject to injury or mortality as a result of activities such as vehicle collisions, collisions with wind turbines, golf ball strikes, predation or attack by unrestrained pets, entanglement with foreign materials, and ingestion of herbicides and pesticides associated with construction, maintenance, or normal business activities in these areas. The proposed 4(d) rule would not change the prohibition on any take of nene associated with these activities, although hazing to move nene away from these activities would be allowed under the 4(d) rule. For these types of activities on non-Federal lands or those without a Federal nexus where section 7 would provide incidental take exemption, landowners or project proponents may develop an HCP and apply for an incidental take permit to address any potential take of the nene to avoid violating the prohibition on take.

Intentional Harassment Not Likely To Cause Mortality or Direct Injury

Hazing and other persistent deterrence actions are management strategies that may be used to address wildlife conflict issues. As nene populations increase, particularly in heavily human-populated lowland areas, they may often come into conflict with human activities. For example, nene are known to use a variety of human-modified areas including wind farms, airports, resorts, golf courses, agricultural operations, residential areas, parks, public recreation areas, and transportation routes. Nene using these areas may present a conflict with normal business activities or cause crop depredation or safety hazards to humans. Humans may also inadvertently harm nene by feeding them, which could result in nene showing aggressive behaviors towards humans, being injured or killed by vehicles or humans, or being placed at increased risk from predators. Methods such as hazing are necessary to prevent and address these potential human-nene conflicts, allowing nene to coexist with areas of established human activity and providing for continued public support of nene recovery actions.

Any deterrence activity that does not create a likelihood of injury by significantly disrupting normal nene behavioral patterns such as breeding, feeding, or sheltering is not take and is not prohibited under the Act.

If an activity creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns such as breeding, feeding, and sheltering, then the activity has the potential to cause take in the form of harassment. Hazing of nene is considered intentional harassment, which creates the likelihood of injury and has been prohibited under section 9 of the Act. Under this proposed 4(d) rule, hazing and other deterrence activities that may cause indirect injury to nene by disrupting normal behavioral patterns, but are not likely to be lethal or cause direct injury (including the need for veterinary care or rehabilitation), would be classified as intentional harassment not likely to cause direct injury or mortality, and would be allowed under Federal law. Such activities may include the use of predator effigies (including raptor kites, predator replicas, etc.), commercial chemical repellents, ultrasonic repellers, audio deterrents (noisemakers, pyrotechnics, etc.), herding or harassing with trained or tethered dogs, or access control (including netting, fencing, etc.). This proposed 4(d) rule would not apply to scenarios involving lethal or directly injurious take. For example, laser irradiation used for hazing may cause ocular damage resulting in temporary or permanent loss of visual acuity or blindness (Oregon State University 2017, *in litt.*), impairing the ability of nene to feed or avoid predators or other hazards (*e.g.,* vehicle collisions). Feral dogs or unrestrained pets are known to take nene adults and goslings, and nene are particularly vulnerable to dogs because they have little instinctive fear of them (NRCS 2007, p. 6). Therefore, the proposed rule would not cover hazing methods such as lasers or untrained and untethered dogs.

Intentional harassment activities not likely to cause direct injury or mortality that are addressed in this proposed 4(d) rule are recommended to be implemented prior to the nene breeding season (September through April) wherever feasible. If, during the breeding season, a landowner desires to conduct an action that would intentionally harass nene to address nene loafing or foraging in a given area, a qualified biologist familiar with the nesting behavior of nene must survey in and around the area to determine whether a nest or goslings are present. If a nest or families with goslings is discovered, a qualified biologist must be notified and the following measures implemented to avoid disturbance of nests and broods: (1) No disruptive activities may occur within a 100-foot (30-meter) buffer around all active nests and broods until the goslings have fledged; and (2) brooding adults (*i.e.,* adults with an active nest or goslings) or adults in molt may not be subject to intentional harassment at any time. In general, any observation of nene nest(s) or gosling(s) should be reported to the Service and authorized State wildlife officials within 72 hours. Additionally, follow-up surveys of the property by qualified biologists should be arranged by the landowner to assess the status of birds present.

Predator Control and Habitat Management

Control of introduced predators and habitat management are identified as two primary recovery actions for nene (USFWS 2004, p. 52). Control of predators (*e.g.,* mongooses, dogs, feral pigs, cats, rats, cattle egrets, and barn owls) may be conducted to eliminate or reduce predation on nene during all life stages. These predators are managed using a variety of methods, including fencing, trapping, shooting, and

toxicants. All methods must be used in compliance with State and Federal regulations. In addition to the application of the above tools, predator control as defined here includes activities related to predator control, such as performing efficacy surveys, trap checks, and maintenance duties. Predator control may occur year-round or during prescribed periods. During approved predator control activities, incidental take of nene may occur in the following manner: (1) Injury or death to goslings, juveniles, or adults from accidental trapping; (2) injury or death due to fence strikes caused from introduction of equipment or materials in a managed area; and (3) injury or death due to ingestion of chemicals approved for use in predator control. Under this proposed 4(d) rule, take resulting from actions implementing predator control activities to benefit nene would not be prohibited as long as reasonable care is practiced to minimize the effects of such taking. Reasonable care may include but is not limited to: (1) Procuring and implementing technical assistance from a qualified biologist(s) on predator control methods and protocols prior to application of methods; (2) compliance with all applicable regulations and following principles of integrated pest management; and (3) judicious use of methods and tool adaptations to reduce the likelihood that nene would ingest bait, interact with mechanical devices, or be injured or die from an interaction with mechanical devices.

Nene productivity and survival are currently limited by insufficient nutritional resources due to habitat degradation and the limited availability of suitable habitat due to habitat loss and fragmentation, especially in lowland areas (USFWS 2004, pp. 29–30). Active habitat management is necessary for populations of nene to be sustained or expanded without the continued release of captive-bred birds. Active habitat management in protected nesting and brooding areas should improve productivity and survival, as well as attract birds to areas that can be protected during sensitive life stages. Habitat management actions may include: (1) Mowing, weeding, fertilizing, herbicide application, and irrigating existing pasture areas for conservation purposes; (2) planting native food resources; (3) providing watering areas, such as water units or ponds or catchments, designed to be safe for goslings and flightless/molting adults; (4) providing temporary supplemental feeding and watering stations when appropriate, such as under poor quality forage or extreme conditions (*e.g.,* drought or fire); (5) if mechanical mowing of pastures is not feasible, alternative methods of keeping grass short, such as grazing; or (6) large-scale restoration of native habitat (*e.g.,* feral ungulate control, fencing).

In the course of habitat management activities, incidental take of nene may occur in the following manner: (1) Accidental crushing of non-flighted juveniles, goslings, or nests with eggs; (2) injury or death due to collisions with vehicles and equipment; (3) injury or death due to ingestion of plants sprayed with herbicides or ingestion of fertilizers; (4) injury or death due to entanglement with landscaping materials or choking on foreign materials; and (5) injury or death of goslings if goslings are separated from parents because of disturbance by restoration activities (*e.g.,* use of heavy equipment or mechanized tools). Under this proposed 4(d) rule, take resulting from habitat management activities would not be prohibited as long as reasonable care is practiced to minimize the effects of such taking. Reasonable care may include but is not limited to: (1) Procuring and implementing technical assistance from a qualified biologist on habitat management activities prior to implementation; and (2) best efforts to minimize nene exposure to hazards (*e.g.,* predation, habituation to feeding, entanglement, vehicle collisions, golf ball strikes).

Additional Authorizations for Law Enforcement Officers

The increased interaction of nene with the human environment also increases the likelihood of encounters with injured, sick, or dead nene. This proposed 4(d) rule would exempt take of nene by law enforcement officers in consultation with State wildlife biologists to provide aid to injured or sick nene, or disposal or salvage of a dead nene. Law enforcement officers would be allowed take of nene for the following purposes: Aiding or euthanizing sick, injured, or orphaned nene; disposing of a dead specimen; and salvaging a dead specimen that may be used for scientific study.

Justification

As the nene population increases in number and range, nene are facing increased interaction and potential conflict with the human environment. If finalized, the reclassification of the nene to threatened status would allow employees of State conservation agencies operating a conservation program pursuant to the terms of a cooperative agreement with the Service in accordance with section 6(c) of the Act, and who are designated by their agencies for such purposes, and who are acting in the course of their official duties, to take nene in the course of carrying out conservation programs (see 50 CFR 17.31(b)). However, there are many activities carried out or managed by landowners or their agents that help reduce conflict or benefit the recovery of nene, and thereby facilitate the expansion of nene populations, but would not be exempted from take prohibitions without a 4(d) rule. These activities include intentional harassment not likely to result in mortality or direct injury, predator control, and habitat management. We anticipate that reclassification and implementation of a 4(d) rule would facilitate the expansion of nene into additional areas with land use practices compatible with the conservation of nene, and reduce the occurrence of nene in areas that do not support the conservation of nene across the landscape. The proposed 4(d) rule would provide incentives to landowners to support the occurrence of nene on their properties, as well as neighboring properties, by alleviating concerns about unauthorized take of nene.

Except as outlined in the proposed 4(d) rule, prohibitions on take of nene would remain in effect. Harm or harassment that is likely to cause mortality or injury would continue to be prohibited because allowing these forms of take would be incompatible with restoring robust populations of nene and restoring and maintaining their habitat.

This rule does not alter the requirements of the Act's section 7 or the interagency regulations implementing section 7 found at 50 CFR part 402. Federal actions covered by this rule would still be subject to section 7. The effect of this rule would be to exclude certain specific actions from the prohibitions on take so that such actions may not require an exemption through section 7(o) of the Act. However, under 50 CFR 402.14 the Federal agency would still need to consult with the Service if the proposed action may affect nene, unless the agency determines with written concurrence from the Service that the proposed action is not likely to adversely affect the nene.

One of the limiting factors in the recovery of nene has been the concern of landowners regarding nene on their property due to the potential damage to agricultural crops and potential conflicts with normal business, recreational, and residential activities. Landowners express concern over their inability to prevent or address the

damage or conflicts caused by nene because of the threat of penalties under the Act. Furthermore, State and Federal wildlife agencies expend resources addressing landowner complaints regarding potential nene damage to agricultural crops and conflicts during normal business, recreational, and residential activities. By providing more flexibility to the landowners regarding management of nene, we envision enhanced support for the conservation of the species, by providing a tool to reduce potential human-wildlife conflicts in areas incompatible with the conservation of nene, as well as promote expansion of the species' range into additional areas compatible with conservation of nene across the State.

The proposed 4(d) rule would address intentional harassment of nene by landowners and their agents that is not likely to result in mortality or direct injury, and predator control and habitat management. Exempting targeted activities that may normally result in take under the prohibitions of the Act would increase the incentive for all landowners to support nene recovery and provide enhanced options for wildlife managers with respect to nene management, thereby encouraging their participation in recovery actions for nene.

We believe the actions and activities that would be allowed under the proposed 4(d) rule, while they may cause some minimal level of harm or disturbance to individual nene, would not be expected to cause mortality or direct injury, would not adversely affect efforts to conserve and recover nene, and in fact should facilitate these efforts because they would make it easier to implement recovery actions and redirect nene activity toward lands that are managed for conservation.

This proposed 4(d) rule would not be made final until we have reviewed and fully considered comments from the public and peer reviewers.

Provisions of the 4(d) Rule

The increased interaction of nene with the human environment increases the potential for nene to cause conflicts for business, agricultural, residential, and recreational activities, as well as the potential for nene to become habituated to hazardous areas (*e.g.,* golf courses, roadways, parks, farms). Therefore, this proposed 4(d) rule would increase the flexibility of nene management for landowners and their agents by allowing take of nene resulting from intentional harassment of nene that is not likely to result in mortality or direct injury, control of introduced predators of nene, and nene habitat management activities.

The proposed 4(d) rule only addresses Federal Endangered Species Act requirements, and would not change State law. It is our understanding that current State of Hawaii (HRS section 195D–4) law does not include the authority to issue regulations, equivalent to those under section 4(d) of the Act, to exempt take prohibitions for endangered and threatened species. Instead, State law requires the issuance of a temporary license for the take of endangered and threatened animal species, if the activity otherwise prohibited is: (1) For scientific purposes or to enhance the propagation or survival of the affected species (HRS 195D–4(f)); or (2) incidental to an otherwise lawful activity (HRS 195D–4(g)). Incidental take licenses require the development of an HCP (section 195D–21) or a safe harbor agreement (section 195D–22), and consultation with the State's Endangered Species Recovery Committee. Therefore, persons may need to obtain a State permit for some of the actions described in the proposed 4(d) rule. In addition, it is our understanding that current State regulations for endangered and threatened wildlife (HAR section 13–124, subchapter 3) do not allow permits for the intentional harassment or hazing of endangered or threatened species, thus changes to these State regulations may be necessary to allow the State to issue such permits.

As explained above, the provisions included in this proposed 4(d) rule are necessary and advisable to provide for the conservation of the nene. Nothing in this proposed 4(d) rule would change in any way the recovery planning provisions of section 4(f) of the Act, the consultation requirements under section 7 of the Act, or the ability of the Service to enter into partnerships for the management and protection of the nene. However, the consultation process may be further streamlined through planned programmatic consultations between Federal agencies and the Service for these activities. We ask the public, particularly State agencies and other interested stakeholders that may be affected by the proposed 4(d) rule, to provide comments and suggestions regarding additional guidance and methods that the Service could provide or use, respectively, to streamline the implementation of this 4(d) rule (see Information Requested, above).

Required Determinations

Clarity of This Proposed Rule

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

(a) Be logically organized;

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

(c) Use clear language rather than jargon;

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

(e) Use lists and tables wherever possible.

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

National Environmental Policy Act

We have determined that an environmental assessment or an environmental impact statement, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared in connection with regulations such as this. 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 all references cited in this proposed rule is available at *http://www.regulations.gov* at Docket No. FWS–R1–ES–2017–0050, or upon request from the Pacific Islands Fish and Wildlife Office (see **ADDRESSES**).

Authors

The primary authors of this document are staff members of the Pacific Islands Fish and Wildlife Office in Honolulu, Hawaii (see **FOR FURTHER INFORMATION CONTACT**).

List of Subjects in 50 CFR Part 17

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

Proposed Regulation Promulgation

Accordingly, we hereby 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; and 4201–4245, unless otherwise noted.

■ 2. Amend § 17.11(h) by revising the entry for ''Goose, Hawaiian'' under BIRDS in the List of Endangered and Threatened Wildlife to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Common name	Scientific name	Where listed	Status	Listing citations and applicable rules
*	*	*	*	*
Birds				
*	*	*	*	*
Goose, Hawaiian (Nene) ..	*Branta sandvicensis*	Wherever found	T	32 FR 4001, 3/11/1967; [Insert **Federal Register** citation when published as a final rule]; 50 CFR 17.41(d) [4d].
*	*	*	*	*

■ 3. Amend § 17.41 by adding a paragraph (d) to read as follows:

§ 17.41 Special rules—birds.

* * * * *

(d) Hawaiian goose (*Branta sandvicensis*) (nene).

(1) *General requirements.* Except as expressly provided in paragraphs (d)(3) and (4) of this section, all provisions of § 17.21, except § 17.21(c)(5), and all provisions of § 17.31(b) apply to the nene.

(2) *Definitions.* For the purposes of this paragraph:

(i) *Nene* means the Hawaiian goose (*Branta sandvicensis*);

(ii) *Intentional harassment* means an intentional act which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering (Intentional harassment may include prior purposeful actions to attract, track, wait for, or search out nene, or purposeful actions to deter nene); and

(iii) *Person* means a person as defined by section 3(13) of the Act.

(3) *Allowable forms of take of nene.* Any person may take nene as a result of the following legally conducted activities in accordance with this paragraph.

(i) *Intentional harassment of nene that is not likely to cause direct injury or mortality.* A person may harass nene on lands they own, rent, or lease, if the action is not likely to cause direct injury or mortality of nene. Techniques for such harassment may include the use of predator effigies (including raptor kites, predator replicas, etc.), commercial chemical repellents, ultrasonic repellers, audio deterrents (noisemakers, pyrotechnics, etc.), herding or harassing with trained or tethered dogs, or access control (including netting, fencing, etc.). Such harassment techniques must avoid causing direct injury or mortality to nene. Before implementation of any intentional harassment activities during the nene breeding season (September through April), a qualified biologist knowledgeable about the nesting behavior of nene must survey in and around the area to determine whether a nest or goslings are present. If a nest is discovered, the Service and authorized State wildlife officials must be notified within 72 hours (see paragraph (d)(5) of this section for contact information) and the following measures implemented to avoid disturbance of nests and broods:

(A) No disruptive activities may occur within a 100-foot (30-meter) buffer around all active nests and broods until the goslings have fledged; and

(B) Brooding adults (*i.e.,* adults with an active nest or goslings) or adults in molt may not be subject to intentional harassment at any time.

(ii) *Nonnative predator control or habitat management activities.* A person may incidentally take nene in the course of carrying out nonnative predator control or habitat management activities for conservation purposes if reasonable care is practiced to minimize effects to the nene.

(A) Predator control activities include use of fencing, trapping, shooting, and toxicants to control predators, and related activities such as performing efficacy surveys, trap checks, and maintenance duties. Reasonable care for predator control activities may include, but is not limited to, procuring and implementing technical assistance from a qualified biologist on predator control methods and protocols prior to application of methods; compliance with all State and Federal regulations and guidelines for application of predator control methods; and judicious use of methods and tool adaptations to reduce the likelihood of nene ingesting bait, interacting with mechanical devices, or being injured or dying from interaction with mechanical devices.

(B) Habitat management activities include mowing, weeding, fertilizing, herbicide application, and irrigating existing pasture areas for conservation purposes; planting native food resources; providing watering areas, such as water units or ponds or catchments, designed to be safe for goslings and flightless/molting adults; providing temporary supplemental feeding and watering stations when appropriate, such as under poor quality forage or extreme conditions (*e.g.,* drought or fire); if mechanical mowing of pastures is not feasible, alternate methods of keeping grass short, such as grazing; and large-scale restoration of native habitat (*e.g.,* feral ungulate control, fencing). Reasonable care for habitat management may include, but is not limited to, procuring and implementing technical assistance from a qualified biologist on habitat management activities, and best efforts to minimize nene exposure to hazards (*e.g.,* predation, habituation to feeding, entanglement, vehicle collisions, golf ball strikes).

(4) *Additional authorizations for law enforcement officers.* When acting in the course of their official duties, State and local government law enforcement officers, working in conjunction with authorized wildlife biologists and wildlife rehabilitators in the State of Hawaii, may take nene for the following purposes:

(i) Aiding or euthanizing sick, injured, or orphaned nene;

(ii) Disposing of a dead specimen; or

(iii) Salvaging a dead specimen that may be used for scientific study.

(5) *Reporting and disposal requirements.* Any injury or mortality of nene associated with the actions

authorized under paragraphs (d)(3) and (4) of this section must be reported to the Service and authorized State wildlife officials within 72 hours, and specimens may be disposed of only in accordance with directions from the Service. Reports should be made to the Service's Law Enforcement Office at (808) 861–8525, or the Service's Pacific Islands Fish and Wildlife Office at (808) 792–9400. The State of Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife may be contacted at (808) 587–0166. The Service may allow additional reasonable time for reporting if access to these offices is limited due to closure.

(6) *Take authorized by permits.* Any person with a valid permit issued by the Service under § 17.22 or § 17.32 may take nene, subject to all take limitations and other special terms and conditions of the permit.

(7) Federal actions remain subject to section 7 of the Act. Nothing in this section relieves Federal agencies from compliance with the provisions of 16 U.S.C. 1536 or 50 CFR part 402.

(8) Nothing in this section provides authorization for take of nene under the Migratory Bird Treaty Act (16 U.S.C. 703–712).

* * * * *

Dated: February 7, 2018.

James W. Kurth,

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

[FR Doc. 2018–06571 Filed 3–30–18; 8:45 am]

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