DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R1–ES–2014–0038; 4500030113]

RIN 1018–BA13

Endangered and Threatened Wildlife and Plants; Endangered Status for 16 Species and Threatened Status for 7 Species in Micronesia

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service, determine endangered status under the Endangered Species Act of 1973, as amended, for 16 plant and animal species from the Mariana Islands (the U.S. Territory of Guam and the U.S. Commonwealth of the Northern Mariana Islands). We also determine threatened status for seven plant species from the Mariana Islands and greater Micronesia in the U.S. Territory of Guam, the U.S. Commonwealth of the Northern Mariana Islands, the Republic of Palau, and the Federated States of Micronesia (Yap). The effect of this regulation will be to add these 23 species to the Federal Lists of Endangered and Threatened Wildlife and Plants.

DATES: This rule becomes effective November 2, 2015.

ADDRESSES: This final rule is available on the Internet at *http://www.regulations.gov* and *http://www.fws.gov/pacificislands*. Comments and materials we received, as well as some of the supporting documentation used in preparing this final rule, are available for public inspection at *http://www.regulations.gov*. All of the comments, materials, and documentation that we considered in this rulemaking are available, by appointment, during normal business hours, at: U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, 300 Ala Moana Boulevard, Room 3–122, Honolulu, HI 96850; by telephone at 808–792–9400; or by facsimile at 808–792–9581.

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

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Endangered Species Act of 1973, as amended (Act or ESA), a species may warrant protection through listing if it is endangered or threatened throughout all or a significant portion of its range. Listing a species as an endangered or threatened species can only be completed by issuing a rule. Critical habitat shall be designated, to the maximum extent prudent and determinable, for any species determined to be an endangered or threatened species under the Act.

This rule will finalize the listing of 23 species from the Mariana Islands as endangered or threatened species, one of which (*Cycas micronesica*) also occurs in the Republic of Palau and the Federated States of Micronesia (Yap). For the sake of brevity, throughout this document we refer to these 23 species simply as the 23 Mariana Islands species. Sixteen of these species are listed as endangered species: Seven plants—*Eugenia bryanii* (no common name (NCN)), *Hedyotis megalantha* (pau dedu, pao doodu), *Heritiera longipetiolata* (ufa halumtanu, ufa halom tano), *Phyllanthus saffordii* (NCN), *Psychotria malaspinae* (aplokating palaoan), *Solanum guamense* (Biringenas halumtanu, birengenas halom tano), and *Tinospora homosepala* (NCN); and nine animals—the Pacific sheath-tailed bat (Mariana subspecies, *Emballonura semicaudata rotensis;* payeyi, paischeey), Slevin's skink (*Emoia slevini;* gualiik halumtanu, gholuuf), Mariana eight-spot butterfly (*Hypolimnas octocula marianensis;* ababbang, libweibwogh), Mariana wandering butterfly (*Vagrans egistina;* ababbang, libweibwogh), Rota blue damselfly (*Ischnura luta;* dulalas Luta, dulalas Luuta), fragile tree snail (*Samoana fragilis;* akaleha dogas, denden), Guam tree snail (*Partula radiolata;* akaleha, denden), humped tree snail (*Partula gibba;* akaleha, denden), and Langford's tree snail (*Partula langfordi;* akaleha, denden). Seven plant species—*Bulbophyllum guamense* (siboyas halumtanu, siboyan halom tano), *Dendrobium guamense* (no common name (NCN), *Cycas micronesica* (fadang, faadang), *Maesa walkeri* (NCN), *Nervilia jacksoniae* (NCN), *Tabernaemontana rotensis* (NCN), and *Tuberolabium guamense* (NCN)—are listed as threatened species.

Delineation of critical habitat requires, within the geographical area occupied by the species, identification of the physical or biological features essential to the species' conservation. Information regarding the life functions and habitats associated with these life functions is complex, and informative data are largely lacking for the 23 Mariana Islands species. A careful assessment of the areas that may have the physical or biological features essential for the conservation of the species and that may require special management considerations or protections, and thus qualify for designation as critical habitat, will require a thorough assessment. We require additional time to analyze the best available scientific data in order to identify specific areas appropriate for critical habitat designation. Accordingly, we find designation of critical habitat to be ''not determinable'' at this time.

The basis for our action. Under the Endangered Species Act, we can determine that a species is an endangered or threatened species based on any of five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) Overutilization for commercial, recreational, scientific, or educational purposes; (C) Disease or predation; (D) The inadequacy of existing regulatory mechanisms; or (E) Other natural or manmade factors affecting its continued existence. We have determined that the 23 Mariana Islands species are experiencing population-level impacts as the result of the following current and ongoing threats:

- Habitat loss and degradation due to development, military activities, and urbanization; nonnative feral ungulates (hoofed mammals, for example, deer, pigs, and water buffalo) and nonnative plants; rats; snakes; wildfire; typhoons; water extraction; and the synergistic effects of future climate change.
- Predation or herbivory by nonnative feral ungulates, rats, snakes, monitor lizards, slugs, flatworms, ants, and wasps.
- The inadequacy of existing regulatory mechanisms to prevent the introduction and spread of nonnative plants and animals.
- Direct impacts from ordnance and live-fire from military training, recreational vehicles, and exacerbated vulnerability to threats and, consequently, extinction, due to small numbers of individuals and populations.

Peer review and public comment. We sought comments from independent specialists to ensure that all of our determinations are based on scientifically sound data, assumptions, and analyses. We also considered all comments and information received during the comment periods and public hearings.

Previous Federal Actions

Please refer to the proposed listing rule, published in the **Federal Register** on October 1, 2014 (79 FR 59364), for previous Federal actions for these species prior to that date. The publication of the proposed listing rule opened a 60-day comment period, beginning on October 1, 2014, and closing on December 1, 2014. In addition, we published a public notice of the proposed rule on October 18, 2014, in the Marianas Variety, Marianas Variety Guam, and the Guam Pacific Daily News newspapers. On January 12, 2015 (80 FR 1491), we reopened the comment period for an additional 30 days and announced two public hearings, each preceded by public information meetings (January 27, 2015, on Guam; and January 28, 2015, on Saipan); and two separate public information meetings, one each on Rota (January 29, 2015) and Tinian (January 31, 2015). This second comment period closed on February 11, 2015. We published public notices in the local Marianas Variety and Pacific Daily News on January 23, 2015, in order to inform the public about the hearings and information meetings, as well as the reopening of the comment period. In total, we accepted public comments on the October 1, 2014, proposed rule (79 FR 59364) for 90 days.

Summary of Changes From Proposed Rule

In preparing this final rule, we reviewed and fully considered comments from the peer reviewers and public on the proposed listings for 23 species. This final rule incorporates the following substantive changes to our proposed rule, based on the comments we received:

(1) The proposed rule described the status of five plant species (four orchids: *Bulbophyllum guamense, Dendrobium guamense, Nervilia jacksoniae,* and *Tuberolabium guamense;* and a plant in the family Primulaceae, *Maesa walkeri*) as meeting the definition of an endangered species under section 3(6) of the Act (any species which is in danger of extinction throughout all or a significant portion of its range). However, new information from further surveys has shown that these five plant species are more numerous on the island of Rota than previous data indicated, each with a population structure consisting of seedlings, juveniles, and adults. This new information indicates that these five plant species are not quite as imperiled throughout their ranges as previously understood at the time of the proposed rule. However, these species are still susceptible to habitat destruction and modification by nonnative plants and animals, fire, and the future effects of climate change on Rota. Additionally, at least 50 percent of their respective ranges occur on the island of Guam, where these species once occurred in abundance but now exist in very low numbers of individuals, and face similar threats as on Rota, in addition to habitat destruction and modification by urban development, military development and training, brown treesnakes (*Boiga irregularis*), and feral pigs (*Sus scrofa*).

The Act defines an endangered species as ''any species which is in danger of extinction throughout all or a significant portion of its range,'' and a threatened species as ''any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' Therefore, because the four orchid species (*Bulbophyllum guamense, Dendrobium guamense, Nervilia jacksoniae,* and *Tuberolabium guamense*) and *Maesa walkeri* appear relatively healthy on Rota, but face threats throughout all of their ranges, and have declined across at least 50 percent of their ranges (*i.e.,* on Guam), we have retained them in this final listing determination but have changed their status to threatened species, as they are at risk of becoming endangered within the foreseeable future throughout all of their ranges. All new data received during the comment period for these five species have been added to Description of the 23 Mariana Islands Species and Summary of Biological Status and Threats Affecting the 23 Mariana Islands Species, below. Further, our rationale for listing each of these five species as threatened species, versus endangered species, is discussed under Determination, below.

(2) We updated the section titled ''Historical and Ongoing Human Impacts'' under *The Mariana Islands,* below, to include recent changes in proposed military actions.

(3) We have corrected our original description of the political division of Micronesia. See ''Political Division'' under *The Mariana Islands,* below.

(4) We have added new island occurrences for three species addressed in this final rule. *Dendrobium guamense* was recently discovered on the island of Aguiguan—a brand new island record (Zarones 2015a, in litt.); the humped tree snail was recently observed on Tinian, an island on which the humped tree snail was previously thought to be extirpated (Naval Facilities Engineering Command Pacific (NavFac, Pacific) 2014, pp. 5–5, 5–7); and one individual of *Heritiera longipetiolata* was reported from Rota, an island on which it was thought this species was extirpated (Cook 2010, pers. comm. cited in CNMI Department of Land and Natural Resources (DLNR) 2014, in litt.). These three island additions have been placed under *Islands in the Mariana Archipelago,* Description of the 23 Mariana Islands Species, and Table 1, below.

(5) We have corrected the common names for many of the plant and animal species addressed in this final rule after consultation with a Chamorro and Carolinian language expert and a comment received from a peer reviewer. These changes can be observed in Table 1 and under Description of the 23 Mariana Islands Species, below.

(6) We have added the parenthetical ''(Mariana subspecies)'' to the common name of the Pacific sheath-tailed bat addressed in this rule, specifically the subspecies *Emballonura semicaudata rotensis,* to allow the reader to more easily distinguish between the four subspecies of Pacific sheath-tailed bats that are known by the same common name.

(7) Due to a comment we received from a peer reviewer, we have changed our general description of partulid (referring to a genus of tree snails in the Pacific) characteristics (see Description of the 23 Mariana Islands Species) to include that the mobility of partulids is more related to ambient precipitation and humidity, rather than with the time of day. Previous reports indicated that partulids are primarily nocturnal.

(8) Due to comments received from a peer reviewer and new information, we have expanded our description of the negative impacts associated with the manokwari flatworm, also known as the New Guinea flatworm (*Platydemus manokwari*), on the four tree snails under *Flatworm Predation on Tree Snails* under Summary of Biological Status and Threats Affecting the 23 Mariana Islands Species, below. This new information suggests that we had greatly underestimated the severity and scope of the threat posed by the manokwari flatworm in the proposed rule.

(9) Due to comments received by the U.S. Navy, and in light of the new 2014 Draft Supplemental Environmental Impact Statement (SEIS) and subsequent 2015 Final EIS, we updated the description of the Marine Corps relocation under ''Historical and Ongoing Human Impacts,'' below. We

cited the Final Supplemental EIS (SEIS) released in July of 2015, and associated changes, which include a proposal to construct and operate facilities on Guam (not Tinian) to support the training and operations of Marines and the removal of the proposal to create four ranges on Tinian since the associated training requirements satisfied by those four ranges are now the subject of another EIS (Commonwealth of the Northern Mariana Islands Joint Military Training (CJMT) EIS, described below). We also dropped ''and Tinian'' in the description of the revised proposed actions associated with the 2015 Final SEIS associated with the relocation. Additionally, we removed the construction of a deep-draft wharf in Apra Harbor and facilities to support the U.S. Missile Defense Task Force since this is no longer proposed on Guam (and is not addressed in the revised proposed action covered in the 2014 Draft SEIS or 2015 Final SEIS).

(10) Due to comments received by the U.S. Navy, and in light of the new 2015 Final SEIS, we updated the description of the Marine Corps relocation under ''Historical and Ongoing Human Impacts,'' below. The updates include the construction of a Marine Corps cantonment (main base) at Naval Computer and Telecommunications Station Finegayan, family housing on Andersen Air Force Base (AAFB), and a live-fire training range on AAFB–Northwest Field as the preferred alternatives. We noted that Orote Point, Pati Point, and Navy Barrigada are no longer preferred locations for any facilities to support the Marine Corps move.

(11) We have edited the section titled ''Ordnance and Live-Fire Training'' under *Factor E. Other Natural or Manmade Factors Affecting Their Continued Existence,* below. We changed the physical location of the ordnance and live-fire training, and subsequently the species impacted by this threat, due to changes presented in the Navy's 2014 Draft SEIS (Joint Guam Program Office (JGPO)–NavFac, Pacific 2014, p. ES–1) and 2015 Final SEIS (JGPO–NavFac, Pacific 2015, p. ES–11; *http://www.guambuildupeis.us/*), and the 2015 CNMI Joint Military Training Draft EIS/Overseas EIS (OEIS) (*http://www.cnmijointmilitarytrainingeis.com/about*). In this final rule, the species that are considered to be negatively impacted by ordnance and live-fire include the plants *Cycas micronesica, Heritiera longipetiolata, Psychotria malaspinae,* and *Tabernaemontana rotensis* and the humped tree snail, Mariana eight-spot butterfly, and Slevin's skink. This change is also noted under ''Historical and Ongoing Human Impacts'' and Table 3, below.

(12) We added new information to ''Conservation Efforts to Reduce Disease and Predation'' and ''Conservation Efforts to Reduce Habitat Destruction, Modification, or Curtailment of Its Range,'' below. In 2013, the U.S. Navy erected five new exclosures on Tinian, each with 1,000 mature individuals of *Cycas micronesica.* In 2014, the U.S. Navy funded $5.1 M towards brown treesnake projects in the Mariana Islands.

(13) Due to new data we received during the comment period, we added the Mariana eight-spot butterfly, Mariana wandering butterfly, and the Pacific sheath-tailed bat (Mariana subspecies) to ''Small Number of Individuals and Populations,'' below. A recent genetic analysis found no heterogeneity exists between three separate populations of the Mariana eight-spot butterfly on Guam (Lindstrom and Benedict 2014, p. 27). In fact, they found the genetic sequences studied to be identical, which is indicative that little population structure exists among these mobile insects, and that they have recently experienced a population bottleneck limiting genetic diversity for this species on Guam (Lindstrom and Benedict 2014, p. 27). Additionally, since there are no recent observations of the Mariana wandering butterfly, we have deduced that if a population exists, it does so in very small numbers and, therefore, faces the same threat of reduced genetic diversity as the Mariana eight-spot butterfly. A recent genetic analysis of the Pacific sheath-tailed bat (Mariana subspecies) found no genetic diversity among the only known extant population of this species (Oyler-McCance *et al.* 2013, pp. 1,034–1,035). This new data, combined with the observed decrease in range from five islands formerly (Guam, Rota, Saipan, Tinian, and Aguiguan) to just one at present (Aguiguan), has led the Service to conclude that the Pacific sheath-tailed bat (Mariana subspecies) is at risk from low numbers of individuals and populations. We have added the two butterflies and bat addressed in this rule to the threat of small number of individuals and populations under Table 3, and *Factor E. Other Natural or Manmade Factors Affecting Their Continued Existence* ''Small Number of Individuals and Populations,'' below. Additionally, we added the fragile tree snail under the section titled ''Small Number of Individuals and Populations,'' below, as it was noted in Table 3, but missing from the discussion under Factor E.

(14) Due to a comment from a peer reviewer, we have made a change regarding the life-cycle of Slevin's skink under Description of the 23 Mariana Islands Species, below. In the proposed rule, we cited Brown (1991, pp. 14–15) as stating that Slevin's skinks are viviparous (lay their eggs internally and give birth to live young). We have corrected this statement to reflect more recent observations indicating that Slevin's skinks are oviparous (lay eggs that mature and hatch externally) (Zug 2013, p. 184; Rodda 2014, in litt.).

(15) Due to new information received during the comment period, we have added a new occurrence for the Rota blue damselfly. Zarones (*et al.* 2015b, in litt.) reported a new observation of an individual of the Rota blue damselfly, located at a stream east of the Water Cave that is not connected to the Water Cave (Okgok) Stream. This finding was confirmed by U.S. Fish and Wildlife Service (Service) entomologists. This new occurrence has been added under Description of the 23 Mariana Islands Species, below.

(16) According to new information we received during the comment period, we corrected the name of I-Chenchon Park, which is now the Mariana Crow Conservation Area; added the Sabana Heights and Talakhaya conservation areas under the Sabana Wildlife Conservation Area on Rota; and added the newly established Nightingale Reed-warbler Conservation Area and the Micronesian Megapode Conservation area to conservation areas on Saipan (see *Islands in the Mariana Archipelago,* below).

(17) After further analysis, we have concluded that feral cattle are not a threat to the plant *Heritiera longipetiolata* on the island of Tinian, nor are feral cattle considered present in large enough numbers to be assigned to the island of Tinian in Table 4, below. The humped tree snail was believed to be extirpated from Tinian at the time of the proposed rule and, therefore, was not previously assigned this threat on Tinian. Both feral and domestic cattle have been present on Tinian for centuries and have reportedly caused broad-ranging negative impacts to the forest ecosystem (*i.e.,* erosion, trampling, and grazing); however, the number of feral cattle on Tinian has declined in recent times (Wiles *et al.* 1990, pp. 167–180; Flores 2015, in litt.). Cattle ranching on Tinian is on the rise, and depending on the location and amount of land allotted to cattle ranching, negative impacts to the forest ecosystem may be observed in the future. However, at the time of this final rule, neither feral nor domestic cattle

are considered a threat to the plant *Heritiera longipetiolata* or the humped tree snail on the island of Tinian.

(18) In the Regulation Promulgation section of the proposed rule, we identified the historic range of *Cycas micronesica* as Guam and the Mariana Islands. We have corrected the historic range of *Cycas micronesica* in this final rule to additionally include the sovereign island nation of the Federated States of Micronesia (the island of Yap), and the independent island nation of the Republic of Palau.

Background

Mariana Islands Species Addressed in This Final Rule

Table 1 below provides the scientific name, common name, listing status, and range (islands on which the species is found) for the 23 Mariana Islands species that are the subjects of this final rule. Following the table, Figure 1 provides a map of the islands that comprise the Mariana archipelago.

TABLE 1—THE 23 MARIANA ISLANDS SPECIES ADDRESSED IN THIS FINAL RULE

Scientific name	Common name(s)	Listing status	Range
PLANTS			
Bulbophyllum guamense	wild onion siboyas halumtanu [Ch], siboyan halom tano [Cl].	**Threatened**	Guam, Rota, Saipan (H), Pagan (H).
Cycas micronesica	fadang [Ch], faadang [Cl]	Threatened	Guam, Rota, Pagan ‡, Palau *, Yap.*
Dendrobium guamense	NCN	**Threatened**	Guam, Rota, Saipan (H), Tinian, **Aguiguan**, Agrihan (H).
Eugenia bryanii	NCN	Endangered	Guam.
Hedyotis megalantha	pao dedu [Ch], pao doodu [Cl]	Endangered	Guam.
Heritiera longipetiolata	ufa halumtanu [Ch], ufa halom tano [Cl]	Endangered	Guam, Saipan, Tinian, **Rota**.
Maesa walkeri	NCN	**Threatened**	Guam, Rota.
Nervilia jacksoniae	NCN	**Threatened**	Guam, Rota.
Phyllanthus saffordii	NCN	Endangered	Guam.
Psychotria malaspinae	aplokating palaoan [Ch/Cl]	Endangered	Guam.
Solanum guamense	Biringenas halumtanu [Ch], birengenas halom tano [Cl].	Endangered	Guam, Rota (H), Saipan (H), Tinian (H), Asuncion (H), Guguan (H), Maug (H).
Tabernaemontana rotensis	NCN	Threatened	Guam, Rota.
Tinospora homosepala	NCN	Endangered	Guam.
Tuberolabium guamense	NCN	**Threatened**	Guam, Rota, Tinian (H), Aguiguan (H).
ANIMALS			
Emballonura semicaudata rotensis.	Pacific sheath-tailed bat (Mariana subspecies), payeyi [Ch], paischeey [Cl].	Endangered	Aguiguan, Guam (H), Rota (H), Tinian (H), Saipan (H), Anatahan (H §), Maug (H §).
Emoia slevini	Slevin's skink, Marianas Emoia, Marianas skink, gualiik halumtanu [Ch], gholuuf [Cl].	Endangered	Guam (H), Cocos Island, Rota (H), Tinian (H), Aguiguan (H), Sarigan, Guguan, Pagan, Alamagan, Asuncion.
Hypolimnas octocula marianensis.	Mariana eight-spot butterfly, ababbang [Ch], Libweibwogh [Cl].	Endangered	Guam, Saipan (H).
Vagrans egistina	Mariana wandering butterfly, ababbang [Ch], Libweibwogh [Cl].	Endangered	Rota, Guam (H).
Ischnura luta	Rota blue damselfly, dulalas Luta [Ch], dulalas Luuta [Cl].	Endangered	Rota.
Partula gibba	humped tree snail, akaleha [Ch], denden [Cl]	Endangered	Guam, Rota, Aguiguan, Alamagan, Pagan, Sarigan, Saipan, **Tinian**, Anatahan (H).
Partula langfordi	Langford's tree snail, akaleha [Ch], denden [Cl].	Endangered	Aguiguan.
Partula radiolata	Guam tree snail, akaleha [Ch], denden [Cl]	Endangered	Guam.
Samoana fragilis	fragile tree snail, akaleha dogas [Ch], denden [Cl].	Endangered	Guam, Rota.

NCN = no common name.
(H) = historical occurrence (20 years or more prior to present date).
(H §) = possible historical occurrence.
Ch = Chamorro name.
Cl = Carolinian name.
* = range outside of the Mariana Islands.
‡ = Tentative occurrence.
Translations courtesy of the Chamorro/Carolinian Language Policy Commission.
Bold type in the Listing Status and Range columns indicates a change in range from the proposed rule.

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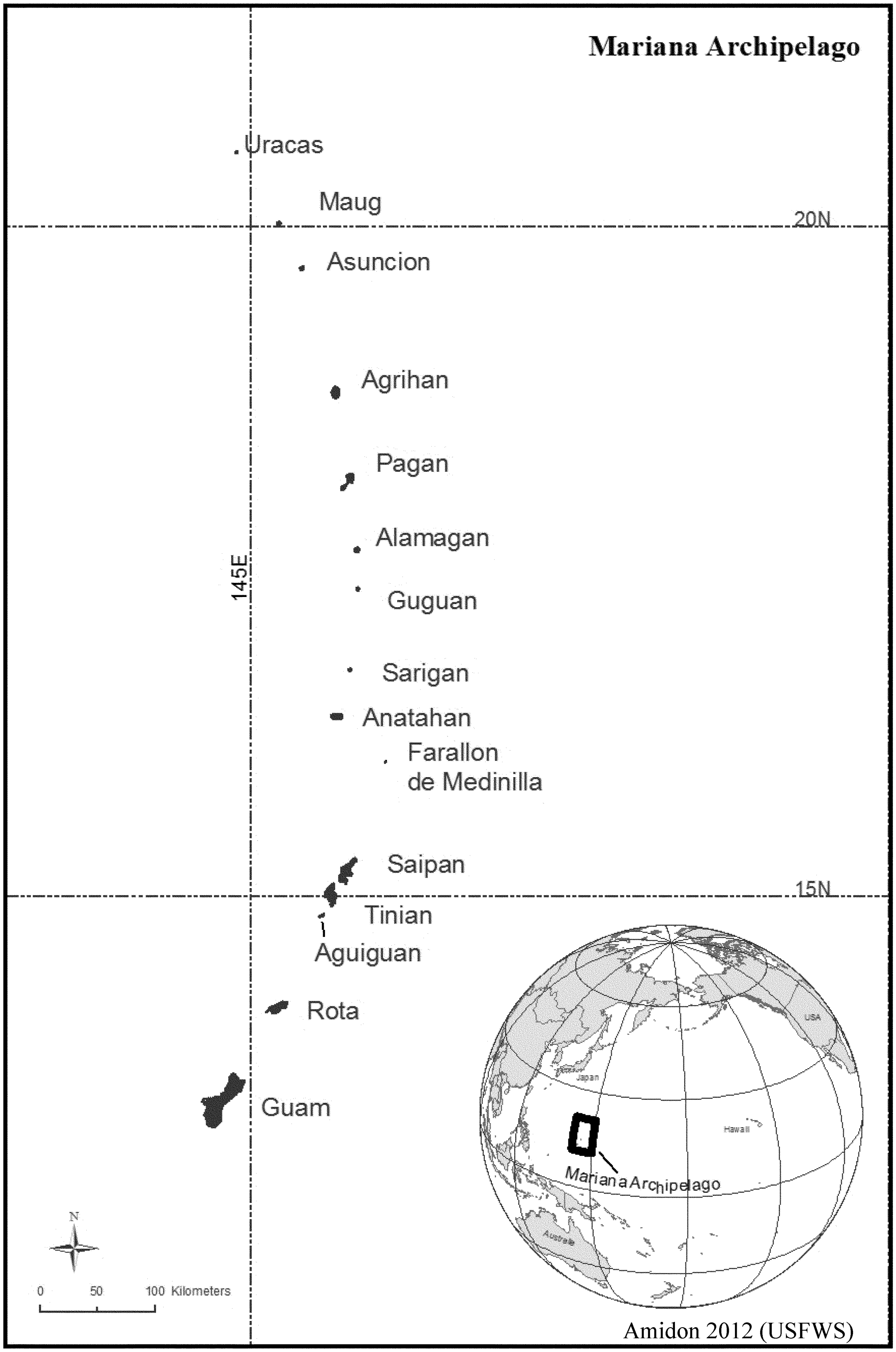
Figure 1. Map of the Mariana Archipelago.



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The Mariana Islands

Here we discuss only background information pertinent to the Mariana Islands that has changed since the proposed rule. Please see the proposed rule (79 FR 59364; October 1, 2014) for a description of the general geography, geology, vegetation, hydrology, climate, biogeography, and pre-historic human impact. We would like to acknowledge a spelling error in the proposed rule under ''Hydrology,'' where we incorrectly spelled Talofofo as Tolofofo. Talofofo is the correct spelling for this hydrological region in Guam. Additionally, we have made substantial changes from the proposed rule to the below section, Historical and Ongoing Human Impacts, for the reasons described above in the section Summary of Changes from Proposed Rule.

Historical and Ongoing Human Impacts

After the initial Chamorro modifications for agriculture and villages, the flora and fauna on the Mariana Islands continued to undergo alterations due not only to ongoing volcanic activity in the northern islands, but also to land use activities and nonnative species introduced by European colonialists. The arrival of the Spanish in 1591 further imposed degradation of the ecosystems of the Mariana Islands with the introduction of numerous nonnative animals and plants. The Spanish occupied the Mariana Islands for nearly 300 years (SIO 2014, in litt.). In 1899, Spain sold the Mariana Islands to Germany, with the exception of Guam, which was ceded to the United States as a result of the Spanish-American war (SIO 2012, in litt.; Encyclopedia Britannica 2014, in litt.).

The German administration altered the forest ecosystem on Rota, Saipan, and Tinian, and on some of the northern islands, by means of *Cocos nucifera* (coconut) farming, which was encouraged for the production of copra (the dried fleshy part of a coconut used to make coconut oil) (Russell 1998, pp. 94–95). Upon the start of World War I, the Japanese quickly took over German occupied islands and accelerated the alteration of the landscape by clearing large areas of native forest on Rota, Saipan, and Tinian, for growing *Saccharum officinarum* (sugarcane) and building associated refineries, and for planting *Acacia confusa* (sosugi) to provide fuel wood (CNMI–SWARS 2010, pp. 6–7). The Japanese drastically altered the islands of Saipan and Tinian, and to a lesser extent on Rota, leaving little native forest. Military activities during World War II further altered the landscape on Saipan and Tinian. Rota was a notable exception, left relatively untouched (CNMI–SWARS 2010, p. 7). Japan also occupied Guam at the onset of World War II; however, by 1944 the United States neutralized the Mariana Islands with the recapture of Saipan, Tinian, and Guam (Encyclopedia Britannica 2014, in litt.). Since World War II, the U.S. military has developed a strong presence in the Mariana Islands, particularly on the island of Guam, where both the U.S. Navy and U.S. Air Force operate large military installations. The island of Farallon de Medinilla is used for military ordnance training (Berger *et al.* 2005, p. 130).

Currently, the U.S. Department of Defense is implementing a project referred to as the ''Guam and Commonwealth of the Northern Mariana Islands Military Relocation'' (Joint Guam Program Office (JGPO)–Naval Facilities Engineering command, Pacific (JGPO–NavFac, Pacific) 2010a, p. ES–1; JGPO–NavFac, Pacific 2013, pp. 1–1—1–3; JGPO–NavFac, Pacific 2014, pp. ES–1—ES–34; JGPO–NavFac, Pacific 2015, pp. ES–1—ES–40; *http://guambuildupeis.us/*). This military relocation proposes: (1) The relocation of a portion of the U.S. Marine Corps (Marine Corps) currently in Okinawa, Japan, which consists of up to 5,000 Marines and their 1,300 dependents, as revised in the Draft Supplemental Environmental Impact Statement (SEIS) (JGPO–NavFac, Pacific 2014, p. ES–3) and Final SEIS (JGPO–NavFac, Pacific 2015, pp. ES–1—ES–40; *http://guambuildupeis.us/*); (2) the development of facilities and infrastructure (*i.e.,* cantonment, family housing, and associated infrastructure) on Guam to support the relocation of military personnel and their dependents (JGPO–NavFac, Pacific 2015, p. ES–3; *http://guambuildupeis.us/*); and (3) the development and construction of facilities and infrastructure on Guam to support training and operations for the relocated Marines, specifically a Live-Fire Training Range Complex (LFTRC) (JGPO–NavFac, Pacific 2015, p. ES–3; *http://guambuildupeis.us/*)

The Final 2015 SEIS focuses on changes to the proposed actions and alternatives identified in the 2010 Final EIS (JGPO–NavFac, Pacific 2014, p. ES–1) and 2014 Draft SEIS (JGPO–NavFac, Pacific 2015, pp. ES–1—ES–40; *http://guambuildupeis.us/*). The preferred alternative sites on Guam for the implementation of the Marine relocation efforts and development of an LFTRC now include Alternative E Finegayan (Navy Base Guam)–Andersen Air Force Base (AFB) and Alternative 5 Northwest Field on Andersen AFB, respectively. Alternative E is a new alternative not presented in the 2014 Draft SEIS. The 2014 Draft SEIS had listed Alternative A Finegayan as the preferred alternative for cantonment and housing, and the new preferred Alternative E places the cantonment on Finegayan and family housing on Andersen AFB. This new Alternative E was added to reduce the amount of vegetation that would have to be cleared, present additional opportunities for forest enhancement mitigation, maintain the natural buffer area between developed areas and nearby sensitive coastal resources (*e.g.,* Haputo Ecological Reserve Area), and leverage existing family housing support facilities already in place at Andersen AFB (JGPO–NavFac, Pacific 2015, p. ES–15; *http://guambuildupeis.us/*). Finegayan and Northwest Field on Andersen AFB collectively support 16 of the 23 species or their habitats (11 of the 14 plants: *Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Eugenia bryanii, Heritiera longipetiolata, Maesa walkeri, Nervilia jacksoniae, Psychotria malaspinae, Solanum guamense, Tabernaemontana rotensis,* and *Tuberolabium guamense;* and 5 of the 9 animals: The Mariana eight-spot butterfly, the Mariana wandering butterfly, the Guam tree snail, the humped tree snail, and the fragile tree snail) (JGPO–NavFac, Pacific 2014, pp. ES–18—ES–22; JGPO–NavFac, Pacific 2015, p. ES–11; *http://guambuildupeis.us/*).

The Final SEIS describes: (1) More moderate construction activity over 13 years instead of a 7-year intense construction boom; (2) a significant reduction in projected peak population increase (from 79,000 to less than 10,000) and steady state population increase (from 33,000 to approximately 7,400); (3) a reduction in the project area at Finegayan from 2,580 ac (1,044 ha) to 1,213 ac (491 ha); (4) utilization of 510 ac (206 ha) of existing infrastructure on Andersen AFB for family housing; (5) no new land acquisition; (6) a reduction in project area at Northwest Field (instead of Route 15); and (7) an overall decrease in power and water demands (JGPO–NavFac, Pacific 2014, p. ES–3; JGPO–NavFac, Pacific 2015, p. ES–11; *http://guambuildupeis.us/*).

Concurrent with the relocation efforts discussed above, the U.S. Marine Corps (the Executive Agent designated by the U.S. Pacific Command) published their ''Commonwealth of the Northern Mariana Islands (CNMI) Joint Military Training (CJMT) Draft Environmental Impact Statement (EIS)–Overseas Environmental Impact Statement (OEIS)'' (herein referred to as the ''CJMT Draft EIS–OEIS'') (CNMI Joint Military Training Draft EIS–OEIS at *http://www.cnmijointmilitarytrainingeis.com/about*). The 2015 Draft CJMT EIS–OEIS informs the public that the military has proposed plans to use Tinian and Pagan to establish a series of live-fire range training areas, training courses, and maneuver areas to reduce existing joint service training deficiencies and meet the U.S. Pacific Command Service Components' unfilled unit level and combined level training requirements in the Pacific (2015 CNMI Joint Military Training Draft EIS–OEIS at *http://www.cnmijointmilitarytrainingeis.com/about*).

The northern two-thirds of Tinian are leased to the Department of Defense (DOD), and the development of these lands will negatively impact the habitat of 2 of the 23 species addressed in this final rule, the plant *Heritiera longipetiolata,* and the humped tree snail. Likewise, live-fire training on Tinian will negatively impact the habitat and individuals of *H. longipetiolata* and the humped tree snail. On Pagan, both Alternative 1 and Alternative 2 claim the entire island for training purposes, with the north dedicated to live-fire maneuver areas, and the south dedicated to non-live-fire maneuver areas (CJMT Draft EIS–OEIS *http://www.cnmijointmilitarytrainingeis.com/about*). If the entire island of Pagan is used for training purposes, it will negatively impact 2 of the 16 species listed as endangered species in this final rule, Slevin's skink and the humped tree snail, and their habitats. Additionally, *Cycas micronesica* may be present on Pagan, although this is not yet confirmed. If *Cycas micronesica* is confirmed on Pagan, then this species would be considered negatively impacted by ordnance and live-fire training on both Guam and Pagan.

Additionally the entire Mariana archipelago is located within the Mariana Islands Training and Testing (MITT) Study Area, which comprises air, land, and sea space, and includes the existing Mariana Islands Range Complex (MIRC), its surrounding seas, and a transit corridor between the MIRC and the Navy's Hawaii Range Complex, where training and testing activities may occur. The MIRC is the only Navy range complex in the MITT Study Area (JGPO–NavFac, Pacific 2013, pp. 1–3; Mariana Islands Training and Testing *http://mitt-eis.com/EISOEIS/Background.aspx*). The MITT Study Area opens up every island within the Mariana Archipelago as a potential training site (*Mariana Islands Training and Testing http://mitt-eis.com/EISOEIS/Background.aspx*), which subsequently may result in negative impacts to any number of the 23 species addressed in this final rule. Proposed actions include increases in training activities on Guam, Rota, Saipan, Tinian, Farallon de Medinilla (increase in bombing), and Pagan. Likely negative impacts include, but are not limited to, direct damage to individuals from live-fire training and ordnance, wildfire resulting from live-fire and ordnance, direct physical damage (*e.g.,* trampling by humans, helicopter landing, etc.) to individuals, and spread of nonnative species. Additionally, water purification training is proposed for all of these islands, except Farallon de Medinilla, which may be particularly damaging to the Rota blue damselfly, for which the only known location exists along the freshwater streams of the Talakhaya watershed.

In addition to military spending, Guam's economy depends on tourism. More than one million tourists visit Guam annually, mostly arriving from Japan, Korea, and other Asian countries. In the early 1960s, military contributions to Guam's economy approached 60 percent, with tourism adding almost another 30 percent. There was a downturn in military presence in the 70s and 80s. Also at this time, the growth of a private economy occurred, fueled by tourism (Guampedia *http://www.guampedia.com/evolution-of-the-tourism-industry-on-guam-2/*, Accessed April 23, 2015). Currently, tourism accounts for about 60 percent of Guam's annual business revenue and 30 percent of all non-Federal jobs (Guam Visitor Bureau 2014, p. 3; *http://www.guamvisitorsbureau.com/*, accessed April 25, 2014; *http://guampedia.com/evolution-of-the-tourism-industry-on-guam-2/#toc-consequences-and-conclusions*, accessed April 25, 2014).

An increase in human population, whether from tourism or a military presence, also increases the type and intensity of stressors on endangered and threatened species. These stressors range from increased development, which results in loss of habitat, to increased risk for introduction of harmful nonnative species, which directly or indirectly impact native species and their habitats. As Guam is seeking a ''no visa required'' status for visitors from Russia and China (Guam Visitor Bureau 2014, p. 33), monitoring of sea ports and airports against inadvertent introduction of harmful and invasive species is especially important (see ''*Factor D. The Inadequacy of Existing Regulatory Mechanisms''*). The proposed increase in military training activities throughout the Marianas heightens the importance for enhanced monitoring at these sites.

Political Division

Micronesia is made up of six island groups: (1) Mariana Islands; (2) Caroline Islands, consisting of the sovereign island nation of the Federated States of Micronesia (Yap, Chuuk, Pohnpei, and Kosrae) and the independent island nation of the Republic of Palau; (3) Gilbert Islands (politically the Republic of Kiribati); (4) Marshall Islands (politically the Republic of the Marshall Islands); (5) Nauru (politically the Republic of Nauru, the world's smallest republic, consisting of a single phosphate rock island); and (6) Wake Island (also known as Wake Atoll, an unorganized, unincorporated territory of the United States). Micronesia, together with Polynesia, is described as the ''Polynesia-Micronesia Hotspot,'' reflecting the fact that these island groups contain an exceptional concentration of endemic (found nowhere else in the world) species, and are currently experiencing exceptional habitat loss (Myers *et al.* 2000, pp. 853–858) (see Summary of Biological Status and Threats Affecting the 23 Mariana Islands Species, below).

Islands in the Mariana Archipelago

Please see the proposed rule (79 FR 59364; October 1, 2014) for a description of each of the 14 Mariana Islands; a map of the islands is included here as Figure 1. The below island descriptions are included in this final rule because they include at least one substantial change since publication of the proposed rule. These sections reflect new information received during the two comment periods on the proposed rule.

Guam

Guam is the largest and southernmost island of the Mariana Islands. It is nearly 31 miles (mi) (50 kilometers (km)) long and from 4 to 9 mi (7 to 15 km) wide, with a peak elevation of 1,332 feet (ft) (406 meters (m)) at Mt. Lamlam (Muller-Dombois and Fosberg 1998, p. 269). Guam is located in the northwestern Pacific Ocean, 1,200 mi (1,930 km) east of the Philippines, 3,500 mi (5,632 km) west of the Hawaiian Islands, and 54 mi (87 km) south of Rota. The northern and southern regions of the island show marked contrast due to their geologic history. The northern region is an extensive, upraised, terraced, limestone plateau or ''mesa'' between 300 and 600 ft (90 and 180 m) above sea level interrupted by a few low hills, of which two (Mataguac and Mt. Santa Rosa) are volcanic in nature, while others are exclusively coralline limestone (*e.g.,* Barrigada Hill and Ritidian Point (Stone 1970, p. 12)). The southern region is primarily volcanic material (*e.g.,* basalts) with several areas capped by a layer of limestone (Stone 1970, p. 12).

Of all the Mariana Islands, Guam contains the most extensive stream and drainage systems, particularly in the Talofofo Region (Stone 1970, p. 13; Muller-Dombois and Fosberg 1998, p. 269). Fairly extensive wetland areas are located on both coasts of the southern region as well as at Agana Swamp located in the middle of the island. Guam is also the most populated of all the Mariana Islands, with an estimated 170,000 residents. Guam has experienced impacts from at least 4,000 years of human contact, starting with the Chamorro, followed by the Spanish, Germans, Japanese, and Americans (see ''Pre-Historical Human Impact'' and ''Historical Human Impact,'' above). World War II and subsequent U.S. military activity have also negatively impacted natural habitats on Guam; however, the buffer zones around the U.S. Navy and Air Force bases on Guam and conservation areas designated on these bases support some of the last remaining intact native habitats and subsequently some of the last remaining individuals of the rarest species. There are three conservation areas on the island designated by the Guam Department of Aquatic and Wildlife Resources (GDAWR): (1) Anao Conservation Area; (2) Bolanos Conservation Area; and, (3) Cotal Conservation Area (GDAWR 2006, p. 39; Sablan Environmental, Inc. 2008, p. 3). Guam supports the forest, savanna, stream, and cave ecosystems (see ''Mariana Islands Ecosystems,'' below). Twenty of the 23 species addressed in this final rule occur on Guam (all 14 plants: *Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Eugenia bryanii, Hedyotis megalantha, Heritiera longipetiolata, Maesa walkeri, Nervilia jacksoniae, Phyllanthus saffordii, Psychotria malaspinae, Solanum guamense, Tabernaemontana rotensis, Tinospora homosepala,* and *Tuberolabium guamense;* and 5 of the 9 animals: Slevin's skink (Cocos Island, off Guam), the Mariana eight-spot butterfly, the Guam tree snail, the humped tree snail, and the fragile tree snail. The Pacific sheath-tailed bat (Mariana subspecies) and the Mariana wandering butterfly occurred on Guam historically.

Rota

Just northeast of Guam (36 mi; 58 km) and southwest of Aguiguan (47 mi; 76 km), Rota is the fourth largest island in the Mariana Islands, measuring 33 square miles (mi^2) (96 square kilometers (km^2)) in land area (Mueller-Dombois and Fosberg 1998, p. 265; CNMI Statewide Assessment and Resource Strategy Council (CNMI–SWARS) 2010, p. 6). The highest point on the island is Mount Sabana (also referred to as the Sabana plateau or simply the Sabana), at just over 1,600 ft (488 m) (Mueller-Dombois and Fosberg 1998, p. 265). The Sabana plateau is characterized by a savanna ringed by forest that extends onto the surrounding karst limestone cliffs and down the rugged slopes that encircle all sides of the Sabana (Mueller-Dombois and Fosberg 1998, pp. 265–266). Rota consists primarily of terraced limestone surrounding a volcanic core that protrudes from the topmost plateau, or Sabana. The Sabana is noticeably wetter than the rest of the island and is the only location known to support all four orchids listed as threatened species in this final rule (*Bulbophyllum guamense, Dendrobium guamense, Nervilia jacksoniae,* and *Tuberolabium guamense*) (Harrington *et al.* 2012, in litt.).

Rota has experienced land alterations since the arrival of the first Chamorro more than 4,000 years ago. When the Mariana Islands were occupied by the Japanese (1914–1944), they cleared forest areas to plant large sugarcane plantations and conducted phosphate mining on the Sabana plateau (Amidon 2000, pp. 4–5; Engbring *et al.* 1986, pp. 10, 27). Although Rota was never invaded during World War II, it was heavily bombed by U.S. military forces (Engbring *et al.* 1986, pp. 8, 11). Rota has a population of approximately 3,000 people. In recent years, three terrestrial conservation areas have been designated on Rota by the CNMI Department of Land and Natural Resources (DLNR): (1) The Sabana Wildlife Conservation Area (which includes the Sabana Heights Conservation Area and the Talakhaya Conservation Area); (2) Mariana Crow Conservation Area and Bird Sanctuary; and (3) Wedding Cake Wildlife Conservation Area (Berger *et al.* 2005, p. 14). Rota supports the forest, savanna, stream, and cave ecosystems. Eleven of the 23 species addressed in this final rule currently occur on Rota (8 of the 14 plants: *Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Heritiera longipetiolata* (recently rediscovered; formerly thought extirpated from Rota), *Maesa walkeri, Nervilia jacksoniae, Tabernaemontana rotensis,* and *Tuberolabium guamense;* and 4 of the 9 animals: The Mariana wandering butterfly, the Rota blue damselfly, the fragile tree snail, and the humped tree snail). The plant *Solanum guamense,* and the Pacific sheath-tailed bat (Mariana subspecies), were known from Rota historically.

Aguiguan

Aguiguan is known as ''Goat Island'' due to the presence of a large feral goat population (Engbring *et al.* 1986, p. 8). Located approximately 8 km (5 mi) southwest of Tinian, Aguiguan is a small uninhabited island measuring 7 mi^2 (18 km^2) in land area with a peak elevation of 515 ft (157 m) at Mt. Alutom (CNMI–SWARS 2010, p. 6). This island was historically inhabited by the Chamorro people (Russell 1998, pp. 90–91). Aguiguan is entirely limestone, with very steep cliffs fringing nearly the entire island, making access difficult (Berger *et al.* 2005, p. 36). There are no streams on the island (Engbring *et al.* 1986, p. 8). During the Japanese occupation, large areas of native forest were cleared for sugarcane plantations, a large runway and other war-related structures (Engbring *et al.* 1986, p. 8; Mueller-Dombois and Fosberg 1998, p. 264). Ecosystem types on Aguiguan include forest and cave. Four of the 23 species addressed in this final rule occur on Aguiguan: the plant *Dendrobium guamense* (recently discovered for the first time on Aguiguan); and the Pacific sheath-tailed bat (Mariana subspecies), humped tree snail, and Langford's tree snail. The plant *Tuberolabium guamense* was known from Aguiguan historically.

Tinian

Located approximately 3 mi (5 km) southeast of Saipan and 7 mi (9 km) north of Aguiguan, Tinian is the third largest island in the Mariana Islands, measuring 40 mi^2 (101 km^2) in area, with a peak elevation of 584 ft (178 m) at Lasso Hill (Engbring *et al.* 1986, p. 5). The island of Tinian has a population of over 3,000 residents. Tinian's climate is the same as that of Guam (see ''*The Mariana Islands,''* above). The island is predominantly limestone with low-lying plateaus and ridges, and lacks surface streams (Stafford *et al.* 2005, p. 15; Engbring *et al.* 1986, p. 5). There are two small wetland areas, heavily overgrown with no open water, Hagoi Marsh and Marpo Swamp, which serve as a domestic water source (Engbring *et al.* 1986, p. 5). Tinian has lost most of its primary (native) forest, due initially to clearing for agriculture by the Chamorro, followed by agricultural endeavors of German colonialists in the early 1900s (*e.g.,* coconut plantations) and then by Japanese settlers after 1914 (*e.g.,* sugarcane plantations) (Berger *et al.* 2005, pp. 36–37). Impacts to Tinian's native vegetation were then compounded by impacts from military activities during World War II (Mueller-Dombois and Fosberg 1998, p. 262; Russell 1998, p. 98; CNMI–SWARS 2010, pp. 6–7, 28–29). Currently, approximately 5 percent of primary (native) forest remains on Tinian (Engbring *et al.* 1986, p. 25), predominantly along the southeastern portion of Tinian (Spaulding 2013, in litt.; Spaulding 2015, in litt.). Tinian supports the forest and cave ecosystems. Tinian currently has no designated conservation areas. Three of the 23 species addressed in this final rule occurs on Tinian, the plants *Dendrobium guamense* and *Heritiera longipetiolata* and the humped tree snail (recently rediscovered; formerly thought extirpated from Tinian). The plants *Solanum guamense* and *Tuberolabium guamense* and the Pacific sheath-tailed bat (Mariana subspecies) were known from Tinian historically.

Saipan

Located approximately 3 mi (4.5 km) northeast of Tinian, Saipan is the second largest and second most populous of the Mariana Islands, measuring 44 mi^2 (115 km^2) with a peak elevation of 1,555 ft (474 m) at Mt. Tapochau (Mueller-Dombois and Fosberg 1998, p. 256). The island is composed primarily of terraced limestone peaks, with exposed volcanic ridges and slopes (Mueller-Dombois and Fosberg 1998, p. 256). Saipan supported a large population of Chamorro people for thousands of years, followed by the Spanish, Germans, Japanese, and the U.S. military forces, and was also heavily impacted by World War II. Saipan is the site of one of the largest battles in the Pacific between U.S. and Japanese forces. Much of Saipan's forests were destroyed during World War II, with only pockets of native forest surviving (Engbring *et al.* 1986, pp. 3–5, 10–12; Berger *et al.* 2005, pp. 38–39). Due to this widespread destruction of native forests and subsequent erosion, the nonnative tree *Leucaena leucocephala* (tangantangan) was seeded for erosion control (Berger *et al.* 2005, p. 32). Tangantangan is now a dominant tree species on the island, and the CNMI Division of Forestry has suggested it forms a unique mixed forest habitat on Saipan not reported from the other islands (CNMI–SWARS 2010, p. 7). There are six conservation areas on Saipan: (1) Bird Island Wildlife Conservation Area; (2) Kagman Wildlife Conservation Area and Forbidden Island Sanctuary; (3) Marpi Commonwealth Forest; (4) Nightingale Reed-Warbler Conservation Area; (5) Micronesian Megapode Conservation Area; and (6) the Saipan Upland Mitigation Bank (Berger *et al.* 2005, p. 14). Ecosystem types on Saipan include forest, savanna, and cave. One of the 23 species addressed in this final rule occurs on Saipan, the humped tree snail. The plants *Bulbophyllum guamense, Dendrobium guamense,* and *Solanum guamense,* the Pacific sheath-tailed bat (Mariana subspecies), and the Mariana eight-spot butterfly were known from Saipan historically.

Pagan

Located 42 mi (68 km) from Agrihan and 30 mi (48 km) from Alamagan, Pagan is the fifth largest island in the Marianas archipelago, and the largest of the northern Mariana Islands, with an area of 19 mi^2 (48 km^2) (Ohba 1994, p. 17). Four volcanoes comprise Pagan: Mt. Pagan in the north, and an unnamed complex of three older volcanoes to the south (Ohba 1994, p. 17; Smithsonian Institution 2014a, in litt.). These volcanoes are connected by a narrow isthmus. The highest point on this island is Mt. Pagan, which rises 1,870 ft (570 m) above sea level. Mt. Pagan is one of the most active volcanoes in the Mariana Islands, with its most recent eruption in 2012 (Smithsonian Institution 2014b, in litt.). The largest eruption during historical times took place in 1981, when lava buried 10 percent of the island, and ash covered the entire island, forcing the 53 residents to flee to Saipan (Smithsonian Institution 2014b, in litt.). The island of Pagan supports the forest and savanna ecosystems. Two of the 23 species are known to occur on Pagan, the animals Slevin's skink and the humped tree snail. The tree *Cycas micronesica* also likely occurs on Pagan; however, this is not yet confirmed (see *Cycas micronesica* under Description of the 23 Mariana Islands Species, below). The plant *Bulbophyllum guamense* occurred historically on Pagan.

The descriptions for each of the remaining northern islands in the Mariana Archipelago remain unchanged from the proposed rule and, therefore, are not included in this final rule. Please refer to the proposed rule (79 FR 59364; October 1, 2014) for further information.

An Ecosystem-Based Approach to Organizing This Listing Rule

In the Mariana Islands, as within most archipelagos, native species that occur in the same habitat types (ecosystems) depend on many of the same biological features and the successful functioning of that ecosystem to survive. We have, therefore, organized the species addressed in this final rule by common ecosystems. Although the listing determination for each species is analyzed separately, we have organized the individual analysis for each species within the context of the broader ecosystem in which it occurs for efficiency and to reduce repetition for the reader. In addition, native species that share ecosystems often face a suite of common factors that may be a threat to them, and ameliorating or eliminating these threats for each individual species often requires the same management actions in the same areas. Cost-effective management of these threats often requires implementation of conservation actions at the ecosystem level to enhance or restore critical ecological processes and provide long-term viability of species and their habitat. Organizing the 23 Mariana Islands species by shared ecosystems may also set the stage for a conservation management approach of protecting, restoring, and enhancing critical ecological processes at an ecosystem scale for the long-term viability of all associated native species in a given ecosystem type and locality, thus potentially preventing the future imperilment of any additional species that may require protection.

Based on the best available scientific and commercial data, including information received during the comment period on our proposed rule (79 FR 59364; October 1, 2014), we are listing the plants *Eugenia bryanii, Hedyotis megalantha, Heritiera longipetiolata, Phyllanthus saffordii, Psychotria malaspinae, Solanum guamense,* and *Tinospora homosepala;* and the animals Pacific sheath-tailed bat (Mariana subspecies), Slevin's skink, Mariana eight-spot butterfly, Mariana wandering butterfly, Rota blue damselfly, humped tree snail, Langford's tree snail, Guam tree snail, and fragile tree snail from the Mariana Islands, as endangered species. We are listing the plants *Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Maesa walkeri, Nervilia jacksoniae, Tabernaemontana rotensis,* and *Tuberolabium guamense,* from the Mariana Islands and greater Micronesia, as threatened species.

These 23 Mariana Islands species are found in four ecosystem types: Forest, savanna, stream, and cave (Table 2). Of the 23 species, only the Pacific sheath-tailed bat (Mariana subspecies) is found in more than one ecosystem type (forest and cave).

TABLE 2—THE 23 MARIANA ISLANDS SPECIES AND THE ECOSYSTEMS UPON WHICH THEY DEPEND

Ecosystem	Species	
	Plants	Animals
Forest	*Bulbophyllum guamense*	Pacific sheath-tailed bat (Mariana subspecies).
	Cycas micronesica	Slevin's skink.
	Dendrobium guamense	Mariana eight-spot butterfly.
	Eugenia bryanii	Mariana wandering butterfly.
	Heritiera longipetiolata	Humped tree snail.
	Maesa walkeri	Langford's tree snail.
	Nervilia jacksoniae	Guam tree snail.
	Psychotria malaspinae	Fragile tree snail.
	Solanum guamense.	
	Tabernaemontana rotensis.	
	Tinospora homosepala.	
	Tuberolabium guamense.	
Savanna	*Hedyotis megalantha*.	
	Phyllanthus saffordii.	
Stream		Rota blue damselfly.
Cave		Pacific sheath-tailed bat (Mariana subspecies).

For each species, we identified and evaluated those factors that are threats to each individual species specifically (species-specific threats), as well as those factors which pose common threats to all of the species of a given ecosystem type (ecosystem-level threats). For example, the degradation of habitat by nonnative ungulates is considered a direct or indirect threat to 17 of the 23 species listed as endangered or threatened in this final rule. We have labeled such threats that are shared by all species within the same ecosystem as ''ecosystem-level threats,'' because they impact all species inhabiting that ecosystem type in terms of the nature of the impact, its severity, timing, and scope. Beyond ecosystem-level threats, we further identified and evaluated species-specific threats that may be unique to certain species, and not shared by all other species in the same ecosystem. For example, the threat of predation by nonnative flatworms is unique and specific to the four tree snails addressed in this final rule.

Mariana Islands Ecosystems

As noted above, for the purposes of organizing our threats discussion for the 23 species by shared habitats, we have identified four broad Mariana Islands ecosystems: forest, savanna, stream, and cave, based on physical features, elevation, substratum, vegetation type, and hydrology (see *The Mariana Islands,* above; and the proposed rule (79 FR 59364; October 1, 2014)). We acknowledge the presence of other ecosystems (*e.g.,* coastal, wetland) in the Mariana Islands, however, we limit our discussion to these four because they are the relevant ecosystems that support the 23 species listed as endangered or threatened species in this final rule. These four ecosystems are described in the proposed rule (79 FR 59364; October 1, 2014) and these descriptions are hereby incorporated into this final rule, with the exception of a revised description of the forest ecosystem, below; see Table 2 (above) for a list of the species that occur in each ecosystem type.

Forest Ecosystem

There are two substrate types in the forest ecosystem, limestone and volcanic (Stone 1970, pp. 9, 14, 18–24; Falanruw *et al.* 1989, pp. 6–9; Ohba 1994, pp. 19–29; Mueller-Dombois and Fosberg 1998, p. 243). The annual rainfall in the forest ecosystem lies within the archipelago average, ranging from 78 to 100 inches (in) (2,000 to 2,500 millimeters (mm)), with a rainy season from June or July through October or November. The temperature of the forest ecosystem mirrors the archipelago monthly averages, between 75 degrees Fahrenheit (°F) and 82 °F (24 degrees Celsius (°C) and 28 °C), with extremes of 64 °F and 95 °F (18 °C and 35 °C). There are multiple plant species present throughout the forest ecosystem, and on most of the islands; however, variations in species structure are observed (Fosberg 1960, pp. 37, 56–59, plates 1–40; Falanruw *et al.* 1989, pp. 6–9; Ohba 1994, pp. 19–29; Mueller-Dombois and Fosberg 1998, pp. 257, 268, 270–271).

Native canopy species in the forest ecosystem (as defined here) include but are not limited to: *Artocarpus mariannensis, Barringtonia asiatica, Claoxylon* spp., *Cordia subcordata, Cyanometra ramiflora, Elaeocarpus joga, Ficus prolixa, Hernandia labyrinthica, H. sonora, Merrilliodendron megacarpum, Ochrosia mariannensis, O. oppositifolia, Pandanus dubius, P. tectorius, Pisonia grandis, Pouteria obovata,* and *Premna obtusifolia* (Falanruw *et al.* 1989, pp. 6–9; Raulerson and Rinehart 1991, pp. 6–7, 11, 14, 20, 24, 28, 33, 50, 52–53, 62–63, 72, 91, 96, 104; Ohba 1994, pp. 19–29; Mueller-Dombois and Fosberg 1998, pp. 257, 268, 270–271; Wiewel *et al.* 2009, pp. 206–207). Native subcanopy species include but are not limited to: *Aglaia mariannensis, Aidia cochinchinensis, Allophylus timoriensis, Eugenia palumbis, E. reinwardtiana, Hibiscus tiliaceus, Maytenus thompsonii, Meiogyne cylindrocarpa, Psychotria mariana,* and *Xylosma nelsonii* (Stone 1970, pp. 9, 14, 18–24; Falanruw *et al.* 1989, pp. 6–9; Raulerson and Rinehart 1991, pp. 13, 47, 56, 59, 68–69, 77, 84, 88; Ohba 1994, pp. 19–29; Mueller-Dombois and Fosberg 1998, pp. 252–253, 257, 268, 272); and native understory species include but are not limited to: *Discocalyx megacarpa, Hedyotis* spp., *Nephrolepis bisserrata, N. hirsutula, Phyllanthus marianus,* and *Piper guamense* (Falanruw *et al.* 1989, pp. 6–9; Ohba 1994, pp. 19–29; Mueller-Dombois and Fosberg 1998, pp. 247, 268). Further, in select areas of the forest ecosystem, usually where the forest is situated such that it receives and retains more moisture, the canopy trees are covered in various mosses and epiphytic ferns and orchids (Mueller-Dombois and Fosberg 1998, p. 268).

Dominant canopy, subcanopy, and understory species can vary from one location to the next on the same island, and from island to island. These species can be endemic to one island, occur on one or more of the southern islands, or occur on one or more of the northern islands. In addition, biologists have observed overlap of forest species on limestone and volcanic substrata, suggesting that physical properties may be more important than chemical properties of these substrates in determining vegetation characteristics (Mueller-Dombois and Fosberg 1998, p. 243). Elevation also contributes to variations in vegetation, as observed on Mt. Alutom, Mt. Almagosa, Mt. Lamlam, and Mt. Bolanus on Guam; the Rota Sabana; and on the slopes of the northern islands (Stone 1970, pp. 9, 14, 18–24; Falanruw 1989, pp. 4–6; Mueller-Dombois and Fosberg 1998, pp. 262–264); although in some cases there is no definite correlation with elevation (*i.e.,* the moisture-retaining, moss- and epiphyte-covered sections of the forest ecosystem are found near the coast in some areas and also at mid to high elevations) (Fosberg 1960, p. 30). Additionally, biologists have observed a change in distribution of *Hernandia* species with elevation. For example, *H. sonora,* dominant on the coastal side of the forest ecosystem, changes distinctly to *H. labyrinthica* as the elevation increases (Falanruw *et al.* 1989, p. 8; Amidon 2000, p. 49). The significance of these interpretations of forest-associated species in the Mariana archipelago to the 14 plants in this rule is not adequately definitive to subclassify a forest type for each of the species in this rule; therefore, we describe a general forest ecosystem here, with the substrate, temperatures, precipitation, and associated native canopy, subcanopy, and understory species, listed above. The forest ecosystem supports 20 of the 23 species listed as endangered or threatened species in this final rule (all except the plants *Hedyotis megalantha* and *Phyllanthus saffordii,* which occur only in the savanna ecosystem, and the Rota blue damselfly, which occurs only in the stream ecosystem).

Description of the 23 Mariana Islands Species

Plants

In order to avoid confusion regarding the number of populations of each species (*i.e.,* because we do not consider an individual plant to represent a viable population), we use the word ‘‘occurrence’’ instead of ‘‘population.’’ Additionally, we use the word occurrence to refer only to wild (*i.e.,* not propagated and outplanted) individuals because of the uncertainty of the persistence to at least the second generation (F2) of the outplanted individuals. A population consists of mature, reproducing individuals forming populations that are self-sustaining (as indicated, for example, by the presence of individuals representing multiple life-history stages). Also, there is a high potential that one or more of the outplanted populations may be eliminated by normal or random adverse events, such as fire, nonnative plant invasion, or disease, before a seed bank can be established.

Bulbophyllum guamense (siboyas halumtanu, siboyan halom tano), an epiphyte in the orchid family (Orchidaceae), is known from widely distributed occurrences on the southern Mariana Islands of Guam and Rota, in the forest ecosystem (Ames 1914, p. 13; Raulerson and Rinehart 1992, p. 90; Costion and Lorence 2012, pp. 54, 66; Global Biodiversity Information Facility (GBIF) 2012a—*Online Herbarium Database;* Zarones *et al.* 2015c, in litt.). *Bulbophyllum guamense* was recorded historically on Guam from clifflines encircling the island, and on the slopes of Mt. Lamlam and Mt. Almagosa. As recently as 1992, this species was reported to occur in large mat-like formations on trees ‘‘all over the island,’’ (Guam) (Raulerson and Rinehart 1992, p. 90). Currently, there are 12 known occurrences (3 on Guam and 9 on Rota) totaling fewer than 250 individuals on Guam and at least 261 individuals on Rota. At the time of the proposed rule, our information indicated that there were likely fewer than 30 individuals of this species on Rota. However, a recent survey team on Rota reported at least 261 individuals of *B. guamense* along the Sabana tableland and slopes above 980 ft (300 m) elevation with a population structure consisting of seedlings, juveniles, and flowering adults. This survey team estimated the overall number of individuals could be as high as 16,000. This latter estimate appears to be an assumption based on the premise that *B. guamense* is uniformly distributed across the region in preferred habitat areas (Zarones *et al.* 2015c, in litt.).

The Service does not concur that there are enough data to determine that this species is uniformly distributed across the Sabana, and subsequently cannot support the extrapolation of numbers for this species to be as high as 16,000, although it is possible. The healthy population structure of *B. guamense* recently observed on Rota, with multiple generations of plants present, does show that the status of this species is better on this island than previously understood. Historically, there are a couple of herbarium records of *B. guamense* occurring on Pagan (last observed in 1984) and Saipan (last observed in 1970), however, these are considered outliers and not within the accepted endemic range of *B. guamense.* Due to the common occurrence of errors detected throughout the herbaria records and literature, the Service recognizes Guam and Rota as the most scientifically credible range for this species. *Bulbophyllum guamense* has declined in number of populations and individuals on Guam, which represents half of its known range, and the species exists in a specialized niche habitat within the forest ecosystem on Rota. The remaining individuals of *B. guamense* are vulnerable to the effects of continued habitat loss and destruction from agriculture, urban development, nonnative animals and plants, fires, and typhoons, combined with predation by nonnative invertebrates such as slugs. We anticipate the effects of climate change will further exacerbate many of these threats in the future.

Cycas micronesica (fadang, faadang), a cycad in the cycad family (Cycadaceae), is known from Guam, Rota, and tentatively on Pagan, as well as Palau (politically the independent Republic of Palau) and Yap (geographically part of the Caroline Islands; politically part of the Federated States of Micronesia), in the forest ecosystem (Hill *et al.* 2004, p. 280; Keppel *et al.* 2008, p. 1,006; Cibrian-Jaramillo *et al.* 2010, pp. 2,372–2,375; Marler 2013, in litt.).

Just 10 years ago, *Cycas micronesica* was ubiquitous on the island of Guam, and similarly common on Rota. *Cycas micronesica* is currently under attack by a nonnative insect, the cycad aulacaspis scale (*Aulacaspis yasumatsui*) that is causing rapid mortality of plants at all locations (Marler 2014, in litt.). As of January 2013, *C. micronesica* mortality reached 92 percent on Guam, and cycads on Rota are experiencing a similar fate (Marler 2013, in litt.). All seedlings of *C. micronesica* in a study area were observed to die within 9 months of infestation by *A. yasumatsui* (see ‘‘*Factor C. Disease and Predation,’’* below for further discussion) (Marler and Muniappan 2006, p. 3; Marler and Lawrence 2012, p. 233; Western Pacific Tropical Research Center 2012, p. 4; Marler 2013, pers. comm.).

Currently, there are 15 to 20 occurrences of *Cycas micronesica* totaling 900,000 to 950,000 individuals on the Micronesian Islands of Guam, Rota, Yap, and Palau. There may be a small number of individuals on Pagan; however, this is not yet confirmed. On Guam and Rota there are fewer than 630,000 (Marler 2013, pers. comm.). These totals do not distinguish between successfully reproducing adults and juveniles (Marler 2013, pers. comm.), which, because of the effects of the cycad aulacaspis scale, implies that the number of extant individuals that can successfully reproduce is much lower. On Guam, there are four fragmented occurrences, totaling fewer than 516,000 individuals: One occurrence along the shoreline to the base of the limestone cliffs on the north side; a second occurrence beginning at the forest edge along the cliffs and continuing into the forest on the north side; a third occurrence on the northern plateau; and a fourth occurrence along the ravines and rock outcrops on the southern side, with a few individuals occurring across the savanna.

On Rota, there are four known occurrences within the forest ecosystem, totaling fewer than 111,500 individuals (Marler 2013, in litt.). On the northeast shore the first occurrence totals fewer than 25,500 individuals; the second occurrence, on the northwest shore, totals fewer than 21,600 individuals; the third occurrence on the south shore totals fewer than 63,600 individuals; and the fourth occurrence on Wedding Cake peninsula totals fewer than 300 individuals.

There are likely a relatively limited number of individuals of *Cycas micronesica* on Pagan. In recent surveys, Pratt (2011, pp. 33–42) reported finding *Cycas circinalis* in a ravine on the southwest part of the island. Cycas *micronesica* was once merged with *C. rumphii* or *C. circinalis,* but is now considered a separate species (Hill 1994, pp. 543–567; Hill *et al* 2004, p. 280). It is more likely that this cycad species on Pagan is *C. micronesica;* however, until identification is confirmed, we consider this a tentative location.

Yap consists of a group of four islands, three of which are separated by water but share a common reef, with a total land area of 39 mi² (102 km²). On Yap, there are three occurrences of *Cycas micronesica,* totaling 288,450 individuals (Marler 2013, in litt). Palau consists of three larger islands, Babeldaob, Koror, and Ngeruktabel, and between 250 and 300 smaller islands referred to as the ''Rock Islands.'' The total land area is 177 mi² (458 km²). On Palau, there are four occurrences of *C. micronesica* totaling fewer than 2,500 individuals: (1) Two occurrences on Ngeruktabel Island, totaling fewer than 900 individuals, (2) one occurrence on Ngesomel Island totaling fewer than 600 individuals, and (3) possibly as many as 1,000 individuals scattered on the Rock Islands (Marler 2013, in litt.). The aulacaspis scale was observed on the main islands of Palau in 2008 (Marler 2014, in litt.), and is expected to reach Yap as well (Marler 2013, in litt.).

The nonnative cycad aulacaspis scale quickly causes mortality of all life stages of *C. micronesica,* preventing reproduction of *C. micronesica,* and leading to its extirpation (see ''Factor C. Disease and Predation,'' below). The magnitude of the ongoing threats of predation by the scale and nonnative animals, secondary infestations by other insects, and loss of habitat due to development, typhoons, and direct damage and destruction by military live-fire training is large, and these threats are imminent. We anticipate the effects of climate change will further exacerbate many of these threats in the future. Although *C. micronesica* presently is found in relatively high numbers, the factors affecting this species can result in very rapid mortality of large numbers of individuals. A study by Marler and Lawrence (2012, pp. 239—240) shows that if the ongoing negative population density trajectory for *C. micronesica* established over 4 years is sustained, extirpation of *C. micronesica* from Guam and Rota will occur by 2019. Marler and Lawrence's data show that it is reasonable to conclude that, unless an effective biocontrol is discovered, the scale will similarly impact the three populations of *C. micronesica* in the Rock Islands of Palau within several years. Additionally, frequent travel between Guam and Yap increases the likelihood that the scale will reach Yap in the foreseeable future.

Dendrobium guamense (no common name (NCN)), an epiphyte and occasional lithophyte in the orchid family (Orchidaceae), is known from the forest ecosystem on Guam, Rota, Saipan (historically), and Tinian, and was recently recorded for the first time on Aguiguan (Ames 1914, p. 14; Raulerson and Rinehart 1992, p. 98; Quinata 1994, in litt.; Raulerson 2006, in litt.; Costion and Lorence 2012, p. 66; Zarones *et al.* 2015a, in litt.; Zarones *et al.* 2015c, in litt.). Raulerson (2006, in litt.) cites *D. guamense* as also occurring on Agrihan, however, a voucher record or survey report to support this location could not be found. As recently as the 1980s, this species was common in trees on Guam and Rota, with more than 12 occurrences on Guam and 17 occurrences on Rota (Raulerson and Rinehart 1992, p. 98; Consortium Pacific Herbarium (CPH) 2012a—*Online Herbarium Database,* 5 pp.).

Currently, there are at least 21 occurrences totaling approximately 1,250 individuals distributed on the islands of Guam, Rota, Tinian, and Aguiguan; this is more than twice as many individuals as were known at the time of the proposed rule. On Guam, there are 4 occurrences totaling fewer than 250 individuals (Quinata *et al.* 1994, p. 8; Harrington *et al.* 2012, in litt). On Rota, at least 15 occurrences of *D. guamense* are now known, and a recent survey team reported more than 700 individuals of *D. guamense* on the western third of Rota, represented by seedlings, juveniles, and flowering adults (Harrington *et al.* 2012, in litt.; Zarones *et al.* 2015c, in litt.). The presence of multiple generations in a healthy population structure indicates that the status of *D. guamense* on Rota is better than previously known. This survey team indicated that *D. guamense* is abundant across its preferred habitat on Rota, and subsequently suggested that the actual number of individuals could be as high as 35,000 (Zarones *et al.* 2015c, in litt.). The Service supports the finding that the number of *D. guamense* individuals on Rota is in the thousands, although we do not agree that it is reasonable to assume the species is evenly distributed across the island. However, this species is the most abundant of the three epiphytic orchids listed as threatened species in this final rule.

Additionally, Zarones *et al.* (2015a, in litt.) discovered three individuals of *D. guamense* on the island of Aguiguan, a new island record for this species. Zarones *et al.* (2015a, in litt.) hypothesize that more individuals may be found on Aguiguan and other northern islands within CNMI if more in-depth surveys were attempted. There are two reported occurrences on the island of Tinian, with an unknown number of individuals (Quinata 1994, in litt.; Raulerson 2006, in litt.; CPH 2012a—*Online Herbarium Database,* 5 pp.). Historically, *D. guamense* was also known from Saipan, in the forest ecosystem (Raulerson 1987, in litt.; Raulerson 2006, in litt.; CPH 2012a—*Online Herbarium Database,* 5 pp.). Formerly relatively common on Guam, the remaining few populations of *D. guamense* and habitat for population enhancement or restoration on Guam is at risk; additionally, *D. guamense* occurrences are limited to just a few individuals on Tinian and Aguiguan, with no confirmed individuals on Saipan at this time. *Dendrobium guamense* appears stable and healthy on Rota, however, Raulerson and Rinehart (1992, p. 87) warned that, although the endemic orchids on Rota appear abundant, they occupy specialized habitat that are in fact rare.

On all islands on which it is known to occur (historically or present), *D. guamense* faces two or more of the following impacts: Habitat loss and destruction from agriculture, urban development, nonnative animals and plants, fire, and typhoons, combined with herbivory by nonnative invertebrates such as slugs. We anticipate the effects of climate change will further exacerbate many of these threats in the future.

Eugenia bryanii (NCN), a perennial shrub in the Myrtle family (Myrtaceae), is known only from Guam. Historically, *E. bryanii* occurred on windy, exposed clifflines along the west and east coasts of the island, and from along the Pigua River, in the forest ecosystem (Costion and Lorence 2012, p. 82; Gutierrez 2012, in litt.). Currently, *E. bryanii* is known from 5 occurrences totaling fewer than 420 individuals (Gutierrez 2014, in litt.). Populations of *E. bryanii,* a single island endemic, are decreasing from initial numbers observed on Guam, and these remaining small populations are at risk, due to continued habitat loss and destruction from agriculture, urban development, nonnative animals and plants, and typhoons, combined with herbivory by deer. We anticipate the effects of climate change will further exacerbate many of these threats in the future.

Hedyotis megalantha (pao dedu, pao doodu), a perennial herb in the coffee family (Rubiaceae), is known only from the savanna ecosystem on Guam. Historically, *H. megalantha* was reported solely from Guam; however, because several herbarium records reported this species on Rota and Saipan, we investigated other reports and taxonomic and genetic analyses concerning the range of this species. We believe the Rota and Saipan reports are misidentifications or herbarium errors of one or more of the other *Hedyotis* species also found in the Mariana Islands (Fosberg *et al.* 1993, pp. 63–79; CPH 2012b—*Online Herbarium Database;* World Checklist of Select Plant Families (WCSP) 2012a—*Online Herbarium Database*). Between 1911 and 1966, this species ranged from the mid-central mountains and west coast of Guam, south to Mt. Lamlam (Bishop Museum 2013—*Online Herbarium Database*).

Currently, *H. megalantha* is known from one large scattered occurrence totaling fewer than 1,000 individuals on southern Guam (Costion and Lorence 2012, pp. 54, 86; Gutierrez 2012, in litt.; Bishop Museum 2013—*Online Herbarium Database;* Gutierrez 2013, in litt.). *Hedyotis megalantha* typically occurs as lone individuals rather than in patches or groups (Gutierrez 2013, in litt.). In sum, the single known occurrence of *H. megalantha,* a single island endemic, is decreasing from initial numbers observed on Guam, and the remaining individuals are at continued risk due to ongoing habitat loss and destruction from agriculture, urban development, nonnative animals and plants, fires, and typhoons, combined with habitat destruction and direct damage by recreational vehicles. We anticipate the effects of climate change will further exacerbate many of these threats in the future.

Heritiera longipetiolata (ufa halumtanu, ufa halom tano; looking glass tree), a tree in the hibiscus family (Malvaceae), is known only from the Mariana Islands. A few herbarium records have cited *H. longipetiolata* on Palau, Chuuk, Pohnpei, and the Eastern Caroline Islands; however, upon a thorough review of the literature and herbarium records, and conferring with local botanical experts, we conclude that these few outlying occurrences are actually *H. littoralis,* not *H. longipetiolata* (Stone 1970, pp. 23, 420–421; Raulerson and Rinehart 1991, p. 94; Wiles 2012, in litt.; Center for Plant Conservation 2010, in litt.; CPH 2012c—*Online Herbarium Database;* Global Biodiversity Information Facility (GBIF) 2014—*Online Herbarium Database;* Harrington *et al.* 2012, in litt.; Lorence 2013, in litt.).

Historically, *Heritiera longipetiolata* is reported from Guam, Rota, Saipan, and Tinian, in the forest ecosystem (Stone 1970, p. 420; Raulerson and Rinehart 1991, p. 94; CPH 2012c—*Online Herbarium Database;* GBIF 2014—*Online Herbarium Database*). By 1997, there were about 1,000 individuals on Guam, several hundred on Tinian, and fewer than 100 on Saipan, with no known remaining individuals on Rota at that time (Wiles in International Union for Conservation of Nature (IUCN) Red List 2014, in litt.). Currently, *H. longipetiolata* is known from 10 occurrences totaling approximately 200 individuals, on Guam, Saipan, Tinian, and Rota, all within the forest ecosystem (M and E Pacific, Inc., pp. 6, 8, 31, 78; Harrington *et al.* 2012, in litt; Grimm 2013, in litt). On Guam, *H. longipetiolata* is presently known from 4 occurrences, totaling approximately 90 individuals; on Tinian, there are between 30 and 40 individuals of *H. longipetiolata,* and possibly more in adjacent forested areas (Spaulding 2013, in litt.; Williams 2013, in litt.; Spaulding 2015, in litt.); on Saipan, *H. longipetiolata* is known from 3 occurrences, totaling at least 53 individuals, with several hundred seedlings beneath the trees (Camacho and Micronesian Environmental Services (MES) 2002, pp. 38–39); and on Rota, more recent information indicates that there is at least one known individual of *H. longipetiolata* (Cook 2010, in litt. cited in CNMI–DLNR 2015, in litt.).

Although Wiles stated that there is strong evidence that *H. longipetiolata* is not regenerating, and that seedlings and seeds are eaten by ungulates and crabs, this observation appears to have been made on Guam where feral deer and feral pigs are abundant and have been observed to eat seedlings of *H. longipetiolata* (Guam Comprehensive Wildlife Conservation Strategy 2005, p. 117; Rogers 2012, in litt.; Wiles in IUCN Red List 2014, in litt.). *Heritiera longipetiolata* is on Guam's endangered species list, listed as Vulnerable on IUCN's Red List of Threatened Species, and is also a species of concern for Guam's Plant Extinction Prevention Program. With roughly 200 individuals remaining across its range (Guam, Saipan, Tinian, and Rota), both *Heritiera longipetiolata* and habitat for the recovery of this species are at risk due to ongoing habitat loss and destruction from agriculture, urban development, nonnative animals and plants, and typhoons. We anticipate the effects of climate change will further exacerbate many of these threats in the future. Herbivory by pigs and deer, and habitat and direct destruction by military live-fire training also negatively impact *H. longipetiolata.*

Maesa walkeri (NCN), a shrub or small tree in the primrose family (Primulaceae), is found only in the Mariana Islands. Historically, *M. walkeri* is known from the islands of Guam and Rota, within the forest ecosystem (Fosberg and Sachet 1979, pp. 368–369; M and E Pacific, Inc. 1998, pp. 31, 79; Raulerson and Rinehart 1991, p. 67; Costion and Lorence 2012, p. 84; CPH 2012d—*Online Herbarium Database;* GBIF 2012b—*Online Herbarium Database;* Wagner *et al.* 2012—*Flora of Micronesia*). Several voucher specimens (preserved and labeled representative whole plants or plant parts, used to compare and correctly identify plant species, usually kept as part of an herbarium collection) report *M. walkeri* from the Carolinian Island of Pohnpei, but after careful review of the best available data (cited above), we conclude that *M. walkeri* is endemic to the Mariana Islands.

Historically, *M. walkeri* was known from at least 13 occurrences on Guam and 9 occurrences on Rota (Bishop Museum 2014—*Online Herbarium Database*). Currently, *M. walkeri* is known from 5 occurrences in the forest ecosystem on Guam and Rota, totaling at least 686 individuals. This is a significant increase over numbers of individuals that were known at the time of the proposed rule (estimated at fewer than 60). On Guam, there are two individuals (M and E Pacific, Inc. 1998, pp. 31, 79; Grimm 2013, in litt.); and on Rota, there are at least 684 individuals spread out across the Sabana, with a healthy population structure consisting of seedlings, juveniles, and adults (Harrington *et al.* 2012, in litt.; Gawel 2013, in litt.; Liske-Clark *et al.* 2015, in litt.). The presence of multiple generations of the species indicates that the status of *M. walkeri* is much better on Rota than previously understood. The number of individual *Maesa walkeri* plants on Rota has been estimated to be in the thousands across the Sabana region in small canopy gaps amidst the Pandanus forest and along the forest edge; however, this is assuming *M. walkeri* is evenly distributed (Ulloa 2015, pers. comm. cited in Liske-Clark *et al.* 2015, in litt.; Liske-Clark *et al.* 2015, in litt.).

The Service supports the conclusion that there may be several thousand more individuals across the Sabana. The cumulative data indicate that *Maesa walkeri* was once relatively abundant on Guam and Rota, and has since declined substantially on Guam. The only healthy extant population of *M. walkeri* remains on the Rota Sabana within a very specialized niche habitat that is experiencing habitat loss and degradation from nonnative animals (deer and rats) and plants, and fire; and is at risk from impacts associated with typhoons and future climate change (*e.g.,* potential shift in range to accommodate changes in temperature, precipitation, humidity, etc., until the range no longer exists). Additionally, habitat on Guam that is essential for the recovery of *M. walkeri* continues to be affected by ongoing habitat loss and destruction from agriculture, urban development, nonnative animals and plants, fires, and typhoons. The effects of future climate change will likely exacerbate many of these impacts. *Maesa walkeri* is a species of concern for Guam's Plant Extinction Prevention Program.

Nervilia jacksoniae (NCN), a small herb in the orchid family (Orchidaceae), is found only in the Mariana Islands. Historically, *N. jacksoniae* occurred on the islands of Guam and Rota, in the forest ecosystem, and ranged from northern to southern Guam and on the Sabana region of Rota (Rinehart and Fosberg 1991, pp. 81–85; Raulerson and Rinehart 1992, p. 118; Costion and Lorence 2012, p. 67). Currently, there are approximately 15 occurrences totaling at least 520 individuals on the islands of Guam and Rota, in the forest ecosystem (Harrington *et al.* 2012, in litt.; Zarones *et al.* 2015d, in litt.). On Guam, *N. jacksoniae* is known from 2 occurrences totaling fewer than 200 individuals (M and E Pacific, Inc. 1998, p. 58; Grimm 2012, in litt.; McConnell 2012, pers. comm.). On Rota, *N. jacksoniae* is known from 13 scattered occurrences totaling at least 320 individuals in the forest ecosystem (Rinehart and Fosberg 1991, pp. 81–85; Raulerson and Rinehart 1992, p. 118; Costion and Lorence 2012, p. 67; CPH 2012e—*Online Herbarium Database;* GBIF 2012c—*Online Herbarium Database;* McConnell 2012, pers. comm.; Zarones *et al.* 2015d, in litt.).

Zarones *et al.* (2015d, in litt.) recently conducted a small survey on Rota, reporting 167 individuals of *N. jacksoniae* along four transects in just 1.5 hours, and estimated that there may be as many as 100,000 individuals distributed across the Pandanus forest on the Rota Sabana. This estimate, however, appears to be based on the premise that this species is uniformly distributed across area. There are also a few scattered occurrences along the areas adjacent to the Sabana (Zarones *et al.* 2015d, in litt.). Our records indicate that this species occurs in a more patchy distribution, in specialized niche habitat (Harrington *et al.* 2015, in litt.). Similarly, Falanruw *et al.* (1989, pp. 6–7) noted variation in the distribution of native species across the Sabana, referring to the observed variations in forest structure as phases of limestone forest. However, we do concur that the number of *N. jacksoniae* individuals is likely to be much higher than what has been observed by field biologists on Rota in the past, as this species can occur deep within forested areas in the Sabana region that are difficult to access due to extremely rugged karst and thick *Pandanus* forest. Thus, although exact numbers are not known, the best available scientific data do indicate that *N. jacksoniae* is likely more abundant than was understood at the time of the proposed rule. Nonetheless, the habitat for *N. jacksoniae* in the Sabana region is experiencing habitat destruction and modification by nonnative animals (*i.e.,* Philippine deer and rats) and plants, fire, and typhoons. Additionally, *N. jacksoniae* is preyed upon by nonnative invertebrates such as slugs.

Data indicate that populations of *N. jacksoniae* are decreasing from their initial abundance observed on Guam (Rinehart and Fosberg 1991, p. 84; Cook 2012, in litt.; Harrington *et al.* 2012, in litt.), primarily due to habitat loss and destruction from agriculture and urban development; in addition to nonnative animals (*i.e.,* pigs, water buffalo, Philippine deer, and brown treesnake) and plants, fires, and typhoons, and predation by nonnative invertebrates such as slugs. We anticipate the effects of climate change will further exacerbate many of these threats in the future.

Phyllanthus saffordii (NCN), a woody shrub in the Phyllanthaceae family, is historically known only from the southern part of Guam within the savanna ecosystem. Several literature and database sources report this species from the northern Mariana Islands (Costion and Lorence 2012, pp. 82–83; Wagner 2012—*Flora of Micronesia;* U.S. Department of Agriculture—Agriculture Research Service—Germplasm Resources Information Network (USDA–ARS–GRIN) 2013—*Online Database;* WCSP 2012b—*Online Database*); however, a thorough review of the literature, databases, and herbaria records revealed recorded occurrences only on Guam (Merrill 1914, pp. 104–105; Glassman 1948, p. 181; Stone 1970, pp. 387–388; Pratt 2011, p. 59; Gutierrez 2012, in litt.; GBIF 2012d—*Online Herbarium Database;* Bishop Museum 2013—*Online Herbarium Database;* Smithsonian Institution 2014—*Flora of Micronesia Database*). Until the early 1980s, *P. saffordii* ranged from central to southern Guam (Bishop Museum 2014—*Herbarium Database*). Currently, *P. saffordii* is known from 4 scattered occurrences on southern Guam, totaling fewer than 1,400 individuals (Gutierrez 2013, in litt.; Gawel *et al.* 2013, in litt.). Populations of *P. saffordii,* a single island endemic, are thus decreasing from initial numbers observed on Guam, and are at risk, due to continued habitat loss and destruction from agriculture, urban development, nonnative animals and plants, fires, and typhoons, combined with habitat destruction and direct damage by recreational vehicles. We anticipate the effects of climate change will further exacerbate many of these threats in the future.

Psychotria malaspinae (aplokating palaoan), a shrub or small tree in the coffee family (Rubiaceae), is known only from Guam. Historically, *P. malaspinae* was known from scattered occurrences on the northeast and southwest sides of Guam, in the forest ecosystem (Merrill 1914, pp. 148–149; Stone 1970, pp. 554–555; Raulerson and Rinehart 1991, p. 83; Fosberg *et al.* 1993, pp. 111–112; Costion and Lorence 2012, pp. 54, 85–86; Bishop Museum 2014—*Online Database;* Wagner 2012—*Flora of Micronesia;* WCSP 2012c—*Online Database*). Currently, *P. malaspinae* is known from only four occurrences, three with only a single individual each (M and E Pacific, Inc. 1998, pp. 67, 79; Grimm 2012, in litt.), none of which have been observed for at least 5 years; and a fourth recently discovered occurrence with three individuals (Guam Plant Extinction Prevention Program 2015, in litt.). Biologists searched for this species during rare plant surveys conducted in July 2012; however, none of the occurrences reported prior to July 2012 were relocated (Harrington *et al.* 2012, in litt.). The tentative specimen of *P. malaspinae* collected from the Ritidian National Wildlife Refuge on Guam in August 2013, cited in the proposed rule as pending identification, turned out to be *P. hombroniana*—another rare endemic species that may warrant conservation actions (Gawel *et al.* 2013, in litt.; Gawel 2015, in litt.). *Psychotria malaspinae* is also a species of concern for Guam's Plant Extinction Prevention Program.

In summary, the species *Psychotria malaspinae,* a single island endemic, has been reduced to an estimated five individuals in the wild, and possibly fewer since several of these individuals have not been observed for several years, rendering this species vulnerable to extinction. There are likely a few scattered individuals or small occurrences such as that recently discovered; however, these remaining individuals are at risk, due to continued habitat loss and destruction from agriculture, urban development, nonnative animals and plants, and typhoons. We anticipate the effects of climate change will further exacerbate many of these threats in the future. Herbivory by pigs and deer, damage by ordnance and live-fire training, combined with the effects of low numbers of individuals, which results in loss of vigor and genetic representation, and limits its ability to compete with other species and adapt to changes in environmental conditions, contribute to the decline of *P. malaspinae.*

Solanum guamense (Biringenas halumtanu, birengenas halom tano), a small shrub in the nightshade family (Solanaceae), is known only from the Mariana Islands (Merrill 1914, pp. 139–140; Stone 1970, p. 521; Costion and Lorence 2012, p. 89). Historically, *S. guamense* was reported from Guam, Rota, Saipan, Tinian, Asuncion, Guguan, and Maug (Stone 1970, p. 521; GBIF 2012e—*Online Database;* Bishop Museum 2014—*Online Database*). Currently, *S. guamense* is known from a single occurrence of one individual on Guam, in the forest ecosystem (Perlman and Wood 1994, pp. 135–136).

Once ranging across multiple islands, *Solanum guamense* is now highly vulnerable to extinction, as there is only one known extant individual of this species. There is a possibility that remaining individuals of *S. guamense* may occur on Asuncion, Guguan, or Maug; or any combination of these three islands, possibly even on Uracas, as these four islands are designated Wildlife Conservation Areas (also referred to as sanctuary islands) by the CNMI constitution (Article IX[2]) (Williams *et al.* 2009, p. 3). This article states that no hunting, habitation, nor introduction of any nonnative species is allowed (2NMIAC § 85–30.1 330) (Williams *et al.* 2009, p. 3). Further, Maug, Asuncion, Guguan, and Uracas are not frequently visited for scientific purposes due to their remoteness and the associated logistical challenges of planning and cost. *Solanum guamense,* and habitat for its recovery on Guam, Rota, Saipan, and Tinian, are at risk, due to continued habitat loss and destruction from agriculture, urban development, nonnative animals and plants, and typhoons. We anticipate the effects of climate change will further exacerbate many of these threats in the future. Herbivory by pigs and deer, combined with the effects of low numbers of individuals, which results in loss of vigor and genetic representation, and limits its ability to compete with other species and adapt to changes in environmental conditions, contribute to the decline of *S. guamense.*

Tabernaemontana rotensis (NCN), a small to medium-sized tree in the dogbane family (Apocynaceae), is historically known from Guam and Rota, in the forest ecosystem (University of Guam (UOG) 2007, p. 6). The genus is widespread throughout tropical and subtropical regions. We originally proposed to list *T. rotensis* in January of 2004 (69 FR 1560, January 9, 2004); however, in April 2004 (69 FR 18499) we declined to do so because an authoritative monographic work on the genus incorporated this species into an expansive interpretation of the widespread species *T. pandacaqui.* In 2011, a genetic study was conducted on specimens from Rota, Guam, Asia, and the Pacific, to determine if those individuals on the Mariana Islands are a monophyletic lineage. The study determined that *T. rotensis* is a valid species, distinct from the widespread *T. pandacaqui* (Reynaud 2012, 27 pp. + appendices).

In 2004, *T. rotensis* was known from 8 individuals on Rota, and at least 250 individuals on Guam (69 FR 1560; January 9, 2004). In 2007, more than 21,000 individuals were found throughout Andersen AFB on Guam, with a population structure representing seedling, juveniles, and reproductive, mature individuals (UOG 2007 p. 4). In 2014, the CNMI DLNR completed a survey of all known locations of naturally occurring and outplanted individuals of *T. rotensis* on Rota, and found nine living naturally occurring individuals and one dead individual (CNMI DLNR 2014, in litt.). These were spread across the western, southern, and eastern parts of the island. Additionally, there are 30 surviving outplanted individuals, ranging in size from 4 to 23 ft (1.3 to 7 m), spread out across the island (J. Manglona, T. Reyes, R. Ulloa, pers. comm. 2014 cited in CNMI DLNR 2014, in litt.). Therefore, the best scientific data currently available indicate that on Guam, *T. rotensis* is known from 6 occurrences totaling approximately 21,000 individuals (M and E Pacific, Inc. 1998, p. 61; UOG 2007, pp. 32–42), and on Rota, *T. rotensis* is known from 9 individuals (CNMI DLNR 2014, in litt.).

Despite the increased number of known individuals of *Tabernaemontana rotensis,* populations of this species on Guam and Rota are at risk due to continued habitat loss and destruction from agriculture, urban development, nonnative animals and plants, fires, and typhoons; combined with ordnance and live-fire training. We anticipate the effects of climate change will further exacerbate many of these threats in the future. The greatest concern regarding this species is not of population size or structure, but the close proximity of occurrences to an area that is likely to be developed according to the proposed AFB and Navy base expansions (UOG 2007, p. 5; JGPO–NavFac Pacific 2010a, 2010b; JGPO–NavFac Pacific 2014; JGPO–NavFac Pacific 2015; *http://guambuildupeis.us/*).

Tinospora homosepala (NCN), a vine in the moonseed family (Menispermaceae), is historically known only from Guam (Merrill 1914, p. 83; Stone 1970, pp. 27, 277; Costion and Lorence 2012, pp. 92–93). Currently, *T. homosepala* is known from 3 occurrences totaling approximately 30 individuals, in the forest ecosystem (Yoshioka 2008, p. 15; Gawel *et al.* 2013, in litt.). There is discussion among botanists as to whether or not *T. homosepala* is either the same as a commonly occurring species found throughout Malaysia and the Philippines or a variety of that species (*T. glabra*) (Costion and Lorence 2012, pp. 92–93; Gawel *et al.* 2013, in litt.). *Tinospora homosepala* differs from *T. glabra* in having equal-sized sepals (petal-like structures of the calyx) as opposed to the outer sepals being much smaller than inner sepals as in *T. glabra*

(Forman 1981, pp. 381, 417, and 419; Costion and Lorence 2012, p. 93).

While these discussions note that additional research on the taxonomy of *Tinospora homosepala* is appropriate to address questions, no changes to the currently accepted taxonomy have been proposed. Though Forman (1981, p. 419) notes that if fruits of *T. homosepala* are discovered and they are indistinguishable from *T. glabra,* it may be preferable to reduce *T. homosepala* to subspecific rank under *T. glabra.* It should also be noted that any future reduction in rank from full species status to that of a subspecies or variety would not, in itself, disqualify this taxon from protection under the Act. All known individuals of *T. homosepala* on Guam are said to be males that reproduce clonally (Yoshioka 2008, p. 15; Gawel *et al.* 2013, in litt.). Clonal reproduction limits genetic diversity, reducing the ability of the species to form new genetic combinations to fit changing environmental conditions (Stebbins 1957, p. 352).

In summary, the species *T. homosepala,* a single island endemic, has been reduced to roughly 30 individuals on Guam, and it is possible that no female representatives of this species remain. These few remaining individuals of the species are at risk of extinction, due to continued habitat loss and destruction from nonnative animals and plants, and typhoons, and by genetic limitations as a result of the possible loss of potential sexual reproduction. We anticipate the effects of climate change will further exacerbate many of these threats in the future.

Tuberolabium guamense (NCN) (*Trachoma guamense* is a synonym), an epiphyte in the orchid family (Orchidaceae), is known only from the Mariana Islands. Historically, *T. guamense* was reported from the islands of Guam, Rota, Tinian, and Aguiguan (Raulerson and Rinehart 1992, p. 127; CPH 2012f—*Online Herbarium Database;* GBIF 2012f—*Online Database*). The Royal Botanical Gardens at Kew's online database (WCSP 2012d—*Online Database*) describes the range for *T. guamense* as the Mariana Islands and the Cook Islands; however, we were unable to confirm this with herbarium specimens as there is not a single voucher that cites the Cook Islands as a collection site (CPH 2012f—*Online Herbarium Database;* GBIF 2012f—*Online Database;* Smithsonian Institution 2014—*Online Herbarium Database*). In 1992, *T. guamense* was found in ''trees and shrubs all over the island'' (Raulerson and Rinehart 1992, p. 127), and the Consortium of Pacific Herbaria has records of 22 collections from Guam, 5 collections from Rota, 15 collections from Tinian, and 3 collections from Aguiguan (CPH 2012f—*Online database*).

Currently, *T. guamense* is known from seven occurrences: one occurrence of one individual on Guam and six occurrences on Rota, in the forest ecosystem (Gawel *et al.* 2013, in litt.; Harrington *et al.* 2012, in litt.; Zarones *et al.* 2015c, in litt.). It is possible that a few more individuals are scattered across native forests on Guam. The number of occurrences on Rota represents an increase over those known at the time of the proposed rule. A recent survey on Rota (Zarones *et al.* 2015c, in litt.) reported finding 239 individuals of *Tuberolabium guamense* along 6 of 18 transects surveyed on the Sabana, with a healthy population structure consisting of seedlings, juveniles, and flowering adults. Zarones *et al.* (2015c, in litt.) estimate that the actual number of *T. guamense* individuals on the Sabana may be as high as 14,600; however, this appears to assume that *T. guamense* is evenly distributed across the Sabana region. The Service does not concur that this species is evenly or uniformly distributed across the Sabana, consequently we conclude that 14,600 individuals is likely an overestimate. For example, a particularly noteworthy observation from these recent surveys is that *T. guamense* seems to occur solely in native canopy trees, with the majority of individuals found on *Hernandia labyrinthica, Premna obtusifolia,* and *Elaeocarpus joga* (Zarones *et al.* 2015c, in litt.). As these native canopy trees are not distributed uniformly across the landscape, neither would we expect *T. guamense* to be evenly or continuously distributed across the Sabana. However, we do agree that the survey results of Zarones *et al.* (2015c, in litt.) indicate that the species *Tuberolabium guamense* is currently more abundant on Rota than previously known.

In summary, populations of *Tuberolabium guamense* are decreasing from their initial abundance observed on Guam, and although new data show a higher number of *T. guamense* individuals than previously thought on Rota, *T. guamense* still occupies very specialized niche habitat in the Sabana region. More than 20 years ago, Raulerson and Rinehart (1992, p. 87) stated that although the orchids may appear abundant on the limestone ridges of Guam and Rota, ''the habitats are limited and in reality these orchids are very rare.'' Additionally, they wrote, ''The islands are small and habitats are rapidly being destroyed by human activity'' (Raulerson and Rinehart 1992, p. 87). Although numbers of *T. guamense* are estimated to be possibly in the thousands on Rota (Zarones *et al.* 2015c, in litt.), because of the specialized niche habitat occupied by this species we are not in full agreement with this estimate, which relies on an assumption of uniform distribution. Furthermore, habitat for the recovery of this species is considered at risk across its range. The remaining representatives of this species and its habitat are vulnerable to ongoing threats posed by the continued habitat loss and destruction from agriculture, urban development, nonnative animals and plants, fires, typhoons, and herbivory by slugs. We anticipate the effects of climate change will further exacerbate many of these threats in the future.

Animals

Pacific Sheath-Tailed Bat (Mariana Subspecies)

The Mariana subspecies of the Pacific sheath-tailed bat (*Emballonura semicaudata rotensis*) (payeyi, paischeey) is a small, insectivorous (insect-feeding), sac-winged bat in the family *Emballonuridae,* an old-world group with an extensive tropical distribution. It is a relatively small bat species with an approximate forearm length of about 1.8 in (45 mm) long. Males weigh 0.2 ounces (oz.) (5.5 grams (g)) on average, and females weigh about 0.24 oz. (6.9 g) (Wiles *et al.* 2011, p. 303). The pelage varies in color from brown to dark brown dorsally with a paler underbody (Walker and Paradiso 1983, p. 211). The common name ''sheath-tailed'' bat refers to the nature of the tail attachment, which involves a short, narrow tail emerging from a more anterior sheath-like membrane (Walker and Paradiso 1983, p. 209).

Taxonomically, four subspecies of Pacific sheath-tailed bats are currently recognized: *Emballonura semicaudata rotensis,* endemic to the Mariana Islands (Guam and the CNMI, referred to here as the Mariana subspecies); *E. s. sulcata* in Chuuk and Pohnpei (Pohnpei subspecies); *E. s. palauensis* in Palau (Palau subspecies); and *E. s. semicaudata* in American and Independent Samoa, Tonga, Fiji, and Vanuatu (South Pacific subspecies) (Koopman 1997, pp. 358–360; Oyler-McCance *et al.* 2013, pp. 1,030–1,036). Recent genetic analysis conducted by Oyler-McCance *et al.* (2013, p. 1,030) found notable genetic differences between *E. s. rotensis, E. s. palauensis,* and *E. s. semicaudata;* the magnitude of these differences was greater than what is typically reported between mammalian subspecies. In addition to divergence from the other three subspecies, which would argue against reintroduction efforts based on translocations of individuals between subspecific localities, the study found no genetic variation between the 12 *E. s. rotensis* individuals collected and examined (Oyler-McCance *et al.,* 2013, p. 1,035), which increases the risks associated with small number of individuals and populations.

Once common and widespread throughout Polynesia and Micronesia, the Pacific sheath-tailed bat, represented by the four subspecies, is the only insectivorous bat recorded from a large part of this area (Hutson *et al.* 2001, p. 138; Gorresen *et al.* 2009, p. 331; Wiles *et al..* 2011, p. 299; Oyler-McCance *et al.* 2013, p. 1,030; Valdez *et al.* 2013, p. 301). In the Caroline Islands, large numbers of individuals of the sheath-tailed bat subspecies *Emballonura semicaudata palauensis* were readily observed by Wiles *et al.* during studies in the 1990s (1997, p. 224). However, the other three subspecies of the bat have declined dramatically, including in Independent and American Samoa and Fiji (Bruner and Pratt 1979, p. 3; Grant *et al.* 1994, pp. 133–134; Wiles *et al.* 1997, pp. 222–223; Wiles and Worthington 2002, pp. 17–19). In American Samoa, a decrease in populations of the sheath-tailed bat subspecies *E. s. semicaudata* was noted as early as the 1970s (Grant *et al.* 1994, pp. 133–134). Researchers have identified several possible factors for the past and ongoing decline of the Pacific sheath-tailed bat throughout its range, including human disturbance of caves for guano mining and shelter during World War II, bombing and shelling during World War II, indiscriminate use of pesticides, predation by monitor lizards, rats, and brown treesnakes, increasingly isolated populations, and loss of foraging habitat due to human conversion and destruction and alteration by typhoons and nonnative plants and animals (Gorresen *et al.* 2009, p. 339; Valdez *et al.* 2011, p. 302; Wiles *et al.* 2011, pp. 306–307; and Oyler-McCance *et al.* 2013, p. 1,035).

In the Mariana Islands, fossil evidence indicates the Mariana subspecies (*Emballonura semicaudata rotensis*) (hereafter simply referred to as the Pacific sheath-tailed bat or simply ''bat,'' unless noted otherwise), was common on both Guam and Rota, and somewhat less common on the island of Tinian (Steadman 1999, p. 321; Wiles and Worthington 2002, pp. 1–3; Wiles *et al.* 2011, p. 299). Historically, populations of the Pacific sheath-tailed bat were reported from Saipan (Wiles *et al.* 2011, p. 299), and possibly on Anatahan and Maug as well (Lemke 1986, pp. 743–745). The Mariana subspecies of the Pacific sheath-tailed bat is now restricted to a single remaining population on the small (2.7 square-mile (sq mi; 7 square-kilometer (sq km)) island of Aguiguan, where it was first observed in 1984 (Wiles *et al.* 2011, p. 299). The bat has clearly experienced a precipitous reduction from its wider historical range in the Mariana Islands (formerly Guam, Rota, Saipan, Tinian, and Aguiguan), which can reasonably be assumed to be coincident with a significant decline in abundance of individuals.

Currently, the Aguiguan bat population consists of several roosting colonies estimated to number between 359 to 466 individuals (Wiles and Worthington 2002, p. 15; Wiles 2007, pers. comm.; O'Shea and Valdez 2009, pp. 2–3; Wiles *et al.* 2011, p. 299; Oyler-McCance *et al.* 2013, p. 1,030). During several field surveys between 1995 and 2008, Wiles *et al.* (2011, pp. 299–305), examined a total of 114 caves on the island, of which approximately 8 caves contained roosting bats, with 4 caves consistently occupied during the 13-year study period. Colonies ranged in size from 333 bats in the largest colony, to between 1 and 64 one bats in the other colonies (Wiles *et al.* 2011, pp. 301–303).

Despite observed declines in populations of most Pacific sheath-tailed bat subspecies elsewhere, as well as with the Marianas subspecies in general across the Marianas Archipelago, researchers have recorded a small increase in the observed number of bats on Aguiguan in past years, starting with 98 individuals in 1995, up to 285 to 364 bats in 2003, and 359 to 466 bats in 2008 (Wiles *et al.* 2011, p. 304). The researchers used population growth models to ensure that this apparent increase is biologically plausible, as opposed to a potential artifact of variable survey methods; they conclude that the increase is most likely real, while cautioning that additional data and analysis are needed. They also suggest that the single remaining population of the Mariana subspecies of Pacific sheath-tailed bat on Aguiguan is more likely limited by foraging habitat, and not by roosting habitat (Wiles *et al.* 2011, pp. 304–305). Although this very small population on the tiny island of Aguiguan appears to be relatively healthy, it has limited foraging habitat, which is threatened by feral goats, nonnative plants, development, and typhoons; and the bats are at risk from predation by rats, monitor lizards, and brown treesnakes.

Breeding of Pacific sheath-tailed bats is timed to coincide with offspring born during the onset of the rainy season when there are predictably greater numbers of insect prey. Pacific sheath-tailed bat females produce one pup per litter annually, which translates into relatively low fecundity for the species (Wiles *et al.* 2011, p. 303). The bats are nocturnal and roost during the day in a wide range of cave-types, including overhanging cliffs, limestone solution caves, crevices, and lava tubes, (Grant *et al.* 1994, pp. 134–135; O'Shea and Valdez 2009, pp. 105–108), and emerge shortly before sunset to forage on insects (Craig *et al.* 1993, p. 51; Wiles and Worthington 2002, p. 13; Wiles *et al.* 2011, pp. 301–303). Unlike the Pohnpei subspecies, which utilizes hollow trees for roosting (Wiles *et al.* 2011, p. 305), the Mariana subspecies of the Pacific sheath-tailed bat appears to be cave-dependent on Aguiguan, which has approximately 114 caves of various sizes classified from small to large (Wiles *et al.* 2011, pp. 301–302). On the Northern Mariana Islands, which contain far fewer caves due to their relatively young geologic age and volcanic origin, it is possible that the presence of the predatory monitor lizard may preclude the use of hollow trees as roosting sites by the Pacific sheath-tailed bat (Wiles 2011, p. 306).

The Pacific sheath-tailed bat is also known to share roosting caves with Mariana swiftlets (birds, *Aerodramus* spp.) (Lemke 1986, pp. 744–745; Tarburton 2002, pp. 106–107; and Wiles and Worthington 2002, pp. 7, 13; Wiles *et al.* 2011, p. 302). During several field studies between 1995 and 2008, Wiles *et al.* (2011, pp. 302–303), observed Mariana swiftlets roosting in seven out of eight caves co-occupied by the bat, albeit within somewhat segregated portions of the cave. In the same 1995–2008 study, Wiles *et al.* (2011, p. 302) also determined that bats on Aguiguan prefer caves characterized as ''large'' (over 1,076 ft^2 (100 m^2) in floor area with ceiling heights reaching 16 to 98 ft (5 to 30 m)) (see ''Cave Ecosystem,'' in the proposed rule (79 FR 59364; October 1, 2014), for further cave description). Researchers also found occupied caves to be fairly constant in both temperature and humidity, with conditions homogenous and consistent between occupied caves, including most seemingly suitable, unoccupied caves (Wiles *et al.* 2011, p. 305).

Some information about the Pacific sheath-tailed bat's biology and life history, including reproduction, habitat use, diet, and limiting factors, has been historically difficult to observe and collect due to a variety of factors including the bat's small size, secretive habits, difficulty of capture, non-specific roosting sites, and—following its extirpation from most of the islands in its range in the Marianas—the remoteness of the sole remaining population (Wiles and Worthington 2002, p. 19; Esselstyn *et al.* 2004, p. 304; Wiles *et al.* 2011, p. 305). Funded by the Department of the Navy and the Service, more recent studies including Gorresen *et al.* 2009 (pp. 331–340), O'Shea and Valdez 2009 (pp. 95–97), Valdez *et al.* 2011 (pp. 301–309), Wiles *et al.* 2011 (pp. 299–309), and Oyler-McCance *et al.* 2013 (pp. 1,030–1,036), have provided us with new information about the species. For example, we now know from fecal pellets collected from caves on Aguiguan that Pacific sheath-tailed bats there consume a diverse array of small-sized (0.078–0.314 in (2–8 mm)) insects, including ants, bees, and wasps (Hymenoptera), moths (Lepidoptera), and beetles (Coleoptera), as their primary prey (O'Shea and Valdez 2009, pp. 63–65; Valdez *et al.* 2011, pp. 301–307).

Earlier surveys of habitat use on Aguiguan in 2003 revealed that the Pacific sheath-tailed bat forages almost entirely in native and nonnative forests near their roosting caves, ignoring non-forested habitats on the island (Esselstyn *et al.* 2004, p. 307). Outside of the Mariana Islands, Bruner and Pratt (1979, p. 3) observed similar behavior, with the other subspecies of Pacific sheath-tailed bats (*Emballonura semicaudata semicaudata, E. s. sulcata,* and *E. s. palauensis*) foraging only in native forests. New evidence from recent studies appears to confirm prior observations regarding the association between bat foraging and native limestone forest. For example, the aforementioned dietary study by Valdez *et al.* 2011 (pp. 301–307), showed that the bat feeds on certain insects, including barklice (Pscoptera) and fungus-feeding beetles, each very specific to forest habitat on Aguiguan. A 2008 study analyzed the bat's specific method of echolocation (use of sonar to navigate) and flight pattern, both of which are similar to other insect-eating, forest-foraging bats, to identify a correlation between foraging activity and roosting site proximity to native forest canopy and the height and nature of that forest canopy (O'Shea and Valdez 2009, pp. 105–108; Gorresen *et al.* 2009, p. 331). The Gorresen *et al.* study (2009, p. 336) as well as Wiles *et al.* (2011 p. 305), point to the high number of unoccupied caves on Aguiguan and suggest it is likely the amount of native forest cover, not the number of suitable roost sites, that may be the main factor currently limiting the island's Pacific sheath-tailed bat population. Some researchers go further to point out that insectivorous bats relying on forested areas for foraging are at greater risk of extinction than those which employ a wider range of foraging methods (Gorresen *et al.* 2009, p. 339). Researchers familiar with the status of the Pacific sheath-tailed bat readily identify an almost complete lack of native forest regeneration on Aguiguan and the ever-present possibility of forest destruction by hurricanes as two factors threatening the species' continued existence in the Mariana Islands (Gorresen *et al.* 2009, p. 339; Wiles *et al.* 2011, pp. 306–307).

In summary, the Mariana subspecies of the Pacific sheath-tailed bat (*Emballonura semicaudata rotensis*), now reduced to a single, remaining population on Aguiguan, has shown a clear and significant decline from its original wide range across at least four, and possibly as many as six, of the Mariana Islands. With recent research suggesting inter-genetic homogeneity within its own population, we now understand that the Mariana Islands Pacific sheath-tailed bat is at especially great risk due to its small population size and isolation from other subspecies. Despite the small increases in abundance of the sole remaining population noted in recent years, the Mariana subspecies of the Pacific sheath-tailed bat faces threats of continued habitat loss and destruction. Additionally, predation by monitor lizards, and potential predation by the brown treesnake, may contribute to the further decline of the species.

Slevin's Skink

Slevin's skink (*Emoia slevini,* gualiik halumtanu, ghóluuf) is a small lizard in the reptile family Scincidae, the largest lizard family in number of worldwide species. Slevin's skink was first described in 1972 by Walter C. Brown and Marjorie V.C. Falanruw, which is the most recent and accepted taxonomy (Brown and Falanruw 1972, p. 107). It is the only lizard endemic to the Mariana Islands and is on the Government of Guam's Endangered Species List (Fritts and Rodda 1993, p. 3; Rodda *et al.* 1997, p. 568; Rodda 2002, p. 2; CNMI Division of Fish and Wildlife (DFW) 2005, p. 174; GDAWR 2006, p. 107; Guam Department of Agriculture 2014, in litt.). Slevin's skink previously occurred on the southern Mariana Islands (Guam, Cocos Island, Rota, Tinian, and Aguiguan), where it is now extirpated, except from Cocos Island off Guam, where it was recently rediscovered (Fritts and Rodda 1993, p. 2; Steadman 1999; Lardner 2013, in litt.). Local skink experts hypothesize that the individuals on Cocos Island may be a distinct species or subspecies from Slevin's skinks in the northern islands, and are currently conducting a genetic analysis to determine the taxonomic status (Reed 2015, in litt.).

Surveys conducted in the 1980s and 1990s show that Slevin's skink was once present on the northern islands of Sarigan, Guguan, Alamagan, Pagan, and Asuncion (Vogt 1997, in litt.; Berger *et al.* 2005, pp. 174–175; GDAWR 2006, p. 107); however, none were captured on Anatahan or Agrihan or ever reported historically from these islands (Rodda *et al.* 1991, p. 202; Berger *et al.* 2005, p. 175). The skink has not yet been reported from the southern island of Saipan, or the northern islands of Farallon de Medinilla, Maug, or Uracas. The densest population was on Alamagan (island area of 2,800 ac; 1,130 ha) in the early 1990s, but researchers believe that overgrazing by introduced ungulates may preclude the long-term viability of that population (Fritts and Rodda 1993, p. 1; Rodda 2002, pp. 1–3). The most recent surveys of Alamagan were completed in 2000. Based on their survey efforts, Cruz *et al.* (2000, pp. 24, 26) reported a capture rate of approximately 0.019 Slevin's skinks per trap hour for Alamagan, which was lower than the capture rate of 0.033 per trap hour reported by McCoid *et al.* (1995, as cited in Cruz *et al.* 2000, p. 24) 5 years earlier. The authors state that this may be indicative of a decline in the population of Slevin's skink on the island, but also note that it may be due to seasonal fluctuations (sampling was limited to only 2 nights at a single location in June 2000); they conclude that more surveys are needed (Cruz *et al.* 2000, p. 26).

After the eradication of feral ungulates from the island of Sarigan in 1998, the catch rate of skinks (number of lizards captured per hour) roughly quadrupled in a survey conducted in 2007 (Vogt 2007, p. 5–5; Kessler 2011, p. 322), which indicates the skinks are doing much better on Sarigan and that ungulates played a role in their prior decline. Numbers of Slevin's skinks trapped on Asuncion in surveys conducted in 2008 were quite low; only 3 individuals were captured following 350 hours of effort at 20 trap stations, translating to 0.008 per trap hour (Williams *et al.* 2008, pp. 36). Recent intensive surveys on Pagan conducted in 2010 by Reed *et al.* (2010, pp. 22, 27) found no Slevin's skinks, leading some experts to postulate that Slevin's skink may be potentially extirpated on Pagan, if not certainly rare, but ultimately concluding that it is too early to make a definitive judgment (Rodda 2014, in litt.). The current status of Slevin's skink on Guguan is unknown.

Slevin's skink measures 3 in (77 mm) from snout to cloaca vent (the opening for reproductive and excretory ducts), although length can vary slightly (Vogt and Williams 2004, p. 65). Fossil remains indicate its prehistoric size was much larger, up to 4.3 in (110 mm) in length (Rodda 2010, p. 3). Slevin's skink is darkly colored, from olive to brown, with darker flecks in a checkerboard pattern, and a light orange to bright yellow underside (Vogt and Williams 2004, p. 65). Their skin tends to be shiny, and is very durable and tough. Juveniles may appear cream-colored (Vogt and Williams 2004, p. 65; Rodda 2010, p. 3).

Slevin's skink is a fast-moving, alert, insectivorous lizard, typically found on the ground or at ground level, and is active during the day. The species occurs in the forest ecosystem, with most individuals observed on the forest floor using leaf litter as cover (Brown and Falanruw 1972, p. 110; Cruz *et al.* 2000, p. 21; GDAWR 2006, p. 107; Lardner 2013, in litt.). Occasionally, individuals were observed in low hollows of tree trunks (Brown and Falanruw 1972, p. 110). It is a social species, seen often in the company of other individuals, including other nonnative skink species (Vogt and Williams 2004, pp. 59, 65). The females are oviparous, with a normal clutch size of two (Zug 2013, p. 184; Rodda 2014, in litt.). Other specific life-history or habitat requirements of Slevin's skink are not well documented (Rodda 2002, p. 3; Zug 2013, p. 184).

Slevin's skink was most numerous in the Mariana Islands before the introduction of other competing lizards and predators, and loss of native forest (Vogt and Williams 2004, p. 65; Berger *et al.* 2005, p. 175). After World War II, Slevin's skink had notably vanished from the larger southern Mariana Islands (Fritts and Rodda 1993, p. 4), which suggests the species may be sensitive to habitat destruction or changes in land use practices (Fritts and Rodda 1993, p. 4; Berger *et al.* 2005, p. 174). Likewise, as noted above, the observed four-fold increase in captures of Slevin's skink on Sarigan following the removal of nonnative ungulates from that island (Vogt 2007, p. 5–5; Kessler 2011, p. 322) indicates that nonnative ungulates have a negative impact on the species. Slevin's skink had not been recorded on Guam since 1945 and had not been observed on Cocos Island since the early 1990s (Rodda and Fritts 1992, p. 171; Campbell 2011, in litt.), until a specimen was captured on Cocos Island in January of 2011 (following eradication of rats from that island; Campbell 2011, pers. comm.). Over half of Cocos Island is developed for a hotel, and it is a tourist destination (Fritts and Rodda 1993, p. 2). Only about 25 ac (10 ha) of suitable habitat for Slevin's skink is available on Cocos Island, and this is periodically overwashed during typhoons (Fritts and Rodda 1993, pp. 2, 5), thus there is little if any stable suitable habitat permanently available on the island.

The northern islands of its known occurrence provide less than 19,843 ac (8,030 ha) of land area, not all of which is suitable habitat. Slevin's skink is no longer found on the larger southern islands of Guam, Rota, and Tinian, which, combined, provided the great majority of its formerly occupied range, totaling an estimated 179,900 ac (72,800 ha). Even without considering its potential recent extirpation from Pagan, based on these numbers it is apparent that Slevin's skink has likely been reduced to just 10 percent of its overall historical range, and its remaining suitable habitat is a subset of that area.

In summary, once widespread, the remaining known populations of Slevin's skink are made up of a few individuals on Cocos Island, where habitat is limited and subject to overwashing, and occurrences of undetermined numbers of individuals on Alamagan, Guguan, Sarigan, and Asuncion. Slevin's skink persists in low numbers observed on Cocos Island, is possibly extirpated from Pagan, and has not been reobserved on Guam, Rota, Tinian, or Aguiguan. Of the nine islands from which it was formerly known, Slevin's skink is known to be recovering to some degree from the effects of past threats (nonnative ungulates) only on the island of Sarigan; however, other threats remain on this island (*e.g.,* rats). Overall, Slevin's skink has been lost from 90 percent of its former range. Because populations are reduced in distribution and likely small, we conclude the remaining populations of Slevin's skink are at risk, due to continued habitat loss and destruction from agriculture, development, nonnative animals (feral pigs, cows, and goats), and typhoons. We anticipate the effects of future climate change will further exacerbate many of these threats in the future. Predation by rats, monitor lizards, and possible predation by the brown treesnake (if the snake is introduced to other islands), also pose ongoing threats to Slevin's skink.

Mariana Eight-Spot Butterfly

The Mariana eight-spot butterfly (*Hypolimnas octocula marianensis*) (abbabang, libweibwogh), a butterfly in the Nymphalidae family, is known solely from the islands of Guam and Saipan, in the forest ecosystem (Schreiner and Nafus 1996, p. 2; Schreiner and Nafus 1997, p. 26). It may be extirpated from Saipan (Schreiner and Nafus 1997, p. 26). This subspecies was originally described by Butler and is recognized as a distinct taxon in Swezey (1942, p. 35), the most recent and accepted taxonomy for this species. Like most nymphalid butterflies, orange and black are the two primary colors exhibited by this subspecies. The males are smaller than the females by at least a third or more in size. Males are predominantly black with an orange stripe running vertically on each wing. The stripe on the hindwings exhibits small black dots in a vertical row. Overall, the females appear more orange in color than the males, and black bands across the apical (top) margins of both pair of wings are exhibited. Along the inner margin of these black bands, large white spots are exhibited across the entire length of the wings (Schreiner and Nafus 1997, pp. 15, 26–27). The caterpillar larva of this species is black in color with red spikes and a black head, differentiating it from similar-appearing caterpillars including *Hypolimnas bolina* and *H. anomala* (Schreiner and Nafus 1996, p. 10; Schreiner and Nafus 1997, p. 26).

The larvae of this butterfly feed on two native plants, *Procris pedunculata* (no common name) and *Elatostema calcareum* (tapun ayuyu) (Schreiner and Nafus, 1996, p. 1). Both of these forest herbs (family Urticaceae) are found only on karst substrate within the forest ecosystem, draped over boulders and small cliffs (Schreiner and Nafus 1996, p. 1; Rubinoff 2013, in litt.). Surveys show that these two host plants are no longer observed in places where nonnative ungulates can reach them easily, and in the rare case that a plant grows long enough to extend beyond the protection of the extremely rugged limestone karst, browsing damage is observed (Rubinoff 2013, in litt.; Lindstrom and Benedict 2014, pp. 29, 32–35; Rubinoff 2014, in litt.). The eradication of ungulates would allow these host plants to expand their range onto less rugged karst, consequently increasing their availability for the Mariana eight-spot butterfly. When adult butterflies were observed, they were always in proximity to the host plants (Rubinoff 2011, in litt.; Rubinoff 2013, p. 1). The two host plants have been recorded on the islands of Guam, Rota, Saipan, and Tinian (Schreiner and Nafus 1996, p. 2; Schreiner and Nafus 1997, p. 26; Harrington *et al.* 2012, in litt.; Rubinoff and Haines 2012, in litt.; Rubinoff, in litt. 2013). However, despite recent surveys (2011–2013) on Rota, Tinian, and Saipan, the Mariana eight-spot butterfly is currently known only from the island of Guam (Schreiner and Nafus 1996, p. 2; Schreiner and Nafus 1997, p. 26; Rubinoff and Haines 2012, in litt.; Rubinoff 2013, in litt.).

Recent surveys conducted across Guam confirmed the occurrence of the Mariana eight-spot butterfly in six areas on the island (Lindstrom and Benedict 2014, p. 9). This survey report did not provide estimates for the number of individuals per population. Lindstrom and Benedict (2014, p. 9) stated that there are currently only 6 populations of this species, not the 11 populations cited in the October 1, 2014, proposed rule (79 FR 59364). We do not believe this difference reflects a reduction in the number of populations since the publication of the proposed rule, however. In part, this discrepancy in numbers may lie in the definition of a ''current population.'' We distinguish populations as separate if they are 3,280 ft (1,000 m) or more apart, and define *current* as a report within 20 years from the present date. In addition, although quite extensive, the surveys conducted by Lindstrom and Benedict and colleagues (2014, pp. 1–44) did not survey all previously cited current occurrences for the Mariana eight-spot butterfly on Guam (Schreiner and Nafus 1996, p. 2; Schreiner and Nafus 1997, p. 26; Rubinoff 2011, in litt.; Rubinoff and Haines 2012, in litt.; Rubinoff 2013, in litt.), so some may have been overlooked. Finally, a lack of observation on select transects at previously reported sites does not necessarily translate to a complete absence of the species at that location; the lack of observation may be more indicative that the species exists in very low numbers. Especially if the site is visited only once, it is easy to miss an observation if individuals are quite rare.

On Saipan, several areas were found that supported host plants in 2011 and 2012; however, no individuals of the Mariana eight-spot butterfly were seen, and it may be extirpated on Saipan (Schreiner and Nafus 1997, p. 26; Harrington *et al.* 2012, in litt., p. 19; Rubinoff 2014, in litt.). It is possible that small undetected populations of the Mariana eight-spot butterfly still occur on islands previously recorded (Lindstrom and Benedict 2014, p. 34), or even on the more isolated northern islands on which it has not previously been recorded (Rubinoff 2014, in litt.); however, without any evidence, this remains postulation.

In summary, the Mariana eight-spot butterfly is now found in only six populations on the island of Guam. This butterfly is dependent upon two relatively rare host plant species, both of which are susceptible to the effects of ungulate grazing. The Mariana eight-spot butterfly is vulnerable to the impacts of continued habitat loss and destruction from agriculture, urban development, nonnative animals and plants, and typhoons. We anticipate the effects of climate change will further exacerbate many of these threats in the future. Herbivory of its host plants by nonnative animals, combined with direct predation by ants and parasitic wasps, contribute to the decline of the Mariana eight-spot butterfly.

Mariana Wandering Butterfly

The Mariana wandering butterfly (*Vagrans egistina*) (abbabang, libweibwogh) is endemic to the islands of Guam and Rota in the Mariana archipelago, in the forest ecosystem. This butterfly was originally named *Issoria egistina* (Swezey 1942, p. 35). In 1934, Hemming published the genus *Vagrans* as a replacement name for the genus *Issoria.* Schreiner and Nafus (1997) recognize this species as *Vagrans egistina,* which is the most recent and accepted taxonomy.

Like most nymphalid butterflies, the Mariana wandering butterfly is primarily orange and black in coloration. This species is largely black in appearance with a prominent orange irregular pattern extending from the forewings to the hindwings. Obvious stripes or rows of spots are lacking (Schreiner and Nafus 1997, plate 9). The caterpillar larva life stage of this species is brown in color with black-colored spikes (Schreiner and Nafus 1996, p. 10).

Mariana wandering butterflies are known to be good fliers, and in earlier times, probably existed as a series of meta-populations (Harrison *et al.* 1988, p. 360), with considerable movement and interbreeding between local and stable populations and continued colonization and extinction in disparate localities. The larvae of this butterfly feed on the plant species *Maytenus thompsonii* (luluhut) in the Celastraceae family, which is endemic to the Mariana Islands (Swezey 1942, p. 35; Schreiner and Nafus 1996, p. 1). The host plant *M. thompsonii* is known to occur within the forest ecosystem on Guam, Rota, Saipan, and Tinian (Vogt and Williams 2004, p. 121).

Historically, the Mariana wandering butterfly was originally collected and described from the island of Guam where it was considered to be rare, but widespread (Swezey 1942, p. 35). The species has not been observed on Guam since 1979, where it was last collected in Agana. Currently, it is considered likely extirpated from Guam (Schreiner and Nafus 1996, pp. 1–2; Rubinoff 2013, in litt.). The Mariana wandering butterfly was first collected on Rota in the 1980s (Schreiner and Nafus 1996, p. 10). During several 1995 surveys on Rota, it was recorded at only one location among six different sites surveyed (Schreiner and Nafus 1996, pp. 1–2). From June through October 2008, extensive surveys for the Mariana wandering butterfly were conducted on the island of Tinian under the direction of the Service. While several *Maytenus thompsonii* host plant population sites were identified in limestone forest habitat, no life stages of the Mariana wandering butterfly were observed (Hawley in litt., 2008, pp. 1–9). Despite extensive surveys on Guam in 2013 for the Mariana wandering butterfly and several other candidate species, no evidence (*i.e.,* egg, larva, or adult) of the Mariana wandering butterfly was found (Lindstrom and Benedict 2014, pp. 21–41).

Although considered extirpated from Guam, whether the Mariana wandering butterfly continues to exist on Rota is unknown, since the island has not been surveyed specifically for this butterfly since 1995. It is possible this species occurs on the northern islands where host plants are found (Rubinoff 2014, in litt.), although there is no record of its presence. Several years of seasonal surveys are needed to determine the status of this species, but if it persists, it is likely in very low numbers as it has not been observed in many years. Any remaining populations of the Mariana wandering butterfly continue to be at risk from ongoing habitat loss and destruction by rats and typhoons. We anticipate the effects of climate change will further exacerbate many of these threats in the future. Herbivory of its host plant by nonnative animals, combined with direct predation by ants and parasitic wasps, contribute to the decline of the Mariana wandering butterfly.

Rota Blue Damselfly

The Rota blue damselfly (*Ischnura luta*) (dulalas Luta, dulalas Luuta) is a small damselfly endemic to the island of Rota and found within the stream ecosystem. Grouped together with dragonflies in the order Odonata, damselflies fall within the suborder

Zygoptera. The Rota blue damselfly belongs to the family Coenagrionidae, and it is the only known damselfly species endemic to the Mariana Islands. This species was first described in 2000 (Polhemus *et al.* 2000, pp. 1–2) based upon specimens collected in 1996. The species is relatively small in size, with males measuring 1.3 in (34 mm) in body length, with forewings and hindwings 0.7 in (18 mm) and 0.67 in (17 mm) in length, respectively. Both sexes are predominantly blue in color, particularly the thorax and portions of the male's abdomen are brilliant, iridescent blue. Both sexes have a yellow and black head with some yellow coloration on the abdomen. Females of this species may be distinguished by their slightly smaller size and somewhat paler blue body color (Polhemus *et al.* 2000, pp. 1–8).

Resembling slender dragonflies, damselflies are readily distinguished by their trait of folding their wings parallel to the body while at rest rather than holding them out perpendicular to the body. The general biology of narrow-winged damselflies includes territorial males that guard areas of habitat where females will lay eggs (Moore 1983a, p. 89; Polhemus and Asquith 1996, pp. 2–7). During copulation, and often while the female lays eggs, the male grasps the female behind the head with terminal abdominal appendages to guard the female against rival males; thus males and females are frequently seen flying in tandem. Adult damselflies are predaceous and feed on small flying insects such as midges and other flies.

The immature larval life stages (naiads) of the vast majority of damselfly species are aquatic, breathe through flattened abdominal gills, and are predaceous, feeding on small aquatic invertebrates or fish (Williams 1936, p. 303). Females lay eggs in submerged aquatic vegetation or in mats of moss or algae on submerged rocks, and hatching occurs in about 10 days (Williams 1936, pp. 303, 306, 318; Evenhuis *et al.* 1995, p. 18). Naiads may take up to 4 months to mature (Williams 1936, p. 309), after which they crawl out of the water onto rocks or vegetation to molt into winged adults, typically remaining close to the aquatic habitat from which they emerged. Adults have been observed in association only with the single perennial stream on Rota; therefore, we believe the larval stage of the Rota blue damselfly is aquatic.

The Rota blue damselfly was first discovered in April 1996, when a few individuals were observed and one male and one female specimen were collected outside the Talakhaya Water Cave (also known as Sonson Water Cave) located below the Sabana plateau (Camacho *et al.* 1997, p. 4; Polhemus *et al.* 2000, pp. 1–8). The size of the population at the time of discovery was estimated to be small and limited to the stream area near the mouth of the cave. The primary source of the stream is spring water emerging at the limestone-basalt interface below the highly permeable limestone of the Sabana plateau (Polhemus *et al.* 2000, pp. 1–8; Keel *et al.* 2011, p. 1). This spring also serves as the main source of fresh water supply for the population of Rota (Polhemus *et al.* 2000, pp. 1–8; Keel *et al.* 2011, p. 1). A concrete collection structure with associated piping has been built into and surrounding the entrance of the water cave. This catchment system and a smaller, adjacent catchment deliver approximately 2.7 to 3.8 million liters-per-day (0.7 to 1 million gallons) of water to Rota's municipal system (Keel *et al.* 2011, pp. 29–30) (see ''Stream Ecosystem,'' in the proposed rule (79 FR 59364; October 1, 2014), and Water Extraction under *Factor E. Other Natural or Manmade Factors Affecting Their Continued Existence,* below, for further discussion).

Eighteen years elapsed between the original discovery of the species in 1996 and the next known survey for the Rota blue damselfly. In January 2014, two male specimens were observed flying above a portion of the stream located at approximately 770 ft (235 m) in elevation, and below the Talakhaya (Sonson) Water Cave (Richardson 2014, in litt.). No specimens were observed immediately in the vicinity of the water cave entrance, and no fish were observed in the stream immediately below the cave entrance (Richardson 2014, in litt.). This is a notable observation because many damselfly species endemic to Pacific islands are known to be susceptible to predation by nonnative fish species that eat the naiad life stage of the damselfly. In November 2015, Zarones *et al.* (2015b, in litt.) conducted a survey on Rota looking for the Rota blue damselfly and found one individual along a stream 744 yards (680 m) to the west of Water Cave area, not connected to the stream at the Water Cave. Zarones *et al.* (2015b, in litt.) did not report whether or not any native or nonnative fish were observed in the stream.

Predation by nonnative fish is a serious threat to the Hawaiian *Megalagrion* damselfly naiads (Englund 1999, pp. 235–236). Eggs laid in vegetation or on rocks in streams hatch in about 10 days and develop into naiads. Naiads take approximately 4 months to mature before emerging from the water (Williams 1936, pp. 303, 306, 309, 318). Fish predation has been an important factor in the evolution of behavior in damselfly naiads in continental systems (Johnson 1991, p. 8), and damselflies in the wider-ranging *Ishnura* (as opposed to the Hawaiian *Megalagrion*) may have developed avoidance behaviors (Polhemus 2014, pers. comm.). On a survey of the stream (Okgok River, also known as Babao) fed by the Talakhaya (Sonson) Water Cave, the presence of four native fish species was noted: The eel *Anguilla marmorata,* the mountain gobies *Stiphodon elegans* and *Sicyopus leprurus,* and the flagtail, or mountain bass, *Kuhlia rupestris* (Camacho *et al.* 1997, p. 8). Densities of these native fish were low, especially in areas above the waterfall. Gobies can maneuver in areas of rapidly flowing water by using ventral fins that are modified to form a sucking disk (Ego 1956, in litt.). The flagtails were abundant only in the lower reach of the stream. Freshwater gobies in Hawaii are primarily browsers and bottom feeders, often eating algae off rocks and boulders, with midges and worms being their primary food items (Ego 1956, in litt.; Kido *et al.* 1993, p. 47). It can only be speculated that the Rota blue damselfly may have adapted its behavior to avoid the benthic feeding habits of native fish species. The release of aquarium fish into streams and rivers of Guam is well documented, but currently, no nonnative fish have been found in the Rota stream (Tibbatts 2014, in litt.).

The Rota blue damselfly appears to be extremely limited in range and researchers remain perplexed by its absence from other Mariana Islands (Polhemus *et al.* 2000, p. 8). Particularly striking is the fact that it has never been collected on Guam, despite the islands' larger size and presence of over 100 rivers and streams. The Rota blue damselfly's population site (Talakhaya watershed area) is afforded some protection from human impact by its remote and relatively inaccessible location; however, a reduction or removal of stream flow due to increased interception for municipal usage, and from lower water quantities resulting from the effects of future climate change, could eliminate one of the only two known populations of the species (see ''Stream Ecosystem,'' in the proposed rule (79 FR 59364; October 1, 2014), and Water Extraction under *Factor E. Other Natural or Manmade Factors Affecting Their Continued Existence,* below, for further discussion). Introduction of nonnative fish into the stream could also impact or eliminate the Rota blue damselfly naiads, leading to its extirpation. In addition, low numbers of individuals results in loss of vigor and genetic representation, and contributes to the vulnerability of the single known population of the Rota blue damselfly.

Humped Tree Snail

The humped tree snail (*Partula gibba;* akaleha, denden), in the Partulidae family, is endemic to the forest ecosystem on the Mariana Islands of Guam, Rota, Saipan, Tinian, Aguiguan, Anatahan, Sarigan, Alamagan, and Pagan. The humped tree snail was first collected on Guam in 1819 by Quoy and Gaimard during the Freycinet Uranie expedition of 1817–1819 and was once considered the most abundant tree snail on Guam (Crampton 1925, pp. 8, 25, 60). Currently, the humped tree snail is known from the islands of Guam, (Hopper and Smith 1992, p. 81; Smith *et al.* 2009, pp. 10, 12, 16), Rota (Smith 1995, p. 1; Bauman 1996, pp. 15, 18), Saipan (Hadfield 2010, pp. 20–21), Tinian (NavFac, Pacific 2014, pp. 5–5—5–7), Sarigan (Hadfield 2010, p. 21), Alamagan (Bourquin 2002, p. 30), and Pagan (Hadfield 2010, pp. 8–14), in the forest ecosystem. The humped tree snail may occur on Aguiguan, but was not relocated on a survey by Smith in 2006 (Smith 2013, p. 14). This species is no longer extant on Anatahan due to volcanic activity in 2003 and 2005 (Kessler 2011, pp. 321, 323).

The shell of the humped tree snail can be left- or right-coiling, conic-ovate, translucent, with evenly spaced spiral sculpturing (Cowie 2014, in litt.). The color ranges from white to brown, and a pointed apex is colored rose-red, with a milky white suture. Adult snails are from 0.6 to 0.7 in (14 to 18 mm) long, and 0.4 to 0.6 in (10 to 14 mm) wide, with 4.5 whorls, the last of which is the largest (Pilsbry 1909–1910, in Crampton 1925, p. 60; Smith *et al.* 2009, p. 2). In general, partulid snails may live up to 5 years. They reproduce in less than 1 year, at which time they can produce up to 18 young each year. Partulids are ovoviviparous (give birth to live young), more mobile during higher ambient humidity and precipitation and less mobile during dry periods, live on bushes or trees, and feed primarily on dead or decaying plant material (Cowie 1992, p. 167; Hopper 2014, in litt.).

The humped tree snail occurs in cool, shaded forest habitat as first observed by Crampton (Crampton 1925, pp. 31, 61), with high humidity and reduced air movement that prevents excessive water loss. Crampton (1925, pp. 31, 61) described the habitat requirements of the partulid tree snails as having ‘‘sufficiently high and dense growth to provide shade, to conserve moisture, and to effect the production of a rich humus. Hence the limits to the areas occupied by tree snails are set by the more ultimate ecological conditions which determine the distribution of suitable vegetation.’’ Crampton further notes that the Mariana Islands partulid tree snails live on subcanopy vegetation and are not found in high canopy. Although tree snails in the Mariana Islands likely evolved to live upon native vegetation, there is no clear indication of obligate relationships with any particular type of tree or plant (Fiedler 2014, in litt.). Further, Mariana partulid snail species are observed to use nonnative ‘‘home plants’’ to which they have apparently adapted (Fiedler 2014, in litt.). Although it has been suggested that native crabs may prey on Mariana partulid snails (Fiedler 2014, in litt.), they are not regarded as a major threat to these tree snails compared to alien carnivorous flatworms (*i.e.,* the manokwari flatworm) and snails (*i.e.,* the rosy wolf snail *Euglandina rosea* and *Gonaxis* spp.) (Cowie 1992, p. 175). Nonnative mites and ants have also raised some concerns about their impacts on Mariana partulid snails (Fiedler 2014, in litt.); however, these are only potential threats at this time.

Following is a brief historical overview of the humped tree snail in the Mariana archipelago. Crampton (1925, pp. 8, 25, 60) first observed the humped tree snail on Guam, in at least 39 sites, totaling more than 3,000 individuals. In 1989, Hopper and Smith (1992, p. 81) resurveyed 34 of Crampton's 39 sites and did not locate any live individuals; however, they discovered individuals at a new site not noted by Crampton. In 2009, the number of individuals of the humped tree snail on Guam was thought to have declined from hundreds to fewer than 50 individuals (Smith *et al.* 2009, p. 11); however, in 2014, a previously undocumented population consisting of approximately 100 individuals was discovered (Fiedler 2014, in litt.; Myounghee Noh and Associates 2014, pp. 1–28, and Appendices A and B), which brings the total number of confirmed individuals on Guam to fewer than 150.

Bauman (1996, pp. 15, 18) surveyed Rota and reported finding live humped tree snails at 5 out of 25 former sites. The largest of these populations may have totaled as many as 1,000 snails. However, this population was located along the main road of Rota and was subsequently cleared for development (Miller 2007, pers. comm.), thus we conclude this population is no longer extant since its suitable habitat at this site was removed. Four other populations on Rota in 2007 were small and totaled fewer than 600 individuals, collectively. Crampton was unable to visit Tinian, although he states that tree snails were known from that island (Crampton 1925, p. 6). Smith reported finding only very old shells on two surveys (2006 and 2008) of Tinian (Smith 2013, p. 6). The humped tree snail was thought to be extirpated from Tinian, until a recent survey located a single colony in a very isolated spot on the island (NavFac 2014, pp. 5–5—5–7).

The humped tree snail was discovered on Aguiguan in 1952, in six colonies (biologists often refer to snail populations as ‘‘colonies'') (Kondo 1970, pp. 75, 81). In 1992, two separate surveys reported snails observed at four locations on Aguiguan (Craig and Chandran 1992, p. 8; Smith 1995, pp. 13–14), but by 2008, no live snails were found on this island (Smith 2013, p. 14). On Saipan, Crampton collected almost 7,000 humped tree snails in 1925 (Crampton 1925, p. 62). By 1991, Smith and Hopper (1994, p. 11) could not find any live snails at 12 sites visited on the island; however, 2 small populations were later discovered, one in 2002, in the central forest area, and another in a mangrove wetland in 2010 (Bourquin 2002, in litt.; Hadfield 2010, pp. 20–21).

In 1994, Kurozumi reported approximately 20 individuals from Anatahan; however, these were possibly extirpated due to violently destructive volcanic eruptions between 2003 and 2005 (Kessler 2011, p. 321). Kurozumi also reported humped tree snails from Sarigan in 1994, and the population appears to be increasing as a result of the removal of ungulates. A survey of Sarigan in 2006 found the healthiest population in native forest at an elevation of approximately 1,300 ft (400 m) (Smith 2006 in Martin *et al.* 2008, p. 8–1). The species was first reported on Alamagan by Kondo in 1949, with over 50 individuals collected from wet forest (Easley 1970, p. 87). The populations have declined on Alamagan by more than 70 percent for individuals and approximately 27 percent for populations since that time (Kurozumi 1994, pp. 115–116). The humped tree snail was first reported from Pagan by Kondo in 1949 (Easley 1970, p. 87). Populations persist on Pagan, although declines similar to those on Alamagan have been observed (Kurozumi 1994, pp. 115–116).

In summary, populations of the humped tree snail are rapidly decreasing from initial numbers observed, and with continued habitat loss and predation by nonnative species, are at risk. The effects of future climate change are likely to have negative impacts on the habitat of the humped tree snail, and further exacerbate other threats to the species, such as threats from typhoons to small, isolated populations. The populations on Sarigan may be relatively more stable due to the removal of ungulates (see ''Conservation Efforts to Reduce Habitat Destruction, Modification, or Curtailment of Its Range,'' below), but predation by rats remains a threat on that island (Kessler 2011, p. 320), as does the potential introduction of other harmful nonnative species (Hopper 2014, in litt.). Collecting of snail shells for trade may also contribute to the decline of the humped tree snail (USFWS 2012, in litt.).

Preliminary new data, soon to be published but still under review, suggest that the individuals identified as humped tree snails on Rota may be a different species (Hadfield 2010, pp. 20–21; Sischo and Hadfield 2015, under review). The species description for this newly identified partulid on Rota, tentatively named *Partula lutaensis,* will be published in a separate paper currently being drafted (Sischo 2015, in litt.). However, we must make our determination based on the best scientific data available, and at this point in time the humped tree snail is recognized as a single species. Our determination is that the humped tree snail, as currently described, warrants listing as an endangered species. If taxonomic changes are made in the future, we may reevaluate the status of any newly recognized species or subspecies at that point in time.

Langford's Tree Snail

Langford's tree snail (*Partula langfordi;* akaleha, denden), in the Partulidae family, is endemic to the forest ecosystem of the island of Aguiguan. Langford's tree snail was first collected and described by Kondo while working on biological control agents in the early 1950s (Kondo 1970, 18 pp.). Kondo's taxonomic work is the most recent and accepted taxonomy for this species. This tree snail has not been observed in the wild since 1992, when one live individual was observed on the northwest terrace of the island (Berger *et al.* 2005, p. 154). Surveys conducted in 2006 and 2008 revealed only old shells of dead *P. langfordi* (Smith 2013, p. 14).

Langford's tree snail has a dextral (to the right or clockwise from the opening of the shell at the lower right, as opposed to sinistral, to the left, or counterclockwise) shell, described by Kondo (1970, pp. 75–77) as being ovate-conic and moderately thin. The holotype of this species has a length of 0.6 in (14 mm), a diameter of 0.4 in (9 mm), and an aperture length of 0.3 in (8 mm). It has a spire of five whorls that are slightly convex, with an obtuse apex. Its aperture is oblong-ovate with the white mouth projections thickened and expanded. It is buff colored superimposed by maroon.

Although much less studied than related partulid snails from the Mariana Islands, the biology of Langford's tree snail is believed to be the same. See ''Humped tree snail (*Partula gibba*),'' above, for details.

Historically, Langford's tree snail is known only from the island of Aguiguan. In the 1970 survey of Aguiguan, it was noted that Langford's tree snail was collected from an area where it occurred sympatrically with the humped tree snail (Easely 1970, p. 89). The mixed populations were not uniformly distributed, but occurred in small colonies with large unoccupied areas between the colonies. In five of the sites, the Langford's tree snail outnumbered the humped tree snail, and it appeared that humped tree snails were more numerous and dominant in the western portion of the site while Langford's tree snails were dominant in the eastern portion of the site (Kondo 1970, p. 81). Three other colonies of Langford's tree snail were collected, two on the north coast and one on the west end of Aguiguan (Kondo 1970, p. 81). A total of 464 adults were collected from 7 sites (Kondo 1970, p. 81). In 1985, five adult Langford's tree snails were collected from the west end of the island (Smith 1995). The last survey in which the species was detected in the wild was conducted in 1992, and one live snail was observed on the northwest terrace of the island (Smith 1995). Surveys of Aguiguan in 2006 and 2008 failed to locate any live Langford's tree snails (Smith 2013, p. 14).

In 1993, the University of Nottingham in England had six young and four adult Langford's tree snails in captivity. By 1994, two adult snails remained. Unfortunately, at the end of 1994, the last two Langford's tree snails died (Pearce-Kelly *et al.* 1995, pp. 647–660).

The 2005 Comprehensive Wildlife Conservation Strategy for CNMI (Division of Fish and Wildlife) (Berger *et al.* 2005) states that ''all partulid snails are selected as a species of special conservation need'' (p. 153), and that ''[Crampton] found as many as 31 snails on the underside of a single leaf of caladium'' (p. 155) (demonstrating that it would be easy to miss a large number of snails if that one particular leaf were missed during a survey). This strategy outlines conservation actions for Langford's tree snail, including more numerous and intensive surveys, removal of goats from Aguiguan island, control of nonnative species, and reforestation with native plants (Berger *et al.* 2005, pp. 158–159). Given that so few surveys have been conducted on Aguiguan, and only previously surveyed sites were ever revisited, it is possible Langford's tree snail may be found.

In summary, Langford's tree snail is at risk from threats associated with small numbers of individuals and populations (*e.g.,* population declines through loss of vigor and genetic representation), habitat loss and degradation by nonnative animals (goats and rats) and development, and predation by nonnative animals (rats and flatworms). Due to the small number of individuals and populations, natural events such as typhoons also pose a threat, as a single catastrophic event could potentially result in the extinction of the species. Further, the collection of snail shells for trade may also contribute to the decline of the humped tree snail (USFWS 2012, in litt.). Although not all of the negative impacts that will result from climate change can be predicted, the cumulative data suggest that climate change will impact Langford's tree snails, likely by means of alteration of habitat to less favorable conditions.

Guam Tree Snail

The Guam tree snail (*Partula radiolata;* akaleha, denden), in the Partulidae family, is endemic to the forest ecosystem of Guam; this species is not found on any other island. The Guam tree snail was first collected by Quoy and Gaimard during the French *Astrolabe* expedition of 1828 and was initially named *Bulimus* (*Partula*) *radiolatus* by Pfeiffer in 1846, which he changed to *Partula radiolata* in 1849 (Crampton 1925, p. 34). Crampton's 1925 taxonomic work is the most recent and accepted taxonomy for this species.

The shell of the Guam tree snail is pale straw-colored with darker streaks and brown lines, and has impressed spiral lines. Adult length is 0.5 to 0.7 in (13 to 18.5 mm), width is 0.3 to 0.5 in (8 to 12 mm), with five slightly convex whorls (Pilsbry 1909–1910 in Crampton 1925, p. 35; Smith *et al.* 2008 in Kerr 2013, p. 10). Juvenile Guam tree snails are sometimes mistakenly identified as *Samoana fragilis* (Fielder 2014, in litt.). The biology of the Guam tree snail is very similar to that of the humped tree snail (see ''Humped tree snail (*Partula gibba*),'' above, for further description). The Guam tree snail prefers the same cool, shaded forest habitat as the humped tree snail and Langford's tree snail, described above.

Historically, suitable habitat for the Guam tree snail was widely available prior to World War II, and included strand vegetation, forested river borders, and lowland and highland forests; as Crampton (1925, pp. 36–37) described, ''it occurs almost everywhere on the island where suitable vegetation exists,'' although historical population numbers are unknown. Crampton (1925, pp. 38–40) found the Guam tree snail at 37 of 39 sites surveyed on Guam and collected a total of 2,278 individuals. The actual population sizes were probably considerably larger since the purpose of Crampton's collections was to evaluate geographic differences in shell patterns and not to assess population size. In 1989, Hopper and Smith (1992, p. 78) resurveyed 34 of Crampton's 39 sites on Guam and an additional 13 new sites. They observed that 9 of the original 34 sites resurveyed supported these snails; however, the Crampton site identified as having the largest remaining population of the Guam tree snail (estimated at greater than 500 snails) had been completely eliminated by the combined effects of land clearing for a residential development and a subsequent series of typhoons in 1990, 1991, and 1992 (Smith 1995, pp. 6–11).

Of the 13 new sites surveyed by Hopper and Smith in 1989, 7 supported populations of the Guam tree snail. One of these populations was eliminated by wildfires that burned into ravine forest occupied by the snails in 1991 and 1992 (Smith and Hopper 1994, pp. 10–11). Further surveys by Smith (1995, pp. 1–25) revealed five new populations of the Guam tree snail. According to Smith, by 1995, there were 20 sites that still supported small populations of the Guam tree snail. Snails were moved from 1 of these 20 sites to a new location due to the development of a golf course (Smith 1995, pp. 6–11). In 2003 an additional small colony (fewer than 100 snails) was found on the U.S. Naval Base (Smith 2006, pers. comm.). A smaller colony (20 to 25 snails) was found in 2004 along the Lonfit River (Smith 2006, pers. comm.). Additionally, surveys on the Guam Naval Magazine located another new population, with shells of tree snails in abundance on the ground at all locations (Miller 2006, pers. comm.; JGPO–NavFac 2014 apps, pp. 27, 59).

Further surveys of lands leased by the Navy in 2009 indicated a decline in densities of tree snails by about half, which was attributed to a loss of native understory (Smith *et al.* 2009, pp. 13–14). In 2011, a survey of Andersen AFB revealed a single colony of Guam tree snail (Joint Regional Marianas Integrated Natural Resources Management Plan Appendices 2012, p. 15). In 2013, a survey team on Guam observed small colonies of the Guam tree snail (ranging from 10 to 150 individuals per colony) at approximately 20 sites around the island (Lindstrom and Benedict 2014, p. 27). A 2014 study conducted solely at the Haputo Ecological Reserve Area (HERA) and adjacent forested areas counted almost 1,500 live Guam tree snails (Myounghee Noh and Associates 2014, pp. 1–28, and Appendices A and B); however, there are nonnative ungulates (pigs and deer) and the manokwari flatworm in the area (Lindstrom and Benedict 2014, pp. 32–33; Myounghee Noh and Associates 2014, p. B–8), all of which pose threats to the Guam tree snail. Some snail experts who frequently conduct fieldwork in the Mariana Islands have reported there are at least 26 populations of the Guam tree snail; however, they also note that habitat destruction and the manokwari flatworm still pose significant threats to this species, which is particularly vulnerable as a single-island endemic (Fiedler 2014, in litt.).

Lindstrom and Benedict (2014, p. 27) conducted a genetic analysis using snail slime collected at 20 sites around Guam. The results from this genetic analysis showed the Guam tree snail has a very low degree of genetic diversity between all the surveyed populations, which makes this species vulnerable to extinction pressures associated with low numbers of individuals and populations (*e.g.,* disease). Additionally, despite being the most widespread partulid on Guam, Lindstrom and Benedict's data (2014, pp. 27, 31, 32) show that Guam tree snails are still disappearing compared to historical abundance (Lindstrom and Benedict 2014, p. 32).

Overall, populations of the Guam tree snail continue to decline, from first observations of at least 37 populations as observed by Crampton, down to 26 colonies or fewer today. Continued loss of habitat due to development and removal of native plants by ungulates contribute to this loss, trade of shells by collectors may be a threat, and predation by the invasive manokwari flatworm is likely a significant source of mortality (see Summary of Biological Status and Threats Affecting the 23 Mariana Islands Species, below). We anticipate the effects of climate change will further exacerbate many of these threats in the future.

Fragile Tree Snail

The fragile tree snail (*Samoana fragilis;* akaleha dogas, denden), in the Partulidae family, is known from the forest ecosystems of Guam and Rota. This species was first described as *Partula fragilis* by Férussac in 1821 (Crampton 1925, p. 30). It is the only species representing the genus of *Samoana* in the Mariana Islands. The fragile tree snail was first collected on Guam in 1819 by Quoy and Gaimard during the Freycinet Uranie expedition of 1817 to 1819 (Crampton 1925, p. 30). Crampton's 1925 taxonomic work for this species is the most recent and accepted taxonomy for this species.

The conical shell of the fragile tree snail is 0.5 to 0.6 in (12 to 16 mm) long, 0.4 to 0.5 in (10 to 12 mm) wide, and is formed by four whorls that spiral to the right. The common name is derived from the thin, semi-transparent nature of the shell. The shell has delicate spiral striations intersected by transverse growth striations. The background color is buff, tinted by narrow darker marks and whitish banding that are derived from the internal organs of the animal that are visible through the shell (Mollendorff 1894 in Crampton 1925, p. 31). Sometimes the Guam tree snail and fragile tree snail are difficult to distinguish from one another and DNA comparison is necessary to determine the identity (Fiedler 2014, in litt.). The biology and habitat for this partulid tree snail are the same as those described for the three partulid species described above (see the ''Humped tree snail (*Partula gibba*),'' above).

Historically, the fragile tree snail was known from 13 populations on Guam and 1 population on Rota (Crampton 1925, p. 30; Kondo 1970, pp. 86–87). Easely (1970, p. 86) documented the 1959 discovery of the fragile tree snail on Rota by R.P. Owen. The same area had been surveyed just 7 years earlier by Benavente and Kondo, in 1952, but the fragile tree snail was not observed (Easley 1970, p. 87). In 1989, Hopper and Smith (1992, p. 78) resurveyed Crampton's original sites plus 13 more, all on Guam. At that time, they found fragile tree snails at only six sites. The most recent surveys on Guam for the fragile tree snail were conducted in 2008, 2011, 2013, and 2014. Currently, two colonies are known on Guam (Smith *et al.,* 2009, pp. 7, 13; Myounghee Noh and Associates 2014, pp. 1–28, and Appendices A and B; Lindstrom and Benedict 2014, pp. 1–44, and Appendices A–E). Lindstrom and Benedict (2014, p. 30) found no genetic heterogeneity between the two populations on Guam, indicative of a small population that has undergone a population bottleneck, which makes this species less resilient evolutionarily and more vulnerable to extinction pressures. The original site where this species was found on Rota was converted to agricultural fields, and no living snails were found there in 1995; however, in 1996, a new colony was found on Rota in a different location (Bauman 1996, pp. 18, 21).

We lack quantitative estimates of population sizes for the fragile tree snail (Bauman 1996, p. 21), but Crampton (1925, p. 30) originally described this species as rare and low in numbers. Available data indicate the number of known colonies has declined between 1925 and the present, from approximately 14 colonies to only 3 colonies.

In summary, populations of the fragile tree snail are decreasing from initial numbers observed on Guam and Rota, and are at risk, due to continued habitat loss and destruction from agriculture, urban development, nonnative animals and plants, and typhoons. We anticipate the effects of climate change will further exacerbate many of these threats in the future. Trade of shells by collectors, combined with direct predation by rats and flatworms, also contribute to the decline of the fragile tree snail. Low numbers of individuals likely contribute to population declines through loss of vigor and genetic representation.

Summary of Biological Status and Threats Affecting the 23 Mariana Islands Species

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. A species may be determined to be an endangered or threatened species due to one or more 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; and (E) other natural or manmade factors affecting its continued existence. Listing actions may be warranted based on any of the above threat factors, singly or in combination. Each of these factors is discussed below.

In considering what factors might constitute threats to a species, we must look beyond the exposure of the species to a particular factor to evaluate whether the species may respond to that factor in a way that causes actual impacts to the species. If there is exposure to a factor and the species responds negatively, the factor may be a threat, and, during the status review, we attempt to determine how significant a threat it is. The threat is significant if it drives, or contributes to, the risk of extinction of the species such that the species warrants listing as an endangered or threatened species as these terms are defined in the Act. However, the identification of factors that could impact a species negatively may not be sufficient to warrant listing the species under the Act. The information must include evidence sufficient to show that these factors are operative threats that act on the species to the point that the species meets the definition of an endangered or threatened species under the Act.

If we determine that the level of threat posed to a species by one or more of the five listing factors is such that the species meets the definition of either endangered or threatened under section 3 of the Act, that species may then be proposed for listing as an endangered or threatened species. The Act defines an endangered species as ''in danger of extinction throughout all or a significant portion of its range,'' and a threatened species as ''likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' The threats to each of the individual 23 species listed as endangered or threatened species in this final rule are summarized in Table 3, and discussed in detail below. Since there are 15 islands in the Mariana Islands, Table 4 (below) is provided as a supplement to Table 3, to allow the reader to better understand the presence of nonnative species addressed in this final rule that negatively impact the 23 species on an island-by-island basis.

TABLE 3—SUMMARY OF PRIMARY THREATS IDENTIFIED FOR EACH OF THE 23 MARIANA ISLANDS SPECIES

Species	Ecosystem	Factor A						Factor B	Factor C			Factor D	Factor E
		Development, military training, urbanization	Non-native animals	Non-native plants	Fire	Typhoons	Climate change	Overutilization	Predation and herbivory by ungulates	Predation and herbivory by nonnative vertebrates	Predation and herbivory by nonnative invertebrates	Inadequate existing regulatory mechanisms	Species-specific
Plants													
Bulbophyllum guamense	FR	X	R, BTS	X	X	X	X				S	X	
Cycas micronesica	FR	X	R, P, B, D, BTS.	X	X	X	X		P, D		CAS	X	ORD
Dendrobium guamense	FR	X	R, BTS	X	X	X	X				S	X	
Eugenia bryanii	FR	X	R, D, BTS	X		X	X		D			X	
Hedyotis megalantha	SV	X	R, P, BTS	X	X	X	X					X	REC
Heritiera longipetiolata	FR	X	R, P, B, D, BTS.	X		X	X		P, D			X	ORD
Maesa walkeri	FR	X	R, P, B, D, BTS.	X	X	X	X					X	
Nervilia jacksoniae	FR	X	P, B, D, R, BTS.	X	X	X	X				S	X	
Phyllanthus saffordii	SV	X	R, P, BTS	X	X	X	X					X	REC
Psychotria malaspinae	FR	X	R, P, B, D, BTS.	X		X	X		P, D			X	LN, ORD
Solanum guamense	FR	X	R, P, D, BTS	X		X	X		P, D			X	LN
Tabernaemontana rotensis	FR	X	R, P, B, D, BTS.	X	X	X	X					X	ORD
Tinospora homosepala	FR		R, BTS	X		X	X					X	LN
Tuberolabium guamense	FR	X	R, BTS	X	X	X	X				S	X	
Animals													
Pacific sheath-tailed bat (*Emballonura semicaudata rotensis*).	FR, CA	X	R, G			X	X			R, BTS, ML		X	LN
Slevin's skink (*Emoia slevini*)	FR	X	R, G, P,			X	X			R, BTS, ML		X	ORD
Mariana eight spot butterfly (*Hypolimnas octocula marianensis*).	FR	X	R, P, B, D, BTS.	X		X	X				A, W	X	LN, ORD
Mariana wandering butterfly (*Vagrans egistina*)	FR		R			X	X				A, W	X	LN
Rota blue damselfly (*Ischnura luta*)	ST	X		X		X	X					X	LN, WE
Humped tree snail (*Partula gibba*)	FR	X	R, G, P, B, C, D, BTS.	X	X	X	X	X		R	F	X	ORD
Langford's tree snail (*Partula langfordi*)	FR	X	R, G	X		X	X	X		R	F	X	LN
Guam tree snail (*Partula radiolata*)	FR	X	R, P, B, D, BTS.	X	X	X	X	X		R	F	X	LN
Fragile tree snail (*Samoana fragilis*)	FR	X	R, P, B, D, BTS.	X		X	X	X		R	F	X	LN

Factor A = Habitat modification;
Factor B = Overutilization;
Factor C = Disease or predation;
Factor D = Inadequacy of regulatory mechanisms;
Factor E = Other Species-specific threats;
FR = Forest;
SV = Savanna;
ST = Stream;
CA = Cave;
R = Rats;
P = Pigs;
B = Water buffalo;
D = Deer;
C = Cattle;
G = Goats;
S = Slugs;
CAS = Scale;
ML = Monitor lizard;
A = Ants;
W = Parasitic wasps;
F = Manokwari flatworm;
BTS = Brown treesnake;
REC = Recreational vehicles;
ORD = Ordnance;
LN = Limited numbers;
WE = Water extraction.

TABLE 4—NONNATIVE ANIMAL SPECIES THAT NEGATIVELY IMPACT THE 23 MARIANA ISLANDS SPECIES OR THEIR HABITAT, BY ISLAND

Island	Pigs	Goats	Cattle	Water Buffalo	Deer	Rats	Monitor Lizard	Brown Tree-snake	Insects and worms	Species subject to threats posed by nonnative animal species on these islands (see Table 3, above)	
										Plants	Animals
Guam	X	....	....	X	X	X	*X	X	A, W, F, S, CAS.	*Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Eugenia bryanii, Hedyotis megalantha, Heritiera longipetiolata, Maesa walkeri, Nervilia jacksoniae, Phyllanthus saffordii, Psychotria malaspinae, Solanum guamense, Tabernaemontana rotensis, Tinospora homosepala, Tuberolabium guamense.*	Slevin's skink (on Cocos Island), Mariana eight-spot butterfly, Mariana wandering butterfly, Guam tree snail, Humped tree snail, Fragile tree snail.
Rota	....	....	....	....	X	X	*X	**X	A, W, F, S, CAS.	*Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Heritiera longipetiolata, Maesa walkeri, Nervilia jacksoniae, Tabernaemontana rotensis, Tuberolabium guamense.*	Mariana wandering butterfly, Rota blue damselfly, Humped tree snail, Fragile tree snail.
Aguiguan	....	X	....	....	....	X	*X	....	F	*Dendrobium guamense.*	Pacific sheath-tailed bat, Humped tree snail, Langford's tree snail.
Tinian	....	....	....	....	....	X	*X	....	F	*Dendrobium guamense Heritiera longipetiolata.*	Humped tree snail.
Saipan	....	....	....	....	....	X	*X	**X	A, W, F	*Heritiera longipetiolata*	Mariana eight-spot butterfly, Humped tree snail.
Farallon de Medinilla.	....	....	....	....	....	X	....	....	....	....	
Anatahan	....	....	....	....	....	X	*X	....	....	....	
Sarigan	....	....	....	....	....	X	*X	....	†F	....	Slevin's skink, Humped tree snail.
Guguan	....	....	....	....	....	X	....	....	†F	....	Slevin's skink.
Alamagan	X	X	X	....	....	X	*X	....	†F	....	Slevin's skink, Humped tree snail.
Pagan	X	X	X	....	....	X	*X	....	†F	*Cycas micronesica* § ...	Slevin's skink, Humped tree snail.
Agrihan	X	X	....	....	....	X	*X	....	....	....	
Asuncion	....	....	....	....	....	X	....	....	....	....	Slevin's skink.
Maug	....	....	....	....	....	X	....	....	....	....	
Uracas	....	....	....	....	....	X	....	....	....	....	

A = Ants.
W = Parasitic wasp.
F = Manokwari flatworm.
S = Slugs.
CAS = Cycad aulacaspis Scale.
* Animals only.
** Confirmed sightings of brown treesnakes have occurred on Saipan and Rota; however, no established populations have been documented.
† Not yet documented, but high potential to spread to these islands.
§ Tentative, to be confirmed.

Methods

The available scientific research on each of the species listed as endangered or threatened species in this final rule is limited because of their rarity and the challenging logistics associated with conducting fieldwork in the Mariana Islands (*i.e.,* areas are typically remote, difficult to access and work in, and expensive to survey in a comprehensive manner). However, there is information available on many of the threats that act on Mariana Island ecosystems, and, for some ecosystems, these threats are well studied and understood. Each of the native species that occur in the Mariana Islands ecosystems suffers from exposure to these threats because each species that depends upon a shared ecosystem requires many of the same physical and biological features and the successful functioning of their specific ecosystem to survive, and in some cases, this information is the best and only information available to assess threats to the species. In addition, in some cases we have identified species-specific threats—threats that affect only a particular species or subset of species within a shared ecosystem—such as predation of tree snails by nonnative invertebrates. The species discussed in this final rule, which are dependent on the native ecosystems that are affected by these threats, have in turn shown declines in either number of individuals, number of occurrences, or changes in species abundance and species composition. These declines can reasonably be attributed directly or indirectly to the threats discussed below. By indirectly, we mean that where there are threats to the ecosystem that negatively affect the ecosystem, the species in that ecosystem that depend upon it for survival are negatively affected as well.

The following constitutes a list of ecosystem-scale threats that affect the 23 species addressed in this final rule, in the four described ecosystems on the Mariana Islands:

(1) Foraging and trampling of native plants by feral pigs, goats (*Capra hircus*), cattle (*Bos taurus*), water buffalo (*Bubalus bubalis*), and Philippine deer (*Cervus mariannus*), which can result in severe erosion of watersheds (Cuddihy and Stone 1990, p. 63; Berger *et al.* 2005, pp. 42, 44, 138, 156–157; CNMI–SWARS 2010, pp. 9–10; Kessler 2011, pp. 320–324). Foraging and trampling events destabilize soils that support native plant communities, bury or damage native plants, and have adverse effects on water quality due to runoff over exposed soils (Cuddihy and Stone 1990, p. 63; Berger *et al.* 2005, pp. 42, 44, 138, 156–157; CNMI–SWARS 2010, pp. 9–10; Kessler 2011, p. 323).

(2) Ungulate destruction of seeds and seedlings of native plant species through foraging and trampling facilitates the conversion of disturbed areas from native to nonnative vegetative communities (Cuddihy and Stone 1990, p. 65).

(3) Disturbance of soils by feral pigs from rooting can create fertile seedbeds for alien plants, some of them spread by ingestion and excretion by pigs (Cuddihy and Stone 1990, p. 65; Kessler 2011, pp. 320, 323).

(4) Increased nutrient availability as a result of pigs rooting in nitrogen-poor soils, which facilitates establishment of alien weeds. Introduced vertebrates are known to enhance the germination of alien plants through seed scarification in digestive tracts or through rooting and fertilization with feces of potential seedbeds (Stone 1985, p. 253). In addition, alien weeds are more adapted to nutrient-rich soils than native plants (Cuddihy and Stone 1990, p. 65), and rooting activity creates open areas in forests, allowing alien species to completely replace native stands.

(5) Rodent damage to plant propagules, seedlings, or native trees, which changes forest composition and structure (Cuddihy and Stone 1990, p. 67).

(6) Feeding or defoliation of native plants by nonnative insects, which can reduce geographic ranges of some species, because the damage caused by these insects weakens the plants, making them more susceptible to disease or other predators and herbivores (Cuddihy and Stone 1990, p. 71).

(7) Nonnative insect predation on native insects, which affects native plant species by preventing pollination and seed set and dispersal, and can directly kill native insects (Cuddihy and Stone 1990, p. 71).

(8) Nonnative animal (rat, snake, and monitor lizard) predation on native birds, tree snails, bats, and skinks causes island extirpations or extinctions, in addition to altering seed dispersal of native plants (Cuddihy and Stone 1990, pp. 72–73).

(9) Future effects from climate change. Although we do not have specific information on the impacts of the effects of climate change to the 23 species, projected increases in ambient temperature and precipitation, as well as increased severity of typhoons, will likely exacerbate other threats to these species as well as provide additional stresses on their habitats. The probability of species extinction as a result of climate change impacts increases when its range is restricted, habitat decreases, and numbers of populations decline (IPCC 2007, p. 48), as is the case for the 23 species under consideration here.

Each of the above threats is discussed in more detail below, and summarized above in Table 3. The most-often cited effects of nonnative plants on native plant species are competition and displacement. Competition may be for water, light, or nutrients, or it may involve allelopathy (chemical inhibition of growth of other plants). Alien plants may displace native species of plants by preventing their reproduction, usually by shading and taking up available sites for seedling establishment. Alien plant invasions may also alter entire ecosystems by forming monotypic stands, changing fire characteristics of native communities, altering soil-water regimes, changing nutrient cycling, or encouraging other nonnative organisms (Vitousek *et al.* 1987, pp. 224–227; Smith 1989, p. 62).

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

Habitat Destruction and Modification by Development, Military Training, and Urbanization

The consequences of past land use practices, such as agricultural or urban development, have resulted in little or no native vegetation remaining throughout the inhabited islands of the Mariana archipelago, largely impacting the forest, savanna, stream, and cave ecosystems (Steadman 1990, pp. 207–215; Steadman 1995, pp. 1,123–1,131; Fritts and Rodda 1998, pp. 119–120; Critical Ecosystem Partnership Fund 2007, pp. i–viii, 1–127). Areas once used for agriculture by the Chamorro are now being converted into residential areas, left fallow, or are being burned by hunters to attract deer (GDAWR 2006, p. 30; Boland 2014, in litt.). Guam's projected population increase by 2040 to 230,000 is an increase of almost 70 percent from that in 2010 (World Population Review 2014, in litt.). CNMI's current population of a little more than 51,000 is a decrease from that in 2010, due to collapse of the local garment industry (Eugenio 2009, in litt.). In their 2015 Final SEIS (*http://guambuildupeis.us/*) (see ''Historical and Ongoing Human Impacts,'' above), the U.S. Department of Navy states that approximately 5,000 Marines will be relocated from Okinawa to Guam, accompanied by approximately 1,300 dependents, with a concurrent introduction of support staff and development of infrastructure, and increased use of resources such as water (Berger *et al.* 2005, p. 347; JGPO–NavFac, Pacific 2015, p. ES–3).

The military buildup on Guam was originally valued in excess of $10 billion (2.5 times the size of the current Guam economy), and was planned to take place over 4 years (Guam Economic Development Authority 2011, p. 58). The scope of the relocation of personnel has decreased since this estimate in 2011, but the relocation will still greatly affect infrastructure and resource needs (JGPO–NavFac, Pacific 2015, p. ES 3; CJMT EIS–OEIS 2015, pp. ES–1–ES–77; *http://www.cnmijointmilitarytrainingeis.com/*). The current preferred alternative sites on Guam for cantonment and live-fire training include the Naval Computer and Telecommunications Station Finegayan and Northwest Field on Andersen AFB, where, in total, 16 of the 23 species or their habitat are known to occur (11 of the 14 plants: *Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Eugenia bryanii, Heritiera longipetiolata, Maesa walkeri, Nervilia jacksoniae, Psychotria malaspinae, Solanum guamense, Tabernaemontana rotensis,* and *Tuberolabium guamense;* and 5 of the 9 animals: The Mariana eight-spot butterfly, the Mariana wandering butterfly, the Guam tree snail, the humped tree snail, and the fragile tree snail), and additionally includes the host plants *Procris penduncculata* and *Elatostema calcareum* for the Mariana eight-spot butterfly and the host plant *Maytenus thompsonii* for the Mariana wandering butterfly. Further, the Navy is planning jungle training at the Naval Munitions Site (NMS) on Guam, which will require the establishment of foot trails within the southern portion of the NMS due to repeat use during maneuvering training. At least 5 of the 23 species (the plants *Cycas micronesica, Maesa walkeri, Psychotria malaspinae,* and *Tuberolabium guamense;* and the Guam tree snail) are known to occur on the Naval Magazine.

The inhabited island of Tinian and the uninhabited island of Pagan are planned to be used for military training with live-fire weapons and presence of military personnel (see ''Historical and Ongoing Human Impacts,'' above). The northern two-thirds of Tinian are leased by the U.S. Department of Defense, and the development of these lands and effects from live-fire training will directly impact the tree *Heritiera longipetiolata* and the humped tree snail, and their habitat in the forest ecosystem. Pagan is occupied by Slevin's skink, the humped tree snail, and tentatively *Cycas micronesica;* and is historical habitat of *Bulbophyllum guamense,* all of which will be negatively impacted by direct destruction by live-fire weapons or possible wildfires caused by them and by trampling and destruction by military personnel.

Most private lands on the island of Rota are on flat or low sloping ground. Low sloping grounds comprise approximately 66 percent of Rota's land base, and at least 75 percent of these lands are, or will soon be, committed to private use (CNMI Talakhaya-Sabana Conservation Action Plan (TSCAP)–CNMI Division of Environmental Quality (CNMI DEQ) 2012, p. 7). CNMI government programs call for the transfer of portions of public lands from public to private ownership through agriculture or village homestead programs (TSCAP–CNMI DEQ 2012, p. 7). In November 2007, the people of Rota voted to legalize casino gambling to increase tourism, and two development projects have been proposed. First, the Treasure Island Casino, which will build upon the existing Rota Hotel (CNMI Tourism Master Plan 2012, pp. 128–129; Zotomayor 2014, in litt.); and second, a casino designed around the existing Rota Resort and Country Club. Rota currently has seven operational hotels, and tourism is one of the island's primary industries, although a lack of reliable transportation currently limits the amount of visitors (CNMI Tourism Master Plan 2012, pp. 128–129). The 2012 CNMI Tourism Master Plan outlines ways to increase tourism and improve infrastructure on Saipan, Tinian, and Rota. Further development on Rota will cause an increase of water use, which will subsequently impact the Talakhaya Springs and the streams fed by the springs, as the Talakhaya Springs are the primary source of water used for human development on Rota. Specifically, dewatering of the streams on Rota could lead to elimination of the only known population of the Rota blue damselfly (see ''Water Extraction,'' below). Additionally, development around and within forested areas on Rota will also directly impact the forest habitat and individuals of *Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Heritiera longipetiolata, Maesa walkeri, Nervilia jacksoniae, Tabernaemontana rotensis,* and *Tuberolabium guamense;* and the habitat and host plants of the Mariana wandering butterfly, and the humped tree snail and fragile tree snail.

Other urban development (primarily involving housing development) will further impact the ecosystems that support native species. On Guam, a housing development is proposed for the Sigua highlands, where two of the plant species (*Hedyotis megalantha* and *Phyllanthus saffordii*) addressed in this rule are known to occur (Kelman 2013, in litt.). In addition, the island of Aguiguan is proposed to be developed as an ecotourism resort (Eugenio 2013, in litt.). If developed, this ecotourism resort will negatively impact the forest and cave ecosystems that support three of the animals (the Pacific sheath-tailed bat, the humped tree snail, and Langford's tree snail) listed as endangered species in this final rule, by causing destruction of the forest ecosystem (and associated food sources for the Pacific sheath-tailed bat) for development of tourist facilities for transportation and accommodation, by associated introduction of nonnative predators and herbivores, and by causing direct disturbance by visitation of caves.

The total land area for all of the northern islands (within these species' current and historical range) is only 62 mi^2 (160 km^2), and 44 mi^2 (114 km^2) of this land area is on islands with volcanic activity, which could impact the species and their habitat. The larger land area on the southern islands (332 mi^2 (857 km^2)), within these species' current and historical range, is undergoing increased human use, as described above.

In summary, development, military training, urbanization (Guam DAWR 2006, p. 69), and the associated destruction or degradation of habitat through loss of forest and savanna areas, disturbance of caves, and dewatering of streams, are serious threats to 13 of the 14 plants (*Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Eugenia bryanii, Hedyotis megalantha, Heritiera longipetiolata, Maesa walkeri, Nervilia jacksoniae, Phyllanthus saffordii, Psychotria malaspinae, Solanum guamense, Tabernaemontana rotensis,* and *Tuberolabium guamense*), and to 8 of the 9 animals (the Pacific sheath-tailed bat, Slevin's skink, the Mariana eight-spot butterfly, the Rota blue damselfly, the Guam tree snail, the humped tree snail, Langford's tree snail, and the fragile tree snail) that are dependent on these ecosystems. We do not have sufficient information specific to 2 of the 23 species, *Tinospora homosepala* and the Mariana wandering butterfly, that would lead us to conclude that habitat loss as a result of development, military training, or urbanization is a threat to these species. For a more thorough discussion of previous occupations and current U.S. military activities, see ''Historical and Ongoing Human Impact,'' above.

Habitat Destruction and Modification by Nonnative Animals

Animal species introduced by humans, either intentionally or accidentally, are responsible for some of the greatest negative impacts to the four Mariana Islands ecosystems described here (Stone 1970, pp. 14, 32; Intoh 1986 in Conry 1988, p. 26; Fritts and Rodda 1998, p. 130). Although there are numerous reports of myriad introduced animal species that have negatively impacted the four described Mariana Islands ecosystems, ranging from ungulates to insects (including such diverse animals as the musk shrew (*Suncus murinus*), dogs (*Canis lupis familiaris*), cats (*Felis catus*), and black drongoes (birds; *Dicrurus macroercus*)), we have focused our efforts here on the negative impacts of those species that impose the greatest harmful effects on the four ecosystems (see Tables 3 and 4, above). In addition, we address the compounding effects on these ecosystems that arise when the pressure of two or more individual negative impacts is greater than the sum of their parts (*i.e.,* synergistic effects). Below we discuss the negative impacts of various nonnative animals, including feral pigs, goats, cattle, and water buffalo, as well as Philippine deer, rats, and the brown treesnake, which impose the greatest adverse impacts on one or more of the 4 described Mariana Islands ecosystems (forest, savanna, stream, and cave) that support the 23 species addressed in this final rule (Stone 1970, pp. 14, 32; Intoh 1986 in Conry 1988, p. 26; Fritts and Rodda 1998, pp. 130–133; Berger *et al.* 2005, pp. 42, 44, 138, 156–157; CNMI–SWARS 2010, pp. 7, 24). Because most of the islands in the Mariana archipelago are small (Guam being the largest), the negative impacts associated with a destructive nonnative animal species affect the entire island. The mild climate of the islands, combined with the lack of competitors or predators, has led to the successful establishment of large populations of these introduced animals, to the detriment of the native Mariana Island species and ecosystems. These effects are discussed in more detail, below.

Habitat Destruction and Modification by Introduced Ungulates

Like most oceanic islands, the Mariana Islands, and greater Micronesia, did not support indigenous populations of terrestrial mammalian herbivores prior to human colonization (Wiles *et al.* 1999, p. 194). Although agriculture and land use by the Chamorro clearly altered the landscape and composition of native biota in the Mariana Islands, starting more than 3,500 years ago (Perry and Morton 1999, p. 126; Steadman 1995, pp. 1,126–1,127), impacts to the native species and ecosystems of the Marianas accelerated following the arrival of Magellan in the 1500s (Pregill 1998, p. 66; Perry and Morton 1999, pp. 126–127). The Spanish and subsequent explorers intentionally introduced pigs, cattle, goats, water buffalo, and Philippine deer to serve as food sources (Fosberg 1960, p. 54; Conry 1988, pp. 26–28). The isolation of the Mariana Islands allowed plant species to evolve without defenses to browsing and grazing animals, such as secondary metabolites and spines, making them highly susceptible to herbivory (Bowen and Van Vuren 1997, p. 1,249; Wiles *et al.* 1999, p. 194). Introduced mammals have profoundly influenced many insular ecosystems around the globe through alteration of the physical environment, culminating in the decline and loss of native biota (Stone 1970, pp. 14, 32; Scowcroft and Giffin 1983 in Wiles *et al.* 1999, p. 194; Stone 1985, pp. 251, 253–263; Campbell and Donlan 2004, pp. 1,363, 1,365), including the Mariana Islands ecosystems (Conry 1988, pp. 27–28; Mueller-Dombois and Fosberg 1998, pp. 250–252, 264; Berger *et al.* 2005, pp. 42, 44, 138, 156–157; CNMI–SWARS 2010, pp. 7, 24).

The presence of alien mammals is considered one of the primary factors underlying the alteration and degradation of native plant communities and habitats on the Mariana Islands. The destruction or degradation of habitat due to nonnative ungulates, including pigs, goats, cattle, water buffalo, and deer, is currently a threat to 17 of the 23 species addressed in this final rule, in 2 of the 4 ecosystems (forest and savanna) on 7 of the 15 Mariana Islands (Guam, Rota, Aguiguan, Tinian, Alamagan, Pagan, and Agrihan). Habitat degradation or destruction by ungulates is a threat to 10 of the 14 plant species (*Cycas micronesica, Eugenia bryanii, Hedyotis megalantha, Heritiera longipetiolata, Maesa walkeri, Nervilia jacksoniae, Phyllanthus saffordii, Psychotria malaspinae, Solanum guamense,* and *Tabernaemontana rotensis*), and 7 of the 9 animal species (the Pacific sheath-tailed bat, Slevin's skink, the Mariana eight-spot butterfly, the Guam tree snail, the humped tree snail, Langford's tree snail, and the fragile tree snail) addressed in this final rule (Table 3) (Stone 1970, pp. 14, 32; Perlman and Wood 1994, pp. 135–136.; Fritts and Rodda 1998, pp. 130–133; Mueller-Dombois and Fosberg 1998, p. 250; Perry and Morton 1999, pp. 126–127; Wiles and Johnson 2004, p. 586; Vogt and Williams 2004, pp. 82–89; Berger *et al.* 2005, pp. 42, 44, 138, 156–157; CNMI–SWARS 2010, pp. 7, 24; Pratt 2011, pp. 2, 36; Cook 2012, in litt.; Rogers 2012, in litt.; Rubinoff and Haines 2012, in litt.; Gawel 2014, in litt.; Marler 2014, in litt.). The three epiphytic orchids (*Bulbophyllum guamense, Dendrobium guamense,* and *Tuberolabium guamense*), the vine *Tinospora homosepala,* the Mariana wandering butterfly and its host plant *Maytenus thompsonii,* and the Rota blue damselfly are not reported to be vulnerable to habitat modification and destruction caused by nonnative ungulates.

Pigs—The destruction or degradation of habitat due to nonnative feral pigs is currently a threat in 2 (forest and savanna) of the 4 Mariana Islands ecosystems and their associated species on 4 of the 15 islands (Guam, Alamagan, Pagan, and Agrihan) (Berger *et al.* 2005, pp. 37–38, 40–44, 51, 95, 114; CNMI–SWARS 2010, p. 15; Kessler 2011, pp. 320, 323; Pratt 2011, pp. 2, 36). Pigs are present on other islands in the archipelago not noted above (*i.e.,* Rota, Saipan, and Tinian); however, they are present in very low numbers, primarily on farms and, therefore, not considered a threat on these islands at this time.

Feral pigs are known to cause deleterious impacts to ecosystem processes and functions throughout their worldwide distribution (Aplet *et al.* 1991, p. 56; Anderson and Stone 1993, p. 201; Campbell and Long 2009, p. 2,319). Feral pigs are extremely destructive and have both direct and indirect impacts on native plant communities. While rooting in the earth in search of invertebrates and plant material, pigs directly impact native plants by disturbing and destroying vegetative cover, and trampling plants and seedlings. It has been estimated that at a conservative rooting rate of 2 square yards (yd^2) (1.7 m^2) per minute, with only 4 hours of foraging a day, a single pig could disturb more than 1,600 yd^2 (1,340 m^2) (or approximately 0.3 ac, or 0.1 ha) of groundcover per week (Anderson *et al.* 2007, in litt.). Pigs may also reduce or eliminate plant regeneration by damaging or eating seeds and seedlings (further discussion of predation by nonnative ungulates is provided under ''*Factor C. Disease and Predation,''* below). Pigs are a major vector for the establishment and spread of competing invasive, nonnative plant species by dispersing plant seeds on their hooves and fur, and in their feces (Diong 1982, pp. 169–170, 196–197), which also serves to fertilize disturbed soil (Siemann *et al.* 2009, p. 547). In addition, pig rooting and wallowing contributes to erosion by clearing vegetation and creating large areas of disturbed soil, especially on slopes (Smith 1985, pp. 190, 192, 196, 200, 204, 230–231; Stone 1985, pp. 254–255, 262–264; Tomich 1986, pp. 120–126; Cuddihy and Stone 1990, pp. 64–65; Aplet *et al.* 1991, p. 56; Loope *et al.* 1991, pp. 18–19; Gagne and Cuddihy 1999, p. 52; Nogueira-Filho *et al.* 2009, p. 3,681; CNMI–SWARS 2010, p. 15; Dunkell *et al.* 2011, pp. 175–177; Kessler 2011, pp. 320, 323). Erosion, resulting from rooting and trampling by pigs, impacts native plant communities by contributing to watershed degradation and alteration of plant nutrient status, as well as causing direct damage to individual plants from landslides (Berger *et al.* 2005, pp. 42–44; Vitousek *et al.* 2009, pp. 3,074–3,086; Chan-Halbrendt *et al.* 2010, p. 251; Kessler 2011, pp. 320–324).

In the Hawaiian Islands, pigs have been described as the most pervasive and disruptive nonnative influence on the unique native forests, and are widely recognized as one of the greatest current threats to Hawaii's forest ecosystems (Aplet *et al.* 1991, p. 56; Anderson and Stone 1993, p. 195). The negative impacts from pig rooting and wallowing described above negatively affects 2 of the 4 described ecosystems (forest and savanna), and 14 of the 23 species (9 plants: *Cycas micronesica, Hedyotis megalantha, Heritiera longipetiolata, Maesa walkeri, Nervilia jacksoniae, Phyllanthus saffordii, Psychotria malaspinae, Solanum guamense,* and *Tabernaemontana rotensis;* and 5 animals: Slevin's skink, the Mariana eight-spot butterfly, and the Guam tree snail, the humped tree snail, and the fragile tree snail) listed as endangered or threatened species in this final rule (Conry 1988, pp. 27–28; Vogt and Williams 2004, p. 88; Berger *et al.* 2005, pp. 37–38, 40–44, 51, 95, 114; CNMI–SWARS 2010, p. 15; SWCA Environmental Consultants (SWCA) 2010, p. 38; Kessler 2011, pp. 320, 323; Pratt 2011, pp. 2, 36; Harrington *et al.* 2012, in litt.).

Goats—Habitat destruction or degradation of habitat due to nonnative feral goats is currently a threat to three of the species addressed in this final rule in two (forest and cave) of the four Mariana Islands ecosystems, on the islands of Aguiguan, Alamagan, Pagan, and Agrihan (Berger *et al.* 2005, pp. 36, 38, 40, 42–47; CNMI–SWARS 2010, p. 15; Kessler 2011, pp. 320–323; Pratt 2011, pp. 2, 36). Goats are presumably present on other islands (*e.g.,* Guam and Saipan, and possibly Rota), but these individuals are primarily on farms and, therefore, are not considered a threat at this time (Kremer 2013, in litt.). Three of the 23 species listed as endangered or threatened species in this rule (the Pacific sheath-tailed bat, the humped tree snail, and Langford's tree snail), within the forest and cave ecosystems on the above-mentioned islands, are negatively affected by feral goats.

The feral goat population on Aguiguan increased from a handful of animals in 1992 to more than 1,000 in 2002, which led to the general destruction of the forest ecosystem due to lack of regeneration of native plants and almost complete loss of understory plants, leaving only two native plants that are unpalatable, *Cynometra ramiflora* and *Meiogyne cylindrocarpa* (Wiles and Worthington 2002, p. 7; Cruz *et al.* 2008, p. 243). In addition, feral goats on Aguiguan have been observed entering caves for shelter, which disrupts the endangered Mariana swiftlet colonies and is believed to disturb the Pacific sheath-tailed bat (Wiles and Worthington 2002, p. 17; Cruz *et al.* 2008, p. 243). Researchers found that if caves suitable for bats were occupied by goats, there were no bats present in the caves (GDAWR 1995, p. 95). Goats are widely recognized to have almost limitless ranges, and are able to access, and forage in, extremely rugged terrain (Clarke and Cuddihy 1980, pp. C–19, C–20; Culliney 1988, p. 336; Cuddihy and Stone 1990, p. 64).

Goats have completely eliminated some plant species from islands (Mueller-Dombois and Fosberg 1998, p. 250; Atkinson and Atkinson 2000, p. 21). Goat browsing negatively impacts the habitat that supports the humped tree snail (on Aguiguan, Alamagan, and Pagan), and the fragile tree snail and Langford's tree snail (on Aguiguan) in the forest ecosystem by altering the essential microclimate, leading to increased desiccation and disruption of plant decay processes (Mueller-Dombois and Fosberg 1998, p. 250). On Agrihan, goats have destroyed much of the shrubs that make up the subcanopy, and the herbs in the understory (Ohba 1994, p. 19). In addition, goats eat the seeds and seedlings of one of the dominant Micronesian (Mariana Islands and Palau) endemic canopy species, *Elaeocarpus joga,* preventing its regeneration (Ohba 1994, p. 19; Ritter and Naugle 1999, pp. 275–281). None of the 23 species addressed in this final rule are known to currently occur on Agrihan; however, this island may be involved in future recovery efforts for 1 or more of the 23 species, and 2 other listed species, the Mariana fruit bat (*Pteropus mariannus mariannus*) and the Micronesian megapode (*Megapodius laperouse*), occur there.

Cattle—Habitat destruction or degradation of habitat by feral cattle is currently a threat to one species addressed in this final rule (the humped tree snail) in the forest ecosystem on the islands of Alamagan and Pagan (Berger *et al.* 2005, pp. 114, 218; Kessler 2011, p. 320). Cattle grazing damages the native vegetation and contributes to loss of native plant species, and also alters the essential microclimate leading to increased desiccation and disruption of plant decay processes necessary to support the humped tree snail, which currently occurs on the islands of Alamagan and Pagan (Mueller-Dombois and Fosberg 1998, p. 261; Pratt 2011, pp. 2, 36; Hadfield 2010, 23 pp.; Berger *et al.* 2005, pp. 114, 218). Feral cattle eat native vegetation, trample roots and seedlings, cause erosion, create disturbed areas into which alien plants invade, and spread seeds of alien plants in their feces and on their bodies. The forest in areas grazed by cattle degrades to grassland pasture, and plant cover is reduced for many years following removal of cattle from an area. Feral cattle have also roamed the island of Tinian for centuries and are reported to have negatively affected habitat across the island by grazing, trampling plants, and exposing soil, thereby changing the microclimate and composition of vegetation (Wiles *et al.* 1990, pp. 167–180; Natural Resources Conservation Service (NRCS) 2015, in litt.).

At present the number of feral cattle on Tinian is very low, and we do not consider feral cattle to currently pose a significant threat to the two species that occur on the island (the plant *Heritiera longipetiolata,* and the humped tree snail). However, cattle ranching is gaining in popularity, and in the future the number of cattle is expected to double from 1,500 individuals (Bagnol 2014, in litt.; NRCS 2015, in litt.). The number of cattle ranchers on Tinian has risen from 10 or 12 in 2010, to 49 ranchers by 2014 (Bagnol 2014, in litt.). As numbers of cattle and ranchers increase on Tinian, there may be a somewhat greater risk of cattle potentially escaping and becoming feral. Both feral and domestic cattle can drastically alter the landscape (Wiles *et al.* pp. 176–177), and depending on the location and amount of land designated as pasture land for domestic cattle, negative impacts to the forest ecosystem may be observed in the future. The Pacific sheath-tailed bat, and the plants *Dendrobium guamense, Solanum guamense,* and *Tuberolabium guamense,* occurred historically on Tinian.

Water buffalo—Several herds of Asiatic water buffalo or carabao roam southern Guam and the Naval Magazine area, and cause damage to the forest and savanna ecosystems that support 10 of the 23 species listed as endangered or threatened species (6 plants: *Cycas micronesica, Heritiera longipetiolata, Maesa walkeri, Nervilia jacksoniae, Psychotria malaspinae,* and *Tabernaemontana rotensis;* 4 animals: The Mariana eight-spot butterfly, the Guam tree snail, the humped tree snail, and the fragile tree snail) (Conry 1988, pp. 27–28; Harrington *et al.* 2012, in litt.). Water buffalo create mud wallows and trample vegetation (Conry 1988, p. 27). Wallowing pools can cover as much as 0.3 ac (0.1 ha) and reach a depth of 3 ft (1.0 m) (Conry 1988, p. 27), and trampling denudes land cover, leaving erosion scars and slumping (Conry 1988, pp. 27–28). Water buffalo negatively impact the Mariana eight-spot butterfly by damaging the habitat that supports its two host plants (*Procris penduncluata* and *Elatostema calcareum*). Although four additional species (the three epiphytic orchids (*Bulbophyllum guamense, Dendrobium guamense,* and *Tuberolabium guamense*), and the Mariana wandering butterfly and its host plant *Maytenus thompsonii*) may occur on the Naval Magazine, these four species are not as vulnerable to the negative impacts associated with water buffalo.

Deer—Habitat destruction or degradation due to Philippine deer is currently a threat to 13 of the 23 species found in 2 of the 4 described Mariana Island ecosystems (forest and savanna) on the islands of Guam and Rota (Wiles *et al.* 1999, pp. 198–200). Philippine deer have caused extensive damage resulting in changes in the forest structure, including erosion, grazing to the point of clearing the entire herbaceous understory, consumption of seeds and seedlings preventing regeneration of native plants and the spread of invasive plant species, and other physical damage (*e.g.,* trunk rubbing) (Schreiner 1997, pp. 179–180; Wiles *et al.*1999, pp. 193–215; Berger *et al.* 2005, pp. 36, 45–46, 100; CNMI–SWARS 2010, p. 24; JGPO–NavFac, Pacific 2010b, p. 3–33; SWCA 2011, pp. 35, 42; Harrington *et al.* 2012, in litt.). At least 34 native plant species in the forest ecosystem have been documented as known food of the deer on the islands of Guam and Rota, including: (1) Genera of 5 plant species addressed in this final rule (*Cycas* spp. (*e.g., C. micronesica*), *Eugenia* spp. (*e.g., E. bryanii*), *Heritiera* spp. (*e.g., H. longipetiolata*), *Psychotria* spp. (*e.g., P. malaspinae*), and *Solanum* spp. (*e.g., S. guamense*); and genera of the 2 host plants, *Procris* spp. and *Elatostema* spp., that support the Mariana eight-spot butterfly; (2) several keystone ecosystem species: *Artocarpus mariannensis* (dokdok, seeded bread fruit), *Discocalyx megacarpa* (otot), *Merrilliodendron megacarpum* (faniok), *Piper* spp., *Pipturus argenteus,* and *Premna obtusifolia* (false elder); and (3) the listed plant species *Serianthes nelsonii* (Wiles *et al.* 1999, pp. 198–200, 203; Rubinoff and Haines 2012, in litt.). Philippine deer degrade the habitats that support 12 of the 23 species listed as endangered or threatened species in this final rule, in the forest and savanna ecosystems on the islands of Guam and Rota (8 plants: *Cycas micronesica, Eugenia bryanii, Heritiera longipetiolata, Maesa walkeri, Nervilia jacksoniae, Psychotria malaspinae, Solanum guamense,* and *Tabernaemontana rotensis;* and 4 animals: The Mariana eight-spot butterfly (including the two host plants *Procris penduncluata* and *Elatostema calcareum*), the Guam tree snail, the humped tree snail, and the fragile tree snail).

In summary, the habitats for 17 of the 23 species within all 4 ecosystems (forest, savanna, stream, and cave) identified in this rule are exposed to ongoing destruction and modification by feral ungulates (pigs, goats, cattle, and water buffalo), and Philippine deer (10 plants: *Cycas micronesica, Eugenia bryanii, Hedyotis megalantha, Heritiera longipetiolata, Maesa walkeri, Nervilia jacksoniae, Phyllanthus saffordii, Psychotria malaspinae, Solanum guamense,* and *Tabernaemontana rotensis;* and 7 animals: The Pacific sheath-tailed bat, Slevin's skink, the Mariana eight-spot butterfly (and its two host plants *Procris penduncluata* and *Elatostema calcareum*), the Guam tree snail, the humped tree snail, Langford's tree snail, and the fragile tree snail). The effects of these nonnative animals include: (1) The destruction of vegetative cover and the required microclimate of the 4 tree snails, (2) trampling of plants and seedlings and direct consumption of native vegetation and the 10 plants, as well as the host plants for the 2 butterflies, (3) altering the native ecosystems that provide habitat for the 10 plants and 7 animals by soil disturbance leading to erosion and sedimentation, (4) dispersal of alien plant seeds on hooves and coats and in feces, which contributes to invasion and alteration of ecosystems required by the 10 plants and 7 animals, (5) alteration of soil nitrogen availability, and creation of open areas conducive to further invasion of native ecosystems by nonnative pest plant species, and (6) alteration of food availability for the Pacific sheath-tailed bat by destruction of native forest and the associated insect prey. All of these impacts lead to the subsequent conversion of a plant community dominated by native species to one dominated by nonnative species (see ''Habitat Destruction and Modification by Nonnative Plants,'' below). In addition, because these nonnative animals inhabit terrain that is often steep and rugged (Cuddihy and Stone 1990, pp. 64–65; Berger *et al.* 2005, pp. 36–38, 40–47, 51, 95, 100, 114, 218), foraging and trampling contribute to severe erosion of watersheds. Nonnative ungulates would thus pose a potential threat to the Rota blue damselfly's stream habitat, if these ungulates were allowed to roam freely on Rota (Dunkell *et al.* 2011, p. 192).

Habitat Destruction and Modification by Introduced Small Vertebrates

Rats—There are three rat species found in the Mariana Islands: (1) The Polynesian rat (*Rattus exulans*), the only rat found in prehistoric fossil records; (2) the Norway rat (*R. norvegicus*); and (3) a putative new southeast Asian *Rattus* species, originally thought to be *R. diardii* (synonymous with *R. tanezumi*) (Kuroda 1938 in Wiewel *et al.* 2009, p. 208; Wiewel *et al.* 2009, pp. 210, 214–216; Pages *et al.* 2010, p. 200; Pages *et al.* 2013, pp. 1,019–1,020). One or more of these rat species are present on all 15 Mariana Islands (Wiewel *et al.* 2009, pp. 205–222; Kessler 2011, p. 320). Rats are a threat to the forest and savanna ecosystems that support 22 of the 23 species listed as endangered or threatened in this final rule (all 14 plant species and 8 of 9 animal species—all except the Rota blue damselfly in the stream ecosystem), by affecting regeneration of native vegetation, thereby destroying or eliminating the associated flora and fauna of these ecosystems.

Rats are recognized as one of the most destructive invasive vertebrates, causing significant ecological, economic, and health impacts (Cuddihy and Stone 1990, pp. 68–69; Atkinson and Atkinson 2000, pp. 23–24). Rats impact native plants by eating fleshy fruits, seeds, flowers, stems, leaves, roots, and other plant parts (Atkinson and Atkinson 2000, p. 23), and can seriously affect plant regeneration. A New Zealand study of rats in native forests has demonstrated that, over time, differential regeneration of plants, as a consequence of rat predation, may alter the species composition of forested areas (Cuddihy and Stone 1990, p. 69). Rats have caused declines or even the complete elimination of island plant species (Campbell and Atkinson 1999, in Atkinson and Atkinson 2000, p. 24). Plants with fleshy fruits are particularly susceptible to rat predation (Stone 1985, p. 264; Cuddihy and Stone 1990, pp. 67–69).

Rats also impact the faunal composition of ecosystems by predation or competition with native amphibian, avian, invertebrate, mammalian, and reptilian species, often resulting in population declines or even extirpations; disruption of island trophic systems including nutrient cycling; and by the creation of novel vectors and reservoirs for diseases and parasites (Pickering and Norris 1996 in Wiewel *et al.* 2009, p. 205; Chanteau *et* *al.* 1998 in Wiewel *et al.* 2009, p. 205; Fukami *et al.* 2006, pp. 1,302–1,303; Towns *et al.* 2006, pp. 876–877; Wiewel *et al.* 2009, p. 205).

Rats are less numerous on Guam compared to Rota, Saipan, and Tinian, due to the presence of the brown treesnake (see ''Brown Treesnake,'' below) (Wiewel *et al.* 2009, p. 210). An inverse relationship has been observed between rat density and the density of the brown treesnake, as rats are a food source and, therefore, contribute toward the brown treesnake's persistence (Rodda and Savidge 2007, p. 315; Wiewel *et al.* 2009, p. 218). Rodda *et al.* (1991, in Berger *et al.* 2005, p. 175) suggests that rats negatively impact native reptile populations, such as Slevin's skink, by aggressively competing for habitat. Several restoration studies have shown rapid increases in skink populations after removal of rats (Towns *et al.* 2001, pp. 6, 9).

Brown treesnake—The brown treesnake, native to coastal eastern Australia and north through Papua New Guinea and Melanesia, was accidentally introduced to Guam shortly after World War II (Rodda and Savidge 2007, p. 307). This arboreal, nocturnal snake was first observed near the Fena Reservoir in the Santa Rita area, and now occupies all ecosystems on Guam (Rodda and Savidge 2007, p. 314). There are reported sightings of the brown treesnake on Saipan; however, there are no known established populations on Saipan at this time (Campbell 2014, pers. comm.; Phillips 2014, pers. comm.). On September 3, 2014, a brown treesnake was captured in a snake trap along the Rota Seaport fence line promptly initiating extensive island-wide surveys that did not detect any others (Phillips 2015, in litt.). The brown treesnake is believed responsible for the extirpation of 13 of Guam's 22 native bird species (including all but 1 of its native forest bird species), and for contributing to the elimination of the Mariana fruit bat, the Pacific sheath-tailed bat, and Slevin's skink populations from the island (Rodda and Savidge 2007, p. 307).

The loss or severe reduction of so many bird species and other small native animal species on Guam has ecosystem-wide impacts, since many of these bird and small animal species were responsible for seed dispersal and pollination of native plants (Perry and Morton 1999, p. 137; Rodda and Savidge 2007, p. 311; Rogers 2008, in litt.; Rogers 2011, pp. 1–75). Some report that the brown treesnake has eliminated virtually all native seed dispersers (Fritts and Rodda 1998, p. 129). Field studies have demonstrated that seed dispersal of selected native plant species (*Aglaia mariannensis, Elaeocarpus joga,* and *Premna obtusifolia*) have declined on Guam as compared to neighboring islands (Rota, Saipan, and Tinian), due to brown treesnake predation on native birds and other small native vertebrate species (Ritter and Naugle 1999, pp. 275–281; Rogers 2008, in litt.; Rogers 2009, in litt.; Rogers 2011, pp. 1–75). Almost three quarters of the native tree species on Guam were once dependent on birds to eat their fruits and disperse their seeds (Rogers 2009, in litt.; Rogers 2011, pp. 1–75). Detailed studies on the native tree *P. obtusifolia* show that seeds handled by birds are twice as likely to germinate than seeds that fall off the tree and land directly below on the forest floor (by either simply nicking the seed and dropping it, or fully digesting the outer seed coat and excreting it in feces) (Rogers 2009, in litt.; Rogers 2011, pp. 1–75). An impact at one trophic level (elimination of seed dispersers) has cascading effects on other trophic levels, and can affect ecosystem stability (Perry and Morton 1999, p. 137).

The brown treesnake's elimination of native plant seed dispersers is an indirect threat that negatively impacts 2 of the 4 described ecosystems (forest and savanna), and the habitat of 18 of the 23 species (all 14 plant species and 4 of the 9 animal species, including the Mariana eight-spot butterfly, the Guam tree snail, the humped tree snail, and the fragile tree snail) listed as endangered or threatened in this final rule.

Habitat Destruction and Modification by Nonnative Plants

Native vegetation on the Mariana Islands has undergone extreme alteration because of past and present land management practices, including ranching, the deliberate introduction of nonnative plants and animals, agricultural development, military actions, and war (Ohba 1994, pp. 17, 28, 54–69; Mueller-Dombois and Fosberg 1998, p. 242; Berger *et al.* 2005, pp. 45, 105, 110, 218, 347, 350; CNMI–SWARS 2010, pp. 7, 9, 13, 16). Some nonnative plants were brought to the Mariana Islands by various groups of people, including the Chamorro, for food or cultural reasons.

The native flora of the Mariana Islands (plant species that were present before humans arrived) consisted of no more than 500 taxa, 10 percent of which were endemic (species that occur only in the Mariana Islands). Over 100 plant taxa have been introduced from elsewhere, and at least one third of these have become pests (*i.e.,* injurious plants) (Stone 1970, pp. 18–21; Mueller-Dombois and Fosberg 1998, pp. 242–243, 249, 262–263; Costion and Lorence 2012, pp. 51–100). Of these approximately 30 nonnative pest plant species, at least 9 have altered the habitat of 20 of the 23 species listed as endangered or threatened species in this final rule (only 3 of the animal species, the Pacific sheath-tailed bat, the Slevin's skink, and the Mariana wandering butterfly, are not directly impacted by nonnative plants (see Table 3)).

Nonnative plants degrade native habitat in the Mariana Islands by: (1) Modifying the availability of light through alterations of the canopy structure; (2) altering soil-water regimes; (3) modifying nutrient cycling; (4) altering the fire regime affecting native plant communities (*e.g.,* successive fires that burn farther and farther into native habitat, destroying native plants and removing habitat for native species by altering microclimatic conditions to favor alien species); and (5) ultimately converting native-dominated plant communities to nonnative plant communities (Smith 1985, pp. 217–218; Cuddihy and Stone, 1990, p. 74; Matson 1990, p. 245; D'Antonio and Vitousek 1992, p. 73; Ohba 1994, pp. 17, 28, 54–69; Vitousek *et al.* 1997, pp. 6–9; Mueller-Dombois and Fosberg 1998, pp. 242–243, 249, 262–263; Berger *et al.* 2005, pp. 45, 105, 110, 218, 347, 350; CNMI–SWARS 2010, pp. 7, 9, 13, 16).

The following list provides a brief description of the nonnative plants that impose the greatest negative impacts to forest, savanna, and stream ecosystems and the species addressed in this final rule that depend on these ecosystems (all 14 of the plant species and 6 of the animal species, including the Mariana eight-spot butterfly, Rota blue damselfly, humped tree snail, Langford's tree snail, Guam tree snail, and fragile tree snail).

- *Antigonon leptopus* (chain of hearts, Mexican creeper, coral vine), a perennial vine native to Mexico, has become widespread throughout the Mariana Islands. This species is a fast-growing, climbing vine that can reach up to 25 ft (8 m) in length, and smothers all native plants in its path (University of Florida Center for Aquatic and Invasive Plants (UF) 2014, in litt.). The fact that this species can tolerate poor soil and a wide range of light conditions makes this species a very successful invasive plant (UF 2013, in litt.).
- *Coccinia grandis* (ivy or scarlet gourd), native throughout Africa and Asia, is an aggressive noxious pantropical weedy vine that forms dense blankets that smother vegetation,

and currently proliferates on Guam and Saipan (Space and Falanruw 1999, pp. 3, 9–10). This species is considered the most invasive and serious threat to forest health by the CNMI DFW (CNMI–SWARS 2010, p. 15). Currently, *C. grandis* covers nearly 80 percent of Saipan (CNMI–SWARS 2010, p. 15).

- *Chromolaena odorata* (Siam weed, bitterbrush, masigsig), native to Central and South America, is an herbaceous perennial that forms dense tangled bushes up to 6 ft (2 m) in height, but can grow up to 20 ft (6 m) as a climber on other plants (Invasive Species Specialist Group (ISSG)–Global Invasive Species Database (GISD) 2006, in litt.). This species can grow in a wide range of soils and vegetation types, giving it an advantage over native plants (ISSG–GISD 2006, in litt.). Dense stands of *C. odorata* prevent the establishment of native plant species due to competition and allelopathic (growth inhibition) effects (ISSG–GISD 2006, in litt.).
- *Lantana camara* (lantana), a malodorous, branched shrub up to 10 ft (3 m) tall, was brought to the Mariana Islands as an ornamental plant. Lantana is aggressive, thorny, and forms thickets, crowding out and preventing the establishment of native plants (Davis *et al.* 1992, p. 412; Wagner *et al.* 1999, p. 1,320).
- *Leucaena leucocephala* (tangantangan, koa haole), a shrub native to the neotropics, is a nitrogen-fixer and an aggressive competitor that often forms the dominant element of the vegetation (Geesink *et al.* 1999, pp. 679–680).
- *Paspalum conjugatum* (Hilo grass, sour grass) is a perennial grass that occurs in wet habitats and forms a dense ground cover. Its small, hairy seeds are easily transported on humans and animals, or are carried by the wind through native forests, where it establishes and displaces native vegetation (Pace *et al.* 2000, p. 23; Motooka *et al.* 2003; Pacific Island Ecosytems at Risk (PIER) 2008).
- *Pennisetum* species are aggressive colonizers that outcompete most native species by forming widespread, dense, thick mats. *Pennisetum setaceum* (fountain grass) has been introduced to Guam (Space and Falanruw 1999, pp. 3, 5). Fountain grass occurs in dry, open places; barren lava flows; and cinder fields, is fire-adapted, and burns swiftly and hot, causing extensive damage to the surrounding habitat (O'Connor 1999, p. 1,581). On Hawaii Island, fountain grass is estimated to cover hundreds of thousands of acres and has the ability to become the dominant component in dry, open places in the Mariana Islands (O'Connor 1999, p. 1,578; Fox 2011, in litt.). *Pennisetum purpureum* and *P. polystachyon* have been introduced to Guam and Saipan (Space and Falanruw 1999, pp. 3, 5). *Pennisetum purpureum* (Napier grass, elephant grass) is a vigorous grass that produces razor-sharp leaves and forms thick clumps up to 13 ft (4 m) that resemble bamboo (Plantwise 2014, in litt.). Tall, dense thickets of *P. purpureum* outcompete and smother native plants, and can dominate fire-adapted grassland communities (Holm *et al.* 1979, in Plantwise 2014, in litt.). Similarly, dense thickets of *Pennisetum polystachyon* (mission grass) alter the fire regime and outcompete and smother native plants (University of Queensland 2011, in litt.).
- *Triphasia trifolia* (limeberry, limoncito), a shade-tolerant woody shrub native to southeast Asia, Malaysia, and the Christmas Islands, is an aggressive plant that forms dense, spiny thickets in the forest understory that smother native plant species and outcompetes them for light and water (Commonwealth Agricultural Bureau International (CABI) 2014—*Invasive Species Compendium Online Database*).
- *Vitex parviflora* (small-leaved vitex; molave tree, agalondi), a medium-sized tree up to 35 ft (10 m) native to Indonesia, Malaysia, and the Philippines, often forms monotypic stands, and can spread by seeds and pieces of roots and stems. *Vitex parviflora* forms thickets that outcompete, prevent recruitment of, and exclude native plants (Guaminsects 2005, in litt.). *Vitex parviflora* has greatly altered native habitats on Guam (SWCA 2010, p. 36, 67), and is one of the most dominant trees on the island (Water and Environmental Research Institute-Island Research and Education Initiative (WERI–IREI) 2014b, in litt.).

Habitat Destruction and Modification by Fire

Fire is a human-exacerbated threat to native species and native ecosystems throughout the Mariana Islands, particularly on the island of Guam. Wildfires plague forest and savanna areas on Guam every dry season despite the island's humid climate, with at least 80 percent of wildfires resulting from arson (JGPO–NavFac, Pacific 2010b, p. 1–9). Deer hunters on Guam and Rota frequently create fires in order to lure deer to new growth for easier hunting (Boland 2014, in litt.; Kremer 2014, in litt.). It is not uncommon for these fires to become wildfires that spread across large expanses of the savanna ecosystem as well as into the adjacent forest ecosystem. Between 1979 and 2001, more than 750 fires were reported annually on Guam, burning more than 155 mi^2 (401 km^2) during this time period (JGPO–NavFac, Pacific 2010b, p. 1–8). Six of these 750 fires burned more than 1,000 ac (405 hectares (ha)) (JGPO–NavFac, Pacific 2010b, p. 1–8). On the island of Rota, fires are often set on the Sabana by hunters, which burn into adjacent native forest.

Fire can destroy dormant seeds of native species as well as plants themselves, even in steep or inaccessible areas. Successive fires that burn farther and farther into native habitat destroy native plants and remove habitat for native species by altering microclimate conditions to those favorable to alien plants. Alien plant species most likely to be spread as a consequence of fire are those that produce a high fuel load, are adapted to survive and regenerate after fire, and establish rapidly in newly burned areas. Grasses (particularly those that produce mats of dry material or retain a mass of standing dead leaves) that invade native forests and shrublands provide fuels that allow fire to burn areas that would not otherwise easily burn (Fujioka and Fujii 1980 in Cuddihy and Stone 1990, p. 93; D'Antonio and Vitousek 1992, pp. 70, 73–74; Tunison *et al.* 2002, p. 122). Native woody plants may recover from fire to some degree, but fire shifts the competitive balance toward alien species (National Park Service (NPS) 1989 in Cuddihy and Stone 1990, p. 93). Another factor that contributes to wildfires on Guam, and other Mariana Islands with nonnative ungulates, includes land clearing for pasturage and ranching, which results in fire-prone areas of nonnative grasses and shrubs (Stone 1970, p. 32; CNMI–SWARS 2010, pp. 7, 20). Further, the danger of fire increases following intense typhoons, due to large fuel accumulation (Donnelly 2010, p. 6).

Wildfire is a threat to nine plant species (*Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Hedyotis megalantha, Maesa walkeri, Nervilia jacksoniae, Phyllanthus saffordii, Tabernaemontana rotensis,* and *Tuberolabium guamense*) and two animal species (the Guam tree snail (Guam) and the humped tree snail (Guam and Rota)), because individuals of these species occur in the savanna ecosystem or the forest ecosystem adjacent to the savanna ecosystem, on southern Guam (*i.e.,* Cetti Watershed area) and on the Rota Sabana, where fires are common (Grimm 2012, in litt.; Gutierrez 2012, in litt.; Gutierrez 2013, in litt.).

Habitat Destruction and Modification by Typhoons

The Mariana Islands lie in the western North Pacific basin, which is the world's most prolific typhoon basin, with an annual average of 26 named tropical cyclones between 1951 and 2010, depending on the database used (Keener *et al.* 2012, p. 50). Typhoons are seasonal, occurring more often in the summer, and tend to be more intense during El Niño years (Gualdi *et al.* 2008, pp. 5,205, 5,208, 5,226). In May 2015, Typhoon Dolphin passed between Guam and Rota, initiating a disaster declaration by the Federal Emergency Management Agency (FEMA) for Guam and by the CNMI Governor for the island of Rota (FEMA 2015a, in litt.). Then, in August 2015, Typhoon Soudelor slammed directly into Saipan destroying buildings and downing trees and power lines, thus initiating a second major disaster declaration for the Mariana Islands this year (FEMA 2015b, in litt.). Additionally, in 2013, one of the strongest typhoons ever recorded (Typhoon Haiyan) passed just south of the Marianas and struck the Philippines. Between 2002 and 2005, three typhoons (Typhoon Chataan (2002), Typhoon Tingting (2004), and Typhoon Nabi (2005)) and two super typhoons (Super Typhoon Pongsona (2002) and Super Typhoon Chaba (2004)) struck the Mariana Islands (FEMA 2014, in litt.). In the previous 20 years (between 1976 and 1997), only eight typhoons reached the island chain that caused damage warranting FEMA assistance (FEMA 2014, in litt.).

Typhoons may cause destruction of native vegetation and open the native canopy, thus modifying the availability of light, and creating disturbed areas conducive to invasion by nonnative pest species and nonnative plant species that compete for space, water, and nutrients, and alter basic water and nutrient cycling processes. This process leads to decreased growth and reproduction for all 14 plant species addressed in this final rule (see Table 3, above), and for the host plants (*Procris pendunculata, Elatostema calcareum,* and *Maytenus thompsonii*) for the 2 butterfly species (Perlman 1992, 9 pp.; Kitayama and Mueller-Dombois 1995, p. 671). Additionally, typhoons initiate a large pulse in the accumulation of debris and often trigger landslides with large debris flows (Lugo 2008, pp. 368, 372), as well as induce defoliation and wind-thrown trees, which can create conditions favorable to wildfires or result in the direct damage or destruction of individuals of the 14 plant species addressed in this final rule. Further, typhoon frequency globally may decrease; however, there may be some regional increases (*e.g.,* in the western north Pacific), with an increase in the frequency of higher intensity events due to climate change (Emanuel *et al.* 2008, p. 361).

Typhoons are a natural occurrence in the Pacific Islands, and the native species here have coevolved with such natural disturbances. However, when species have become greatly reduced in numbers or distribution due to other factors, even a natural disturbance can constitute a significant threat, and can result in local extirpation or even extinction. Typhoons pose a threat to the nine animal species listed as endangered species in this rule, because the associated high winds may dislodge larvae, juveniles, or adult individuals from their host plants, caves, or streams, thereby increasing the likelihood of mortality caused by lack of essential nutrients for proper development; increase their exposure to predators (*e.g.,* rats, brown treesnake, monitor lizards, ants) (see ''*Factor C. Disease and Predation,''* below); destroy host plants; open up the canopy and alter the microclimate; or cause direct physical damage or mortality. Damage by subsequent typhoons could further decrease the remaining native plant-dominated habitat areas, and the associated food resources, that support the nine animal species. For plant and animal species that persist only in low numbers and restricted ranges, such as the 23 Mariana Islands species addressed here, natural disasters, such as typhoons, can be particularly devastating (Mitchell *et al.* 2005, p. 4–3). Although typhoons would not normally be considered a threat to native species, in cases such as these the species are vulnerable due to reductions in abundance and range as a consequence of other threat factors.

Habitat Destruction and Modification by Climate Change

Our analyses under the Act include consideration of ongoing and projected changes in climate. The terms ''climate'' and ''climate change'' are defined by the Intergovernmental Panel on Climate Change (IPCC). ''Climate'' refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (Le Treut *et al.* 2007, p. 96). The term ''climate change'' thus refers to a change in the mean or variability of one or more measures of climate (*e.g.,* temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (Le Treut *et al.* 2007, p. 104). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative, and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (*e.g.,* habitat fragmentation) (IPCC 2007, pp. 8–14, 18).

Climate change will be a particular challenge for the conservation of biodiversity because the introduction and interaction of additional stressors may push species beyond their ability to survive (Lovejoy 2005, pp. 325–326). The synergistic implications of climate change and habitat fragmentation are the most threatening facet of climate change for biodiversity (Hannah *et al.* 2005, p. 4). The magnitude and intensity of the impacts of global climate change and increasing temperatures on native Mariana Island ecosystems are unknown. Currently, there are no climate change studies that specifically address impacts to the specific Mariana Island ecosystems discussed here or any of the 23 individual species addressed in this final rule that are associated with these ecosystems. There are, however, climate change studies that address potential changes in the tropical Pacific on a broader scale. Based on the best available information, climate change impacts could lead to the loss of native species that comprise the communities in which the 23 species occur (Pounds *et al.* 1999, pp. 611–612; Still *et al.* 1999, p. 610; Benning *et al.* 2002, pp. 14,246–14,248; Allen *et al.* 2010, pp. 668–669; Sturrock *et al.* 2011, p. 144; Townsend *et al.* 2011, pp. 14–15; Warren 2011, pp. 165–166). In addition, weather regime changes (droughts, floods, typhoons) will likely result from increased annual average temperatures related to more frequent El Niño episodes as hypothesized for other Pacific Island chains (Giambelluca *et al.* 1991, p. iii). Future changes in precipitation and the forecast of those changes are highly uncertain because they depend, in part, on how the El Niño-La Niña weather cycle (a disruption of the ocean atmospheric system in the tropical Pacific having important global consequences for weather and climate) might change (State of Hawaii 1998, p. 2–10). The 23 species listed as endangered or threatened species in this final rule are vulnerable to extinction due to anticipated environmental changes that may result from global climate change, due to their small population size and highly restricted ranges. Environmental changes that are likely to affect these species are expected to include habitat loss or alteration and changes in disturbance regimes (*e.g.,* storms and typhoons).

The range of global surface warming since 1979 is 0.29 degrees Fahrenheit (°F) to 0.32 °F (0.16 degrees Celsius (°C) to 0.18 °C) per decade (Trenberth *et al.* 2007, p. 237). Globally, the annual number of warm nights increased by about 25 days since 1951, with the greatest increase since the mid-1970s (Alexander *et al.* 2006, pp. 7–8). The bulk of the increase in mean temperature is related to a larger increase in minimum temperatures compared to the increase in maximum temperatures (Giambelluca *et al.* 2008, p. 1). Globally averaged, 2012 ranked as the eighth or ninth warmest year since records began in the mid- to late 1800s (Lander and Guard 2013, p. S–11).

To date, climate change indicators specific to the Mariana Islands have not been published; however, data collected on climate change indicators from the Pacific Region, (*e.g.,* the Hawaiian Islands) show that predicted changes associated with increases in temperature include, but are not limited to, a shift in vegetation zones upslope, shifts in animal species' ranges, changes in mean precipitation with unpredictable effects on local environments, increased occurrence of drought cycles, and increases in the intensity and number of hurricanes (*i.e.,* typhoons) (Loope and Giambelluca 1998, pp. 514–515; Emanuel *et al.* 2008, p. 365; U.S. Global Change Research Program (US–GCRP) 2009, pp. 145–149, 153; Keener *et al.* 2010, pp. 25–28; Finucane *et al.* 2012, pp. 23–26; Keener *et al.* 2012, pp. 47–51). It is reasonable to extrapolate these predictions to the Mariana Islands as climate in this area is strongly influenced by the phase of the El Niño Southern Oscillation (ENSO) (Lander and Guard 2013, pp. S192–S194). In addition, weather regime changes (*e.g.,* droughts, floods, and typhoons) will likely result from increased annual average temperatures related to more frequent El Niño episodes in the Mariana Islands (Keener *et al.* 2012, pp. 35–37, 47–51), and elsewhere in the Pacific (Giambelluca *et al.* 1991, p. iii). However, despite considerable progress made by expert scientists toward understanding the impacts of climate change on many of the processes that contribute to El Niño variability, it is not possible to say whether or not El Niño activity will be affected by climate change (Collins *et al.* 2010, p. 391).

As global surface temperature rises, the evaporation of water vapor increases, resulting in higher concentrations of water vapor in the atmosphere, further resulting in altered global precipitation patterns (U.S. National Science and Technology Council (US–NSTC) 2008, pp. 60–61; US–GCRP 2009, pp. 145–146). While annual global precipitation has increased over the last 100 years, the combined effect of increases in evaporation and evapotranspiration is causing land surface drying in some regions leading to a greater incidence and severity of drought (US–NSTC 2008, pp. 60–61; US–GCRP 2009, pp. 145–146). Over the past 100 years, most of the Pacific has experienced an annual decline in precipitation; however, the western North Pacific (*e.g.,* western Micronesia, including the Mariana Islands) has experienced a slight increase (up to 14 percent on some islands) (US–NSTC 2008, p. 63; Keener *et al.* 2010, pp. 53–54). Increases in rain are associated with alterations in faunal breeding systems and increases in disease prevalence, flooding, and erosion (Easterling *et al.* 2000, p. 2,073; Harvell *et al.* 2002, pp. 2,159–2,161; Nearing *et al.* 2004, pp. 48–49). It should be noted that, although the western North Pacific typically experiences large amounts of rainfall annually, drought is a serious concern throughout Micronesia due to limited storage capacity and small groundwater supplies (Keener *et al.* 2012, pp. 49, 58, 119). Future changes in precipitation in the Mariana Islands are uncertain because they depend, in part, on how the El Niño-La Niña weather cycle might change (State of Hawaii 1998, p. 2–10). Long periods of decline in annual precipitation result in a reduction in moisture availability, loss of wet forest, an increase in drought frequency, and a self-perpetuating cycle of invasion by nonnative plants, increasing fire-cycles, and increasing erosion.

Climate modeling has projected changes in typhoon frequency and intensity due to global warming over the next 100 to 200 years (Emanuel *et al.* 2008, p. 360, Figure 8; Yu *et al.* 2010, pp. 1,355–1,356, 1,369–1,370); however, there are no certain climate model predictions for a change in the duration of Pacific tropical cyclone storm season (which generally runs from May through November) (Collins *et al.* 2010, p. 396). A typhoon (as a tropical cyclone is referred to in the Northwest Pacific ocean) is the generic term for a medium- to large-scale, low-pressure storm system over tropical or subtropical waters with organized convection (*i.e.,* thunderstorm activity) and definite cyclonic surface wind circulation (counterclockwise direction in the Northern Hemisphere) (Holland 1993, p. 7, National Oceanic and Atmospheric Administration (NOAA) 2011, in litt.). In the north Pacific Ocean, west of the International Date Line, once a typhoon reaches an intensity of winds of at least 150 mi per hour (65 m per second), it is classified as a super typhoon (Neumann 1993, pp. 1–2; NOAA 2011, in litt.). The high winds and strong storm surges associated with typhoons, particularly super typhoons, have periodically caused great damage to the vegetation of the Mariana Islands.

On a global scale, sea level is rising as a result of 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.). Sea level rose at an average rate of 0.1 in (3.1 mm) per year between 1961 and 2003 (IPCC AR4 2007, p. 30), with a predicted increase in 2100 of 1.6 to 4.6 ft (0.5 to 1.4 m) above the 1990 level (Rahmstorf 2007, p. 368). Seven of the 23 species (5 plants: *Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Heritiera longipetiolata,* and *Nervilia jacksoniae;* and 2 animals: the humped tree snail and the Mariana eight-spot butterfly (indirectly through impacts to its 2 host plants (*Procris pendunculata* and *Elatostema calcareum*)) have individuals that occur close to the coast in the adjacent forest ecosystem at or near sea-level and may be negatively impacted by sea-level rise and coastal inundation due to climate change; however, there is no specific data available on how sea-level rise and coastal inundation will impact these species.

In summary, we conclude that the projected effects of climate change, including increased variability of ambient temperature, precipitation, typhoons, and sea-level rise and inundation would provide additional stresses on the 4 ecosystems and each of the 23 associated species because they are highly vulnerable to disturbance and related invasion of nonnative species, thus exacerbating the current threats to the species. The risk of extinction as a result of such factors increases when a species' range is restricted, its habitat decreases, and its population numbers decline (IPCC 2007, pp. 8–11). These 23 species face this greater risk of extinction due to the loss of redundancy and resiliency created by their limited ranges, restricted habitat requirements, small population sizes, or low numbers of individuals. We therefore conclude these 23 species are vulnerable to the projected environmental impacts that may result from changes in climate and subsequent impacts to their habitats (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). Even natural stochastic events such as typhoons pose a heightened risk under such conditions, since such an event is capable of eliminating all or a significant proportion of remaining individuals of these species. Based on the above information, changes in environmental conditions that result from climate change are likely to negatively impact the 23 species listed as endangered or threatened species in this rule. The projected effects of increasing temperature, and other aspects of climate change on the 23 species may be direct, such as physiological stress caused by increased temperature or lack of moisture, or indirect, such as the modification or destruction of habitat, increased competition by nonnative species, and changes in disturbance regimes that lead to changes in habitat (*e.g.,* fire, increased incidence or intensity of typhoons). The specific and cumulative effects of climate change on each of these 23 species are presently unknown, but we anticipate that these effects, if realized, will exacerbate the current threats to these species.

Conservation Efforts To Reduce Habitat Destruction, Modification, or Curtailment of Its Range

There are no approved Habitat Conservation Plans, Candidate Conservation Agreements, or Strategic Habitat Areas that specifically address these 23 species and threats to their habitat.

In 2012, the Guam Plant Extinction Prevention Program (GPEPP) was formed to address conservation concerns for a select group of native Mariana Islands plant species, including three of the plant species addressed in this final rule: *Heritiera longipetiolata, Maesa walkeri,* and *Psychotria malaspinae.* GPEPP is a partnership between the University of Guam (UOG), multiple Federal agencies (USFWS, DOD, and USDA), Hawaii State DLNR, and the Hawaii Plant Extinction Prevention Program (Hawaii PEPP). The goal of GPEPP is to prevent the extinction of native Mariana Islands plant species that have fewer than 200 individuals remaining in the wild on the island of Guam (GPEPP 2014, in litt.). The group currently has funding limitations, so they are focusing their efforts on tree species. The program's main objectives are to monitor, collect, survey, manage, and reintroduce native plant species in the Mariana Islands. They plan to work with conservation partners to protect wild populations and preserve genetic material (GPEPP 2014, in litt.).

A conservation project on Rota, administered through the Water and Environmental Research Institute of the Western Pacific at the University of Guam, is aimed to analyze the island's hydrology, with the ultimate goal of protection of the Sabana Watershed and Talakhaya Springs (Keel *et al.* 2007, pp. 5, 22–23). Erosion control, revegetation, and water source preservation conducted as part of this project may provide protection to 9 of the 23 species in this final rule that currently or historically occurred on the southern side of the central plateau of Rota (6 plants: *Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Maesa walkeri, Nervilia jacksoniae, Tuberolabium guamense;* 3 animals: The Mariana wandering butterfly, the Rota blue damselfly, and the humped tree snail).

A U.S. Fish and Wildlife Service Biological Opinion (1998) recommended that the Navy fund conservation and recovery projects in the Mariana Islands to improve habitat and population sizes of the federally listed Micronesian megapode as mitigation for bombing activities on Farallon de Medinilla. This resulted in the removal of ungulates from Sarigan, which has improved native habitat that supports two species in this final rule, the humped tree snail and Slevin's skink, by decreasing the impacts of trampling and browsing on native plants. Sarigan may serve as a location for recovery of Slevin's skink and the humped tree snail.

Since 1993, the U.S. Department of Agriculture, Wildlife Services' Brown Treesnake Program in Guam has been working to prevent the inadvertent spread of the snake to other locations, and to reduce negative impacts by the brown treesnake on economic and ecological resources. Experimentation with toxicant drops to control the brown treesnake is ongoing. The U.S. Department of Agriculture, Wildlife Services, is the lead agency for this work, in cooperation with the National Wildlife Research Center, U.S. Geological Survey, the U.S. Fish and Wildlife Service, and the U.S. Department of Defense. Results of the toxicant drops are currently under review (Phillips 2014, in litt.). Additionally, in fiscal year (FY) 2014, the Navy funded $1.8 million in projects to meet objectives for control, suppression, and eradication of brown treesnakes to benefit native species, including the 23 species addressed in this rule, and their habitat. Funding has been programmed to continue this effort through 2021. Also in FY2014 the Navy funded $3.3 million for control and containment to prevent the spread and establishment of brown treesnakes to new areas, including the CNMI where 17 of the 23 species addressed in this final rule occur.

Area 50, a 59-ac (24-ha) exclosure on Andersen AFB on Guam containing a relictual patch of limestone forest, was created to exclude ungulates and the brown treesnake (Hess and Pratt 2006, p. 2). This enclosure was maintained for ecosystem and species experimental research. Several individuals of the tree *Tabernaemontana rotensis* occur within the enclosure, and would benefit from protection from predators and habitat disturbance (Hess and Pratt 2006, p. 7). However, researchers found the enclosure in a state of neglect, and invaded by nonnative plant species and pigs, with only 20 ac (8 ha) of undisturbed primary forest remaining by 2006 (Hess and Pratt 2006, p. 24). We are unaware of any efforts to continue maintenance of this enclosure since that time. In 2014, the Air Force completed the construction of a 306-ac (124-ha) exclosure on Andersen AFB (U.S. Department of Navy (DON) 2014, in litt.); however, through the Joint Guam Program Office (JGPO), the U.S. Navy has proposed a live-fire training range within a large portion of the fenced area. Additionally, this exclosure is a mitigation measure for a previous DOD action (Intelligence, Surveillance, Reconnaissance Strike Project). There are proposed mitigation measures associated with the new live-fire training range, but because they are only proposed at this time they are not included in this final rule. Also in 2014, the Navy also funded a project to examine the distribution and abundance of *Tabernaemontana rotensis* on Joint Regional Marianas (JRM) lands (DON 2014, in litt.).

Rota's Department of Fish and Wildlife constructed exclosures for two occurrences of *Tabernaemontana rotensis* in the Sabana Conservation Area, but only one exclosure remains, as the other burned in a fire (Hess and Pratt 2006, p. 33; 65 FR 35029, June 1, 2000).

The Micronesian Challenge is a commitment by the Federated States of Micronesia, the Republic of Palau, the Republic of the Marshall Islands, Guam, and the CNMI to preserve at least 30 percent of near-shore marine resources and 20 percent of the terrestrial resources across Micronesia by 2020 (Micronesian Challenge 2011, in litt.). The CNMI Government is already attempting to meet this goal by planning to designate conservation lands within native forest (CNMI–SWARS 2010, p. 30). The Micronesian Challenge organization has partnered with many national and international environmental organizations (*e.g.,* The Nature Conservancy, Micronesian Conservation Trust, and the New York Botanical Gardens), and focuses on conservation outreach to native Micronesians and visitors (Micronesian Challenge 2011, in litt.; *http://themicronesiachallenge.blogspot.com/p/links.html*).

Summary of Habitat Destruction and Modification

The threats to the habitats of each of the 23 Mariana Islands species are occurring throughout the entire range of each of the species, except where noted above, with consequent deleterious effects on individuals and populations of these species. These threats include land conversion by agriculture and urbanization, habitat destruction and modification by nonnative animals and plants, fire, the potential alteration of environmental conditions resulting from climate change, and compounded impacts due to the interaction of these threats. While the conservation measures described above address some threats to the 23 species, due to the pervasive and expansive nature of the threats resulting in habitat degradation, these measures are insufficient to eliminate these threats to any of the 23 species addressed in this final rule.

Development and urbanization represents a serious and ongoing threat to 21 of the 23 species because they cause permanent loss and degradation of habitat.

The effects from ungulates are ongoing because ungulates currently occur in all 4 ecosystems that support the 23 species in this final rule. The threat of habitat destruction and modification posed by introduced ungulates is serious, because they cause: (1) Trampling and grazing that directly impacts plants, including 10 of the 14 plant species addressed in this rule, and the 2 host plants used by the Mariana eight-spot butterfly for shelter, foraging, and reproduction; (2) increased soil disturbance, leading to mechanical damage to individuals of 10 of the 14 plant species, and also the host plants for the Mariana eight-spot butterfly; (3) creation of open, disturbed areas conducive to weedy plant invasion and establishment of alien plants from dispersed fruits and seeds, which results over time in the conversion of a community dominated by native vegetation to one dominated by nonnative vegetation; and (4) increased erosion, leading to destabilization of soils that support native plant communities, elimination of herbaceous understory vegetation, and creation of disturbed areas into which nonnative plants invade. The brown treesnake and rats both negatively impact the four ecosystems by eating native animals that native plants rely on to disperse seeds, limiting the regenerative capacity of the native forest. These threats are expected to continue or increase without ungulate control or eradication.

Nonnative plants represent a serious and ongoing threat to 20 of the 23 species addressed in this final rule (all 14 plant species, the Mariana eight-spot butterfly, the Rota blue damselfly, and all 4 tree snails) (see Table 3) through habitat destruction and modification, because they: (1) Adversely impact microhabitat by modifying the availability of light; (2) alter soil-water regimes; (3) modify nutrient cycling processes; (4) alter fire characteristics of native plant habitat, leading to incursions of fire-tolerant nonnative plant species into native habitat; (5) outcompete, and possibly directly inhibit the growth of, native plant species; and (6) create opportunities for subsequent establishment of nonnative vertebrates and invertebrates. Each of these threats can convert native-dominated plant communities to nonnative plant communities (Cuddihy and Stone 1990, p. 74; Vitousek 1992, pp. 33–36). This conversion has negative impacts on all 14 plant species addressed here, as well as the native plant species upon which the Mariana eight-spot butterfly and the Rota blue damselfly depend for essential life-history needs. For example, nonnative plants that outcompete native plants can destabilize streambanks, exacerbating the potential for landslides and rockfalls, in turn dislodging Rota blue damselfly eggs and naiads from streams, and also displace or destroy vegetation used for perching by adults, leaving them more susceptible to predation.

The threat from fire to 11 of the 23 species in this final rule that depend on the savanna ecosystem and adjacent forest ecosystems (9 plant species: *Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Hedyotis megalantha, Maesa walkeri, Nervilia jacksoniae, Phyllanthus saffordii, Tabernaemontana rotensis,* and *Tuberolabium guamense;* and 2 animal species: The Guam tree snail and the humped tree snail) (see Table 3, above) is serious and ongoing because fire damages and destroys native vegetation, including dormant seeds, seedlings, and juvenile and adult plants. After a fire, nonnative, invasive plants, particularly fire-tolerant grasses, outcompete native plants and inhibit their regeneration (D'Antonio and Vitousek 1992, pp. 70, 73–74; Tunison *et al.* 2002, p. 122; Berger *et al.* 2005, p. 38; CNMI–SWARS 2010, pp. 7, 20; JGPO–NavFac, Pacific 2010b, p. 4–33). Successive fires that burn farther and farther into native habitat destroy native plants and animals, and remove habitat for native species by altering microclimatic conditions and creating conditions favorable to alien plants. The threat from fire is unpredictable but increasing in frequency in the savanna ecosystem that has been invaded by nonnative fire-prone grasses, and that is subject to abnormally dry to severe drought conditions.

Natural disasters, such as typhoons, are a threat to native terrestrial habitats on the Mariana Islands in all 4 ecosystems addressed here, and to all 14 plant species identified in this final rule, because they result in direct impacts to ecosystems and individual plants by opening the forest canopy, modifying available light, and creating disturbed areas that are conducive to invasion by nonnative pest plants (Asner and Goldstein 1997, p. 148; Harrington *et al.* 1997, pp. 346–347; Berger *et al.* 2005, pp. 36, 45, 71, 100, 144; CNMI–SWARS 2010, p. 10; JGPO–NavFac, Pacific 2010b, pp. 1–8). In addition, typhoons are a threat to the nine animal species in this rule because strong winds and intense rainfall can kill individual animals, and can cause direct damage to streams (Polhemus 1993, pp. 86–87). High winds and torrential rains associated with typhoons can also destroy the host plants for the two butterfly species, and can dislodge individual butterflies and their larvae from their host plants and deposit them on the ground where they may be crushed by falling debris or eaten by nonnative wasps and ants. In addition, the high winds can dislodge bats from their caves and cause individual harm or death. Typhoons pose an ongoing threat because they are unpredictable and can occur at any time. Although typhoons are a natural occurrence in the Pacific, their impact can be particularly devastating to the 23 species because, as a result of other threats, they now persist in low numbers or occur in restricted ranges and are, therefore, less resilient to such disturbances, rendering them highly vulnerable. In such cases, a particularly destructive super typhoon could potentially drive localized endemic species to extinction in a single event.

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

Plants

We are not aware of any threats to the 14 plant species that would be attributed to overutilization for commercial, recreational, scientific, or educational purposes.

Animals

We are not aware of any threats to five of the nine animal species (the two Mariana butterflies, Pacific sheath-tailed bat, Slevin's skink, or Rota blue damselfly) addressed in this final rule that would be attributed to overutilization for commercial, recreational, scientific, or educational purposes. We do have evidence indicating that collection is a threat to the four tree snail species addressed in this final rule, as discussed below.

Tree Snails—Tree snails can be found around the world in tropical and subtropical regions and have been valued as collectibles for centuries. Evidence of tree snail trading among prehistoric Polynesians was discovered by analysis of the multi-archipelagic distribution of the Tahitian endemic *Partula hyalina* and related taxa (Lee *et al.* 2007, pp. 2,907, 2,910). In their study, Lee *et al.* (2007, pp. 2,908–2,910) found evidence that *P. hyalina* had been traded as far away as Mangaia in the Southern Cook Islands, a distance of more than 500 mi (805 km). The endemic Hawaiian tree snails within the family Achatinellidae were extensively collected for scientific as well as recreational purposes by Europeans in the 18th to early 20th centuries (Hadfield 1986, p. 322). Historically, tree snails were abundant in the Pacific Islands. During the 1800s collectors observed 500 to 2,000 snails per tree, and sometimes collected more than 4,000 snails in several hours (Hadfield 1986, p. 322). Likewise, in the Mariana Islands, Crampton (an early naturalist in the islands) alone took 2,666 adult humped tree snails from 8 sites on Saipan in just 6 days in 1925 (Crampton 1925, p. 100). Repeated collections of hundreds to thousands of individuals at a time by early collectors may have contributed to decreased population sizes and reduction of reproduction potential due to the removal of potential breeding adults (Hadfield 1986, p. 327). The collection of tree snails persists to this day, and the market for rare tree snails serves as an incentive to collect them. A search of the Internet (*e.g.,* eBay and Etsy) reveals Web sites that offer snail shells from more than 100 land and sea snail species (along with corals and sand) from around the world, including rare and listed *Achatinella* and *Partulina.* These sites encourage collectors by making statements such as "These assorted land snail shells from the tropical regions of the world are great for crafters and decorations for tanks" and refer to shells with colorful names such as "rainbow shells from Haiti" (*http://www.shells-of-aquarius.com/snail-shells.html*; *https://www.etsy.com/uk/search?q=tree+snail*). Concerned citizens alert law enforcement of Internet sales and notify the public about illegal sales through personal web blogs (*http://bioacoustics.blogspot.com/2012/04/endangered-species-on-ebay.html*). Over the past 100 years, Mariana species of partulid tree snail shells have been made into jewelry and purses and sold to tourists (Kerr 2013, p. 3). As recent as 2012, jewelry made with partulid shells has been observed in stores in the Mariana Islands (USFWS 2012, in litt.). Based on the history of collection of Pacific island tree snails, the market for Mariana tree snail shells, and the vulnerability of the small populations of the humped tree snail, Langford's tree snail, the Guam tree snail, and the fragile tree snail, we consider collection a threat to the four endemic Mariana tree snail species listed as endangered species in this rule.

Summary of Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

We have no evidence to suggest that overutilization for commercial, recreational, scientific, or educational purposes poses a threat to any of the 14 plant species, 2 butterflies, Pacific sheath-tailed bat, Slevin's skink, or Rota blue damselfly listed as endangered or threatened species in this final rule. We consider the four species of tree snails vulnerable to the impacts of overutilization due to collection for trade or market. Based on the history of collection of Pacific tree snails, the current market for Marianas tree snail shells and tree snail shells world-wide, and the inherent vulnerability of the small populations of the Guam tree snail, the humped tree snail, Langford's tree snail, and the fragile tree snail to the removal of breeding adults, we consider collection to pose a serious and ongoing threat to these species.

Factor C. Disease and Predation

Disease

We are not aware of any threats to the 23 species addressed in this final rule that would be attributable to disease.

Predation and Herbivory

There are multiple animal species, ranging from mammals and rodents to reptiles and insects, reported to impact 17 of the 23 species listed as endangered or threatened species in this final rule by means of predation or herbivory (Table 3). Those species that have the most direct negative impact on the 23 species include: Feral pigs, Philippine deer, rats, the brown treesnake, monitor lizards, Cuban slugs (*Veronicella cubensis*), the manokwari flatworm, the cycad aulacaspis scale, ants (*Tapinoma minutum, Technomyrmex albipes, Monomorium floricola,* and *Solenopsis geminata*), and parasitoid wasps (*Telenomus* sp. and *Ooencyrtus* sp.). Data show these nonnative animals have caused a decline of 17 of the 23 species (Intoh 1986 in Conry 1988, p. 26; Fritts and Rodda 1998, pp. 130–133). Although feral goats, cattle, and water buffalo occur on one or more of the Mariana Islands and are recognized to negatively impact the ecosystems in which they occur (see "*Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range,*" above), we have no direct evidence that goats, cattle, or water buffalo browse specifically on any of the 14 plant species addressed in this final rule.

Ungulates

Pigs—Feral pigs are widely recognized to negatively alter ecosystems (see "Habitat Destruction and Modification by Introduced Ungulates," above). In addition, feral pigs have been observed to eat the leaves, fruits, seeds, seedlings, or bark from 4 of the 14 plant species listed as endangered or threatened species in this final rule (*Cycas micronesica, Heritiera longipetiolata, Psychotria malaspinae,* and *Solanum guamense*) in the forest ecosystem (Perlman and Wood 1994, pp. 135–136; Harrington *et al.* 2012, in litt.; Rogers 2012, in litt.; Marler 2013, pers. comm.). Similarly, on other Pacific islands (*e.g.,* the Hawaiian Islands), pigs are known to eat and fell plants and remove the bark from a variety of native plant species, including *Clermontia* spp., *Cyanea* spp., *Cyrtandra* spp., *Hedyotis* spp., *Psychotria* spp., and *Scaevola* spp. (Diong 1982, p. 144). In addition, evidence of pigs feeding on *Cycas micronesica* has been observed, hypothesized as a means to obtain grubs

(Harrington *et al.* 2012, in litt.). Pigs also eat standing living stems of plants, thought to be for the same intent (Marler 2013, pers. comm.). Feral pigs have been documented to eat the host plants that support the Mariana eight-spot butterfly (*Procris pendunculata* and *Elatostema calcareum*).

In addition to deer imposing negative impacts on habitat at an ecosystem scale in the Mariana Islands on which they occur (primarily Guam and Rota), deer are known to consume leaves, seeds, fruits, and bark of 5 of the 14 plant species (*Cycas micronesica, Eugenia bryanii* (deer are known to consume all Mariana Islands *Eugenia* spp.), *Heritiera longipetiolata, Psychotria malaspinae,* and *Solanum guamense*), and the 2 host plants for the Mariana eight-spot butterfly (Wiles *et al.* 1999, pp. 198–200, 203; Rubinoff and Haines 2012, in litt.).

Other Nonnative Vertebrates

Rats

Rat Predation on Tree Snails—Rats (*Rattus* spp.) have been suggested as responsible for the greatest number of animal extinctions on islands throughout the world, including extinctions of various snail species (Towns *et al.* 2006, p. 88). Rats are known to prey upon Pacific island endemic arboreal snails (Hadfield *et al.* 1993, p. 621). In the Waianae mountains of Oahu, Meyer and Shiels (2009, p. 344) found shells of the endemic Oahu tree snail (*Achatinella mustelina*) with characteristic rat damage (*e.g.,* damage to the shell opening and cone tip), but noted that, since a high proportion of crushed shells could not reliably be collected in the field, the impact of rat predation on snail populations may be underestimated. Rat predation on tree snails has also been observed on the Hawaiian Islands of Lanai (Hobdy 1993, p. 208; Hadfield 2005, in litt, p. 4), Molokai (Hadfield and Saufler 2009, p. 1,595), and Maui (Hadfield 2006, in litt.). Rat populations on Guam may be limited by predation by the brown treesnake, thereby limiting rat predation on native tree snails. Because rats occur in larger numbers on the Mariana Islands to the north of Guam, rat predation is considered a threat to the three tree snail species addressed in this final rule that occur on the other Mariana Islands (the humped tree snail on Rota, Aguiguan, Saipan, Sarigan, Alamagan, and Pagan; the fragile tree snail on Rota; and Langford's tree snail on Aguiguan).

Rat Predation on Bats—Rats may prey on the Pacific sheath-tailed bat, listed as an endangered species in this final rule. Rats are omnivores and are opportunistic feeders. Rats have a widely varied diet consisting of nuts, seeds, grains, vegetables, fruits, insects, worms, snails, eggs, frogs, fish, reptiles, birds, and mammals (Fellers 2000, p. 525; GISD 2014, in litt.). Rats occur on Aguiguan, the only island on which the Pacific sheath-tailed bat is known to roost (Berger *et al.* 2005, p. 144). Rats are predators on young bats at roosts (that are nonvolant, *i.e.,* have not yet developed the ability to fly) (Wiles *et al.* 2011, p. 306). The black rat was determined to be the primary factor in reproductive failure for a maternal colony of Townsend's big-eared bat (*Corynorhinus townsendii*) in California (Fellers 2000, pp. 524–525). Many of the roosting sites used by the Pacific sheath-tailed bat on Aguiguan appear to be impassable to rats; however, this may be due to rats limiting the selection of roosting sites because of their foraging and surveillance for prey in caves (Wiles and Worthington 2002, p. 18; Berger *et al.* 2005, p. 144). Because rats occur on all of the Mariana Islands, the Service considers rats a threat to the Pacific sheath-tailed bat.

Rat Predation on Skinks—Rats are known to prey on a variety of skink species around the globe (Crook 1973 in Towns *et al.* 2001, p. 3; Whitaker 1973 in Towns *et al.* 2001, p. 3; McCallum 1986 in Towns *et al.* 2001, p. 3; Towns *et al.* 2001, pp. 3–4, 6–8; Towns *et al.* 2006, pp. 875–877, 883). A New Zealand study showed the cause of the decline of rare reptiles on island reserves became evident through associations with the spread of Pacific rats (*Rattus exulans*) to these island reserves (Crook, 1973; Whitaker, 1973, 1978; and McCallum, 1986 in Towns *et al.* 2001, p. 3). Other restoration projects in New Zealand have demonstrated the native reptile populations undergo a resurgence following aggressive conservation activities to control predatory mammals, especially rodents (Towns *et al.* 2001, p. 3). The reptile species showing the most rapid response to removal of rats was the shore skink (*Oligosoma smithi*), with an increase of the capture frequency of shore skinks by up to 3,600 percent over 9 years (Towns 1994, unpub. in Towns *et al.* 2001, p. 10). Rats occur on all of the Mariana Islands and are a threat to the Slevin's skink on the islands on which it currently occurs (Cocos Island, Alamagan, and Sarigan), and are a threat on islands where the skink was observed in the 1980s and 1990s (Guguan, Pagan, and Asuncion) but for which their current status is unknown. Once thought to be extirpated from Cocos Island (just offshore of Guam), Slevin's skink was observed on Cocos Island for the first time in more than 20 years following the eradication of rats and monitor lizards (Fisher 2012 pers. comm., in IUCN 2014, in litt.), indicating that predation by these nonnative species has a significant negative effect on skink populations.

Brown Treesnake

The brown treesnake (see ''Habitat Destruction and Modification by Introduced Small Vertebrates,'' above) preys upon a wide variety of animals, and although it is only known to occur on Guam at this time, it is an enormous concern that the brown treesnake will be introduced to other Mariana Islands (The Brown Treesnake Control Committee 1996, pp. 1, 5; USFWS–Brown Treesnake Strategic Plan 2015, pp. 1–85). This nocturnal arboreal snake occupies all ecosystems on Guam, and consumes small mammals and lizards, usually in their neonatal state (Rodda and Savidge 2007, pp. 307, 314). The brown treesnake is attributed with the extirpation, or contribution thereof, of 13 of Guam's 22 native bird species. Roosting and nesting birds, eggs, and nestlings are all vulnerable. If the brown treesnake establishes on any other of the Mariana Islands it will impose a wide range of negative impacts, both environmental and economic (Campbell 2014, pers. comm.).

Brown Treesnake Predation on Bats—The brown treesnake has the potential to prey on fruit bats and the Pacific sheath-tailed bat, as brown treesnake are known to climb in caves and prey on Mariana swiftlets. Predation by treesnakes possibly caused losses of sheath-tailed bats in southern Guam in the 1950s and 1960s, but invaded northern Guam too late to have played a role in the bat's extirpation there (Wiles *et al.* 2011, p. 306). If the brown treesnake should be introduced to Aguiguan, the only island in the Mariana archipelago that currently supports a population of the Pacific sheath-tailed bat, it would negatively affect this population, either by predation or by limiting available cave sites (Rodda and Savidge 2007, p. 307). Additionally, if the BTS is introduced to islands in the Mariana archipelago that historically supported the Pacific sheath-tailed bat (*i.e.,* Guam, Rota, Saipan, Tinian, Anatahan, and Maug), recovery for this species will be difficult, and the Service considers the brown treesnake a potential threat to the Pacific sheath-tailed bat on these islands.

Brown Treesnake Predation on Skinks—The brown treesnake is known to prey on a wide variety of small vertebrates on Guam, including skinks. Juvenile brown treesnake are known to feed exclusively on lizards (including skinks) (Savidge 1988, in Rodda and Savidge 2007, pp. 314–315). In one study, 250 food items were taken from the digestive systems of brown treesnake, and of these, 194 were lizards or lizard eggs (Savidge 1988 cited in Rodda and Fritts 1992, p. 166). If the brown treesnake is introduced to any of the islands that currently (Cocos Island, Alamagan, and Sarigan) or historically (Guam, Rota, Tinian, Aguiguan, Guguan, and Pagan) support the Slevin's skink, it will negatively impact by decreasing populations and the numbers of individuals, and when combined with habitat loss, and other threats, could lead to their extirpation. Additionally, if the brown treesnake is introduced to islands where the Slevin's skink occurred historically (Guam, Rota, Tinian, Aguiguan, Guguan, and Pagan), recovery for this species will be difficult, and the Service considers the brown treesnake a potential threat to the Slevin's skink on these islands.

Monitor Lizard

Monitor Lizard Predation on Bats—The monitor lizard (hilitai, *Varanus indicus*), a carnivorous, terrestrial, arboreal lizard that can grow up to 3 ft (1 m) in length, is present on every island in the Mariana Islands except for Farallon de Medinilla, Guguan, Asuncion, Maug, and Uracas (Vogt and Williams 2004, pp. 76–77). It is unknown when the monitor lizard was introduced to Guam and the Northern Mariana Islands; however, it is known that the presence of this species in the islands predates European contact (Vogt and Williams, p. 77). Monitor lizards typically hunt over large areas and feed frequently on a wide variety of prey including, but not limited to, crabs, snails, snakes, lizards, skinks, fish, rats, squirrels, rabbits, sea turtle eggs, and birds (Losos and Greene 1988, pp. 379, 393; Bennet 1995 in ISSG–GISD 2007, in litt.). In the Mariana Islands, monitor lizards prey on both invertebrates and vertebrates, including large animals like chickens and the endangered Micronesian megapode (Martin *et al.* 2008 in IUCN 2007, in litt.). Considering their varied diet, which includes small vertebrates, and given the opportunity, predation by monitor lizards is a threat to the Pacific sheath-tailed bat listed as an endangered species in this rule, in the forest and cave ecosystems (USDA–NRCS 2009, p. 8).

Monitor Lizard Predation on Skinks—Monitor lizards are known to prey on all life stages of lizards (eggs, juveniles, and adults), and also other monitor lizards; therefore, we expect that monitor lizards negatively impact the Slevin's skink as well (Rodda and Fritts 1992, pp. 166–174; Vogt 2010, in litt.). The specific reasons for the decline of Slevin's skink (currently known from only 3 of the 10 islands where occurrences have been noted) are not known. Rodda *et al.* (1991) suggest that the combination of introduced species such as rats and shrews and other reptiles negatively impact native reptile populations, including Slevin's skink, by aggressively competing for habitat and food resources, and through predation (see ''Rat Predation on Skinks,'' above) (Rodda *et al.* 1991 in Berger *et al.* 2005, pp. 174–175). The monitor lizard is known to have a varied diet (coconut crabs, snails, snakes, lizards, skinks, fish, rats, sea turtle eggs, and birds) (Berger *et al.* 2005, pp. 69–70, 90, 347–348; Losos and Greene 1988, pp. 379, 393; Bennet 1995 in ISSG–GISD 2007, in litt.; Cota 2008, pp. 18–27); therefore, predation of Slevin's skink by monitor lizards is a threat to the Slevin's skink throughout its range in the Mariana Islands.

Nonnative Fish Predation on Damselflies

A survey of the Okgok River (or Okgok Stream, also known as Babao), conducted in 1996, showed that only four fish species (all native species) were present: The eel *Anguila marmorata,* the mountain gobies *Stiphodon elegans* and *Sicyopus leprurus,* and the flagtail or mountain bass, *Kuhlia rupestris.* Other freshwater species observed included a prawn, shrimps, and gastropods (Camacho *et al.* 1997, pp. 8–9). Densities of these native fish were low, especially in areas above the waterfall. Gobies can maneuver in areas of rapidly flowing water by using ventral fins that are modified to form a sucking disk (Ego 1956, in litt.). Freshwater gobies in Hawaii are primarily browsers and bottom feeders, often eating algae off rocks and boulders, with midges and worms being their primary food items (Ego 1956, in litt.; Kido *et al.* 1993, p. 47). The flagtails were abundant only in the lower reach of the stream. We can only speculate that the Rota blue damselfly may have adapted its behavior to avoid the benthic feeding habits of native fish species.

Nonnative fish (*Gambusia* spp.) were introduced to Guam streams for mosquito control. Other nonnative fish from the aquarium trade (*e.g.,* guppies, swordtails, mollies, betta, oscars, and koi) have been released and documented in Guam streams. Currently, none of these fish are known from the Okgok River (Okgok Stream, Babao) on Rota, but biologists believe that *Gambusia* and guppies would be the most likely species to be introduced (Tibbatts 2014, in litt.). The release of aquarium fish into streams and rivers of Guam is well documented, but currently, no nonnative fish have been found in the Rota stream (Tibbatts 2014, in litt.). Therefore, release of nonnative fish is only a potential threat at this time, as they could impact the Rota blue damselfly by eating the naiad life stage, interrupting its life-cycle, and leading to its extirpation.

Nonnative Invertebrates

Slug Herbivory on Native Plants—The nonnative Cuban slug (*Veronicella cubensis*) is considered one of the greatest threats to native plant species on Pacific Islands (Robinson and Hollingsworth 2006, p. 2). The Cuban slug is a recent introduction to the Micronesian islands. These terrestrial mollusks are generalist feeders, and can attack a wide variety of plants, and switch food preferences if potential food plants change (Robinson and Hollingsworth 2006, p. 2). Slugs feed on the two host plants (*Elatostema calcareum* and *Procris pendunculata*) that support the Mariana eight-spot butterfly, being listed as endangered in this final rule. The Cuban slug has been known on Rota since 1996, occurs in large numbers, and is currently a pest to agricultural and ornamental crops on the island (Badilles *et al.* 2010, pp. 2, 4, 8). Some agricultural losses are reported to be as high as 70 percent of the crop (Badilles *et al.* 2010, p. 7). In addition, these slugs are known to attack orchids, which place all four species of orchids listed as threatened species in this final rule (*Bulbophyllum guamense, Dendrobium guamense, Nervilia jacksoniae,* and *Tuberolabium guamense*) at risk from slug predation on the islands of Guam and Rota (Badilles *et al.* 2010, p. 7; Cook 2012, in litt.).

Flatworm Predation on Tree Snails—The extinction of native land snails on several Pacific Islands has been attributed to the terrestrial manokwari flatworm (*Platydemus manokwari;* also known as the New Guinea flatworm), native to western New Guinea (Cowie 2001, p. 120; Sugiura and Okochi 2006, p. 700; Sugiura 2010, p. 1,499; Global Invasive Species Database (GISD)–Invasive Species Specialist Group (ISSG)–International Union for Conservation of Nature (IUCN)1,499; GISD–ISSG–IUCN Species Survival Commission 2010, in litt.; Cowie 2014, in litt.; Fiedler 2014, in litt.; Hopper

2014, in litt.; Commonwealth Agricultural Bureau International (CABI–Invasive Species Compendium 2015, in litt.). It is believed to occur on most of the southern Mariana Islands, and was first observed on Guam in 1978 (Hopper and Smith 1992, pp. 78, 82–83; Berger *et al.* 2005, p. 158). In many areas, the flatworm was initially introduced intentionally for the purpose of controlling the nonnative giant African snail (*Achatinella fulica*); it was found to be effective in reducing the abundance of the giant African snail by as much as 95 percent (Hopper and Smith 1992, p. 82). This flatworm has diminished numbers of two nonnative predatory snails, the rosy wolf snail (*Euglandina rosea*) and *Gonaxis* spp., both of which are widely recognized as significant contributors to the overall decline in tree snails throughout the Pacific (Hadfield 1986, pp. 325–330; Cowie 1992, p. 171; Hopper and Smith 1992, p. 78; Kerr 2013, pp. 5–6). Some snail experts propose that, due to the presence of the manokwari flatworm, these two nonnative snails are no longer a threat to the Mariana Islands tree snails (Kerr 2013, p. 5). However, other snail experts are not so quick to discount the possible future impacts of these two predators (Cowie 2014, in litt.). The manokwari flatworm is highly invasive and preys on live snails of any species (Sugiura *et al.* 2006, p. 700, and references therein), and thus poses a significant threat to all endemic snails of the Mariana Islands.

The manokwari flatworm is capable of spreading easily to new geographic areas through inadvertent introductions and despite agricultural controls and regulations. First discovered in New Guinea in 1962, it is now found in Australia, Japan, Indonesia, the Caribbean (Puerto Rico), and numerous Pacific Islands (*e.g.,* Fiji, Tahiti, Singapore, Samoa, Philippines), including the Mariana Islands. It is known to occur on Guam, Rota, Tinian, Saipan, and Aguiguan (Hopper and Smith 1992, p. 77; ISSG–GISD 2015, in litt.). Its propensity to spread through inadvertent introduction is illustrated by recent discoveries of the manokwari flatworm in both France (Justine *et al.* 2015, p. 2) and the mainland United States in Florida (Justine *et al.* 2015, p. 1).

The manokwari flatworm exhibits remarkable fecundity. In laboratory studies, individuals reached sexual maturity just 3 weeks after hatching, and the time period from copulation to cocoon-laying ranged from 2 to 40 days, at which time a single cocoon is produced (Kaneda *et al.* 1990, p. 526). Cocoon-laying usually occurred at 7- to 10-day intervals, with some adults over 200 days old still capable of laying (Kaneda *et al.* 1990, p. 526). Each cocoon produced 3 to 9 juveniles, with a mean number of 5 (Kaneda *et al.* 1990, p. 526). Adequately fed adults lived up to 2 years, and starved adults lived up to 1 year (Kaneda *et al.* 1990, p. 526). Additionally, manokwari flatworms are very fragile and may fragment into pieces, with each piece having the potential to regenerate into a complete flatworm (Kaneda *et al.* 1990, p. 526).

In contrast, partulid snails are generally slow-growing, long-lived, and slow-reproducing land snails (Cowie 1992, p. 194). Partulids can live up to 5 years and reach maturity at approximately 1 year, or a little less, in age (Murray and Clark 1966 pp. 1,264–1,277; Cowie 1992, p. 174). Partulids produce their first offspring between 16 and 24 months of age, and give birth to a single juvenile on average about every 20 days thereafter (Murray and Clark 1966 pp. 1,264–1,277; Cowie 1992, p. 174). These differences in life-history characteristics place the endemic partulid snails at a disadvantage, as the predatory manokwari flatworm can quickly reproduce in large numbers and overwhelm the small numbers of remaining tree snails.

The manokwari flatworm can be found on the ground as well as meters up in native trees and is more active during rain events (Hopper 2014, in litt.). This flatworm is known to feed on juvenile and adult partulid snails (Hopper and Smith 1992, p. 82; Iwai *et al.* 2010, pp. 997–1,002; Sugiura 2010, pp. 1,499–1,507; Hopper 2014, in litt.). Studies of captive partulids at the UOG Marine Laboratory showed that a single manokwari flatworm consume four to five adult snails over a single week, averaging one killed and consumed every other day (Hopper 2014, in litt.). The manokwari flatworm is able to track snails based on chemical cues in their mucus trails, and can discriminate between, and show a preference for, particular snail species (Iwai *et al.* 2010, p. 1,000). Controlled experiments in the Ogasawara Islands demonstrated flatworm predation on 50 percent of the snails available in the test area within 3 days, and 90 percent snail mortality due to predation within 11 days (Sugiura *et al.* 2006, p. 702). The manokwari flatworm is considered a highly effective predator on Mariana Partulidae, of all age classes, and likely all other native and nonnative terrestrial snails (Hopper 2014, in litt.). Hopper (2014, in litt.) asserts that the manokwari flatworm is the most important threat to tree snails since it occurs in native forests as well as nonnative and disturbed forest. Fiedler (2014, in litt.) describes tree snails on Guam as occurring in proximity to sources of fresh water (river, ponds, or near surface ground water) and high humidity, which are also conditions ideal for the predatory manokwari flatworm, and notes that the flatworm has been observed at nearly every location where partulid snails occur on Guam.

There are no known natural enemies of the manokwari flatworm, and no biological controls that would not also kill the four tree snails. One exception is that hot water has been suggested as a physical control, after laboratory studies showed that the temperature of water required to kill flatworms (109 °Fahrenheit (F) (43 °Celsius (C))) is lower than the temperature to kill snails (122 °F (50 °C)) (Sugiura 2008, p. 207); however, we are unaware of this method being implemented in the field. This method is employed during the quarantine of ornamental plants in some areas (Sugiura 2008, p. 207). It is unknown if the temperature that kills flatworms may harm the reproductive or other necessary biological functions of snails, even though it does not kill them.

In summary, the manokwari flatworm's arboreal habits, voracious appetite, and high fecundity make this predator a very harmful invasive species (GISD–ISSG 2010, in litt.). The IUCN Invasive Species Specialist Group has named the manokwari flatworm to its list of *100 of the World's Worst Invasive Alien Species* (ISSG 2004, pp. 6–7). As referenced above, the manokwari flatworm is already credited with the extinction of several island endemic snail species. Due to its widespread occurrence on the southern Mariana Islands, and the risk of unintentional introduction on the northern Mariana Islands, predation by the manokwari flatworm is considered a threat to all four tree snail species (the Guam tree snail, the humped tree snail, Langford's tree snail, and the fragile tree snail) listed as endangered species in this final rule. These four snails are also experiencing habitat loss due to development, habitat degradation by nonnative plants and animals, predation by rats, and threats associated with low heterozygosity. As populations of the tree snails have been reduced in both number and distribution, they are also vulnerable to negative impacts resulting from future climate change and typhoons.

Scale Herbivory on Cycas—Cycas micronesica is currently declining on two (Guam and Rota) of the five Micronesian islands on which it occurs due to the presence of a phytophagous (plant-eating) insect, the cycad aulacaspis scale (*Aulacaspis yasumatsui*) (Marler and Lawrence 2012, pp. 238–240; Marler 2012, pers. comm.). The cycad aulacaspis scale, first described in Thailand (Takagi 1977 in Marler and Lawrence 2012, p. 233), was unintentionally introduced into the United States (Florida) a little more than 20 years ago (Howard *et al.* 1999 in Marler and Lawrence 2012, p. 233), subsequently spreading to other regions. It was introduced to Guam in 2003, possibly via importation of the landscape cycad, *Cycas revoluta* (Marler and Lawrence 2012, p. 233). By 2005, the cycad aulacaspis scale had spread throughout the forests of Guam. Although this scale has infested *C. micronesica* populations on Guam, Rota, and the larger islands of Palau, most of the data has been collected on Guam, where more than 50 percent of the total known *Cycas* individuals occur (Marler 2012, pers. comm.). In 2002, prior to the scale infestation, *C. micronesica* was the most abundant tree species on Guam (Donnegan *et al.* 2002, p. 16). At an international meeting of the Cycad Specialist Group in Mexico in 2005, the cycad aulacaspis scale was identified as a critical issue for cycad conservation worldwide and was given priority status (IUCN/Species Survival Commission Cycad Specialist Group 2014, in litt.).

The cycad aulacaspis scale attacks every part of the leaf, which subsequently turns white. The leaf then collapses, and with progressive infestation, death of the entire plant can occur in less than 1 year (Marler and Muniappan 2006, pp. 3–4). Field studies conducted on the Guam National Wildlife Refuge on Guam by Marler and Lawrence (2012, p. 233) between 2004 and 2011 found that 6 years after the cycad aulacaspis scale was found on the refuge, mortality of *C. micronesica* there had reached 92 percent. The scale first killed all seedlings at their study site, followed by the juveniles, then most of the adult plants. The cycad aulacaspis scale is unusual in that it also infests the roots of its host plant at depths of up to 24 in (60 cm) in the soil (University of Florida 2014, in litt.). Marler and Lawrence (2012, pp. 238, 240) predict that if the predation by cycad aulacaspis scale is unabated, it will cause the extirpation of *C. micronesica* from western Guam by 2019.

Nonnative specialist arthropods like the cycad aulacaspis scale are particularly harmful to native plants when introduced to small insular oceanic islands because the native plants lack the shared evolutionary history with arthropods and have not developed resistance mechanisms (Elton 1958 in Marler and Lawrence 2012, p. 233), and the nonnative arthropods are not constrained by the natural pressures or predators of their native range (Howard *et al.* 1999, p. 26; Keane and Crawely 2002 in Marler and Lawrence 2012, p. 233). In addition, *C. micronesica* is the sole native host of the cycad aulacaspis scale on Guam, which raises concerns to biologists who predict that the extirpation of *C. micronesica* from Guam will bring about negative cascading ecosystem responses and manifold ecological changes (Marler and Lawrence 2012, p. 233). Because this scale spread to Rota in 2006 (Moore *et al.* 2006, in litt.), and the larger islands of Palau in 2008 (Marler in Science Daily 2012, in litt.), the same degree of negative impact to *C. micronesica* in these areas is likely to occur.

As shown in other case studies worldwide, the scale insects are known to spread rapidly, within a few months, from the site of introduction (University of Florida 2014, in litt.). Although the scale is present on the larger islands of Palau, it has not yet reached the numerous smaller Rock Islands, where more than 1,000 individuals of *C. micronesica* are estimated to occur. As scales can be wind dispersed, it could be a short amount time for infestation in the Rock Islands, as shown by its rapid spread throughout Florida between 1996 and 1998 (Marler 2014, in litt.; University of Florida 2014, in litt). The Rock Islands are a popular tourist destination, and the scale could also be inadvertently transported on plant material and soils (International Coral Reef Action Network (ICRAN) 2014, in litt.). Yap is an intermediate stop-over point for those traveling between Guam and Palau. *Cycas micronesica* on Yap are also considered at risk as scales can be spread by wind dispersal and on transportation of already infested plant material and soil; and because of the rapidity with which it spreads (ISSG–GISD 2014, in litt.; University of Florida 2014, in litt.). In addition, three other insects (a nonnative butterfly (*Chilades pandava*), a nonnative leaf miner (*Erechthias* sp.), and a native stem borer (*Dihammus marianarum*), opportunistically feed on *C. micronesica* weakened by the cycad aulacaspis scale, compounding its negative impacts (Marler 2013, pp. 1,334–1,336).

Scales, once established, require persistent control efforts (Gill 2012, in litt.; University of Florida 2014, in litt.). Within the native range of the scale in southeast Asia, cycads are not affected, as the scale is kept in check by native predators; however, there are no predators of the scale in areas where it is newly introduced (Howard *et al.* 1999, p. 15). Release of biocontrols has been attempted to abate the scale infestation; however, these were unsuccessful: *Rhyzobius lophanthae* in 2004, which established immediately; *Coccobius fulvus* in 2005, which did not establish; and *Aphytis lignanensis* in 2012, which died in the laboratory prior to release (Moore *et al.* 2006, in litt.). *Rhyzobius lophanthae* prolonged the survival of many *Cycas* trees during the first 6 years of scale infestation; however, with time, the size difference between the scale and *R. lophanthae* proved to be a problem when it was observed that the scale could find locations on the *Cycas* plant body that the predator (*R. lophanthae*) could not access (Marler and Moore 2010, p. 838). Even with this biocontrol, *Cycas micronesica* populations are still declining and no reproduction has been observed on Guam since 2005 (Moore *et al.* 2006, in litt.).

Ant Predation on Butterflies—Four species of nonnative ants have been observed to prey upon the Mariana eight-spot butterfly (Schreiner and Nafus 1996, p. 3), and are believed to also negatively impact the Mariana wandering butterfly, the two butterfly species listed as endangered species in this final rule: (1) Dwarf pedicel ants (*Tapinoma minutum*); (2) tropical fire ants (*Solenopsis geminata*); (3) white-footed ants (*Technomyrmex albipes*); and (4) bi-colored trailing ants (*Monomorium floricola*). These ants eat the butterfly eggs (Schreiner and Nafus 1996, p. 3; Rubinoff 2014, in litt.). Many ant species are known to prey on all immature stages of Lepidoptera and can completely exterminate populations (Zimmerman 1958). In a 1-year study, Schreiner and Nafus (1996, pp. 3–4) found predation by nonnative ants to be one of the primary causes of mortality (more than 90 percent) in the Mariana eight-spot butterfly. These four ant species occur on the islands of Guam, Rota, and Saipan, which support the two butterfly species. Biologists observed high mortality of the instar larval stages of the Mariana eight-spot butterfly (Schreiner and Nafus 1996, pp. 2–4), for unknown reasons, but this, compounded with predation of eggs by ants, negatively impacts both the Mariana eight-spot butterfly and the Mariana wandering butterfly.

Parasitic Wasp Predation on Butterflies—Two native parasitoid wasps, *Telenomus sp.* (no common name) and *Ooencyrtus* sp. (no common name), are known to lay their eggs in eggs of native Mariana Islands Lepidoptera species (Mariana eight-spot butterfly (Guam and Saipan) and

Mariana wandering butterfly (Guam and Rota) (Schreiner and Nafus 1996, pp. 2–5). These wasps are tiny and likely hitch-hiked with adult female butterflies in order to access freshly laid eggs, as has been observed in related species (Woelke 2008, pp. 1–27). These wasps negatively impact the Mariana eight-spot and Mariana wandering butterflies because they lay their own eggs within the butterfly eggs, thus preventing caterpillar development. Habitat destruction and loss of host plants, along with continued parasitism, act together to negatively affect populations and individuals of the Mariana eight-spot butterfly and the Mariana wandering butterfly. These parasitoid wasps occur on the three islands (Guam, Rota, and Saipan) that support the Mariana eight-spot butterfly and the Mariana wandering butterfly listed as endangered species in this final rule.

Conservation Efforts To Reduce Disease or Predation

Conservation efforts to reduce predation are the same as those mentioned under Factor A. *Habitat Destruction, Modification, or Curtailment of Its Range* (see ''Conservation Efforts to Reduce Habitat Destruction, Modification, or Curtailment of Its Range,'' above). Additionally, there have been five fenced 1-ac (0.5-ha) exclosures erected on Tinian as of 2013, each planted with 1,000 individuals of mature *Cycas micronesica* (DON 2014, in litt.). Precautions were taken to ensure plantings had broad genetic representation. Cycads within these exclosures actively managed to ensure health and survival. Funding has been programmed to support this project through 2020. Tinian was selected for these exclosures since the scale does not occur on this island.

Summary of Disease and Predation

We are unaware of any information that indicates that disease is a threat to any of the 23 species addressed in this final rule.

Although conservation measures are in place in some areas where one or more of the 23 Mariana Islands species occurs, our information does not indicate that they are ameliorating the threat of predation described above. Therefore, we consider predation and herbivory by nonnative animal species (pigs, deer, rats, brown treesnakes, monitor lizards, slugs, flatworms, ants, and wasps) to pose an ongoing threat to 17 of 23 species addressed in this final rule (see Table 3, above) throughout their ranges for the following reasons:

(1) Observations and reports have documented that pigs and deer browse and trample 5 of the 23 plant species (*Cycas micronesica, Eugenia bryanii, Heritiera longipetiolata, Psychotria malaspinae,* and *Solanum guamense*), and the host plants of the Mariana eight-spot butterfly, addressed in this rule (see Table 3), in addition to studies demonstrating the negative impacts of ungulate browsing and trampling on native plant species of the islands (Spatz and Mueller-Dombois 1973, p. 874; Diong 1982, pp. 160–161; Cuddihy and Stone 1990, p. 67).

(2) Nonnative rats, snakes, flatworms, and monitor lizards prey upon one or more of the following six animal species addressed in this final rule: The Pacific sheath-tailed bat, Slevin's skink, and the four tree snails.

(3) Ants and wasps prey upon the eggs and larvae of the two butterflies, the Mariana eight-spot butterfly and Mariana wandering butterfly.

(4) Nonnative slugs cause mechanical damage to plants and destruction of plant parts (branches, fruits, and seeds), including orchids, and are considered a threat to 4 of the 14 plant species in this rule (*Bulbophyllum guamense, Dendrobium guamense, Nervilia jacksoniae,* and *Tuberolabium guamense*).

(5) *Cycas micronesica* is currently preyed upon by the cycad aulacaspis scale on three of the five Micronesian islands (Guam, Rota, and Palau) on which it occurs (Hill *et al.* 2004, pp. 274–298; Marler and Lawrence 2012, p. 233; Marler 2012, pers. comm.). This scale has the ability to severely impact or even extirpate *C. micronesica* throughout its range if not abated.

These threats are serious and ongoing, act in concert with other threats to the species and their habitats, and are expected to continue or increase in magnitude and intensity into the future without effective management actions to control or eradicate them.

Factor D. The Inadequacy of Existing Regulatory Mechanisms

The Mariana Islands encompass two different political entities, the U.S. Territory of Guam and the U.S. Commonwealth of the Northern Mariana Islands, and issues regarding existing regulatory measures for each entity are discussed in separate paragraphs below.

U.S. Territory of Guam

We are aware of regulatory measures regarding conservation of natural resources established by the Government of Guam. Under Guam Annotated Rules (GAR) Title 9–Animal Regulations (9 GAR–Animal Regulations), there are two divisions: (1) Division 1: Care and Conservation of Animals, and (2) Division 2: Conservation, Hunting and Fishing Regulations (*www.guamcourts.com*, accessed February 9, 2014). Division 1 addresses the importation of animals, animal and zoonotic disease control, commercial quarantine regulations, and plant and non-domestic animal quarantine; however, there is no documentation as to what extent this regulation is enforced. Division 2 Chapter 63 covers fish, game, forestry, and conservation. Article 2 (sections 63201 through 63208) describe authorities under the Endangered Species Act of Guam (Guam ESA). This Article vests regulatory power in the Guam Department of Agriculture. The Guam ESA prohibits, with respect to any threatened or endangered species of plants or wildlife of Guam and the United States: (1) Import or export of any such species to or from Guam and its territory; (2) take of any such species within Guam and its territory; (3) possession, processing, selling or offering for sale, delivery, carrying, transport, or shipping, by any means whatsoever, any such species; provided that any person who has in his possession such plants or wildlife at the time this provision is enacted into law, may retain, process, or otherwise dispose of those plants or wildlife already in his possession, and (4) violation of any regulation or rule pertaining to the conservation, protections, enhancement, or management of any designated threatened or endangered species.

As of 2009 (the currently posted list), Guam DAWR recognizes 6 of the 23 species as endangered (the plant *Heritiera longipetiolata;* 3 of the 4 tree snails (the Guam tree snail, the humped tree snail, and the fragile tree snail), the Pacific sheath-tailed bat, and Slevin's skink). The other 17 species on Guam listed as threatened or endangered species in this final rule will be recognized as such and protected by Guam DAWR under the Endangered Species Act of Guam, as required by the Act, upon the publication of this final listing rule. However, Guam's ESA does not address the threats imposed upon the 21 species that occur currently or historically on Guam that are ongoing and are expected to increase in magnitude in the near future (Langford's tree snail and the Rota blue damselfly are the only species addressed in this rule with no record of occurrence on Guam). Only three species addressed in this final rule currently benefit from conservation actions on Guam, those conducted by the Guam PEPP for *Heritiera longipetiolata, Maesa walkeri,* and *Psychotria malaspinae,* as discussed in ''Conservation Efforts to Reduce Habitat Destruction, Modification, or Curtailment of Its Range,'' above. Under Guam's ESA, the Department of Agriculture is authorized to establish priorities for the conservation and protection of threatened and endangered species and their associated ecosystems, but we are unaware of any documentation of these priorities or actions conducted for protection of the 21 Guam species. If comprehensive conservation and protection actions are implemented for the 21 Guam species and their associated ecosystems, it would greatly reduce the inadequacies outlined above; however, the high costs associated with curbing problematic nonnative species often precludes the adequate implementation of such actions to fully address the threats to listed species.

The capacity of Guam to mitigate the effects of introduced pests (*e.g.,* brown treesnakes, ungulates, and weeds) is also limited due to the large number of taxa currently causing damage. Resources available to reduce the spread of these species and counter their negative ecological effects are sparse. Despite the fact that Guam receives assistance from the USDA, U.S. Department of Homeland Security, and other Federal agencies, the scope of threats remains challenging. Due to the magnitude and intensity of threats associated with the introduction of harmful nonnative species in the Marianas (*e.g.,* brown treesnakes, cycad aulacaspis scale, and the nonnative plant *Chromolaena odorata*), the fact that both new and established introduced species continue to pose a significant problem in Guam leads us to conclude that current regulatory mechanisms are inadequate to address such threats.

U.S. Commonwealth of the Northern Mariana Islands (CNMI)

The CNMI has multiple regulatory measures in place intended to protect natural resources (*www.cnmilaw.org*, accessed February 9, 2014 (CNMI 2014, in litt.)). Six Chapters under Title 85: Department of Land and Natural Resources (DLNR) encompass the most relevant regulatory measures with respect to the 16 CNMI species addressed in this final rule (*www.cnmilaw.org*, accessed February 9, 2014). Chapter 85–20 addresses animal quarantine rules and regulations, including domestic animals of all types, and associated port of entry laws. Chapter 85–30 addresses noncommercial fish and wildlife regulations, including the List of Protected Wildlife and Plants Species in the CNMI, which includes 1 of the 23 species addressed in this final rule (the plant *Tabernaemontana rotensis*). Species or subspecies listed as threatened or endangered under CNMI law (§ 85–30.1–101 Prohibitions) may not be harvested, captured, harassed, or propagated except under the terms of a special permit issued by the Director for scientific purposes, or for propagation in captivity for the purpose of preservation. A person who, without a special permit issued in accordance with the regulations under CNMI law (§ 85–30.1–110 Prohibitions), harvests, injures, imports, exports, captures, or harasses a species or subspecies listed under CNMI law (§ 85–30.1–101), intentionally or not, is in violation and subject to penalties under Title 2 (Natural Resources) Commonwealth Code (CMC) § 5109.

Existing regulations are also in place to protect wildlife conservation areas under CNMI law (§ 85–30.1–330), (*e.g.,* prohibitions of hunting, fishing, collecting, killing, commercial activity, destruction of habitats or artifacts, and camping) (CNMI–DLNR–Rota 2015, in litt.). Chapter 85–60 covers the Division of Plant Industry, including plant quarantine regulations. Chapter 85–80 covers the Division of Zoning. Chapter 85–90 addresses permits necessary for the clearing and burning of vegetation, and removal of plants or plant products, or soil, from areas designated as diverse forests on public lands. Chapter 85–100 addresses brown treesnake prevention regulations. All six chapters under Title 85 mentioned above have a component that is designed to protect native species, including rare species at risk from competition and predation by nonnative, and in some cases native, species. However, these regulations are difficult to enforce due to lack of funding availability and human resources (CNMI–DLNR–Rota 2015, in litt.).

Further, the capacity of the CNMI to mitigate the effects of introduced pests (*e.g.,* nonnative ungulates, brown treesnakes, weeds, and predatory flatworms) is also limited due to the large number of taxa currently causing damage. Resources available to reduce the spread of these species and counter their negative ecological effects are sparce. Despite the fact that CNMI receives assistance from the USDA, U.S. Department of Homeland Security, and other Federal agencies, the scope of threats remains challenging. Due to the magnitude and intensity of threats associated with the introduction of harmful nonnative species in the Marianas (*e.g.,* brown treesnakes, cycad aulacaspis scale, and predatory flatworms) poses a significant threat to the native species of the Marianas; the fact that both new and established introduced species continue to pose a significant problem in the CNMI leads us to conclude that current regulatory mechanisms are inadequate to address such threats.

Greater enforcement of local laws in place would provide additional benefit to the 16 species listed as endangered or threatened species in this final rule that occur in the CNMI (the plants *Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Heritiera longipetiolata, Maesa walkeri, Nervilia jacksoniae, Tabernaemontana rotensis,* and *Tuberolabium guamense;* the humped tree snail, Langford's tree snail, and the fragile tree snail; the two butterflies, the Pacific sheath-tailed bat, Slevin's skink, and the Rota blue damselfly). However, the magnitude and intensity of threats, combined with the high costs associated with curbing problematic nonnative species and the lack of funding and human resources to implement regulations, preclude the ability of regulatory actions to fully address the threats to listed species, thus rendering current regulatory mechanisms inadequate to protect the 16 CNMI species in this final rule.

U.S. Department of Defense (DOD)

The Sikes Act (16 U.S.C. 670) authorizes the Secretary of Defense to develop cooperative plans with the Secretaries of Agriculture and the Interior for natural resources on public lands. The Sikes Act Improvement Act of 1997 requires Department of Defense installations, in cooperation with the Service and the State fish and wildlife agency, to prepare Integrated Natural Resources Management Plans (INRMPs) that provide for the conservation and rehabilitation of natural resources on military lands consistent with the use of military installations to ensure the readiness of the Armed Forces. The Sikes Act states that the INRMP is to reflect the mutual agreement of the parties concerning conservation, protection, and management of fish and wildlife resources. DOD guidance states that mutual agreement should be the goal for the entire plan, and requires agreement of the Service with respect to those elements of the plan that are subject to other applicable legal authority of the Service such as the Endangered Species Act.

In December 2013, the Department of the Navy, JRM, completed an Integrated Natural Resources Management Plan

(INRMP) to address the conservation, protection, and management of fish and wildlife resources on DOD-managed and -controlled areas on Guam, specifically Naval Base Guam and Andersen Air Force Base, including leased lands in the CNMI on Tinian and Farallon de Medinilla. On July 2, 2013, the Navy requested the Service's endorsement of the JRM INRMP. The JRM INRMP is under review by the Service, but at present the Navy is operating under an INRMP that has not been agreed to by the Service. The Service's primary concerns include the need to increase efficiency regarding coordination with Federal and State partners, implement recovery efforts for extirpated endemic species (several of which exist only in captive-breeding programs), implement large-scale control and eradication of brown treesnakes, increase protected lands (*e.g.,* conservation areas) in order to recover endangered and threatened species, implement ungulate control, and increase conservation actions on Tinian and Farallon de Medinilla. The Service is continuing to work with the Navy on the development of their INRMP for DOD lands in this region.

At this time, the actions outlined in the INRMP do not alleviate the threats to the species addressed in this final rule that occur on DOD lands as the most current draft of the INRMP (December 2013) predates the publication of the proposed rule (October 1, 2014). The December 2013 INRMP (U.S. Navy 2013, p. ES–2) states that ''Several non-candidate Marianas species are also being considered for evaluation for inclusion in the proposed rules. Once the USFWS determines which species will be included in the proposed rules, JRM will develop a supplemental document for inclusion in the JRM INRMP for those species with the potential to be on Navy lands. The supplemental document will also include information on the known status of each species and will identify projects to be undertaken on JRM lands to manage the long-term conservation of the species.'' The Service has not received the supplemental document to make a determination of whether or not the proposed actions will alleviate the threats to the species in this final rule that occur on DOD lands.

Multijurisdictional Regulatory Mechanisms

The task of preventing the spread of deleterious nonnative species requires multijurisdictional efforts. The brown treesnake (BTS) technical working group (comprising agencies within the U.S. Department of the Interior (*e.g.,* USFWS, U.S. Geological Survey, National Park Service), DOD (*e.g.,* JRM and NavFac Pacific), Department of Transportation (DOT), U.S. Territory of Guam, CNMI, State of Hawaii, and other nongovernmental partners) designs and implements actions to address the regulatory mechanisms currently in place (*e.g.,* CNMI: Administrative Code Chapter 85–20 and Chapter 85–60; Guam: 9 GAR–Animal Regulations, Division 1: And U.S. Executive Orders 13112 and 13112) to prevent inadvertent transport of deleterious species (*e.g.,* brown treesnakes) into Guam and the Mariana Islands, and from Guam to other areas, which are important efforts that provide some benefits to all 23 species. However, these efforts are not sufficient to eliminate the continuing threats associated with the brown treesnake in the Marianas. For example, in 2014, a brown treesnake was captured at the sea port on Rota (BTS Strategic Plan 2015, p. iii), as described above under Factor C. Additionally, the BTS Strategic Plan, authored by the BTS technical working group, states that ''current snake management strategies have been successful in decreasing, but not eliminating, the probability of snakes becoming established on other islands (BTS Strategic Plan 2015, p. iii).''

Summary of the Inadequacy of Existing Regulatory Mechanisms

Both the U.S. Territory of Guam and the U.S. Commonwealth of the Northern Mariana Islands have regulations in place designed to provide protection for their respective natural resources, including native forests, water resources, and the 23 species addressed in this rule; however, enforcement of these regulations is not documented. Greater enforcement of local laws in place would provide additional benefit to the 23 species; however, the magnitude and intensity of threats, the high costs associated with curbing problematic nonnative species, and the lack of funding and human resources to implement such regulations preclude the ability of current regulatory mechanisms to fully address the threats to the 23 species in this final rule. The conservation actions proposed in the 2013 INRMP do not address the 23 Mariana Islands species in this final rule, as the INRMP predates the proposed listing rule (October 2014). The JRM is currently drafting a supplement that will address the threats imposed upon the 23 species that occur on DOD lands; however, the Service has not yet received this document. The multi-agency BTS technical working group aims to prevent inadvertent transport of deleterious species (the brown treesnake) into Guam and the Mariana Islands, and from Guam to other areas, and although these efforts are important and provide some benefits to all 23 species, they are not sufficient to eliminate the continuing threats associated with the brown treesnake in the Marianas.

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

Other factors that pose threats to some or all of the 23 species include ordnance and live-fire training, water extraction, recreational off-road vehicles, and small numbers of populations and small population sizes. Each threat is discussed in detail below, along with identification of which species are affected by these threats.

Ordnance and Live-Fire Training

Several individuals of the plants *Cycas micronesica, Psychotria malaspinae,* and *Tabernaemontana rotensis,* and the Mariana eight-spot butterfly, listed as threatened or endangered species in this rule, are located on the Northwest Field of Andersen AFB and the Guam National Wildlife Refuge within the boundaries of the preferred site for a new live-fire training range complex proposed in the 2015 Final SEIS for the Guam and CNMI Military Relocation (JGPO–NavFac, Pacific 2015, pp. ES–1—ES–40). This live-fire training range complex will consist of 5 live-fire training ranges and associated range control facilities and access roads (JGPO–NavFac, Pacific 2014, p. ES–5; JGPO–NavFac, Pacific 2015, pp. ES–5, ES–11). Once developed, military training is expected to be conducted within the 5 live-fire training ranges (including a multipurpose machine gun range), for 39 weeks out of the year, with 2 night-trainings per week (JGPO–NavFac, Pacific 2014, pp. ES–1, ES–5, and Figure 2.5–6). Depending on the type of ammunition used, there could be substantial damage to vegetation, or a possible fire started from ordnance use, which could destroy individuals of *Cycas micronesica, Psychotria malaspinae,* and *Tabernaemontana rotensis,* and the Mariana eight-spot butterfly, and their habitat.

Live-fire training is also proposed for the entire northern half of Pagan and on northern Tinian (see ''Historical and Ongoing Human Impacts,'' above (CJMT Draft EIS–OEIS *http://www.cnmijointmilitarytrainingeis.com/about*). Similarly, as described above, ordnance and live-fire training are a threat to the species addressed in this rule that occur on Tinian (*Heritiera longipetiolata* and the humped tree snail) and Pagan (humped tree snail and Slevin's skink). Additionally, we believe there may be a small population of *Cycas micronesica* on Pagan; however, this is not yet confirmed. Direct damage to individuals from live-fire and ordnance has already been documented in the past for the plants *Cycas micronesica* and *Heritiera longipetiolata* along the Tarague ridgeline (GDAWR 2013, in litt.). On the Tarague ridgeline near an existing firing range on Andersen AFB, ricochet bullets and ordnance have broken branches and made holes through parts of *Cycas micronesica* and *Heritiera longipetiolata* trees, causing added stress and a possible avenue for disease (Guam DAWR 2013, pers. comm.). Although there is a buffer zone at the end of this firing range, there is not a buffer zone on either side, thus increasing the risk of damage to nearby forests. In 2014, DON biologists conducted a site visit to the Tarague ridgeline and reported they were unable to detect any damage to the individuals of *C. micronesica* and *H. longipetiolata* present in this area, concluding the trees must have healed from their wounds (DON 2014, in litt.). We consider ordnance and live-fire training a direct threat to individuals of the plants *Cycas micronesica, Heritiera longipetiolata, Psychotria malaspinae,* and *Tabernaemontana rotensis;* and to the humped tree snail, Mariana eight-spot butterfly, and Slevin's skink. Additionally, we consider ordnance and live-fire a threat to these species due to the associated risk from fires caused by ordnance and live-fire training.

Water Extraction

The Rota blue damselfly was only first discovered in April 1996, outside the Talakhaya Water Cave (also known as Sonson Water Cave) located below the Sabana plateau on the island of Rota (see the species' description, above) (Polhemus *et al.* 2000, pp. 1–8; Camacho *et al.* 1997, p. 4). The Talakhaya Water Cave, As Onon Spring, and the perennial stream formed from runoff from the springs at the Water Cave support the only known population of the Rota blue damselfly. Rota's municipal water is obtained by gravity flow from these two springs (up to 1.8 Mgal/day) (Keel *et al.* 2007, pp. 1, 5; Stafford *et al.* 2002, p. 17). Under ordinary climatic conditions, this area supplies water in excess of demand but El Niño-Southern Oscillation (ENSO)-induced drought conditions can lead to significantly reduced discharge, or may completely dewater the streams (Keel *et al.* 2007, pp. 3, 6, 19). In 1998, water captured from the springs was inadequate for municipal use, and water rationing was instituted (Keel *et al.* 2007, p. 6). As the annual temperature rises resulting from global climate change, other weather regime changes such as increases in droughts, floods, and typhoons will occur (Giambelluca *et al.* 1991, p. iii). Increasing night temperatures cause a change in mean precipitation, with increased occurrences of drought cycles (Loope and Giambelluca 1998, pp. 514–515; Emanuel *et al.* 2008, p. 365; U.S. Global Change Research Program (US–GCRP) 2009, pp. 145–149, 153; Keener *et al.* 2010, pp. 25–28; Finucane *et al.* 2012, pp. 23–26; Keener *et al.* 2012, pp. 47–51). The limestone substrate of Rota is porous, with filtration through the central Sabana being the sole water source for the few streams on the island and for human use. There are no other groundwater supplies on the island, and storage capacity is limited. The Rota blue damselfly is dependent upon any water that escapes the Talakhaya Springs naturally, beyond what has not already been removed for human use.

The likelihood of dewatering of the Talakhaya Springs is high due to climate change causing increased ENSO conditions, and increased human demand. The ''Public and Agency Participation'' section of the Comprehensive Wildlife Conservation Strategy for the Commonwealth of the Northern Mariana Islands (2005, p. 347) cites ''individuals state the Department of Public Works has been increasing their water extraction from Rota's spring/stream systems. Historically, this water source flowed year-around, yet now they are essentially dry most of each year'' (see the species description ''Rota blue damselfly,'' above; and ''Stream Ecosystem,'' in the proposed rule (79 FR 59364; October 1, 2014), for further discussion). Water extraction is an ongoing threat to the Rota blue damselfly. The loss of this perennial stream would remove the only known breeding and foraging habitat of the sole known population of the Rota blue damselfly, thereby likely leading to its extinction.

Recreational Vehicles

The savanna areas of Guam are popular for use of recreational vehicles. Damage and destruction caused by these vehicles are a direct threat to the plants *Hedyotis megalantha* and *Phyllanthus saffordii,* listed as endangered species in this final rule, as well as a threat to the savanna habitat that supports these plant species (Gutierrez 2013, in litt.; Guam DAWR 2013, pers. comm.). *Hedyotis megalantha* and *P. saffordii* are particularly at risk, as the only known individuals of these species are scattered on the savanna and local biologists have observed recreational vehicle tracks directly adjacent to these two species (Gutierrez 2013, in litt.; Guam DAWR 2013, pers. comm.).

Small Numbers of Individuals and Populations

Species that are endemic to single islands are inherently more vulnerable to extinction than are widespread species, because of the increased risk of genetic bottlenecks, random demographic fluctuations, climate change effects, and localized catastrophes, such as typhoons and disease outbreaks (Pimm *et al.* 1988, p. 757; Mangel and Tier 1994, p. 607). These problems are further magnified when populations are few and restricted to a very small geographic area, and when the number of individuals in each population is very small. Species with these population characteristics face an increased likelihood of extinction due to changes in demography, the environment, genetic bottlenecks, or other factors (Gilpin and Soulé 1986, pp. 24–34). Small, isolated populations often exhibit reduced levels of genetic variability, which diminishes the species' capacity to adapt and respond to environmental changes, thereby lessening the probability of long-term persistence (Barrett and Kohn 1991, p. 4; Newman and Pilson 1997, p. 361). Very small, isolated populations are also more susceptible to reduced reproductive vigor due to ineffective pollination (plants), inbreeding depression (plants and animals), and hybridization (plants and insects). The problems associated with small population size and vulnerability to random demographic fluctuations or natural catastrophes are further magnified by synergistic interactions with other threats, such as those discussed above (see *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* and *Factor C. Disease or Predation,* above).

The following 3 plant species have a very limited number of individuals (fewer than 50) in the wild: *Psychotria malaspinae, Solanum guamense,* and *Tinospora homosepala.* We consider these species highly vulnerable to extinction due to threats associated with small population size or small number of populations because:

- The only known occurrences of *Psychotria malaspinae, Solanum guamense,* and *Tinospora homosepala* are threatened either by ungulates, rats, brown treesnake, nonnative plants, fire, or a combination of these. Furthermore, *Tinospora homosepala* may no longer be able to sexually reproduce, as the only known remaining individuals of this species all appear to be male.

- *Psychotria malaspinae* is known from fewer than 10 scattered individuals, and *Solanum guamense* is known from a single individual (Yoshioka 2008, p. 15; Cook 2012, in litt.; CPH 2012f—*Online Herbarium Database;* Harrington *et al.* 2012, in litt.; Grimm 2013, in litt.; Rogers 2012, in litt.; WCSP 2012d—*Online Herbarium Database*).

Animals—Like most native island biota, the single island endemics Guam tree snail, Langford's tree snail, and Rota blue damselfly are particularly sensitive to disturbances due to low number of individuals, low population numbers, and small geographic ranges. Additionally, the fragile tree snail, Mariana eight-spot butterfly, Mariana wandering butterfly, and Pacific sheath-tailed bat (Mariana subspecies) each have a low number of populations, even though they historically occurred on two or more islands within the Marianas Archipelago. Current data indicate that the only known remaining individuals of the Mariana eight-spot butterfly occur on Guam, there are no known individuals of the Mariana wandering butterfly on Guam or Rota, and the Pacific sheath-tailed bat (Mariana subspecies) now occurs only on Aguiguan. The fragile tree snail occurs in low number of populations on Guam (two populations) and Rota (one population). Furthermore, recent genetic analyses conducted on the fragile tree snail, Guam tree snail, and Mariana eight-spot butterfly on Guam show that the fragile tree snail and the Mariana eight-spot butterfly have no heterogeneity, even between different populations, rendering these species highly vulnerable to the negative effects associated with loss of genetic diversity. The Guam tree snail has a very low level of genetic diversity, but not enough to consider it exempt from the threats associated with low numbers (Lindstrom and Benedict 2014, pp. 26–27).

We consider these 10 species to be especially vulnerable to extinction due to either low number of individuals or low number of populations, or both; because these species occur on single islands, or only two neighboring islands; are declining in number of individuals and range; have low or no detectable genetic diversity; and are consequently vulnerable and at risk from one or more of the following threats: Predation by nonnative rats, monitor lizards, and flatworms; habitat degradation and destruction by nonnative ungulates; fire; typhoons; drought; and water extraction (see *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* and *Factor C. Disease or Predation,* above).

Conservation Efforts To Reduce Other Natural or Manmade Factors Affecting Its Continued Existence

We are unaware of any conservation actions planned or implemented at this time to abate the threats to the species negatively impacted by ordnance and live-fire (the plants *Cycas micronesica, Heritiera longipetiolata,* and *Psychotria malaspinae;* and the humped tree snail, Mariana eight-spot butterfly, and Slevin's skink); water extraction (Rota blue damselfly), recreational vehicles (*Hedyotis megalantha* and *Phyllanthus saffordii*), or low numbers (the plants *Psychotria malaspinae, Solanum guamense,* and *Tinospora homosepala;* the fragile tree snail, Guam tree snail, and Langford's tree snail; the Mariana eight-spot butterfly and Mariana wandering butterfly; and the Rota blue damselfly).

Summary of Other Natural or Manmade Factors Affecting Their Continued Existence

We consider the threat from ordnance and live-fire training to be a serious and ongoing threat for four plant and three animal species addressed in this final rule (the plants *Cycas micronesica, Heritiera longipetiolata, Psychotria malaspinae,* and *Tabernaemontana rotensis;* and the humped tree snail, Mariana eight-spot butterfly, and Slevin's skink), because direct damage to individual plants and animals may be fatal, or cause enough damage to render them more vulnerable to other threats. We consider the threat from water extraction to be a serious and ongoing threat for the Rota blue damselfly because the spring that supplies Rota's municipal water is also the spring that supports the primary population of the only two known occurrences of the species. We consider recreational off-road vehicles a threat to the plants *Hedyotis megalantha* and *Phyllanthus saffordii* because off-road vehicles can damage individual plants and destroy the habitat that supports these two species.

We consider the threat from limited numbers of populations and low numbers of individuals (fewer than 50) to be serious and ongoing for 3 plant species addressed in this final rule (*Psychotria malaspinae, Solanum guamense,* and *Tinospora homosepala*) because: (1) These species may experience reduced reproductive vigor due to ineffective pollination or inbreeding depression; (2) they may experience reduced levels of genetic variability, leading to diminished capacity to adapt and respond to environmental changes, thereby lessening the probability of long-term persistence; and (3) a single catastrophic event (*e.g.,* fire) may result in extirpation of remaining populations and extinction of the species. This threat applies to the entire range of each species.

The threat to the fragile tree snail, Guam tree snail, Langford's tree snail, Mariana eight-spot butterfly, Mariana wandering butterfly, Pacific sheath-tailed bat (Marianas subspecies), and Rota blue damselfly from limited numbers of individuals and populations is ongoing and is expected to continue into the future because population numbers of these species are so low that: (1) They may experience reduced reproductive vigor due to inbreeding depression; (2) they may experience reduced levels of genetic variability leading to diminished capacity to adapt and respond to environmental changes, thereby lessening the probability of long-term persistence; (3) a single catastrophic event, whether of anthropogenic or natural origin (*e.g.,* super typhoon), may result in extirpation of remaining populations and extinction of these species; and (4) species with few known locations are less resilient to threats that might otherwise have a relatively minor impact on widely distributed species. For example, an increase in predation of these species that might be absorbed in a widely distributed species could result in a significant decrease in survivorship or reproduction of a species with limited distribution. Additionally, the limited distribution of these species magnifies the severity of the impact of the other threats discussed in this final rule.

Summary of Factors

The primary factors that pose serious and ongoing threats to 1 or more of the 23 species throughout all or a significant portion of their ranges in this final rule include:

- Habitat degradation and destruction by development; activities associated with military training and urbanization; nonnative ungulates and plants; rats; brown treesnakes; fire; typhoons; and the interaction of these threats with the projected effects of climate change (Factor A);
- Overutilization of tree snails due to collection for trade or market (Factor B);
- Predation or herbivory by nonnative animal species (ungulates, deer, rats, brown treesnakes, monitor lizards,

slugs, flatworms, ants, and wasps) (Factor C);

• Inadequate existing regulatory mechanisms to address the spread or control of nonnative species (Factor D); and

• Other natural or manmade factors, including impacts from ordnance and live-fire training, water extraction, recreational vehicles, and increased vulnerability to extinction as a consequence of these threats due to limited numbers of populations and individuals (Factor E).

While we acknowledge that the voluntary conservation measures described above may help to ameliorate some of the threats to the 23 species addressed in this final rule, these conservation measures are not sufficient to control or eradicate these threats to the point that these species do not meet the definition of threatened or endangered under the Act.

Summary of Comments and Recommendations

On October 1, 2014, we published a proposed rule to list 23 species (14 plants, 4 tree snails, 2 butterflies, 1 bat, 1 skink, and 1 damselfly) as endangered or threatened species throughout their ranges (79 FR 59364). The comment period for the proposal opened on October 1, 2014, for 60 days, ending on December 1, 2014. We requested that all interested parties submit comments or information concerning the proposed rule. We contacted all appropriate State and Federal agencies, county governments, elected officials, scientific organizations, and other interested parties and invited them to comment. In addition, we published a public notice of the proposed rule on October 20, 2014, in the local Marianas Variety Guam Edition, Marianas Variety, and Pacific Daily News, at the beginning of the comment period. We received two requests for public hearings. On January 12, 2015, we published a notice (80 FR 1491) reopening the comment period on the October 1, 2014, proposed rule (7959364), for an additional 30 days in order to allow interested parties more time for comments on the proposed rule. In that same document (80 FR 1491; January 12, 2015), we announced two public hearings, each preceded by a public information meeting, as well as two separate public information meetings, for a total of four public information meetings altogether. The two public hearings preceded by public information meetings were held in the U.S. Territory of Guam (Guam) on January 27, 2015; and the U.S. Commonwealth of the Northern Mariana Islands (CNMI) (Saipan) on January 28, 2015. The two separate public information meetings were held on the islands of Rota (CNMI) on January 29, 2015; and Tinian (CNMI) on January 31, 2015.

During the comment periods, we received 23 comment letters, including 9 peer review comment letters, on the proposed listing of the 23 Mariana Island species. In this final rule, we address only those comments directly relevant to the proposed listing of 23 species in Guam and the CNMI. We received several comments that were not germane to the proposed listing of 23 species (for example, suggestions for future recovery actions should the species be listed); such comments are not addressed in this final rule.

Three comment letters were from the CNMI Department of Land and Natural Resources (DLNR); one was from a representative in the CNMI legislature; two were from Guam government agencies (Guam Department of Agriculture, Division of Aquatic and Wildlife Resources (GDAWR); and Guam Bureau of Statistics and Planning); two were from Federal agencies (National Park Service and U.S. Navy); and six were from nongovernmental organizations or individuals. Nine letters were responses from requested peer reviews. The CNMI DLNR and one public commenter requested a public hearing and extension of the comment period. In response, we reopened the comment period for 30 days, from January 12, 2015, to February 11, 2015. In addition, during the public hearings held on January 27, 2015 (Guam), and January 28, 2015 (Saipan), seven individuals or organizations made oral comments on the proposed listing.

All substantive information related to the listing of the 23 species provided during the comment periods, including technical or editorial corrections, has either been incorporated directly into this document or is addressed below (also see Summary of Changes from the Proposed Rule, above). Comments received were grouped into general issues specifically relating to the proposed listing status of the 14 plants, the 4 tree snails, the 2 butterflies, the bat, the skink, or the damselfly, and are addressed in the following summary and incorporated into the final rule as appropriate.

Peer Review

In accordance with our peer review policy published in the **Federal Register** on July 1, 1994 (59 FR 34270), we solicited expert opinions from 21 knowledgeable individuals with scientific expertise on the Mariana Islands plants, tree snails, butterflies, bat, skink, and damselfly, and their habitats, including familiarity with the species, the geographic region in which these species occur, and principles of conservation biology. We received responses from nine of these peer reviewers. Eight of the nine peer reviewers supported our methods and conclusions, and one peer reviewer solely provided corrections to local common names. Four peer reviewers noted particular agreement with our evaluation of the scientific data informing our assessment of the conservation status of support for the listing of the four tree snails, and concurred with the associated status and threat assessments. Similarly, two peer reviewers noted particular agreement with our status assessment for the two butterflies; two peer reviewers noted particular support for the assessment of the bat; and one peer reviewer noted particular support for the assessment of the skink. We reviewed all comments received from the peer reviewers for substantive issues and new information regarding the listing of 23 species. All nine reviewers provided information on one or more of the Mariana Islands species, which was incorporated into this final rule (see also Summary of Changes from Proposed Rule). Several of the peer reviewers specifically commented that the proposed rule represented an exhaustive and largely accurate (barring some relatively minor corrections) assessment of the status and threats to the species; we did not receive any peer reviews that took general issue with the scientific rigor of our evaluation. Peer reviewer comments are addressed in the following summary and incorporated into the final rule as appropriate.

Peer Review General Comments

(1) *Comment:* One peer reviewer commented that many of the Chamorro names of the animals and plants listed in the proposed rule either do not conform to accepted orthography of the language or appear incorrect, and provided corrections for select species.

Our Response: After the publication of the proposed rule, we solicited the guidance from a local language specialist to ensure proper use of Chamorro and Carolinian common names in all our documents regarding the 23 species, and to translate some of our public outreach material disseminated at the two public hearings (Guam and Saipan) and four public information meetings (Guam, Saipan, Rota, and Tinian) held in January 2015. We have incorporated all of the recommended changes to the Chamorro and Carolinian common names for plants and animals under Table 1 and Summary of the 23 Species, above; and noted this change under Summary of Changes from the Proposed Rule, above. However, due to past complications with attempts to use diacritical marks in our rules, we have elected not to print them here. Please see Kerr (2014, in litt.) and USFWS (2015, in litt.) for the Chamorro and Carolinian names of plants and animals addressed in this final rule, with the proper diacritical marks. Additionally, the language expert we consulted did not change the spelling of Chamorro to Chamoru, as suggested by Kerr (2014, in litt.), so we retained the use of Chamorro for this final rule.

(2) *Comment:* One peer reviewer commented that the proposed rule does not take into account information from Candidate Species surveys carried out by University of Guam (UOG) and University of Hawaii (UH) research biologists in 2013, and cited Lindstrom and Benedict 2014.

Our Response: We have incorporated all new relevant information from the 2013 candidate species surveys conducted by UOG and UH biologists (Lindstrom and Benedict 2014, pp. 1–44, and Appendices A–E) under Description of the 23 Mariana Islands Species and Summary of Biological Status and Threats Affecting the 23 Mariana Islands Species, above.

(3) *Comment:* One peer reviewer expressed confusion regarding the relationship between predation and herbivory under *Factor C. Disease and* Predation, above.

Our Response: The term ''predation'' comes directly from the statutory language used in the identification of Factor C under section 4(a)(1) of the Act, which refers to the potential threat of ''disease and predation.'' In our discussions under Factor C, we use the term ''herbivory'' as analogous to predation, but our choice of terminology depends on the subject of the action. In general, we use the term herbivory if the subject being eaten is a plant, and the term predation if the subject being eaten is an animal.

(4) *Comment:* One peer reviewer stated that it is not clear what an 'ecosystem focus' means or how it would be implemented, particularly if a species occurs in more than one ecosystem.

Our Response: The ecosystem approach allows us to assess and protect each individual species in need of conservation, whether that species occurs in a single ecosystem or multiple ecosystems, but to organize our rule in a more efficient manner. For each species under consideration for listing as a threatened species or endangered species under the Act, we must evaluate the threats to that species under a common ''5-factor'' framework as required by the statute. Specifically, the Act mandates us to consider whether a species may be a threatened species or endangered species because of any of the following factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) Overutilization for commercial, recreational, scientific, or educational purposes; (C) Disease or predation; (D) The inadequacy of existing regulatory mechanisms; or (E) Other natural or manmade factors affecting its continued existence. When species share the same ecosystem, they often have similar life-history requirements and experience the same threats. Grouping these species by shared ecosystems allows us to evaluate the threats shared by these species in a more efficient way and reduce repetition for the reader. Each species is still considered on a strictly individual basis as to whether or not it warrants listing.

If an individual species is determined to meet the definition of a threatened species or endangered species under the Act, subsequent to listing that species will be the subject of a recovery plan. In the recovery phase, it is our intention that the ecosystem approach will be beneficial in terms of allowing us to focus on restoring all of the components within a particular ecosystem to its optimal health and functionality, which will support not only one or a few species of particular interest, but all native species within that ecosystem (for example, control of feral pigs would benefit all native species within a shared ecosystem). This approach should ultimately protect other vulnerable species that may otherwise need listing in the future as well, and is consistent with the stated purpose of the Act ''to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved.''

(5) *Comment:* Two peer reviewers expressed concern regarding the proposed military actions on Pagan, and the associated negative impacts these actions will have on one or more of the 23 species. One of these peer reviewers stated that either of the two butterflies, either the Mariana wandering butterfly or the Mariana eight-spot butterfly, may occur on Pagan.

Our Response: The potential for future military actions on Guam and the CNMI is one of the threats we considered in making the listing determinations finalized in this document. As discussed in the section Summary of Biological Status and Threats Affecting the 23 Mariana Islands Species, we consider military actions on Pagan likely to negatively impact the humped tree snail and the Marianas skink, as well as any other of the 23 species that may occur on Pagan but have not yet been discovered or confirmed (*e.g., Cycas micronesica* or the two butterflies).

(6) *Comment:* One peer reviewer stated that it is important to protect the humped tree snail and fragile tree snail at their known population sites on Guam (Haputo Ecological Reserve Area (HERA) and Hilaan), as well as the Mariana eight-spot butterfly and its host plants) from feral ungulates and human development, military and otherwise. Additionally, the reviewer suggested that we must protect all areas with potential habitat and sites of the host plants, not just the karst towers towards the cliff lines.

Our Response: The Service appreciates support for the conservation of the tree snails and butterflies addressed in this final rule and the concurrence regarding the threats associated with ungulates and human development on these species. These suggestions will be taken into account as we move forward with recovery planning and implementation for these species.

Peer Review Comments on the Two Butterflies

(7) *Comment:* One peer reviewer commented that extensive surveys indicate that ungulate browsing has reduced the range of the two host plants for the Mariana eight-spot butterfly to only the most rugged karst within the forest ecosystem, and when one of these plants grows long enough to outreach the protection of the karst, browsing damage is usually observed. Additionally, this peer reviewer stated that the two host plants have been observed on Saipan as recently as 2011, which provides a more recent observation than what was cited in the proposed rule, and suggests that it is possible that the Mariana eight-spot butterfly may still occur on this island in small numbers.

Our Response: We have added this information to Description of the 23 Mariana Islands Species, above.

(8) *Comment:* One peer reviewer commented that recent surveys were conducted for the Mariana wandering butterfly on Tinian, Saipan, and Rota earlier this year, as well as Guam. The host plant (*Maytenus thompsonii*) was even more abundant than what Global Positioning Systems (GPS) data

reflected; however, not a single individual of the Mariana wandering butterfly was observed.

Our Response: We appreciate being provided the most up-to-date survey data for the Mariana wandering butterfly on Guam, Rota, Tinian, and Saipan; and have added any new data under Description of the 23 Mariana Islands Species, above.

(9) *Comment:* Two peer reviewers stated that small populations of either of the two butterflies may occur on other islands previously unreported if suitable habitat exists, or may remain in small obscure populations on islands where they have been known to occur but have not been observed for many years.

Our Response: We agree that the best available information indicates that the two butterflies may exist in small, undetected, and obscure populations within their known ranges, or may possibly be on other islands within the Mariana Archipelago that provide suitable habitat, but where they have not yet been observed. We have added this information under Description of the 23 Mariana Islands Species, above. As this information is purely speculative, however, we did not consider it in our final determination.

Peer Review Comments on the Tree Snails

(10) *Comment:* One peer reviewer commented that shell collecting does not appear to be a current threat to the four tree snails. The CNMI Department of Land and Natural Resources (DLNR) made a similar comment, noting that the DLNR Division of Fish and Wildlife recently conducted a threat assessment for partulid snails in the CNMI in consultation with regional snail experts and concluded that shell collecting was not a threat to any snail population in the CNMI.

Our Response: Based on the best available information, the Service has concluded that collection of tree snail species is an ongoing threat to tree snail species around the globe, including in the Mariana Islands, where the Service has recently observed jewelry (bracelets and necklaces) made from tree snails (USFWS 2012, in litt.). Given the rarity of the tree snail species considered here, the potential collection of even a few individuals could have serious consequences for the population.

(11) *Comment:* A survey in 2013 found a small number of humped tree snails in an isolated spot on Tinian.

Our Response: We have updated this final rule to incorporate the new location data of the humped tree snail on Tinian. This new information is significant, since at the time of the proposed rule we did not have information to suggest that the humped tree snail was still found on that island.

(12) *Comment:* One peer reviewer commented that it was difficult to understand how the brown treesnake poses a threat to the four tree snails.

Our Response: We have attempted to clarify the nature of the threat posed by the brown treesnake to the tree snails in this final rule. The brown treesnake is not a direct threat to the four tree snails, but we conclude it poses an indirect threat to these species through alteration or degradation of habitat. The brown treesnake has been shown to alter forest structure as a secondary impact resulting from direct predation on native birds, which many native trees rely upon for seed dispersal (Rogers 2008, in litt.; Rogers 2009, in litt.). By interfering with the natural seed dispersal mechanism provided by native birds, the actions of the brown treesnake change the distribution, species composition, and ultimately the structure of the forest. The alteration of forest structure subsequently alters the microclimate requirements necessary to support tree snails on Guam, and other islands in the Marianas, ultimately degrading habitat quality and availability for the tree snails.

(13) *Comment:* Two peer reviewers provided new information regarding the status of the fragile tree snail on Guam, and specifically the confirmed discovery of a second population at Hilaan Point, Dededo, totaling approximately 100 individuals or less. Besides the new population at Hilaan and the original at Haputo Ecological Reserve Area, one peer reviewer suggested the fragile tree snail may occur in other undiscovered locations on Guam, where access is limited and difficult. Additionally, one peer reviewer noted that the fragile tree snail is often confused with the Guam tree snail due to superficial similarities, particularly juveniles of the Guam tree snail, even by trained biologists, although DNA comparisons have helped to confirm identifications.

Our Response: We appreciate receiving the status update for the fragile tree snails, which we have included under Description of the 23 Mariana Islands Species, above. Additionally, we have added the distinguishing phenotypic traits of the fragile tree snail to our files (Fiedler 2014, in litt.).

(14) *Comment:* One peer reviewer commented that the Guam tree snail is the most widespread and common partulid on Guam and its abundance is underreported in the proposed rule. This peer reviewer stated that surveys on Guam have documented at least 26 separate locations, varying from quite small in size to relatively large populations (*e.g.,* one population contained a single tree with over 700 individuals on it). The reviewer cautioned, however, that because a large tree may hold hundreds of snails and the majority of any given population, the loss of a single tree could potentially have a significant negative impact on a population. The researcher further noted that observed fluctuations of Guam tree snails from 100 individuals or so down to only a few individuals within a month's time indicates that populations are vulnerable to mass mortality, possibly from manokwari flatworms or other factors. The reviewer concluded by stating that, although the abundance and range of the Guam tree snail may be greater than previously reported, the species remains threatened by a variety of factors.

Our Response: We appreciate the new information about the range and abundance of the Guam tree snail, and we have revised the description of the status of the species under the Description of the 23 Mariana Islands Species, above. We considered whether this information might change our evaluation of the status of the species. As part of our evaluation, we also carefully weighed the new information regarding the significant threat posed to all of the tree snails by the predatory manokwari flatworm, which we had underestimated in our proposed rule (see our response to Comment 25, below). We considered the fact that the Guam tree snail is a single-island endemic, and in addition to being subject to predation by the manokwari flatworm everywhere it is found on Guam, the Guam tree snail is subject to a significant number of other threats as well. Thus we concluded that, despite having a wider range and greater abundance than described in our proposed rule, the Guam tree snail currently remains at great risk of extinction due to a variety of factors including habitat loss, predation by flatworms and other nonnative mollusks, and a lack of genetic diversity.

(15) *Comment:* One peer reviewer provided updated information regarding the status of the humped tree snail and noted that there are now two known populations of the species on Guam, both of which are located at HERA. The peer reviewer also recommended efforts to conserve all populations of the species in the event that allopatric populations between the islands turn out to be different subspecies or species. Additionally, the reviewer noted that,

although a captive-breeding program in the United Kingdom (UK) has been successful in culturing the humped tree snail (Pearce Kelly, pers. comm.), that population originated from a single individual, apparently collected in Saipan, and, therefore, genetic diversity in the captive population is likely very low.

Our Response: We appreciate receiving the new information and updated status on the humped tree snail. A recent survey conducted by Myounghee Noh and Associates (2014, pp. 1–28 and Appendices A and B) also reported this newly discovered second population of the species at HERA. We have added this new information under Description of the 23 Mariana Islands Species, above. At the time of the publication of the proposed rule, we were aware of only the one population with 50 scattered individuals along the forest edge adjacent to the sand at HERA.

As discussed in this final rule, we understand that genetic work is ongoing on humped tree snail populations to elucidate any possible further divisions of the species into separate subspecies or subspecies. We agree there is a need for further research in this area. We must make our determination based on the best scientific data available, and at this point in time the humped tree snail is recognized as a single species. Our determination is that the humped tree snail, as currently described, warrants listing as an endangered species. If taxonomic changes are made in the future, we may reevaluate the status of any newly recognized species or subspecies at that point in time.

(16) *Comment:* One peer reviewer stated there may be a few native predators on Guam's partulids, particularly crustaceans (*e.g.,* anomuran crabs (land hermit crabs, coconut crabs), as well as the 'arboreal crab' (*Labuanium rotundatum*)); however, crabs are not regarded as a major threat to partulids compared to the manokwari flatworm. This peer reviewer also commented that mites in the genus *Riccardoella* have been found on the native marsh snail and on another terrestrial snail, *Pythia scarabaeus.* Mites in the genus *Riccardoella* are known parasites of terrestrial snails and slugs; and until now have not been recorded from the Mariana Islands.

Our Response: We have added native crabs and nonnative parasitic mites as potential threats to partulids in our threats analysis.

(17) *Comment:* Based upon observations of ants inside of shells from recently dead tree snails still stuck to vegetation and, while inspecting live partulids, one peer reviewer expressed concern regarding the potential for ants to prey upon partulids in the Marianas, particularly by the little fire ant (*Wasmannia auropuncta*) due to its aggressive nature.

Our Response: We have added predation by ants as a potential threat to the partulid tree snails in the Marianas.

(18) *Comment:* One peer reviewer commented that the negative impact of ungulates on partulid populations cannot be overstated and noted that the presence of pigs and deer in large numbers ensures that the understory of the vegetation will be trampled or devoured, altering the presence of snail home plants and degrading the soil. The reviewer noted repeated observations of locations that once had thriving tree snail populations being turned into ''snail-free zones'' due to the impact from pigs and deer.

Our Response: We agree that both pigs and deer alter and significantly impact the habitat that supports the four tree snails; this threat is identified as one of the many factors that have led to the listing of these four species as endangered in this final rule (see *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range*).

(19) *Comment:* One peer reviewer noted that, although tree snails in the Mariana Islands likely evolved to live upon native vegetation, there are no clear indications of obligate relationships with any particular type of tree or plant. This commenter further noted that all three partulid snail species on Guam (humped tree snail, Guam tree snail, and the fragile tree snail) are observed to use nonnative ''home plants'' to which they have apparently adapted. The peer reviewer suggested that an ecosystem approach may pose some challenges for conservation of the snails given their adaptation to nonnative vegetation, and recommended that snail conservation actions ensure the safety of native partulids inhabiting nonnative vegetation prior to removal or control of that vegetation.

Our Response: We are aware that some partulid snail populations in the Mariana Islands occur on nonnative plants. For example, Service biologists have observed tree snails in Rota on nonnative plant species such as *Triphasia trifolia,* which is widely recognized to have negative impacts on native forest structure (Harrington *et al.* 2012, in litt., p. 44; CABI 2014–*Invasive Species Compendium Online Database*). Nevertheless, we appreciate the peer reviewer highlighting this nonnative plant management concern, and we agree this issue may present a management challenge in the future when we address the species' recovery. Most research, however, indicates the four proposed partulid snail species prefer native plant species as home plants or trees (see Description of the 23 Mariana Islands Species, above).

(20) *Comment:* One peer reviewer stated that tree snails on Guam tend to occur in proximity to sources of fresh water and high humidity, and noted that these conditions are also ideal for the predatory manokwari flatworm, which has been observed at nearly every location where partulid snails occur on Guam.

Our Response: We appreciate the information emphasizing the overlap between habitat preferences of tree snails and the distribution of the manokwari flatworm on Guam. Based on the comments of peer reviewers and new information available to us since the publication of the proposed rule (for example, high reproductive capacity of the flatworm and significant rates of tree snail mortality when the flatworm is present), we conclude that the threat posed by the manokwari flatworm is considerably greater than we had formerly understood. We have incorporated this new information into this final rule, and it is our intent to identify this threat as both a research need and management concern during future conservation and recovery efforts for the partulid snails.

(21) *Comment:* One peer reviewer cautioned against a narrow focus of conservation effort for the Guam tree snail given its widespread distribution. The reviewer suggested that protecting only the Guam tree snail populations in HERA and Hilaan, due to its abundance and co-occurrence with the fragile tree snail and the humped tree snail, risks losing important biodiversity from other population sites.

Our Response: We appreciate receiving this perspective from the peer reviewer. The prioritization of conservation and recovery actions for the tree snails and other species listed in this final rule will be identified and addressed in a forthcoming recovery plan.

(22) *Comment:* Two peer reviewers provided new information and updates regarding the distribution of the humped tree snail based on recent surveys for the species. The reviewers noted that while once widespread on Guam, humped tree snails are now restricted to small populations at only 2 or 3 sites on Guam; a single remnant population on Saipan in one small area; one population of 1,000 individuals on Pagan Island in a small area within the

ancient southern caldera; one population of unknown size on the summit of Sarigan; and one small, isolated population discovered in 2013 on Tinian.

Our Response: We appreciate receiving the updated distribution status for the humped tree snail and have added any new relevant data under Description of the 23 Mariana Islands Species, above. In particular we appreciate learning of the recent discovery that a humped tree snail colony still occurs on the island of Tinian, as previous data had indicated that the species was extirpated from the island.

(23) *Comment:* One peer reviewer suggested that partulid snail activity may be tied to ambient humidity and precipitation rather than circadian pattern, as described in the proposed rule, based upon the reviewer's observations of snails active during rainy days and snail inactivity during dry nights. The reviewer suggested this trait may increase the vulnerability of tree snails to changes in their environment, should climatic conditions lead to reduced precipitation and decreased humidity.

Our Response: We appreciate receiving this new life-history information and included these details under Description of the 23 Mariana Islands Species, above. Additionally, we will address the matter further as we begin the recovery planning phase for these species.

(24) *Comment:* One peer reviewer questioned the purpose of citing Crampton (as referenced in Berger *et al.* 2005) in the proposed rule regarding the presence of as many as 31 partulid snails on the underside of a single leaf of *Caladium.* The peer reviewer noted that, when partulid snails were observed in large clusters on leaves, it was always among relatively sizeable and dense, albeit rare, populations of snails, that would have been readily observed even if some individual leaves were not inspected.

Our Response: We included Crampton's field observations in the proposed rule to illustrate the potential challenge in accurately surveying for numbers of snails in nature. If a population of snails has only 100 individuals, for example, missing a single leaf with 30 or more snails representing up to a third of the total population would result in a substantial underestimate of population size.

(25) *Comment:* Three peer reviewers commented that the level of threat posed by the manokwari flatworm is erroneously understated in the proposed rule, and provided additional information about its predation efficiency and potential to impact the tree snails, including the following observations: One reviewer noted that the manokwari flatworm, once considered mostly ground-dwelling, is now known to climb trees and feed on juvenile partulid snails, and during field surveys the flatworm has been found to commonly occur several meters up in native trees and during most rain events. The reviewers emphasized that the flatworm is an effective predator on the tree snails of all age classes, and is likely the most important threat to these tree snails since it occurs in native, nonnative, and disturbed forest.

Our Response: We appreciate receiving this new information, and we have updated the discussion of this threat under the Summary of Biological Status and Threats Affecting the 23 Mariana Islands Species. Additional new information we considered in evaluating the threat posed by the manokwari flatworm includes the high fecundity of the flatworm, which can reach the age of sexual reproduction in just 3 weeks, and can lay cocoons at 7- to 10-day intervals, producing a mean of 5.2 juveniles from each cocoon (Kaneda *et al.* 1990, p. 526). The manokwari flatworm can live up to 2 years and survive extended periods of starvation, retaining their reproductive capacity after more than a year without feeding (Kaneda *et al.* 1990, p. 526). Compared to the partulid tree snails, which generally start reproducing at about 1 year of age and produce up to 18 young a year (living up to 5 years), it is clear that the flatworm can quickly outnumber native tree snail species. This fact, combined with the observed high potential rates of predation by the flatworm under field test conditions (up to 90 percent mortality of tree snails within 11 days (Sugiura *et al.* 2006, p. 72)), and its rapid, unintentional introduction to new geographic areas, leads us to agree with the peer reviewers that we formerly underestimated the degree of threat posed by the manokwari flatworm.

(26) *Comment:* One peer reviewer commented that investigations on Rota in 1990, and Saipan, Sarigan, and Pagan in 2010, indicate that none of the native *Partula* species are abundant or secure on any of those islands visited with the exception of Sarigan, on which only a single species, the humped tree snail, is present. With only Sarigan containing a vigorous population of the humped tree snail, the reviewer stated that this species most certainly has declined throughout a significant portion of its range, and pointed out that the humped tree snail is not secure even on Sarigan, as this island is not safe from other threats including new or existing invasive species, volcanic activity, etc. Another peer reviewer also commented that, despite the encouraging occurrence of seemingly large, healthy populations of humped tree snail on Sarigan, human access remains unrestricted on that island, and species such as rats, ants, or other snail predators may gain access to the island through unregulated human landings, resulting in invasive predators that are virtually impossible to control.

Our Response: We have updated our records as appropriate regarding the field observations and data collected on partulids in the Marianas and incorporated this new information into this final rule. Although the proposed rule had noted that rats and monitor lizards are already present on Sarigan, we have noted the threat of additional potential predators to the island's population of the humped tree snail (*e.g.,* potential invasion by the manokwari flatworm, if it is not already present). We are aware that humans occasionally access the more remote northern islands and the associated risk of newly introduced nonnative species. We agree with the reviewers that the humped tree snail remains threatened by a variety of factors throughout its range, including on the island of Sarigan.

Peer Review Comments on Slevin's Skink

(27) *Comment:* One peer reviewer concurred with our assessment of the status and threats to Slevin's skink, but noted that we had failed to note extirpated populations for Slevin's skink species in Table 1 of the proposed rule, as we had done for other species. The reviewer indicated that Slevin's skink was formerly present but is no longer found on Guam, Rota, and Tinian. The reviewer furthermore noted that, since Slevin's skink was not found on Pagan during the recent intensive surveys there (Reed *et al.* 2010), it is most likely also extirpated, or at least certainly rare, on Pagan as well. Lastly, the reviewer suggested there may be an unverified record for Slevin's skink on Maug at this time.

Our Response: We appreciate the information and have corrected historical occurrences of Slevin's skink in Table 1, and noted the possibility of Slevin's skink being extirpated on Pagan under Description of the 23 Mariana Islands Species. We have added the possible occurrence of Slevin's skink on Maug to our files, but did not include this information here since this record is unverified at this time.

(28) *Comment:* One peer reviewer stated that female Slevin's skinks do not carry their eggs internally and give birth to live young (viviparity), but rather they lay eggs in which the embryonic development occurs outside the mother (oviparity), with a normal clutch size of two (Zug 2013).

Our Response: We appreciate this new information and have included it in this final rule.

Peer Review Comments on the Pacific Sheath-Tailed Bat

(29) *Comment:* One peer reviewer noted that recently published scientific articles improve known biological information about the Pacific sheath-tailed bat, and the reviewer suggested the proposed rule be updated to reflect this new information. Additionally, the researcher recommended that the proposed rule clarify several matters about the bat's biology, including for example, diet, occurrence, foraging activity, limiting factors on the island of Aguiguan, improved understanding of the threats to the species, and the species' forest habitat foraging requirements.

Our Response: We appreciate the comment and have included all new relevant information reflected in the recent publications regarding the Pacific sheath-tailed bat (see Description of the 23 Mariana Islands Species, above).

Comments From the Government of Guam

(30) *Comment:* The Bureau of Statistics and Plans, Guam Coastal Management Program (BSP–GCMP), commented that they concur with our assessment regarding the status of the 23 species. Additionally, the Bureau stressed the importance of effectively managing and protecting Guam's unique natural resources from invasive species.

Our Response: We appreciate the BSP–GCMP's commitment to conservation on Guam, and we look forward to collaborating in the future to conserve endangered and threatened species, and their habitats, in the Mariana Islands.

(31) *Comment:* The Department of Agriculture's Division of Aquatic and Wildlife Resources (GDAWR) commented that it concurs with our conclusions regarding the status of the 23 species. The Department noted that the accidental introduction of the brown treesnake had resulted in the demise of Guam's native forest birds, as well as negative impacts to native bat and lizard populations. The Department suggested that a loss of pollinators and seed dispersers from Guam's ecosystems has compounded impacts upon native forest regeneration, with cascading effects.

Our Response: We agree with the GDAWR and have evaluated the effects of the brown treesnake on the 23 species in terms of both direct and indirect effects, including the indirect impact of the brown treesnake on the forest ecosystem through direct removal of animals that act as pollinators and seed dispersal agents through predation. We appreciate the GDAWR's comments and commitment to conservation on Guam, and look forward to future collaboration to conserve endangered and threatened species and their habitats on Guam and in the Mariana Islands.

(32) *Comment:* The GDAWR noted that, while nine of Guam's native bird species and two fruit bat species were listed under the ESA due to the threat of extinction from the brown treesnake, the department had initiated recovery actions to save Guam's endemic bird species by collecting the remaining individuals from the wild and implementing ongoing active captive-breeding and release programs. The GDAWR comments that its vision remains to return these listed species, as well as those unlisted species that remain in the CNMI, to the forests on Guam through the control of brown treesnake and other predators that impact the restoration of the species.

Our Response: We commend the GDAWR for its vision and efforts to conserve Guam's endangered species and other native biota. As discussed in this final rule, the brown treesnake continues to pose a significant threat to the native species of Guam, through both direct effects, such as predation, and by indirect effects, including altering forest structure by interfering with natural seed dispersal mechanisms. Gaining control of the brown treesnake and other nonnative predators will directly or indirectly benefit all 23 species in this final rule, as well as previously listed species in the Mariana Islands.

(33) *Comment:* The GDAWR noted that increasing development on military and private lands continues to directly threaten native species, including the partulid snails, through loss of habitat.

Our Response: We appreciate the GDAWR's comments and commitment to conservation on Guam, and concurrence regarding the threat posed to Guam's native species, including the partulid snails, by habitat loss due to increasing development on military and private lands.

(34) *Comment:* The GDAWR noted that isolated pockets of native snails are being discovered through surveys conducted to assess their status on Guam. They also suggested that these species are recoverable through mitigation measures and transplantation to areas where feral pigs and introduced deer are controlled, despite the threat of predation by the flatworm and predatory nonnative snails.

Our Response: We agree that several attributes of the partulid snails, including their size and transportability, increases the likelihood of their eventual conservation and recovery. Specific recovery actions for the tree snails and other species listed here will be identified and addressed in the recovery planning process, subsequent to this rulemaking.

(35) *Comment:* The GDAWR commented on the importance of conserving unique native plant species, including fadang (*Cycas micronesica*), an endemic species that was once dominant in the limestone forests on Guam. They concurred with our assessment that fadang has been hit hard by introduced pests (most notably, the cycad scale) that limit its growth and reproduction. The GDAWR expressed support for the listing of this species, which will in turn provide for the recovery of other native species that depend on native forest.

Our Response: We appreciate the agreement with our assessment of the status of *Cycas micronesica* and the threats to that species, as well as other native plant species of the Mariana Islands. We look forward to continuing our collaboration with GDAWR to protect endangered and threatened species, and their habitats, in Guam and the CNMI.

Comments From the CNMI Government

(36) *Comment:* The CNMI Department of Land and Natural Resources (DLNR) concurred with our assessment of the status of 7 of the 23 species in the proposed rule (three plants: *Cycas micronesica, Heritiera longipetiolata,* and *Tabernaemontana rotensis;* and four animals: Pacific sheath-tailed bat, humped tree snail, Langford's tree snail, and the fragile tree snail), and our conclusion that these 7 species meet the definition of threatened or endangered under the Act. For the remaining nine species in this final rule that occur in the CNMI, they did not agree with our assessment of the status of six plant species, including the four orchids (*Bulbophyllum guamense, Dendrobium guamense, Nervilia jacksoniae,* and *Tuberolabium guamense*), *Maesa walkeri,* or *Solanum guamense,* which are addressed in comment (44) . They expressed skepticism regarding the presence of the Mariana eight-spot butterfly on Saipan (see comment (37));

and they did not express a clear position regarding the proposed listing of the Rota blue damselfly (see comment (38)) or Slevin's skink (see comment (39)).

Our Response: We appreciate the CNMI DLNR's agreement with our assessment of the conservation status of 7 of the 23 species addressed in this final rule. Comments from the CNMI DLNR relevant to the other CNMI species considered in this final rule are addressed separately in response to the comments noted above.

(37) *Comment:* The CNMI DLNR commented that they are unable to verify the claim in the proposed rule that the Mariana eight-spot butterfly once occurred on Saipan, and the modern range does not appear to include the CNMI. The proposed rule cites two unpublished reports (Schreiner and Nafus 1996, Schreiner and Nafus 1997); however, neither of these reports cite a source for the occurrence on Saipan. In addition, the 1996 paper states "no specimens were found in the fairly extensive collection of butterflies at the Saipan Department of Agriculture." The DLNR suggests that, despite recent targeted surveys, there is no verifiable evidence that the Mariana eight-spot butterfly has been found on Saipan within at least the last 40 years; therefore, Saipan should not be considered within the range of the Mariana eight-spot butterfly.

Our Response: The proposed rule described Saipan as part of the historical range of the Mariana eight-spot butterfly, and noted that it may possibly be extirpated from that island; only Guam was included within the description of the known contemporary range of the species. To clarify where the data regarding the historical occurrence of the Mariana eight-spot butterfly on Saipan originates, there is a placeholder and label at the Bishop Museum for a Mariana eight-spot butterfly specimen collected on Saipan on July 30, 1920, which was loaned to the American Museum of Natural History (AMNH) (Richardson 2015, in litt.). The new collection manager at the Bishop Museum has requested information from AMNH regarding this specimen. If this specimen is in error, the known range for the Mariana eight-spot butterfly will be edited to solely include Guam; however, at this time, evidence suggests that the historical range of this species includes Guam and Saipan (Richards 2015, in litt.). At least one species expert suggests that the Mariana eight-spot butterfly and Mariana wandering butterfly may persist on some of the northern Mariana Islands in very low numbers, making observations difficult (Rubinoff 2014, in litt.). Butterfly experts continue to search islands not previously known to support either of the two butterflies addressed in this rule.

(38) *Comment:* The CNMI DLNR stated that the Rota blue damselfly appears to be associated with an uncommon specialized habitat on Rota, *i.e.,* freshwater streams at relatively high elevation. Additionally, they report a new occurrence of the Rota blue damselfly, located at a stream east of the Water Cave that is not connected to the Water Cave (Okgok) Stream (Zarones *et al.*2015b, in litt.). A comprehensive survey of all potential habitat sites on Rota has not been conducted, and no surveys of potential habitat on Saipan have been conducted.

Our Response: We have added the stream east of the Water Cave as a new population site for the Rota blue damselfly under Description of the 23 Mariana Islands Species, above; and to Summary of Changes from the Proposed Rule, above. We note, however, that this observation was of a single individual. In addition, we concur that comprehensive surveys of all potential habitat have not been conducted on Rota and Saipan. The Service looks forward to collaborating with the CNMI DLNR to collect more data on this species and monitor known populations.

(39) *Comment:* The CNMI DLNR stated that the status and trends of the Slevin's skink are unknown in the northern Mariana Islands The DLNR assumes that the Slevin's skink persists on Guguan and Asuncion, in addition to the occurrences on Alamagan and Sarigan described in the proposed rule. The DLNR's Division of Fish and Wildlife will be conducting expeditions to Guguan in 2015 and 2016, which should permit confirmation of its persistence there, as well as provide information on the status of potential invasive predators.

Our Response: The skink was historically known from Guam, Cocos Island, Rota, Tinian, Pagan, Sarigan, Guguan, Alamagan, and Asuncion; however, it is believed to be extirpated from Guam, Rota, Aguiguan, and Tinian, and was not observed during a recent survey on Pagan (Reed *et al.* 2010, pp. 22, 27) (see Description of the 23 Mariana Islands Species, above). We concur that the status of Slevin's skink is unknown on several of the northern islands (*e.g.,* Sarigan, Guguan, Alamagan, and Asuncion); however, the skink is thought to be extirpated on four, now possibly five, of the nine islands on which it was previously known to occur. Of the islands where it is known to persist, Slevin's skink has begun to recover from the effects of past threats (ungulates, which were removed) only on Sarigan, and even there it still faces other threats (*e.g.,* rats). It appears to be very rare on the other small islands where it remains, and may be extirpated from Pagan. The greatly reduced distribution of this species, now restricted to roughly 10 percent of its former range, combined with the risk from rat predation on all of the northern islands on which it occurs; predation by monitor lizards on Sarigan, Alamagan, and Pagan; habitat degradation by feral pigs and goats on Alamagan and Pagan; and habitat destruction from proposed military actions on Pagan leads us to conclude that Slevin's skink warrants the protections of the Act. We look forward to learning the results from the planned surveys, and to collaborating with the CNMI DLNR to learn more about the status of Slevin's skink in the northern islands.

(40) *Comment:* The CNMI DLNR stated that *Heritiera longipetiolata* still occurs on Rota, contrary to the information presented in the proposed rule. They provided information that a field biologist observed one large individual of *Heritiera longipetiolata* on the Rota Sabana in 2010. Additionally, the Rota DLNR is currently propagating and outplanting *Heritiera longipetiolata* (Manglona, pers. comm. 2014).

Our Response: We have added the new location data for *Heritiera longipetiolata,* on Rota under *Islands in the Mariana Archipelago,* Description of the 23 Mariana Islands Species and Table 4, above; and under Summary of Changes from the Proposed Rule, above.

(41) *Comment:* The CNMI DLNR stated that the information presented in the proposed rule regarding the number of individuals of *Heritiera longipetiolata* on Saipan and Tinian is confusing. The DLNR urged the Service to contact local botanical experts directly for information, and provided the original reference for an occurrence on Saipan (Camacho and MES 2002, pp. 38–39). This report includes 53 individual *Heritiera longipetiolata* trees, of which 37 were with flower or bud, as well as 383 seedlings beneath the adult trees (Camacho and MES 2002, pp. 38–39).

Our Response: We appreciate the clarification regarding the number of individuals of *Heritiera longipetiolata* on Saipan. We have added the 53 individuals and numerous seedlings of *Heritiera longipetiolata* observed by Camacho and MES (2002, pp. 38–39) under Description of the 23 Mariana Islands Species, above. The 30 *Heritiera longipetiolata* individuals on Saipan referenced in the proposed rule originated from an estimate we made using the best available data we had at the time (Guerrero 2013, in litt.; Williams 2013, in litt.; Wiles *in* IUCN Red List 2014, in litt.). Regarding the number of individuals on Tinian, new information has revealed that there are at minimum 30 to 40 individuals of *Heritiera longipetiolata* in the southeast portion of Tinian, and likely more individuals in the area along the forested eastern portion of Tinian (Spaulding 2015, in litt.). We have corrected the estimated number of individuals for *Heritiera longipetiolata* on Tinian under Description of the 23 Mariana Islands Species, above. The Service has been in contact with local biologists, including those from the CNMI DLNR, since 2012 in preparation of the development of this rule (Harrington *et al.*2012, in litt.) (please see our response to comment (73), below).

(42) *Comment:* The CNMI DLNR recommends that surveys be conducted in the near future to determine the current status of the occurrences of *Heritiera longipetiolata* that have been recently reported on Saipan, Tinian, and Rota, and asked that we contact the State Forester directly to discuss the status and occurrences of this species in the CNMI.

Our Response: We agree that further surveys need to be conducted to better understand the number and status of individuals of *Heritiera longipetiolata* on the islands of Saipan, Rota, and Tinian in the CNMI. We attempted to contact the State Forester directly as suggested on April 22, 2015, to discuss the status of this species in the CNMI, but to date have not received a response. Although we acknowledge that more information is always desirable, the Act requires that we make our decisions based on the best scientific and commercial data available at the time of our determination.

(43) *Comment:* The CNMI DLNR requested that the Service provide the reference for the eight individuals of *Tabernaemontana rotensis* on Rota in 2004, and whether or not these individuals were naturally occurring or outplanted since the proposed rule does not consider outplanted individuals as an occurrence. The proposed rule states ''Currently on Rota, *T. rotensis* is known from two occurrences, each composed of fewer than 5 individuals'' and cites Harrington *et al.*(2012); however, Harrington *et al.* (2012) does not provide the exact numbers, only ''low number of individuals.'' This reference does state the two locations of the occurrences where this species was observed (Palii and Water Cave). In 2014, DLNR completed a survey of all known locations of naturally occurring and outplanted individuals of *T. rotensis* on Rota and found nine living naturally occurring individuals and one dead individual. Additionally, they report 30 surviving outplanted individuals, ranging in size from 4 to 23 ft (1.3 to 7 m), spread out across the island (J. Manglona, T. Reyes, R. Ulloa, pers. comm. 2014). The Rota DLNR Forestry Division has been carrying out an outplanting program for *Tabernaemontana rotensis* for several years.

Our Response: It is correct that the Service does not count outplanted individuals in our analyses regarding the number of individuals and occurrences for plant species. We appreciate the update regarding the number of *T. rotensis* individuals on Rota, and have added this updated information under Description of the 23 Mariana Islands Species, above, in addition to correcting the language to reflect precisely the wording in the cited report regarding low numbers of individuals.

(44) *Comment:* The CNMI DLNR and a representative of the CNMI legislature stated that the proposed listing for many of the 23 species was based on their status and threats on Guam with little consideration to their status and threats in the CNMI, and that the proposed rule provided inadequate information to support the determination of endangered status for several of the 23 species. Species specifically mentioned include all four orchid species (*Bulbophyllum guamense, Dendrobium guamense, Nervilia jacksoniae,* and *Tuberolabium guamense*), the shrub to small tree *Maesa walkeri,* and the herbaceous plant *Solanum guamense.* Their comments include the following: There is no evidence to indicate a decline of *Bulbophyllum guamense, Dendrobium guamense, Nervilia jacksoniae, Tuberolabium guamense,* or *Maesa walkeri* on Rota, and these species are much more common in the CNMI than indicated in the proposed rule. They provided the results of a 7-day survey by DLNR biologists (conducted in 2015) with both observed numbers and, by extrapolation, estimated counts for each of these species on Rota. Based on their observations, DLNR biologists estimated the total number of individuals on the western portion of Rota to be approximately 16,000 for *Bulbophyllum guamense,* approximately 35,000 for *Dendrobium guamense,* approximately 100,000 for *Nervilia jacksoniae,* and approximately 14,600 for *Tuberolabium guamense.* For *Maesa walkeri,* they were unable to calculate the density and, therefore, make an estimate for the Sabana region, but the DLNR stated they are confident that thousands of *Maesa walkeri* exist on the Sabana plateau, and perhaps other locations on Rota. They could not say at this time whether or not *Maesa walkeri* is restricted to the Sabana Region.

Our Response: The Service evaluates a species for potential listing under the Act based on the status of that species throughout all or a significant portion of its range at the time of the determination. For some of the 23 Mariana Islands species, that range is represented by a single island (*e.g., Eugenia bryanii* and Langford's tree snail), while other species have ranges that include two or more islands (*e.g., Bulbophyllum guamense* and the humped tree snail) (see Description of the 23 Mariana Islands Species and Table 1, above, for the range of each of the 23 species). In each case our evaluation includes consideration of the status of these species and threats acting upon them throughout the entirety of their present ranges, which for each of the four orchids and *Maesa walkeri,* predominantly includes the islands of Guam and, in the CNMI, Rota. The DLNR provided new information from surveys conducted since the publication of the proposed rule demonstrating that these five plant species are more numerous on the island of Rota than previous data indicated, each with a population structure consisting of seedlings, juveniles, and adults. We have incorporated this new data into our consideration of the status of these species, and conclude that this information indicates these five plant species are not as imperiled throughout their ranges as we had understood at the time of the proposed rule. However, these species are still susceptible to multiple threats, including habitat destruction and modification by nonnative plants and animals, the potential effects of climate change, and fire on Rota. Additionally, at least 50 percent of their respective ranges occur on the island of Guam, where these species once occurred in abundance but now exist in very low number of individuals and face similar threats as on Rota, in addition to habitat destruction and modification by urban development, military development and training, brown treesnakes, and feral pigs.

The Act defines an endangered species as ''any species which is in danger of extinction throughout all or a significant portion of its range,'' and a threatened species as ''any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' Therefore, because the four orchid species (*Bulbophyllum guamense, Dendrobium guamense, Nervilia jacksoniae, Tuberolabium guamense*) and *Maesa walkeri* appear relatively healthy on Rota, but are threatened by the above-mentioned factors throughout all of their ranges, and have declined across at least 50 percent of their ranges (*i.e.,* on Guam), we have retained them in this final listing determination but have changed their status to threatened species, as we conclude they are at risk of becoming endangered within the foreseeable future. All new data received during the comment period for these five species have been added to Description of the 23 Mariana Islands Species and Summary of Biological Status and Threats Affecting the 23 Mariana Islands Species, below. Further, our rationale for listing each of these five species as threatened species versus endangered species is discussed under Determination, below.

(45) *Comment:* The CNMI DLNR commented that the Service used inaccurate scientific methods to determine the status of the 23 species and the proposed rule contains several inaccuracies regarding sources of citations and misleading use of references. Specifically, they stated that the Service should have conducted comprehensive surveys across all 14 islands of the CNMI in order to determine the status of the respective species reported to occur historically or currently in the CNMI. Furthermore, they felt the Service relied upon a broad range of factors purported as causing declines with little to no direct scientific evidence that these factors are negatively affecting each species (*i.e.,* inadequate regulatory mechanisms, typhoons, and climate change).

Our Response: We agree that conducting comprehensive surveys across all 14 islands within the CNMI would be ideal; however, this is not practical or possible. As required by the Act, we have relied upon the best scientific and commercial data available to inform our evaluation and decision. For example, the references cited show that the threats outlined in the proposed rule, and this final rule, negatively affect one or more species, their habitat(s), or both (see Summary of Biological Status and Threats Affecting the 23 Mariana Islands Species, above). In our analysis, we thoroughly considered whether these threats, acting either singly or in concert, are affecting each of these species to the degree that the species meets the definition of an endangered species or threatened species under the Act. We affirm our position that threats associated with climate change, inadequate regulatory mechanisms, and typhoons are well supported, as detailed and referenced in this document. Each of these stressors may not necessarily act as a direct threat to the species, but may be considered a contributing factor to endangered or threatened status when evaluated in conjunction with other stressors acting on the species. As described in this final rule, considered collectively, our evaluation leads us to the conclusion that the negative effects of all these threats on these species, which are already vulnerable due to restricted ranges and reduced population sizes and numbers, are such that they meet the definition of an endangered species or threatened species under the Act. Further, minor corrections and changes to the citations are noted under Summary of Comments and Recommendations, herein, or have been directly incorporated into this final rule. More substantial corrections and changes are noted under Summary of Changes from the Proposed Rule, above.

(46) *Comment:* The CNMI DLNR commented that the Service used arbitrary definitions of the term ''decline.'' The use of decline should be consistent and use actual numbers of individuals rather than a decline in overall range (*i.e.,* a decline in the number of islands on which a species occurs).

Our Response: We believe this may be a matter of semantics. In the proposed rule, we used the word ''decline'' as a synonym for ''reduction'' or ''loss.'' We recognize that some readers may prefer the term ''decline'' to be used in association with specific quantitative data, as in numbers of individuals, whereas the term ''reduction'' may be considered more appropriately used with regard to more general qualities, such as the range of the species. However, whether called a decline or a reduction, a significant loss of a species from its former range is widely recognized throughout the conservation literature as a threat because it reduces the redundancy and resiliency of that species to withstand future perturbations. It may also result in a significant loss of evolutionary or adaptive capacity, through a loss of genetic diversity. For example, the range of the Mariana subspecies of the Pacific sheath-tailed bat has either declined or been reduced from possibly seven islands to only one, Aguiguan. The fact that the range of this subspecies has now been diminished such that it now exists in a single known population on only one island renders it vulnerable to extinction, regardless of the metric used to describe that loss of range. In addition, it is reasonable to conclude that a species that has experienced a significant reduction in range has also been reduced in abundance.

(47) *Comment:* The CNMI DLNR and one public commenter stated that the proposed rule contains unreasonable assumptions (*i.e.,* threats, impacts to species, and invasive species), is based on little to no empirical data, and that both the ecosystem approach and climate change sections are oversimplified. The ESA lists species, not ecosystems, and is a species-based regulation. As such, the factors must be considered as they individually affect species, whether directly or indirectly.

Our Response: The proposed rule describes the known negative impacts of nonnative animals and plants, the projected effects of climate change, and other threats as reported in the peer-reviewed scientific conservation literature. The negative impacts on species and on ecosystems resulting from the introduction of nonnative species are well documented around the globe (Vitousek *et al.* 1997, pp. 1–16; Reaser *et al.* 2007, pp. 98–111; Pimentel 2011, pp. 1–7; Simberloff 2011, in litt.; Simberloff *et al.* 2013, pp. 58–60). Additionally, climate change impacts at the ecosystem and species level are documented around the globe and include, but are not limited to, alteration in humidity, temperature, and sea level, which subsequently result in species range shifts, alterations of a specific microhabitat upon which select species depend, or disruption in pollination regimes (*e.g.,* disruption in pollinator life cycle or flowering life cycle of a plant to where they are no longer in sync to promote pollination) (Chen *et al.* 2011, pp. 1,024–1,026; Saikkonen *et al.* 2012, pp. 239; Robbirt *et al.* 2014, pp. 2,845–2,849; Willmer 2014, pp. R1133–R1135; Lambers 2015, pp. 501–502; Urban 2015, pp. 1–33). Although we may not have empirical data that definitively demonstrates or quantifies the effect of these threat factors specific to each species considered in this final rule, if those threat factors are present, it is reasonable to conclude that they would have the same negative impact on any of the 23 Mariana Islands species that has been observed in other situations and reported in the literature. We have attempted to clarify here that although the specific future effects of climate change cannot be determined at this point, the anticipated changes in environmental conditions as a result of climate change are likely to further exacerbate the existing threats to the 23 species. As required by the Act, we must make our determinations based on the best scientific and commercial data available. Lacking observations of how each of the 23 Mariana Islands species may specifically respond to the threat factors considered here, we must rely upon reasonable assumptions regarding the effects of those threats as informed by the best available science.

We agree that the ESA lists species, not ecosystems, and this is a species-based regulation. Under the Act, we determine whether a species is an endangered species or a threatened species based on any of five factors (see Summary of Biological Status and Threats Affecting the 23 Mariana Islands Species, above), and we are required to make listing determinations solely on the basis of the best available scientific and commercial data *available* [emphasis ours] (sections 4(a)(1) and 4(b)(1)(A) of the Act). As described in this final rule, we have thoroughly considered the best scientific and commercial data available for each of the species under consideration, and have made our determination as to status for each species individually. It is a fact that by virtue of occurring in the same ecosystem, many of these species experience the same threat factors. These species are organized by ecosystem in our proposed and final rules solely for the purpose of considering threats that are shared by all species that occur in those ecosystems; this avoids redundancy in the rule, as well as recognizes that for the purposes of potential subsequent recovery actions, should the species be listed, management to reduce those threats would collectively benefit all species that occur in that ecosystem. This ''ecosystem'' approach to recovery is consistent with the stated purpose of the Act under section 2(b), which states that the Act is ''to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved.'' Nonetheless, as clearly stated in this rulemaking, our evaluation and determination regarding the status of each species is made on a case-by-case basis, and each species is added individually to §§ 17.11 and 17.12 of the Code of Federal Regulations; ecosystems are not a valid subject for listing under the Act (see Regulation Promulgation, below).

(48) *Comment:* The CNMI DLNR commented that at present there are insufficient data to determine whether or not *Solanum guamense* meets the criteria for listing in the CNMI. The reported occurrences for *S. guamense* on six of the CNMI islands are derived strictly from herbarium records and plant species incidental observation lists. No comprehensive quantitative surveys have been conducted for *S. guamense* anywhere in the CNMI. Without any recent systematic botanical surveys to prove otherwise, DLNR assumes *S. guamense* persists on all six islands of the CNMI where it was previously reported. They report a plan to search for *S. guamense* on a 2015 Department expedition to Guguan, and on other northern islands whenever the opportunity arises.

Our Response: We agree that additional data regarding the status of *S. guamense* would be desirable. However, under the Act, we are required to make listing determinations solely on the basis of the best available scientific and commercial data *available* [emphasis ours] (sections 4(a)(1) and 4(b)(1)(A) of the Act). Further, we consider the status of a species throughout its entire range, regardless of political boundaries; that is, in this case, we do not consider whether the species warrants listing just in the CNMI, but wherever it occurs. The best available data show that *S. guamense* once occurred on the islands of Guam, Rota, Saipan, Tinian, Asuncion, Guguan, and Maug (see Description of the 23 Mariana Islands Species, above). We have no data available to us to suggest that it continues to be extant on any of these islands, with the exception of Guam. Currently, the only known occurrence of this species comes from a 1994 report on Andersen AFB on Guam (Perlman and Wood 1994, p. 152), where a single occurrence of one individual was observed (Perlman and Wood 1994, pp. 135–136). When the best available scientific data indicate that a species has been reduced to a single known individual, it meets the definition of an endangered species under the Act.

(49) *Comment:* The CNMI DLNR commented that, because *Solanum guamense* is reported to occur on limestone cliff and terrace habitats on the southern islands of CNMI, and the northern islands of CNMI only contain volcanic soils, *S. guamense* clearly occupies a different habitat in the northern islands.

Our Response: Based on the best available information, the physical nature of the substrate is more likely to be the defining factor identifying habitat that supports *S. guamense.* However, we do not disagree that it may occupy a different habitat type in the northern islands of CNMI. Muller-Dombois and Fosberg (1998, p. 243) observed that the forest type on rough lava flows on some of the northern islands, especially Alamagan, is similar in aspect and even in composition to the forest on rough limestone in the southern Marianas, leading these researchers to suggest that the physical nature of the substratum may be of greater importance than the chemical composition.

(50) *Comment:* The CNMI DLNR stated that development and urbanization are not a threat to the four orchid species (*Bulbophyllum guamense, Dendrobium guamense, Nervilia jacksoniae,* and *Tuberolabium guamense*) or *Maesa walkeri* on Rota, and that the threat of development and urbanization on Rota is overstated. They additionally stated that Aguiguan is the only uninhabited southern island of CNMI, and dispute the assertion that ecotourism development would negatively affect the forest and cave ecosystems that support the humped tree snail, Langford's tree snail, and the Pacific sheath-tailed bat (Marianas subspecies). They point out that Tinian community leaders with an interest in ecotourism have proactively initiated consultations with DLNR Division of Fish and Wildlife staff to ensure that native species and habitats on Aguiguan are conserved and enhanced, as they feel that these are the foundation of a successful ecotourism enterprise. Finally, they state that Slevin's skink occurs only on northern islands under no threat of development.

Our Response: Although development and agriculture are not primary threats to the four orchids or *Maesa walkeri* on Rota, the threat from development exists on Guam, which consists of more than 50 percent of their entire ranges. Additionally, we placed the proposed ecoresort on Aguiguan, although currently uninhabited, under the general category of development and urbanization (despite being aimed at ecotourism) since the proposed construction on this island will remove or degrade habitat for the Pacific sheath-tailed bat, the humped tree snail, and Langford's tree snail. The only known population of Pacific sheath-tailed bats occurs on Aguiguan, and any loss of habitat, including foraging areas, will negatively impact this species. Similarly, Aguiguan is the only island where Langford's tree snail has been observed. The proposed military actions and associated infrastructure on Pagan and Tinian are considered development that will negatively impact the plant *Heritiera longipetiolata,* tentatively the plant *Cycas micronesica* (pending identification on Pagan), the humped tree snail, and Slevin's skink. Listing determinations are based solely on the best available scientific and commercially available data relevant to the status of the species; by statute we cannot consider the potential economic or political impacts when we make a determination as to whether a species meets the definition of an endangered species or threatened species under the Act.

(51) *Comment:* The CNMI DLNR stated that the scope and timing of potential expansion of military training activities and possible impacts on proposed species on Tinian and Pagan is speculation at this time. The proposed rule claims that *Bulbophyllum guamense* was historically on Pagan but is not currently found there, and that the proposed military training on Pagan will negatively impact the species. They claim this argument is flawed because if *Bulbophyllum guamense* has been extirpated from Pagan, future military activities there cannot negatively impact the species.

Our Response: The proposed actions on Tinian and Pagan, if implemented, pose a direct threat to the species now known to occur there: The plant *Heritiera longipetiolata,* the humped tree snail, Slevin's skink, and possibly *Cycas micronesica* (pending confirmation on Pagan). In addition, we note that these activities may negatively affect the historical habitat of *Bulbophyllum guamense.* Although military training and activities are not a direct threat to individuals of *B. guamense* since it no longer occurs on Pagan, these activities could negatively impact its habitat on Pagan and preclude future recovery efforts for the species, thus affecting its conservation. Because these actions have been officially proposed in the CNMI Joint Military Training (JMT) draft Environmental Impact Statement (EIS)/ Overseas EIS (*http://www.cnmijointmilitarytrainingeis.com/*), we conclude there is a reasonable expectation that they will be implemented, and thus are more than just speculation.

(52) *Comment:* The CNMI DLNR commented that the status of the Anatahan feral pig population is unknown following the 2003 volcanic eruption. Feral pigs are present on Alamagan, Pagan, and Agrihan, and could potentially threaten the humped tree snail and Slevin's skink. On Pagan, they may threaten *Cycas micronesica.* Feral pigs do not co-occur with *Heritiera longipetiolata* or *Solanum guamense* in the CNMI; therefore, they are not a threat to these two species. Feral pigs are noticeably absent from Rota, the only island in CNMI where 10 of the proposed 14 plants, and the fragile tree snail, occur.

Our Response: Our own records and information, and thus this final rule, are in agreement with DLNR's comment regarding the specific islands in the CNMI occupied by feral pigs. However, we consider pigs a threat to populations of both *Heritiera longipetiolata* and *Solanum guamense* outside of the CNMI on the island of Guam, where these plant species and pigs do co-occur (see Table 3, Table 4, and *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range,* above.

(53) *Comment:* The CNMI DLNR stated that water buffalo do not occur in the CNMI.

Our Response: We agree. Our proposed rule identified water buffalo as a potential threat only on the island of Guam.

(54) *Comment:* The CNMI DLNR stated that feral cattle are present only on Alamagan and Pagan within the CNMI. Feral cattle could potentially represent a threat to the humped tree snail and Slevin's skink. *Heritiera longipetiolata* is not reported to occur on Alamagan or Pagan, so feral cattle are not a threat to *Heritiera longipetiolata* in the CNMI.

Our Response: The best available data indicate that feral cattle occur on the islands of Alamagan and Pagan in the CNMI. Although the proposed rule cites the presence of feral cattle also on the island of Tinian, new information provided by the CNMI DLNR suggests that feral cattle are no longer present on Tinian. Feral domestic cattle have roamed Tinian for the past few centuries, which resulted in substantial changes to the landscape by means of erosion, grazing, and trampling (Wiles *et al.* 1990, pp. 167–199; NRCS 2014, in litt.). Presently, however, the number of feral cattle on Tinian is considered negligible, if any exist at all. Cattle ranching is on the rise on Tinian, and cattle may become a threat on Tinian in the future. We have removed feral cattle as a threat to species that occur on Tinian (see Summary of Changes from the Proposed Rule, above). However, we maintain our position that feral cattle are present on Pagan, and are a threat to the humped tree snail, Slevin's skink, and tentatively to *Cycas micronesica.*

(55) *Comment:* The CNMI DLNR commented that feral goats are present on Agrihan, Pagan, Alamagan, and Aguiguan in the CNMI, and could be considered a threat to four of the proposed animals: Pacific sheath-tailed bat, Slevin's skink, humped tree snail, and Langford's tree snail.

Our Response: We appreciate the confirmation regarding the threat from goats to the species addressed in this final rule present on the islands of Agrihan, Pagan, Alamagan, and Aguiguan. *Cycas micronesica* is likely present on Pagan as well, in which case goats will also negatively impact this species.

(56) *Comment:* The CNMI DLNR states that the brown treesnake is not established on Rota, or on any other island in the CNMI and is, therefore, not an existing threat to the species in the CNMI. Further, interdiction of snakes from Guam continues to be addressed in the CNMI through a robust brown treesnake program active on Rota, Saipan, and Tinian. While it is possible that at some point in the future the brown treesnake may become established in the CNMI, the proposed rule itself does not consider the possibility of future establishment of invasive species such as goats.

Our Response: We commend the brown treesnake program in the CNMI for their dedicated work toward preventing the establishment of the brown treesnake. We have concluded, however, that because the brown treesnake has been found on Saipan (Campbell 2014, pers. comm.; Phillips 2014, pers. comm.) and just recently on Rota as well (Phillips 2015, in litt.), the risk of the brown treesnake becoming established on one or more of the islands in the CNMI is high. We disagree that the likelihood of establishment for an invasive nonnative species such as a goat and brown treesnake are comparable, as brown treesnake are much smaller animals and can easily be accidentally transported in ships and planes; thus the possibility of accidental introduction is much greater.

(57) *Comment:* The CNMI DLNR states that if the brown treesnake were to become established on Rota, it may impact the forest structure in the very long term if seed dispersers and pollinators are eliminated. However, the epiphytic orchids (*Bulbophyllum guamense, Dendrobium guamense,* and *Tuberolabium guamense*) were found to occur on many different host plants, and in the case of *B. guamense* and *D. guamense,* they were found on several introduced plant species. *Dendrobium guamense* was found on standing and fallen dead trees, and even on cliff faces. There is no evidence to suggest an eventual change in the forest structure would negatively impact these species.

Our Response: We disagree. The best available scientific data indicate that if the brown treesnake were to establish on Rota, it would impact the forest structure by eliminating seed dispersers (Rogers 2008, in litt.; Rogers 2009, in litt.; Caves *et al.* 2013, pp. 1–9). The actions of the brown treesnake indirectly alter forest structure, subsequently altering essential microclimates necessary to support species such as the four tree snails and four orchids addressed in this final rule. The three epiphytic orchids occupy a highly specialized niche habitat that is easily disturbed. Raulerson and Rinehart (1992, p. 89) clearly state that, although the orchids in the Marianas appear abundant, their habitat range is limited, and in reality these orchids are very rare. Additionally, the brown treesnake has severely altered the forest structure on Guam (Rogers 2008, in litt.; Rogers 2009, in litt.), where at minimum, 50 percent of the entire range exists for each of the four orchids addressed in this final rule.

(58) *Comment:* The CNMI DLNR stated that the proposed rule gives information on nine of the nonnative plant species deemed to have the greatest negative impact on forest ecosystems, yet does not state how precisely these nonnative plants impact the proposed species, in particular the epiphytic orchids.

Our Response: The proposed rule and this final rule outline how each of the nonnative plants impact native species, including the four orchids (see ''Habitat Destruction and Modification by Nonnative Plants,'' above). Examples provided include: Nonnative plants can form dense blankets that smother and outcompete native plants and animals; they can form dense tangled monostands that outcompete and crowd out native plants or negatively alter essential microclimates that support native animals and plants; nonnative plants can produce allelopathic effects or be able to occupy a more broad range of habitat types thus affording it an advantage; and nonnative plants can prevent the establishment of native plants. Orchid-specific examples include the potential to be smothered by nonnative vines (*e.g., Antigonon leptopus*) to the degree that they do not receive sunlight or block access from pollinators.

(59) *Comment:* The CNMI DLNR commented that, while fires are common in grasslands on Rota, the species *Cycas micronesica, Dendrobium guamense, Maesa walkeri, Tabernaemontana rotensis,* and the humped tree snail are found in limestone forests, which generally are not impacted by fire, except at the forest edge.

Our Response: Fires that occur on grasslands adjacent to the forest edge can directly impact individuals of the noted species that occupy the forest edge, as well as cause indirect impacts through continual encroachment of the grassland into the forest, thus decreasing the forested area and the habitat that supports these species. We consider fire a threat to these species on all of the islands where they are known to occur (see Table 3, Table 4, and Habitat Destruction and Modification by Fire, above).

(60) *Comment:* The CNMI DLNR commented that they are unable to accept typhoons as a threat for any of the proposed species. Frequent and intense typhoons are a natural occurrence in the Mariana Islands. These species have all persisted in the Marianas despite many typhoons in the past. Typhoons per se are not a primary threat; however, if a species exists in limited numbers, then a typhoon may present an indirect threat.

Our Response: We concur that typhoons are not a threat to native species with healthy and abundant populations, and we have modified the discussion of typhoons in this final rule to more accurately reflect this view. However, we do consider typhoons to pose a threat for the very reason identified by the DLNR: Because each of the 23 species considered here have been reduced to limited numbers and range, or are decreasing at high rates (*i.e., Cycas micronesica*), they have become vulnerable to extirpation or extinction from natural disturbances such as typhoons. Due to the threats outlined in Table 3, these species and their associated natural habitats now lack the natural resiliency and redundancy they once had that enabled them to withstand such natural events.

(61) *Comment:* The CNMI DLNR stated that the proposed rule claims that individuals of *Bulbophyllum guamense* that occur close to the coast in the adjacent forest ecosystem at or near sea level may be negatively impacted by sea-level rise and coastal inundation; however, the Department's evidence indicates the species is found only at higher elevations, and thus would not be affected by sea-level rise.

Our Response: Although we agree that the majority of individuals of *Bulbophyllum guamense* have been recorded at higher elevations, *B. guamense* is also known to occur along the coastlines at the Haputo Ecological Reserve Area, Ritidian Point, and Two-Lovers Point, on the island of Guam, and, therefore, we conclude that sea-level rise is a concern.

(62) *Comment:* The CNMI DLNR provided an update to the protected conservation areas on both Rota and Saipan. There are three conservation areas on Rota, including the Sabana Wildlife Conservation Area, encompassing both the Sabana Heights and Talakhaya (added in 2007 through Rota Local Law 15–8); the Wedding Cake Wildlife Conservation Area (Rota Local Law 9–3); and the Mariana Crow Conservation Area, declared in 2014, which encompasses the former I-Chenchon Park (§ 85–30.4). On Saipan, there are six conservation areas. There are the four areas mentioned in the proposed rule; as well as two new conservation areas in Marpi, both deeded to DLNR in 2012, and include the Nightingale Reed-warbler Conservation Area and the Micronesian Megapode Conservation Area.

Our Response: We have revised this final rule to accurately reflect this information (see *Islands in the Mariana Archipelago* and Summary of Changes from the Proposed Rule, above. We support the goals and intent of all of CNMI's natural protected areas.

(63) *Comment:* The CNMI DLNR commented that they acknowledge the presence of deer on Rota, but suggested there is no evidence of deer herbivory impacts on *Cycas micronesica, Heritiera longipetiolata,* or *Solanum guamense.* The Department further disagreed with the claim that mammalian herbivory by deer and pigs contributes to the decline of *Solanum guamense* based upon the prevalence of *Solanum torvum* on Tinian, and the fact that leaves and green fruits of plants of the *Solanum* genus are often toxic to livestock.

Our Response: As noted in Table 4 of this final rule, deer are identified as a threat on the islands of Guam and Rota. The *Solanum* genus contains more than 1,500 species, many of which are edible by animals, including *S. tuberosum* (potato), *S. melongena* (eggplant), *S. Arcanum* (wild tomato), and *Solanum nelsonii,* endemic to Hawaii and eaten by deer, rats, and cattle (USFWS 2014, in litt.). Furthermore, according to our sources (Wheeler 1979, pp. 1–51; Wiles *et al.*1999, pp. 193–215; Perlman and Wood 1994, p. 152; Rogers 2012, in litt.; Wiles 2012, in litt.; Marler 2014, in litt.) and as reflected in Table 4, the impacts of deer and other ungulate herbivory upon *Cycas micronesica, Heritiera longipetiolata,* and *Solanum guamense* have been observed on the islands of Rota or Guam, where these plants co-occur with deer and pigs.

(64) *Comment:* The CNMI DLNR stated that, in consultation with regional experts, its Division of Fish and Wildlife recently conducted threat assessments for the Pacific sheath-tailed bat, Slevin's skink, humped tree snail, Langford's tree snail, and the fragile tree snail. The assessments indicated that rats have likely contributed to the past decline in candidate snail species and remain an ongoing threat to native snail species. However, their assessments did not identify predation by rats or monitor lizards as a threat to the Pacific sheath-

tailed bat or Slevin's skink (Liske-Clark, in prep.).

Our Response: We agree with the Department that rats remain a serious ongoing threat to the four proposed partulid snails addressed in this rule. However, our sources regarding Slevin's slink (Losos and Greene 1988, pp. 379–386; Rodda in litt. 1991, p. 205; Rodda in litt. 2002, pp. 2–3; Lardner in litt. 2012, pp. 1–2; Allison *et al.* 2013, in litt.) and the Pacific sheath-tailed bat (Valdez *et al.* 2011, p. 302; Wiles *et al.* 2011, p. 306;), which include several of the leading species experts, indicate that both species are threatened by predation from rats and monitor lizards.

(65) *Comment:* The CNMI DLNR stated that the proposed rule offers no scientific evidence to show that slugs are directly impacting the four orchids (*Bulbophyllum guamense, Dendrobium guamense, Nervilia jacksoniae,* and *Tuberolabium guamense*) addressed in this rule.

Our Response: We acknowledge that we do not have direct evidence of slug herbivory specific to the four orchid species considered here. However, these mollusks are well-known pests of orchids throughout the world (Hamom 1995, pp. 45–46; Hollingsworth and Sewake 2002, pp. –2; Joe and Daehler 2008, pp. 245–255) and of a variety of plants on Rota (Badilles *et al.*2010, pp. 2–7; Cook 2012, in litt). Therefore, based on the known presence of nonnative slugs on Rota and their known habitat of consuming orchids, we believe it is reasonable to conclude that slug herbivory is a threat to the four orchid species on the island of Rota.

(66) *Comment:* The CNMI DLNR stated that they concur with regional experts and the proposed rule regarding the significant threat posed by the *Platydemus* flatworm to the tree snail species proposed for listing (Liske-Clark, in prep.).

Our Response: We appreciate receiving the Department's assessment of the threats to the tree snails that we are listing via this final rule.

(67) *Comment:* The CNMI Department of Land and Natural Resources challenged the claim that current regulatory mechanisms in place in the CNMI are modestly enforced and are currently inadequate to protect the 16 (sic) CNMI species.

Our Response: The proposed rule and this final rule identify the spread of nonnative plants and animals as the primary example as to why we consider CNMI regulations to be modestly enforced and inadequate. After receiving comments on the proposed rule, we have added that a paucity of funding availability and human resources hinders the enforcement of regulations (CNMI DLNR–Rota 2015, in litt.). We acknowledge that addressing the magnitude and intensity of harmful nonnative species (*e.g.,* brown treesnakes, aulacaspis scale, flatworms, and plants such as *Chromolaena odorata*) and their continual spread in the Marianas is a daunting and challenging task. However, this ongoing problem indicates that existing regulatory mechanisms have not curbed the impact or spread of these species. Therefore, current regulatory mechanisms are considered inadequate at this time.

(68) *Comment:* The CNMI DLNR concurred that limited numbers is a threat for the Rota blue damselfly, Langford's tree snail, and fragile tree snail. However, the Department noted that the threat of limited numbers for the fragile tree snail is listed in Table 3, but is not included in the description of threats.

Our Response: We have corrected this oversight in the text of this final listing rule (see Table 3 and Summary of Changes from the Proposed Rule, above).

(69) *Comment:* The CNMI DLNR is unaware of any vandalism ever occurring on Rota targeting *Tabernaemontana rotensis* and suggested that the only reason why vandals might specifically target *T. rotensis,* or any particular species, would be its current or proposed status under the Act.

Our Response: Vandalism of federally listed plant populations is well-documented across the United States, and there was an occurrence of vandalism to *Tabernaemontana rotensis* in the late 1990s (Hess and Pratt 2006, p. 33). However, we have concluded that vandalism is not an imminent threat to *Tabernaemontana rotensis* since there have been no documented occurrences since that time and have, therefore, removed this threat for this species from Table 3 and Factor E, above.

(70) *Comment:* The CNMI DLNR stated that they have no evidence of ordnance directly impacting *Cycas micronesica* or *Heritiera longipetiolata* in the CNMI. The Department stated that, while ordnance use may be a potential threat on Pagan and Tinian in the future, they did not believe ordnance is a current or potential threat on any other island in the CNMI.

Our Response: Our information regarding current and future planned military activity on Guam and within the CNMI indicate that *Cycas micronesica* and *Heritiera longipetiolata* are at risk of likely impacts from ordnance on the islands of Guam and Tinian, respectively. Damage to both *C. micronesica* and *H. longipetiolata* by ordnance and live-fire has been observed near a firing range on Andersen AFB (Guam DAWR 2013, in litt.).

(71) *Comment:* The CNMI DLNR reported a new occurrence for *Dendrobium guamense* with three individuals of *Dendrobium guamense* observed on the island of Aguiguan.

Our Response: We have updated this final rule to include Aguiguan within the range of this species (see Description of the 23 Mariana Islands Species, Table 1, and Summary of Changes from the Proposed Rule, above).

(72) *Comment:* The CNMI DLNR reported a new occurrence for the Rota blue damselfly in a separate stream not used for water consumption on Rota, and commented that this second occurrence suggests the threat of water extraction is not as severe as stated in the proposed rule. The Department recommended that all streams of the Talakhaya region of Rota be surveyed for the damselfly in order to determine the full distribution of this species. Additionally, the Department noted that surveys should be conducted along streams on Saipan and the Talofofo watershed on Guam.

Our Response: We have added this new occurrence information under Description of the 23 Mariana Islands Species and Summary of Changes from the Proposed Rule, above. We agree with the Department that additional surveys for the damselfly are desirable and would enhance our understanding of this species' status and biology. However, under the Act, we are required to make listing determinations on the basis of the best available scientific and commercial data available (see 16 U.S.C. 1533(a)(1) and (b)(1)(A)). While we appreciate learning of the new occurrence, the observation of a single additional individual is not sufficient to change our conclusion that the threat of water extraction is any less. The fact remains that the vast majority of known individuals representing the entire species is found on a stream that is used for water consumption on Rota, and thus this factor remains a significant threat.

(73) *Comment:* The CNMI DLNR stated that they had not seen much public engagement, education or outreach for the community of Rota with regard to the proposed rule. They noted that the Service came to the DLNR office for a 2-day visit, but expressed the opinion that this was not sufficient for a rulemaking that would create a great impact on cultural, social, economic,

and environmental resources in the future.

Our Response: We regret that the CNMI DLNR feels our outreach efforts have been insufficient. The Service initiated communication regarding this rulemaking with the CNMI DLNR starting as early as spring 2012, including the Secretary and supervisory biologist. The CNMI DLNR supervisory biologist assisted our biologists in the field on Saipan during July 2012 and was invited to review and comment on their survey trip report (Harrington *et al.* 2012, in litt.), which included not only the 14 plants listed in this final rule, but 17 additional plants that were considered for conservation actions at that time. Similarly, the CNMI DLNR Division of Fish and Wildlife on Rota collaborated with our field biologists in 2012, and were also asked to review and comment on the plant species. Our biologists also met with the CNMI DLNR Division of Forestry on Rota in 2012 to discuss the status of 31 Mariana Islands plant species considered for conservation actions.

In November 2012, our Deputy Field Supervisor—Programmatic Division and Acting Deputy Field Supervisor—Geographic Program had a meeting each with the Secretary of CNMI DLNR and the Mayor of Rota, in which the potential listing of these species was mentioned. In June 2013, they met with the Secretary and Mayor of Rota again, and provided a briefing paper regarding the 23 species. In January of 2014, our Acting Deputy Field Supervisor—Geographic Program, along with several staff biologists, met with the Mayor of Saipan, the Mayor of Tinian, and the Mayor of Rota along with the Rota Division of Fish and Wildlife and Division of Forestry, specifically to discuss the 23 species. In May 2014, prior to the publication of the proposed rule, we held two public information meetings, one each on Guam and Saipan, in order to inform the public and answer questions about the 23 species and listing process. Also in May 2015, our Field Supervisor and Deputy Field Supervisor—Programmatic Division and Acting Deputy Field Supervisor—Geographic Program briefed the CNMI Legislature, and met with the CNMI DLNR on Saipan, to discuss the status of the 23 species, answer questions, and gain information on one or more of the 23 species and conservation issues. In July 2014, our Field Supervisor and Deputy Field Supervisor—Programmatic Division met with the Legislative Representative from Rota regarding the orchids. Upon the publication of the proposed rule (October 1, 2014), we published news releases in the Marianas Variety, Marianas Variety Guam, and Pacific Daily News.

Due to requests received during the first comment period, we reopened the comment period for an additional 30 days (January 12, 2015, through February 11, 2015); and in January 2015, held two public hearings (one each on Guam and Saipan), and four public information meetings (one each on the islands of Guam, Rota, Saipan, and Tinian). The public information meeting on Rota had 11 attendees. Additionally, most of the species addressed in this final rule that occur on Rota are found within existing conservation boundaries or designated critical habitat. Any future targeted conservation measures on Rota will likely occur within these areas and, therefore, minimize impacts to the local community. Further, once a species is listed, for private or other non-Federal property owners we offer voluntary safe harbor agreements that can contribute to the recovery of species, habitat conservation plans (HCP) that allow activities (*e.g.,* grazing) to proceed while minimizing effects to species, funding through the Partners for Fish and Wildlife Program to help promote conservation actions, and grants to the States under section 6 of the Act. Overall, the Service has attempted to inform and engage the community of Rota to the extent possible, and we look forward to continue working with the CNMI DLNR and the members of the local community for the conservation of native species on Rota.

(74) *Comment:* The CNMI DLNR submitted comment with the suggestion that the Endangered Species Act (the Act) be modified to accommodate different situations because it believes the way the ESA is currently written and applied is limited by its one-size-fits-all approach.

Our Response: Changing the Act requires a legislative action by the United States Congress and is beyond the scope of this listing action.

(75) *Comment:* A member of the CNMI Legislature commented that the CNMI is slowly rebounding from a slow and weakened economy, and that they are faced with significant economic challenges. In order to address these issues, the Government approved a series of proposed developments that include the construction of 2,000-plus integrated casino resorts at various locations yet to be determined, themed entertainment facilities, beverage outlets, villas, chapels, and sports facilities that are to be built at other locations. This commenter stated that it is inevitable that listing species for protection and conservation will place stumbling blocks for economic prosperity for the people of the Commonwealth.

Our Response: The Act requires that our listing determinations be based solely on the best scientific and commercial data available. The Act does not allow us to consider the impacts of listing on economics or human activities whether over the short term, long term, or cumulatively.

(76) *Comment:* Two commenters, the CNMI DLNR and a representative of the CNMI legislature, commented that the Service must provide the financial resources to effectively carry out and enforce Federal conservation programs in the CNMI. This added task, absent financial support, is counterproductive. The CNMI DLNR is understaffed and underfunded. The representative from the Legislature further commented that Federal conservation programs in the CNMI are being hampered due to being understaffed and no or under-appropriated Federal financial support; and, therefore, the Service should not depend solely on data collected from the CNMI DLNR Division of Fish and Wildlife.

Our Response: The Service does not solely rely on any one source to inform our proposals or to make a determination. We rely on the best scientific and commercial data available at the time of our decision; that data may come in many forms and from multiple sources. In this case, we have relied on peer-reviewed published articles, unpublished research, habitat modeling reports, digital data publicly available on the Internet, and the expert opinions from specialized biologists to determine the status of the 23 species. Regarding funding, the Service provides funding to CNMI DLNR and other local conservation programs such as the brown treesnake program, and pending our future budget, which changes annually, we intend to allocate funds to assist with actions that aim to recover the 23 species addressed in this final rule. The funding of the CNMI DLNR is outside the scope of this rulemaking.

(77) *Comment:* A representative from the CNMI legislature and one public commenter stated that it was difficult to navigate the methods provided to the public to make a comment. The Web sites and addresses are long and confusing, technology is limited in many areas of the CNMI, and small community voices likely will not be heard. People would like to comment, but do not understand how or where, or even what impacts would result from the listing of the 23 species. People also do not understand how these species reached being considered for

endangered or threatened status, or what these species even look like.

Our Response: Please see our response to comment (73), above, where we outline the multiple public information meetings held to inform the public and answer questions. At all of these meetings, we provided contact information, information about the 23 species (including pictures), and explained why they were being considered for listing as threatened or endangered species. We also had biologists present to explain the listing process and answer questions to members of the public. The public information meetings held in January 2015 on Guam, Saipan, Rota, and Tinian were held during the second open comment period, and we accepted written comments at those meetings. We also held public hearings, at which members of the public could present their comments orally if they preferred to do so. We have provided multiple opportunities to inform the public, answer their questions, and submit comments regarding the proposed rule. We always appreciate feedback on how we can improve our outreach efforts.

(78) *Comment:* A representative of the CNMI legislature and a public commenter requested that the Service separate out the 16 plants and animals that were not previously candidate species, and assign them a totally different process, and only move on with the 7 candidate species at this time. CNMI biologists have conducted surveys that found there are many more individuals of some species than what was stated in the proposed rule. More research is needed to determine whether or not the additional 16 species warrant listing.

Our Response: We included the additional 16 species in this listing package for the sake of efficiency and saving taxpayer dollars. We evaluated these species under the same standards and with the same rigor outlined in the ESA that we apply to all species under consideration for listing, whether previous candidates or not. Under the Act, we determine whether a species is an endangered species or a threatened species because of any of five factors, and we are required to make listing determinations solely on the basis of the best available scientific and commercial data *available* [emphasis ours] (sections 4(a)(1) and 4(b)(1)(A)). Further, our Policy on Information Standards under the Act (published in the **Federal Register** on July 1, 1994 (59 FR 34271)), the Information Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Pub. L. 106–554; H.R. 5658)), and our associated Information Quality Guidelines (*www.fws.gov/informationquality/*), provide criteria and guidance, and establish procedures to ensure that our decisions are based on the best scientific data available. They require our biologists, to the extent consistent with the Act and with the use of the best scientific and commercially available data, to use primary and original sources of information as the basis for recommendations to list a species.

In accordance with our peer review policy published on July 1, 1994 (59 FR 34270), we solicited peer review from knowledgeable individuals with scientific expertise that included familiarity with the species, the geographic region in which the species occurs, and conservation biology principles. Additionally, we requested comments or information from other concerned governmental agencies, the scientific community, industry, and any other interested parties concerning the proposed rule. Comments and information we received helped inform this final rule. We have incorporated all new information, including the studies conducted by CNMI DLNR biologists, under Description of the 23 Mariana Islands Species and Summary of Biological Status and Threats Affecting the 23 Mariana Islands Species, above; and we discuss our rationale for retaining the species that are more abundant than previously described in the proposed rule under Summary of Changes from the Proposed Rule, above. Therefore, in this final rule, we have made our determination to list the 23 species as threatened or endangered species based on the best scientific and commercial data available.

Please see also our responses to comments 4, 45, and 47, above.

(79) *Comment:* A representative of the CNMI legislature expressed concern that more land on Rota will be set aside if the listings are finalized, especially due to the recent large piece of public land set aside on Rota to mitigate for the Mariana crow that is listed as endangered. Additionally, there was a recent Federal law passed by Congress authorizing a feasibility study for a National Park monument on Rota.

Our Response: We understand that there is concern about the potential consequences following the listing of these 23 species. However, the direct effect of this rulemaking is limited to placing these 23 species on the Federal Lists of Endangered and Threatened Wildlife and Plants, which in turn affords them protections under sections 7 and 9 of the Federal Endangered Species Act . The listing of these species does not carry with it any automatic requirement that additional land be set aside on Rota for the purposes of conservation. Should the listing of these species initiate some interest by the local government or some other entity in potentially setting aside some additional lands for conservation, such an action would entail an entirely separate endeavor and legal process from this rulemaking.

Comments From Federal Agencies

Comments From the U.S. National Park Service

(80) *Comment:* The U.S. National Park Service (NPS) commented that they concur with the proposed rule to add these 23 species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Of the 23 species, the NPS Monitoring and Inventory Program and War in the Pacific National Historical Park (NHP) staff have recently found three plant species present on park land on Guam (*Cycas micronesica, Tinospora homosepala,* and *Phyllanthus saffordii*). Also, they suggest that the plant *Hedyotis megalantha* is probably present in the park as the park contains appropriate habitat that is likely supporting the occurrence of that species. A small population of the Guam tree snail is also present in at least one site in the park. The humped tree snail has been recorded recently in American Memorial Park on Saipan.

Our Response: We appreciate being informed regarding species status, threats, and numbers. The presence of the three plants and Guam tree snail at War in the Pacific NHP on Guam, and the presence of the humped tree snail at American Memorial Park on Saipan, were included in our analyses published in the proposed rule. The NPS participated in meetings with the Service and other Federal and State partners during the information-seeking stage of the proposed rule.

Comments From the U.S. Navy

(81) *Comment:* The U.S. Navy requested that we correct the description of the Marine Corps relocation and, specifically, recommended citing the Draft Supplemental EIS (SEIS) released in April of 2014. The proposed action is to construct and operate facilities on Guam (not Tinian) to support the training and operations of Marines. Four ranges on Tinian were proposed in the original 2010 record of decision (ROD); however, the training requirements satisfied by those four ranges are now the subject of another EIS (CNMI Joint Military Training, or CJMT) and, as such, are not

a part of the revised proposed action covered in the 2014 Draft SEIS for the Marine Corps relocation to Guam. Additionally, the construction of a deep-draft wharf in Apra Harbor and facilities to support the U.S. Missile Defense Task Force is no longer proposed on Guam (and is not addressed in the revised proposed action covered in the 2014 Draft SEIS).

Our Response: We have incorporated these changes from the new 2014 Draft SEIS and the 2010 ROD under *Historical and Ongoing Human Impacts,* above, and under Summary of Changes from the Proposed Rule, above.

(82) *Comment:* The U.S. Navy commented that the preferred alternatives identified in the 2014 Draft SEIS for the Marine Corps relocation to Guam include construction of a Marine Corps cantonment (main base) at Naval Computer and Telecommunication Station Finegayan and a live-fire training range on Andersen Air Force Base–Northwest Field. Orote Point, Pati Point, and Navy Barrigada are not preferred locations for any facilities to support the Marine Corps move. Andersen South and the Naval Magazine were addressed in the 2010 ROD and, as discussed in the 2014 Draft SEIS, action and activities at those two locations are still proposed.

Our Response: We have updated our description of *Historical and Ongoing Human Impacts,* above. Additionally, we have noted this change under Summary of Changes from the Proposed Rule, above.

(83) *Comment:* The U.S. Navy acknowledged that many of the proposed species occur on Department of Navy (DON) lands. Specifically, proposed species that are known to occur on lands managed by Joint Regional Marianas (JRM) include the plants *Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Heritiera longipetiolata, Maesa walkeri, Nervilia jacksoniae, Psychotria malaspinae, Tabernaemontana rotensis,* and *Tuberolabium guamense;* and the Mariana eight-spot butterfly (and associated host plants *Procris pendunculata* and *Elatostema calcareum*), humped tree snail, Guam tree snail, and the fragile tree snail; as well as the host plant (*Maytenus thompsonii*) for the Mariana wandering butterfly. Additionally, the previously listed tree *Serianthes nelsonii* also occurs on JRM lands. They noted the proposed plants *Hedyotis megalantha* and *Phyllanthus saffordii* may also occur on lands managed by JRM.

Our Response: We appreciate the Navy's confirmation of those species that are known to occur or may occur on JRM lands. We look forward to collaborating with the JRM Natural Resource Program team to plan and implement conservation measures to achieve the recovery of all endangered and threatened species that occur on JRM lands.

(84) *Comment:* The U.S. Navy provided updated information on the humped tree snail and Guam tree snail related to surveys conducted at Haputo Ecological Reserve Area on Naval Base Guam Telecommunication Site in 2014, and surveys all over Guam for the Federal Candidate Species Survey and Monitoring on Guam, Monthly Report for August 2014 (Lindstrom and Benedict 2014).

Our Response: We have incorporated all new relevant data for the humped tree snail and Guam tree snail under Description of the 23 Mariana Islands Species and Summary of Biological Status and Threats Affecting the 23 Mariana Islands Species, above.

(85) *Comment:* The U.S. Navy commented that, in the section titled Habitat Destruction and Modification by Development, Military Training, and Urbanization, the proposed rule states that the northern two-thirds of Tinian are leased by the Department of Defense, and the development of these lands and effects from live-fire training will directly impact the trees *Heritiera longipetiolata* (on Tinian) and *Cycas micronesica* (on Pagan) and their habitat in the forest ecosystem. The Navy concurs that there may be an impact during construction, dependent on the location of ranges and the distribution of *H. longipetiolata* (Tinian) and *C. micronesica* (Pagan). However, they believe it is unlikely that live-fire training will impact these species since the ordnance or small-arms will be directed into cleared impact areas. The same comment applies to the humped tree snail and Slevin's skink on Pagan; both are forest species, and only forest clearing (if needed for range construction) may impact them.

Our Response: One of the primary threats to each of the 23 species in the proposed rule is land clearing that results in direct loss of habitat. We maintain our position regarding threats associated with live-fire training for the above-mentioned species, as the risk of direct damage from ricocheted bullets and misplaced ordnance cannot be eliminated, nor can the associated risk of fire. Direct damage resulting from live-fire training has been observed in the past to individuals of *Heritiera longipetiolata* and *Cycas micronesica* at the firing range adjacent to Tarague Beach, on Andersen Air Force Base, Guam (GDAWR 2013, pers. comm.). Further, the direct trampling of individuals and destruction of habitat from military personnel remain threats to the above species. New information received during the first comment period informed us that the humped tree snail has recently been documented on Tinian. Therefore, land clearing and live-fire training are also a threat to the humped tree snail on Tinian (see Description of the 23 Mariana Islands Species, above, and Summary of Changes from the Proposed Rule, above). The Service looks forward to further collaboration with the DOD to develop strategies that simultaneously support the DOD's mission-critical activities and avoid or minimize impacts to listed, proposed, and candidate species, and their habitats.

(86) *Comment:* The U.S. Navy commented that, in the section titled ''Habitat Destruction and Modification by Introduced Ungulates,'' the proposed rule does not report three epiphytic orchids (*Bulbophyllum guamense, Dendrobium guamense,* and *Tuberolabium guamense*), the vine *Tinospora homosepala,* the Mariana wandering butterfly and its host plant *Maytenus thompsonii,* and the Rota blue damselfly to be vulnerable to habitat modification and destruction caused by nonnative ungulates. They point out that ungulates on Guam have modified the current forest ecosystem, resulting in minimal regeneration of native tree species, including those that are hosts for the epiphytic orchids and butterflies; impacts from ungulates would be expected to impact these species.

Our Response: When species face myriad threats, we focus on those that pose the greatest risk to the species. Although the cumulative scientific literature confirms the negative impacts on ecosystems resulting from nonnative ungulates, we have no evidence at this time to support assigning nonnative ungulates as a threat to the three epiphytic orchids, nor the Mariana wandering butterfly and its host plant *Maytenus thompsonii.* The Service exercises caution when assigning a threat to a species. The three epiphytic orchids often occur high up in the canopy far from the reach of ungulates, and the tree *Maytenus thompsonii* does not yet appear to be impacted by ungulates to the degree that we would consider the Marianas wandering butterfly to be threatened by ungulates.

(87) *Comment:* The U.S. Navy commented that, although the proposed rule states that *Cycas micronesica* and *Heritiera longipetiolata* have been impacted from activities at a firing range near Tarague Beach along the ridge line on Andersen Air Force Base Guam

(note: We assume the firing range referenced is Combat Arms Training and Maintenance (CATM)]), JRM has not received any reports of damage to these or any other proposed species in areas at or adjacent to the CATM Range from training activities at this site. JRM conducted a survey of the CATM Range on October 30, 2014, to assess the presence and relative abundance of proposed species and to search for signs of impact from activities at the range. *Cycas micronesica* was present at all areas searched, with abundance ranging from 1individual to approximately 50 at each site. No evidence of range-related damage was observed to individuals of *C. micronesica,* including no signs of damage from ricochet bullets to cycads or other vegetation at any sites. *Heritiera longipetiolata* was not observed at any sites. Considering the observed abundance of the species proposed for listing, the absence of signs of damage from range activities, and the type of training that occurs at the range, impacts from activities at the CATM Range (including ricochet bullets) it is not expected to present a significant threat to the species proposed for listing. This finding is expected to also apply to other ranges that currently exist on Guam due to the similar type of training that occurs at these ranges.

Our Response: We appreciate the Navy's investigation into the threat from live-fire weapons to *Heritiera longipetiolata* and *Cycas micronesica* near Tarague Beach, and the recent update that live-fire is not negatively impacting these species as described in the proposed rule. The Service has taken this comment into consideration and has omitted Tarague Beach from the sites where live-fire training and ordnance are considered to negatively impact these two plant species. However, due to the preferred site for the new live-fire range on Northwest Field on Andersen AFB over the Guam National Wildlife Refuge, and the associated proposed training activities on Pagan and Tinian, the Service concludes that DOD ordnance and live-fire training remain a threat to these two previously mentioned plant species (*Cycas micronesica* (Northwest Field Andersen AFB) and *Heritiera longipetiolata* (Tinian)), and has been added as a threat to the humped tree snail and Slevin's skink, also addressed in this final rule, because they occur on Pagan where live-fire training is planned as described in the CNMI Joint Military Training Draft EIS/OEIS (*http://www.cnmijointmilitary trainingeis.com/about*). Additionally, the plants *Psychotria malaspinae* and *Tabernaemontana rotensis* and the Mariana eight-spot butterfly occur within the suggested boundaries of the live-fire training area on the Northwest Field on Andersen Air Force Base (USFWS 2015, in litt.) and, therefore, are being assigned the threat from live-fire training and ordnance.

Other threats to these seven species, and their habitats, associated with DOD live-fire training include direct destruction by land clearing, live-fire weapons training and possible fires caused by this activity, or inadvertent trampling and destruction by military personnel. The threat from live-fire training and ordnance to the plants *Cycas micronesica, Heritiera longipetiolata,* and *P. malaspinae,* and *Tabernaemontana rotensis* and the humped tree snail, Marianas eight-spot butterfly, and Slevin's skink, listed as threatened or endangered in this final rule, has been added to Table 3 and Summary of Biological Status and Threats Affecting the 23 Mariana Islands Species, above. These changes are also noted under Summary of Changes from the Proposed Rule, above.

(88) *Comment:* The U.S. Navy commented that the JRM INRMP uses an ecosystem approach to adaptively manage natural resources to protect native species, including federally listed endangered, threatened, and proposed species and their habitat. They describe the key components of ecosystem management in the INRMP as: (1) Control and eradication of ungulates (deer, pigs and carabao); (2) restoration and maintenance of native forests; and (3) control and eradication of brown treesnakes that will lead to the reintroduction of native forest birds and bats and restore native habitat. Long-term forest management plans specific to Andersen Air Force Base (AAFB) and Navy Base Guam (NBG) are under development for the Guam National Wildlife Refuge Overlay lands, including site-specific descriptions for the protection, restoration, and enhancement of native forest as well as eradication of invasive plants. The restoration of forest ecosystems will benefit the recovery of ESA-listed species and proposed species. They further state that funding has been programmed to support this work through 2020. For example, the INRMP program will erect fencing on Andersen Air Force Base and Navy Base Guam to exclude ungulates from native forest, eradicate ungulates within fenced areas, and maintain ungulate densities at near zero in non-fenced areas. So far, a 306-ac ungulate fence has been initiated on AAFB. Additionally, ungulate control on AAFB and NBG has been initiated, and eradication of ungulates in the fenced areas will be initiated in FY2015. In the Marianas, JRM lands include 53,709 terrestrial acres and 79,260 acres of submerged lands. Some of the most environmentally sensitive areas on Guam and in the CNMI, including habitat for proposed species, occur within these lands.

Our Response: We appreciate the update regarding conservation activities and mitigation measures being implemented by the U.S. Navy on AAFB and NBG and commend these efforts. We have added the new exclosure information under the section ''Conservation Efforts to Reduce Habitat Destruction, Modification, or Curtailment of Its Range.'' Although the INRMP has not yet been approved by the Service, we have taken all of the information provided by these comments into consideration. We look forward to collaborating with the DOD to further these conservation efforts in the Mariana Islands, and we are continuing to coordinate with the U.S. Navy on the development of their INRMP.

(89) *Comment:* The U.S. Navy commented that the JRM INRMP program is funding research for large-scale suppression and eradication of brown treesnakes. In FY 2014, the Navy funded $1.8M in projects to meet objectives for control, suppression, and eradication of brown treesnakes to benefit native species (including proposed species) and their habitat. Funding has been programmed to continue this effort through 2021. Additionally, in FY 2014 the Navy funded $3.3M for control and containment to prevent the spread and establishment of brown treesnakes to new areas, including the CNMI where species in this rulemaking action occur.

Our Response: The eradication of brown treesnakes from Guam is a priority of the Service, as well as preventing the spread and establishment of brown treesnakes elsewhere, and the Service appreciates the DOD's commitment. We have added the Navy's $5.1M investment toward brown treesnake eradication under the section ''Conservation Efforts to Reduce Habitat Destruction, Modification, or Curtailment of Its Range,'' above.

(90) *Comment:* The U.S. Navy commented that during FY 2014 JRM executed projects targeting these species, such as partulid snail surveys and predation studies, and will continue to do so in FY 2015. During FY 2015 the JRM INRMP will be revised to specifically address species proposed for ESA-listing as endangered or threatened that occur on JRM lands.

This effort will continue JRM's commitment to conservation and recovery of native species in the Marianas.

Our Response: We have incorporated all new relevant information from the recent candidate surveys (NavFac, Pacific 2014, pp. 1–1—7–2, and Appendix A; Lindstrom and Benedict 2014, pp. 1–44, and Appendices A–E; Myounghee Noh and Associates 2014, pp. 1–28, and Appendices A–B) into this final rule under Description of the 23 Mariana Islands Species and Summary of Biological Status and Threats Affecting the 23 Mariana Islands Species, above. Significant changes are also noted under Summary of Changes from the Proposed Rule, above.

(91) *Comment:* The U.S. Navy stated that JRM INRMP contains goals and objectives specifically for *Cycas micronesica* and *Tabernaemontana rotensis.* This includes a project that began in 2007 to collect cycad germplasm from geographically and genetically diverse plants on Guam and plant 1,000 saplings on Tinian to ensure a broad genetic representation of Guam's cycads in a living seed bank. The collection has been actively managed and expanded. In 2013 AAFB fenced five 1-ac ungulate exclusion plots that contain approximately 1,000 mature cycad plants. Cycads within the plots are actively managed to ensure health and survival; funding has been programmed to support this project through 2020. During FY2014 the Navy funded a project to examine the distribution and abundance of *T. rotensis* and other proposed species on JRM lands.

Our Response: We have incorporated the new cycad exclosures on Tinian into this final rule under *Conservation Efforts to Reduce Disease and Predation,* above.

Public Comments on the Proposed Listing of 23 Species

(92) *Comment:* Two commenters agreed that all 23 species face threats of high magnitude and imminence, and that the cumulative impacts on these species will take a heavy toll on their ability to adapt and survive. One of the commenters suggested that human population growth and a rising tourism industry will further hinder the ability to control invasive species. Further, they stated that, although the brown treesnake may not yet be found in the northern Mariana Islands, the military expansion into these islands will undoubtedly spread the invasion of this species. Further, they suggested that the economic and environmental roles the 23 species play in the ecosystem cannot be overlooked. The current rate of species extinctions is more than 1,000 times greater than the background rate calculated from the fossil record and genetic data that spans millions of years (Pimm *et al.* 2014).

Our Response: We appreciate the concurrence regarding our analysis for each of the 23 species, and we recognize the threat posed by the potential spread of the brown treesnake onto islands where it does not yet occur. The Act requires us to make listing decisions based solely on the best scientific and commercial data available; considerations such as the potential economic role of a species in an ecosystem cannot enter into a listing determination.

(93) *Comment:* Several commenters expressed concern that more listing of endangered species will prevent landowners from building on their own property. One of these commenters stated that the Fish and Wildlife Service said he could not cut down trees or build a home on his family's property due to the presence of the nightingale reed-warbler (listed as an endangered species). The commenters suggested propagating species to increase their populations as an alternative to listing, and questioned why existing mitigation lands are not sufficient to conserve these species.

Our Response: Programs are available to private landowners to assist with managing habitat for listed species, as well as provide permits to protect private landowners from the take prohibition when such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity (*e.g.,* habitat conservation plans (HCP) and safe harbor agreements (SHA)). Private landowners may contact their local Service field office to obtain information about these programs and permits. The Service believes that restrictions alone are neither an effective nor a desirable means for achieving the conservation of listed species. We are committed to working collaboratively with private landowners, and strongly encourage individuals with listed species on their property to work with us to develop incentive-based measures such as SHAs or HCPs, which have the potential to provide conservation measures that effect positive results for the species and its habitat while providing regulatory relief for landowners. The conservation and recovery of endangered and threatened species, and the ecosystems upon which they depend, is the ultimate objective of the Act, and the Service recognizes the vital importance of voluntary, nonregulatory conservation measures that provide incentives for landowners in achieving that objective.

Regarding proactive measures for species of concern, the Service collaborates with and funds multiple programs that work on the propagation and outplanting of threatened and endangered plants and captive-breeding programs for threatened and endangered animals, as well as for candidate species. However, while we agree that such measures are often desirable and necessary to achieve the conservation of the species, the Act does not allow for the pursuit of such activities as an alternative to listing. The statute requires that we consider whether a species is endangered or threatened as a result of any of five threat factors, specifically: (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. If we conclude that the species in question meets the definition of an endangered species or threatened species, then that species is listed and receives Federal protections under the Act. One component of these protections is the development of a recovery plan, which may employ the conservation measures suggested by the commenters, depending on the needs of the species. Additionally, although existing mitigation lands can be used for conservation actions, the availability of such lands may not be sufficient to offset the full suite of threats that are negatively affecting the species such that we would conclude listing is not warranted. For example, mitigation lands may not provide enough resources or be large enough in size to fully support the population sizes and distribution needed for long-term viability of a species, or the nature of the stressor may be such that mitigation lands do little to offset the threat (such as impacts from manokwari flatworm predation on native tree snails). Thus, while existing mitigation lands or conservation areas make an important contribution to the conservation of these species, they are not sufficient to address all of the threats leading to the determination that these species are endangered or threatened, as defined by the Act.

(94) *Comment:* Several commenters stated that the proposed rule was based on a lawsuit rather than science. Additionally, one commenter expressed sincere disapproval of the ESA, primarily based on the resulting need

for permits and difficulty to delist species.

Our Response: The timing of our proposed rule was based on a July 12, 2011, multiyear workplan filed as part of a settlement agreement with the Center for Biological Diversity and others, in a consolidated case in the U.S. District Court for the District of Columbia (In re Endangered Species Act Section 4 Deadline Litigation, No. 10–377 (EGS), MDL Docket No. 2165 (D.D.C. May 10, 2011), approved by the court on September 9, 2011). The settlement enables the Service to systematically, over a period of 6 years, review and address the needs of more than 250 candidate species to determine if they should be added to the Federal Lists of Endangered and Threatened Wildlife and Plants. Addressing the seven candidate species is part of this settlement agreement. However, it is important to note that these species were already candidates for listing prior to the settlement, and were added to the candidate list as a result of our earlier determination, based solely on the best scientific and commercial data available, that they meet the definition of endangered species or threatened species according to the Act. Section 4 of the Act and its implementing regulations (50 CFR part 424) set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. The listing process is not arbitrary, but uses the best available scientific and commercial data and peer-review in decisionmaking. In our proposed rule and this final rule, we have adhered to all statutory requirements in evaluating the status of the 23 species addressed here, the 7 original candidate species as well as 16 additional species native to the Marianas, and in making our determination that these species meet the definition of either endangered species or threatened species under the Act.

The Service is fully committed to working with communities and private landowners in partnership to minimize any impacts that may potentially result from the listing of a species while achieving conservation goals. For example, the Service works with landowners to develop habitat conservation plans or safe harbor agreements, and provide permits to private landowners for taking a listed species when it is incidental to the carrying out of an otherwise lawful activity. Private landowners may contact their local Service field office to obtain information about these programs and permits. The Service believes that restrictions alone are neither an effective nor a desirable means for achieving the conservation of listed species. The conservation and recovery of endangered and threatened species, and the ecosystems upon which they depend, is the ultimate objective of the Act, and the Service recognizes the vital importance of voluntary, nonregulatory conservation measures that provide incentives for landowners in achieving that objective.

The commenter's objections to the ESA in general are beyond the scope of this rulemaking.

(95) *Comment:* One commenter stated that the Service is proposing to double the number of listed species in the CNMI in one action. The commenter further stated that most people in the Marianas do not have the history or experience with the ESA listing process to be able to absorb the magnitude of the detailed scientific information contained in the proposed rule, and suggested the initial 60-day public comment period was insufficient to review all of the detailed information, including references cited, and provide comments.

Our Response: We appreciate the concern regarding public understanding of the proposed rule. Public review and understanding is important to us, which is why we extended the initial public comment period by an additional 30 days, for a total of 90 days. We also held two public hearings (one each on Guam and Saipan) and four public information meetings (one each on Guam, Saipan, Rota, and Tinian) in January 2015. These public information meetings were provided specifically to address the concerns expressed by the commenter, and to ensure that the public had an opportunity to fully understand our proposal and engage in discussion or ask questions of Service staff. Please see our response to comment (73), above, for a detailed summary of outreach regarding the proposed rule. Further, all the handouts and the proposed rule were made available to the public online at *http://www.fws.gov/pacificislands/*, and the Service is always available to answer any questions from the public during normal business hours as noted in the proposed rule.

(96) *Comment:* Two commenters expressed concern that the needs of proposed or listed species are being placed above people's needs.

Our Response: The 23 species designated as threatened or endangered species in this final rule are all species that occur in the Mariana Islands and nowhere else in the entire world, with the exception of *Cycas micronesica,* which is also found on Yap and in Palau. It is accurate that the statute requires determinations as to whether species merit the protections of the Act as an endangered species or threatened species be based solely on scientific and commercial data, as that data informs our evaluation of the threats affecting the species and their conservation status. However, the Service is fully committed to working with communities and private landowners in partnership to minimize any impacts that may potentially result from the listing of a species while achieving conservation goals. For example, the Service works with landowners to develop safe harbor agreements or habitat conservation plans as needed. The listing of the 23 species does not mean that economic progress cannot be made or that private land cannot be developed. Please also see our response to comment (93), above.

(97) *Comment:* One commenter stated there is not a recovery plan or a realistic accurate target date of recovery for these species.

Our Response: Recovery plans are initiated upon the publication of a final listing rule as funding is available.

(98) *Comment:* One commenter expressed concern that the species proposed for listing that occur on Federal Government property are not properly protected. This commenter offered an example, stating that on Northwest Field on Andersen AFB a few hundred, or maybe thousands, of *Cycas micronesica* trees were destroyed.

Our Response: The commenter did not provide information pertaining as to how or when these cycads were purportedly destroyed. Department of Defense lands often support many rare species because access is so limited and they establish relatively large buffer areas that are often left untouched. Thus, military actions can be beneficial to species and their habitats, but they can also be destructive to species and their habitats, as outlined under Summary of Biological Status and Threats Affecting the 23 Mariana Islands Species, above. All Federal agencies must consult with the Service, under section 7 of the Act, prior to carrying out actions that may impact listed species. The Service provides suggestions to avoid or minimize impacts to species, and methods for mitigation when appropriate. In this particular case, as *Cycas micronesica* was not a candidate species prior to being proposed for listing as a threatened species in October 2014, the DOD was under no obligation to conserve this species or consult with the Service regarding the potential removal of *Cycas micronesica* trees. Thus if such actions did take place, we would have been unaware of them.

Determination

Section 4 of the Act (16 U.S.C. 1533), and its implementing regulations at 50 CFR part 424, set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, we may list a species based on (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) Overutilization for commercial, recreational, scientific, or educational purposes; (C) Disease or predation; (D) The inadequacy of existing regulatory mechanisms; or (E) Other natural or manmade factors affecting its continued existence. Listing actions may be warranted based on any of the above threat factors, singly or in combination.

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the 23 species listed as endangered or threatened species in this final rule. We find that all 23 species face threats that are ongoing and expected to continue into the future throughout their ranges from the present destruction and modification of their habitats from nonnative feral ungulates, rats, or nonnative plants (Factor A). Destruction and modification of habitat by development, military training, and urbanization is a threat to 13 of the 14 plant species (*Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Eugenia bryanii, Hedyotis megalantha, Heritiera longipetiolata, Maesa walkeri, Nervilia jacksoniae, Phyllanthus saffordii, Psychotria malaspinae, Solanum guamense, Tabernaemontana rotensis,* and *Tuberolabium guamense*) and to 8 of the 9 animal species (the Pacific sheath-tailed bat, Slevin's skink, the Mariana eight-spot butterfly, the Rota blue damselfly, the Guam tree snail, the humped tree snail, Langford's tree snail, and the fragile tree snail). Habitat destruction and modification from fire is a threat to nine of the plant species (*Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Hedyotis megalantha, Maesa walkeri, Nervilia jacksoniae, Phyllanthus saffordii, Tabernaemontana rotensis,* and *Tuberolabium guamense*) and two tree snails (the Guam tree snail and the humped tree snail). Destruction and modification of habitat from typhoons is a threat to all 23 species, which are vulnerable as a result of past reductions in population size and distribution. Rising temperatures and other effects of projected climate change may impact all 23 species, but there is limited information on the exact nature of impacts that these species may experience. Although the specific and cumulative effects of climate change on each of these 23 species are presently unknown, we anticipate that these effects, if realized, will exacerbate the current threats to these species (Factor A).

Overcollection for commercial and recreational purposes poses a threat to all four tree snail species (the Guam tree snail, the humped tree snail, Langford's tree snail, and the fragile tree snail) (Factor B).

Predation or herbivory on 9 of the 14 plant species (*Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Eugenia bryanii, Heritiera longipetiolata, Nervilia jacksoniae, Psychotria malaspinae, Solanum guamense,* and *Tuberolabium guamense*) and 8 of the 9 animals (all except the Rota blue damselfly) by feral pigs, deer, brown treesnakes, rats, monitor lizards, slugs, flatworms, ants, or wasps poses a serious and ongoing threat (Factor C).

The inadequacy of existing regulatory mechanisms (*i.e.,* inadequate protection of habitat and inadequate protection from the introduction of nonnative species) poses a serious and ongoing threat to all 23 species (Factor D).

There are serious and ongoing threats to three plant species (*Psychotria malaspinae, Solanum guamense,* and *Tinospora homosepala*), the fragile tree snail, Guam tree snail, Langford's tree snail, Mariana eight-spot butterfly, Mariana wandering butterfly, Pacific sheath-tailed bat, and Rota blue damselfly, due to small numbers of populations and individuals; to *Cycas micronesica, Heritiera longipetiolata, Psychotria malaspinae, Tabernaemontana rotensis,* the humped tree snail, Mariana eight-spot butterfly, and Slevin's skink from ordnance and live-fire training; to the Rota blue damselfly from water extraction; and to *Hedyotis megalantha* and *Phyllanthus saffordii* from recreational vehicles (Factor E) (see Table 3). These threats are exacerbated by these species' inherent vulnerability to extinction from stochastic events at any time because of their endemism, small numbers of individuals and populations, and restricted habitats.

The Act defines an endangered species as any species that is ''in danger of extinction throughout all or a significant portion of its range'' and a threatened species as any species ''that is likely to become endangered throughout all or a significant portion of its range within the foreseeable future.'' We find that 16 of the 23 Mariana Islands species are presently in danger of extinction throughout their entire range, based on the severity and scope of the ongoing and projected threats described above. These 16 species are: the 7 plants *Eugenia bryanii, Hedyotis megalantha, Heritiera longipetiolata, Phyllanthus saffordii, Psychotria malaspinae, Solanum guamense,* and *Tinospora homosepala;* and all 9 animals: the Pacific sheath-tailed bat (*Emballonura semicaudata rotensis*), Slevin's skink (*Emoia slevini*), the Mariana eight-spot butterfly (*Hypolimnas octocula marianensis*), the Mariana wandering butterfly (*Vagrans egistina),* the Rota blue damselfly (*Ischnura luta*), the Guam tree snail (*Partula radiolata*), the humped tree snail (*Partula gibba*), Langford's tree snail (*Partula langfordi*), and the fragile tree snail (*Samoana fragilis*). We conclude these 16 species are endangered due to the small number of individuals representing the entire species and the limited or concentrated geographic distribution of those remaining individuals or populations, rendering the species in its entirety highly susceptible to extinction as a consequence of these imminent threats. These threats are exacerbated by the loss of redundancy and resiliency of these species, and the continued inadequacy of existing protective regulations. Therefore, on the basis of the best available scientific and commercial information, we have determined that each of these 16 species meets the definition of an endangered species under the Act. We find that threatened species status is not appropriate for these 16 species, as the threats are already occurring rangewide and are not localized, because the threats are ongoing and expected to continue into the future, and because the severity of the threats is so great that these species are currently in danger of extinction. In addition, the remaining populations of these species are so small that we cannot conclude they are likely capable of persisting into the foreseeable future in the face of the current threats. We, therefore, list these 16 species as endangered species in accordance with section 3(6) of the Act.

As noted above, the Act defines a threatened species as any species ''that is likely to become endangered throughout all or a significant portion of its range within the foreseeable future.'' We list seven plant species as threatened species in accordance with section 3(6) of the Act: *Bulbophyllum guamense, Cycas* *micronesica, Dendrobium guamense, Maesa walkeri, Nervilia jacksoniae, Tabernaemontana rotensis,* and *Tuberolabium guamense.*

*Bulbophyllum guamense*is primarily known from Guam and Rota, with the exception of a few herbarium records that report this species as historically occurring on the islands of Pagan and Saipan. The cumulative data (*i.e.,* herbaria records, scientific literature, survey reports, books, and interviews with local biologists; as well as direct observations from Service and other biologists) show that *Bulbophyllum guamense* historically occurred on clifflines encircling Guam, and on the slopes of Mt. Lamlam and Mt. Almagosa; as well as across the Rota Sabana and surrounding slopes. As recently as 1992, this species was reported to occur in large mat-like formations on trees ''all over the island'' (Guam) (Raulerson and Rinehart 1992, p. 90). While the number of *B. guamense* individuals on Guam are low, the number of individuals on the Rota Sabana is much higher, with a relatively healthy population structure consisting of juveniles and adults (Zarones *et al.* 2015c, in litt.). Almost all of the individuals of *B. guamense* on Rota occur within the boundaries of the Sabana Conservation Area, which also encompasses much of the designated critical habitat for the Rota white-eye (*Zosterops rotensis*) and Mariana crow (*Corvus kubaryi*) (listed as endangered).

Although more than 50 percent of the range of *B. guamense* occurs on Guam, where this species has experienced a significant decline in number of individuals and populations due to threats predominantly associated with habitat destruction and modification (*i.e.,* urban development, military development and training, brown treesnake, nonnative plants, fire, typhoons, and climate change), this species appears to be relatively healthy on Rota. However, due to the presence of threats similar to those on Guam (*i.e.,* habitat destruction and modification from nonnative plants and animals (rats), fire, typhoons, and climate change; and herbivory by invertebrates such as slugs), populations of *B. guamense* on Rota remain highly vulnerable. We conclude that, given its relatively greater population size on Rota, with a healthy population structure, *B. guamense* is not currently in danger of extinction; thus endangered status is not appropriate. However, given that we are unaware of any conservation actions being implemented at this time to abate the threats to *B. guamense* on Rota, and the best available scientific and commercial information indicates that the cumulative effects of the threats are so great the species will become in danger of extinction in the foreseeable future, we conclude that *Bulbophyllum guamense* meets the definition of a threatened species under the Act.

Cycas micronesica occurs on Guam, Rota, and tentatively Pagan in the CNMI, as well as on islands in the nations of Palau and Yap. More than 50 percent of the known individuals occur on Guam and Rota in the CNMI, and are currently impacted by the cycad aulacaspis scale to the extent that botanists estimate the species could be largely extirpated from these two islands within 4 years, by 2019. The status of the tentative individuals of this species on Pagan is unknown, although only a small population is believed to occur on that island. While the cycad aulacaspis scale has reached the larger islands of Palau, it has not yet reached the Rock Islands of Palau, or Yap, and these islands may afford some temporary protection for the remaining individuals while control methods and biocontrols for the cycad aulacaspis scale are undergoing research. Due to the rapid spread of the scale and associated high mortality, populations in Palau and Yap remain highly vulnerable. Given its relatively greater population size and distribution on multiple islands, some of which have not yet been affected by the cycad aulacaspis scale, we conclude that *Cycas micronesica* is not currently in danger of extinction, thus endangered status is not appropriate. However, given the observed rapid spread of the cycad aulacaspis scale, the likelihood that the scale will soon be transported to areas that are currently unaffected, and the high mortality rate experienced by *Cycas micronesica* upon exposure to the scale, we conclude that *Cycas micronesica* is likely to become in danger of extinction within the foreseeable future, and thus meets the definition of a threatened species under the Act.

Dendrobium guamense predominantly occurs on the islands of Guam and Rota, with a few scattered occurrences on Tinian and Aguiguan. Historically, it also occurred on Saipan and possibly Agrihan. During the 1980s, this species was common in trees on Guam and Rota (Raulerson and Rinehart 1992, p. 98; Consortium Pacific Herbarium (CPH) 2012a—*Online Herbarium Database,* 5 pp.; Costion and Lorence 2012, p. 66). Currently, the populations of *D. guamense* on Guam, which comprise more than 50 percent of its known range, have declined to low numbers due to threats predominantly associated with habitat destruction and modification (*i.e.,* development, military training, nonnative plants and animals (brown treesnake), fire, typhoons, and climate change) (Harrington *et al.* 2012, in litt.). This species is abundant with healthy population structure on the island of Rota (Zarones *et al.* 2015c, in litt.). However, due to the presence of threats similar to those that occur on Guam (*i.e.,* habitat destruction and modification from nonnative plants and animals (rats), fire, typhoons, and climate change; and predation by nonnative invertebrates such as slugs), *D. guamense* remains highly vulnerable on Rota. Additionally, two or more threats exist on all islands on which *D. guamense* is known to occur (historically or present) (see Table 4, above). Raulerson and Rinehart (1992, p. 87), two renowned botanists who have studied extensively in the Marianas, stated that, although these orchids (referring to native orchids in the Marianas) appear abundant, the habitats are limited and in reality these orchids are quite rare. They also stated that the islands are small and habitats are rapidly being destroyed by human activity; thus these orchids can be considered rare. We conclude that, given its relatively large population size and distribution on multiple islands, and the healthy population structure on Rota, *Dendrobium guamense* is not currently in danger of extinction; thus endangered status is not appropriate. However, given the myriad threats imposed upon this species throughout its range, and the fact that *D. guamense* has significantly declined throughout more than 50 percent of its entire range, we have determined that *D. guamense* is likely to become in danger of extinction within the foreseeable future, and thus meets the definition of a threatened species under the Act.

Maesa walkeri occurs on the islands of Guam and Rota. Once relatively abundant on both of these islands, this species has since been reduced to extremely low numbers on Guam, which represents more than 60 percent of its former known range. On Rota, there are at least 684 individuals of *Maesa walkeri* in the Sabana region displaying a healthy population structure including seedlings, juveniles, and flowering adults (Liske-Clark *et al.* 2015, in litt.). Local biologists estimate the actual number to be in the thousands (Liske-Clark *et al.* 2015, in litt.), and we concur with this estimate. Despite the relative abundance and seemingly healthy population structure of *Maesa walkeri* on Rota, this species remains vulnerable on this island due to habitat destruction and modification by nonnative plants and animals (rats and Philippine deer), fire, typhoons, and climate change. Given its relative abundance and health on Rota, we conclude that *Maesa walkeri* is not currently in danger of extinction, thus endangered status is not appropriate. However, given the substantial decline in number of individuals on Guam (only two individuals known to remain) due to habitat destruction and modification by urban development, military training and development, nonnative plants and animals (*i.e.,* brown treesnake, pigs, and water buffalo), fire, typhoons, and climate change; the fact that Guam accounts for more than 60 percent of the known range for *Maesa walkeri;* and the presence of similar threats on Rota, we have determined that *Maesa walkeri* is likely to become in danger of extinction within the foreseeable future, and thus meets the definition of a threatened species under the Act.

Nervilia jacksoniae is known from the islands of Guam and Rota, and is the only endemic terrestrial orchid in the Mariana Islands. This species was once abundant on Guam and Rota, and has since declined to low numbers on Guam, which represents more than 60 percent of its former known range. Populations on Guam face threats associated with habitat destruction and modification by development, military training, nonnative plants and animals (*i.e.,* pigs, deer, water buffalo, and brown treesnake), fire, typhoons, and climate change; as well as herbivory by nonnative invertebrates such as slugs. Although relatively healthy populations can still be found on Rota (Zarones *et al.* 2015d, in litt.), these individuals face threats similar to those that occur on Guam (*i.e.,* habitat destruction and modification from nonnative animals (deer and rats) and plants, fire, typhoons, and climate change), and thus remain vulnerable. Given the relatively large and healthy populations on Rota, we conclude that *Nervilia jacksoniae* is not currently in danger of extinction, thus endangered status is not appropriate. However, given the substantial loss of individuals on Guam, which consists of at least 60 percent of its known range, combined with the myriad threats imposed upon *Maesa walkeri* throughout its range, we have determined that this species is likely to become in danger of extinction within the foreseeable future, and thus meets the definition of a threatened species under the Act.

Tabernaemontana rotensis was, until recently, believed to be part of the wider ranging *T. pandacaqui,* until genetic studies showed it to be unique to Guam and Rota. There may be as many as 8,000 individuals on Guam with a healthy population structure, but there are only a few individuals on Rota. The threats of habitat destruction and modification by nonnative plants and animals, fire, typhoons, climate change, and inadequate regulatory mechanisms exist throughout its range. Additionally, habitat destruction and modification from urban and military development, and military training, further negatively impact this species on Guam. Given the relatively large and healthy population of *T. rotensis* on Guam, even in the face of current threats, we conclude that *T. rotensis* is not currently in danger of extinction; thus endangered status is not appropriate. However, because the species has been reduced to only a few individuals on Rota, and the remaining population on Guam is subject to a suite of ongoing threats as described above, we conclude that *Tabernaemontana rotensis* is likely to become in danger of extinction within the foreseeable future. Therefore, on the basis of the best available scientific and commercial information, we determine that this species meets the definition of a threatened species under the Act.

Tuberolabium guamense is predominantly known from the islands of Guam and Rota, with a few scattered historical occurrences on Tinian and Aguiguan. This species was once relatively abundant within specialized habitat on Guam and Rota, but has since declined substantially on Guam, which comprises more than 50 percent of its known former range. On Guam, the habitat upon which this species depends is experiencing destruction and modification by urban development, military development and training, nonnative plants and animals (brown treesnake), fire, typhoons, and climate change. *Tuberolabium guamense* is still relatively abundant on Rota, with a population structure consisting of juveniles and flowering adults (Zarones *et al.* 2015c, in litt.). Observations made during recent surveys indicate that this is the only endemic epiphytic orchid in the Marianas that is solely found in native trees (Zarones *et al.* 2015c, in litt.). Although *T. guamense* appears relatively healthy on Rota, its habitat on this island is experiencing destruction and modification from nonnative animals (deer and rats) and plants, fire, typhoons, and climate change. *Tuberolabium guamense* is also at risk from herbivory by nonnative invertebrates such as slugs. Additionally, more than 20 years ago Raulerson and Rinehart (1992, p. 87) stated that, although these orchids may appear abundant on the limestone ridges of Guam and Rota, the habitats are limited and in reality these orchids are very rare. We conclude that, given its relative abundance and health on Rota, *T. guamense* is not currently in danger of extinction; thus endangered status is not appropriate. However, due to the substantial loss of individuals on Guam, which consists of at least 60 percent of its known range, combined with the myriad threats imposed upon T. guamense throughout its range, we have determined that this species is likely to become in danger of extinction within the foreseeable future, and thus meets the definition of a threatened species under the Act.

Under the Act and our implementing regulations, a species may warrant listing if it is endangered or threatened throughout all or a significant portion of its range. Because we have determined that each of the 23 Mariana Islands species is either endangered or threatened through all of its range, no portion of its range can be ''significant'' for the purposed of the definition of ''endangered'' and ''threatened'' species. See the Final Policy on Interpretation of the Phrase ''Significant Portion of Its Range'' in the Endangered Species Act's Definitions of ''Endangered Species'' and ''Threatened Species'' (79 FR 37577).

Available Conservation Measures

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

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

Recovery planning includes the development of a recovery outline shortly after a species is listed and preparation of a draft and final recovery plan. The recovery outline guides the immediate implementation of urgent recovery actions and describes the process to be used to develop a recovery plan. Revisions of the plan may be done to address continuing or new threats to the species, as new substantive information becomes available. The recovery plan identifies site-specific management actions that set a trigger for review of the five factors that control whether a species remains endangered or may be downlisted or delisted, and methods for monitoring recovery progress. Recovery plans also establish a framework for agencies to coordinate their recovery efforts and provide estimates of the cost of implementing recovery tasks. Recovery teams (composed of species experts, Federal and State agencies, nongovernmental organizations, and stakeholders) are often established to develop recovery plans. When completed, the recovery outline, draft recovery plan, and the final recovery plan will be available on our Web site (*http://www.fws.gov/endangered*), or from our Pacific Islands Fish and Wildlife Office (see **FOR FURTHER INFORMATION CONTACT**).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, territories, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (*e.g.,* restoration of native vegetation), research, captive-propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their range may occur primarily or solely on non-Federal lands. To achieve recovery of these species requires cooperative conservation efforts on all lands.

Following the publication of this final listing rule, funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost-share grants for non-Federal landowners, the academic community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the State(s) of the U.S. Territory of Guam and the U.S. Commonwealth of the Northern Mariana Islands would be eligible for Federal funds to implement management actions that promote the protection or recovery of the 23 species. Information on our grant programs that are available to aid species recovery can be found at: *http://www.fws.gov/grants*.

Please let us know if you are interested in participating in recovery efforts for this species. Additionally, we invite you to submit any new information on these species whenever it becomes available and any information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

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

For the 23 plants and animals listed as endangered or threatened species in this rule, Federal agency actions that may require consultation as described in the preceding paragraph include, but are not limited to, actions within the jurisdiction of the Natural Resources Conservation Service, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and branches of the Department of Defense (DOD). Examples of these types of actions include activities funded or authorized under the Farm Bill Program, Environmental Quality Incentives Program, Ground and Surface Water Conservation Program, Clean Water Act (33 U.S.C. 1251 *et seq.*), Partners for Fish and Wildlife Program, and DOD activities related to training, facilities construction and maintenance, or other military missions.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered and threatened wildlife and plants. The prohibitions of section 9(a)(1) of the Act, and implemented at 50 CFR 17.21 for endangered wildlife, and at §§ 17.61 and 17.71 for endangered and threatened plants, respectively, apply. For listed wildlife species, these prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to take (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt any of these), import, export, ship in interstate commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. Under the Lacey Act (18 U.S.C. 42–43; 16 U.S.C. 3371–3378), it is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to agents of the Service, the National Marine Fisheries Service, other Federal land management agencies, and State conservation agencies.

With respect to endangered plants, prohibitions outlined at section 9(a)(2) of the Act and 50 CFR 17.61 make it illegal for any person subject to the jurisdiction of the United States to import or export, transport in interstate or foreign commerce in the course of a commercial activity, sell or offer for sale in interstate or foreign commerce, or to remove and reduce to possession any such plant species from areas under Federal jurisdiction. In addition, the Act prohibits malicious damage or destruction of any such species on any area under Federal jurisdiction, and the removal, cutting, digging up, or damaging or destroying of any such species on any other area in knowing violation of any State law or regulation, or in the course of any violation of a State criminal trespass law. Exceptions to these prohibitions are outlined in 50 CFR 17.62.

With respect to threatened plants, 50 CFR 17.71 provides that all of the provisions in 50 CFR 17.61 shall apply to threatened plants. These provisions make it illegal for any person subject to the jurisdiction of the United States to import or export, transport in interstate or foreign commerce in the course of a commercial activity, sell or offer for sale in interstate or foreign commerce, or to remove and reduce to possession any such plant species from areas under Federal jurisdiction. In addition, the Act prohibits malicious damage or destruction of any such species on any area under Federal jurisdiction, and the removal, cutting, digging up, or damaging or destroying of any such species on any other area in knowing violation of any State law or regulation, or in the course of any violation of a State criminal trespass law. However, there is the following exception for threatened plants. Seeds of cultivated specimens of species treated as threatened shall be exempt from all the provisions of 50 CFR 17.61, provided that a statement that the seeds are of ''cultivated origin'' accompanies the seeds or their container during the course of any activity otherwise subject to these regulations. Exceptions to these prohibitions are outlined in 50 CFR 17.72.

We may issue permits to carry out otherwise prohibited activities involving endangered and threatened wildlife and plant species under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22 for endangered wildlife and at §§ 17.62 and 17.72 for endangered and threatened plants, respectively. With regard to endangered wildlife, a permit must be issued for the following purposes: For scientific purposes, to enhance the propagation or survival of the species, and for incidental take in connection with otherwise lawful activities. With regard to endangered plants, the Service may issue a permit authorizing any activity otherwise prohibited by 50 CFR 17.61 for scientific purposes or for enhancing the propagation or survival of endangered plants. With regard to threatened plants, a permit issued under this section must be for one of the following: Scientific purposes, the enhancement of the propagation or survival of threatened species, economic hardship, botanical or horticultural exhibition, educational purposes, or other activities consistent with the purposes and policy of the Act. Requests for copies of the regulations regarding listed species and inquiries about prohibitions and permits may be addressed to U.S. Fish and Wildlife Service, Pacific Region, Ecological Services, Eastside Federal Complex, 911 NE. 11th Avenue, Portland, OR 97232–4181 (telephone 503–231–6131; facsimile 503–231–6243).

It is our policy, as published in the **Federal Register** on July 1, 1994 (59 FR 34272), to identify to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of a final listing on proposed and ongoing activities within the range of a listed species. The following activities could potentially result in a violation of section 9 of the Act; this list is not comprehensive:

(1) Unauthorized collecting, handling, possessing, selling, delivering, carrying, or transporting of the 23 species, including import or export across State, Territory, or Commonwealth lines and international boundaries, except for properly documented antique specimens of these taxa at least 100 years old, as defined by section 10(h)(1) of the Act.

(2) Introduction of nonnative species that compete with or prey upon the nine animal species, such as the introduction of competing, nonnative plants or animals to the Mariana Islands (U.S. Territory of Guam and U.S. Commonwealth of the Northern Mariana Islands).

(3) The unauthorized release of biological control agents that attack any life stage of the nine animal species.

(4) Impacts to the nine animal species from destruction of habitat, disturbance from noise (related to military training), and other impacts from military presence.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the Pacific Islands Fish and Wildlife Office (see FOR FURTHER INFORMATION CONTACT). Requests for copies of the regulations concerning listed animals and general inquiries regarding prohibitions and permits may be addressed to the U.S. Fish and Wildlife Service, Pacific Region, Ecological Services, Endangered Species Permits, Eastside Federal Complex, 911 NE. 11th Avenue, Portland, OR 97232–4181 (telephone 503–231–6131; facsimile 503–231–6243).

The Federal listing of the 23 species included in this final rule may invoke Commonwealth and Territory listing under CNMI and Guam Endangered Species laws (Title 85: § 85–30.1–101 and 5 GCA § 63205, respectively) and supplement the protection available under other local law. These protections would prohibit take of these species and encourage conservation by both government agencies. Further, the governments are able to enter into agreements with Federal agencies to administer and manage any area required for the conservation, management, enhancement, or protection of endangered and threatened species. Funds for these activities could be made available under section 6 of the Act (Cooperation with the States and Territories). Thus, the Federal protection afforded to these species by listing them as endangered or threatened species will be reinforced and supplemented by protection under Territorial and Commonwealth law.

Required Determinations

National Environmental Policy Act (42 U.S.C. 4321 et seq.)

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

References Cited

A complete list of references cited in this rulemaking is available on the Internet at *http://www.regulations.gov* and upon request from the Pacific Islands Fish and Wildlife Office (see FOR FURTHER INFORMATION CONTACT).

Authors

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

List of Subjects in 50 CFR Part 17

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

Regulation Promulgation

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

PART 17—[AMENDED]

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

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

■ 2. Amend § 17.11(h), the List of Endangered and Threatened Wildlife, as follows:

■ a. By adding an entry for ''Bat, Pacific sheath-tailed'' (*Emballonura semicaudata rotensis*), in alphabetical order under MAMMALS, to read as set forth below;

■ b. By adding an entry for ''Skink, Slevin's'' (*Emoia slevini*), in alphabetical order under REPTILES, to read as set forth below;

■ c. By adding entries for ''Snail, fragile tree'' (*Samoana fragilis*), ''Snail, Guam tree'' (*Partula radiolata*), ''Snail, humped tree'' (*Partula gibba*), and ''Snail, Langford's tree'' (*Partula langfordi*), in alphabetical order under SNAILS, to read as set forth below; and

■ d. By adding entries for ''Butterfly, Mariana eight-spot'' (*Hypolimnas octocula marianensis*), ''Butterfly, Mariana wandering'' (*Vagrans egistina*), and ''Damselfly, Rota blue'' (*Ischnura luta*), in alphabetical order under INSECTS, to read as set forth below:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
MAMMALS							
*	*	*	*	*	*	*	
Bat, Pacific sheath-tailed (Mariana subspecies) (Payeyi, Paischeey).	*Emballonura semicaudata rotensis*.	U.S. Territory of Guam, U.S. CNMI.	Entire	E	858	NA	NA
*	*	*	*	*	*	*	
REPTILES							
*	*	*	*	*	*	*	
Skink, Slevin's (Gualiik halumtanu, Gholuuf).	*Emoia slevini*	U.S. Territory of Guam, U.S. CNMI.	Entire	E	858	NA	NA
*	*	*	*	*	*	*	
SNAILS							
*	*	*	*	*	*	*	
Snail, fragile tree (Akaleha dogas, Denden).	*Samoana fragilis*	U.S. Territory of Guam, U.S. CNMI.	Entire	E	858	NA	NA
Snail, Guam tree (Akaleha, Denden).	*Partula radiolata*	U.S. Territory of Guam	Entire	E	858	NA	NA
Snail, humped tree (Akaleha, Denden).	*Partula gibba*	U.S. Territory of Guam, U.S. CNMI.	Entire	E	858	NA	NA
*	*	*	*	*	*	*	
Snail, Langford's tree (Akaleha, Denden).	*Partula langfordi*	U.S. CNMI	Entire	E	858	NA	NA
*	*	*	*	*	*	*	
INSECTS							
*	*	*	*	*	*	*	
Butterfly, Mariana eight-spot (Ababbang, Libweibwogh).	*Hypolimnas octocula marianensis*.	U.S. Territory of Guam, U.S. CNMI.	Entire	E	858	NA	NA
Butterfly, Mariana wandering (Ababbang, Libweibwogh).	*Vagrans egistina*	U.S. Territory of Guam, U.S. CNMI.	Entire	E	858	NA	NA
*	*	*	*	*	*	*	
Damselfly, Rota blue (Dulalas Luta, Dulalas Luuta).	*Ischnura luta*	U.S. CNMI	Entire	E	858	NA	NA
*	*	*	*	*	*	*	

* * * * *

■ 3. Amend § 17.12(h), the List of Endangered and Threatened Plants, as follows:

■ a. By adding entries for *Bulbophyllum guamense, Cycas micronesica, Dendrobium guamense, Eugenia bryanii, Hedyotis megalantha, Heritiera longipetiolata, Maesa walkeri, Nervilia jacksoniae, Phyllanthus saffordii, Psychotria malaspinae, Solanum guamense, Tabernaemontana rotensis, Tinospora homosepala,* and *Tuberolabium guamense,* in alphabetical order under FLOWERING PLANTS, to read as set forth below:

§ 17.12 Endangered and threatened plants.

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(h) * * *

Species		Historic range	Family	Status	When listed	Critical habitat	Special rules
Scientific name	Common name						
FLOWERING PLANTS							
*	*	*	*	*	*	*	
Bulbophyllum guamense	Siboyas halumtanu, Siboyan halom tano.	U.S. Territory of Guam, U.S. CNMI.	Orchidaceae	T	858	NA	NA
*	*	*	*	*	*	*	
Cycas micronesica	Fadang, Faadang	U.S. Territory of Guam, U.S. CNMI, Federated States of Micronesia, Independent Republic of Palau.	Cycadaceae	T	858	NA	NA
*	*	*	*	*	*	*	
Dendrobium guamense	None	U.S. Territory of Guam, U.S. CNMI.	Orchidaceae	T	858	NA	NA
*	*	*	*	*	*	*	
Eugenia bryanii	None	U.S. Territory of Guam	Myrtaceae	E	858	NA	NA
*	*	*	*	*	*	*	
Hedyotis megalantha	Pau dedu, Pao doodu ...	U.S. Territory of Guam	Rubiaceae	E	858	NA	NA
*	*	*	*	*	*	*	
Heritiera longipetiolata ...	Ufa halumtanu, Ufa halom tano.	U.S. Territory of Guam, U.S. CNMI.	Malvaceae	E	858	NA	NA
*	*	*	*	*	*	*	
Maesa walkeri	None	U.S. Territory of Guam, U.S. CNMI.	Primulaceae	T	858	NA	NA
*	*	*	*	*	*	*	
Nervilia jacksoniae	None	U.S. Territory of Guam, U.S. CNMI.	Orchidaceae	T	858	NA	NA
*	*	*	*	*	*	*	
Phyllanthus saffordii	None	U.S. Territory of Guam	Phyllanthaceae ...	E	858	NA	NA
*	*	*	*	*	*	*	
Psychotria malaspinae ...	Aplokating palaoan	U.S. Territory of Guam	Rubiaceae	E	858	NA	NA
*	*	*	*	*	*	*	
Solanum guamense	Biringenas halumtanu, Birengenas halom tano.	U.S. Territory of Guam, U.S. CNMI.	Solanaceae	E	858	NA	NA
*	*	*	*	*	*	*	
Tabernaemontana rotensis.	None	U.S. Territory of Guam, U.S. CNMI.	Apocynaceae	T	858	NA	NA
*	*	*	*	*	*	*	
Tinospora homosepala ..	None	U.S. Territory of Guam	Menispermaceae	E	858	NA	NA
*	*	*	*	*	*	*	
Tuberolabium guamense	None	U.S. Territory of Guam, U.S. CNMI.	Orchidaceae	T	858	NA	NA
*	*	*	*	*	*	*	

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Dated: September 9, 2015.

Stephen Guertin,

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

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BILLING CODE 4310–55–P