

U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

Scientific Name:

Solanum nelsonii

Common Name:

popolo

Lead region:

Region 1 (Pacific Region)

Information current as of:

06/01/2013

Status/Action

Funding provided for a proposed rule. Assessment not updated.

Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

New Candidate

Continuing Candidate

Candidate Removal

Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status

Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species

Range is no longer a U.S. territory

Insufficient information exists on biological vulnerability and threats to support listing

Taxon mistakenly included in past notice of review

Taxon does not meet the definition of "species"

Taxon believed to be extinct

Conservation efforts have removed or reduced threats

___ More abundant than believed, diminished threats, or threats eliminated.

Petition Information

___ Non-Petitioned

X Petitioned - Date petition received: 05/11/2004

90-Day Positive:05/11/2005

12 Month Positive:05/11/2005

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing?
Yes

Explanation of why precluded:

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for this species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The Progress on Revising the Lists section of the current CNOR (<http://endangered.fws.gov/>) provides information on listing actions taken during the last 12 months.

Historical States/Territories/Countries of Occurrence:

- **States/US Territories:** Hawaii
- **US Counties:** Hawaii, HI, Honolulu, HI, Kauai, HI, Maui, HI
- **Countries:** United States

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories:** Hawaii
- **US Counties:** Hawaii, HI, Honolulu, HI, Kauai, HI, Maui, HI
- **Countries:** United States

Land Ownership:

The largest population in the main Hawaiian Islands is on private land on Molokai, owned by The Nature Conservancy of Hawaii (TNCH). The populations in the northwestern Hawaiian Islands are on Federal lands within the Papahānaumokuākea Marine National Monument, managed by the U.S. Fish and Wildlife Service (FWS), the National Oceanic and Atmospheric Administration (NOAA), and the Hawaii Department of Land and Natural Resources (Hawaii DLNR). The population on the island of Hawaii is on State-owned land.

Lead Region Contact:

Lead Field Office Contact:

PACIFIC ISLANDS FISH AND WILDL OFC, Kristi Young, 503 231-6845, kristi_young@fws.gov

Biological Information

Species Description:

Solanum nelsonii is a sprawling or trailing shrub which grows up to 3.3 feet (ft) (1 meter (m)) tall, forming clumps up to 4.9 ft (1.5 m) in diameter. Young stems and leaves are densely pubescent and do not have spines. Leaves are grayish green, have entire margins, are arranged alternately along the stems, and are broadly ovate. Flowers are perfect and have a white tubular corolla that is tinged with lavender to pale purple. Round berries are usually black when mature with numerous seeds. *S. nelsonii* is unusual in the genus with its doubly curved, purple anthers, which possibly suggest different pollinators than bees (Symon 1999, pp. 1,273-1,274).

Taxonomy:

Solanum nelsonii was described by Dunal (1852). This species is recognized as a distinct taxon in the Manual of Flowering Plants of Hawaii (Symon 1999, pp. 1,273-1,274), the most recently accepted Hawaiian plant taxonomy.

Habitat/Life History:

Typical habitat is coral rubble or sand in coastal sites up to 490 ft (150 m) in elevation (Symon 1999, p. 1,273).

Historical Range/Distribution:

Historically, *Solanum nelsonii* was known from the island of Hawaii at South Point and South Kona; the island of Niihau at Kealea Bay, Kawaewaae, and Leahi; Pearl and Hermes on North Island, Seal-Kittery Island, and Grass Island; and on Green Island (Kure). This species was last collected on Niihau in 1949 (HBMP 2008). The only plant on Maui was reported to have disappeared in the mid-1990s after cattle had been allowed to graze in its last known habitat (HBMP 2008).

Current Range Distribution:

Currently, this species occurs on the islands of Hawaii and Molokai, and on the northwestern Hawaiian Islands of Kure, Midway (Sand, Eastern, and Spit islands), Laysan, Pearl and Hermes, and Nihoa (Vanderlip, in litt. 2010).

Population Estimates/Status:

Solanum nelsonii is known from populations in the Northwestern Hawaiian Islands on Kure (unknown number of individuals), Midway (approximately 260 plants), Laysan (approximately 490 plants), Pearl and Hermes (unknown number of individuals), Nihoa (8,000 to 15,000 adult plants); in the main Hawaiian Islands from an unknown number of plants on Molokai including Ilio Point (47 individuals) and Moomomi Preserve (4 individuals down from 50 known previously); and from individuals seen at Kaalualu, Kamilo, and Kaulana Bay, South Point (5 fence-enclosed individuals) on the island of Hawaii (Bio, in litt. 2008;

Tangalin, in litt. 2006; Rehkemper, in litt. 2006; Aruch, in litt. 2006; Moses, in litt. 2005; Vanderlip, in litt. 2010; Conry, in litt. 2012; Plant Extinction Prevention Program (PEPP), in litt. 2013).

Threats

A. The present or threatened destruction, modification, or curtailment of its habitat or range:

In the past, resort and urban development was a primary threat to *Solanum nelsonii* on the main Hawaiian Islands (HBMP 2008). Coastal strand has been replaced on most islands by human habitation, starting with the first Hawaiians in 300-600 A.D. Remnant coastal strand communities, habitat for *S. nelsonii*, are often species poor, but were very likely more diverse prior to human impact. Recreational impacts, such as off-road vehicles and trampling by tourists, have made many of these remaining strand communities on the main Hawaiian Islands unsuitable for *S. nelsonii* survival (Cuddihy and Stone 1990; Bruegmann, in litt. 1997; Agorastos, in litt. 2011). On Hawaii, human impacts from four-wheel drive and all-terrain vehicles continue to be the biggest threat to the population at South Point (Agorastos, in litt. 2011).

The individuals of *S. nelsonii* found on the northwestern Hawaiian Islands are not threatened by resort and urban development or by recreational impacts, such as off-road vehicles and trampling by tourists, because these activities are not allowed within these islands, now part of the Papahānaumokuākea Marine National Monument. Access is strictly regulated through a permit system because of the sensitivity of the organisms on these islands to human disturbance (Papahānaumokuākea Marine National Monument 2007).

On Molokai, *S. nelsonii* is threatened by wild cattle (*Bos taurus*) and axis deer (*Axis axis*) that degrade and destroy habitat (HBMP 2008). Threats to *S. nelsonii* on the island of Hawaii are not specified. As early as 1778, European explorers introduced livestock, which became feral, increased in number and range, and caused significant changes to the natural environment of Hawaii. Past and present activities of introduced alien mammals are the primary factor altering and degrading vegetation and habitats on Molokai. Cattle, the wild progenitors of which were native to Europe, northern Africa, and southwestern Asia, were introduced to the Hawaiian Islands in 1793. Large feral herds developed as a result of restrictions on killing cattle decreed by King Kamehameha I. While small cattle ranches were developed on Kauai, Oahu, and West Maui, very large ranches of tens of thousands of acres were created on East Maui and Hawaii. Much of the land used in these private enterprises was leased from the State or was privately owned and classified as Forest Reserve and Conservation District land. 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 becomes degraded to grassland pasture, and plant cover is reduced for many years following removal of cattle from an area. Several alien grasses and legumes purposely introduced for cattle forage have become noxious weeds (Tomich 1986; Cuddihy and Stone 1990). Axis deer were introduced to Molokai in 1868, and within 30 years, the population was estimated at 7,000 animals. By 1996, the population at Kalaupapa had resulted in remarkable negative impacts on the vegetation (Dorman 1996). The interaction of feral pigs and axis deer has reduced the *Metrosideros-Cibotium* (ohia-hapuu) rain forest to a grassy scrubland (Dorman 1996). Deer have moved from relatively open, lower elevation shrub areas into the rain forest above Halawa Valley, likely due to hunting pressure (Dorman 1996). Currently, the axis deer population is estimated to be at least 1,500 on the Molokai Ranch lands alone and 5,000 to 6,000 animals total for Molokai and Lanai combined (Dorman 1996; Nicholas, in litt. 2006).

Overwash from tsunami is a potential threat to populations on Kure, Midway (Sand, Eastern, and Spit Islands), Laysan, Pearl, and Hermes, and other low-lying coastal areas occupied by *S. nelsonii*. The Pacific tsunami generated by the magnitude 9.0 earthquake off the northeast coast of Japan on March 11, 2011, resulted in overwash 100 feet inland on Kure, complete overwash of Spit Island, over 60 percent overwash of Eastern Island, and overwash of the entire coastline of Sand Island (FWS 2011; Starr, in litt. 2011; Vanderlip, in litt. 2011). Tsunami waves may dislodge *S. nelsonii* individuals; however, the impacts of brief

submergence in sea water alone may not result in the loss of *S. nelsonii* individuals or its habitat requirements. Starr (in litt. 2011) estimates that the 2011 tsunami swept over almost all of the *S. nelsonii* plants mapped on Midway in 2008.

B. Overutilization for commercial, recreational, scientific, or educational purposes:

None known.

C. Disease or predation:

Predation by axis deer and rats is cited as a threat to *Solanum nelsonii* populations on Molokai at Ilio Point and Moomomi Preserve (PEPP, in litt. 2012). The ability of cattle to degrade native vegetation by grazing and trampling was recognized very soon after large-scale ranching began in Hawaii (Cuddihy and Stone 1990), and predation by cattle may also be a threat to this species. Deer are primarily grazers but also browse numerous plant species (Waring 1996), and damage to fencing and crops has also been reported (Simpson, in litt. 2001).

Because Hawaii's native plants evolved without any browsing or grazing mammals present, many lost natural defenses to such impacts (Carlquist 1980). Browsing by ungulates has been observed on many other native species, including common and rare or even endangered species (Cuddihy and Stone 1990). Therefore, though we do not have evidence of feral cattle and deer browsing directly on this species, the FWS believes that browsing by these feral ungulates is a likely threat to *S. nelsonii*.

The nonnative grasshopper, *Schistocera nitens*, is a likely threat to *S. nelsonii* (Wegman et al. 2002) on Midway, Laysan, and Nihoa (Richardson, in litt. 2007). Its presence on Pearl and Hermes is unknown. This insect is a recent invader in the northwestern Hawaiian Islands, and was observed to cause widespread destruction of native plants on Nihoa by defoliation (Wegman et al. 2002).

D. The inadequacy of existing regulatory mechanisms:

Solanum nelsonii currently receives no protection under Hawaii's endangered species law or the Federal Endangered Species Act.

Axis deer are managed in Hawaii as game animals, but many populate inaccessible areas where hunting is difficult, if not impossible, and therefore has little effect on their numbers. Deer hunting is allowed year-round or during certain months, depending on the area (Hawaii DLNR 1999, 2003); however, public hunting is not adequate to eliminate this threat to *S. nelsonii*. Hunting of feral cattle is no longer allowed in Hawaii (Hawaii DLNR 1985) except under permitted conditions.

E. Other natural or manmade factors affecting its continued existence:

Alien plant species are a threat to *Solanum nelsonii* as they degrade habitat and outcompete native species (HBMP 2008). On Molokai, the primary nonnative plant threats include *Atriplex semibaccata* (Australian saltbush), *Cenchrus ciliaris* (buffelgrass), *Chenopodium murale* (nettle goosefoot), *Cynodon dactylon* (bermuda grass), *Prosopis pallida* (kiawe), and *Setaria parviflora* (foxtail grass) (Moses, in litt. 2005). On the island of Hawaii, the nonnative plant that is the greatest threat to *S. nelsonii* is *C. ciliaris* (PEPP 2008, p. 110).

Atriplex semibaccata is a perennial herb introduced to Lanai around 1895 as an experimental forage plant for cattle, and is now naturalized on all of the main Hawaiian Islands (Wagner et al. 1999). It is drought and fire tolerant, with an elongated tap root. It forms dense spreading mats which can be up to 6 ft across (University of California 2008). We are unaware of any control methods for this species.

Cenchrus ciliaris is native to Africa and tropical Asia. It is naturalized in Hawaii and common in dry areas in a wide variety of disturbed habitats. It is a fire-adapted grass that provides fuel for fires and recovers quickly, increasing its cover with each succeeding fire (Pacific Island Ecosystems at Risk (PIER) 2006). We are unaware of any control methods for this species beyond herbicide application (University of Hawaii 2013).

Chenopodium murale is an annual herb native to the Mediterranean and southwest Asia. It is naturalized in Hawaii and is documented from Kure, Midway atolls, and the French Frigate Shoals (Wagner et al. 1999). It grows from sea level to elevations as high as 6,562 ft (2,000 m) in open and shaded sites, and is 3 ft (1 m) tall before flowering (PIER 2008a). We are unaware of any control methods for this species.

Cynodon dactylon is a grass native to tropical Africa and is now widely cultivated. It is naturalized in Hawaii in disturbed areas and in exposed rocky and sandy sites (O'Connor 1999). It is also documented from Kure, Midway, Pearl and Hermes atolls, Laysan, and the French Frigate Shoals. This grass forms a solid mat. It will grow in very poor soil and in drought, dies above ground but readily regrows from rhizomes (PIER 2008b). We are unaware of any control methods for this species.

Prosopis pallida was introduced to Hawaii in 1828, and its seed pods were used as fodder for ranch animals. The seeds were then quickly spread by ranch animals. *P. pallida* became a dominant component of the vegetation in low elevation, dry, disturbed sites, as it is well adapted to dry habitats. It overshadows other vegetation and the deep tap roots use all available water. This species fixes nitrogen and can outcompete native species (Wagner et al. 1999; PIER 2006b). We are unaware of any control methods for this species beyond herbicide application (University of Hawaii 2013).

Setaria parviflora is a perennial grass native to Europe and was introduced to Hawaii around 1895. This grass is naturalized in a wide variety of habitat, from wet to dry, low to high elevations, in pastures, urban sites, and agricultural lands. The culms can be up to 4 ft (1.2 m) tall, shading and crowding out native plant species (O'Connor 1999). *S. parviflora* may occur as a single plant or as a significant colony (University of Florida 2005). We are unaware of any control methods for this species beyond herbicide application and control by selective grazing (University of Hawaii 2013).

The original native flora of Hawaii consisted of about 1,400 species, nearly 90 percent of which were endemic. Of the total native and naturalized Hawaiian flora of 1,817 taxa, 47 percent were introduced from other parts of the world, and nearly 100 species have become pests (Smith 1985; Wagner et al. 1999). Several studies (Cuddihy and Stone 1990; Wood and Perlman 1997; Robichaux et al. 1998, p. 4) indicate nonnative plant species may outcompete native plants similar to *S. nelsonii*. Competition may be for space, light, water, or nutrients, or there may be a chemical produced that inhibits growth of other plants (Smith 1985; Cuddihy and Stone 1990). In addition, nonnative pest plants found in habitat similar to that of this species have been shown to make the habitat less suitable for native species (Smathers and Gardner 1978; Smith 1985; Loope and Medeiros 1992; Medeiros et al. 1992; Ellshoff et al. 1995; Meyer and Florence 1996; Medeiros et al. 1997; Loope et al. 2004). In particular, alien pest plant species degrade habitat by modifying availability of light, altering soil-water regimes, modifying nutrient cycling, or altering fire characteristics of native plant communities (Smith 1985; Cuddihy and Stone 1990; Vitousek et al. 1997). Because of demonstrated habitat modification and resource competition by nonnative plant species in habitat similar to the coastal habitat of *S. nelsonii*, the FWS believes nonnative plant species are a threat to this species.

Conservation Measures Planned or Implemented :

Nonnative plant control protects the population of *Solanum nelsonii* on Molokai. The Nature Conservancy is conducting weed control in the area where *S. nelsonii* is found of Hawaii as well (Moses, in litt. 2005). Access to the islands in the Papahānaumokuākea Marine National Monument is strictly regulated through a permit system because of the sensitivity of the organisms on these islands to human disturbance. Limited weed control is conducted in the National Monument (Papahānaumokuākea Marine National Monument 2007). This species is represented in ex situ collections at Hawaiian Islands National Wildlife Refuge facility

on Laysan Island, Volcano Rare Plant Facility (2 individuals), and Lyon Arboretum (104 individuals from Oahu), and in seed storage at Lyon Arboretum Seed Lab (1,029 seeds) (Rehkemper, in litt. 2006; Volcano Rare Plant Facility 2008; Conry, in litt. 2012; Imoto, in litt. 2013).

Summary of Threats :

Based on our evaluation of habitat degradation and loss by ungulates (Molokai), and nonnative plants (Molokai and the northwestern Hawaiian Islands), we conclude there is sufficient information to develop a proposed rule for this species due to the present and threatened destruction, alteration, or curtailment of its habitat and range, and the displacement of individuals of *Solanum nelsonii*, and due to competition with nonnative plants for space, nutrients, water, and light. Predation by cattle, deer, and a grasshopper, is a likely threat to *S. nelsonii*. We find that this species is warranted for listing throughout all of its range, and, therefore, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

For species that are being removed from candidate status:

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions(PECE)?

Recommended Conservation Measures :

- Survey for populations of *Solanum nelsonii* in historical locations on Maui and the island of Hawaii.
- Control cattle and deer by removing these species from areas where *S. nelsonii* populations exist and preventing reinvasion through the use of exclosures.
- Control alien plants using physical, mechanical, and biological control methods, as well as herbicides when necessary. Continue to conduct research into potential biocontrol species.
- Develop and implement a grasshopper control program on the northwestern Hawaiian Islands
- Continue propagation efforts for maintenance of genetic stock.
- Reintroduce individuals into suitable habitat within historic range that is being managed for known threats to this species.

Priority Table

Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/Population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/Population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/Population	9
	Non-Imminent	Monotype genus	10
		Species	11
		Subspecies/Population	12

Rationale for Change in Listing Priority Number:

Magnitude:

Solanum nelsonii is moderately threatened by ungulates (Molokai) which degrade and destroy habitat, and that may directly consume individuals, and by nonnative plants that outcompete and displace it (Molokai, Hawaii, and the northwestern Hawaiian Islands). The Nature Conservancy of Hawaii is conducting weed control in the area where *S. nelsonii* is found on Molokai. Limited weed control is conducted in the northwestern Hawaiian Islands. In addition, *S. nelsonii* is likely threatened by predation by a nonnative grasshopper in the northwestern Hawaiian Islands. Currently, no control measures are in place for this grasshopper. Given that threats from nonnative plants on Molokai are currently being managed, there is limited weed control in the northwestern Hawaiian Islands, and no control of grasshoppers, the overall magnitude of these threats is moderate.

Imminence :

Threats to *Solanum nelsonii* from nonnative plants and ungulates are considered imminent because they are ongoing throughout the range of this species. Nonnative plants must be continually controlled throughout the range of this species. The threat of predation by a nonnative grasshopper in the northwestern Hawaiian Islands is imminent because grasshoppers are not being controlled.

 Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

Emergency Listing Review

 No Is Emergency Listing Warranted?

Solanum nelsonii does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the taxon within the time frame of the routine listing process. On Molokai, conservation measures for *S. nelsonii* include weed control. Limited weed control is conducted on the northwestern Hawaiian Islands. This species is represented in ex situ collections and in seed storage. If it becomes apparent that the routine listing process is not sufficient to

prevent large losses that may result in this species' extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of *S. nelsonii* as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

Description of Monitoring:

Much of the information on this form is based on the results of a meeting of 20 botanical experts held by the Center for Plant Conservation in December of 1995. We incorporated additional information on this species from our files and the most recent supplement to the Manual of Flowering Plants of Hawaii (Wagner and Herbst 2003). In 2004, the Pacific Islands Office contacted the following species experts: Robert Hobdy, retired from the Hawaii Division of Forestry and Wildlife (DOFAW); Joel Lau, HBMP; Arthur Medeiros, U.S. Geological Survey Biological Resources Discipline (USGS-BRD); Hank Oppenheimer, resource manager for the Maui Land and Pineapple Company; and Steve Perlman and Ken Wood, National Tropical Botanical Garden. No new information was provided. In 2005 we contacted species experts and confirmation of the status was provided by Wailana Moses and FWS refuge staff. New status information was provided by Cindy Rehkemper, Natalia Tangalin, and Samuel Aruch in 2006; Kealii Bio from PEPP in 2008; and Patrice Moriyasu from the Volcano Rare Plant Facility in 2009 and was incorporated into this assessment. In 2010, we received no new information. In 2011, we contacted the species experts listed below and received new information from Nick Agorastos, DOFAW-Hawaii; Fern Duvall, DOFAW-Maui; and Forest Starr, USGS-BRD. In 2012 and 2013 we received information from the State and incorporated it into this form.

List all experts contacted in 2011:

Name Date Affiliation

Agorastos, Nick 02/16/11 Division of Forestry and Wildlife, Hawaii
Bakutis, Ane 02/16/11 Plant Extinction Prevention Program, Molokai
Ball, Donna 02/16/11 U.S. FWS, Partners Program, Hawaii
Bily, Pat 02/16/11 The Nature Conservancy, Maui
Bio, Kealii 02/16/11 Plant Extinction Prevention Program, Hawaii
Caraway, Vickie 02/22/11 Hawaii Division of Forestry and Wildlife, Oahu
Ching, Susan 02/16/11 Plant Extinction Prevention Program, Oahu
Clark, Michelle 02/16/11 U.S. FWS, Partners Program, Kauai
Duvall, Fern 02/16/11 Hawaii Division of Forestry and Wildlife, Maui
Fay, Kerri 02/16/11 The Nature Conservancy, Maui
Garnett, Bill 02/16/11 National Park Service, Kalaupapa, Molokai
Haus, Bill 02/16/11 National Park Service, Haleakala NP, Maui
Higashino, Jennifer 02/16/11 U.S. FWS, Partners Program, Maui
Imada, Clyde 02/16/11 Bishop Museum, Botany Department
Kawelo, Kapua 02/16/11 U.S. Army, Environmental Division
McDowell, Wendy 02/16/11 Plant Extinction Prevention Program, Kauai
Medeiros, Arthur 02/16/11 U.S. Geological Survey
Moses, Wailana 02/16/11 The Nature Conservancy, Molokai
Oppenheimer, Hank 02/16/11 Plant Extinction Prevention Program, Maui Nui
Perlman, Steve 02/16/11 National Tropical Botanical Garden
Perry, Lyman 02/16/11 Division of Forestry and Wildlife, Hawaii
Pratt, Linda 02/16/11 U.S. Geological Survey, Biological Resources Division
Starr, Forest 02/16/11 U.S. Geological Survey
Stevens, Bryon 02/16/11 DLNR Natural Area Reserves, Maui
Ward, Joe 02/22/11 Puu Kukui Watershed Preserve
Welton, Patti 02/16/11 National Park Service, Haleakala NP, Maui
Wysong, Michael 02/16/11 DLNR Natural Area Reserves, Kauai

The Hawaii Biodiversity and Mapping Program identified this species as critically imperiled (HBMP 2006). Based on the International Union for Conservation of Nature and Natural Resources Red List of Threatened Species, this species is recognized as Endangered (facing a very high risk of extinction in the wild) (Bruegmann and Caraway 2003). *Solanum nelsonii* is included in the list of species in Hawaii's 2005 Comprehensive Wildlife Conservation Strategy (Mitchell et al. 2005).

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

Hawaii

Indicate which State(s) did not provide any information or comment:

none

State Coordination:

On February 20, 2013, we provided the Hawaii Division of Forestry and Wildlife with copies of our most recent candidate assessments for their review and comment. We received information on March 23, 2013, and incorporated it into this form.

Literature Cited:

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Cuddihy, L.W., and C.P. Stone. 1990. Alteration of native Hawaiian vegetation; effects of humans, their activities and introductions. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu. 138 pp.

Dorman, P. 1996. Axis deer in Hawaii. Research paper for Botany Department, Resource Management and Conservation in Hawaii, University of Hawaii. 9 pp.
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(FWS) U.S. Fish and Wildlife Service. 2011. Midway Atoll National Wildlife Refuge, March 10-11, 2011, Tsunami Overwash map. <http://www.fws.gov/midway/tsunami.html>, accessed on April 1, 2011.

(Hawaii DLNR) Hawaii Department of Land and Natural Resources. 1985. Hunting in Hawaii, Division of Forestry and Wildlife, Honolulu, 3 pp.

(Hawaii DLNR) Hawaii Department of Land and Natural Resources. 1999. Rules regulating game mammal hunting, updated 2003. 56 pp.

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- (PIER) Pacific Island Ecosystems at Risk. 2008a. *Chenopodium murale*. http://www.hear.org/pier/species/chenopodium_murale.htm, accessed on March 13, 2008.
- (PIER) Pacific Island Ecosystems at Risk. 2008b. *Cynodon dactylon*. http://www.hear.org/pier/species/cynodon_dactylon.htm, accessed on March 13, 2008.
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Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:



06/13/2013

Date

Concur:



10/28/2013

Date

Did not concur: _____

_____ Date

Director's Remarks: