5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Neraudia ovata* (no common name)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2013. Endangered and threatened wildlife and plants; Initiation of 5-year status reviews of 44 species in Oregon, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 78(24):8185-8187.

Lead Region/Field Office:

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawaii

Name of Reviewer(s):

Chelsie Javar-Salas, Plant Biologist, PIFWO
Marie Bruegmann, Plant Recovery Coordinator, PIFWO
Kristi Young, Programmatic Deputy Field Supervisor, PIFWO

Methodology used to complete this 5-year review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office of the U.S. Fish and Wildlife Service (USFWS), beginning on March 4, 2013. The review was based on a review of current, available information since the last 5-year review for *Neraudia ovata* (USFWS 2008). The evaluation by Chelsie Javar-Salas, Plant Biologist, was reviewed by the Plant Recovery Coordinator. It was subsequently reviewed and approved by the Programmatic Deputy Field Supervisor.

Background:

For information regarding the species listing history and other facts, please refer to the Fish and Wildlife Service's Environmental Conservation On-line System (ECOS) database for threatened and endangered species at: *http://ecos.fws.gov/tess_public*.

Review Analysis:

Please refer to the previous 5-year review for *Neraudia ovata* published on January 18, 2008 (available at: *http://ecos.fws.gov/docs/five_year_review/doc1855.pdf*) for a complete review of the species' status, threats, and management efforts. No significant new information regarding the species' biological status has come to light since listing to warrant a change in the Federal listing status of *N. ovata*.

This short-lived perennial is endangered and endemic to Hawaii Island (USFWS 1998). The status and trends for *Neraudia ovata* are provided in the tables below.

New status information:

- During the 2003 to 2007 surveys 11 wild individuals of *Neraudia ovata* were found at Puu Anahulu on State owned lands (State of Hawaii Department of Land and Natural Resources [DLNR] 2015a). These individuals are protected within individual fences

and will be enclosed by a larger fence in the future. In 2014, 6 of the 10 individuals were relocated and monitored (Plant Extinction Prevention Program [PEPP 2014]).

- In fiscal year 2009, there were 116 individuals of *Neraudia ovata* at Pohakuloa Training Area (PTA) (U.S. Army Garrison Pohakuloa [US Army] 2010). In fiscal year 2010, 90 individuals remained. The loss of 26 individuals in Area of Species Recovery 24 between monitoring cycles represents 22 percent of the known population. Within the large-scale fence units are Areas of Species Recovery (ASRs), which are defined as 100-meter (328-foot) buffers around known federally-listed plant population where management is focused (US Army 2014). The primary factors in the decline of this species are dry conditions due to drought combined with increased ungulate pressure (US Army 2010). In fiscal year 2013, there were approximately 75 individuals (32 mature and 43 immature) (US Army 2014). At least 11 of the 75 individuals are female and seed collections have been from 10 of these plants (US Army 2014). Since 2004, there are 25 male and female individuals in the PTA greenhouse representing 15 founders from the wild population.
- In North Kona on private property, there is one wild mature individual and 99 reintroduced individuals of *N. ovata* (J. Wagner, Future Forests Nursery, pers. comm. 2015). There are three reintroduced individuals at Kaloko-Honokohau National Historical Park. There are an additional 11 reintroduced individuals on private property in North Kona (J. Wagner, pers. comm. 2015).
- The single wild individual remains at Manuka Natural Area Reserve.
- In 2009, there were five populations containing a total of eight wild individuals of *Neraudia ovata* (PEPP 2009, 2010). In 2014, there were five populations containing 47 mature and 43 immature wild individuals in North Kona, Pohakuloa Training Area, and Kau (PEPP 2014). There are eleven reintroduction sites containing more than 615 individuals of *N. ovata.*
- The number of wild individuals has decreased from the 150 individuals reported in the previous 5-year review to 90 wild individuals (47 mature and 43 immature) in 2015. The number of reintroduced individuals increased from the estimated 325 individuals reported in the previous 5-year review to more than 615 individuals.

New threats:

- Climate change destruction or degradation of habitat – Fortini *et al*. (2013) conducted a landscape-based assessment of climate change vulnerability for native plants of Hawaii using high resolution climate change projections. Climate change vulnerability is defined as the relative inability of a species to display the possible responses necessary for persistence under climate change. The assessment by Fortini *et al*. (2013) concluded that *Neraudia ovata* is minimally vulnerable to the impacts of climate change.
- Stochastic events – Drought mortality or reduced viability – Drought may exacerbate the effects of ungulates and has direct adverse impacts on *N. ovata* (PEPP 2010; J. Wagner, pers. comm. 2015; US Army 2014).
- Collecting impacts – Illegal collection for scientific, horticultural or other purposes threatens the populations of *N. ovata*, as well as possible excessive visitation. For instance, on two occasions in 2013, five reintroduced individuals of *N. ovata* were uprooted in the Mauna Kea area and those five plants were stolen along with other

common and federally listed plants (P. Peshut and S. Evans, US Army, pers. comm. 2013).

New management actions:

- Surveys / inventories – A survey was conducted for new individuals of *N. ovata* in Kau (PEPP 2014). At least two mature individuals were discovered and fruits were collected from those plants (PEPP 2014).
- Ungulate monitoring and control – In 2009, four exclosures were constructed for *N. ovata* at Puu Anahulu (PEPP 2009). Each exclosure was 9 meters by 9 meters (30 feet by 30 feet) in size. In 2014, the fenced exclosure was maintained and inspected for any damages (PEPP 2014).
- Invasive plant monitoring and control – Annual weed control is ongoing in North Kona on private property (J. Wagner, pers. comm. 2015) and at Pohakuloa Training Area (US Army 2014).
- Population viability monitoring and analysis
    - Monitoring of the 11wild individuals at Puu Anahulu revealed that severe drought was affecting the plants as noted by wilting (PEPP 2010). In 2014, the plants were revisited and monitored (PEPP 2014).
    - The wild individual on private land in North Kona was monitored (PEPP 2012).
- Captive propagation for genetic storage and reintroduction
    - The Volcano Rare Plant Facility (2013) has 36 plants propagated in their nursery representing five locations. The Facility propagated 20 plants for reintroductions next year. Meanwhile, eight individuals were reintroduced on private property in Kona. In 2014, the Volcano Rare Plant Facility (2014) had the same number of plants propagated in their nursery representing five locations. The Facility propagated 17 plants for reintroductions next year and a single individual was reintroduced at Puu Waawaa.
    - The Lyon Arboretum's Seed Conservation Lab (2014) has 10 seeds in genetic storage.
    - The Hawaii Volcanoes National Park (2014) has 12 cuttings and 30 plants in their nursery.
    - Pohakuloa Training Area has 97 seeds from two founders in genetic storage (US Army 2014). In total more than 286,000 seeds, representing 122 accessions from 38 founders, have been collected and are in storage at Pohakuloa Training Area (US Army 2014). Pohakuloa Training Area also provided the following plants for reintroduction efforts: 30 plants to Hawaii Volcanoes National Park, 10 plants and 29 cuttings to Jill Wagner, 320 cuttings to the US Forest Service's Environmental Security Technology Certification Program, and 2 plants to the State Department of Forestry and Wildlife (US Army 2014).
    - Propagation of *N. ovata* by cuttings is 50 percent successful but highly dependent on the founder (US Army 2014). However, propagation of *N. ovata* by seeds has been less successful with low germination rates observed after 10 years of being sown.
    - Fruits were collected from 3 of the 10 wild individuals at Puu Anahulu (PEPP 2014). The fruits were given to the Volcano Rare Plant Facility for propagation.

- In Kau, fruits from two wild individuals were collected and given to the Volcano Rare Plant Facility for propagation (PEPP 2014).

- Reintroduction / translocation
  - Two individuals of *N. ovata* were reintroduced in a Natural Area Reserve System on Hawaii Island (DLNR 2014).
  - The Hawaii Volcanoes National Park (2014) reintroduced 30 individuals in the Park.
  - At Puu Waawaa, 270 individuals was reintroduced in 2014 (DLNR 2015b)
  - During 2002 to 2004, four individuals were reintroduced at Pohakuloa Training Area (US Army 2014). An additional 46 individuals was reintroduced in 2014. There were 48 individuals remaining in 2014 with a natural recruitment of 20 seedlings of *N. ovata* (US Army 2014).
  - Near Saddle Road, there are 63 reintroduced individuals (US Army 2014).
  - On State owned lands in North Kona, there are two reintroduced populations containing a total of 50 mature and 13 immature individuals. At the first population between 2004 and 2009, 42 individuals were reintroduced. In 2014, none of those reintroductions survived but two mature naturally recruited individuals were observed (US Army 2014). The second reintroduced population contained 111 individuals in 2005 to 2012. In 2014, 21 individuals were reintroduced. There are 48 individuals remaining at the site with a natural recruitment of 13 immature individuals (US Army 2014).
  - On County lands in North Kona, there are 28 reintroduced individuals with a natural recruitment of 11 mature and 86 immature individuals (US Army 2014).

Synthesis:
Stabilizing, downlisting, and delisting objectives are provided in the Big Island II: addendum to the recovery plan for the Big Island plant cluster (USFWS 1998), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Neraudia ovata* is a short-lived perennial, and to be considered stable, the taxon must be managed to control threats (e.g., fenced) and be represented in an *ex situ* (at other than the plant's natural location, such as a nursery or arboretum) collection. In addition, a minimum of three populations should be documented on the Big Island (Island of Hawaii). Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

The interim stabilization goals for this species have not been met. Although, there are 90 known wild individuals, none of the five populations contains more than 50 mature individuals and none of the reintroduced populations contain more than 50 mature individuals (Table 1). In addition, all threats are not being sufficiently managed throughout all of the populations (Table 2). Therefore, *Neraudia ovata* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:
- Surveys / inventories – Survey geographical and historical range for a current assessment of the species' status.

- Captive propagation for genetic storage and reintroduction – Continue collection of genetic resources for storage, propagation, and reintroduction into protected suitable habitat within historical range.
- Ungulate monitoring and control – Maintain existing exclosures and monitor for potential incursions.
- Invasive plant monitoring and control – Eradicate invasive introduced plants within ungulate exclosures and maintain exclosures free of invasive plants.
- Population viability monitoring and analysis – Continue monitoring wild and outplanted individuals.
- Fire monitoring and control – Develop and implement a fire management plan at the existing exclosure.
- Climate change adaptation strategy – Research the suitability of habitat for reintroducing this species in the future due to the impacts of climate change.
- Alliance and partnership development – Initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this taxon.

Table 1. Status and trends of *Neraudia ovata* from listing through current 5-year review.

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1994 (listing)	11	0	All threats managed in all 3 populations	No
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	No
1998 (recovery plan)	11	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	12	ca 60	All threats managed in all 3 populations	Partially
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	No
2008 (5-yr review)	ca 150 (9% mature)	ca 325 (7% mature)	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2015 (5-yr review)	ca 90	ca 615	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially

Table 2. Threats to *Neraudia ovata* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – degradation of habitat and herbivory	A, C, D, E	Ongoing	Partially, fenced exclosures at Puu Anahulu, PTA
Invasive introduced plants	A, E	Ongoing	Partially, weed control occurs at fenced locations
Invertebrate predation or herbivory – white fly, scales	C	Ongoing	Partially, removed by hand for seedlings in North Kona
Rodent predation or herbivory – rats	C	Ongoing	None
Fire	E	Ongoing	None
Drought	E	Ongoing	None
Low numbers	E	Ongoing	Partially, captive propagation for genetic storage and reintroduction
Climate change	A, E	Increasing	None

References:

See previous 5-year review for a full list of references (USFWS 2008). Only references for new information are provided below.

Fortini, L., J. Price, J. Jacobi, A. Vorsino, J. Burgett, K. Brinck, F. Amidon, S. Miller, S. Gon II, G. Koob, and E. Paxton. 2013. A landscape-based assessment of climate change vulnerability for all native Hawaiian plants. Technical report HCSU-044. Hawaii Cooperative Studies Unit, University of Hawaii at Hilo, Hawaii. 141 pages.

Harold L. Lyon Arboretum Seed Conservation Laboratory. 2014. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Seed storage database. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.

Hawaii Volcanoes National Park. 2014. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.

[PEPP] Plant Extinction Prevention Program. 2009. Plant Extinction Prevention Program annual report, fiscal year 2009 (July 1, 2008-June 30, 2009). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[PEPP] Plant Extinction Prevention Program. 2010. Plant Extinction Prevention Program annual report, fiscal year 2010 (July 1, 2009-June 30, 2010).

Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[PEPP] Plant Extinction Prevention Program. 2012. Plant Extinction Prevention Program annual report, fiscal year 2012 (July 1, 2011-June 30, 2012). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[PEPP] Plant Extinction Prevention Program. 2014. Plant Extinction Prevention Program annual report, fiscal year 2014 (July 1, 2013-June 30, 2014). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[DLNR] State of Hawaii Department of Land and Natural Resources. 2014. Department of Land and Natural Resources, Division of Forestry and Wildlife, Section 6 final report for plant habitat management, Natural Area Reserves, Hawai‘i. July 1, 2013 – December 30, 2013. Unpublished.

[DLNR] State of Hawaii Department of Land and Natural Resources. 2015a. Department of Land and Natural Resources, Division of Forestry and Wildlife, 2003-2007 botanical survey data updated 16 April 2015. Microsoft Excel worksheet. Unpublished data submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[DLNR] State of Hawaii Department of Land and Natural Resources. 2015b. Department of Land and Natural Resources, Division of Forestry and Wildlife, Fy13 and 14 and 15 outplanting at Puu Waawaa updated 18 April 2015. Microsoft Excel worksheet. Unpublished data submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[US Army] U.S. Army Garrison Pohakuloa. 2010. Natural Resources Program, annual report, Pohakuloa Training Area, Island of Hawaii. 01 October 2009 to 30 September 2010. U.S. Army Garrison Pohakuloa LTC Rolland C. Niles, Commanding December 2010. Prepared in cooperation with the Center for Environmental Management of Military Lands, Colorado State University. 147 pages.

[US Army] U.S. Army Garrison Pohakuloa. 2014. Natural Resources Office, biennial report, Pohakuloa Training Area, Island of Hawaii. 01 October 2011 to 30 September 2013. Prepared in cooperation with the Center for Environmental Management of Military Lands, Colorado State University. 166 pages.

[USFWS] U.S. Fish and Wildlife Service. 1998. Big Island II: Addendum to the recovery plan for the Big Island plant cluster. U.S. Fish and Wildlife Service, Portland, Oregon. 88 pages + appendices.

[USFWS] U.S. Fish and Wildlife Service. 2008. *Neraudia ovata* 5-year review short form summary. Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii. 6 pages.

Volcano Rare Plant Facility. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

Volcano Rare Plant Facility. 2014. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

Personal communications

Peshut, Peter J. and Steven A. Evans. 2013. Manager, Natural Resources Office, US Army Garrison-Pohakuloa and Botanical Program Manager, Center for Environmental Management Military Lands. Letter to Tim Langer, Pacific Islands Fish and Wildlife Office, dated December 23, 2013. Subject: theft of listed plants.

VanDeMark, Joshua R. 2014. Hawaii Island Coordinator, Plant Extinction Prevention Program. E-mail to Donna Ball, Pacific Islands Fish and Wildlife Office, dated September 26, 2014. Subject: status updates.

Wagner, Jill. 2015. Owner and Biological Services Consultant, Future Forests Nursery and Hawaii Forest Initiative. E-mail to Chelsie Javar-Salas, Pacific Islands Fish and Wildlife Office, dated February 14, 2015. Subject: Request for info for 5-year reviews.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Neraudia ovata* (no common name)

Pre-1996 DPS listing still considered a listable entity? N/A

Recommendation resulting from the 5-year review:

_____ Delisting
_____ Reclassify from Endangered to Threatened status
_____ Reclassify from Threatened to Endangered status
X No Change in listing status

Appropriate Listing/Reclassification Priority Number, if applicable:_____

for **Programmatic Deputy Field Supervisor, Pacific Islands Fish and Wildlife Office**

Maine m Bluegrove Date 2015-08-03