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. 2018. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 156 species in Oregon, Washington, Hawaii, Palau, Guam, and the Northern Mariana Islands. Federal Register 88(83): 20088–20092, May 7, 2018.

Lead Region/Field Office:

Interior Region 12/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai‘i

Name of Reviewer:

Cheryl Phillipson, Biologist, PIFWO
Lauren Weisenberger, Plant Recovery Coordinator, PIFWO
Megan Laut, Conservation & Restoration Team Manager, PIFWO

Methodology used to complete this 5-year review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (Service) beginning in October 2019. The review was based on a review of current, available information since the last 5-year review for *Neraudia ovata* (USFWS 2015). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, Conservation and Restoration Team Manager.

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 (*http://ecos.fws.gov/tess_public*).

Review Analysis:

Please refer to the previous 5-year reviews for *Neraudia ovata* published in the Federal Register on January 18, 2008 and August 3, 2015 (available at *https://ecos.fws.gov/docs/five_year_review/doc1855.pdf* and *https://ecos.fws.gov/docs/five_year_review/doc4557.pdf*) for a complete review of the species' status, threats, management efforts, and references cited. We are not aware of any significant new information regarding the species' biological status since listing to warrant a change in the Federal listing status of *N. ovata*.

This short-lived perennial sprawling shrub and obligate outcrosser in the Urticaceae (nettle) family is endangered. The status and trends for *Neraudia ovata* are provided in the tables below.

New Status Information:

- Currently, there is one wild population within the Pōhakuloa Training Area (PTA), totaling 53 mature and 43 immature individuals, and three populations at other locations (Kaloko Makai, Puʻuanahulu, and Manukā Natural Area Reserve (NAR)) totaling eight wild individuals (PEPP 2019).

New Threats:

- Climate change loss or degradation of habitat—Climate change may pose a threat to this species. Fortini *et al.* (2013) conducted a landscape-based assessment of climate change vulnerability for native plants of Hawaiʻi 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. This assessment concluded that *Neraudia ovata* is vulnerable to the impacts of climate change, with a vulnerability score of 0.285 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). Therefore, additional management actions may be needed to conserve this taxon into the future, such as locating key microsites that overlap with current and future climate envelopes for outplanting efforts.
- Predation by nonnative insects–Spittlebugs—The only new threat detected at PTA was infestation by spittlebugs (U.S. Army Garrison 2020, pp. 20–21). The two-lined spittlebug (*Prosapia bicincta*) is native to the southern U.S. and was first reported on the island of Hawaiʻi in 2016. These insects prefer high-nitrogen grass species, which is grown in abundance on the island as cattle fodder. An infestation by spittlebugs feeding on the grass can decimate entire pastures. These insects encase their nymphs in a protective mass of foam. Currently, there are no effective controls for this insect (West Hawaiʻi Today, Hawaiʻi News 2019, in litt.).

New Management Actions:

- Surveys and inventories—The U.S. Army Garrison monitors *Neraudia ovata* at the Pōhakuloa Training Area (PTA) (U.S. Army Garrison 2010, p. 4-15). PTA reported conducting surveys over nine census periods from 2016 to 2019 to assess the status of *N. ovata* (U.S. Army Garrison 2020, pp. 20–21).
- Captive propagation for genetic storage and reintroduction—
    - In 2013, PTA reported collection of 331 seeds representing nine founders from two areas of species recovery (ASR 14, 24) for genetic storage (U.S. Army Garrison 2013, p. 14). Collections for 2019 include 1,409 seeds representing 13 founders for storage and 313 cuttings representing 32 founders for propagation (U.S. Army Garrison 2020, p. 35). A complete count including previous collections indicates 6,130 seeds in storage collected from plants in the field and 236,474 seeds collected from plants grown in the greenhouse (U.S. Army Garrison 2020, pp. 35–36).
    - Lyon Arboretum Seed Conservation Laboratory reports 10 seeds in storage with the previously collected 1,977 seeds in their collection either tested or withdrawn (Lyon Arboretum 2019).

    - Hawai‘i Volcanoes National Park (HVNP) acquired propagative material (31 plants, 4,855 seeds) from the PTA Rare Plant Propagation Facility and Volcano Rare Plant facility for storage or propagation for reintroduction (HVNP 2019).
    - In 2018, the plant nursery for Ka‘ūpūlehu Dryland Forest Preserve (DFP) reported a flat of plants in propagation representing one founder (Ka‘ūpūlehu DFP).
    - In 2018, the plant nursery for Pu‘uwa‘awa‘a reported collection and storage of 447 seeds representing three founders (Pu‘uwa‘awa‘a 2018).
    - The Volcano Rare Plant Facility (VRPF) reported 37 plants representing 13 founders, 15 plants sent to Future Forests Nursery for storage or reintroduction, one plant sent to the Pu‘uwa‘awa‘a, and 15 plants grown for reintroduction at other sites (VRPF 2019).
- Reintroduction—
    - PTA reported reintroduction in the training area or within two exclosures on adjacent lands at Pu‘uanahulu of 63 individuals, 48 indivduals reintroduced at the Mixed Tree unit, four on the east range, and three to five individuals planted at Pu‘uhuluhulu (U.S. Army Garrison 2013, p. 17; U.S. Army Garrison 2020, p. 43; PTA Rare Plant Facility 2019).
    - There are several reintroduced populations within exclosures managed by the State at Pu‘uwa‘awa‘a. These include 141 plants at Uhiuhi, 946 plants at Hauaina, 310 plants at Kīpuka ‘Owē‘owē, 16 plants at Pu‘uwa‘awa‘a Cone, seven plants at Ma‘ohauhele, 141 plants at Uhiuhi I/Wiliwili, and three plants not within a unit (USDA Forest Service 2015; Pu‘uwa‘awa‘a 2018). These reintroduced populations total as many as 1,564 individuals (Adkins 2020, in litt.).
    - In 2016, the Plant Extinction Prevention Program (PEPP) reported assisting staff at Ka‘ūpūlehu with reintroduction of 10 individuals of *N. ovata* (PEPP 2016). In 2019, PEPP reintroduced an additional 20 individuals at Pu‘uwa‘awa‘a and three individuals at Kīpuka ‘Owē‘owē (PEPP 2019).
    - There are 28 plants reintroduced at West Hawai‘i Veteran’s Center (PEPP 2019).
    - From 2014 to 2019, 106 individuals of *N. ovata* were planted at four sites in exclosures at Palamanui (Future Forests Nursery 2019).
    - Approximately 119 individuals were reintroduced on private land near Kaloko (PEPP 2019).
    - Thirty plants were reintroduced at Kapāpala Lower in Hawai‘i Volcanoes National Park (HVNP 2019).
- Viability monitoring and analysis—
    - PTA conducted four germination trials using 354 seeds from *N. ovata*, and reported that five seedlings were produced, indicating a very low germination rate (1 percent) (U.S. Army Garrison 2020, p. 40). The estimated seed longevity is 10 years (U.S. Army Garrison 2013, p. 16). Trials using 308 cuttings produced 97 plants (31 percent success), but

results varied depending on the founder used (U.S. Army Garrison 2013, p. 16; U.S. Army Garrison 2020, p. 40).

- Losses from juveniles and adult age classes, as well as transition from the juvenile to the adult age class, appears to drive patterns in the numbers of plants present at a location (U.S. Army Garrison 2020, pp. 20–21).

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

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1996 (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)	16	ca 60	All threats managed in all 3 populations	Partially
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	No
2008 (5-year review)	ca 150	ca 300	All threats managed in all 3 populations	Partially

			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No, the majority of plants are not mature
2015 (5-year 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
Date	**No. wild individuals**	**No. outplanted**	***Preventing Extinction Criteria identified by HPPRCC**	***Preventing Extinction Criteria Completed?**
2020 (5-year review)	ca 104	ca 1,984	All threats managed in all 3 populations	Partially, all populations fenced, some with nonnative plant control
			Complete genetic storage	Partially
			Reproduction (i.e. viable seeds, seedlings, saplings) at all 3 populations	Partially, natural recruitment at one population
			3 populations with 100 mature individuals each	No

* The Preventing Extinction Stage was established in 2011. Prior to 2011, the Interim Stabilization Stage was the first stage towards recovery (now it is the second stage after Preventing Extinction).

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

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate destruction and degradation of habitat; herbivory and competition	A, C, E	Ongoing	Yes, all populations within exclosures
Established ecosystem altering invasive plant species degradation of habitat and competition	A, E	Ongoing	Partial, nonnative plant control efforts within exclosures
Fire destruction and degradation of habitat	A	Ongoing	Partial, PTA fire management plan
Drought destruction and degradation of habitat	A	Ongoing	None
Climate change degradation or loss of habitat	A	Ongoing	None
Predation and herbivory by rodents	C	Ongoing	None
Predation and herbivory by invertebrates–white fly, scale, spittlebugs	C	Ongoing	None
Lack of adequate hunting regulations	D	Ongoing	Partial, all populations are within exclosures, must be monitored for ingress
Reduced viability due to low numbers	E	Ongoing	Partial, collection, storage, and reintroduction, with germination trials

Synthesis:
Currently, there are four wild populations of *Neraudia ovata* totaling 104 individuals on the island of Hawai‘i. A landscape-based assessment of climate change vulnerability for native plants of Hawai‘i using high resolution climate change projections was made by Fortini *et al.* (2013) and their analysis showed that *N. ovata* is vulnerable to the effects of climate change. All wild and reintroduced individuals are provided protection from feral ungulates by exclosures; however, these must be monitored for ingress. Some nonnative plant control is ongoing within exclosures. Seed and cuttings collection, propagation, and reintroduction are ongoing. Almost 2,000 plants have been reintroduced, but the survival of all those individuals and the amount of reproduction within those populations is unknown. Infestation by spittlebugs is observed to be a new threat with no known control for this insect.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Big Island II: Addendum to the Recovery Plan for the Big Island Plant Cluster (USFWS 1998), and have been updated according to the draft revised recovery objective guidelines developed by the Hawai‘i and Pacific Plants Recovery Coordinating Committee

(HPPRCC 2011). The HPPRCC identifies an additional initial objective, the Preventing Extinction Stage, in addition to the Interim Stabilization, Delisting, and Downlisting objectives. Furthermore, life history traits such as breeding system, population size fluctuation or decline, and reproduction type (sexual or vegetative), have been included in the calculation of goals for the number of populations and reproducing individuals for each stage. The goals for each stage remain grouped by life span defined as annual, short-lived perennial (fewer than 10 years), or long-lived perennial.

Neraudia ovata is a short-lived perennial shrub and an obligate outcrosser. To prevent extinction, which is the first milestone in recovering the species, the taxon must be managed to control threats (e.g., fenced) and have 50 individuals (or the total number of individuals if fewer than 50 exist) from each of three populations represented in *ex situ* (secured off-site, such as a nursery or seed bank) collections that are well managed. In addition, a minimum of three populations should be documented on the island of Hawai‘i where they now occur or occurred historically and each of these populations must be naturally reproducing (i.e., viable seeds, seedlings, saplings) with a minimum of 100 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. There are no wild populations totaling 100 mature individuals; and survival and fecundity of these reintroductions is unknown (Table 1). Genetic representation is partially complete with at least 32 founders represented in collections (Table 1). However, not all threats are being managed and a new insect pest was recently discovered (Table 1, Table 2). Therefore, *N. ovata* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:
Predation by spittlebugs is observed as a new threat to *Neraudia ovata*; however, there is no other significant new information regarding the species' biological status since the last 5-year review in 2015. Thus, the following recommendations for future actions are added or reiterated for the 5-year review for 2020.

- Surveys and inventories—Continue to survey geographical and historical range of *Neraudia ovata* for a current assessment of the species' status.
- Ungulate monitoring and control—Maintain existing exclosures and monitor for ungulate ingress.
- Ecosystem-altering invasive plant monitoring and control—Eradicate invasive plants within exclosures and maintain exclosures as nonnative, invasive plant-free.
- Fire protection—Continue to improve and implement the fire management plan developed for PTA and develop and implement fire management plans for other sites with wild and reintroduced populations.
- Drought protection—Continue to monitor and control feral ungulates and nonnative plants to protect and increase vigor of *N. ovata* during times of drought.

- Climate change adaptation strategy—Assess the modeled effects of climate change on this species and use to determine future landscape needed for its recovery.
- Predation and herbivory by invertebrates—Determine effects of invertebrates and develop and implement effective control methods within the vicinity of all known *N. ovata* populations if necessary.
- Captive propagation for genetic storage and reintroduction—Continue collection and propagation efforts for maintenance of genetic stock and for reintroduction into protected suitable habitat within historical range.
- Reintroduction and translocation—Continue to establish new populations in historical and other suitable habitat, and augment wild populations on the island of Hawai‘i.
- Population biology research—Continue to conduct studies to determine possible causes for lack of seed viability.
- Alliance and partnership development—Continue to work with the U.S. Army Garrison at PTA and other partners and land managers in planning and implementation of ecosystem-level restoration and management to benefit this species.

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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

For **Field Supervisor, Pacific Islands Fish and Wildlife Office**

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