

## 5-YEAR REVIEW

### Short Form Summary

**Species Reviewed:** *Nothocestrum breviflorum* (‘aiea)

**Current Classification:** Endangered

#### **Federal Register Notice announcing initiation of this review:**

[USFWS] U.S. Fish and Wildlife Service. 2023. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 133 Species in Oregon, Washington, Idaho, Montana, California, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 88(56): 17611–17614, March 23, 2023.

#### **Lead Region/Field Office:**

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai‘i

#### **Name of Reviewer:**

Daniel Adamski, Biologist, PIFWO

Lauren Weisenberger, Plant Recovery Coordinator, PIFWO

Megan Laut, Recovery Program 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 2023. The review was based on a review of current, available information since the last 5-year review for *Nothocestrum breviflorum* (USFWS 2020). The evaluation by Daniel Adamski, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, Recovery Program 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/ecp/species/7493>).

#### **Review Analysis:**

Please refer to the previous 5-year reviews for *Nothocestrum breviflorum* published in the Federal Register on August 28, 2012 (available at [https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public\\_docs/species\\_nonpublish/1975.pdf](https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/1975.pdf)), and on September 28, 2020 (available at [https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public\\_docs/species\\_nonpublish/3118.pdf](https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3118.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. breviflorum*.

This long-lived perennial tree and obligate outcrosser in the Solanaceae (nightshade) family is endangered and found on the island of Hawai‘i. The status and trends for *Nothocestrum breviflorum* are provided in the tables below.

#### New Status Information:

- At the time of the previous five-year review in 2020, there were approximately 156 wild individuals within Pu‘uwa‘awa‘a area and the Pu‘uwa‘awa‘a Forest Bird Sanctuary (FBS) (Department of Land and Natural Resources –Division of Forestry and Wildlife (DLNR-DOFAW). Currently, the population estimate remains unchanged from 2020, except for the addition of one individual each at Honokua and Kamā‘oa (DLNR-DOFAW 2015; Plant Extinction Prevention Program [PEPP] 2024). Additional surveys of historic populations at Honopue were conducted in 2022, but no individual plants were observed (PEPP 2024).
- Currently, there are up to 80 founder lines represented in *ex situ* storage and propagation collections, including seeds in seed banks and plants in a nursery or living collection (Lyon Arboretum 2024; State of Hawai‘i Department of Forestry and Wildlife [DOFAW] 2025; Hawai‘i Island Seed Bank [HISB] 2025; National Tropical Botanical Garden [NTBG] 2025).

#### New Threats:

- None

#### New Management Actions:

- Monitoring and surveys—PEPP surveys historic locations and monitors wild populations of *Nothocestrum breviflorum* (Ball 2024; PEPP 2024).
- Ungulate monitoring and control—PEPP and staff at the Nāpu‘u Conservation project monitors and repairs fences and excludes ungulates from fences protecting reintroduced populations (PEPP 2024). In 2021, PEPP completed construction of a new fences at Honokua and Kamā‘oa (PEPP 2024).
- Established ecosystem altering invasive plant species control—Nonnative grasses and plants are controlled by PEPP and DOFAW at Pu‘uwa‘awa‘a FBS (PEPP 2024).
- Rodent control and monitoring—PEPP reported control of rodents around populations at Pu‘uwa‘awa‘a FBS (PEPP 2024).
- Collection and propagation for genetic storage and reintroduction—
  - DOFAW reported approximately 80 collections from 2020 to 2025, and currently 527 potted plants are in propagation for outplanting and living collections (DOFAW 2025).
  - HISB reports over 30 collections since 2019, but currently only 32 seeds in storage from one founder (HISB 2025).
  - Lyon Arboretum Seed Conservation Laboratory reported two seeds in collection were utilized for testing, and no seeds remain in storage (Lyon Arboretum 2024).
  - NTBG reports approximately 201 seeds in storage from three individual founders, collected in 1991; viability is unknown. In addition, one individual plant remains as a living collection at the Southshore Garden (NTBG 2025).
  - PEPP reported collection of mature fruit at Honokua in 2023 (PEPP 2024).
- Translocation—Between 2001 and 2006, there were 123 individuals reintroduced at Kīpuka Puauulu, and monitoring in 2019 revealed 30 individuals remained. No

monitoring has been conducted since (Hawai‘i Volcanoes National Park (HVNP) 2024). The plant nursery for Ka‘ūpūlehu Dryland Forest Preserve (DFP) reported 38 individuals sent for outplanting in 2023 (Ka‘ūpūlehu 2023-2024). In 2024, PEPP reported four individuals were reintroduced at Pu‘uwa‘awa‘a FBS (PEPP 2024). Volcano Rare Plant Facility (VRPF) reported three individuals were sent for outplanting at Kīpāhoehoe in 2023 (VRPF 2024). DOFAW reported outplanting 662 total plants from 2020–2025, with the largest outplantings at Aiea (252 plants), Hua‘ina (228 plants), Kīpuka ‘Ōwe‘ōwe (57 plants), and Pāpala (49 plants) (DOFAW 2025).

**Table 1. Status and trends of *Nothocestrum breviflorum* from listing through current 5-year review. Table 1a shows progress according to Interim Stabilization Goals; Table 1b shows progress according to Preventing Extinction Goals.**

**Table 1a.**

| <b>Date</b>                 | <b>No. wild individuals</b> | <b>No. Outplanted</b> | <b>Stability Goals identified in Recovery Plan</b> | <b>Stability Goals Completed?</b> |
|-----------------------------|-----------------------------|-----------------------|----------------------------------------------------|-----------------------------------|
| <b>1994 (Listing)</b>       | 53                          | 0                     | All threats managed in the 3 populations           | No                                |
|                             |                             |                       | Complete genetic storage                           | No                                |
|                             |                             |                       | 3 populations with 25 individuals each             | No                                |
| <b>2012 (5-year review)</b> | <150                        | 79                    | All threats managed in the 3 populations           | Partially                         |
|                             |                             |                       | Complete genetic storage                           | Partially                         |
|                             |                             |                       | 3 populations with 25 individuals each             | No                                |

**Table 1b.**

| <b>Date</b>                 | <b>No. wild individuals</b> | <b>No. outplanted</b>                                                 | <b>*Preventing Extinction Targets identified by HPPRCC</b>                  | <b>*Preventing Extinction Targets Completed?</b> |
|-----------------------------|-----------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------|
| <b>2020 (5-year review)</b> | ca 156                      | 200–2,000 (survival unknown)                                          | All threats managed in all 3 populations                                    | Partially                                        |
|                             |                             |                                                                       | Reproduction (i.e., viable seeds, seedlings, saplings) at all 3 populations | Unknown                                          |
|                             |                             |                                                                       | Complete genetic storage                                                    | Partial                                          |
|                             |                             |                                                                       | 3 populations with 50 mature individuals each                               | No                                               |
| <b>2025 (5-year review)</b> | ca 158                      | ca 730; possibly more. Survival of outplants prior to 2019 is unknown | All threats managed in all 3 populations                                    | Partially                                        |
|                             |                             |                                                                       | Complete genetic storage                                                    | Partially                                        |
|                             |                             |                                                                       | Reproduction (i.e., viable seeds, seedlings, saplings) at all 3 populations | No                                               |
|                             |                             |                                                                       | 3 populations with 50 mature individuals each                               | Partially                                        |

\* 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 *Nothocestrum breviflorum* and ongoing conservation efforts.**

| <b>Threat</b>                                                                | <b>Listing factor</b> | <b>Current Status</b> | <b>Conservation/ Management Efforts</b>                         |
|------------------------------------------------------------------------------|-----------------------|-----------------------|-----------------------------------------------------------------|
| Ungulate destruction and degradation of habitat                              | A, C                  | Ongoing               | Partial, exclosures at Ka‘ūpūlehu Mauka, Pu‘uwa‘awa‘a FBS, HVNP |
| Established ecosystem altering invasive plant species degradation of habitat | A, E                  | Ongoing               | Partial, nonnative plant control efforts within some exclosures |
| Agriculture and urban development                                            | A                     | Ongoing               | None                                                            |
| Fire destruction and degradation of habitat                                  | A                     | Ongoing               | Partial, weed control and fire management plan for some areas   |
| Climate change degradation and loss of habitat                               | A                     | Ongoing               | None                                                            |
| Predation and herbivory by rodents                                           | C                     | Ongoing               | Partial, some rodent control at Pu‘uwa‘awa‘a FBS                |
| Inadequate regulatory mechanisms—hunting                                     | D                     | Ongoing               | Partial, exclosures at Ka‘ūpūlehu Mauka, Pu‘uwa‘awa‘a FBS, HVNP |
| Hiking and trail maintenance                                                 | E                     | Ongoing               | None                                                            |

**Synthesis:**

Currently there approximately 158 wild individuals of *Nothocestrum breviflorum* on the island of Hawai‘i. Individuals are provided protection from ungulates by fencing, rodent control, and nonnative plant control. Seed collections, propagation, and reintroductions are ongoing.

Stabilizing (interim) targets, and Downlisting and Delisting criteria are provided in the Recovery Plan for the Big Island Plant Cluster (USFWS 1996), and 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.

*Nothocestrum breviflorum* is a long-lived perennial tree and 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 a total 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) with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met (Table 1). There are not three reproducing populations, all threats are not being managed, and genetic storage is not complete (Table 2). Therefore, *Nothocestrum breviflorum* meets the definition of Endangered as it remains in danger of extinction throughout its range.

### **Recommendations for Future Actions:**

No significant new information regarding the species’ biological status has been reported since the last 5-year review in 2020. Thus, the following recommendations for future actions are updated or reiterated for the 5-year review for 2024.

- Surveys and monitoring—
  - Continue to monitor known populations of *Nothocestrum breviflorum* to assess resiliency and make collections.
  - Continue surveys for populations of *Nothocestrum breviflorum* in areas of potentially suitable habitat.
  - Determine suitable locations for reintroductions.
- Ungulate monitoring and control—Monitor and maintain fenced exclosures and construct new fences to protect individuals from the negative impacts of browsing by ungulates.
- Invasive nonnative plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species, and those that compete with *Nothocestrum breviflorum*.
- Site and habitat protection—Develop and implement effective control measures to reduce the impacts of destruction by fire, agriculture and urban development, hiking, and hunting impacts.
- Climate change adaptation strategy—Research suitability of habitat for viability of species, including where to conduct translocations in the future due to the impacts of climate change.
- Captive propagation for genetic storage and reintroduction—Continue to maintain collection and propagation efforts for maintenance of genetic stock and for reintroduction.
- Build resiliency, redundancy, and representation—Increase species’ viability through habitat restoration, threat control, and reintroduction and translocation into suitable habitat that is being managed for known threats to this species to reduce impacts of reduced viability due to low numbers.
- Research—Conduct genetic studies to determine genetic variation within the population (and between populations) and plan an effective breeding program.
- Alliance and partnership development—Continue to work with partners and other land managers in preventing site destruction from fire and nonnative plant

degradation of habitat, as well as planning and implementation of ecosystem-level restoration and management to benefit this species.

## References:

- [DLNR-DOFAW] Department of Land and Natural Resources-Division of Forestry and Wildlife. 2015. Draft habitat conservation plan for game management at Pu‘u Wa‘awa‘a and Pu‘u Anahulu, Nāpu‘u conservation project. 268 pp.
- [DOFAW] State of Hawai‘i Department of Forestry and Wildlife. 2025. Report on controlled propagation of listed 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, Hawai‘i.
- [HISB] Hawai‘i Island Seed Bank. 2025. Report on controlled propagation of listed 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, Hawai‘i.
- [HPPRCC] Hawai‘i and Pacific Plants Recovery Coordinating Committee. 2011. Revised recovery objective guidelines. 8 pp.
- Ka‘ūpūlehu Dryland Forest Preserve. 2023-2024. Report on controlled propagation of listed 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, Hawai‘i.
- Lyon Arboretum. 2024. Report on controlled propagation of listed 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, Hawai‘i.
- [NTBG] National Tropical Botanical Garden. 2025. Report on controlled propagation of listed 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, Hawai‘i.
- [PEPP] 2024. Plant Extinction Prevention Program FY 2023 annual report Oct 1, 2023-Sep 30, 2024), USFWS CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F14AC00174, December 24, 2016, UH Mānoa, PCSU, PEPP. 56 pp.
- [USFWS] U.S. Fish and Wildlife Service. 1996. The Recovery plan for the Big Island plant cluster. Portland, OR. 176 pp. + appendices.

- [USFWS] 2012. *Nothocestrum breviflorum* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI.  
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- [USFWS] 2020. *Nothocestrum breviflorum* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI.  
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- [USFWS] 2023. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 133 Species in Oregon, Washington, Idaho, Montana, California, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 88(56): 17611–17614, March 23, 2023.
- [VRPPF] Volcano Rare Plant Propagation Facility. 2024. Report on controlled propagation of listed 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, Hawai‘i.



**U.S. FISH AND WILDLIFE SERVICE**

SIGNATURE PAGE for 5-YEAR REVIEW of *Nothocestrum breviflorum* ('aiea)

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

**Recommendation resulting from the 5-year review:**

|                                     |                                                 |
|-------------------------------------|-------------------------------------------------|
| <input type="checkbox"/>            | Delisting                                       |
| <input type="checkbox"/>            | Reclassify from Endangered to Threatened status |
| <input type="checkbox"/>            | Reclassify from Threatened to Endangered status |
| <input checked="" type="checkbox"/> | No Change in listing status                     |

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

\_\_\_\_\_ Date \_\_\_\_\_