

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Achyranthes splendens* var. *rotundata* (Round-leaved chaff flower, 'Ewa hinahina)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2022. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 167 Species in Oregon, Washington, Idaho, Montana, California, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 87(90):28031–28034, May 10, 2022.

Lead Region/Field Office:

Region 1/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, 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 *Achyranthes splendens* var. *rotundata* (USFWS 2020). The evaluation by Cheryl Phillipson, 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/4709>).

Review Analysis:

Please refer to the previous 5-year reviews for *Achyranthes splendens* var. *rotundata* published in the Federal Register on July 22, 2009; August 7, 2013; and September 29, 2020 (available at https://ecos.fws.gov/docs/tess/species_nonpublish/1362.pdf, https://ecos.fws.gov/docs/tess/species_nonpublish/2055.pdf, and https://ecos.fws.gov/docs/tess/species_nonpublish/3149.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 *A. splendens* var. *rotundata*.

This short-lived perennial shrub in the Amaranthaceae (amaranth) family is endangered and is known from the island of O'ahu and historically from Moloka'i and Lāna'i. The

status and trends for *Achyranthes splendens* var. *rotundata* are provided in the tables below.

New Status Information:

- Currently, there are three recently monitored wild populations on O‘ahu (Kalaehoa Heritage Park, lower Mākaha, and Campbell Industrial Park) totaling 59 mature and 4 immature individuals, including the 6 new individuals discovered on a cliff of lower Mākaha valley (PEPP 2019–2023). In 2005, the largest population was at upper Mākaha (900 individuals), but the current status of this part of the population is unknown (PEPP 2019–2023; Army Natural Resources Program of O‘ahu [ANRPO] 2022). There are four translocated populations on O‘ahu at Kahuku, Ka‘ena Point, Campbell Industrial Park, and the Kalaehoa Unit of the Pearl Harbor National Wildlife Refuge Complex (34, 3, 12, and 23 individuals, respectively) and one at Mokio on Moloka‘i (1 individual).
- Currently, there are approximately five populations represented in *ex situ* storage and propagation collections, including seeds in seed banks, vegetative material, and plants in nurseries or living collections.

New Threats:

- None reported.

New Management Actions:

- Monitoring and surveys—The Plant Extinction Prevention Program (PEPP) continues to monitor wild individuals of *Achyranthes splendens* var. *rotundata* on O‘ahu (PEPP 2019–2023). Translocations at the Kalaehoa Unit are monitored by the USFWS (2022a, 2022b, 2023). The translocation on Moloka‘i is managed by the Moloka‘i land trust and the PEPP.
- Invasive nonnative plant management—Nonnative invasive plants are controlled at the populations at Ka‘ena Point, the Kalaehoa Unit, the Kalaehoa Heritage Park, Kahuku, Campbell Industrial Park, and at Mokio on Moloka‘i (PEPP 2021, p. 25; SWCA Environmental Consultants [SWCA] 2021a, p. 4; SWCA 2021b, p. 4; USFWS 2022a, 2022b, 2023).
- Drought management—In December 2021, translocated plants at Campbell Industrial Park were initially watered for the first week followed by every other day watering for two weeks to prevent mortality (SWCA 2021b, p. 5).
- Control of predation by nonnative invertebrates—Scale insects (mealybugs) and the bostrichid beetle (*Amphicerus* sp.) damaging plants at the Kalaehoa Unit were treated with a pesticide (SWCA 2021a, p. 6).
- Collection and propagation for genetic storage and reintroduction—
 - The State’s O‘ahu Rare Plant Nursery reported propagation and storage of three plants at the Dillingham facility representing one translocated plant at the Campbell Industrial Park site and one plant propagated from an unidentified source, and storage of two plants propagated at the Waimano facility representing a second translocated plant at the Campbell Industrial Park site (O‘ahu Rare Plant Facility 2023).

- PEPP collected 80 fruit from one founder at the Kalaeloa Heritage Park (PEPP 2019–2023).
- From 1990 through 1996, the National Tropical Botanical Garden (NTBG) reported storage of 10,810 seeds representing four founders at Ka‘ena Point, one founder at Barber’s Point, and one first-generation plant at the garden. In addition, one clone of the first-generation individual was planted as a living collection at their Southshore Garden in 1995. More recently, from 2006 through 2021, 11,647 seeds were stored representing one founder each from Ka‘ena Point and Barber’s Point, one first-generation plant at the garden, and one first-generation plant at McBryde Garden (sourced from Barber’s Point). Eight plants were propagated from a clone of the first-generation plant from Barber’s point, and 10 plants were added to the living collection at the Southshore Garden (representing the Barber’s Point founder) (NTBG 2022).
- The Lyon Seed Conservation Laboratory reported 6,074 seeds in storage collected in 1999 from a cultivated plant at Honolulu Botanical Garden; 3,871 seeds in storage collected in 2012 from a cultivated plant at Koko Crater Botanical Garden; and almost 83,000 seeds in storage collected in 2019 representing a first-generation plant grown from a cutting from one founder at Campbell Industrial Park. Seeds were also collected and stored from three reintroduced subpopulations at the Campbell Industrial Park translocation site: 29,873 seeds representing eight individuals from the first site, 1,390 seeds representing two individuals from the second site, and 8,374 seeds representing two individuals from the third site (Lyon Arboretum 2022).
- In 2018, Waimea Arboretum reported propagation and storage of 51 plants/seeds representing seven founders from an unidentified source (Waimea Arboretum 2018). In 2022, the arboretum received five plants from Lyon Arboretum, representing three of the four founders at the Kenai (Campbell Industrial Park) site (Waimea Arboretum 2022).
- Translocation—
 - Beginning in 2014, the CIRI Land Development Company and AKC Leasing Corporation received an incidental take license for take of *Achyranthes splendens* var. *rotundata* at the Kenai Industrial Park site (SWCA 2021a, p. 1). Mitigation measures included establishment of populations at the Kalaeloa Unit using genetic stock from plants at the site and additional nearby plants. Five translocation plots were established (SWCA 2021a, pp. 1–2). In 2014, approximately 159 individuals were translocated to the plots but by 2020 only 13 of these survived; however, 97 recruits from these individuals were observed (SWCA 2021a, p. 8). In 2021, a total of 135 recruits were observed; however, overall mortality increased (SWCA 2021b, pp. 6–7). By the end of June there was a total of 121 plants (SWCA 2021b, p. 10). Surveys conducted by USFWS in December 2023 reported only 5 plants remaining in the SWCA mitigation site (USFWS 2023).
 - The USFWS monitors other translocations of *A. splendens* var. *rotundata* at Kalaeloa, and in March 2021, 185 individuals were counted, with some mortality by April 2022, and 107 individuals remaining (USFWS 2022a). A follow-up survey conducted in December of 2022 counted only 54 plants

remaining (USFWS 2022b). By December 2023, only 23 plants remained (USFWS 2023).

- In 2022, PEPP reported an initial reintroduction of 10 individuals at the Campbell Industrial Park translocation site, with four individuals located at two subpopulations in 2021; 29 individuals reintroduced at Kahuku Point; and three mature individuals remaining at Ka‘ena Point from old plantings along with 14 recruits (PEPP 2019–2023). In 2022, PEPP reported one plant remained on Moloka‘i which will be monitored (PEPP 2022, p. 26).
- In 2022, two translocated subpopulations at Kahuku, a coastal site on O‘ahu, consisted of 29 and 5 individuals, respectively (PEPP 2019–2023).

Table 1. Status and trends of *Achyranthes splendens* var. *rotundata* from listing through current 5-year review. Table 1a shows progress according to Downlisting Goals; Table 1b shows progress according to Preventing Extinction Goals.

Table 1a.

Date	No. wild individuals	No. Outplanted	Downlisting Goals identified in Recovery Plan	Downlisting Goals Completed?
1986 (listing)	~400	0	3 reproducing populations with a minimum of 500 reproductive plants per population in both the ‘Ewa Plain and Ka‘ena Point regions	No
			Each population secure from threats	No
			Each population stable and increasing in number for a minimum of 10 consecutive years	No
			Land area for each population sufficient to provide a buffer of 30 to 50 meters	No
2009 (5-year review)	~1,600–1,700	100s	3 reproducing populations with a minimum of 500 reproductive plants per population in both the ‘Ewa Plain and Ka‘ena Point regions	Partially

			Each population secure from threats	Partially
			Each population stable and increasing in number for a minimum of 10 consecutive years	Partially
			Land area for each population sufficient to provide a buffer of 30 to 50 meters	No
2013 (5-year review)	~1,600–1,700	350–400	3 reproducing populations with a minimum of 500 reproductive plants per population in both the ‘Ewa Plain and Ka‘ena Point regions	Partially
			Each population secure from threats	Partially (see Table 2)
			Each population stable and increasing in number for a minimum of 10 consecutive years	No
			Land area for each population sufficient to provide a buffer of 30 to 50 meters	No

Table 1b.

Date	No. wild individuals	No. outplanted	*Preventing Extinction Targets identified by HPPRCC	*Preventing Extinction Targets Completed?
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2020 (5-year review)	Unknown (<1,000 from 2005)	641 (560 at Kalaeloa; 2 at Ka'ena; 79 at Moloka'i-survival unknown)	All threats managed in all 3 populations	Partially
			Reproduction (i.e., viable seeds, seedlings) at all 3 populations	Partially, recruitment at Kalaeloa and 'Īlio Point
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially, 1 population not monitored in 15 years
2024 (5-year review)	ca 59 mature 5 immature	ca 350; ca 72 remain on O'ahu, recruitment at 2 locations; 1 remains on Moloka'i	All threats managed in all 3 populations	Partial, insect management ongoing at Kalaeloa; nonnative plant control at translocation sites
			Complete genetic storage	Partial; complete for Campbell Industrial Park founders
			Natural reproduction at all 3 populations	Partial, 14 recruits at Ka'ena, 135 recruits at Kalaeloa
			3 populations with 50 mature individuals each	Partial, 1 population at Kalaeloa Heritage Park

* 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 *Achyranthes splendens* var. *rotundata* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Habitat conversion for industrial and agricultural development	A	Ongoing	Partial, 2 translocations fenced
Deposition of trash and construction materials into exclosures	A, E	Ongoing	Partial, removal of materials from fenced areas
Degradation and destruction by drought	A	Ongoing	Partial, 1 translocated population initially irrigated
Established ecosystem altering invasive plant species degradation of habitat, and competition by nonnative invasive plants	A, E	Ongoing	Partial, nonnative plant control at translocation sites
Climate change degradation or loss of habitat	A	Ongoing	None
Degradation and destruction by fire	A	Ongoing	None
Predation and herbivory by insects and insect farming by ants	C	Ongoing	Partial, periodic insect control at Kalaeloa

Synthesis:

Currently there are 59 wild mature individuals and 4 immature individuals of *Achyranthes splendens* var. *rotundata* on O‘ahu. Four translocated populations are provided protection by fencing and nonnative plant control. Seed collections, propagation, and outplanting for all wild and translocated populations (except at Mākaha) are ongoing.

Stabilizing (interim), downlisting, and delisting criteria are provided in the Draft Recovery Plan for *Chamaesyce skottsbergii* var. *skottsbergii* and *Achyranthes splendens* var. *rotundata* (USFWS 1993) and preventing extinction criteria have been added 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.

Achyranthes splendens var. *rotundata* is a short-lived perennial shrub. 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 O‘ahu and Moloka‘i or Lāna‘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. There is only one population totaling at least 50 reproducing individuals (Table 1). Genetic storage is complete for one wild population only (Table 1). Insect damage is addressed for one population (Table 1, Table 2). Invasive nonnative plants are controlled at all translocated populations (Table 1, Table 2). Although there is natural recruitment at two translocated populations, mortality is high for mature plants, and populations continue to decline (Table 1). Other threats including drought, fire, and climate change are not addressed. Therefore, *Achyranthes splendens* var. *rotundata* 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 reiterated for the 5-year review for 2024.

- Surveys and inventories—
 - Continue surveys of suitable habitat and historical range for a thorough assessment of the species’ status.
 - Determine suitable habitat on Moloka‘i and Lāna‘i for translocations.
- Invasive nonnative plant monitoring and control—Continue control of established ecosystem-altering nonnative invasive plant species, and those that compete with *Achyranthes splendens* var. *rotundata*.
- Fire prevention and control—Develop and implement fire prevention management plans for all wild and translocated populations.
- Climate change adaptation strategy—Assess the modeled effects of climate change on this species to determine future landscape needed for its recovery.
- Invertebrate monitoring and control—
 - Develop and implement control methods for scale insects and ants at all populations.
 - Develop and implement control methods for the bostrichid beetle (*Amphicerus* sp.) at all wild and reintroduced populations.
- Captive propagation for genetic storage and reintroduction—Continue collection and propagation efforts for maintenance of genetic stock and for reintroduction.
- Build resiliency, redundancy, and representation—Continue to increase species’ viability through habitat restoration, threat control, and translocation into suitable

habitat that is being managed for known threats to this species to reduce impacts of climate change.

- Population biology research—Study populations with regard to size and structure, geographical distribution, flowering cycles, pollination mechanisms, seed dispersal agents, longevity, seed banks, specific environmental requirements, limiting factors, and threats.
- Alliance and partnership development—Continue to work with partners and other land managers in planning and implementation of ecosystem-level restoration and management to benefit this species.

References:

[ANRPO] Army Natural Resources Program of O‘ahu. 2022. Population structure data for *Achyranthes splendens* var. *rotundata*.

[HPPRCC] Hawai‘i and Pacific Plants Recovery Coordinating Committee. 2011. Revised recovery objective guidelines. 8 pp.

Lyon Arboretum. 2022. 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. 2022. 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.

O‘ahu Rare Plant Nursery. 2023. 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] Plant Extinction Prevention Program. 2021. Plant Extinction Prevention Program fiscal year 2021 interim performance report (October 1, 2020-September 30, 2021), Cooperative Agreement F19AC00532 (Interim report), U.S. Fish and Wildlife Service CFDA Program #15.657 Endangered Species Conservation—Recovery Implementation Funds, University of Hawai‘i at Mānoa, Pacific Cooperative Studies Unit, Plant Extinction Prevention Program. 46 pp.

[PEPP] 2022. Plant Extinction Prevention Program fiscal year 2022 interim performance report (October 1, 2021-September 30, 2022), Cooperative Agreement F19AC00532 (Interim report), U.S. Fish and Wildlife Service CFDA Program #15.657 Endangered Species Conservation—Recovery Implementation Funds, University of Hawai‘i at Mānoa, Pacific Cooperative Studies Unit, Plant Extinction Prevention Program. 50 pp.

- [PEPP] 2019–2023. Plant Extinction Prevention Program fiscal years 2019 to 2023 interim performance report (October 1, 2018-September 30, 2023). U.S. Fish and Wildlife Service CFDA Program \$15.657 Endangered Species Conservation—Recovery Implementation Funds, Cooperative Agreement: F18AC00502 (Final performance report), University of Hawai‘i at Mānoa, Pacific Cooperative Studies Unit. 105 pp. + database.
- [SWCA] SWCA Environmental Consultants. 2021a. Annual Report for the Kenai Industrial Park: Round-leaved Chaff Flower (*Achyranthes splendens* var. *rotundata*) Habitat Conservation Plan July 1-2019-June 30, 2020. May 2021. Prepared for CIRI Land Development Company and AKC Leasing Corporation, submitted to State of Hawai‘i Division of Forestry and Wildlife. 21 pp. + appendices.
- [SWCA] 2021b. Annual Report for the Kenai Industrial Park: Round-leaved Chaff Flower (*Achyranthes splendens* var. *rotundata*) Habitat Conservation Plan July 1-2020-June 30, 2021. September 2021. Prepared for CIRI Land Development Company and AKC Leasing Corporation, submitted to State of Hawai‘i Division of Forestry and Wildlife. 11 pp. + appendices.
- [USFWS] U.S. Fish and Wildlife Service. 1993. Draft recovery plan for *Chamaesyce skottsbergii* var. *skottsbergii* and *Achyranthes splendens* var. *rotundata*. Portland. 71 pp. + appendices.
- [USFWS] 2009. *Achyranthes splendens* var. *rotundata* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. https://ecos.fws.gov/docs/tess/species_nonpublish/1362.pdf.
- [USFWS] 2013. *Achyranthes splendens* var. *rotundata* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. https://ecos.fws.gov/docs/tess/species_nonpublish/2055.pdf.
- [USFWS] 2020. *Achyranthes splendens* var. *rotundata* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. https://ecos.fws.gov/docs/tess/species_nonpublish/3149.pdf.
- [USFWS] 2022. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 167 Species in Oregon, Washington, Idaho, Montana, California, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 87(90): 28031–28034, May 10, 2022.
- [USFWS] 2022a. Kalaeloa endangered plant survey, April 2022. 5 pp.
- [USFWS] 2022b. Kalaeloa endangered plant survey, December 2022. 6 pp.
- [USFWS] 2023. Kalaeloa endangered plant survey, December 2023. 6 pp.

Waimea Arboretum. 2018. 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.

Waimea Arboretum. 2022. 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 *Achyranthes splendens* var. *rotundata*
(Round-leaved chaff flower; 'Ewa hinahina)

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
- No Change in listing status

For Field Supervisor, Pacific Islands Fish and Wildlife Office

Date _____