

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Ischaemum byrone* (Hilo Ischaemum)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2019. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 91 species in Oregon, Washington, Hawai‘i, and American Samoa. Federal Register 84(112): 27152–27154, June 11, 2019.

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 2020. The review was based on a review of current, available information since the last 5-year review for *Ischaemum byrone* (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 *Ischaemum byrone* in the Federal Register on August 27, 2010 and August 20, 2015 (available at https://ecos.fws.gov/docs/tess/species_nonpublish/1614.pdf and https://ecos.fws.gov/docs/tess/species_nonpublish/2298.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 *I. byrone*.

This short-lived perennial grass in the Poaceae (grass) family is endangered and occurs on Moloka‘i, Maui, Hawai‘i, and possibly Kaua‘i, and is historically known from O‘ahu. The status and trends for *Ischaemum byrone* are provided in the tables below.

New Status Information:

- In 2016, critical habitat was designated on Moloka‘i for *Ischaemum byrone* in seven units in the coastal ecosystem (1,561 hectares [ha], 3,851 acres [ac]) and on Maui in eight units in the coastal ecosystem (419 ha, 1,032 ac) (81 FR 17790, March 30, 2016). Critical habitat as designated on the island of Hawai‘i in 2003 remains the same (68 FR 39624, July 2, 2003).
- On Maui in 2019, Haleakalā National Park (HALE NP) reported that wild occurrences of *I. byrone* at ‘Ōhe‘o were extirpated (NPS 2019, p. 83). In 2021, approximately 100 individuals were observed at ‘Ōhi‘a (Pauwalu Point) (PEPP 2021). Other occurrences at Hanawī, Mokuapapa and Mokuhipi islets, Honomā‘ele, Pukaulua, Mū‘olea, Puhilele Point, and Kālepa Point (most last observed in 2016) may remain, possibly totaling more than 500 individuals. On the island of Hawai‘i some of the few wild occurrences are possibly extirpated by recent lava flows and further surveys are needed at previously documented sites for a current assessment of the status of *I. byrone* (Keir 2018, in litt.; NPS 2015, p. 463). Occurrences on Moloka‘i have not been thoroughly surveyed since 2010 when there was estimated to be 200 individuals from Wailau to Waiehu. These locations were observed in 2021 and are still extant, but census data could not be collected at this time (Bakutis 2021, pers. comm.). Additionally, plants at known sites further west towards Pelekunu (Kaholaiki Bay) could not be relocated, where as in past years an estimated 20 to 50 plants could be observed on the rock outcroppings and cliffs in the bay and along the vegetation edge (Bakutis 2021, pers. comm.). As reported in the previous 5-year review in 2015, a population on Kaua‘i could not be confirmed because of the inaccessible location.

New Threats:

- Beginning in May 2018, volcanic activity in the Puna area of the island of Hawai‘i covered large areas with lava, ignited fires, and produced toxic sulfur dioxide fumes, destroying occurrences of *Ischaemum byrone* along the coast from Kapoho to ‘Opihikao (Keir 2018, in litt.).
- In September 2021, declines in populations along the North shore of Moloka‘i at Kaholaiki Bay were detected. These populations are protected from ungulates and landslides have not occurred in the area. Rats were suspected as a potential threat to *I. byrone* by consuming and destroying seeds and hence limiting regeneration. Slugs were also observed in the area.
- In 2015, we reported the climate change vulnerability of *I. byrone* as assessed by Fortini et al. (2013) without providing its rank. *Ischaemum byrone* is extremely vulnerable to the impacts of climate change with a vulnerability score of 0.852 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). In addition, this species has no overlap between current and future climate envelopes and is unlikely to tolerate expected changes in climate at its current locations. This means that this species must persist within suitable microrefugia or move to newly available climate-compatible areas to avoid extinction.

New Management Actions:

- Surveys and monitoring—The Plant Extinction Prevention Program (PEPP) surveyed an occurrence on east Maui (PEPP 2021).
- Collection and propagation for genetic storage and reintroduction—
 - From 2016 to 2019, the Lyon Arboretum Seed Conservation Laboratory reported storage of 885 seeds representing one founder from Honopou (Maui) and 507 seeds representing one founder from Mū‘olea Point-Alaaula (Maui) (Lyon Arboretum 2020).
 - In 2016, Haleakalā National Park (HALE NP) reported 200 seeds in storage representing 20 founders from ‘Ōhe‘o (HALE NP 2016). In 2019, 100 seeds and three propagules were in storage representing one founder from ‘Ōhe‘o (HALE NP 2019).
 - In 2019, the Maui Nui Botanical Garden (MNBG) reported storage of 100 seeds representing seven founders from Mū‘olea (Maui) (MNBG 2019).
 - The National Tropical Botanical Garden (NTBG) has at least four plants in living collections at Kahanu Garden with more than 230 seeds collected from these plants (NTBG 2020).
 - From 2016 to 2017, the Olinda Rare Plant Facility (ORPF) reported 16 plants in inventory representing two founders from Honopou (Maui) and one plant in inventory representing one founder from Kaupakulua (Maui) (ORPF 2020).
- Reintroduction and translocation—
 - HALE NP reported outplanting of 10 *Ischaemum byrone* to ‘Ōhe‘o in 2016 and an additional outplanting in 2020 to ‘Ōhe‘o and Kukui Bay (HALE NP 2016, 2020).
 - In 2021, on the island of Hawai‘i, Malama O Puna—Hawaiian Reforestation Program reported outplantings at Malama Ki (79 individuals total), MacKenzie State Park (16 individuals total), and at Nanawale Forest Reserve (90 individuals total), and observed several previous outplantings surviving (Kobsa 2021, in litt.). Some recruitment is observed but survival of the outplantings is challenged by drought.

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

Date	No. wild individuals	No. outplanted	Downlisting Criteria identified in Recovery Plan	Downlisting Criteria Completed?
1994 (listing)	est total 1,200–2,200 (Moloka‘i, Maui, Hawai‘i)	0	All threats managed in all 5–7 populations	No
			Complete genetic storage	No

			5–7 populations with 300 mature individuals each	No
			Naturally reproducing, stable, & increasing in number	Unknown
			Stable for 5 consecutive years	Unknown
1996 (recovery plan)	Unknown (Kaua‘i) Unknown (Moloka‘i) 1,000–2,000 (Maui) 1,000s (Hawai‘i)	Unknown	All threats managed in all 5–7 populations	No
			Complete genetic storage	No
			5–7 populations with 300 mature individuals each	No
			Naturally reproducing, stable, & increasing in number	No
			Stable for 5 consecutive years	No
2003 (critical habitat)	2 (Kaua‘i) <2,000 (Moloka‘i) <2,000 (Maui) ca 3,000 (Hawai‘i)	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			5–7 populations with 300 mature individuals each	Partially
			Naturally reproducing, stable, & increasing in number	No
			Stable for 5 consecutive years	No

2010 (5-year review)	>300 (Kaua'i) ca 200 (Moloka'i) few 1,000 (Maui) ca 700+ (Hawai'i)	34 planted (Maui) 515 planted, only 15 survive (Hawai'i)	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			5–7 populations with 300 mature individuals	Partially
			Naturally reproducing, stable, & increasing in number	No
			Stable for 5 consecutive years	No
2015 (5-year review)	Unknown, inaccessible (Kaua'i) ca 200 (Moloka'i) several 1,000 (Maui) 1,000 (Hawai'i)	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			5–7 populations with 300 mature individuals	Partially
			Naturally reproducing, stable, & increasing in number	No
			Stable for 5 consecutive years	No
2016 (critical habitat, Maui Nui)	ca 200 (Molokai) several 1,000 (Maui)	10+ (Maui)	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			5–7 populations with 300 mature individuals	Partially

			Naturally reproducing, stable, & increasing in number	Partially, some natural recruitment
			Stable for 5 consecutive years	No
Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2021 (5-year review)	Unknown (Kaua'i) ca 200 (Moloka'i) ca 500 (Maui) 0? (Hawai'i)	10+ (Maui) ca 185 (Hawai'i)	All threats managed in all 3 populations	Partially, ungulate control at HAVO and HALE NP
			Complete genetic storage	Partially, 30 founders from 3 Maui populations
			Natural reproduction at all 3 populations	Partially, recruitment observed on Maui and Hawai'i)
			3 populations with 50 mature individuals each	Yes

* 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 *Ischaemum byrone* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation and destruction of habitat by feral ungulates	A	Ongoing	Partial, ungulate control at HAVO and HALE NP
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial, nonnative plant control at HAVO and HALE NP
Degradation and destruction by fire	A	Ongoing	Partial, fire management plans for HAVO and HALE NP

Degradation and destruction by landslides	A	Ongoing	None
Degradation and destruction by drought	A	Ongoing	None
Degradation and destruction of habitat by agricultural and urban development	A	Ongoing	None
Predation and herbivory by feral ungulates	C	Ongoing	Partial, ungulate control at HAVO and HALE NP
Predation and herbivory by rats	C	Potential	None
Volcanic activity	E	Ongoing	Partial, some plants translocated
Human activity—trampling, trail clearing	E	Ongoing	None
Climate change	E	Ongoing	None

Synthesis:

Currently there are approximately 500 wild individuals of *Ischaemum byrone* on Maui and approximately 200 individuals on Moloka‘i. Several individuals were destroyed by lava on the island of Hawai‘i in 2018 and some other wild populations have not been monitored since the last 5-year review. Rats were a potential threat suspected at Kaholaiki Bay on Moloka‘i. A potential population was observed on Kaua‘i in 2015 but because of its inaccessible location a positive identification is pending. Seed collections are ongoing and approximately 30 founders from three Maui populations are represented. More than 10 plants were reintroduced along the coast in Haleakalā National Park.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Big Island Plant Cluster (USFWS 1996) 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.

Ischaemum byrone is a short-lived perennial grass. 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 one or more of the islands 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 are approximately 700 individuals remaining on Maui and Moloka‘i, with unknown numbers on Hawai‘i and Kaua‘i. This is a decline in numbers since the last 5-year review. Some ungulate and nonnative plant control are conducted in the national parks on Maui and Hawai‘i; however, coastal habitat is difficult to fence. Genetic representation is incomplete. Not all threats are being addressed (Table 2). Therefore, *Ischaemum byrone* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

Rats are reported as a potential threat to occurrences on Moloka‘i; however, no 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 2021.

- Surveys and inventories—Survey current and historical range for a complete assessment of the species’ status.
- Ungulate monitoring and control—Continue to conduct ungulate control where possible to protect all occurrences from the impacts of feral ungulates, including browsing.
- Invasive plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species at all wild and reintroduced populations.
- Predator and herbivore monitoring and control—Determine impacts from rats and develop and implement effective control measures for rodents at all *I. byrone* populations that are impacted.
- Fire monitoring and control—Implement fire management plans for all populations on lands managed by the National Parks. Develop and implement fire management plans for all other populations.
- Captive propagation for genetic storage and reintroduction—Continue collection of genetic resources for storage, propagation, and reintroduction into managed suitable habitat.
- Reintroduction and translocation—Continue reintroductions and augmentations into suitable habitat within historical range in areas that are managed for known threats and to reduce impacts from stochastic events. Monitor reintroductions for successful recruitment.
- Human interaction monitoring and management—Develop and implement effective measures to reduce the impacts of hikers and trail maintenance.
- Climate change adaptation strategy—
 - Research suitability of habitat for reintroduction of this species in the future due to impacts of climate change.
 - Build resiliency and redundancy by increasing numbers of populations and individuals to reduce the impacts of climate change.

- 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 taxon.

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U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Ischaemum byrone*
(Hilo Ischaemum)

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

_____ Date _____