Stenogyne cranwelliae
(no common name)

5-Year Review
Summary and Evaluation

U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawai‘i

5-YEAR REVIEW

Species reviewed: *Stenogyne cranwelliae* (no common name)

TABLE OF CONTENTS

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1.0 GENERAL INFORMATION

1.1 Reviewers:

Cheryl Phillipson, Biologist, Pacific Islands Fish and Wildlife Office (PIFWO)
Lauren Weisenberger, Plant Recovery Coordinator, PIFWO
Megan Laut, Conservation and Restoration Team Manager, PIFWO

Lead Regional Office:
Interior Region 12, Portland Regional Office

Lead Field Office:
Pacific Islands Fish and Wildlife Office

Cooperating Field Office(s):
N/A

Cooperating Regional Office(s):
N/A

1.2 Methodology used to complete the review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office of the U.S. Fish and Wildlife Service (Service), beginning in October 2019. The review was based on the final rule listing this species; peer reviewed scientific publications; unpublished field observations by the Service, State of Hawai‘i, and other experienced biologists; unpublished survey reports; notes and communications from other qualified biologists; as well as a review of current, available information. The evaluation of Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, Conservation and Restoration Team Manager.

1.3 Background:

1.3.1 FR Notice citation 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.

1.3.2 Listing history:

Original Listing
FR notice: [USFWS] U.S. Fish and Wildlife Service. 2013. Endangered and threatened wildlife and plants; determination of endangered species status for 15 species on Hawaii Island; final rule. Department of the Interior, Federal Register 78: 63638–64690, October 29, 2013.

Date listed: October 29, 2013
Entity listed: *Stenogyne cranwelliae*
Classification: Endangered

Revised Listing, if applicable
FR notice: N/A
Date listed: N/A
Entity listed: N/A
Classification: N/A

1.3.3 Associated rulemakings:

N/A

1.3.4 Review History:

This is the first 5-year review for *Stenogyne cranwelliae*.

1.3.5 Species' Recovery Priority Number at start of this 5-year review:

5

1.3.6 Current Recovery Plan or Outline:

Name of plan or outline: Recovery Outline for the Island of Hawai‘i
Date issued: October 2019
Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?

____**Yes**
__X_**No**

2.1.2 Is the species under review listed as a DPS?

____**Yes**
____**No**

2.1.3 Was the DPS listed prior to 1996?

____**Yes**

____No

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

____Yes
____No

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?

____Yes
____No

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?

____Yes
____No

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

____Yes
__X_No

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

____Yes
____No

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery?

____Yes
____No

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:
A synthesis of the threats (Listing Factors A, C, D, and E) affecting this species is presented in section 2.3.2 and Table 2. Listing Factor B (overutilization for commercial, recreational, scientific, or educational purposes) is not known to be a threat to this species.

The recovery plan is currently being drafted. However, the Hawai‘i and Pacific Plants Recovery Coordinating Committee (HPPRCC) has outlined the actions and goals for stages leading towards recovery (2011). These stages are described below.

Current information is lacking for many Hawaiian plant species on the status of the species and their habitats, breeding systems, genetics, and propagule storage options. The following downlisting and delisting criteria for plants have therefore been adopted from the revised recovery objective guidelines developed by the HPPRCC (2011). Many of the Hawaiian plant species are at very low numbers, so the Service also developed criteria for avoiding imminent extinction and an interim stage before downlisting, based on the recommendations of the HPPRCC, to assist in tracking progress toward the ultimate goal of recovery. These criteria are assessed on a species-by-species basis, especially as additional information becomes available.

In general, long-lived perennials are those taxa either known or believed to have life spans greater than 10 years; short-lived perennials are those known or believed to have life spans greater than one year but less than 10 years; and annuals are those known or believed to have life spans less than or equal to one year. When it is unknown whether a species is long- or short-lived, the Service has erred on the side of caution and considered the species short-lived. This will be revised as more is learned about the life histories of these species. Narrow extant range and broad contiguous range are recognized as not needing different numbers of individuals or populations, but that the populations will be distributed more narrowly or more broadly, respectively, across the landscape. Obligate outcrossers are those species that either have male and female flowers on separate plants or otherwise require cross-pollination to fertilize seeds, and therefore require equal numbers of individuals contributing to reproduction as males and females, doubling the number of mature individuals. Species that reproduce vegetatively may reproduce sexually only on occasion, resulting in the majority of the genetic variation being between populations, therefore requiring additional populations. Species that have a tendency to fluctuate in number from year to year require a larger number of mature individuals on average to allow for decline in years of extreme habitat conditions and recuperation in numbers in years of more normal conditions.

Preventing Extinction

Stabilizing (interim), downlisting, and delisting objectives have been updated according to the draft revised recovery objective guidelines developed by the 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.

Stenogyne cranwelliae is a short-lived perennial vine. 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 six populations should be documented on the island of Hawai‘i where they now occur or occurred historically. Each of these populations must be naturally reproducing (i.e., viable seeds, seedlings) with a minimum of 50 mature, reproducing individuals per population.

This recovery objective has not been met (see Table 1).

Interim Stage

To meet the interim stage of recovery of *Stenogyne cranwelliae*, 300 mature individuals are needed in each of six populations and all major threats must be controlled around the populations designated for recovery at this stage. There should also be demonstrated regeneration of seedlings and documented replacement regeneration within each of the target populations. The populations must be adequately represented in an *ex situ* collection as defined in the Center for Plant Conservation's guidelines (Guerrant *et al.* 2004) that is secure and well managed. Adequate monitoring must be in place and conducted to assess individual plant survival, population trends, trends of major limiting factors, and response of major limiting factors to management.

This recovery objective has not been met (see Table 1).

Downlisting Criteria

In addition to achieving 10 to 20 populations with 500 mature individuals per population and all of the goals of the interim stage, all target populations must be stable, secure, and naturally reproducing for a minimum of 10 years. Species-specific management actions are not ruled out. Downlisting should not be considered until an adequate population viability analysis (PVA) has been conducted to assess needed numbers more accurately based on current management and monitoring data collected at regular intervals determined by demographic parameters of the species, although they should only be one of the factors used in making a decision to downlist. Information necessary for the PVA that should be available through monitoring (ideally annually) includes major limiting factors, breeding system, population structure and density, and proven management methods for major threats.

This recovery objective has not been met (see Table 1).

Delisting Criteria

In addition to achieving 10 to 20 populations with 500 mature individuals per population and all of the goals of the interim and downlisting stages, all target populations must be stable, secure, naturally reproducing, and within secure and viable habitats for a minimum of 20 years. Species-specific management actions must no longer be necessary, but ecosystem-wide management actions are not ruled out if there are long-term agreements in place to continue management. These numbers are initial targets, but may be revised upward as additional information is available, including adequate PVAs for individual species based on current management and monitoring data collected at regular intervals determined by demographic parameters of the species, although they should only be one of the factors used in making a decision to delist. Genetic analyses should be conducted to ensure that adequate genetic representation is present within and among populations compared to the initial variation assessed in the interim stage. Numbers need to be considered on a species-by-species basis.

This recovery objective has not been met (see Table 1).

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:
Stenogyne cranwelliae is a perennial vine in the Lamiaceae (mint) family. The leaves are membranous and ovate with crenate margins and are attached to sharply four-angled stems with pubescence concentrated on stem angles. There are six flowers per verticillaster (an inflorescence in which the flowers are arranged in a whorl) and the corollas are a very pale pink with a straight tube (Weller and Sakai 1999, p. 837). Flowers were described as having a smaller lower lip, long tubes, and are odorless (Lindqvist and Albert 2002, p. 1710).

The specific life history characteristics of *Stenogyne cranwelliae* have not been studied and little is known about the phenology and reproduction of this species. Based on the report from 1996, fruit and flowers were observed on plants from July through November (Perlman and Wood 1996, pp. 6, 33). Due to the structure of the flower, other species of this genus are thought to be pollinated and dispersed by forest birds feeding on nectar and subsequent fruit, specifically honeycreepers (Lindqvist and Albert 2002, p. 1710). With the assumption that successful reproduction of this species requires nectarivorous birds, any decline in forest bird populations can significantly affect the continued longevity of this species.

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

Only one population was found in the Kohala mountains at the time of its discovery in 1935 and no information is available about the size and distribution of that population. It was not observed again until 1995 during plant surveys in the Kohala mountains. In 2009, approximately 89 plants were outplanted in the Puʻu O ʻUmi Natural Area Reserve (NAR) in the Kohala mountains (VRPF 2002-2019). Additionally, in 2010, a "few scattered patches" in the Waimanu bog unit were also recorded (Agorastos 2010, pers. comm.). However, on a survey in 2020, no plants were found in the fenced Waimanu bog unit; however, two groups of plants consisting of three individuals each were observed at two other sites (VanDeMark 2020, in litt.). Although there was not a complete survey of the area in 2020, the few plants observed in 2020 suggests that the populations within the Kohala mountains are likely in decline. A population in a new area was discovered in 2014, when a single individual of this species was observed in the Hakalau Forest National Wildlife Refuge (NWR).

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):
No information.

2.3.1.4 Taxonomic classification or changes in nomenclature:
Stenogyne cranwelliae was discovered in 1935 by L.M. Cranwell and C. Skottsberg and was described by Sherff in 1939, who named it for its discoverer. This species is recognized in Weller and Sakai (1990, p. 837) and is the currently recognized taxonomy.

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):
See section 2.3.1.2 above for spatial distribution of the species.

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):
Stenogyne cranwelliae occurs in wet montane forest in the Kohala mountains dominated by *Metrosideros polymorpha* (ʻōhiʻa). Associated native species include *Cheirodendron trigynum* (ʻōlapa), *Cyanea* spp. (hāhā), and *Cibotium* spp. (hāpuʻu) (USFWS 2019b). The only other record of *S. cranwelliae* is in the Hakalau Forest NWR in wet montane forest dominated by *M. polymorpha* and *Acacia koa* (koa) with the associated native species *Rubus* spp., *Vaccinium* spp., *Cheirodendron trigynum*, *Cyanea* spp., and *Clermontia* spp. (USFWS 2010, pp. 4-13, L-1).

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range (Factor A):

Ungulate destruction and degradation of habitat—Destruction and degradation of habitat by feral pigs (*Sus scrofa*) is a threat to *Stenogyne cranwelliae* (Cuddihy and Stone 1990, p. 63, 65–66; Tomich 1986, pp. 156–163). During the 1995 survey, Perlman and Wood noted that some populations had significant pig damage in the Kohala mountains. Feral ungulates have direct impacts on individuals of *S. cranwelliae* including rooting and trampling. They degrade and destroy habitat directly by digging and rooting while searching for food which results increased erosion and loss of vegetation cover (Anderson et al. 2007, p. 2). They also impact the habitat indirectly by spreading nonnative plant seeds in their hooves, coats, and feces (Cuddihy and Stone 1990, p. 63). Additionally, there are no natural predators to these ungulates, and hence, no real control on population growth.

Established ecosystem-altering invasive plant competition and modification and degradation of habitat—Invasive introduced plants modify habitat occupied by native plant species by changing the availability of light, altering soil-water regimes, modifying nutrient cycling, and changing the fire characteristics of the native plant community (Cuddihy and Stone 1990, p. 74). In addition, invasive plants have the ability to outcompete native plant species for space, water, nutrients, and light (Lowe et al. 2019, pp. 14–15). These competitive advantages adversely affect the microhabitat by modifying plant communities, decreasing biological diversity, altering the fire regime, and preventing reproduction of native species. (D'Antonio and Vitousek 1992, pp. 70, 73–74; Cuddihy and Stone 1990, p. 74). Habitat modification and destruction by invasive nonnative plants negatively affects wild and reintroduced population of *Stenogyne cranwelliae* in the Kohala mountains. Invasive nonnative plants observed in the Kohala mountains include *Hedychium gardnerianum* (kahili ginger), *H. coronarium* (white ginger), *H. flavescens* (yellow ginger), *Setaria palmifolia* (palm grass), *Psidium cattleianum* (strawberry guava), *Axonopus fissifolius* (carpet grass), *Juncus ensifolius* (rush), *Juncus effusus* (common rush), *Paspalum conjugatum* (Hilo grass), and *Tibouchina herbacea* (cane tibouchina) (Perlman and Wood 1996, pp. 12–13). Invasive nonnative plants observed in Hakalau Forest NWR include *Passiflora mollissima* (banana poka), *Juncus effusus*, *Pennisetum clandestinum* (kikuyu grass), *Psidium cattleyanum*, and *Ehrharta stipoides* (meadow ricegrass) (Barnett and Simonson, 2013, pp. 16–17, USFWS 2010, pp. 4-98–4-99).

Climate change loss 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. This assessment concluded that *Stenogyne cranwelliae* is highly vulnerable to the impacts of climate change with a vulnerability score of 0.673 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable). Therefore, additional management actions are needed to conserve this taxon into the future, such as locating key microsites that overlap with current and future climate envelopes for outplanting efforts.

Tropical cyclone frequency and intensity are projected to change as a result of climate change over the next 100 to 200 years (Vecchi and Soden 2007, p. 4137; Emanuel *et al.* 2008, p. 348; Yu *et al.* 2010, pp. 1369–1372). In the central Pacific, modeling projects an increase of up to two additional tropical cyclones per year in the main Hawaiian Islands by 2100 (Murakami *et al.* 2013, pp. 1–6). Hurricanes pose an ongoing and ever-present threat because they can happen at any time. In 2018, Hurricane Iselle was downgraded to a tropical storm as it neared the southeast coast of the island of Hawai‘i with maximum sustained winds of 60 knots (69 miles per hour) (Kimberlain et al. 2018, p. 4). Significant damage by strong winds occurred within the Ka‘ū and Puna districts of the island of Hawai‘i. A destructive hurricane holds the potential of driving a localized endemic species such as *Stenogyne cranwelliae* to extinction in a single event.

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes (Factor B):
Not a threat.

2.3.2.3 Disease or predation (Factor C):
Predation and herbivory by rats—Predation and herbivory rats is a threat to *Stenogyne cranwelliae.* Rats have been reported damaging seeds and seedlings of native plants which ultimately changes the forest composition and structure and directly impacting plants by herbivory (Cuddihy and Stone 1990, p.67-69, DLNR 2020, entire). In a survey by Perlman and Wood (1996, pp. 11, 13-15, and 18) and the Hakalau Forest NWR CCP (USFWS 2010, pp. C-19–C-20), predation and herbivory by rats is reported to be a significant threat to the survival of *S. cranwelliae*.

Predation and herbivory by slugs—Invasive slugs are generalist herbivores mainly feeding on seedlings and low-statured herbaceous plants and are noted as a threat to *Stenogyne cranwelliae* in the survey conducted by Perlman and Wood (1996, p. 33). These invertebrates have a two-fold effect on the ecosystems of Hawai‘i. Not only do they cause direct endangerment of *S. cranwelliae* through reduced recruitment by directly consuming seedlings, but they may also facilitate the success of competitive invasive species (Joe and Daehler 2008, pp. 245–246).

2.3.2.4 Inadequacy of existing regulatory mechanisms (Factor D): All wild and reintroduced populations of *Stenogyne cranwelliae* except those within Hakalau Forest NWR occur within a State hunting area. The State of Hawai‘i provides game mammal hunting opportunities (e.g., “sustained yield”) in public hunting areas on the island of Hawai‘i (DLNR 2012). Nonnative feral ungulates pose a major ongoing threat to native species through destruction and modification of habitat, and through direct herbivory or predation. Wild and reintroduced populations of *S. cranwelliae* are protected by exclosures; however, this fencing must be maintained and monitored for ungulate ingress. In addition, public hunting areas are not fenced and game mammals have unrestricted access to most areas across the landscape, regardless of underlying land use designation; therefore, any unfenced wild and reintroduced populations are at risk (DLNR 2010).

Currently, four agencies are responsible for inspection of goods arriving in Hawai‘i (CGAPS 2009). The Hawai‘i Department of Agriculture (HDOA) inspects domestic cargo and vessels and focuses on pests of concern to Hawai‘i, especially insects or plant diseases. The U.S. Department of Homeland Security-Customs and Border Protection (CBP) is responsible for inspecting commercial, private, and military vessels and aircraft and related cargo and passengers arriving from foreign locations, focusing on non-propagative plant materials, and internationally regulated commercial species under the Convention in International Trade in Endangered Species (CITES). Also included are federally listed noxious seeds and plants, soil, and pests of concern for forests and agriculture. The U.S. Department of Agriculture-Animal and Plant Health Inspection Service-Plant Protection and Quarantine (USDA-APHIS-PPQ 2010) inspects propagative plant material, provides identification services for arriving plants and pests, and conducts pest risk assessments among other activities (HDOA 2009). The Service inspects arriving wildlife products, enforces the injurious wildlife provisions of the Lacey Act (18 U.S.C. 42; 16 U.S.C. 3371 et seq.) and prosecutes CITES violations. The State of Hawai‘i allows the importation of most plant taxa, with limited exceptions. Many invasive plants established in Hawai‘i have expanding ranges. Resources available to reduce the spread of these species and counter their negative ecological effects are limited. Control of established nonnative invasive plants is largely focused on a few invasive species that cause significant economic or environmental damage to public and private lands, and comprehensive control of an array of invasive plants remains limited in scope. The introduction of new invasive plant species to the State of Hawai‘i is a significant risk to *Stenogyne cranwelliae* and other federally listed species.

2.3.2.5 Other natural or manmade factors affecting its continued

existence (Factor E):
Low numbers of populations and individuals—Small, isolated populations often exhibit reduced levels of genetic variability, which diminishes the species' capacity to adapt and respond to environmental changes, thereby lessening the probability of long-term persistence (Barrett and Kohn 1991; pp. 3, 7; Newman and Pilson 1997, pp. 354–355). The problems associated with small population size and vulnerability to random demographic fluctuations or natural catastrophes are further magnified by synergistic interactions with other threats, such as anthropogenic impacts like habitat loss from human development or predation and competition by nonnative species. Very small plant populations may experience reduced reproductive vigor due to ineffective pollination or inbreeding depression. Small numbers (less than 10) and fragmented populations (only two) may cause of loss of reproductive vigor of *Stenogyne cranwelliae*.

Current Management Actions:

- Feral ungulate control—In 2014 the Division of Forestry and Wildlife fenced a small section of the Kohala mountains to exclude ungulates. This fence protects four the sites within a population of *Stenogyne cranwelliae* from ungulate damage. Additional fencing has been proposed but is not yet implemented (USFWS 2019). These additional fences would protect five of the six areas of previously known populations in the Kohala mountains. Additionally, the Hakalau Forest NWR Comprehensive Conservation Plan (CCP) includes proposals for building and maintaining fencing to prevent ungulate impacts to the native *Acacia koa* forests as well as eradication plans to control pest species (USFWS 2010, p. 6).
- Control of established ecosystem-altering invasive plants—The Hakalau Forest NWR is actively working to control and eradicate invasive plants throughout the *Acacia koa–Metrosideros polymorpha* forest located within its boundaries (USFWS 2010, p. G-4).
- Predation and herbivory by rats—The Hakalau Forest NWR implements a management plan that specifically defines rats as pests and proposes a budget for studies of impacts caused by rats, and studies for rat control and exclusion measures (USFWS 2010, pp. C-19–C-22).
- Predation and herbivory by slugs—While the Hakalau Forest NWR CCP lists slugs as a threat to listed species and the montane wet *Metrosideros polymorpha* forest, there is currently no plan for control or eradication (USFWS 2010, pp. 4–6).
- Captive propagation for genetic storage and reintroduction—There are three wild plants represented at the Volcano Rare Plant Facility (VRPF) that were established and are maintained and propagated via vegetative propagation (cuttings) representing two individuals from

the Kohala mountains and one individual from Hakalau Forest NWR (VRPF 2002-2019).

- Reintroduction—In 2009, approximately 89 plants were reintroduced at Pu‘u O ‘Umi NAR in the Kohala mountains (VRPF 2002-2019).

Table 1. Status and trends of *Stenogyne cranwelliae* from listing through 5-year review.

Date	No. wild individuals	No. outplanted	Preventing Extinction Criteria identified by HPPRCC	Preventing Extinction Criteria Completed?
2013 (listing)	<160	ca 89	All threats managed in all 6 populations	No
			Complete genetic storage	Partially
			6 populations with 50 mature individuals each	No
2020 (5-year review)	ca 7	Unknown	All threats managed in all 6 populations	Partially, exclosures at one previously known population
			Complete genetic storage	Partially, 3 founders represented
			6 populations with 50 mature individuals each	No

Table 2. Threats to *Stenogyne cranwelliae* and ongoing conservation efforts.

Threat	Listing Factor	Current Status	Conservation/Management Efforts
Ungulate degradation and destruction of habitat	A	Ongoing	Partial, exclosure at previously known population
Degradation and destruction of habitat by established ecosystem-altering invasive plant species	A	Ongoing	Partial, nonnative plant control at Hakalau NWR
Climate change degradation or loss of habitat, including hurricanes	A	Ongoing	None

Predation and herbivory by ungulates	C	Ongoing	Partial, exclosure at previously known population
Predation and herbivory by rats	C	Ongoing	None
Predation and herbivory by slugs	C	Ongoing	None
Inadequacy of regulatory mechanisms	D	Ongoing	Partial, exclosure at previously known population
Low numbers of individuals and populations	E	Ongoing	Partial, collection and propagation ongoing

2.4 Synthesis

There are two populations, one of six individuals and one of one individual of *Stenogyne cranwelliae* 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 *S. cranwelliae* is highly vulnerable to the effects of climate change. Feral ungulate control is ongoing within the exclosure for the wild and reintroduced populations in the Kohala mountains and at Hakalau NWR; however, fencing must be maintained and monitored for ingress. Nonnative plant control is conducted at Hakalau NWR. Almost 90 individuals have been reintroduced; however, their current status is unknown. A few plants representing a few individuals from the Kohala mountains and Hakalau NWR are in storage.

Preventing extinction, interim stabilization, downlisting, and delisting objectives are provided in HPPRCC's Revised Recovery Objective Guidelines (2011). To prevent extinction, which is the first step 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 an *ex situ* (at other than the plant's natural location, such as a nursery or arboretum) collection that is well managed. In addition, a minimum of six 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. There are only two very small wild populations remaining, and the status of the individuals

reintroduced in 2009 is uncertain. Genetic storage goals have not been met (Table 1). In addition, not all threats are being sufficiently managed throughout the range of the species (Table 2). Therefore, *Stenogyne cranwelliae* meets the definition of endangered as it remains in danger of extinction throughout its range.

3.0 RESULTS

3.1 Recommended Classification:

____Downlist to Threatened
____Uplist to Endangered
____Delist
____*Extinction*
____*Recovery*
____*Original data for classification in error*
__X__No change is needed

3.2 New Recovery Priority Number:

Brief Rationale:

3.3 Listing and Reclassification Priority Number:

Reclassification (from Threatened to Endangered) Priority Number:____
Reclassification (from Endangered to Threatened) Priority Number:____
Delisting (regardless of current classification) Priority Number:____

Brief Rationale:

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- Surveys and inventories—Continue to search suitable habitat for individuals of *Stenogyne cranwelliae* in recent and historical locations.
- Ungulate monitoring and control—Continue to construct and maintain fenced exclosures to protect wild and reintroduced individuals from the negative impacts of feral ungulates. Monitor exclosures for ingress.
- Invasive plant monitoring and control—Continue to control established ecosystem-altering nonnative invasive plant species and those that compete with *S. cranwelliae* at all populations.
- Predation and herbivory by ungulates—Continue to fence and monitor populations for ungulates.
- Predation and herbivory by rats—Implement effective controls for rats at all populations.
- Predation and herbivory by slugs—Develop and implement effective controls for slugs at all populations.

- Captive propagation for genetic storage and reintroduction—Continue to collect seeds for storage and propagation efforts.
- Reintroduction and translocation—Continue to establish and augment populations to increase numbers of populations and individuals in suitable habitat to reduce the impacts of competition with nonnative plants; ungulate, rat, and slug predation; climate change and hurricanes, and low numbers.
- Climate change adaptation strategy—Research suitability of habitat in the future due to the impacts of climate change.
- Alliance and partnership development—Continue to collaborate with partners in planning and implementation of ecosystem-level restoration and management to benefit this species.

5.0 REFERENCES

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Stenogyne cranwelliae*
(no common name)

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

____Downlist to Threatened
____Uplist to Endangered
____Delist
_X__No change needed

Appropriate Listing/Reclassification Priority Number, if applicable: _____

Review Conducted By:
Cheryl Phillipson, Fish and Wildlife Biologist, PIFWO
Lauren Weisenberger, Plant Recovery Coordinator, PIFWO
Megan Laut, Conservation and Restoration Team Manager, PIFWO

FIELD OFFICE APPROVAL:

MEGAN LAUT Digitally signed by MEGAN LAUT
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for _____
Field Supervisor, Pacific Islands Fish and Wildlife Office