Labordia tinifolia var. *lanaiensis*
(Kamakahala)

5-Year Review
Summary and Evaluation

U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii

5-YEAR REVIEW

Species reviewed: *Labordia tinifolia* var. *lanaiensis* (Kamakahala)

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5-YEAR REVIEW
Labordia tinifolia var. *lanaiensis* (Kamakahala)

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:
Region 1, Endangered Species Program, Division of Recovery, Jesse D'Elia, (503) 231-2071

Lead Field Office:
Pacific Islands Fish and Wildlife Office, Loyal Mehrhoff, Field Supervisor, (808) 792-9400

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 (USFWS), beginning on April 8, 2010. The review was based on the designation of critical habitat for *Labordia tinifolia* var. *lanaiensis* and the addendum to the recovery plan for the multi-island plants (USFWS 2003, 2002), as well as a review of current, available information. The Bernice Pauahi Bishop Museum provided an initial draft of portions of the review and recommendations for conservation actions needed prior to the next five-year review. The evaluation of Samuel Aruch, biological consultant, was reviewed by a recovery biologist and the Plant Recovery Coordinator. The document was then reviewed by the Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before submission to the Field Supervisor for approval.

1.3 Background:

1.3.1 Federal Register (FR) Notice citation announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2010. Endangered and threatened wildlife and plants; 5-year review status of 69 species in Idaho, Washington, Hawaii, Guam, and the Commonwealth of the Northern Mariana Islands. Federal Register 75(67):17947-17950.

1.3.2 Listing history

Original Listing
FR notice: USFWS. 1999. Endangered and threatened wildlife and plants; final endangered status for 10 plant taxa from Maui Nui, Hawaii; final rule. Federal Register 64(171):48307-48324.
Date listed: September 3, 1999
Entity listed: Species
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:

USFWS. 2003. Endangered and threatened wildlife and plants; final designation of critical habitat for three plant species from the island of Lanai, Hawaii; final rule. Federal Register 68(6):1220-1274.

The proposed critical habitat designation for 5,861 hectares (14,482 acres) surrounding Lanaihale (Lanai D) for 28 plant species, including *Labordia tinifolia* var. *lanaiensis*, was deferred because of a preexisting cooperative agreement between the USFWS and Castle and Cooke Resorts, LLC (USFWS 2003).

USFWS 2012. Endangered and threatened wildlife and plants; listing 38 species on Molokai, Lanai, and Maui as endangered and designating critical habitat on Molokai, Lanai, Maui and Kahoolawe for 135 species. Federal Register 77(112):34464-34775.

Critical habitat is currently being proposed for *Labordia tinifolia* var. *lanaiensis* (USFWS 2012).

1.3.4 Review History:

Species status review [FY 2011 Recovery Data Call (August 2011)]: Undetermined

Recovery achieved:
1 (0-25%) (FY 2007 Recovery Data Call)

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

6

1.3.6 Current Recovery Plan or Outline

Name of plan or outline: USFWS. 2002. Addendum to the recovery plan for the Multi-Island plants. U.S. Fish and Wildlife Service, Portland, Oregon. viii +

125 pages. Available online at <http://www.fws.gov/pacificislands/recoveryplans.html>.
Date issued: December 10, 2002
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***
__X_ ***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***
__X_ ***No***

2.2 Recovery Criteria

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

__X_ ***Yes***
____ ***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?

__X_ ***Yes***

____ ***No***

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

__X_ ***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, B, C, D, and E) affecting this species is presented in Section 2.3.2 and Table 2.

Stabilizing, downlisting, and delisting objectives are provided in the addendum to the recovery plan for multi-island plants (USFWS 2002), based on whether the species is an annual, a short-lived perennial (fewer than ten years), or a long-lived perennial. *Labordia tinifolia* var. *lanaiensis* is a short-lived perennial, and to be considered stabilized, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g.*, fenced) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on islands where they now occur or occurred historically. For the species to be considered stable, each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Labordia tinifolia* var. *lanaiensis* should be documented on islands where they now occur or occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with a minimum of 300 mature individuals per population. Each population should persist at this level for a minimum of five consecutive years before downlisting is considered.

This recovery objective has not been met.

For delisting, a total of eight to ten populations of *Labordia tinifolia* var. *lanaiensis* should be documented on the island of Lanai. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with 300 mature individuals per population. Each population should persist at this level for a minimum of five consecutive years before delisting is considered.

This recovery objective has not been met.

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:

While *Labordia tinifolia* var. *lanaiensis* has been described as a short-lived perennial shrub, Hank Oppenheimer (Plant Extinction Prevention Program, pers. comm. 2010) has observed that the species definitely lives longer than ten years, and should be designated as a long-lived shrub, with stabilization, downlisting, and delisting criteria adjusted accordingly. Oppenheimer noted that the fruit of individuals found within the upper Awehi Gulch enclosure are mature during August thus visits before and after August are either too early or too late to collect fruits. Oppenheimer also noted that some trees flowered consistently but never produced fruit, even though a fruit-bearing tree was directly adjacent; he surmised that those individuals might be dioecious, or possibly self-incompatible.

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:

Historically, *Labordia tinifolia* var. *lanaiensis* was known from the entire length of the summit ridge of Lanaihale on the island of Lanai. In recent times, the population has become more restricted to the southeastern end of the summit ridge of Lanaihale, which is privately owned land.

Currently, there are one to three populations totaling an estimated 300 to 800 scattered individuals on Lanai (USFWS 1999, 2002, 2003, 2010). Hank Oppenheimer (pers. comm. 2010) believes this estimate is too high; and recent data records of low numbers supports his opinion: Kunoa Gulch, 1997, 7 individuals; Haalelepaakai, 2000, 2 individuals; Awehi Gulch south of Puhielelu Ridge, 2001, 7 individuals; Kapohaku-Waiapaa, below Puu Alii, 2001, 10 individuals; Awehi Gulch, south of Puhielelu Ridge, 2 individuals; and headwaters of Lopa Gulch, a single individual (Hawaii Biodiversity and Mapping Program 2010; National Tropical Botanical Garden 2010a).

Ken Wood (National Tropical Botanical Garden, pers. comm. 2010) related that he has personally seen only 40 or 50 individuals during his years of exploring prime habitat sites on Lanai, but has not extensively covered the island. Some rarely accessed gulch heads are thickly covered with difficult-to-navigate *Dicranopteris linearis* (uluhe) adjacent to the Lanaihale road offer promise of containing *Labordia tinifolia* var. *lanaiensis*, and Wood optimistically believes that there may be three or

four populations remaining with 200 to 300 individuals (K. Wood pers. comm. 2010). On the other hand, Wood has only observed about 30 individuals within the past decade (K. Wood pers. comm. 2010).

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

No new information.

2.3.1.4 Taxonomic classification or changes in nomenclature:

Endemic to Lanai, this taxon was described by E.E. Sherff in 1938 (Sherff 1938). Wagner *et al*. (1999) recognized three varieties of *Labordia tinifolia*: var. *tinifolia*, from Kauai, Oahu, Molokai, Maui, and Hawaii; var. *wahiawaensis*, restricted to Kauai; and var. *lanaiensis*, from Lanai and Mapulehu on Molokai. The expanded island distribution of var. *lanaiensis* was based on the inclusion of *L. triflora* as a synonym by Wagner *et al*. (1999). The latter taxon was a Molokai endemic described by William Hillebrand in 1888 based on a collection he made in 1870, and it remained the sole collection at the time Wagner *et al*. (1999) examined material of *Labordia*; with no additional material to examine, the authors chose to consider the specimen an anomalous example of *L. tinifolia* var. *lanaiensis* (Motley 1995). Subsequently, in 1990 Joel Lau collected material in Kua Gulch on Molokai that was confirmed by Tim Motley as authentic *L. triflora*, based on its distinct morphology. Motley (1995) then resurrected the name *L. triflora* as a Molokai endemic, thus returning *L. tinifolia* var. *lanaiensis* to its status as a Lanai endemic taxon. Both taxa (*L. tinifolia* var. *lanaiensis* and *L. triflora*) were subsequently federally listed as endangered taxa (USFWS 1999).

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.):

No new information.

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

The typical habitat of *Labordia tinifolia* var. *lanaiensis* is gulch slopes in *Metrosideros polymorpha* (ohia)-*Dicranopteris linearis* (uluhe) lowland mixed mesic to wet forest between 550 and 1,013 meters (1,804 and 3,323 feet) elevation. Associated native plant species include *Coprosma* spp. (pilo), *Cyrtandra grayana* (haiwale), *Freycinetia arborea* (ieie), *Kadua acuminata* (au), *Bobea elatior* (ahakea), *Clermontia grandiflora* subsp.

munroi (oha wai), *Melicope* spp. (alani), *Myrsine lessertiana* (kolea), *Perrottetia sandwicensis* (olomea), *Pipturus albidus* (mamaki), *Pittosporum confertiflorum* (hoawa), *Pouteria sandwicensis* (alaa), *Psychotria* spp. (kopiko), *Scaevola chamissoniana* (naupaka kuahiwi), and *Xylosma hawaiiense* (maua) (USFWS 1999, 2002, 2003; Hawaii Biodiversity and Mapping Program 2010; National Tropical Botanical Garden 2010a; H. Oppenheimer, pers. comm. 2010).

2.3.1.7 Other:

No new information.

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:

Threats:

- Ungulate degradation of habitat (USFWS 1999, 2002, 2003; K. Wood, pers. comm. 2010; H. Oppenheimer, pers. comm. 2010)
    - Axis deer (*Axis axis*)
    - Feral mouflon sheep (*Ovis musimon*)
- Established ecosystem-altering invasive plant species degradation of habitat (USFWS 1999, 2002, 2003)
    - *Hedychium gardnerianum* (kahili ginger)
    - *Morella faya* (firetree)
    - *Psidium cattleianum* (strawberry guava)
    - *Rubus rosifolius* (thimble berry)
    - *Schinus terebinthifolius* (Christmasberry)
- Landslides and flooding (USFWS 1999, 2002, 2003).

Current conservation efforts:

- Ungulate exclosure:
    - Castle and Cooke is constructing approximately 35 kilometers (22 miles) of fencing around the Lanaihale summit to control the depredations of feral axis deer. The fence will be completed in three increments. The first increment is completed and the second increment is well under construction (H. Oppenheimer, pers. comm. 2010).

    - A single population of at least four to five individuals of *L. tinifolia* var. *lanaiensis* occurs in a small, ungulate-free exclosure in upper Awehi Gulch (H. Oppenheimer, pers. comm. 2010).

- Ecosystem-altering invasive plant species control – A single population of at least four to five individuals of *L. tinifolia* var. *lanaiensis* occurs in a small, ungulate-free exclosure in upper Awehi Gulch, where Oppenheimer has been doing limited manual and chemical control of *Psidium cattleianum*, *Rubus rosifolius*, and *Morella faya* (H. Oppenheimer, pers. comm. 2010).

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

None reported.

2.3.2.3 Disease or predation:

Threats:

- Ungulate predation or herbivory – Axis deer and feral mouflon sheep (USFWS 1999, 2002, 2003; K. Wood, pers. comm. 2010; H. Oppenheimer, pers. comm. 2010)

2.3.2.4 Inadequacy of existing regulatory mechanisms:

Threats:

- Lack of adequate hunting regulation in areas with ungulates – The lack of adequate ungulate control and the existence of established hunting programs in areas where *L. tinifolia* var. *lanaiensis* occurs continue to threaten this species.

2.3.2.5 Other natural or manmade factors affecting its continued existence:

Threats:

- Ungulate trampling – Axis deer and feral mouflon sheep (USFWS 1999, 2002, 2003; K. Wood, pers. comm. 2010; H. Oppenheimer, pers. comm. 2010)
- Established invasive plant species competition (USFWS 1999, 2002, 2003; K. Wood, pers. comm. 2010; H. Oppenheimer, pers. comm. 2010)
    - *Cinnamomum burmanii* (Padang cassia)
    - *Eucalyptus robusta* (swamp mahogany)

- *Leptospermum scoparium* (New Zealand tea)
- *Tibouchina herbacea* (glory bush)

- Climate change may pose a threat to this species. However, current climate change analyses in the Pacific Islands lack sufficient spatial resolution to make predictions on impacts to this species. The Pacific Islands Climate Change Cooperative (PICCC) has currently funded climate modeling that will help resolve these spatial limitations. We anticipate high spatial resolution climate outputs by 2013.

Current conservation efforts:

- Captive propagation for genetic storage and reintroduction:
  - The Center for Conservation Research and Training Seed Storage Laboratory (2010) reported 39 seeds in storage.
  - National Tropical Botanical Garden (2009) reported 352 seeds in storage (300 from Kunoa, 40 from Awehi, 12 from Puhielelu); no seed was reportedly in storage for the 2010 report (National Tropical Botanical Garden 2010b).
  - It was previously reported that seeds of *Labordia tinifolia* var. *lanaiensis* were stored at Lyon Arboretum for many years in the past and the species was well suited for micropropagation (USFWS 2002).
  - While seed longevity studies for *Labordia tinifolia* var. *lanaiensis* are ongoing, seeds of *Labordia tinifolia* var. *tinifolia* from Oahu have lasted many years under controlled conditions (USFWS 2002).
- Competitive invasive plant species control – A single population of at least four to five individuals of *L. tinifolia* var. *lanaiensis* occurs in the small, ungulate-free exclosure in upper Awehi Gulch, where Oppenheimer has been doing limited manual and chemical control of *Cinnamomum burmanii* and *Leptospermum scoparium* (H. Oppenheimer, pers. comm. 2010).

2.4 Synthesis

The interim stabilization goals for this species have not been met, as current population information is too vague to assess whether there are one to three populations with at least 50 mature individuals in each population (Table 1), and all threats are not being managed (Table 2). Therefore, *Labordia tinifolia* var. *lanaiensis* meets the definition of endangered as it remains in danger of extinction throughout its range.

Table 1. Status of *Labordia tinifolia* var. *lanaiensis* from listing through 5-year review.

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1999 (listing)	300-1,000	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2002 (recovery plan)	300-800	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	3-8	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2012 (5-year review)	200-300	0	All threats managed in all 3 populations	Partially (see Table 2)
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Unknown

Table 2. Threats to *Labordia tinifolia* var. *lanaiensis* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – Degradation of habitat, herbivory, trampling	A, C, D, E	Ongoing	Partially: Ungulate exclosure at Lanaihale and Awehi Gulch
Established ecosystem-altering invasive plant species degradation of habitat	A	Ongoing	Partially: Ecosystem-altering invasive plant species control at Awehi Gulch
Landslides and flooding	A	Ongoing	No
Established invasive plant species competition	E	Ongoing	Partially: Competitive invasive plant species control at Awehi Gulch
Climate change	A, E	Increasing	No

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

- Captive propagation for genetic storage and reintroduction:
    - Continue to collect seeds from tagged individuals, keeping close track of the maternal source for use in *ex situ* propagation.

    - Continue to collect seeds from all existing populations and send to at least two or three different venues for propagation.
- Captive propagation protocol development – Explore alternate methods of propagation for *Labordia tinifolia* var. *lanaiensis* (e.g., cuttings, tissue culture).
- Ungulate exclosures – Complete the Lanaihale fencing project.
- Ungulate control – Remove axis deer within the exclosure once the fencing is complete at Lanaihale.
- Reintroduction / translocation site identification – While surveying for new populations or reintroduced populations, determine which sites are least invaded by invasive introduced plant species and which appear to have the highest likelihood of maintaining new reintroductions.
- Surveys / inventories – Continue to conduct thorough surveys for *Labordia tinifolia* var. *lanaiensis* in habitats where it has historically been found on Lanai, as well as in other potentially suitable habitats.
- Ecosystem-altering invasive plant species control – Continue to control ecosystem-altering invasive plant species around all populations.
- Competitive invasive plant species control – Continue to control invasive introduced plant species around all populations.
- Population biology research – Research the life history of *Labordia tinifolia* var. *lanaiensis* in reference to designating the taxon from a short-lived perennial to long-lived perennial.
- Site / area / habitat protection – Develop and implement effective measures to reduce the impact of landslides and flooding.
- Alliance and partnership development – Work with Castle and Cooke and other land managers to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.
- Threats research – Assess the modeled effects of climate change on this species, and use to determine future landscape needed for the recovery of the species.

5.0 REFERENCES

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Personal communications:

Oppenheimer, Hank. 2010. Maui Nui Coordinator, Plant Extinction Prevention Program, Lahaina, Hawaii. E-mail to Clyde Imada, Bernice Pauahi Bishop Museum, dated November 22, 2010 and December 5, 2010. Subject: *Labordia tinifolia* var. *lanaiensis*.

Wood, Ken. 2010. Research Biologist, National Tropical Botanical Garden, Kalaheo, Hawaii. E-mail to Clyde Imada, Bernice Pauahi Bishop Museum, dated December 1, 2010. Subject: *Labordia tinifolia* var. *lanaiensis*.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Labordia tinifolia* var. *lanaiensis* (Kamakahala)

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

Appropriate Listing/Reclassification Priority Number, if applicable:_____

Review Conducted By:
Chelsie Javar, Fish and Wildlife Biologist
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for

Jess Newton Date 8/28/2012