Pittosporum halophilum
(hōʻawa)

5-Year Review
Summary and Evaluation

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

5-YEAR REVIEW

Species reviewed: *Pittosporum halophilum* (hō‘awa)

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5-YEAR REVIEW
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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on the final rule listing this species; the final critical habitat designation; peer reviewed scientific publications; unpublished field observations by the Service, State of Hawai‘i, and other experienced biologists; unpublished survey reports; notes and communications from other qualified biologists; as well as a review of current, available information.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 status for 38 species

on Molokai, Lanai, and Maui; final rule. Department of the Interior, Federal Register 78 (102): 32014–32065, May 28, 2013.

Date listed: May 28, 2013
Entity listed: *Pittosporum halophilum*
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] U.S. Fish and Wildlife Service. 2016. Endangered and threatened wildlife and plants; designation and nondesignation of critical habitat on Molokai, Lanai, Maui, and Kahoolawe; final rule. Department of the Interior, Federal Register 81 (61): 17790–18110, March 30, 2016.

Critical habitat was designated for *Pittosporum halophilum* on Molokaʻi in seven units in the coastal ecosystem (1,562 hectares (ha); 3,851 ac) (81 FR 17790).

1.3.4 Review History:

This is the first 5-year review for *Pittosporum halophilum*.

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 islands of Maui, Molokaʻi, Kahoʻolawe, and Lānaʻi (Maui Nui)
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.

Pittosporum halophilum 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 three populations should be documented on Molokaʻi where they now occur or occurred historically. Each of these populations must be naturally reproducing (*i.e.*, viable seeds, seedlings, saplings), 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 *Pittosporum halophilum*, 300 mature individuals are needed in each of three 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 growth to at least sapling stage for woody species 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 secured and well-maintained. 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 five 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 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:

Pittosporum halophilum is a shrub in the pittosporum family (Pittosporaceae) that occurs on Moloka‘i and its offshore islets. Shrubs are 0.4 to 1.8 meters (m) (1.3 to 6 feet (ft)) tall with gray-brown to medium brown branches. Leaves are 3.5 to 7 centimeters (cm) (1.4 to 2.8 inches (in)) long, the lateral veins in 5 to 9 pairs, the leaves lower surfaces with slightly raised veins and densely covered with a tan to golden yellow short matted woolly hairs. Leaf bases are wedge-shaped. Inflorescences are sparsely to densely covered with whitish-gray to golden yellow short matted woolly hairs, with 5 to 10 fragrant white to cream-colored flowers. *Pittosporum halophilum* is observed to be functionally unisexual (separate male and female plants). The dry fruit are subcuboid (almost cube-like) to ovoid (egg-shaped) with densely tan to golden brown hairs (Wood and Kiehn 2011, pp. 469–471)

Pittosporum halophilum has been observed flowering between March and July and again between November and January (Plant Extinction Prevention Program (PEPP) 2018, pp. 24–25; Wood and Kiehn 2011, p. 470). It was observed fruiting from November through June (Wood and Kiehn 2011, p. 470) with mature fruit in late October (PEPP 2018, pp. 24–25). We do not have information about seed viability or under what conditions seeds germinate. Other life history information is currently unknown, including information on plant growth stages, longevity, and the

length of time it takes to flower. Mature plants observed by PEPP in 2001 are still alive, indicating that some individuals may live more than 18 years (PEPP 2018, p. 24).

Relatively few studies have been conducted on the breeding system of *P. halophilum*. The flowers of the Hawaiian genus of *Pittosporum* are fragrant pale white or cream-colored and their corollas form a tube at anthesis (the period during which a flower is fully open and functional), which often signifies pollination by moths (Wood and Kiehn 2011, p. 472). For the *Pittosporum* genus, moth visitors were noted from the genera: *Hyposmocoma*, *Diplosara*, *Philodoria*, and *Parectopa* (Lepidoptera), and *Plagithmysus* (Coleoptera), *Sarona* (Heteroptera), and *Drosophila* (Diptera) (Swezey 1954 and Montgomery 2007 in Wood and Kiehn 2011, p. 472). It is not known if a pollinator is able to perform floral visitations between Molokaʻi and the adjacent islets (Wood and Kiehn 2011, p. 471). *Pittosporum halophilum* may be functionally unisexual (having separate male and female plants) which is derived from observations of herbarium vouchers and individuals growing in cultivation (Wood and Kiehn 2011, p. 472). The few exceptions have been documented on Huelo where the only two female plants are able to produce viable seeds in the absence of male plants on the islet, and the remote plant located at Kūkaʻiwaʻa that continues to make viable seeds. Potential reasons for these exceptions are the very rare development of hermaphroditic flowers (reproductive organs normally associated with both male and female sexes in the same flower) on plants that are known to be functionally unisexual (not often seen in cultivation) or apomictic (producing seed without fertilization) seed production (Wood and Kiehn 2011, p. 472). There is one wild individual on Mōkapu Islet that was noted as having flowers with both sexes or possibly just female parts in 2010 (PEPP 2018, p. 24).

Moths are speculated to be pollinators for the species due to the presence of fragrant pale white or cream-colored flowers and corollas forming a tube at anthesis (the period during which a flower is fully open and functional) (Wood and Kiehn 2011, p. 471–472).

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:

The historical range for this species is known only from the type specimens that were collected in 1910 and 1911 along the windward sea cliffs of Molokaʻi between Kalawao and Waikolu (Rock 1911, p. 16). After this species was first described, it was not seen for more than 80 years. It was rediscovered in 1994 when two plants were found on Huelo islet (Wood and Kiehn 2011, p. 466). Seeds were collected from one plant

in 1994 and 1999. The fact that this species was not seen for 80 years may related to the lack of survey efforts in this remote part of Molokaʻi. Access to Kalaupapa peninsula was limited due to the government's decision to set it aside to isolate people with Hansen's disease (i.e., leprosy) from 1886 to 1969 (National Park Service 2019).

In more recent times, *Pittosporum halophilum* was documented on Kūkaʻiwaʻa peninsula and the three islets of Huelo, Mōkapu, and ʻŌkala (Wood and Kiehn 2011, p. 469).

In 2010, there was one wild individual on near the sea cliffs of Kūkaʻiwaʻa peninsula at 46 m (150 ft) (78 FR 32014, May 28, 2013).

On Huelo, two plants were destroyed by a landslide sometime after 2002, and no wild individuals remain (Wood and Kiehn 2011, pp. 466, 469–470).

In 2000, on Mōkapu islet, 15 individuals occurred in two sites, one site at 45 to 70 m (150 to 220 ft) elevation and the second site at 60 m (200 ft) elevation (Wood 2008, p. 6). In 2005, 10 individuals remained. Wood and Kiehn (2011, p. 468) noted that four of those individuals died as a result of landslides in 2001 and 2002. In 2011, there were five individuals reported from Mōkapu (Wood and Kiehn 2011, p. 468). As of 2015, there were four individuals of *Pittosporum halophilum* on Mōkapu (PEPP 2019).

On ʻŌkala islet in 2005 there were two wild individuals found at 37 m (120 ft) elevation (Wood 2008, p. 8). Both in 2010 and 2014 (78 FR 32014; PEPP 2019), one individual was reported from ʻŌkala islet. Currently, there are two wild individuals on ʻŌkala, one male plant and one female plant (Wood *et al.* 2018, p. 4).

In summary, there are three populations totaling seven wild individuals, and approximately 42 planted individuals in five planting sites. Three planting sites are within Kalaupapa National Park, totaling approximately 30 individuals (Bakutis 2019, pers. comm.). On Mōkapu islet, there are 10 recently planted individuals. On ʻŌkala islet, there are two recently planted individuals (PEPP 2018, p. 19; PEPP 2019, p. 17).

The distribution of the populations has narrowed from its historical range from Kalawao to Waikolu. It is not known if the planted individuals are naturally regenerating or recruiting (Bakutis 2019, pers. comm.).

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):
A few genetic studies have been conducted for *Pittosporum halophilum*. The chromosome number for *P. halophilum* is $2n = 24$ (Wood and Kiehn

2011, p. 470). This is based on studies conducted on a plant grown in the nursery at the National Tropical Botanical Garden.

A DNA finger-printing study on plants of the Hawaiian *Pittosporum*, which included *P. halophilum* and *P. confertiflorum*, conducted by C. Hogne-Beattie and C. Gemmill (in Wood and Kiehn 2011, p. 470) using inter-simple sequence repeats (ISSRs) determined that there were genetic differences between all members of the Hawaiian *Pittosporum*. Additionally, the study showed that the two species appear to be closely related but can be separated on the origin of the ISSR loci.

It is uncertain if genetic exchange is occurring among the populations. The dispersal ability for this species is uncertain. The ability for the populations residing on the offshore islet to exchange genetic diversity with the population located at Kūkaʻiwaʻa on Molokaʻi is unknown.

2.3.1.4 Taxonomic classification or changes in nomenclature:
Joseph Rock originally described *Pittosporum halophilum* from collections made in 1910 and 1911 on Molokaʻi (Rock 1911; Wood and Kiehn 2011, p. 466). The original publication of the taxon name was misspelled as *P. halophylum*. Sherff (1941, p. 18) later corrected it to the current spelling, *P. halophilum*, as displayed in Rock's original type collection. In addition, since the type specimen did not contain important morphological characters such as seed capsules, *P. halophilum* was placed under *P. confertiflorum*, and not recognized as a distinct species at that time (Wagner *et al.* 1999, pp. 1040–1041). However, in the supplement to Wagner *et al*., Wagner and Herbst (2003, p. 39) considered *P. halophilum* as a distinct species based on new collection information. A taxonomic assessment was conducted by Wood and Kiehn (2011, p. 465–475), and, based on substantial differences from *P. confertiflorum* (i.e., a small, shrubby habit; smaller leaves with cuneate bases and unique tan to golden yellow wooly dense tomentum on lower leaf surfaces; shorter petioles; subcuboid to ovoid capsules; and, in most individuals, functionally unisexual flowers), they concluded that *P. halophilum* merits recognition on species level, which is the currently accepted 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):
Pittosporum halophilum is currently found in the coastal shrubland and grasslands within the salt spray zone, with the exception of the

Kūkaʻiwaʻa peninsula population which is located in mesic shrubland and grassland habitat, yet still within the salt spray zone.

Huelo islet is located 125 m (410 ft) off of the north shore of Molokaʻi and is located approximately 2.5 km (1.5 miles) east of Kalaupapa Peninsula. It is managed by the Kalaupapa National Historic Park of the National Park Service. The islet is roughly 0.73 ha (1.8 acres) in area and has a maximum elevation of 60 m (197 ft). The substrate is finely textured to sometimes granular with a mix of decaying palm leaf (*Pritchardia hillebrandii*) litter, guano, talus, and humus (Wood 2008, p. 2).

Mōkapu islet is located roughly 1,200 m (3,937 ft) north of Huelo islet and is situated approximately 2.4 km (1.5 miles) east of Kalaupapa Peninsula. The islet is managed as a State Seabird Sanctuary by the State of Hawaiʻi Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW). The islet is roughly 6 hectares (ha) (14.8 acres (ac)) in area and has a maximum elevation of 110 m (360 ft). The substrate is finely textured to sometimes granular with a combination of talus and humus, comparable to Huelo and ʻŌkala (Wood 2008, p. 5). On Mōkapu islet, the associated native species for *P. halophilum* are *Diospyros sandwicensis* (lama), *Chenopodium oahuense* (ʻāweoweo), *Sida fallax* (ʻilima), *Osteomeles anthyllidifolia* (ʻūlei), *Eragrostis variabilis* (kāwelu), *Cuscuta sandwichiana* (kaunaʻoa), and *Euphorbia celastroides* var. *amplectens* (akoko) (PEPP 2018, p. 17).

ʻŌkala islet is located roughly 750 m (2,460 ft) northwest of Huelo islet and is situated approximately 1.5 km (0.9 miles) east of Kalaupapa Peninsula. The islet is managed by the Kalaupapa National Historical Park. The islet is roughly 3 ha (7.4 ac) in area with a maximum elevation of 120 m (394 ft), making it the tallest islet off of Molokaʻi. The substrate is finely textured to sometimes granular with a combination of talus and humus, comparable to Huelo and Mōkapu (Wood 2008, p. 5). On ʻŌkala islet, the associated native species for *P. halophilum* are *Osteomeles anthyllidifolia*, *Euphorbia celastroides* var. *amplectens*, *Wikstroemia uva-ursi* (ʻākia), *Senna gaudichaudii* (kolomona), *Diospyros sandwicensis, Artemisia australis* (ʻāhinahina), *Lipochaeta integrifolia* (nehe), *Schiedea globosa* (no common name), *Chenopodium oahuense*, *Scaevola sericea* (naupaka), *Sida fallax*, *Eragrostis variabilis*, *Sideroxylon polynesicum* (keahi), and *Scaevola coriacea* (naupaka) (Wood 2008, p. 7).

Kūkaʻiwaʻa Peninsula is located to the southeast of Huelo islet on the island of Moloka ʻi. This parcel is under the management of Kalaupapa National Historical Park (KNHP). The peninsula is 15 ha (37 acres) in size. On Kūkaʻiwaʻa Peninsula, the associated native species for *P. halophilum* found in the salt spray zone are *Fimbristylis cymosa* subsp. *umbellato-capitata* (no common name), *Panicum fauriei* var. *carteri* (no

common name), *Tetramolopium sylvae* (pāmakani), *Artemisia australis*, *Bidens hillebrandiana* (koʻokoʻolau), and *Bacopa monnieri* (ʻaeʻae) (Wood 2008, p. 7).

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 ungulates is a threat to *Pittosporum halophilum* at Kūkaʻiwaʻa (Wood and Kiehn 2011, p. 474). Feral ungulates modify and degrade habitat by disturbing and destroying vegetative cover, trampling plants and seedlings, reducing or eliminating plant regeneration by damaging seeds and seedlings, and increasing erosion by creating large areas of bare soil (Loope 1998; van Riper and van Riper 1982). Ecosystem degradation occurs at Kūkaʻiwaʻa by nonnative goats (*Capra hircus*), axis deer (*Axis axis*), and pigs (*Sus scrofa*) (Wood and Kiehn 2011, p. 474).

Established ecosystem-altering invasive plant modification and degradation of habitat—Invasive plant species compete with *Pittosporum halophilum* for water, nutrients, and light. These invasive plant species include *Lantana camara* (lantana), *Pluchea carolinensis* (sourbush), *Digitaria insularis* (sourgrass), *Psidium guajava* (guava), *Schinus terebinthifolius* (Christmas berry), *Clidemia hirta* (Koster's curse), and *Kalanchoe pinnata* (air plant) (Wood and Kiehn 2011, p. 474).

Habitat destruction and degradation by erosion and, landslides—Erosion and landslides adversely impact the habitat and individuals of *Pittosporum halophilum* by destabilizing substrates, damaging and destroying individual plants, and altering hydrological patterns that result in habitat destruction or modification and changes to native plant and animal communities. Due to the steep topography of the islets where *P. halophilum* remains, erosion increases the potential for landslides and rockfalls which negatively impact this species. In fact, at least seven individuals have died as a result of landslides (Wood and Kiehn 2011, p. 468).

Fire destruction and degradation of habitat—Wildfires are increasing in frequency in habitat occupied by *Pittosporum halophilum*. The islands of Molokaʻi, Lānaʻi, Maui, and Kahoʻolawe have experienced 1,291 brush fires between 1972 and 1999 that burned a total of 26,000 ha (64,248 ac) (Pacific Disaster Center 2011; County of Maui 2009, Chapter 3, p. 3). Between 2000 and 2003, 271 wildfires consumed more than 5,000 ac (2,023 ha) (Pacific Disaster Center 2011). The mean annual area burned in Hawaiʻi from 2005 to 2011 accounted for 0.48 percent (8,427 ha yr^{-1},

20,824 ac yr^{-1}) of the state's total land area, greater than the proportion of land area burned across the entire U.S. mainland over the same time period (Trauernicht *et al.* 2015, p. 432). Fire damages and destroys native vegetation, including dormant seeds, seedlings, and juvenile and adult plants. Many nonnative invasive plants, particularly fire-tolerant grasses, outcompete native plants and inhibit their regeneration (D'Antonio and Vitousek 1992, pp. 70, 73–74; Tunison *et al.* 2002, p. 122). Successive fires that burn farther and farther into native habitat destroy native plants and remove habitat for native species by altering microclimatic conditions and creating conditions favorable to nonnative invasive plants. Fire-prone grasses such as *Digitaria insularis* (sourgrass) have been observed to dominate habitat at Kūkaʻiwaʻa (Wood and Kiehn 2011, p. 474). Islets may be less susceptible to wildfire and this may only a potential threat in those areas.

Climate change loss or degradation of habitat—Fortini *et al.* (2013) conducted a landscape-based assessment of climate change vulnerability for native plants of Hawaiʻi 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 *Pittosporum halophilum* is extremely vulnerable to the impacts of climate change, with a vulnerability score of 0.947 (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 location. This means that this species must persist within suitable microrefugia, or move to newly available climate-compatible areas to avoid extinction. Therefore, additional management actions may be needed to conserve this taxon into the future, such as ensuring that adequate viable genetic storage is maintained and identifying suitable microsites where climate change effects are anticipated to occur more slowly.

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):
Rodent predation and herbivory—Predation of seeds by introduced rats (*Rattus* sp.) is a threat to the populations of *Pittosporum halophilum* at Kūkaʻiwaʻa Peninsula and ʻŌkala (Wood and Kiehn 2011, p. 474; PEPP 2019, p. 14). Rats impact individuals of *P. halophilum* by eating seeds, flowers, stems, leaves, roots, and other plant parts (Atkinson and Atkinson 2000, p. 23), and can significantly affect regeneration. Rats have caused declines or even the total elimination of island plant species (Campbell

and Atkinson 1999, in Atkinson and Atkinson 2000, p. 24).

Slug herbivory—Herbivory by slugs may be a threat to this species, as slugs have been observed at the population on Kūkaʻiwaʻa Peninsula (PEPP 2015). Slug herbivory can prevent regeneration through death of individual seedlings and small plants (Joe and Daehler 2008; PEPP 2015).

2.3.2.4 Inadequacy of existing regulatory mechanisms (Factor D): One occurrence of *Pittosporum halophilum* is adjacent to a State hunting area but is not fenced, other occurrences are on off-shore islets or in a managed area (PEPP 2010; Department of Land and Natural Resources (DLNR) 2010). The State of Hawaiʻi provides game mammal (feral pigs and goats, axis deer) hunting opportunities (e.g., "sustained yield") in five public hunting areas on Molokaʻi (DLNR 2012). Nonnative feral ungulates are an ongoing threat to this species through destruction and modification of habitat and by direct predation. Any exclosures must be monitored for ingress by feral ungulates. Public hunting areas are not fenced and game mammals have unrestricted access for most areas across the landscape, regardless of underlying land use designation; therefore, any unfenced populations of *P. halophilum* are at risk (DLNR 2010).

Currently, four agencies are responsible for inspection of goods arriving in Hawaiʻi (CGAPS 2009). The Hawaiʻi Department of Agriculture (HDOA) inspects domestic cargo and vessels and focuses on pests of concern to Hawaiʻi, 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) 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 Hawaiʻi allows the importation of most plant taxa, with limited exceptions. Many invasive plants established in Hawaiʻi 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 *Pittosporum halophilum* and other federally listed species.

2.3.2.5 Other natural or manmade factors affecting its continued existence (Factor E):

Established invasive plant species competition—Nonnative plant species including *Lantana camara*, *Pluchea carolinensis*, *Digitaria insularis*, *Psidium guajava*, *Schinus terebinthifolius*, *Clidemia hirta*, and *Kalanchoe pinnata* compete with *Pittosporum halophilum* for water, light, and nutrients (Wood and Kiehn 2011, p. 474).

Reduced viability due to low numbers—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 by nonnative species. Very small plant populations may experience reduced reproductive vigor due to ineffective pollination or inbreeding depression. *Pittosporum halophilum* is only known from three disparate locations, each with one to three wild individuals, on Moloka‘i and its offshore islets (Wood and Kiehn 2011, p. 47). In addition, there has been no recruitment observed in reintroduced populations (PEPP 2017, 2018).

Current Management Actions:

- Surveys and monitoring—PEPP monitors and surveys for individuals of *Pittosporum halophilum* on Moloka‘i (PEPP 2016, 2017).
- Ungulate control—
    - The Moloka‘i PEPP maintains a fenced area at Kūka‘iwa‘a Peninsula (PEPP 2012).
    - The KNHP, with partner agencies, fenced the Kalaupapa cliff reintroduction site (PEPP 2018).
- Nonnative plant control—In 2018, the Moloka‘i PEPP removed *Lantana camara*, one of the two dominant nonnative, invasive plant species on Mōkapu islet, from the planting areas (PEPP 2018). An estimated 45 percent cover of lantana was removed from the north face and spine of the islet. After the removal of lantana, 100 individuals of *Chenopodium oahuense* (‘āweoweo papa), a prostrate (growing along the ground) groundcover form, were reintroduced into the area to prevent other weeds from taking over the newly exposed site. The second invasive species on the islet, *Digitaria insularis* (sourgrass), could not be removed due to the timing of the seabirds nesting period

on the islet. Because the team was not able to remove sourgrass, the survival rate of the ʻāweoweo papa plantings were less than three percent when the team returned to the site four months later. Sourgrass dominated the area where the lantana was removed and competed with ʻāweoweo papa for light, water, space, and nutrients. The team plans to alter their weed control plan to avoid the seabird nesting period so that they can successfully remove sourgrass and lantana from the islet.

- Rodent control—In 2008, after two aerial applications of rodenticide pellets on Mōkapu islet, rats were eradicated from the islet (Wood and Kiehn 2011, p. 474). Monitoring efforts following the application did not observe rats or rat activity. As a result of the eradication, a single new seedling of *Pittosporum halophilum* was observed on the islet. Currently, only Mōkapu islet is considered rat-free (PEPP 2019).
- Captive propagation for genetic storage and reintroduction—
    - The Lyon Arboretum Seed Conservation Laboratory reported 602 seeds in storage from four accessions representing reintroduced individuals from KNHP (Lyon Arboretum 2019). In addition, there are 10 seeds in storage from the wild founders at ʻŌkala islet (Lyon Arboretum 2019). The Lyon Arboretum Micropropagation Laboratory reported 23 explants from one founder from Mōkapu (mislabeled as Mokomoko Gulch) and three founders from KNHP (Lyon Arboretum 2019).
    - The National Tropical Botanical Garden (NTBG) reports more than 1,000 seeds in storage collected from plants in their living collections. In addition, NTBG has 223 seeds in storage from Mōkapu and 312 seeds in storage from plants at Huelo (NTBG 2019).
    - The Olinda Rare Plant Facility (ORPF) reports 27 potted plants of *Pittosporum halophilum* in their nursery representing four individuals at Mōkapu. ORPF propagated 94 individuals for reintroduction at KNHP (ORPF 2019).
- Reintroduction and translocation—
    - In January 2018, two seedlings of *Pittosporum halophilum* that were propagated at ORPF were planted on Mōkapu islet. By September 2018, both *P. halophilum* plants died as a result of competition by the invasive sourgrass (PEPP 2018). In January 2018, an additional two seedlings of *P. halophilum* were planted on ʻŌkala islet and as of September 30, 2018, these plants were thriving (PEPP 2018). In March 2019, 20 propagules of *P. halophilum* that were propagated at ORPF were planted on Mōkapu islet. When those plantings were monitored in May and June of 2019, 10 out of the 20 plants were dead, for uncertain reasons (PEPP 2019).
    - There are at least three planting sites within KNHP, totaling approximately 30 individuals (Bakutis 2019, pers. comm.). At Kūkaʻiwaʻa, there are six individuals and at Kalaupapa, one site

has four individuals and the other has 20 individuals. In particular, one site at Kalaupapa is fenced and managed with partner agencies, including the local community of Molokaʻi (PEPP 2018). This fenced site is located on a cliff face, and does not receive the direct salt spray when compared to the wild populations located in the coastal areas. The other two sites are unfenced and located in similar habitats as the wild population.

- NTBG reports planting of eight plants for living collection at their nursery (representing plants at Mōkapu and Huelo), and 19 plants outplanted at Mōkapu (NTBG 2019).
- Maui Nui Botanical Garden (MNBG) reports 20 seeds in storage and one propagated plant, representing 1 wild individual (MNBG 2019).

Table 1. Status and trends of *Pittosporum halophilum* from listing through 5-year review.

Date	No. wild individuals	No. outplanted	Preventing Extinction Criteria identified by HPPRCC	Preventing Extinction Criteria Completed?
2013 (listing)	5	6	All threats managed in all 3 populations	Partially, ungulate and nonnative plant control ongoing
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	No
2016 (critical habitat)	5	17	All threats managed in all 3 populations	Partially, ungulate and nonnative plant control ongoing
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	No
2020 (5-year review)	7	82, 40 remain	All threats managed in all 3 populations	Partially, ungulate, rodent, and nonnative plant control ongoing
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	No

Table 2. Threats to *Pittosporum halophilum* and ongoing conservation efforts.

Threat	Listing Factor	Current Status	Conservation/Management Efforts
Ungulate degradation of habitat	A	Ongoing	Partial, one population fenced
Degradation of habitat by established ecosystem-altering invasive plant species	A	Ongoing	Partial, nonnative plant control within exclosure
Degradation and destruction of habitat by erosion and landslides	A	Ongoing	Partial, groundcover planted at erosion sites
Degradation and destruction by fire	A	Ongoing, Potential on islets	None
Climate change degradation or loss of habitat, including hurricanes	A	Ongoing	None
Predation and herbivory by rats	C	Ongoing	None
Herbivory by slugs	C	Potential	None
Inadequacy of existing regulatory mechanisms	D	Ongoing	Partial, one occurrence in managed area is fenced
Competition with invasive plant species	E	Ongoing	Partial, nonnative plant control at reintroduction sites
Reduced viability due to low numbers	E	Ongoing	Partial, seed collection, propagation, and reintroduction ongoing; however no natural recruitment observed

2.4 Synthesis

There are seven wild individuals of *Pittosporum halophilum* at three locations. 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 *P. halophilum* is extremely vulnerable to the effects of climate change, with no overlap between current and future climate envelopes. Genetic representation is complete. Collection, propagation, and reintroduction are ongoing. Of the 82 recently outplanted individuals, 40 survive.

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. In addition, a minimum of three populations should be documented on Moloka‘i and the offshore islets where they now occur or occurred historically and each of these populations must be naturally reproducing (*i.e*., viable seeds, seedlings, or saplings) with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. There are only seven wild plants remaining, and, although genetic representation is complete (Table 1), not all threats are being sufficiently managed throughout the range of the species (Table 2). Therefore, *Pittosporum halophilum* 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 *Pittosporum halophilum* 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.
- Invasive plant monitoring and control—Continue to control established ecosystem-altering nonnative invasive plant species and those that compete with *P. halophilum* at all populations.
- Fire monitoring and control—Develop and implement fire management plans for all wild and reintroduced populations.
- Predation and herbivory by rats and slugs—Implement effective control measures for rats and slugs at all populations.
- Captive propagation for genetic storage and reintroduction—Continue to collect seeds and other propagative materials for storage and reintroduction.
- Reintroduction and translocation—Continue to augment populations and increase numbers of populations and individuals in suitable habitat to reduce the impacts of predation and climate change.
- Population biology research—Research the possible causes of lack of natural recruitment in reintroduced populations.
- Climate change adaptation strategy—Research suitability of habitat in the future due to the impacts of climate change.
- Alliance and partnership development—Continue to contribute to planning and implementation of ecosystem-level restoration and management to benefit this taxon.

5.0 REFERENCES

Atkinson, I.A.E. and T.J. Atkinson. 2000. Land vertebrates as invasive species on islands served by the South Pacific Regional Environment Programme. In Invasive Species in the Pacific: A Technical Review and Draft Regional Strategy, South Pacific Regional Environment Programme, Samoa: 19–84.

Bakutis, A. 2019, pers. comm. Email to L. Weisenberger, USFWS, regarding species shapefiles, newly listed, 14 FEB 2019.

Barrett, S.C.H. and J.R. Kohn. 1991. Genetic and evolutionary consequences of small population size in plants–implications for conservation. *In* Genetics and Conservation of Rare Plants, D.A. Falk and K.E. Holsinger (eds.), Oxford University Press, New York and Oxford, Pp. 3–30.

[CGAPS] Coordinating Group on Alien Pest Species (CGAPS). 2009. CGAPS vision and action plan. Honolulu. 14 pp.

County of Maui. 2009. Chapter 3: Natural hazards. In Draft Maui Island Plan, Natural Hazards Element. Pp. 3-1—3-9 + map.

D'Antonio, C.M. and P.M. Vitousek. 1992. Biological invasions by exotic grasses, the grass/fire cycle and global change. Annual Review of Ecology and Systematics 23: 63–88.

[DLNR] Department of Land and Natural Resources. 2010. Hawaii administrative rules, title 13, subtitle 5, part 2, chapter 123, rules regulating game mammal hunting. 78 pp.

[DLNR] 2012. Hunting area designations, GIS shapefiles.

Fortini, L., J. Price, J. Jacobi, A. Vorsino, J. Burgett, K. Brinck, F. Amidon, S. Miller, S. Gon II, G. Koob, and E. Paxton. 2013. A landscape-based assessment of climate change vulnerability for all native Hawaiian plants. Technical report HCSU-044. Hawai‘i Cooperative Studies Unit, University of Hawai‘i at Hilo, Hawai‘i. 134 pp.

Guerrant, E.O., K. Havens, and M. Maunder. 2004. *Ex Situ* Plant Conservation: Supporting Species Survival in the Wild. Island Press, Washington, D.C. 504 pp.

[HDOA] Hawaii Department of Agriculture. 2009. Plant guidelines for importation to Hawaii. *http://hawaii.gov/hdoa/pi/pq/plants*.

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

Joe, S.M. and C.C. Daehler. 2008. Invasive slugs as under-appreciated obstacles to rare plant restoration: evidence from the Hawaiian Islands. Biological Invasions 10: 245–255.

Loope, L. 1998. Hawaii and the Pacific islands. *In* Status and Trends of the Nation's Biological Resources, Volume 2. Pp. 747–774.

Lyon Arboretum. 2019. 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.

[MNBG] Maui Nui Botanical Garden. 2019. 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.

National Park Service. 2019. A brief history of Kalaupapa. Available online at *https://www.nps.gov/kala/learn/historyculture/a-brief-history-of-kalaupapa.htm*. Accessed July 26, 2019.

[NTBG] National Tropical Botanical Garden. 2019. 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.

Newman, D. and D. Pilson. 1997. Increased probability of extinction due to decreased genetic effective population size: experimental populations of *Clarkia pulchella*. Evolution 51: 354–362.

[ORPF] Olinda Rare Plant Facility. 2019. 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.

Pacific Disaster Center. 2011. Harmful effects of wildfires in Hawaii. Natural Hazards, University of Hawaii, Honolulu, *http://www.pdc.org/iweb/wildfire_effects.jsp?subg=1*, 29 MAR 2011.

[PEPP] Plant Extinction Prevention Program. 2012. Annual report fiscal year 2012 (July 1, 2011-June 30, 2012). 169 pp.

[PEPP] 2015. Annual report fiscal year 2015 (July 1, 2014-June 30, 2015). 179 pp.

[PEPP] 2017. Plant Extinction Prevention Program FY 2017 annual report (Oct 1, 2016-Sep 30, 2017), US FWS CFDA program #15.657; Endangered species conservation-recovery implementation funds, Cooperative Agreement F14AC00174, December 12, 2017, UH Manoa, PCSU, PEPP. 235 pp.

[PEPP] 2018. Plant Extinction Prevention Program, fiscal year 2018 interim performance report, (October 1, 2017 - September 30, 2018), Cooperative Agreement: F18AC00502, 49 pp.

[PEPP] 2019. Plant Extinction Prevention Program, annual recovery subpermit FWSPIFWO-26 report (January 1st, 2018–December 31st 2018), as designated under the U.S. Endangered Species Act. Unpublished report submitted to U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai‘i.

Rock, J.F. 1911. Notes upon Hawaiian plants, with descriptions of new species and varieties. 1911-1918, The College: Honolulu. Pp. 16–17. *https://www.biodiversitylibrary.org/bibliography/58551#/summary*.

Sherff, E.E. 1941. New or otherwise noteworthy plants from the Hawaiian Islands. American Journal of Botany 28(1): 18–31.

[TNCH] The Nature Conservancy of Hawaii. 1992. The alien pest species invasion in

Hawaii: background study and recommendations for interagency planning. Natural Resources Defense Council, Honolulu. 123 pp.

Trauernicht, C., E. Pickett, C.P. Giardina, C.M. Litton, S. Cordell, and A. Beavers. 2015. The contemporary scale and context of wildfire in Hawaii. Pacific Science 69: 427–444.

Tunison, J.T., C.M. D'Antonio, and R.K. Loh. 2002. Fire and invasive plants in Hawai'i Volcanoes National Park. Proceedings of the Invasive Species Workshop: the Role of Fire in the Control and Spread of Invasive Species, K.E.M. Galley and T.P. Wilson (eds.), Fire Conference 2000: the First National Congress on Fire Ecology, Prevention, and Management, Miscellaneous Publication No. 11, Tall Timbers Research Station, Tallahassee, FL. Pp. 122–131.

U.S. Department of Agriculture-APHIS-PPQ. 2010. Roadmap to 2015: a strategic plan for plant protection and quarantine. Animal and Plant Health Inspection Service, Plant Protection and Quarantine. *http://www.aphis.usda.gov/about_aphis/programs_offices/plant_protection/index.shtml*.

[USFWS] U.S. Fish and Wildlife Service. 2013. Endangered and threatened wildlife and plants; determination of endangered status for 38 species on Molokai, Lanai, and Maui; final rule. Department of the Interior, 78 FR 32014, May 28, 2013.

[USFWS] 2016. Endangered and threatened wildlife and plants; designation and nondesignation of critical habitat on Molokai, Lanai, Maui, and Kahoolawe; final rule. Department of the Interior, 81 FR 17790, March 30, 2016.

[USFWS] 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 FR 20088, May 7, 2018.

[USFWS] 2019. Recovery outline for the islands of Maui, Moloka'i, Kaho'olawe, and Lāna'i (Maui Nui). October, 2019.

van Riper, S.G. and C. van Riper. 1982. Pig, Pacific rat, goat, cattle, black-tailed deer, axis deer, Norway rat, and roof rat. *In* A Field Guide to the Mammals in Hawaii, The Oriental Publishing Company, Honolulu. Pp. 24–27, 34–37, 42–45, 56–59.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1999. Manual of the flowering plants of Hawaii. University of Hawai'i Press and Bishop Museum Press, Honolulu. Bishop Museum Special Publication 91. Pp. 1037–1048.

Wood, K. 2008. Vegetation descriptions of Kuka'iwa'a Peninsula and the three islets of Huelo, Mōkapu, and 'Ōkala, Kalaupapa, Moloka'i, Hawai'i. Special report prepared for Kalaupapa National Historic Park. 14 pp.

Wood, K. and M. Kiehn. 2011. *Pittosporum halophilum* Rock (Pittosporaceae: Apiales): rediscovery, taxonomic assessment, and conservation status of a critically endangered endemic species from Moloka'i, Hawaiian Islands. Pacific Science 65 (4): 465–476.

Wood, K., M. DeMotta, and S. Walsh. 2018. Beyond the islet—integrated conservation in Hawai'i. Save Plants, Center for Plant Conservation newsletter. July 2018. *https://saveplants.org/2018/07/11/july-2018.news/*

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Pittosporum halophilum*
(hō‘awa)

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:

for MEGAN LAUT Digitally signed by MEGAN LAUT Date: 2020.08.18 15:47:13 -10'00'

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Field Supervisor, Pacific Islands Fish and Wildlife Office