

Psychotria malaspinae
(aplokating palaoan)

**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: *Psychotria malaspinae* (aplokating palaoan)

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5-YEAR REVIEW
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1.0 GENERAL INFORMATION

1.1 Reviewers:

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Lead Regional Office

Interior Region 12, Portland Regional Office

Lead Field Office:

Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai'i

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 (PIFWO) of the U.S. Fish and Wildlife Service (USFWS), beginning in January 2020. The review was based on the final rule listing this species; peer reviewed scientific publications; unpublished field observations by the USFWS, Territory of Guam and the Commonwealth of the Northern Mariana Islands (CNMI) and other experienced biologists; unpublished survey reports; notes and communications from other qualified biologists; as well as a review of current, available information since the listing of *Psychotria malaspinae* (USFWS 2015). The evaluation by Dawn Bruns, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, Conservation and Restoration Team Manager.

1.3 Background:

For information regarding the species' listing history and other facts, please refer to the Fish and Wildlife Service's Environmental Conservation On-line System (ECOS) database for threatened and endangered species (http://ecos.fws.gov/tess_public).

1.3.1 FR Notice citation announcing initiation of this review:

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 83(88): 20088–20092, May 7, 2018.

1.3.2 Listing history

Original Listing

FR notice: U.S. Fish and Wildlife Service. 2015. Endangered and Threatened Wildlife and Plants; Endangered Status for 16 Species and Threatened Status for 7 Species in Micronesia; Final Rule. Department of the Interior, Federal Register 80 (190): 59424-59497.

Date listed: October 1, 2015

Entity listed: *Psychotria malaspinae*

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 *Psychotria malaspinae*. This species was listed endangered on October 1, 2015 (80 FR 59424, USFWS 2015).

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 23 Mariana Island species.

Date issued: February 3, 2020.

Dates of previous revisions, if applicable: N/A

Critical habitat has not been designated for this species. The draft recovery plan for this species is in preparation.

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
 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? N/A

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? N/A

Yes

No

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

Yes

No

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

Yes

No

2.2 Recovery Criteria

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

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? N/A

Yes

No

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

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.

The recovery plan for this species is currently in preparation. A synthesis of the threats (Listing Factors A, C, D, and E) affecting this species is presented in section 2.3.2 and Table 1. Listing Factor B (overutilization for commercial, recreational, scientific, or educational purposes) and is not known to be a threat to this species.

The Hawai'i and Pacific Plants Recovery Coordinating Committee (HPPRCC) has outlined the actions and goals for stages leading towards recovery (HPPRCC 2011). These stages are described below. Current information is lacking for many Mariana Island plant species on the status of the species and their habitats, breeding systems, genetics, and propagule storage options. Many of the plant species in the Mariana Islands are at very low numbers or are declining rapidly, so the USFWS 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 USFWS 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, Downlisting, and Delisting objectives. 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.

Psychotria malaspinae is a long-lived perennial tree. To prevent extinction, which is the first step in recovering the species, the taxon must be managed to control threats (e.g., fenced and free of pests) 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 secure and well managed. In addition, a minimum of three populations should be documented 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 25 mature individuals per population.

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

Interim Stabilization

In addition to meeting the Preventing Extinction goals, to meet the interim stage of recovery of *Psychotria malaspinae*, 100 mature, reproducing individuals are needed in each of three populations, and threats are controlled around each population designated for recovery at this stage. Multi-island species should be represented by at least one population on each of the islands from which they were known historically (Guam), where suitable habitat exists. There should also be demonstrated regeneration of seedlings, growth to maturity, and documented replacement regeneration within each of the populations. The populations are adequately represented in an *ex situ* collection as defined in the Center for Plant Conservation's guidelines (Guerrant et al. 2004, entire) that is secure and well maintained. Adequate monitoring is 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 preventing extinction and interim stabilization targets, a minimum of 10 populations with 200 mature, reproducing individuals per

population are stable, secure, and naturally reproducing for a minimum of 10 years. Multi-island species should be represented by at least three populations on each of the islands from which they were known historically (Guam), as long as suitable habitat exists.

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 200 mature individuals per population and all of the goals of the preventing extinction, interim stabilization, 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: *Psychotria malaspinae* is a slow-growing shrub to small tree in the coffee family (Rubiaceae) found only in undisturbed limestone forest habitat on the island of Guam (Stone 1970, pp. 554-555; Raulerson and Rinehart 1991, p. 83). The average age at sexual maturity of naturally-occurring *P. malaspinae* plants has not been

documented. Mature plants may live a few decades. Pollinators of *P. malaspinae* have not been documented. Fruits are fleshy and red when mature (Raulerson and Rinehart 1991, p. 83). Both fruits and flowers are eaten by a variety of birds through summer and fall. The seeds, once deposited, sow themselves nearby and produce seedlings. The seeds have low germination rates, possibly as a result of their small fragmented distribution. (University of Florida 2011, in litt.).

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: When listed in 2015, only six individuals of *Psychotria malaspinae* were known including three at the Ordnance Annex site (M and E Pacific, Inc. 1998, p. 79; Grimm, 2012 *in litt.*, entire), which were not relocated in 2012 surveys (Grimm 2012, in litt.; Harrington et al. 2012, in litt.), and three individuals in the Pati Point area (GPEPP 2015, in litt.) which are still alive (DoN, 2018, in litt.). Recent surveys indicate as few as eight to twelve total naturally occurring individuals currently occur – the three in the Pati Point area (GPEPP 2015, in litt., entire), five that were discovered at Ritidian Point Ungulate Fenced Area on Anderson Air Force Base in 2018, and an additional four individuals vouchered and reported during the 2008-2018 period may also still occur along the northeastern coast of Guam.

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: *Psychotria malaspinae* is sometimes misidentified as *P. hombroniana*. The stipules on *Psychotria malaspinae* petioles are calyptrate (hood-like) whereas *P. hombroniana* has sheathing, strongly bifid stipules (Fosberg, et al. 1993, p. 111). When first described, *P. malaspinae* was considered a variety of *P. hombroniana* (Raulerson and Rinehart 1991).

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.): New populations and individuals have been detected within the species range as described in 2.3.1.2.

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem): *Psychotria malaspinae* is endemic to native limestone forest on the island of Guam. Native limestone forest is vulnerable to loss and degradation due to development, non-native animals, invasive plants, typhoons, and effects due to climate change such as increased typhoon frequency and intensity and loss of habitat due to changes in precipitation, hydrology, and temperature. Limestone forest contains a canopy dominated by native tree species which, in most areas, are not regenerating due to ungulate impacts to native plant survival and

reproduction, brown treesnake impacts to seed dispersal. Native forest covers less than 17% of Guam's land area. Refer to Willsey et al (2019) for detailed information regarding the structure and composition of limestone forest habitat.

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:

Psychotria malaspinae occurs in native limestone forest on Guam. The species is therefore vulnerable to loss of its habitat due to development, non-native animals, invasive plants, typhoons, and effects due to climate change.

Agricultural, military training and urban development loss of degradation of habitat—Military, urban, residential, resort, and agricultural development have resulted in the permanent loss of native forest. Native vegetation on the Mariana Archipelago has undergone significant alteration because of past and present land use including ranching, agricultural development, military actions, and war (Ohba 1994, pp. 17, 28, 54–69; Mueller-Dombois and Fosberg 1998, p. 242; Berger et al. 2005, pp. 45, 105, 110, 218, 347, 350). More than 20% of the islands of Saipan and Guam are developed while approximately 6% of Tinian and Rota are developed (Spies et al. 2019).

Ungulate destruction and degradation of habitat—Non-native ungulates including pigs (*Sus scrofa*), water buffalo (*Bubalus bubalis*), and Philippine deer (*Rusa marianna*) degrade the habitat upon which *Psychotria malaspinae* relies. Ungulates degrade the habitat through the following means: a) create trails that damage native vegetative cover; b) destabilize substrate causing erosion, landslides, rockfalls, and vegetation loss; c) injure roots, seedlings, or plants through trampling, trails, or rooting actions; d) create gullies that convey water and contribute to flooding or destabilization of the substrate; and, e) promote invasion of non-native species through transport of seeds, vegetative plant parts, or creation of openings (Cuddihy and Stone 1990, pp. 63–64).

Brown Tree Snake destruction and degradation of habitat—The introduction of the brown treesnake poses a threat to the persistence of habitat needed for the recovery of *Psychotria malaspinae*. The introduction of the brown treesnake to Guam in approximately 1949, has caused the extirpation of a large percentage of bird and small animal species and appears to be responsible for elimination of all or most of the species that disperse seeds and pollinate native plants on Guam (Rodda et al. 1997 p. 565-567, Fritts and Rodda 1998 pp. 115, 131, Savidge 1987 entire, Perry and Morton 1999, p. 137; Rodda and Savidge 2007, p. 311; USFWS 2015). Almost three quarters of the native tree species on Guam were once dependent on birds to eat their fruits and disperse their seeds and germination of some tree species is reduced when the seed coat is not digested by passing through the gut of a bird (USFWS 2015). The only remaining native avian

frugivore on Guam is the Micronesian starling (*Aplonis opaca*) (Pollock et al. 2019). On Saipan, the median dispersal distance modeled by Rehm et al. (2018, pp. 1, 5) for five bird species and 15 tree species was 184 feet (56 meters). In the absence of dispersal, seeds fall under the parent tree resulting in reduced connectivity between disjunct plants and reduced survival of seedlings due to conspecific competition (Nathan and Muller-Landau 2000). Loss of seed dispersers on Guam has resulted in reduced recruitment, altered spatial distribution of native tree species, reduced species richness, and reduced forest regeneration on Guam in comparison to the other islands (Rogers et al. 2017). Elimination of seed dispersers has cascading effects on other trophic levels, and can affect ecosystem stability (Perry and Morton 1999, p. 137; Fricke et al. 2017). The brown treesnake's elimination of native plant seed dispersers is an indirect threat that negatively impacts the habitat of *P. malaspinae*.

Rodent destruction and degradation of habitat—Because rodents have caused declines or even the complete elimination of island plant species (Campbell and Atkinson 1999, in Atkinson and Atkinson 2000, p. 24), they pose a threat to the persistence of the native habitat where *Psychotria malaspinae* occurs. Rodents can alter species composition of forested areas by reducing plant regeneration by eating fleshy fruits, seeds, flowers, stems, leaves, roots, and other plant parts (Atkinson and Atkinson 2000, p. 23; Cuddihy and Stone 1990, p. 69). Three rat species are found throughout the Mariana Islands: the Polynesian rat (*Rattus exulans*), the Norway rat (*R. norvegicus*), and a putative new southeast Asian *Rattus* line, originally thought to be *R. diardii* (synonymous with *R. tanezumi*) (Kuroda 1938 in Wiewel et al. 2009, p. 208; Wiewel et al. 2009, pp. 210, 214–216). One or more of these rat species are present on all of the Mariana Islands where *P. malaspinae* is found (Wiewel et al. 2009, pp. 205–222; Kessler 2011, p. 320). Where rodent populations are currently suppressed where the brown treesnake occurs, rodent threats are expected to increase as brown treesnake suppression is implemented. Degradation of forest habitat by rodents is a potential threat to recovery of *P. malaspinae*.

In addition to the above animals destruction and degradation of habitat, invasive invertebrates, such as ants and the coconut rhinoceros beetle (*Oryctes rhinoceros*), are a potential threat to the habitat of *Psychotria malaspinae*. Ants commonly occur in dense numbers on vegetation in the Mariana Islands (Schreiner and Nafus 1996, pp. 3-4). The habitat upon which *Psychotria malaspinae* relies may not be able to persist where invasive ants occur in high numbers. Ant species such as the dwarf pedicel ants (*Tapinoma minutum*), tropical fire ants (*Solenopsis geminata*), white-footed ants (*Technomyrmex albipes*), bi-colored trailing ants (*Monomorium floricola*), and little fire ants (*Wasmannia auropunctata*) feed on vertebrate and invertebrate eggs, pupae, larvae, and adults (Wild 2014, p. 1). Several incipient populations of little fire ants occur on Guam and there is a potential for the little fire ant to be moved to other locations on Guam and to other islands via the movement of green waste and potted plants. Invasive ant occurrence within proximity of populations of *P. malaspinae* is likely to reduce

the abundance of invertebrates and vertebrates and reduce the reproduction of native habitat plants that are pollinated or dispersed by animals (Willsey et al 2019). In addition to killing palms, the coconut rhinoceros beetle, which occurs on Guam, affects *Pandanus* species (OISC 2020, p. 1), which are native to the Mariana Islands. Degradation of forest habitat is a potential threat to recovery of *P. malaspinae*.

Established ecosystem-altering invasive plant modification and degradation of habitat—The greatest risk posed by invasive plant species in the Marianas is aggressive displacement of native species. Invasive plants threaten the quality and availability of habitat for and can directly outcompete *Psychotria malaspinae*. The native flora of the Mariana Islands consists of approximately 500 taxa, 10 percent of which are endemic to the Mariana Islands. Over 100 plant taxa have been introduced from elsewhere, and at least one third of these plants have become invasive (Stone 1970, pp. 18–21; Mueller-Dombois and Fosberg 1998, pp. 242–243, 249, 262–263; Wagner and Lorence 2012, pp. 51–100). Invasive plant species are responsible for modifying the availability of light, altering soil-water regimes, modifying nutrient cycling, increasing wildfire threat to native plant communities, and ultimately converting native-dominated plant communities to non-native plant communities (Smith 1985, pp. 180–181 and 217–218; Cuddihy and Stone 1990, p. 74; D’Antonio and Vitousek 1992, p. 73; Ohba 1994, pp. 17, 28, 54–69; Vitousek et al. 1997, p. 6–9; Mueller-Dombois and Fosberg 1998, pp. 242–243, 249, 262–263; Berger et al. 2005, pp. 45, 105, 110, 218, 347, 350). Invasive vines can grow in dense patches that smother and kill native plants following typhoons by encroaching in areas where trees were defoliated or destroyed and covering areas which takes light and water resources needed for the recovery and regeneration of the forest (Marler, 2001, p. 264; Willsey, et al. 2019, p. 17). The colonization of invasive plants within native forests has led to the establishment of secondary forest currently found on large portions of Guam, Tinian, and Saipan (Willsey, et al. 2019, p. 17).

Typhoons and climate change degradation or loss of habitat—The impacts of climate change on *Psychotria malaspinae* are not well understood but climate change has had impacts in the tropical Pacific generally. Anticipated weather regime changes are likely to be one of the direct climate change impacts to *P. malaspinae*. The Mariana Islands lie in the world's most prolific typhoon basin. Typhoons cause a number of impacts to native species and native ecosystems. Disturbed or destroyed vegetation due to typhoons modifies light availability and facilitates invasion by invasive plant species that compete for space, water, and nutrients, and alter basic soil hydrology and nutrient cycling processes (USFWS 2015, Willsey et al. 2019). Climate change is expected to increase typhoon frequency and intensity, increase temperatures, and decrease precipitation, which can result in changes to the microclimate of a species (IPCC 2014, pp. 6–11). During typhoons, intense winds can defoliate trees, break primary branches, and uproot or topple trees. Forests can take several years to recover and during this time the habitat is susceptible to encroachment from invasive trees, shrubs, and

vines (Marler 2001, p. 1). “Dry” typhoons have very little rainfall, causing salt water to be carried by the wind and deposited far inland. This causes the leaves on most dicot trees to wither and fall within two days of a storm and can cause mortality (Kerr 2000, p. 895). Droughts and vegetation changes following typhoons can cause an increase in wildfires (Aydlett 2017, in litt.). Such changes may lead to the direct loss of *Psychotria malaspinae* or habitat needed for its conservation. These threats can be particularly devastating to species that persist in limited numbers or distribution.

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes: Such threats have not been identified.

2.3.2.3 Disease or predation: Ungulate browsers, including introduced pigs, Philippine deer, and rodents, are a significant cause of *Psychotria malaspinae* mortality, particularly to seedlings and immature plants (Kessler 2011, p. 320; Liske-Clark 2015, in litt.; Rubinoff and Holland 2018, pp. 222-224). Ungulates disperse plant seeds into unsuitable sites and ungulate trampling and browsing prevent survival of seedlings and saplings of *P. malaspinae*. Feral pigs have been observed to foraging on the leaves, fruits, seeds, seedlings, or bark of this species. The reduction in new growth and recruitment makes *P. malaspinae* less able to recover from stochastic and catastrophic events (decreased resiliency and redundancy). Rodents damage plant propagules, seedlings, and native trees by eating fleshy fruits, seeds, flowers, stems, leaves, roots, and other plant parts (Cuddihy and Stone 1990, p. 67; Atkinson and Atkinson 2000, pp. 23-26).

2.3.2.4 Inadequacy of existing regulatory mechanisms: No regulatory status has been assigned to *Psychotria malaspinae* by the government of Guam. In addition, besides work regarding the brown tree snake, regulations surrounding the introduction, control, and eradication of other invasive species, and the reduction of the threat of wildfire, are lacking. Therefore, existing regulatory mechanisms in Guam are inadequate to address threats imposed upon the species, especially loss of habitat due to development, invasive plants and non-native animals.

2.3.2.5 Other natural or manmade factors affecting its continued existence: Reduced viability due to low numbers—*Psychotria malaspinae* is particularly vulnerable to extinction due to limited numbers of individuals and consequences of small population sizes. We consider the threat from limited numbers of populations and low numbers of individuals when there are fewer than 50 individuals remaining (USFWS 2015). Species with limited numbers are at greater risk of the following: a) reduced reproduction due to lack of pollination or inbreeding depression (Darwin 1876, Chapter 3, p. 1; Lacy 1997, entire; Crnokrak and Roff 1999, pp. 260-268; Frankham 2005, p.133); b) reduced levels of genetic variability and allele loss, potentially due to genetic drift, which can lead to reduced resiliency to persist in changing environments (Stebbins 1950, entire); and c) extirpation of remnant populations of the species by a single

catastrophic event such as a typhoon, drought, flood, or wildfire. Currently there are only eight known trees in two populations of *P. malaspinae*.

Direct impacts from military training continue to be a threat to individual trees. Ordnance and wildfire from live-fire training were identified as threats to *Psychotria malaspinae*. Populations of this species occur at Ritidian Point and in the Northwest Field of Andersen Air Force Base (JRM 2016) where a live-fire training range complex is being constructed. Ricochet bullets and ordnance may break branches and make holes through parts of *Psychotria malaspinae* plants, causing added stress and a possible avenue for disease. Direct damage of ordnance to individual plants may be fatal, or cause enough damage to render them more vulnerable to other threats. There is also the potential for live-fire training to cause wildfires in the area (USFWS 2015).

Current Management Actions:

- Surveys and inventories –
 - The USFWS recommends all sites containing suitable habitat be surveyed for *Psychotria malaspinae* prior to implementation of projects entailing vegetation or soil disturbance.
 - Joint Region Marianas (JRM) surveyed for ESA-listed species, including *P. malaspinae*, at the Naval Munitions Site (NMS) and Naval Base Guam Telecommunication Site, Tarague Triangle, MSA Igloos, THAAD, and other projects to document locations and estimate population densities in sites that are proposed for ungulate exclusion and forest restoration (JRM 2019 and 2020).
- Captive propagation for genetic storage and reintroduction
 - In 2012, the Guam Plant Extinction Prevention Program (GPEPP) was formed to address conservation concerns for a select group of native Mariana Islands plant species. As of May of 2019, GPEPP had propagated 22 individuals of *Psychotria malaspinae* in the GPEPP's nursery and translocated 12 of these individuals (GPEPP 2019, in litt.).
- Habitat protection –
 - A major biosecurity focus within the Mariana Islands is preventing the spread of the brown treesnake to the CNMI from Guam. Federal agencies support local capacity both in Guam and the CNMI. Efforts include inspection of all arriving cargo from Guam to the CNMI by brown treesnake detection dogs as well as specialized trapping around all major ports of entry. The Department of Agriculture, Wildlife Services, in coordination with the National Wildlife Research Center (NWRC), U.S. DoD Environmental Security Technology Certification Program, and the Department of Interior-Office of Insular Affairs (U.S. Geological Survey, USFWS), are using aerial applications of acetaminophen to suppress BTS over forested areas in AAFB (Dorr, et al. 2016, in litt.; Phillips 2014, in litt.; BTSTWG 2015, entire). In addition, repeated and sustained applications could drastically reduce brown treesnake abundance on a landscape scale (Siers, et al. 2018, in litt.).

- An island-wide Habitat Conservation Plan for Guam, that would provide a collaborative and comprehensive approach to endangered species conservation on non-federal lands, is beginning to be developed (USFWS 2020).
- A 2020 Memorandum of Understanding between JRM and the USFWS outlined a mutual understanding regarding the intentions and future considerations of a Department of Defense Readiness and Environmental Protection Integration Initiative (REPI) to address conservation of upland vegetation communities (DON and USFWS 2020).
- Other Natural or Manmade Factors: Limited numbers; ordnance
 - Range Fire Management Plan for Marine Corps Ranges on Guam. A range fire management plan to reduce range/wildfire potential, protect and enhance natural and cultural resources, integrate applicable permit and reporting requirements and implement ecosystem management goals, sustainable training, and objectives already supported on existing Marine Corps installations is being drafted (JRM 2019).

Table 1. Status and trend of *Psychotria malaspinae* from listing through 5-year review.

Date	No. wild individuals	No. outplanted	Preventing Extinction Criteria identified by HPPRCC	Preventing Extinction Criteria Completed?
2015 (listing)	6 mature plants (no seedlings)	0	All threats managed in three populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
2020	8-12 mature plants (no seedlings)	12	All threats managed in three populations	Partial: One population is within an ungulate-fenced area (Ritidian Point)
			Complete genetic storage	Partial
			3 populations with 25 mature individuals each	No

Table 2. Threats to *Psychotria malaspinae* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Agricultural, military training and urban development loss of degradation of habitat	A	Ongoing	Partial. Efforts to assure conservation of native limestone forest initiated: preparation of HCP, REPI habitat protections
Ungulate destruction and degradation of habitat	A	Ongoing	Partial; One population of five individuals within an ungulate-fenced area (Ritidian Point).
BTS degradation of habitat	A	Ongoing	DoD, USGS, USDA-APHIS, DOI, USFWS, and local collaborations to develop and implement brown treesnake control measures.
Rodent degradation of habitat	A	Ongoing	None
Ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial; Invasive plant removal is ongoing at Ritidian Point and similar limestone forest sites, such as the Habitat Management Unit on Andersen AFB, where this species may be conserved
Typhoons and climate change degradation or loss of habitat	A	Ongoing	Partial; As of May of 2019, GPEPP had propagated 22 individuals of <i>P. malaspinae</i> in the GPEPP's nursery and outplanted 12 of these
Herbivory by ungulates, rodents	C	Ongoing	Partial; One population of five individuals within an ungulate-fenced area (Rididian Point).
Inadequate existing regulatory mechanisms	D	Ongoing	Partial. Proposed local legislation to reduce human-caused wildfire ignitions.
Direct impact from military - ordnance	E	Ongoing	Partial; DoD firing ranges are designed to reduce potential impacts to remaining plants and their habitat
Reduced viability due to low numbers	E	Ongoing	Partial; Translocation efforts ongoing

2.4 Synthesis

Only 8 to 12 wild individuals and 22 translocated individuals of this species remain. Five of the *Psychotria malaspinae* plants are within an ungulate-fenced area (Rididian Point, Andersen Air Force Base, Guam, DoN 2018, in litt), but the remaining wild individuals have no ongoing control of any threats. Only 22 individuals have been propagated; 12 of which were outplanted by GPEPP (GPEPP 2019, in litt.).

The status of *Psychotria malaspinae* was assessed in relation to recovery objective guidelines developed by the Hawai'i and Pacific Plants Recovery Coordinating Committee (HPPRCC 2011). The HPPRCC identifies Preventing Extinction, Interim

Stabilization, Delisting, and Downlisting objectives. Life history traits such as breeding system, population size fluctuation or decline, and reproduction type (sexual or vegetative), are included in the calculation of the number of populations and reproducing individuals needed to meet each recovery 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.

Psychotria malaspinae is a long-lived perennial small tree or 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 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 with a minimum of 25 mature, reproducing individuals per population should be documented on Guam and each of these populations must be naturally reproducing (i.e., viable seeds, seedlings, or saplings).

The preventing extinction goals for this species have not been met. There are no populations with at least 25 mature, reproducing individuals, genetic storage goals are not complete (Table 1), and not all threats are being sufficiently controlled throughout the populations (Table 2). Therefore, *Psychotria malaspinae* 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 (Indicate reasons for delisting per 50 CFR 424.11)
- No change is needed

3.2 New Recovery Priority Number, N/A

Brief Rationale:

3.3 Listing and Reclassification Priority Number, N/A

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

- Determine population status and current distribution—Determine the distribution and number of all individuals on each island. Assess the status and threats to each population to inform prioritization of conservation effort.
- Population biology and taxonomy—Research the genetic composition of populations and congeners to determine taxonomic relationships.
- Conduct research to clarify life history information and threats to the populations and their habitat—Conduct research to determine the best way to control the brown treesnake, rodents, and invasive invertebrates. Assess development and land designation and zoning threats to conservation of habitat needed for recovery.
- Ungulate monitoring and control—Continue to construct and maintain fenced enclosures 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. malaspinae* at all populations. Implement measures such as fire danger assessments, fire suppression responses, fuel treatments, regulations, and public outreach to prevent fire from burning native limestone forest.
- Reduce human disturbance from military activities mortality and reduced viability— increase population resiliency by mitigating ordinance and wildfire threats from military activities.
- Captive propagation for genetic storage and reintroduction—Continue to collect seeds and other propagative materials for storage and reintroduction.
- Reintroduction and translocation—Augment population and increase numbers of populations and individuals in suitable habitat to build resiliency and redundancy and reduce the impacts of predation and typhoons, and climate change.
- Develop regulations and policy essential to recover the species and their habitats— Encourage the development of legislation to ensure protection of the listed species under Commonwealth or Territorial law. Develop and support the implementation of biosecurity plans to prevent the influx of new pests and invasive species into the Territory and inter-island movement of pests and invasive species
- Alliance and partnership development—Continue to contribute to planning and implementation of ecosystem-level restoration and management to benefit this taxon.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Psychotria malaspinae*

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

Appropriate Listing/Reclassification Priority Number, if applicable: N/A

Review Conducted By:

Dawn Bruns, Biologist, Pacific Islands Fish and Wildlife Office (PIFWO)
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FIELD OFFICE APPROVAL:

for _____ Date _____
Field Supervisor, Fish and Wildlife Service