

Osmoxylon mariannense
(No common name)

**5-Year Review
Summary and Evaluation**

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

5-YEAR REVIEW

Species reviewed: *Osmoxylon mariannense* (No common name)

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5-YEAR REVIEW
***Osmoxylon mariannense* (No common name)**

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:

Region 1, Endangered Species Program, Division of Recovery, Jesse D'Elia,
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Lead Field Office:

Pacific Islands Fish and Wildlife Office, Loyal Mehrhoff, Field Supervisor, (808)
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Cooperating Field Office(s):

N/A

Cooperating Regional Office(s):

N/A

1.2 Methodology used to complete the review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office of the U.S. Fish and Wildlife Service (USFWS), beginning on April 8, 2010. The review was based on the recovery plan for two plants from Rota (*Nesogenes rotensis* and *Osmoxylon mariannense*) (USFWS 2007), as well as a review of current, available information. The Bernice Pauahi Bishop Museum provided an initial draft of portions of the review and recommendations for conservation actions needed prior to the next five-year review. The evaluation of Samuel Aruch, biological consultant, was reviewed by a recovery biologist and the Plant Recovery Coordinator. The document was then reviewed by the Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before submission to the Field Supervisor for approval.

1.3 Background:

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

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

1.3.2 Listing history

Original Listing

FR notice: USFWS. 2004. Endangered and threatened wildlife and plants; determination of endangered status and prudency determination for designation of critical habitat for two plant species from the Commonwealth of the Northern Mariana Islands. Federal Register 69(68):18499-18507.

Date listed: April 08, 2004

Entity listed: Species

Classification: Endangered

Revised Listing, if applicable

FR notice: N/A

Date listed: N/A

Entity listed: N/A

Classification: N/A

1.3.3 Associated rulemakings:

USFWS. 2004a. Endangered and threatened wildlife and plants; determination of endangered status and prudency determination for designation of critical habitat for two plant species from the Commonwealth of the Northern Mariana Islands. Federal Register 69(68):18499-18507.

The designation of critical habitat for *Osmoxylon mariannense* was prudent but not determinable at the time of listing due to a lack of information regarding the physical and biological features or specific areas essential to the conservation of the species (USFWS 2004a).

1.3.4 Review History:

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

Declining

Recovery achieved:

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

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: USFWS. 2007. Recovery plan for two plants from Rota (*Nesogenes rotensis* and *Osmoxylon mariannense*). U.S. Fish and Wildlife Service, Portland, Oregon. 86 pages. Available online at <<http://pacific.fws.gov/ecoservices/endangered/recovery/default.htm>>

Date issued: May 3, 2007

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
 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
 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 criteria?

Yes
 No

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

A synthesis of the threats (Listing Factors A, B, C, D, and E) affecting this species is presented in Section 2.3.2 and Table 2.

Downlisting and delisting objectives are provided in the recovery plan for two plants from Rota (USFWS 2007). *Osmoxylon mariannense* will be considered for downlisting to threatened status when all of the following criteria are achieved and maintained for a minimum of 10 consecutive years: 1) A total of two populations of *Osmoxylon mariannense* are naturally reproducing and stable, or increasing in numbers. Each population of *O. mariannense* must consist of at least 100 mature, reproducing individuals; 2) Sufficient habitat is protected and managed to achieve criterion 1 above; 3) Management and control of nonnative species by local, regional, Commonwealth, and Federal authorities are demonstrated to be successful and sufficient to achieve criterion 1 above.

This recovery objective has not been met.

Osmoxylon mariannense may be considered for removal (delisting) from the Federal list of endangered and threatened wildlife and plants when all of the following criteria are achieved and maintained for a minimum of 10 consecutive years: 1) A total of four populations of *O. mariannense* are naturally reproducing and stable, or increasing in numbers. Each population of *O. mariannense* must consist of at least 100 mature, reproducing individuals; 2) Sufficient habitat is protected and managed to achieve criterion 1 above; 3) Management and control of nonnative species by local, regional, Commonwealth, and Federal authorities are demonstrated to be successful and sufficient to achieve criterion 1 above.

This recovery objective has not been met.

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

Osmoxylon mariannense is a soft woody tree species that can grow to a height of nearly 9 meters (30 feet). It prefers partial shade or grows on the edges of forests, including areas near cliffs (Manglona no date [n.d.]). The species is dioecious, with male and female flowers being produced on separate trees. Fruits are fleshy and maroon-colored when mature, ranging from the size of about a pea to a small grape. Raulerson and Rinehart (1991) speculated that the fruits probably provide food for wildlife.

The species is said to grow slowly (Koob 2005). Rats are said to eat seeds of this species, and Koob (2005) reported anecdotally that fruit bats eat the seeds, but also that this had not been verified. Koob may have meant to indicate that bats might eat the fruits, as it seems unlikely they would forage specifically for seeds.

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:

Osmoxylon mariannense is endemic to Rota in the Mariana Islands. It grows only on privately-owned lands of the Sabana region, which represents the highest elevation terraces on Rota (USFWS 2004b). Some individuals are found growing near undeveloped roads (USFWS 2004b). Manglona (n.d.) indicated that fewer than 15 individuals remained (presumably in the wild). Super typhoon Pongsona defoliated many individuals, but they were observed to be recovering (USFWS 2004a).

The number of individuals remaining in the wild is uncertain at the present time. For example, the International Union for the Conservation of Nature (IUCN) (2010:1) reported “certainly... fewer than 100 or possibly 50 trees, confined to an area of 15 square kilometers”, but this data likely was based on information contained in Wiles (1998). (The IUCN website also indicates that the species report needs to be updated.) The most recently published report indicated only eight individuals of *Osmoxylon mariannense* remain, and that a single stochastic event could cause the extinction of the species (USFWS 2004a, b). If the number of eight individuals is accurate for 2004, then this reflected a sharp downward trend in the total number of individuals. No recent collection of this species is present in the herbaria at the National Tropical Botanical

Garden (2010) or Bishop Museum in Hawaii (Bishop Museum 2010), so it is unlikely that any estimate has been made on the number of individuals surviving in the wild since 2004. Manglona (n.d.) indicated that the trees are not reproducing in their native habitat, and suggested that the lack of mature, reproductive trees was probably primarily responsible for the decline in population numbers in the wild. However, the effects of typhoons, invasive introduced species, and possibly insect predation, may also be contributing to the decline in the species number.

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:

The species *Osmoxylon mariannense* (Kanehira) Fosberg and Sachet was first described as *Boerlagiodendron mariannense* by Kanehira. Fosberg and Sachet (1980) made the generic transfer to *Osmoxylon*. The species has not been the subject of genetic studies or other recent taxonomic studies.

The genus *Osmoxylon*, of the Ginseng family (Araliaceae), comprises some 50 species. The genus is mostly Malesian but also extends to Taiwan and the western Pacific (Mabberley 2008). Numerous changes have been proposed for generic boundaries in Araliaceae based on recent molecular data (e.g., Plunkett *et al.* 2005) but the boundaries of *Osmoxylon* are not in flux and are unlikely to change (Plunkett *et al.* 2005; G. Plunkett, New York Botanical Garden, pers. comm. 2010).

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

No new information.

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

Osmoxylon mariannense is found in limestone forests at approximately 425 meters (1,400 feet) elevation and higher, where moisture and humidity levels are high, and often near cliffs (Koob 2005; Manglona n.d.). This species is found growing in association with *Pisonia umbellifera* (umumum) and *Hernandia labyrinthica* (nonak) (USFWS 2004b).

2.3.1.7 Other:

No new information.

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

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

Threats:

- Ungulate degradation of habitat (USFWS 2004b; 2007)
 - Feral pigs (*Sus scrofa*)
 - Philippine Deer (*Cervus mariannus*)
- Agricultural and urban development – The remaining forest habitat is threatened by fragmentation and degradation associated with agricultural activities, and road maintenance and construction (USFWS 2007).

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

None noted.

2.3.2.3 Disease or predation:

Threats:

- Ungulate predation or herbivory (USFWS 2004b) – The bark of *Osmoxylon mariannense* may be subject to stripping by deer before reaching reproductive age (Hess and Pratt 2006). Deer have been reported to browse on seedlings of *O. mariannense* (USFWS 2004a, 2007)
- Invertebrate predation or herbivory:
 - Scale, mealy bugs, and aphids were reported to kill many seedlings (Koob 2005)
 - There is concern also that broken branches allow pathogens to invade and kill the plant (Koob 2005)
- Rodent predation or herbivory – Rats are said to eat seeds of this species, and Koob (2005) reported anecdotally that fruit bats eat the seeds, but also that this had not been verified. Koob may have

meant to indicate that bats might eat the fruits, as it seems unlikely they would forage specifically for seeds.

- Slugs – Slugs have been reported to eat seedlings that are a few feet tall (Koob 2005).

2.3.2.4 Inadequacy of existing regulatory mechanisms:

Threats:

- *Osmoxylon mariannense* is included in the list of species protected by the government of the Commonwealth of the Northern Mariana Islands (Division of Fish and Wildlife 2012). These regulations prohibit the collection or possession of protected plant species but provide no requirements for the analysis of potential adverse effects associated with new projects proposed in the Commonwealth of the Northern Mariana Islands (CNMI).

2.3.2.5 Other natural or manmade factors affecting its continued existence:

Threats:

- Typhoons – Recent and strong typhoons have opened up the canopy on Rota more than normal, which may be more amenable to the establishment or proliferation of invasive nonnative plant species (USFWS 2004b; 2007)
- Established invasive plant species competition (USFWS 2007)
 - *Momordica charantia* (bitter melon)
 - *Mikania scandens* (climbing hempvine)
 - *Passiflora suberosa* (corky-stem passionflower)
- Low numbers (USFWS 2007)
- Climate change may pose a threat to this species. However, current climate change analyses in the Pacific Islands lack sufficient spatial resolution to make predictions on impacts to this species. The Pacific Islands Climate Change Cooperative (PICCC) has currently funded climate modeling that will help resolve these spatial limitations. We anticipate high spatial resolution climate outputs by 2013.

Current conservation efforts:

- Captive propagation for genetic storage and reintroduction:
 - In March 2005, seeds were collected from *Osmoxylon mariannense* on Rota by James Manglona (Koob 2005).

- Stan Taisacan propagated *Osmoxylon mariannense* at his ranch on Rota (Koob 2005).
- Captive propagation protocol development:
 - It is now known that the species can be propagated from seeds and air-layering (Manglona n.d.). Soaking seeds in water is said to ensure good germination and they evidently germinate best in vermiculite (Manglona n.d.); however, about four weeks are required before seeds will sprout (Koob 2005). Seedlings were reintroduced when they had reached 0.9 to 1.2 meters (3.0 to 4.0 feet) in height (Koob 2005).
 - Air-layering reportedly has a higher survival rate (Manglona n.d.), and stock can be reintroduced within one or two months using this approach.
- Reintroduction / translocation implementation:
 - At least a single reintroduction at the Rota Zoo, at a lower elevation than its normal range, had survived (Koob 2005).
 - The Forestry Services Section (Rota Division of Land and Natural Resources) reintroduced seedlings germinated by Stan Taisacan at his ranch on Rota (Koob 2005).
- Existing population management and restoration – Two individuals growing along the Sabana roadway are fenced for protection from road maintenance (Manglona n.d).
- Population viability monitoring – Wild and reintroduced individuals are monitored by staff at the Forestry Services Section in Rota (Koob 2005).

2.4 Synthesis

The downlisting goals of this species have not been met as there is no current information on the number of populations and the number of individuals for *Osmoxylon mariannense* (Table 1). In addition, sufficient habitat has not been protected and managed, and management and control of nonnative species is not being conducted (Table 2). Therefore, *Osmoxylon mariannense* meets the definition of endangered as it remains in danger of extinction throughout its range.

Table 1. Status of *Osmoxylon mariannense* from listing through 5-year review.

Date	No. wild individuals	No. outplanted	Downlisting Criteria identified in Recovery Plan	Downlisting Criteria Completed?
2004 (listing)	8	0	2 populations with 100 mature individuals each	No
			Sufficient habitat is protected and managed to achieve criterion	No
			Management and control of nonnative species	No
2007(recovery plan)	8	2	2 populations with 100 mature individuals each	No
			Sufficient habitat is protected and managed to achieve criterion	No
			Management and control of nonnative species	No
2012 (5-year review)	Unknown	Unknown	2 populations with 100 mature individuals each	No
			Sufficient habitat is protected and managed to achieve criterion	Partially (see Table 2)
			Management and control of nonnative species	No

Table 2. Threats to *Osmoxylon mariannense* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – Degradation of habitat and herbivory	A, C	Ongoing	No
Agricultural and urban development	A	Ongoing	Partially: Fenced individuals for protection from road maintenance at Sabana
Invertebrate predation or herbivory	C	Ongoing	No
Rodent predation or herbivory – Rats	C	Ongoing	No
Slugs	C	Ongoing	No
Inadequacy of existing regulatory mechanisms	D	Ongoing	Partially: Protected from collection or possession but no protection from new projects proposed in CNMI
Typhoon	E	Ongoing	No
Established invasive plant species competition	E	Ongoing	No
Low numbers	E	Ongoing	Partially: Captive propagation for genetic storage and reintroduction, reintroduction / translocation implementation, and monitoring
Climate change	A, E	Increasing	No

3.0 RESULTS

3.1 Recommended Classification:

Downlist to Threatened

Uplist to Endangered

Delist

Extinction

Recovery

Original data for classification in error

No change is needed

3.2 New Recovery Priority Number:

Brief Rationale:

3.3 Listing and Reclassification Priority Number:

Reclassification (from Threatened to Endangered) Priority Number: _____

Reclassification (from Endangered to Threatened) Priority Number: _____

Delisting (regardless of current classification) Priority Number: _____

Brief Rationale:

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- Captive propagation for genetic storage and reintroduction:
 - Continue to collect cuttings or seed from tagged individuals, keeping close track of the maternal source for use in *ex situ* propagation.
 - Continue to collect seeds from all existing populations and send to at least two or three different venues for propagation and storage.
- Reintroduction / translocation site identification – Determine where populations could be reintroduced on Rota.
- Reintroduction / translocation implementation – Continue to reintroduce the species back into its known historical range.
- Surveys / inventories:
 - Conduct surveys for *Osmoxylon mariannense* in potentially suitable habitat on Rota that may have been overlooked previously.
 - Survey all remaining individuals (native and reintroduced) to gain a better sense of the ratio of male to female trees.
- Ungulate exclosure – Continue to construct ungulate-proof fenced exclosures around the remaining population and monitor the fences for any signs of breaching.
- Ungulate control – Protect all populations against disturbances from feral ungulates.
- Predator / herbivore control:
 - Implement effective control methods for rodents.
 - Develop and implement a slug control program, if necessary.
- Threats research:
 - Conduct research to determine the impact of invertebrates on *Osmoxylon mariannense* populations.
 - Conduct research on methods to control invertebrates, if necessary.

- Develop and implement an invertebrate control and /or eradication program, if necessary.
- Population viability monitoring – As individual wild trees begin the process of senescence they should be closely watched to determine what factors may be contributing to their demise.
- Established invasive plant species control – Control invasive introduced plant species around all populations.
- Site / area / habitat protection:
 - Develop and implement effective measures to reduce the impact of typhoons.
 - Maintain fencing around individuals near Sabana and those that might be harmed by highway maintenance
 - Prevent the widening of the undeveloped roads that occur near individuals.
- Population biology research:
 - If fruit set begins to decline overall, then monitor the exact flowering times of each tree to determine whether there is a decrease in the overlap of flowering times between male and female trees.
 - Identify the pollination mechanisms and pollinators for the species.
- General outreach:
 - Develop public outreach programs to inform residents of Rota of the importance of native species and their habitat.
 - Work with private landowners to help them conserve this species on their property.
- Alliance and partnership development – Work with private landowners, Mariana Public lands Authority, the Division of Fish and Wildlife, and other land managers to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.
- Threats research – Assess the modeled effects of climate change on this species, and use to determine future landscape needed for the recovery of the species.

5.0 REFERENCES

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Plunkett, Gregory M. 2010. Director and curator, Cullman program for molecular systematics, New York Botanical Garden, Bronx, New York. E-mail to Neil Snow, Bishop Museum, dated December 4, 2010. Subject: phylogeny and generic boundaries of *Osmoxylon*.

Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Osmoxylon mariannense* (No common name)

Pre-1996 DPS listing still considered a listable entity? N/A

Recommendation resulting from the 5-Year Review:

Delisting
 Reclassify from Endangered to Threatened status
 Reclassify from Threatened to Endangered status
 No Change in listing status

Appropriate Listing/Reclassification Priority Number, if applicable: _____

Review Conducted By:

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Date 8/28/2012