

**Beautiful Goetzea or Matabuey
(*Goetzea elegans*)**

**5-Year Status Review:
Summary and Evaluation**



Photo by U.S. Fish and Wildlife Service

**U.S. Fish and Wildlife Service
Southeast Region
Caribbean Ecological Services Field Office
Boquerón, Puerto Rico**

August 2024

5-YEAR STATUS REVIEW
Beautiful goetzea or Matabuey (*Goetzea elegans*)

GENERAL INFORMATION

Current Classification: Endangered

Lead Field Office: Caribbean Ecological Services Field Office, Mayaguez, Puerto Rico

Review Author(s): Caribbean Ecological Services Field Office, Yesenia Muñiz; and Maritza Vargas

Reviewers:

Lead Regional Office: Southeast Region, Carrie Straight

Date of original listing: May 20, 1985 (50 FR 15564; April 19, 1985)

Methodology used to complete the review: In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a status review is to assess each threatened species or endangered species to determine whether its status has changed and if it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants ([50 CFR 424.11](#)). The U.S. Fish and Wildlife Service (Service) evaluated the best available information about the matabuey's biology, habitat, and threats of to inform this status review.

We announced initiation of this review in the Federal Register on May 11, 2023 (88 FR 30324) with a 60-day comment period. The primary sources of information used in this analysis were the 1987 and 2019 recovery plan and amendment, respectively, unpublished survey data and reports, and personal communications with species' experts. This review was completed by the U.S. Fish and Wildlife Service, Caribbean Ecological Service Field Office, Puerto Rico. All literature and documents used for this review are on file at Field Office. All recommendations resulting from this review are the result of thoroughly reviewing the best available information on matabuey.

FR Notice citation announcing the species is under active review:

May 11, 2023 (88 FR 30324)

Species' Recovery Priority Number at start of 5-year review ([48 FR 43098](#)):

The Species' Recovery Priority Number for matabuey is 8, which indicates matabuey is a species with a moderate degree of threat and a high recovery potential.

Review History: The previous two 5-year status reviews for matabuey recommended no status change or the species, and that it continued to be listed as endangered. (Service 2013 and 2019b).

REVIEW ANALYSIS

Listed Entity

Taxonomy and nomenclature

We are not aware of any changes to the taxonomy of this entity, and it is still considered a valid species by the Service.

Distinct Population Segment (DPS) ([61 FR 4722](#))

The Act defines species as including any subspecies of fish, wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This definition limits listing of a DPS to only vertebrate species. Because the species under review is a not a vertebrate, the DPS policy does not apply.

Recovery Criteria

Recovery Plans

Beautiful Goetzea Recovery Plan, April 28, 1987 (Service 1987).

Amendment to the Beautiful Goetzea (*Goetzea elegans*) Recovery Plan, September 24, 2019 (Service 2019a).

Recovery plans are not regulatory documents and are intended to provide guidance to the Service, States, and other partners on methods of minimizing threats to listed species and on criteria that may be used to determine when recovery is achieved. If the recovery criteria defined in the plan are still valid, meeting recovery criteria can indicate that the species no longer requires protections under the Act. However, when recommending whether a listed species should be delisted, the Service must apply the factors in section 4(a) of the Act ([84 FR 45020](#)).

Amended delisting Recovery Criteria

The amended delisting criteria for matabuey are as follows:

1. The three (3) existing populations on privately owned lands (Guajataca Gorge, Fajardo, and Vieques) are protected through a conservation mechanism (addresses Factor A).
2. The three (3) existing populations in Guajataca Gorge, Fajardo, and Vieques show a stable or increasing trend, evidenced by natural recruitment and multiple age classes (addresses Factor A and E).
3. Establish three (3) new populations in areas protected through a conservation mechanism within the known geographical range that demonstrate a stable or increasing trend, evidenced by natural recruitment and multiple age classes (addresses Factor A and E).
4. Threat reduction and management activities have been implemented to a degree that the species will remain viable into the foreseeable future (addresses Factor A and E).

Only criteria number three has been partially met. Matabuey has been planted on several protected areas within the geographical range (see discussion and Table 3) However, no current information is available on the status of those individuals.

Biology and Habitat Summary

A detailed review of the matabuey's biology, distribution, abundance, and habitat can be found on its previous 5-year status reviews (Service 2013 and 2019b), as well as in its Recovery Plan and Amended Recovery Plan (Service 1987 and 2019a, respectively).

Goetzea elegans, commonly known as matabuey, is a plant species under the family Solanaceae. It is a small medium sized tree, growing up to 9 meters tall (30 feet). The leaves are simple, alternate, and glossy green. Its fruit is orange and rounded, containing seeds that are dispersed by birds and other animals. The species was historically known from the municipality of Quebradillas, the foothills of the Luquillo Mountains in the municipalities of Río Grande and Canóvanas, and from the Cambalache Commonwealth Forest in the municipality of Arecibo (Vivaldi et al. 1981, Service 1987).

When matabuey was listed in 1985, less than 50 individuals were known from three sites (considered populations for this review) in the northern karst region of Puerto Rico (Table 1; Service 1985). As of 2024 there are 16 known natural matabuey populations. The latest estimate known for the naturally occurring individuals was about 1,700 individuals (Table 2; Service 2013 and 2019b).

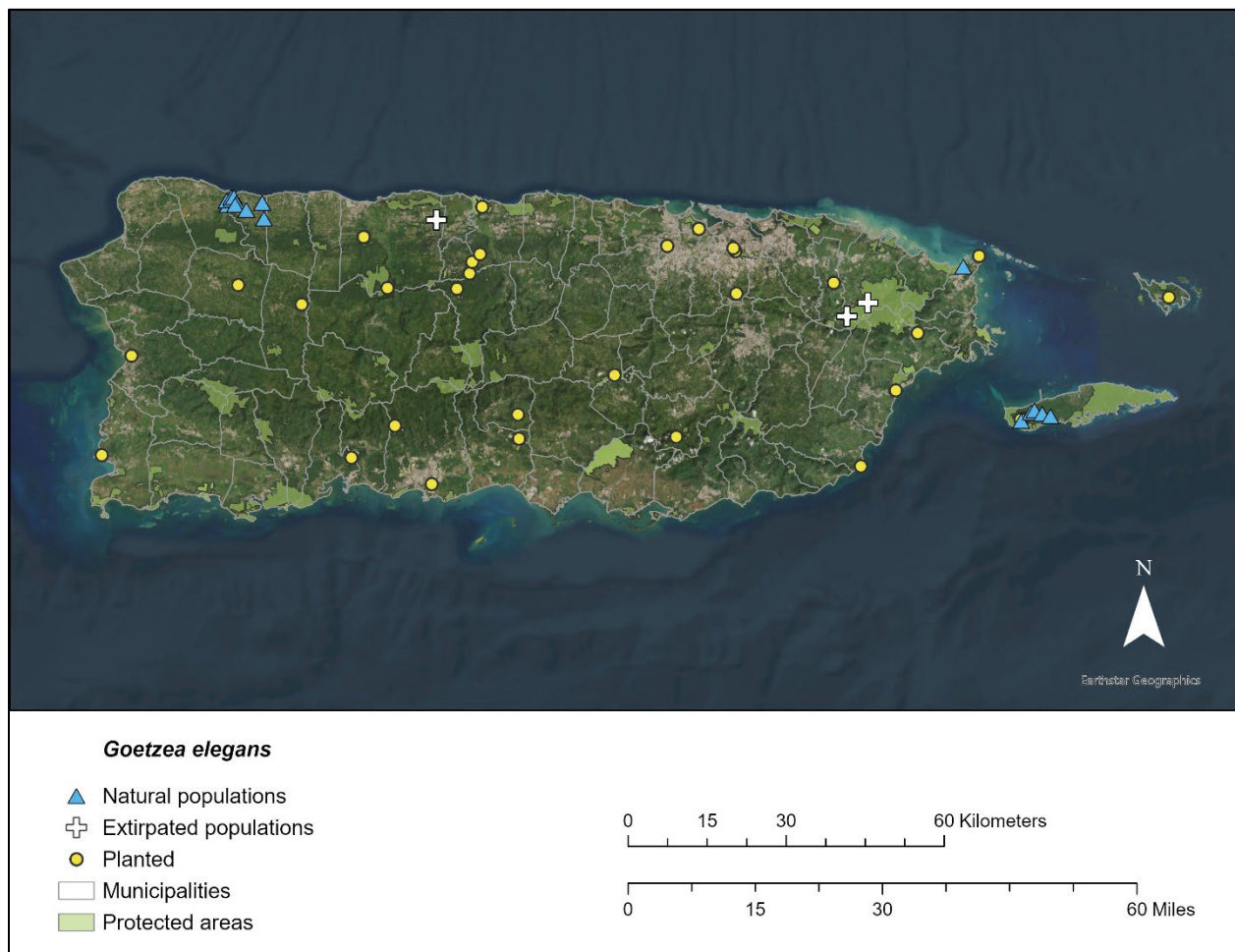


Figure 1. Matabuey distribution in Puerto Rico

Table 1. Number of known, extant natural matabuey populations in Puerto Rico since listing (Service 1985, 2013, and 2019b).

Municipality	Populations 1985	Populations 2013	Populations 2019	Populations 2024
Isabella	2	5	5	5
Quebradillas	1	5	5	5
Fajardo	0	1	1	1
Vieques	0	5	5	5
Total	3	16	16	16

Table 2. Known natural matabuey individuals in Puerto Rico (Service 2013 and 2019b).

Locality	Municipality	Number of Adults	Number of Saplings, Seedlings or Juveniles	Source
State Road PR-113	Isabela	5	0	Santiago-Valentín 1995
State Road PR-2, km 105.2	Isabela	30	63	Santiago-Valentín 1995; Caraballo-Ortíz, pers. comm. 2013
State Road PR-2, km 106.3	Isabela	1	0	Santiago-Valentín 1995
Quebrada La Sequia	Isabela	15	24 +	Santiago-Valentín 1995; Caraballo-Ortíz, pers. comm. 2013
Quebrada Bellaca	Quebradillas	31	42 +	Santiago-Valentín 1995
La Salle	Quebradillas	1	0	Santiago-Valentín 1995
Las Talas A	Quebradillas	6	6+	Santiago-Valentín 1995
Las Talas B	Quebradillas	6	15	Santiago-Valentín 1995
Arca de Noé	Quebradillas	12		URS Corporation Southern 2007
State Road PR- 2 east of State Road PR-113	Isabela	38		URS Corporation Southern 2007
Finca Los Conventos	Fajardo	9	20	Caraballo et al. 2011
Quebrada Ceiba (two localities)	Vieques	3	1	Geo-Marine 2000
Quebrada east of support station	Vieques	2	7	Geo-Marine 2000
Quebrada off east boundary (four localities)	Vieques	15+	43+	Geo-Marine 2000
Monte Pirata	Vieques	7	0	Caraballo-Ortíz, pers. comm. 2013
Quebrada Urbana (six localities)	Vieques	1,215*		J. Sustache, pers. comm. 2012
Total		1,396+	221+	

* This number represents a total. Totals by age class were not estimated for this location.

Organizations like Para La Naturaleza (PLN) and Envirosurvey, Inc. have been working with the Service establishing new matabuey populations to assist with the recovery and conservation of the species. The most recent available information regarding abundance and distribution of those planted individuals is presented in Table 3.

Table 3. Number of individuals planted on lands managed by Para La Naturaleza (PLN) and private properties under the Service’s Partners of Fish and Wildlife Program between 2019 and 2023 (PLN 2019, 2020, 2021, 2022, Envirosurvey, Inc. 2023a and 2023b, and Rosado, pers. comm. 2024). Unless otherwise noted, the current statuses of these populations are unknown.

Introduced Location and Municipality	Num. of Planted Individuals	Comments	Source
Reserva Natural Las Cucharillas, Laguna Secreta Area, Cataño	3	Planted in 2019	PLN 2019
Reserva Natural Las Cucharillas, Cataño	5	Planted in 2019	PLN 2019
Área Natural Protegida Pitahaya, Canóvanas	31	Planted in 2019	PLN 2019
Área Natural Protegida Ojo de Agua, Juana Díaz	1	Planted in 2019	PLN 2019
Área Natural Protegida Río Encantado (Finca Escalera), Florida	7	Planted in 2019	PLN 2019
Área Natural Protegida Río Encantado (Finca Escalera), Florida	155	Planted in 2020	PLN 2020
Reserva Natural Inés María Mendoza, Yabucoa	25	Planted in 2020	PLN 2020
Reserva Natural Cañón San Cristóbal, Barranquitas	26	Planted in 2020,	PLN 2020
Vivero de Río Piedras, San Juan	2	Planted in 2020	PLN 2020
Reserva Natural Reserva La Esperanza, Manatí	4	Planted in 2021	PLN 2021
Área Natural Protegida Río Encantado (Finca Escalera), Florida	581	Planted in 2021	PLN 2021
La Tres Once Farm, Florida	200	Planted in 2022, 78% survival	Trejo, pers. comm. 2024 and Service unpubl. data 2022
Capricho Farm, Manatí	200	Delivered for planting in April 2023	Envirosurvey, Inc. 2023b
La Jungla Farm, Lares	19	Planted in 2023	Envirosurvey, Inc. 2023a

Introduced Location and Municipality	Num. of Planted Individuals	Comments	Source
Área Natural Protegida Río Encantado (Finca Escalera), Florida	141	Planted in 2023	Rosado, pers. comm. 2024
<i>Total</i>	1,400		

Matabuey has been planted in large numbers at different localities in Puerto Rico. Unfortunately, most of these individuals have not been continuously monitored and their current status is unknown. We only have recent information from La Tres Once Farm, a privately owned property, where staff from Envirosurvey, Inc. and the Service monitored the planted matabuey individuals during December 2023 and found that 78% had survived since planting in May 2022 (Envirosurvey, Inc., 2023b). An uncontrolled development of vines and grasses was found during the assessment in this farm and both Envirosurvey, Inc. and the Service recommended the landowner to remove that vegetation to allow the free development of the planted individuals (Envirosurvey, Inc., 2023b).

Additional and current information on planted individuals is still needed to determine the survival rate, recruitment, and reproduction of the species. Matabuey is mainly self-incompatible (mechanism that prevents self-fertilization or rejection of self-pollen) and requires outcrossing (pollination required between two different flowers) for successful seeding and fruiting (Service 2013). Therefore, recurrent monitoring of the populations is needed to determine if propagation is occurring and to what extent the number of individuals are naturally increasing.

In addition to planting matabuey in protected areas, between 2019 and 2022, PLN collected over 1,300 matabuey seeds for propagation from various locations, produced more than 1,500 individuals, and has maintained an inventory in their tree nurseries ranging from 1 to 811 matabuey individuals between 2019 and 2022.

Threats (Five-Factor Analysis) Summary

The status of a species is determined from an assessment of factors specified in section 4 (a)(1) of the Act, including: Factor A: the present or threatened destruction, modification, or curtailment of its habitat or range; Factor B: overutilization for commercial, recreational, scientific, or educational purposes; Factor C: disease or predation; Factor D: the inadequacy of existing regulatory mechanisms; Factor E: other natural or manmade factors affecting its continued existence. A summary of this assessment is detailed below.

Matabuey continues to be threatened by (Factor A). In Puerto Rico, the population at Quebrada Bellaca in the municipality of Quebradillas is still known as one of the largest historic natural populations of the species. This location is considered as a high priority for conservation, but the area has no protection status (Service 2019b). Most of the matabuey natural populations in mainland Puerto Rico also occur in privately owned lands where the species can be impacted by actions like habitat modification and destruction, grazing, and road construction and maintenance. In Vieques Island, one small population occurs within Vieques National Wildlife Refuge; however, the remaining four natural populations occur along creeks outside of the Refuge (Service 2019b). The habitat outside the refuge can be subject of modification or

destruction and even within the Refuge the population is subject to habitat modification caused by tropical storms (discussed below under Factor E).

We have no indication that overutilization for commercial, recreational, scientific, or educational purposes (Factor B) is a threat to the species. Furthermore, although there is likely predation of seeds by native and non-native animals, at this time we have no indication of the level of the threat of this predation and at this time consider it not significant (Factor C). We also have no information indicating that disease poses a threat to the species.

Currently, this plant is protected under Commonwealth's Law No. 241-1999 (12 L.P.R.A. Sec. 107), known as Nueva Ley de Vida Silvestre de Puerto Rico (New Wildlife Law of Puerto Rico) and Regulation 6766 or Reglamento para Regir el Manejo de las Especies Vulnerables y en Peligro de Extinción en el Estado Libre Asociado de Puerto Rico (Regulation 6766: To govern the management of threatened and endangered species in the Commonwealth of Puerto Rico). Matabuey has been included in the list of protected species and designated as endangered under Regulation 6766. Article 2.06 of this regulation prohibits collecting, cutting, removing, among other activities, listed plant individuals within the jurisdiction of Puerto Rico. These provisions extend to private lands. Based on the presence of Commonwealth laws and regulations protecting matabuey, we believe that the inadequacy of existing regulatory mechanisms should no longer be considered a threat to this species. However, it is important to note that enforcement on private lands continues to be a challenge as accidental damage or extirpation of individuals of endangered plants has occurred due to lack of knowledge of the species by private landowners. In addition, there are threats like changes in climate (Factor E) and habitat modifications (Factor A) that are expected to impact the species into the future that are not prevented by these protections.

Lastly, other natural or manmade factors (Factor E) such as climate change can have the potential of affecting matabuey populations. An increase in strong hurricanes (e.g., Category 3-5) is projected, as well as extreme temperatures, extreme precipitation events, and less rainfall, which, in addition to direct impacts to the species, can increase the risk in fire activity (Intergovernmental Panel on Climate Change 2022, Runkle et al. 2022). All these weather extremes can have future impacts on matabuey that are yet unknown. Unfortunately, we have no information the impacts of Hurricane María on the matabuey and how the natural populations have recovered since then. However, effects of hurricanes and extreme wind/precipitation events on the ecosystem includes massive defoliation, snapped and wind-thrown trees, large debris accumulations, landslides, debris flows, and altered stream channels, among others (Lugo 2008). The small populations of matabuey may be severely impacted by hurricanes, even resulting in mortality of some individuals. Furthermore, hurricanes impacts may promote favorable conditions for invasion of exotic species that can compete with matabuey and reduce its natural recruitment by inhibiting its germination and outcompeting its seedlings. These effects can be exacerbated by human-induced habitat disturbance (e.g., deforestation and urban development).

The fragmented distribution and the reduced number of individuals in several of the natural populations may be considered as an important limiting factor for matabuey. Because matabuey is mainly self-incompatible (cannot self-fertilize), and most of the natural populations have limited or no recruitment, we continue to believe that Factor E is a threat to the species.

Synthesis

Beautiful goetzea or matabuey (*Goetzea elegans*) is a small evergreen tree endemic to the island of Puerto Rico. There are currently 16 known natural populations found in the municipalities of Quebradillas, Isabela, Fajardo, and Vieques Island. The latest known estimate for the naturally occurring populations is about 1,700 individuals. Recovery efforts included planting of approximately 1,400 individuals in protected lands or areas under conservation agreements between 2019 and 2023. However, population assessments have not been recently conducted, thus, the current status of the species is unknown. Although there has been an increase in numbers of matabuey individuals since the species was listed in 1985, most natural populations are located on private lands where threats from habitat modifications are still present. In addition, all populations have been impacted by climate threats including changes in temperature and precipitation, and damage from high winds and extreme precipitation from hurricanes and tropical storms. Based on the limited number of recruiting populations and on-going and future threats, we still consider matabuey continues to meet the definition of an endangered species.

RECOMMENDED FUTURE ACTIVITIES

A detailed discussion of recovery actions is presented in the Recovery Plan and amended Recovery Plan (Service 1987 and Service 2019a) and past 5-year status reviews (Service 2013 and Service 2019b). Based on the available information on the species, we recommend the following actions:

Recovery Activities

- Continue propagating and planting matabuey individuals in protected areas and enhance isolated populations with propagated material with genetic representation from other localities.
- Conduct outreach activities with private landowners and communities to inform them about the species and discuss options for its protection.

Monitoring/ Research Activities

- Assess the natural populations to determine their status (health) and structure, identify habitat enhancement needs, and any new threats.
- Monitor planted individuals to determine their survival.
- Continue surveying suitable habitat to identify new localities or populations, and to identify potential reintroduction sites.

REFERENCES

- Caraballo-Ortiz, M.A., E. Santiago-Valentin, and T.A. Carlo. 2011. Flower number and distance to neighbors affect the fecundity of *Goetzea elegans* (Solanaceae). *Journal of Tropical Ecology* 24: 521-528.
- Caraballo-Ortiz M. A. 2013. Personal Communication. Email to Maritza Vargas addressing *Goetzea elegans* document for review. Email sent March 4, 2013
- Envirosurvey Inc. 2023a. Federal Trust Species Habitat Restoration Initiative in Private Lands if the Karst Region in Puerto Rico. Progress Report on Cooperative Agreement No. F21AC02153. September 2023. 3pp.
- Envirosurvey Inc. 2023b. Federal Trust Species Habitat Restoration Initiative in Private Lands if the Karst Region in Puerto Rico. Progress Report on Cooperative Agreement No. F20AC100870. December 2023. 10pp.
- Geo-Marine, Inc. 2000. Survey of Endangered, Threatened & Candidate Plant Species, Naval Ammunition Support Department (NASD), Vieques, Puerto Rico. Draft Report. 15pp.
- Intergovernmental Panel on Climate Change (IPCC). 2022. Summary for Policymakers [H.-O. Pörtner, D.C. Roberts, E.S. Poloczanska, K. Mintenbeck, M. Tignor, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem (eds.)]. In: *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.
- Lugo, A.E. 2008. Visible and invisible effects of hurricanes on forest ecosystems: an international review. *Austral Ecology* 33:368-398.
- Para La Naturaleza. 2019. Para Renovación de permiso de manejo de especies en peligro de extinción del Departamento de Recursos Naturales y Ambientales de Puerto Rico, Informe 2019, Número 2019-EPE-010 (R-VS-PVS15-SJ00745-07122018). 22pp.
- Para La Naturaleza. 2020. Para Renovación de permiso de manejo de especies en peligro de extinción del Departamento de Recursos Naturales y Ambientales de Puerto Rico, Informe 2020, Número 2020-EPE-014 (R-VS-PVS15-SJ00833-27122019). 26pp.
- Para La Naturaleza. 2021. Para Renovación de permiso de manejo de especies en peligro de extinción del Departamento de Recursos Naturales y Ambientales de Puerto Rico, Informe 2021, Número 2021-EPE-025 (R-VS-PVS15-SJ00920-07052021). 41pp.
- Para La Naturaleza. 2022. Para Renovación de permiso de manejo de especies en peligro de extinción del Departamento de Recursos Naturales y Ambientales de Puerto Rico, Informe 2021, Número 2022-EPE-031 (R-VS-PVS15-SJ-01014-06062022). 36pp.

- Rosado Juliann. 2024. Personal Communication. Email to Maritza Vargas regarding planting information on Matabuey, Para La Naturaleza, for years 2019-2022. Email sent March 18, 2024.
- Runkle, J., K.E. Kunkel, L.E. Stevens, S.M. Champion, D.R. Easterling, A. Terando, L. Sun, B.C. Stewart, G. Landers, and S. Rayne. 2022. Puerto Rico and the U.S. Virgin Islands State Climate Summary 2022. NOAA Technical Report NESDIS 150-PR. NOAA/NESDIS, Silver Spring, MD, 5 pp. <https://statesummaries.ncics.org/chapter/pr/>
- Santiago-Valentín, E. 1995. Reproductive and Population Ecology of *Goetzea elegans* Wydler (Solanaceae or Goetzeaceae). Master's Thesis, University of Puerto Rico, Mayaguez, Puerto Rico. 174pp.
- Sustache J.A. 2012. Personal Communication. Email to Maritza Vargas, U.S. Fish and Wildlife Service, addressing *Daphnopsis helleriana* and Matabuey. Email sent December 18, 2012.
- Trejo N. 2024. Personal Communication. Email to Maritza Vargas regarding Finca La Tres Once en Florida. Email sent July 15, 2024.
- URS Corporation Southern. 2007. Biological Assessment Report Highway PR 22 Extension Hatillo to Aguadilla. Report submitted to the Puerto Rico Highway and Transportation Authority, San Juan, Puerto Rico.
- U.S. Fish and Wildlife Service (Service). 1987. Beautiful *Goetzea* Recovery Plan. U.S. Fish and Wildlife Service, Atlanta, Georgia. 35pp.
- U.S. Fish and Wildlife Service (Service). 2013. Beautiful *goetzea* (*Goetzea elegans*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Boquerón, Puerto Rico. 26 pp.
- U.S. Fish and Wildlife Service (Service). 2019a. Amendment to the Beautiful *Goetzea* (*Goetzea elegans*) Recovery Plan. U.S. Fish and Wildlife Service, Atlanta, GA. 5p.
- U.S. Fish and Wildlife Service (Service). 2019b. Beautiful *goetzea* (*Goetzea elegans*) 5-Year Review: Summary and Evaluation with addendum. U.S. Fish and Wildlife Service, Boquerón, Puerto Rico. 34 pp.
- U.S. Fish and Wildlife Service (Service). 2022. Wildlife Habitat Practice Evaluation Sheets for La Tres Once Farm, Florida, Puerto Rico. U.S. Fish and Wildlife Service, Partners for Fish and Wildlife Program. Dates: August 9, 2022, and November 1, 2022.
- Vivaldi, J.L., R.O. Woodburry, and H. Díaz-Soltero. 1981. Status report on *Goetzea elegans* Wydler. Status report submitted to the U.S. Fish and Wildlife Service, Mayaguez, Puerto Rico. 48pp.

RESULTS / SIGNATURES

U.S. FISH AND WILDLIFE SERVICE

Status Review of *Goetzea elegans or matabuey*

Status Recommendation

On the basis of this review, we recommend the following status for this species. A 5-year review presents a recommendation of the species status. Any change to the status requires a separate rulemaking process that includes public review and comment, as defined in the ESA.

- Downlist to Threatened
- Uplist to Endangered
- Delist (*Indicate reasons for delisting per 50 CFR 424.11*):
 - The species is extinct*
 - The species does not meet the definition of an endangered or threatened species.*
 - The listed entity does not meet the statutory definition of a species.*
- No change needed

FIELD OFFICE APPROVAL:

Field Supervisor, Caribbean Ecological Services Field Office, Fish and Wildlife Service

Approve _____