Nogal or West Indian walnut
(*Juglans jamaicensis*)

5-Year Status Review:
Summary and Evaluation

Photo by Omar Monsegur (USFWS)

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

August 2024

STATUS REVIEW
Nogal or West Indian walnut (*Juglans jamaicensis*)

GENERAL INFORMATION

Current Classification: Endangered

Lead Field Office: Caribbean Ecological Services Field Office, Marielle Peschiera and Damaris Román Ruiz

Reviewers:
Lead Regional Office: Southeast Region, Carrie Straight

Date of original listing: February 12, 1997 (62 FR 1691; January 13, 1997)

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 *Juglans jamaicensis*' biology, habitat, and threats in order 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 and received no comments. The primary sources of information used in this analysis were the 1997 final listing rule (Service 1997), the 1999 recovery plan, previous 5-year reviews (Service 2013, 2019) and agencies unpublished survey data and reports, and personal communication with recognized experts. Survey and habitat information was provided by the Puerto Rico Department of Natural and Environmental Resources (PRDNER). This review was completed by the U.S. Fish and Wildlife Service, Caribbean Ecological Services Field Office, Mayagüez, Puerto Rico. All literature and documents used for this review are on file at the Field Office.

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): 5.
Juglans jamaicensis is a species with a high degree of threat and a low recovery potential.

Review History:
Previous 5-year status reviews, recommending no change in species status, were signed on March 28, 2013, and May 22, 2019 (Service 2013 and 2019, respectively).

REVIEW ANALYSIS

Listed Entity

Taxonomy and nomenclature
We are not aware of any new taxonomic information for *J. jamaicensis*, and we still consider it a valid species.

Distinct Population Segment (DPS) (61 FR 4722)
The Act defines species as including any subspecies of fish or 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 Plan or Outline
Final Recovery Plan for *Juglans jamaicensis*, December 9, 1999

Recovery plans are not regulatory documents and 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).

The Plan specifies that the Service will consider delisting *J. jamaicensis* when:

1. Protection of the known populations has been achieved (through means which may include acquisition and landowner agreements), and

2. New populations (the numbers of which should be determined following the appropriate studies) capable of self-perpetuation have been established within protected areas, such as the Monte Guilarte or Toro Negro Commonwealth Forests.

Criterion 1 has been partially met. The land that harbors the known natural population of *J. jamaicensis* at the base of La Silla de Calderón has been acquired and incorporated into the Guilarte Commonwealth Forest. Few individuals of this population extend into at least one private property adjacent to the Guilarte Commonwealth Forest. Currently, there is an initiative seeking the protection of this habitat outside the Commonwealth Forest and to enhance its connectivity with the Guilarte Forest by establishing conservation agreements with key private landowners.

Criterion 2 has not been met. Planting efforts to establish new *ex situ* populations have been conducted within the Guilarte Commonwealth Forest, Bosque del Pueblo in the municipality of

Adjuntas, and Cañon San Cristobal in the municipality of Barranquitas. Also, the non-governmental organization Para La Naturaleza maintains a living collection of the species at Cañón San Cristóbal from where they collect seed material for ongoing propagation efforts. However, there is no data about the status of the natural individuals at the Guilarte and Bosque del Pueblo forests nor Cañon San Cristobal, or the establishment of any self-sustainable population of this species in Puerto Rico.

Biology and Habitat Summary

A detailed review of the species' biology, distribution, abundance, and its habitat can be found in the previous *Juglans jamaicensis* 5-year status reviews (Service 2013 and 2019).

Juglans jamaicensis is known from Cuba, Hispaniola, and Puerto Rico. We have limited information about the species outside of Puerto Rico. We have provided a summary of our current information below.

Cuba

In Cuba, there are some discrepancies on the taxonomy of the species. Some state that based on external morphological differences of the seed there are two subspecies in Cuba; *J. jamaicensis* C. DC. subsp. *jamaicensis* and *J. jamaicensis* subsp. *insularis*, while others state it is only one species; *J. jamaicensis* C. DC (Espín et al 2020).

As of 2012, the species was known from three main areas in Cuba: central Cuba, western Cuba, and eastern Cuba (Castellanos and Jiménez 2011). Current population numbers and population size are unknown.

Studies conducted by Rodríguez Sosa et al. (2015) at Parque Nacional Turquinom in southern Cuba, reported about 52 *J. jamaicensis* individuals of different age classes in 2012: 23 seedlings, 13 saplings, and 16 adults, whereas in 2013, they documented 43 individuals: 16 seedlings, 13 saplings, and 14 adults. Rodríguez et al. (2015) stated that the age class structure of the species is irregular with good reproduction and germination but poor recruitment. They also found that seedling is the species' most vulnerable age class, with low recruitment from seedlings to saplings.

Since 2016, the Jardín Botánico de Cienfuegos has conducted field surveys, populations assessments, and implemented a propagation program for the species on the island of Cuba (Botanical Gardens Conservation International 2024). "Field surveys carried out in 2016 and 2017 confirmed the existence of four locations with *J. jamaicensis* in central Cuba (Cienfuegos, Villa Clara, and Sancti Spiritus provinces). Consultations with local farmers in Viñales, Pinar del Río, have also indicated the existence of a further location in western Cuba, which will be subject to future field scoping work" (Botanical Gardens Conservation International 2024). Through this initiative, by 2022, the species had been propagated and reintroduced to its natural environment (RCM 2022).

Hispaniola (Haiti and Dominican Republic)
The species is found in the provinces of Azua, Espaillat, Hermanas Mirabal, Independencia, La Vega, Monte Plata, Puerto Plata, San José de Ocoa, and Santiago in the Dominican Republic (Castillo-Lorenzo et al. 2022). Although widely distributed, populations are very small (Academia de Ciencias de la República Dominicana, n.d.). There have been efforts to propagate and reintroduce the species in this Island, but there are no specific details available on these efforts (Academia de Ciencias de la República Dominicana, n.d.). We have no current data on population sizes, recruitment, or numbers in either Haiti or the Dominican Republic.

Puerto Rico
Within Puerto Rico, the only known natural population of *J. jamaicensis* is found at Silla de Calderón, located within the Guilarte Commonwealth Forest (Bosque Estatal Monte Guilarte; Figure 1). For this 5-year status review, we have established the following age classes:

Seedlings - individuals with a height of less than 12 inches ((in) (0.3m (meters)),
Saplings - individuals with a height equal or greater to 12in (0.3m) or with a stem diameter at breast height of less than 2.5cm (0.025m), and
Adults - individuals with a diameter at breast height equal or greater than 2.5cm.

We recommend the use of these categories for any future research and monitoring work with *J. jamaicensis*.

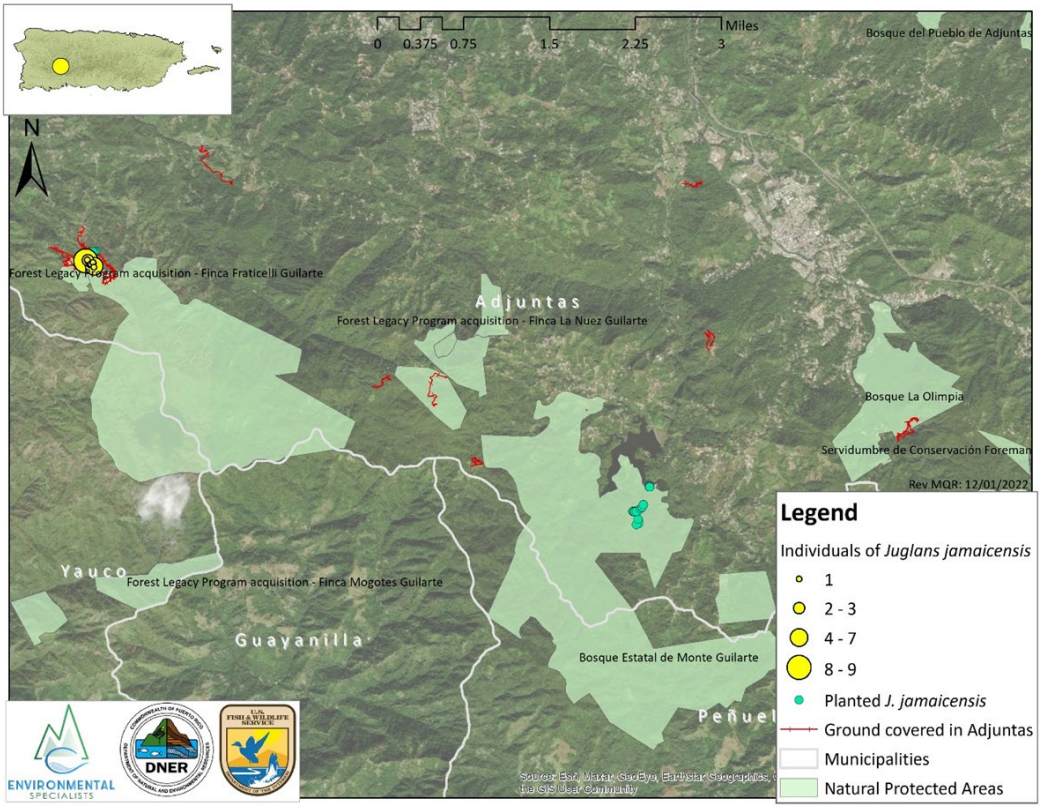

Figure 1. Natural population of *Juglans jamaicensis* (yellow dots) and locations of individuals planted (blue dots) at the Guilarte Commonwealth Forest (green polygons) (PRDNER 2023).

Silla de Calderón - Status as of 2019. In 2019, the Silla de Calderón population was known to have 3-4 adult individuals and 20 seedlings, which were documented in 2017 during a rapid assessment conducted by Dr. Eugenio Santiago (University of Puerto Rico, Río Piedras) following Hurricane María (Service 2019).

Silla de Calderón - Status as of 2020-2021. Between August 2020 and May 2021, the Puerto Rico Department of Natural and Environmental Resources also conducted surveys at Silla de Calderón, where they found 24 *J. jamaicensis* individuals (PRDNER 2022). Using the above age classes, the 24 individuals are composed of 8 adults, 14 saplings, and 2 seedlings (PRDNER 2022; Sustache, pers comm. 2024). Of the 24 individuals, 7 were found within a private property just outside the Guilarte Commonwealth Forest. Within the Guilarte Commonwealth Forest, three tagged adult individuals were found dead, and two other adult individuals were found in "bad condition", presumably due to damage to branches of the crown caused by Hurricane María (PRDNER 2022). No individuals of the species were observed in reproductive stage (flowers or fruits) nor seedlings or recent fruits (only rotten) were observed on the ground during the assessment (PRDNER 2022). The species is known to flower in February and March or April and the nuts ripen and gall during the early summer in Puerto Rico (Espín et al 2020). Since the 2020 assessment was conducted on late April and early May, this could have been the reason no flowers nor fruits were observed.

Silla de Calderón - Status as of 2023. During 2021-2023, despite extending the surveys beyond the Guilarte Commonwealth Forest boundaries into private properties surrounding the natural know population and visiting sites where historical records from herbarium specimens documented presence of the species (i.e., Río Abajo Commonwealth Forest and La Olimpia Forest), no new individuals were found (PRDNER 2023). Additionally, of the two adult individuals reported in bad condition by the Department of Natural and Environmental Resources at Silla de Calderón, one was found dead (PRDNER 2023). Therefore, as of 2023, the Department of Natural and Environmental Resources documented a population of 23 individuals; of which 7 were adults (PRDNER 2023). No details on the other individuals were provided.

In 2023, the Service established a cooperative initiative with the Department of Natural and Environmental Resources, the non-governmental organizations Envirosurvey, Inc., and Para La Naturaleza to protect *J. jamaicensis* habitat, augment the known natural population, and to enhance the habitat connectivity between remaining patches of mature native forests and surrounding agricultural landscape. As part of this initiative, on February 9, 2024, biologists conducted a rapid assessment of the natural population at Silla de Calderón and found that the forested habitat was in excellent conditions. They did not document new individuals; however, a comprehensive population assessment was not conducted and, therefore, the total number of individuals is unknown (Service 2024).

Lago Garzas and Guilarte Commonwealth Forest (Augmentation). Efforts to introduce *J. jamaicensis* individuals within the Guilarte Commonwealth Forest have been previously conducted by the Department of Natural and Environmental Resources (Table 1). In 2009, they planted 50 *J. jamaicensis* individuals within the forest (Service 2019): 6 at Limaní Ward and the

rest at Bellota Ward (Sustache, pers. comm. 2024). As of 2022, only one individual had survived at Limaní Ward and the rest of the individuals planted there and at Bellota did not survive (Sustache, pers. comm. 2024.).

During the 2021-2023 biologists planted 35 individuals in two areas: 29 surrounding the old entrance to Lago Garzas, and 6 near the border of Guilarte Commonwealth Forest and the private property to the north, near the currently known natural population (Figure 1). These individuals were propagated by Para La Naturaleza and contain the germplasm of the remnant natural population of Silla de Calderón (PRDNER 2023). Based on the latest information, only one of the individuals planted at Lago Garzas and one planted in the proximity of the natural population have survived (Sustache, pers. comm. 2024).

Finca AgroForestal VerdeFénix (Introduction). Efforts to introduce the species to other similar habitats, but outside the Guilarte Commonwealth Forest, have also been conducted in both private and public lands (Table 1). On August 30, 2022, Service biologists visited Finca AgroForestal VerdeFenix, a private property located in Guayo Ward in the municipality of Adjuntas, approximately 1 km northwest of the *J. jamaicensis* natural population, to assess the status of one *J. jamaicensis* individual planted by the landowner back in 1997. This individual was handed to the landowner by Para La Naturaleza. Service biologists documented that the *J. jamaicensis* individual was about 13 m high and had a diameter at breast height of 20 cm (Service 2022). According to the landowner, the individual produced over 25 fruits in 2022, and one yellowing fruit was observed in the floor during the site visit. On February 27, 2023, the landowner informed the Service that he had collected 44 seeds from that individual and 18 had sprouted (Table 1) (Rivera pers. comm. 2023). In March 2023, the landowner documented two seedlings near the adult individual planted in 1997. Then, in April 2023, the landowner signed a cooperative agreement with the Service under the Partners for Fish and Wildlife Program to restore and manage habitat to benefit the species.

Cañón San Cristóbal (Introduction). Para La Naturaleza planted five adult individuals of this species (date not specified) at Cañón San Cristóbal in the municipality of Barranquitas (Arocho 2024). Two of the individuals fell due to Hurricane María but re-sprouted, and two saplings near the adults were found during the latest surveys (Arocho 2024), for a total of 7 individuals. Based on the assessment by Arocho (2024), the three adults that had not suffered from the hurricane impacts had several fruits. Furthermore, on April 2022, 50 *J. jamaicensis* individuals propagated at the Para La Naturaleza nursery were planted in the area of Zuñé, Cañón San Cristóbal. The current status of those 50 *J. jamaicensis* individuals is unknown (Arocho 2024) (Table 1).

Table 1. *Juglans jamaicensis* current status by location. No data available is abbreviated as ND. PLN = Para La Naturaleza.

Location	Year surveyed or planted	Seedlings	Saplings	Adults	Total	Current Status (2024)	Source
Guilarte Commonwealth Forest - Silla de Calderón	Natural population surveyed in 2023	2	14	7	23	Adults in good condition; ND for the rest of the stages	PRDNER 2023
Guilarte Commonwealth Forest	Planted in 2009; location unknown	ND	50	ND	50	As of 2022 only 1 individual survived.	Service 2019
Guilarte Commonwealth Forest (Lago Garzas)	Planted in 2022	ND	35	ND	35	As of 2024 only 2 individuals are present	Sustache, pers comm. 2024
Cañón San Cristóbal (PLN nursery)	ND	ND	2 found near adult	5	7	ND	Arocho 2024
Cañón San Cristóbal (PLN-Suñé)	Planted in 2022	ND	50	ND	50	ND	Arocho 2024
Finca AgroForestal VerdeFénix	Planted in 1997	ND	2 found in 2023	1	3	As of 2023, 1 adult and 1 juvenile in good conditions	Rivera, pers. comm. 2023

In 2015 and 2016 *J. jamaicensis'* stranded nuts were found on north-western European shores and Irish waters (Quigley et al. 2016). Quigley stated that while walnuts are generally dispersed by gravity and animals, and sometimes humans, some *Juglans* nuts have good floatation properties and may be dispersed by water. Quigley et al. (2016) studies have found that the flotation time in *J. jamaicencis* nuts is 22 months. Based on the species' flotation properties, Quigley et al. (2016) concluded that *J. jamaicensis* seeds could have drifted via the North Atlantic Drift to Northwest Europe. Morphological and genetical validation are needed to confirm the nuts found on these shores indeed belong to *J. jamaicensis* (Quigley et al. 2016). This information provides an idea of the species' potential dispersal mechanisms.

Threats (Five-Factor Analysis) Summary

Factor A. Present or threatened destruction, modification or curtailment of its habitat or range

The only known *J. jamaicensis* natural population is located within the Guilarte Commonwealth Forest, with few additional individuals just outside of the forest boundaries. Although recent extensive surveys have not located new individuals, there is still the potential areas that have not been surveyed. Outside of protected lands, habitat modification and destruction as the result of land clearing of mature secondary forest for agricultural purposes and construction of

infrastructure, may pose a threat to *J. jamaicensis* because these forest lands may harbor undetected individuals or populations of the species. Additionally, since good quality habitat for the species is limited, any activities that could impact the buffer zone of the forest can result on impacts to the species by encroachment of invasive vegetation. Within the protected habitats (Guilarte Commonwealth Forest), the species is protected from large scale land use changes, however, even protected lands are impacted from natural events like hurricanes and the work to restore human infrastructure after hurricanes (e.g., power lines and road repairs) (discussed in more detail below under factor E). Based on the above information, we consider habitat destruction or modification as a low and non-imminent threat to known individuals of *J. jamaicensis*.

Factor B. Overutilization for commercial, recreational, scientific, or educational purposes

In the past it was believed that *J. jamaicensis* may have been over-collected for its wood and nuts. The small number of trees remaining primarily within a protected area minimizes impacts and accessibility to the trees, therefore, overutilization is no longer considered a threat to *J. jamaicensis* (Service 2019).

Factor C. Disease or predation

Predation of the seeds in the wild are likely but are not known to be a significant threat at this time. Although 2013 5-year status review stated that disease could be a threat to the *J. jamaicensis*, there is no recent information that disease is a current threat to the species.

Factor D. Inadequacy of existing regulatory mechanisms

The Commonwealth of Puerto Rico approved Law No. 241 in 1999, known as "Nueva Ley de Vida Silvestre de Puerto Rico" (New Wildlife Law of Puerto Rico). The purpose of this law is to protect, conserve, and enhance both native and migratory wildlife species, declare as the property of Puerto Rico all wildlife species within its jurisdiction, regulate permits, hunting activities, and exotic species, among others. Law No. 241 includes plants as part of the wildlife species. In 2004, the Puerto Rico Department of Natural and Environmental Resources approved the "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 regulate the management of threatened and endangered species in Puerto Rico). *Juglans jamaicensis* 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.

Based on the presence of Commonwealth laws and regulations protecting *J. jamaicensis,* we believe that the inadequacy of existing regulatory mechanisms should no longer be considered a threat to this species where it occurs on protected lands. 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. This could be exacerbated by the fact that *J. jamaicensis* is difficult to identify unless the tree is bearing fruits, or the person (private landowner, law enforcement officer or biologist) has expertise on identifying the species.

Factor E. Other natural or manmade factors affecting its continued existence

Hurricanes and landslides. Hurricanes frequently affect the islands of the Caribbean. As a species endemic to the Greater Antilles, *J. jamaincensis* should be adapted to hurricanes. The 2017 hurricane season exemplified the impacts that have occurred and are expected to occur in the future. There were 17 named storms and many small island developing states in the region experienced catastrophic impacts (high winds) from at least one storm. All islands within the range of *J. jamaicensis* were impacted by at least one storm with storms having winds of 130 mph or higher (Gould et al. 2018, see Box 20.1: 2017 Atlantic Hurricane Season Impacts within the referenced document). Throughout the Caribbean, storm frequency and intensity are expected to increase in the future (Gould et al. 2018).

With such a small number of wild individuals and little evidence of natural recruitment, any damage to individuals due to hurricanes remains as a threat to the species. In 2017, Hurricane María impacted the island of Puerto Rico causing major damages to forested areas and directly impacting *J. jamaicensis* individuals causing damages to the branches of the crown, which was caused by severe winds (PRDNER 2022). Four years later, two adults damaged from the hurricane were reported to be in bad condition, and in 2023, one of those was reported as dead (PRDNER 2022).

In addition, the heavy rains associated with tropical storms and hurricanes in the mountains of Puerto Rico often lead to landslides. Given the steep slopes on which most known *J. jamaicensis* trees grow, a massive landslide would not only take out the trees and their young offspring, but their seed bank and substrate as well. As stated above, due to the extremely low number of adult individuals and the problems regarding the natural recruitment of the species (see below), severe hurricanes and associated landslides pose a threat to the species.

Drought. Drought is also associated to species lack of healthy development and therefore low recruitment (PRDNER 2022). The species already exist on rocky soils with low water retention. Both droughts and competition for resources increases the lack of recruitment of *J. jamaicensis.* Modeling predicts that there will be a decrease in annual average precipitation in Puerto Rico over the 21st century. This reduction in precipitation with warming expected in the future will likely increase risk of drought in the future (Runkle et al. 2022). The increase in temperatures and corresponding extreme events, like drought, are also expected throughout the Caribbean in the future (Gould et al. 2018).

Lack of recruitment. Lack of natural recruitment represents one of the major threats to *J. jamaicensis* in Puerto Rico. Although, fruit production has been reported to be abundant in the natural population, recruitment is very low, representing high mortality at seedling stages (PRDNER 2022). It has been documented that seeds under a canopy gap develop better than

those in closed canopy (PRDNER 2022). In the 2019 5-year status review, 20 seedlings were documented in the natural population. This could have been due to the canopy opening created from the impacts of Hurricane María. However, canopy gaps also favor colonization of invasive and fast-growing species such as Palma de Sierra (*Prestoea montana*). This could result in competition for resources and ground and sun cover by the invasive plant, all of which impact *J. jamaicensis* development. Another factor adding to the low seedling recruitment may be the lack of seed dispersal, which at present seems to be limited to gravity, making seedlings subject to competition under the parent tree.

Limited genetic variation. As explained in previous 5-year status reviews, the potential for low genetic variation is a great concern for *J. jamaicensis* (Service 2013, 2019). Since the currently known population size is extremely small, it is very likely that its genetic variability is also low. This is exacerbated by the species restricted distribution, specific habitat needs, and lack of habitat connectivity which could reduce the capacity of the species to adapt to changes in the habitat. Currently, new efforts seek to safeguard not only quality habitat surrounding the Guilarte Commonwealth Forest but connect adjacent forested habitat with the Guilarte Commonwealth Forest. Additionally, new efforts look to introduce *J. jamaicensis* individuals to other areas within the Guilarte Commonwealth Forest, seeking to expand the existing population and create new ones.

With climate change predictions of an increase frequency and strength of tropical storms and severe droughts, the species small population size, possible low genetic variability, and lack of recruitment, the species continues to be significantly impacted by Factor E.

Synthesis

Juglans jamaicensis is a large distinctive tree with fissured (separated into distinct areas by narrow cracks) bark, which may reach up to 25 meters (82 feet) in height. This species is known from Cuba, Hispaniola, and Puerto Rico, but little information is available on its status of the populations in Cuba, Haiti, and the Dominican Republic. In Puerto Rico, we estimate that about 24 individuals (2 seedlings, 14 saplings and 8 adults) of *J. jamaicensis* currently exist in a single population at Silla Calderón in the Guilarte Commonwealth Forest. Also, there have been efforts to reintroduce the species at the Guilarte Commonwealth Forest and at Cañón San Cristóbal in the municipality of Barranquitas. However, the status of those individuals is unknown. Furthermore, the natural recruitment of the species continues to be very limited as seedlings and saplings do not appear to reach adult stages.

Available information on the species indicates it is still threatened by natural factors such as lack of genetic variation and natural recruitment, along with threats such as hurricanes, landslides, and non-native species. In addition, if the population does extend to adjacent private properties; we believe that *J. jamaicensis* may be threatened by habitat modification caused by land clearing of mature secondary forest for agricultural purposes and other uses. Throughout the species' range, changes in climate including more extreme weather events (both hurricanes and tropical storms bring extreme wind and landslides, increases in temperature and associated increases in extreme drought events. Because of the limited known populations, small population size, and

ongoing threats, we believe that *Juglans jamaicensis* continues to meet the definition of an endangered species.

RECOMMENDED FUTURE ACTIVITIES

Recovery Activities

1. Continue propagation and reintroduction efforts of *J. jamaicensis*.
2. Enhancement of the genetic diversity of *J. jamaicensis* with germplasm from outside Puerto Rico should be considered. However, this needs to be guided by a comprehensive study of the species populations genetics across its range.
3. The Adjuntas Agricultural Experiment Station from the University of Puerto Rico, should be considered for the propagation of the species as well as for the establishment of an experimental population. This Station offers plenty of land, appropriate ecological conditions, adequate security, and resident personnel trained in plant propagation and maintenance.

Monitoring and Research Activities

1. The known population should be monitored to collect seed material for propagation purposes. A protocol to collect seed should be developed and implemented to avoid altering the natural recruitment of the species and maintain genetic diversity. Seed material from Puerto Rico should be sent to botanical gardens (e.g., Royal Botanical Garden (Kew), Fairchild Tropical Botanic Garden, etc.) to ensure that the species is propagated, and its genetic identity is safeguarded.

2. All existing known trees should be monitored on a yearly basis; additional visits should be conducted after hurricanes, landslides, or other major disturbances to determine their effects on the population.

3. Monitoring should also consider the presence of possible pests affecting the establishment of seedling and saplings.

4. Studies should be conducted to determine the patterns of genetic variation of the species in order to develop a plan to preserve the species germplasm. This should include a comparison with trees from Hispaniola and Cuba (var. *jamaicensis*).

5. In order to consistently monitor *J. jamaicensis* populations, we recommend the adoption of the following age classes categories when conducting surveys on the species: seedlings - individuals with a height of less than 12 inches (in) (0.3m(meters)), saplings - individuals with a height equal or greater to 12in (0.3m) or with a stem diameter at breast height (DBH) of less than 2.5cm (0.025m), and adults - individuals with a DBH equal or greater than 2.5cm.

REFERENCES

Academia de ciencias de la Republica Dominicana. n.d. Rescatando De La Extinción Y Conservando Especies Amenazadas https://www.ideassonline.org/pic/doc/BrochureConservacionEspecies.pdf. Accessed on July 28, 2024

Aquino, C., B.M. Almonte Almonte, and Y. Pimentel. 2021. Hongos del monumento natural Pico Diego De Ocampo: listado preliminar. Ciencia, Ambiente y Clima 4(2):19-26. https://doi.org/10.22206/cac.2021.v4i2.pp19-26.

Arocho, N. 2024. Final report- Inventory of endangered species La Robleda and Cañón San Cristóbal. Unpublished report submitted to the U.S. Fish and Wildlife Service. 11 pp.

Botanical Gardens Conservation International. 2024. Preserving Cuba's native walnut. Website. https://www.bgci.org/our-work/projects-and-case-studies/preserving-cubas-native-walnut-juglans-jamaicensis/ Accessed July 18, 2024.

Castellanos, L. M., and M. R. Jiménez. 2011. Nuevos registros de la presencia de *Juglans jamaicensis* en Villa Clara, Cuba. Revista Del Jardín Botánico Nacional, 32/33, 15–17.

Castillo-Lorenzo, E., B. Peguero, F. Jiménez, W. Encarnación, P. Gómez Barreiro, T. Clase, R. García, T. Ulian. 2022. Árboles autóctonos de la República Dominicana: Conservación de semillas y propagación para una reforestación sustentable. Editado por Castillo-Lorenzo, E., Peguero, B. y Ulian, T. Santo Domingo, República Dominicana.

Espín, R. M., I. F. Santana, A. L. Vitlloch, L. Vasallo, J. León, and I. F. Rañal. 2020. Relation between size, weight and germination in *Juglans jamaicensis* C. DC (walnut). *Revista Cubana de Ciencias Forestales*, *8*(2), 252-261.

Gould, W.A., E.L. Díaz, (co-leads), N.L. Álvarez-Berríos, F. Aponte-González, W. Archibald, J.H. Bowden, L. Carrubba, W. Crespo, S.J. Fain, G. González, A. Goulbourne, E. Harmsen, E. Holupchinski, A.H. Khalyani, J. Kossin, A.J. Leinberger, V.I. Marrero-Santiago, O. Martínez-Sánchez, K. McGinley, P. Méndez-Lázaro, J. Morell, M.M. Oyola, I.K. Parés-Ramos, R. Pulwarty, W.V. Sweet, A. Terando, and S. Torres-González. 2018: U.S. Caribbean. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 809–871. https://nca2018.globalchange.gov/downloads/NCA4_Ch20_US-Caribbean_Full.pdf

Puerto Rico Department of Natural and Environmental Resources. 2011. Informe de progreso del Acuerdo (No. 401817J167) con el Servicio de Pesca y Vida Silvestre de EE. UU. Informe de trabajos realizados 2007-2010. Departamento de Recursos Naturales y Ambientales,

Negociado de Servicio Forestal, Sección de Investigación y Monitoria Forestal.

Puerto Rico Department of Natural and Environmental Resources. 2022. Final report award (No. F20AP00063) with the U.S. Fish and Wildlife Services. Advancing PRDNER Endangered Species Program 19-20. Final report submitted to the U.S. Fish and Wildlife Service. 79pp.

Puerto Rico Department of Natural and Environmental Resources. 2023. Progress report award (No. F21AP04052) with the U.S. Fish and Wildlife Services. Support for the PRDNER Protected Species Program Activities 2021.Draft report submitted to the U.S. Fish and Wildlife Service. 56pp.

Quigley, D. T. G. , P. A. Gainey, H. Moss, W. Judge, E. Venn & A. Dinsdale. 2016. First records of Jamaican walnuts *Juglans jamaicensis* (Juglandaceae) from Irish and UK waters, together with observations on other walnut species reported from NW Europe, New Journal of Botany, 6:2-3, 102-108

Radio Ciudad del Mar. 2022. Cienfuegos Botanical Garden will participate in an international event. Website. https://www.rcm.cu/2022/11/03/cienfuegos-botanical-garden-will-participate-in-an-international-event/. Accessed on July 26, 2024.

Rivera, F. 2023. Personal Communication. Email from Felix Rivera, AgroForestal VerdeFénix, to the U.S. Fish and Wildlife Service, Caribbean Ecological Services Field Office, Puerto Rico. February 10, 2023.

Rodríguez Sosa, J. L., C. Aguilar Espinosa and J.Y Rodríguez Milanés. 2015. Estructura diamétrica y por estado, mortalidad y reclutamiento de *Juglans jamaicensis* C. DC., en el Parque Nacional Turquino. Revista Cubana De Ciencias Forestales, 3(1), 22–30. Recuperado a partir de https://cfores.upr.edu.cu/index.php/cfores/article/view/97

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/

Sustache, J. 2022. Personal Communication. Email between José Sustache, Puerto Rico Department of Natural and Environmental Resources, and U.S. Fish and Wildlife Service, Caribbean Ecological Services Field Office, Puerto Rico. August 26, 2022.

Sustache, J. 2024. Personal Communication. Email between José Sustache, Puerto Rico Department of Natural and Environmental Resources, and U.S. Fish and Wildlife Service, Caribbean Ecological Services Field Office, Puerto Rico. May 21, 2024.

U.S. Fish and Wildlife Service (Service). 1997. Determination of Endangered Status for *Juglans jamaicensis*. Final Rule. Federal Register 62(8):1691-1694.

U.S. Fish and Wildlife Service (Service). 1999. Recovery Plan for *Juglans jamaicensis*. U.S. Fish and Wildlife Service, Atlanta, Georgia. 16pp.

U.S. Fish and Wildlife Service (Service). 2013. *Juglans jamaicensis* 5-year review: summary and evaluation. U.S. Fish and Wildlife Service Southeast Region, Caribbean Ecological Services Field Office, Boquerón, Puerto Rico. 15pp.

U.S. Fish and Wildlife Service (Service). 2019. *Juglans jamaicensis* 5-year review: summary and evaluation. U.S. Fish and Wildlife Service Southeast Region, Caribbean Ecological Services Field Office, Boquerón, Puerto Rico. 19pp.

U.S. Fish and Wildlife Service (Service). 2022. *J. jamaicensis*. Memorandum from Monsegur, O. Site Visit to Finca AgroForestal VerdeFénix. Unpublished data. Aug. 31, 2022. 2pp.

U.S. Fish and Wildlife Service (Service). 2024. *J. jamaicensis* Memorandum from Peschiera, M. Site Visit to Silla de Calderón in the Guilarte Commonwealth Forest. Unpublished data. 1pp.

RESULTS / SIGNATURES

U.S. Fish and Wildlife Service
Status Review of Nogal or West Indian walnut (*Juglans jamaicensis*)

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 Act.

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist:
____ *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*
__X__ No change needed

FIELD OFFICE APPROVAL:

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

Approve LOURDES MENA Digitally signed by LOURDES MENA Date: 2024.08.09 10:13:35 -04'00'