***Callicarpa ampla* / (Capá rosa)**
***Ilex sintenisii* / (no common name)**
***Styrax portoricensis* / Palo de jazmín**
***Ternstroemia luquillensis* / Palo colorado**
***Ternstroemia subsessilis* / (no common name)**

5-Year Review:
Summary and Evaluation

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

Flower buds of Capá rosa and fruits of Palo de jazmín.
Photos by Omar Monsegur (USFWS)

I. GENERAL INFORMATION

A. Methodology used to complete the review: On February 20, 2009, and April 9, 2010, the U.S. Fish and Wildlife Service (USFWS) published a notice in the *Federal Register* (74 FR 7914: 75 FR 18232) announcing the 5-year review for Capá rosa (*Callicarpa ampla)*, *Ilex sintenisii*, Palo de jazmín *(Styrax portoricensis)*, Palo colorado *(Ternstroemia luquillensis*) and *Ternstroemia subsessilis*, and requested new information concerning the biology and status of these species. Since these species share almost the same range, habitat, and threats, all five species were included into a single document. A 60-day comment period was opened; however, no information was received from the public during the comment period.

This 5-year review was prepared by a USFWS biologist and summarizes the information that the USFWS has gathered in the Capá rosa (*Callicarpa ampla)*, *Ilex sintenisii*, Palo de jazmín *(Styrax portoricensis)*, Palo colorado *(Ternstroemia luquillensis*) and *Ternstroemia subsessilis* files since the plants were listed on November 25, 1994. In 2011, the U.S. Forest Service (USFS), under an agreement with USFWS, led an interagency effort that included the USFS, USFWS, and the Puerto Rico Department of Natural and Environmental Resources (PRDNER), to survey and to evaluate the status of the known populations of these 5 tree species located at El Yunque National Forest, which is managed by the USFS. Under the agreement, the USFS also compiled all available information and provided their expert opinion to the USFWS regarding the status of the species. Biologists from the USFWS then completed the 5-year review, and assessed and determined the appropriate status recommendation for the species. Since this review was completed by some of the only known experts for these plants, we did not get additional peer review.

B. Reviewers

Lead Region: Kelly Bibb and Erin Rivenbark, Southeast Region, Atlanta, GA (404) 679-7132 and (706) 613-9493

Lead Field Office: Omar A. Monsegur, Caribbean Ecological Services Field Office (CESFO), Boquerón, Puerto Rico. (787) 851-7297, extension 217.

C. Background

1. Federal Register Notice citation announcing initiation of this review: February 20, 2009; 74 FR 7914 and April 9, 2010; 75 FR 18232.

2. Species Status:

The overall status of *Callicarpa ampla*, *Styrax portoricensis*, *Ternstroemia luquillensis* and *Ternstroemia subsessilis* is unknown. Little information about these species has been gathered since they were listed.

As for *Ilex sintenisii,* its status is improving. New information on this species is noteworthy as populations seem to be healthy and the estimated number of individuals has expanded from about 200 at the time of listing, to approximately 492 individuals at present. The dwarf forest vegetation upon which *I. sintenisii* depends occupies at least 1,000 acres within El Yunque National Forest. This habitat remains almost pristine, and the installation of communication facilities is regulated within the forest. In addition, new information about the taxonomy on the group suggests that it is conspecific (synonym) with *Ilex obcordata*, implying the species may have a broader range that extends throughout the Greater Antilles.

3. Recovery Achieved:

1 (1=0-25%) of the recovery objectives achieved for *Callicarpa ampla, Styrax portoricensis*, *Ternstroemia luquillensis* and *Ternstroemia subsessilis*.

2 (26-50%) of the recovery objectives achieved for *Ilex sintenisi*.

4. Listing History

Original Listing
FR notice: 57 FR 14782
Date listed: April 22, 1992
Entity listed: Species
Classification: Endangered

5. Associated rulemakings: Not applicable.

6. Review History:

The February 22, 1992, final rule (57 FR 14785), and the *Callicarpa ampla, Ilex sintenisii, Styrax portoricensis, Ternstroemia luquillensi*, and *Ternstroemia subsessilis* Recovery Plan, approved on January 31, 1995 (USFWS 1995), are the most comprehensive analyses of the species' status and are used as the reference point documents for this 5-year review.

Recovery Data Call: 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, and 2014.

7. Species' Recovery Priority Number at start of review (48 FR 43098):

5 - *Ternstroemia subsessilis,* and *Styrax portoricensis*. At the time of listing, both trees were recognized as species with high degree of threat and low recovery potential.

11- *Callicarpa ampla, Ternstroemia luquillensis*, and *Ilex sintenisii*. At the time of listing, these trees were recognized as species with moderate degree of threat and low recovery potential.

8. Recovery Plan:

Name of plan: *Callicarpa ampla, Ilex sintenisii, Styrax portoricensis, Ternstroemia luquillensis* and *Ternstroemia subsessilis* Recovery Plan
Date issued: July 31, 1995

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) policy

The Endangered Species Act (Act) defines species to include any distinct population segment of any species of vertebrate wildlife. This definition limits listings as distinct population segments (DPS) only to vertebrate species of fish and wildlife. Because the DPS policy is not applicable to plant species, it is not further addressed in this review.

B. Recovery Criteria

1. Does the species have a final, approved recovery plan containing objective, measurable criteria? The species have an approved recovery plan (USFWS 1995). The plan's downlisting criteria are in part measurable. The plan does not have delisting criteria. However, we did not have enough information to define the number of individuals needed for a sustainable population.

2. Adequacy of recovery criteria

a. Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat?

No. The plan does not include up-to-date information about the species' biology, distribution and abundance. Knowledge about the spatial distribution and habitat requirements for these species has increased.

b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?

Yes. All listing factors that were considered threats at the time of listing are addressed in recovery criteria.

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 Plan specifies that the five trees could be considered for downlisting when the following criteria are met:

1. An agreement between the USFWS and the USFS concerning the protection of *Callicarpa ampla, Ilex sintenisii, Styrax portoricensis, Ternstroemia luquillensis* and *Ternstroemia subsessilis* within the Caribbean National Forest property has been prepared and implemented.

2. An agreement between the USFWS and PRDNER concerning the protection of the three species in Commonwealth forests has been prepared and implemented, and the species is found within PRDNER properties.

3. New populations (the number of which should be determined following the appropriate studies) capable of self-perpetuation have been established within protected areas.

Criterion 1 has been partially met. There is no formal agreement between the USFS and the USFWS for the implementation of a management plan to protect these five species. However, the El Yunque National Forest is managed by the USFS for conservation, and has an approved "Revised Land and Resource Management Plan" (1997), which is currently under revision. Moreover, Federal agencies are mandated to carry out programs for the conservation of endangered species under Section 7 of the Endangered Species Act (ESA) to ensure that any action authorized, funded or carried out by a Federal agency is not likely to jeopardize the continued existence of a federally listed species. Thus, the USFS continually consults with the USFWS to avoid and minimize impacts to listed species and their habitat at El Yunque National Forest.

In addition, on July 26, 2005, the U.S. Congress enacted the Caribbean National Forest Act to designate approximately 10,000 acres of land in the El Yunque National Forest as wilderness and as a component of the National Wilderness Preservation System in accordance with the Wilderness Act (16 U.S.C. 1131 *et seq*.). This Act prohibits certain activities (e.g., timber harvest) within wilderness designated areas, although it does not preclude the installation and maintenance of facilities (e.g., data collection and remote transmission facilities) essential to the scientific and conservation purposes of the Forest Service. Therefore, the majority of the habitat upon which these species depend upon is essentially protected.

Criterion 2 has been partially met. Although there is no specific agreement between USFWS and the PRDNER concerning the protection of these three species in Commonwealth forests, there is an agreement between the two agencies under Section 6 of the Endangered Species Act, in which the PRDNER carries out conservation activities for the benefit of threatened and endangered species. Furthermore, these five species are listed by the PRDNER as endangered, and thus are protected by regulations of the Commonwealth of Puerto Rico (See factor D.). Therefore, special consideration is taken when considering actions within areas that harbor suitable habitat for these species.

Criterion 3 has been initiated. The Puerto Rico Conservation Trust (PRCT) is successfully propagating *Styrax portoricensis*. The USFWS has utilized some of this material and begun planting this species (approximately 50 individuals) at El Yunque National Forest. In addition, the PRDNER began planting *Styrax portoricensis* (approximately 5 individuals) in the Carite Commonwealth Forest. Furthermore, the USFS has propagated *Callicarpa ampla* by air layering (cloning by promoting rooting of branches using hormones), and has planted about three individuals at El Portal in El Yunque National Forest. However, little information is available about the reproductive biology and the ecology of these species. Further research and monitoring of

reintroduced individuals is required to determine the success of these actions. There is no information about the propagation of any of the remaining three species (*Ilex sintenisii*, *Ternstroemia luquillensis* and *Ternstroemia subsessilis)*.

C. Updated Information and Current Species' Status

1. Biology and Habitat

a. Species' abundance, population trends (e.g. increasing, decreasing, stable), demographic features, or demographic trends

Callicarpa ampla: When the recovery plan was approved in 1995, the number of individuals of this species was known to be approximately 14 distributed within five localities in the Palo Colorado Association Forest Type in the Luquillo Mountains (USFWS 1995). During the interagency assessment in 2011, a total of 15 individuals where identified in only two natural populations within El Yunque National Forest (Table 1).

From two localities reported in the Recovery Plan in the Rio Blanco Ward, municipality of Naguabo, only one site with three individuals was located by USFS personnel in 2011 (Luis Rivera, USFS, 2011, pers. comm.). A previously reported site at Mameyes II Ward, municipality of Rio Grande, was not located, and in the Jimenez Ward, also in Rio Grande, only one of the two populations identified in the recovery plan was located. The Jimenez population consists of 12 individuals (27 stems).

The site with three planted individuals at El Portal Visitor Center also was recorded by USFS during the assessment (Table 1). These individuals are the product of one air layer (asexual propagation) from the Rio Blanco Ward site in Naguabo (USFS 1985) that was not located in 2011 and two additional artificial air layers produced from the Jimenez Ward site near Sonadora Creek (Luis Rivera, USFS, 2011, pers. comm.).

There is no long term monitoring of the natural populations, and the USFWS does not have accurate location for most of the historical populations of *C. ampla*. It is possible that some of the populations not found during the 2011 assessment may be extirpated (e.g., by landslides) (see factor D). The USFWS suspects that additional populations of these species may occur within the El Yunque National Forest, and probably in some remnants of native forest in the Carite and Guilarte Commonwealth Forests. However, if present we anticipate low number of individuals and little recruitment, similar to the originally known populations in El Yunque.

Table 1. *Callicarpa ampla* populations surveyed during 2011 by USFS, USFWS, and PRDNER at El Yunque National Forest.

Site Name	Municipality	Number of individuals	Info. Source

Rio Blanco 1	Naguabo	3	Luis Rivera, USFS, 2011, pers. comm.
Rio Espíritu Santo (Sonadora creek 1)	Río Grande	12	Luis Rivera, USFS, 2011, pers. comm.
Rio Mameyes (El Portal Visitor Center)	Río Grande	3	Luis Rivera, USFS, 2011, pers. comm.
*Rio Blanco 2	Naguabo	unknown	USFWS 1995
*Mameyes (La Mina)	Río Grande	unknown	USFWS 1995
*Rio Espíritu Santo (Sonadora creek 2)	Río Grande	unknown	USFWS 1995

*Populations not surveyed or found during the 2011, and whose status is unknown.

Styrax portoricensis: Palo de jazmín is a tree only known from the Luquillo Mountains in eastern Puerto Rico (Liogier and Martorell 2000). At the time of listing (1992) palo de jazmín was known from a single individual growing in the Palo colorado forest west of El Cacique in the Luquillo Mountains. The current number of individuals in the wild (natural populations) is estimated at about 19 trees (Table 2) within the following areas of El Yunque National Forest: Monte Cacique area (1-3 ind.), Río Espiritu Santo (2 ind.), Palo Hueco (8 ind.), Arboretum (2 ind.), and Cristal Trail (4 ind.) (Luis Rivera, USFS, 2011, pers. comm.). The USFS also reported a single planted individual in the Catalina area (USFS office at El Yunque National Forest). There are also unconfirmed records of the species in the area surrounding the Puerto Rican Parrot Aviary (Anastacio Gómez,USFS, 2012, pers. comm.). In addition, the PRCT planted about 5 individuals of this species within a property they manage in the municipality of Barranquitas. These trees have developed as reproductive individuals and are managed for conservation purposes.

Despite the historical information, during the 2011 surveys no individuals of natural populations mentioned above were located at El Yunque National Forest. Since there is no long term monitoring of the natural populations and some of the historical populations seem to be lost or probably extinct, it is not possible to establish any trend about the population's status or demography.

Table 2. *Styrax portoricensis* known populations and approximate number of individuals.

Site Name	**Municipality**	**Number of Individuals**	**Source**
*Arboretum	Canovanas	2	Luis Rivera, USFS, 2011, pers. comm.
*Cacique North West	Río Grande	1	Luis Rivera, USFS, 2011, pers. comm.
*Cacique West	Río Grande	2	Luis Rivera, USFS, 2011, pers. comm.
*Río Espiritu Santo	Río Grande	2	Luis Rivera, USFS, 2011, pers. comm.
*Palo Hueco	Río Grande	8	Luis Rivera, USFS, 2011,

			pers. comm.
†**Catalina	Río Grande	1	Luis Rivera, USFS, 2011, pers. comm.
*Cristal Trail	Luquillo	4	Luis Rivera, USFS, 2011, pers. comm.
†Barranquitas	Barranquitas	5	María de Lourdes, PRCT, 2011, pers. comm.
Total number of individuals		**25 ind. (19 from natural populations)**	

* Populations not surveyed or found during the 2011 surveys, and whose status is unknown. Number of individuals based on data from past reviews. Catalina site is the name as the site where the USFS office is located at El Yunque National Forest.
** Population surveyed during 2011 by USFS, USFWS, and PRDNER.
† Planted individuals.

Ilex sintenisii: When the recovery plan was approved, the number of individuals of this species was known to be between 150 to 200 individuals distributed within El Yunque National Forest: Pico El Yunque and Pico del Este. During the surveys in 2011, a total of 23 subpopulations where identified containing approximately 465 individuals, the majority within the area of Pico El Yunque and Pico del Este (Table 3). Most of the localities are associated with remnants of dwarf forest vegetation along Pico del Este and its access road, and Pico El Yunque and its access road. The dwarf forest is found above 600 m in elevation. This forest type is frequently enveloped by clouds, and its trees, are short, small, dense, and floristically impoverished compared to forests in lower elevations (Weaver 1995). It is probable that the populations reported in the Recovery Plan overlap with the populations surveyed as part of the 2011 surveys (Anastacio Gómez, USFS, 2012, pers. comm.). Furthermore, it is probable that the number of populations and individuals were underestimated as the prime habitat for the species lies within an inaccessible area that is difficult to survey (Omar Monsegur, USFWS, 2011, pers. obs.). Despite the lack of long-term monitoring, the current surveys indicate that *I. sintenisii* is more common and widespread within its habitat at El Yunque.

Table 3 – *Ilex sintenisii* populations surveyed during 2011 by USFS, USFWS, and PRDNER at El Yunque National Forest.

Site Name	**Municipality**	**Number of Individuals**	**Source**
Rio Blanco	Naguabo	27	Luis Rivera, USFS, 2011, pers. comm.
Pico del Este	Fajardo	353	Luis Rivera, USFS, 2011, pers. comm.
Pico El Yunque	Rio Grande	85	Luis Rivera, USFS, 2011, pers. comm.
Total number of individuals		**465**	

Ternstroemia luquillensis and ***Ternstroemia subsessilis:*** When the recovery plan was approved in 1995, the number of individuals of *T. luquillensis* was known to be 6 individuals in 4 populations, and 37 individuals in 4 populations for *T. subsessilis*, all within the Luquillo Mountains (USFWS 1995). The majority of

the known populations of these species consist of 1-5 individuals, with the exception of the 30 individuals found at The Big Rock Trail associated with Road PR 191. Attempts by the interagency group to locate and survey these populations in 2011 were unsuccessful (Luis Rivera USFS, 2011, pers. comm.; Omar A. Monsegur, USFWS, 2011, pers. obs.). Misidentification of the original material and the lack of precise locality description have likely made it difficult for USFS personnel to find these populations (USFWS 1995, Luis Rivera, USFS, 2011, pers. comm., José Sustache, PRDNER, 2011, pers. comm.).

In addition to the populations of El Yunque National Forest, there are two specimen collections of *T. luquillensis* at the herbarium of the University of Puerto Rico at Mayaguez (MAPR) that were collected within the Maricao Commonwealth Forest. However, the herbarium specimens do not contain any information about the abundance of the species in the area.

Based on the above, the USFWS does not have enough data to accurately determine the status of these two species at this time. Because of the absence of sightings, it is possible that the species' status may be declining or that some of their populations are extinct, but further monitoring is needed to support this conclusion.

b. Genetics, genetic variation, or trends in genetic variation (e.g. loss of genetic variation, genetic drift, inbreeding, etc).

There is no new information on the genetic, genetic variation, or trends in genetic variation of *C. ampla, S. portoricensis, I. sintenisii, T. subsessilis* and *T. luquillensis*. However, based on the very small number of populations and individuals of *C. ampla, S. portoricensis, T. subsessilis* and *T. luquillensis*, limited genetic variability is expected.

c. Taxonomic classification or changes in nomenclature. There is no new information on taxonomic classification or changes in nomenclature of *C. ampla, S. portoricensis, T. subsessilis* and *T. luquillensis*. However, González-Gutiérrez (2007) considers *I. sintenisii* as a conspecific (synonym) of *I. obcordata*, which could represent new information on the distribution and abundance of the species as *I. obcordata* has a wider distribution thru the Greater Antilles (Axelrod, 2011). However, it is important to note that work by González-Gutiérrez relies entirely on morphological characters and does not include molecular studies. Furthermore, it has been observed that some species of the genus *Ilex* in Puerto Rico show highly variable morphological characters (Jeanine Vélez, MAPR, 2012, pers. comm.). Thus, at this time, we consider it premature to conclude that *I. sintenisii* and *I.obcordata* are the same species until morphological studies are validated by molecular data (see recommendations section).

d. Spatial distribution, trends in spatial distribution, **or historic range**.

Callicarpa ampla – Historically this species has been reported from the municipalities of Adjuntas, Barranquitas, Cayey and the Luquillo Mountains, and from a single collection in the island of St. Thomas (USFWS 1995; New York Botanical Garden specimens). Based on the current available information, *C. ampla* remains restricted to the El Yunque National Forest in eastern Puerto Rico (i.e., Luquillo Mountains) and there is no evidence of recent (herbarium vouchers) collections in other areas of its historical range.

Styrax portoricensis – The species was historically known from the Luquillo Mountains and from a single collection from Sierra de Yabucoa at Monte Guany (New York Botanical Garden specimen). However, recent collections of currently known localities are only from the El Yunque National Forest (i.e., Luquillo Mountains). The species was probably extirpated from other localities outside the boundaries of El Yunque National Forest, due to the extensive deforestation of the island for agriculture that reached its peak by late 1930s. Therefore, the species current distribution remains restricted to El Yunque National Forest.

Ilex sintenisii – Historically the species has been recorded from Pico El Yunque and Pico del Este within El Yunque National Forest. New information on the taxonomy of this species could expand its distribution to the Greater Antilles (Cuba, La Española, Jamaica and Puerto Rico). However, until molecular data on the relationship within the genus *Ilex* in the Caribbean is available, the USFWS will consider *I. sintenisii* as a valid species and endemic to El Yunque National Forest. Further status determinations and recovery actions will require research on genetics of the group (see recommendations section).

Ternstroemia subsessilis – This species has been historically known from El Yunque National Forest (Luquillo Mountains). In the absence new information or herbarium specimens documenting changes in its distribution, we still consider *T. subsessilis* as endemic to the El Yunque National Forest.

Ternstroemia luquillensis – At the time of listing the species was known from El Yunque National Forest and the Maricao Commonwealth Forest. In the absence new information or herbarium specimens documenting changes in its distribution, we still consider *T. luquillensis* restricted to El Yunque National Forest (i.e.,the Luquillo Mountains) and the Maricao Commonwealth Forest.

e. Habitat

The Luquillo Mountains region is of volcanic origin showing a rough topography, with cliffs and rock exposures at high elevations. The El Yunque National Forest is located within the Luquillo Mountains and holds four vegetation types: Tabonuco forest, Palo Colorado forest, Palma de sierra forest, and dwarf or elfin forest. All known localities of *C. ampla* and *S. portoricensis*, and some localities of *T. luquillensis* and *T. subsessilis* occur within the Palo Colorado vegetation

type. Some localities of *T. luquillensis* and *T. subsessilis*, and all the localities of *I. sintenisii* occur in the dwarf forest vegetation type. The dwarf forest association is found on the mountain summits at elevations greater than 750 meters, and covers only 2 percent of the El Yunque National Forest (Silander et al. 1986).

f. Other relevant information

Little is known about the reproductive biology and the propagation of these five species. However, recent work on *S. portoricensis* by the PRCT shows that the species is easily propagated from seeds. Material planted by the PRCT in one of their properties (Barranquitas) in central Puerto Rico develop into reproductive individuals and are producing abundant fruit. About 50 individuals of *S. portoricensis* provided by the PRCT were planted by USFWS staff in a forest area adjacent to the Puerto Rican Parrot aviary within the El Yunque National Forest (USFWS, 2012). Additionally, over 100 individuals were planted in a conservation area adjacent to the Carite Commonwealth Forest in the municipality of Patillas. This last effort is part of a Partners for Fish and Wildlife Agreement with the NGO Las Casas de la Selva. The Caribbean Ecological Services Field Office is beginning the monitoring of both efforts in collaboration with partners from the USFS and Las Casas de la Selva.

2. Five Factor Analysis

(a) Present or threatened destruction, modification or curtailment of its habitat or range:

Forest management. Based on the information currently available to the USFWS, these five species are mostly restricted to El Yunque National Forest. This forest is managed by the USFS and occupies about 28,000 acres of land. At the time of listing, forest management practices such as the establishment and maintenance of plantations, selective cutting, trails and roads construction and maintenance, and shelter construction may have affected these trees. Furthermore, the proposed reconstruction and reopening of Road PR 191 was considered as a direct threat to some populations of these species. The destruction of the dwarf or elfin forests for the construction and/or expansion of communication facilities by the U.S. Navy and private entities were also considered a threat. A proposal for expansion of the Navy facilities at Pico del Este was also under consideration at that time.

Based on the available information, the core of the known populations of *I. sintenisii, S. portoricensis, C. ampla, T. subsessilis*, and *T. luquillensis* occur within the boundaries of El Yunque National Forest. Since the time of listing the USFWS has not documented any case of an individual of an endangered species being affected by forest management practices (management of plantations, trail maintenance or road construction). Moreover, the plans to reopen Road PR 191

have been abandoned due to the potential for further landslides that may compromise the project. Nonetheless, the USFS consults with the Service under Section 7 of the ESA when proposing actions within the forest to ensure that possible adverse effects to listed species are avoided or minimized before any such project is implemented. In addition, the USFS conduct environmental reviews documents under NEPA for all actions in the forest. These consultation mechanisms are effective tools to minimize possible effects of management activities on species and their habitats.

Moreover, on July 26, 2005, the U.S. Congress enacted the Caribbean National Forest Act of 2005, to designate approximately 10,000 acres of land in the El Yunque National Forest as wilderness and as a component of the National Wilderness Preservation System in accordance with the Wilderness Act (16 U.S.C. 1131 *et seq*.). This provides an additional level of protection to activities that may affect these species. However, the protection of private lands adjacent to the El Yunque National Forest is still a concern (See factor D).

Communication facilities. The USFS has established Standards and Guidelines that do not allow new impacts to the elfin forest (including further expansions or development or construction of new communications towers (Luis Rivera USFS, 2011, pers. comm.). Furthermore, the U.S. Navy no longer operates their facilities at Pico del Este, and they transferred the radar station to the Federal Aviation Administration. Based on the available information, there are no plans or need to expand the existing communication facilities. Current construction activities are basically regular maintenance and replacement of equipment that is confined to the original footprint of the facilities.

Development on private lands. Although we consider these species currently restricted to El Yunque National Forest, private lands with forested suitable habitat in areas adjacent to El Yunque have not been extensively surveyed for the possible presence of these species. We do not discard the possible presence of individuals of these species (*S. portoricensis, C. ampla, T. subsessilis*, and *T. luquillensis*), on suitable habitat outside the forest or just along the forest boundary. These individuals, if present, may be threatened by habitat destruction and modification. In the last decade, the USFWS has provided technical assistance to the Puerto Rico Planning Board on at least three large-scale residential projects in the area. Although Puerto Rico's Planning Board designated a buffer zone surrounding El Yunque National Forest as a Special Planning Area to protect the forest from direct impacts due to development, habitat within the buffer zone and in adjacent areas has experienced modification from the construction of residential projects.

Based on the above, we consider the present or threatened destruction, modification, or curtailment of the species habitat or range as low in magnitude and not imminent threat to these species.

(b) Overutilization for commercial, recreational, scientific, or educational purposes:

Despite the fact that plant collection in El Yunque National Forest is prohibited, when the five species were listed, collection was considered a threat due to the ornamental potential of these species. However, there is no evidence indicating that the species has been affected by these factors. Based on the above, we believe that overutilization for commercial, scientific or educational purposes is no longer a threat to these species.

(c) Disease or predation:

At the time of listing, disease or predation was not considered a threat to the species. Based on the best available information, we continue to consider that the species is not threatened by this factor.

(d) Inadequacy of existing regulatory mechanisms:

As previously mentioned, the core of the populations of *I. sintenisii, S. portoricensis, C. ampla, T. subsessilis*, and *T. luquillensis* known at the time of listing occur within the boundaries of El Yunque National Forest, a forest area managed by the USFS and that occupy about 28,000 acres. As a Federal agency, the U.S. Forest Service is mandated to comply with the Endangered Species Act (ESA). Section 7 of the ESA requires Federal agencies to ensure that any action authorized, funded or carried out by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat.

The Caribbean National Forest Act of 2005, designated 10,000 acres (4,047 ha) within the EYNF as a component of the National Wilderness Preservation System in accordance with the Wilderness Act (16 U.S.C. 1131 *et seq*.). The designation of this wilderness area implies that the habitat has a special protection, as any kind of development is not allowed. All actions in this area require special approval from the USFS.

In 1999, the Commonwealth of Puerto Rico approved Law No. 241, known as the New Wildlife Law of Puerto Rico (*Nueva Ley de Vida Silvestre de Puerto* Rico). The main purpose of this law is to protect, conserve, and enhance both native and migratory wildlife species by declaring all wildlife species within its jurisdiction as the property of Puerto Rico, and by regulating permits and hunting activities. This law also has provisions to protect habitat for all wildlife species, including plants.

In 2004, the PRDNER approved Regulation 6766 to regulate the management of threatened and endangered species in the Commonwealth of Puerto Rico (*Reglamento 6766 - para Regir el Manejo de las Especies Vulnerables y en Peligro de Extinción en el Estado Libre Asociado de Puerto Rico*). (Article 2.06

of this regulation prohibits among other activities, the collection, cutting, or removal of listed plant individuals within the jurisdiction of Puerto Rico. *Ilex sintenisii* was listed in Regulation 6766 as endangered, whereas *S. portoricensis*, *C. ampla*, *T. subsessilis*, and *T. luquillensis* were listed in the regulation as critically endangered.

Since the currently known populations of these species are mostly restricted to El Yunque National Forest, and there are appropriate Commonwealth and Federal laws and regulations protecting these five species, we believe that the inadequacy of existing regulatory mechanisms should no longer be considered a threat to them. However, historical collections indicate that suitable habitat may extend to private properties adjacent to El Yunque. In fact, some of the known populations that occur within El Yunque National Forest are located just along the boundaries of the forest. Thus, it is important to note that enforcement on private lands continues to be a challenge as accidental damage or extirpation of individuals has occurred with other federally listed species due to lack of knowledge of the species by private land owners and law enforcement officers.

(e) Other natural or manmade factors affecting its continued existence:

Hurricanes, Landslides and Climate Change. Due to the low number of populations and individuals, hurricanes were identified as a threat to *I. sintenisii, S. portoricensis, C. ampla, T. subsessilis* and *T. luquillensis* in the final rule. As endemic to the Caribbean, these tree species should be well adapted to tropical storms disturbance. However, the low number of populations and individuals pose a threat to the species by making them more susceptible to stochastic events such as hurricanes. In fact, it is not clear to what extent populations of these species may have been affected by Hurricane Hugo (which devastated El Yunque National Forest in 1989) or Hurricane Georges (in 1998). The heavy rains associated with tropical storms and hurricanes in the mountains of Puerto Rico often lead to landslides.

Natural landslides are common as part of the forest dynamics of El Yunque and it is expected that the frequency of this disturbance increases as a result of severe extreme rain events or droughts. Given the steep slopes on which most of these species grow, massive landslides may extirpate entire populations. The USFWS is aware that an area of road PR 191 that formerly connected the municipalities of Río Grande and Naguabo, and that run across the forest has historically been affected by landslides. This area was the site of some populations that were not located by the interagency group in 2011. Due to the severity of landslides, it was determined that it was not logistically and economically feasible to repair this road. Based on the 2011 surveys, *I. sintenisii* seems to be the only species that is not imminently threatened by hurricanes and landslides. The prime habitat for *I. sintenisii* is associated with dwarf forest vegetation. Due to the low agricultural value and inaccessibility of this habitat, this vegetation was not cleared during the peak of the deforestation of the island, and thus some of the highest parts of El

Yunque remain as pristine forest. This explains the relative abundance of the species along the summits of Pico El Yunque and Pico del Este.

All these five species may be further threatened by climate change, which is predicted to increase the frequency and strength of tropical storms and can cause severe droughts (Hopkinson et al. 2008). Vulnerability to climate change impacts is a function of sensitivity to those changes (e.g., changes rain regime and moisture availability), exposure to those changes, and adaptive capacity (Glick et al. 2011). Despite the relative abundance and apparently stability of the populations of *I. sintenisii*, its habitat is considered rare in Puerto Rico. These areas (dwarf forest vegetation) are ecological islands that harbor unique vegetation and environmental conditions. Shifts of vegetation communities are expected as temperatures and moisture regimes are altered by climate change. Under this scenario populations of *I. sintenisii* as well as *S. portoricensis, C. ampla, T. subsessilis*, and *T. luquillensis* may be displaced or outcompeted by native or exotic species with wider environmental plasticity.

Despite the low number of populations and individuals, the USFWS considers hurricanes, landslides and climate change as a moderate and non-imminent threat to these species.

Genetic Variation. Along with a decreasing population size, negative impacts of habitat fragmentation may result in erosion of genetic variation through the loss of alleles by random genetic drift (Honnay and Jacquemyn 2007) and may also limit the ability of a species to respond to a changing environment (Booy et al. 2000). Given the extremely small population size and lack of connectivity between populations of *S. portoricensis, C. ampla, T. subsessilis* and *T. luquillensis* in Puerto Rico, it is highly likely that their genetic variability is extremely low. Based on the above, we consider the lack of genetic variation a high and imminent threat to *S. portoricensis, C. ampla, T. subsessilis* and *T. luquillensis*.

Overall, we consider hurricanes, landslides, climate change and genetic variation as threats to *S. portoricensis, C. ampla, T. subsessilis* and *T. luquillensis*. Due to the small number of populations, the USFWS considers the above mentioned threats as high in magnitude and imminent for those species. In the case of *I. sintenisii*, the species is at least stable and probably improving, thus we consider the above mentioned threats as low and non-imminent.

3. Synthesis

When *I. sintenisii, S. portoricensis, C. ampla, T. subsessilis* and *T. luquillensis* were listed as endangered in April 22, 1992, they were considered largely restricted to El Yunque National Forest and limited to a few populations. In the case of *C. ampla, S. portoricensis, T. subsessilis* and *T. luquillensis*, all have populations whose status are unknown and the little information available indicate that they are showing no natural recruitment. Moreover, it is probable that some

of the historically known populations have been extirpated due to the small size of populations and the lack of natural recruitment (e.g., *S. portoricensis*). *Callicarpa ampla* was found only in two of the five locations reported in the recovery plan, and information about its natural recruitment is minimal. *Ternstroemia subsessilis* and *T. luquillensis* show a similar scenario with populations that either by taxonomical confusion or by lack of precise location data were not located during recent surveys. Some of the historical populations of these species were located on areas that are affected by landslides on a regular basis. Furthermore, *T. subsessilis* and *T. luquillensis* have never been propagated by seed or asexually. *Styrax portoricensis* is currently known from only two reintroduced sites, one within El Yunque National Forest and the other in a property managed by PRCT in the municipality of Barranquitas. Although *S. portoricensis* has been successfully propagated and individuals reintroduced in the PRCT property are producing seeds, the USFWS has no data that indicate that natural recruitment is occurring.

Overall, *C. ampla*, *S. portoricensis*, *T. subsessilis* and *T. luquillensis* are threatened by habitat destruction or modification (Factor A), and other natural or manmade factors (i.e., hurricanes, landslides, climate change and genetic variation; Factor E). According to this review, Factor A seems to be minimal and non-imminent for these species. However, the low number of populations and individuals highlight the possible cumulative adverse effects due to the natural factors mentioned above. Thus, these species may be highly susceptible to stochastic events. Therefore, we consider Factor E as high in magnitude and imminent.

The new information on *I. sintenisii* is noteworthy as populations seem to be healthy and the estimated number of individuals has expanded from about 200 to approximately 492 individuals. The USFWS considers there is further suitable habitat that may be occupied by this species, but that have not been adequately surveyed due to the inaccessibility of these areas (Pico del Este and Pico El Yunque). The dwarf forest vegetation upon which *I. sintenisii* depends occupy at least 1,000 acres within El Yunque National Forest. In addition, new information about the taxonomy on the group suggests that it is conspecific (synonym) with *Ilex obcordata*, implying the species may have a broader range that extends throughout the Greater Antilles. Thus, the species may be more common and abundant than what was determined at the time of listing. The habitat of *I. sintenisii* is not used for forest plantations and remains almost pristine, and the installation of communication facilities are regulated within the El Yunque National Forest. In general, the overall status of this species appears to be improving. We recommend a comprehensive survey and assessment of the populations to determine if species reclassification is appropriate.

III. RECOMMENDATIONS FOR FUTURE ACTION

1. The USFS should establish a long term monitoring program for the populations of listed plants at El Yunque National Forest to determine population trends for these species. The guidelines for these monitoring should be included as part of the El Yunque National Forest Management Plan.

2. Develop a comprehensive survey and assessment of the population of *I. sintenisii*. This survey must be standardized to ensure that the habitat (dwarf forest) is efficiently surveyed.

3. Molecular studies should be conducted to determine the relationships within the genus *Ilex* in Puerto Rico.

4. The USFS, PRDNER and the USFWS should develop an intensive survey program to inventory areas within and outside El Yunque National Forest with potential habitat for these species. This program should include training to field biologists to allow personnel to recognize listed species in the field.

5. The populations that are actively producing seeds need to be identified and monitored to collect seed material for recovery purposes. A protocol to collect seed should be developed and implemented to avoid altering the natural recruitment of the species.

6. Enhancement of natural populations should be considered a priority, particularly for *S. portoricensis, C. ampla, T. subsessilis* and *T. luquillensis*. The development of adequate propagation techniques is essential for the recovery of these species.

7. Studies should be conducted to determine the patterns of genetic variation within and among populations, in order to develop a plan to preserve the species genetic variability.

8. The recovery plan should be revised to establish measurable delisting criteria, including how many individuals constitute a self-sustainable population and how many populations would be needed to delist the species.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Callicarpa ampla, Ilex sintenisii, Styrax portoricensis, Ternstroemia luquillensis* and *Ternstroemia subsessilis*

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
_X_ No change needed

Review Conducted By: Omar A. Monsegur, Caribbean Ecological Services Field Office, Boquerón, Puerto Rico.

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve Edwin Muñiz Date Sept 2, 2015

REGIONAL OFFICE APPROVAL:

Lead Regional Director, Fish and Wildlife Service

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Approve Frank Quinta III Date 9/8/2015