



# **Puerto Rico's Forests, 2009**

**Thomas J. Brandeis and  
Jeffery A. Turner**

**United States  
Department of  
Agriculture**

**Forest Service**



**Southern  
Research Station**

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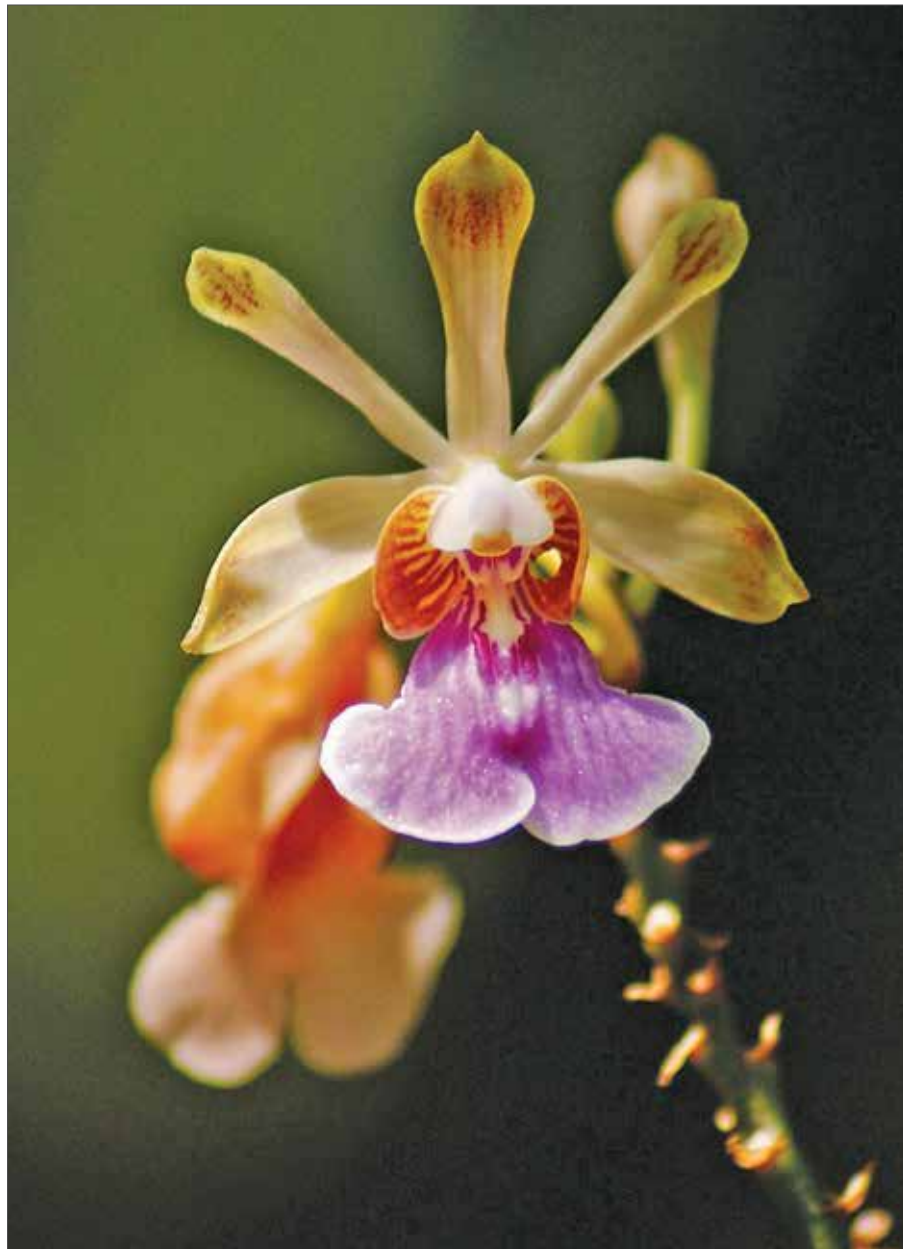
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All photos by Thomas J. Brandeis, Southern Research Station, unless otherwise noted.

Front cover: top left, forest tree roots bind the soil to steep slopes, protecting them from erosion.; top right, the view from El Yunque National Forest towards the town of Luquillo on the northeast coast of Puerto Rico.; bottom, Playa Escondida in the Northeast Ecological Corridor, Puerto Rico. Back cover: top left, El Yunque National Forest.; top right, a freshwater seep in the El Yunque National Forest.; bottom, lower montane forest understory.



The native island peacock orchid (*Psychilis macconnelliae*). (photo by Dr. Humfredo Marcano, Southern Research Station)





# **Puerto Rico's**

## **Forests, 2009**

**Thomas J. Brandeis and  
Jeffery A. Turner**



Subtropical wet forest in northeastern Puerto Rico.



## Welcome...



Ariel E. Lugo

We are pleased to announce the publication of the 2009 forest inventory for Puerto Rico. Puerto Rico's Forests, 2009, published by the Forest Inventory and Analysis (FIA) Program of the U.S. Forest Service, is a valuable resource for managers of the island's forests. The FIA program has included Puerto Rico in its federally mandated inventories of our Nation's forests since 1980; this particular inventory adds Mona Island to the installation of permanent plots, an important addition in light of the many conservation efforts by both Federal and local agencies to preserve this nature reserve.



Robert L. Doudrick

Forest cover on mainland Puerto Rico has remained relatively stable, according to the 2009 forest inventory. The number of trees removed, i.e., anthropogenic interventions to cut and clear forested land, has been remarkably small, according to the inventory. From 2004 to 2009, Puerto Rico's average annual net removal of live trees on nonindustrial private forest land was 85,028 cubic feet of wood volume, a small amount compared to the 1.2 billion cubic feet of wood found in the island's forests. This finding might be attributed to the nationwide economic downturn of 2008 that impacted real estate and other undertakings in Puerto Rico. Since 85 percent of Puerto Rico's forests are on private land, the economic downturn effectively halted indiscriminate development of many of Puerto Rico's forests otherwise vulnerable to development through absence of statutory protection.



Cristina Cabrera

We should remain vigilant in protecting our natural resources. As both the national and local economies begin to recover, our forest resources will remain vulnerable to competing uses. By promoting sustainable forestry and agroforestry practices, and by providing up-to-date tree census information from the FIA program, we can help private landowners find suitable alternatives that not only produce income but also conserve their forested land.



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### Foreword

The Forest and Rangeland Renewable Resources Research Act of 1978 mandated inventories of our Nation's forest resources. These inventories are part of a continuing nationwide undertaking by the regional experiment stations of the U.S. Department of Agriculture Forest Service and cooperating State forestry agencies. Forest inventories in the 13 Southern States (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia), the Commonwealth of Puerto Rico, and the Territory of U.S. Virgin Islands are conducted by the Southern Research Station (SRS), Forest Inventory and Analysis (FIA) Research Work Unit (SRS-4801) operating from its headquarters in Knoxville, TN, and offices in Asheville, NC, and Starkville, MS. The primary objective of these appraisals is to develop and maintain the resource information needed to formulate sound forest policies and programs.

Additional information about any aspect of this inventory may be obtained from:

Forest Inventory and Analysis  
Southern Research Station  
4700 Old Kingston Pike  
Knoxville, TN 37919  
Telephone: 865-862-2000  
William G. Burkman  
Program Manager

This resource bulletin highlights changes in Puerto Rico's forest resources as interpreted from the second cycle of annual remeasurements. Annual inventories of the United States, associated Commonwealth and Territory forests were originally mandated by the Agricultural Research

Extension and Education Reform Act of 1998 (Farm Bill). These inventories feature: (1) a nationally consistent, fixed-radius, four-point plot configuration; (2) a systematic national sampling design consisting of a base grid derived by subdividing the Environmental Monitoring and Assessment Program grid into roughly 6,000-acre hexagons; (3) integration of the forest inventory and forest health monitoring sampling designs; (4) annual measurement of a fixed proportion of permanent plots; (5) reporting of data or data summaries within 6 months after yearly sampling; (6) a default 5-year moving average estimator, with provisions for optional estimators based on techniques for updating information; and (7) a summary report every 5 years. Additional information about annual surveys is available at <http://fia.fs.fed.us/>.

The SRS FIA Research Work Unit and the International Institute of Tropical Forestry (IITF) began data collection for this fourth forest inventory of Puerto Rico in 2005. The usual FIA strategy involves rotating measurements of five systematic samples (or panels), each of which represents about 20 percent of all plots in the State. The 20-percent systematic sample is referred to as one panel of inventory data. A panel may take more than or less than 1 year to complete. In Puerto Rico, however, the sampling is completed in 4 panels and cycle 4 measurements were taken from 2005 to 2009. This bulletin provides inventory statistics and discusses the principal findings from the full remeasurement of all four panels of annual inventory data from the mapped-plot design. Forest land estimates and inventory volume, growth, removals, and mortality statistics are summarized from the data collected for the four panels.



## About Forest Inventory and Analysis Inventory Reports

Two previous periodic inventories and an update completed in 1980, 1985, and 1990 have provided estimates for measuring changes and trends at the Commonwealth level. However, caution is advised when making such comparisons. The annual system represents a dramatic departure from methods used to conduct the previous periodic surveys. Moreover, the annual system continues to evolve as changing technologies are adapted and implemented to improve FIA surveys. The 2009 inventory, for instance, incorporates land area stratification estimates based on satellite imagery which replaces the aerial photography estimation method used in previous inventories, including the 2001–04 Puerto Rico forest

inventory. Improving the accuracy or efficiency of the FIA surveys is justification for altering how the inventory is conducted. However, change detection and trend analysis over time become more difficult due to differences in inventory methods.

The 2009 inventory data, as well as data for other States and survey years, are available at <http://apps.fs.fed.us/fiadb-downloads/datamart.html> and the tools to query those data at <http://www.fia.fs.fed.us/tools-data/default.asp>. Tabular summaries of the current resource statistics for Puerto Rico used in this report are available at [http://srsfia2.fs.fed.us/states/puerto\\_rico.shtml](http://srsfia2.fs.fed.us/states/puerto_rico.shtml). Click on the 2009 survey year. Tabular data for previous surveys also are available at that Web site.

### Acknowledgments

We gratefully acknowledge the U.S. Forest Service's International Institute of Tropical Forestry (IITF), Puerto Rico Department of Natural and Environmental Resources (DNER), and University of Puerto Rico (UPR) Río Piedras Campus for their assistance with the forest inventory of Puerto Rico. FIA also thanks other public agencies and the many private landowners who provided access to measurement plots.

The following field and office personnel contributed to the inventory effort:

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Scientists like Dr. Humfredo Marcano with the FIA program collect data annually on the forests of Puerto Rico. (photo by Iván Vicéns, IITF, U.S. Forest Service)



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Shade-grown coffee, while less common than in the past, is still an important agroforestry crop along the Cordillera Central of Puerto Rico. (photo by Dr. Humfredo Marcano, Southern Research Station)





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Puerto Rico's forested mountain slopes provide the island with fresh water.



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### Forest Area

- Forest area on mainland Puerto Rico held steady, or increased slightly, from 2004 (1,127,416 acres) to 2009 (1,168,291 acres). Expressed in terms of the percent cover of the island, the change was a 1.9 percent increase (52.8 percent in 2004 to 54.7 percent in 2009). This change would seem to indicate that the rate of forest cover increase on mainland Puerto Rico has slowed since the forest inventory began in 1980. Both Culebra (94.6 percent in 2004 to 90.2 percent in 2009) and Vieques (77.1 percent in 2004 to 74.4 percent in 2009) may have experienced a slight loss in forest cover. But, in all these instances the sampling errors are sufficiently large to encompass these small changes in forest cover, making it best to state that forest cover on all three islands remained relatively stable from 2004 to 2009.

### Forest Ownership

- Puerto Rico's forests are 85.1 percent privately owned. The remaining forests are publically administered by the Commonwealth of Puerto Rico (11.1 percent) or the U.S. Federal Government (3.7 percent).

### Biomass, Carbon, and Volume

- There are 1.28 billion cubic feet of merchantable wood in Puerto Rico's forests, 86 percent of which is on unreserved, private lands. Even though larger diameter trees make up a relatively small percentage of the total number of trees in the forest, they provide most of the merchantable volume, particularly in the subtropical moist and subtropical lower montane wet and rain forests. There are 54.0 million tons of above and belowground live tree

Sierran palm forest (*Prestoea acuminata*) are found at higher elevations in Puerto Rico's mountains.





biomass, which converts to approximately 27.0 million tons of carbon, stored in the forests of Puerto Rico.

### Net Growth, Removals, and Mortality

- Puerto Rico's forest trees grew by 65.6 million cubic feet each year but lost 31.6 million cubic feet per year to natural mortality and another 85,028 cubic feet to removals from harvesting and land clearance, for a net annual gain of 34.0 million cubic feet on average from 2004 to 2009. This means a net total gain of 170.0 million cubic feet of wood volume over the entire 5-year period. A total of 425,140 cubic feet of wood were removed from the forests by cutting or land clearance over that same 5-year time period.

### Forest Stand Structure and Tree Species Composition

- The predominant stand size varies widely across the forested life zones of Puerto Rico. Small diameter stands predominate in the subtropical dry forests while lower montane wet and rain forests are principally made-up of larger diameter stands. All stands surveyed on Culebra were small diameter

ones. Mona Island stands were 96 percent small diameter and 4 percent medium diameter. On Vieques, 88 percent of the stands were small diameter, 10 percent were medium diameter and 2 percent were large diameter.

- A total of 298 species were encountered on the forest inventory plots measured from 2006–09. The most important species have not changed much since the previous inventory. *Spathodea campanulata*, the African tulip tree, maintains its position as the most frequently encountered tree and the tree with the greatest measured sum total basal area.

### Forest Health

- For trees with diameter at breast height (d.b.h.)  $\geq 5.0$  inches, 62.0 percent showed some sign of damage or disease. Nearly 78 (77.6) percent of that damage was the presence of conks, fungal fruiting bodies, and other signs of advanced decay, but 95.6 percent of that observed fungus and decay was of minor severity, affecting <10 percent of the affected tree's roots, stump, or bole. An assessment of tree crowns did not show any signs of widespread damage or disease.



### Introduction

#### Puerto Rico's Fourth Forest Inventory

This report presents the results of the fourth forest inventory of the islands of the Commonwealth of Puerto Rico. Inventory methods and specific objectives have evolved since the first forest inventory in 1980 that had a strong focus on answering questions regarding the island's capacity to produce timber (see Birdsey and Weaver 1982, Brandeis and others 2007 for an overview of those changes). But the primary goal has remained the same; assess and monitor the status of the resource and provide that information to all stakeholders. The annualized inventory methods first applied during the third forest inventory which began 2001 (see Brandeis and others 2007) were a major change from the periodic inventories of 1980 and

1990. These annualized methods have been further refined and improved for this fourth inventory which began in 2006. Additionally, the remeasurement of the same plots and trees that were measured during the third forest inventory allows us to make accurate estimates of change over the intervening 5-year period for the first time. The estimates of net tree growth, removals, and mortality made in this report provide unique first-time, insights into subtropical forest dynamics and the continuing changes in Puerto Rico's forests.

This report summarizes and interprets those results, supplementing the tables and data that can be downloaded from the Internet. We discuss recent trends in Puerto Rico's forest area, the patterns of forest ownership, biomass carbon and wood volume stored in the forests, net growth, removals, and mortality, forest stand structure, tree species composition, and forest health issues.

Where not disturbed by human activity, dense, highly diverse forests cover the slopes of Puerto Rico's mountains.





### Methods Used in the 2009 Forest Inventory

#### Study Area and Forest Associations

As with the previous forest inventory, forests on mainland Puerto Rico, Vieques and Culebra were sampled and measured (see Brandeis and others 2007 for details on the sampling design). Mona Island was added with the installation of permanent forest inventory and monitoring plots in 2008. Smaller islands, such as Desecheo, Caja de Muertos, etc., are still not included in the inventory. We continue to use the Holdridge life zones (Holdridge 1967) as described in detail by Ewel and Whitmore (1973) as broad depictions of forest type groups and convenient categories for the presentation of the results.

#### Forest Area Estimation

An area must have a minimum of 10 percent canopy cover of trees, or that had such tree cover previously, and is not undergoing development for a nonforest use to be considered forested by the Forest Inventory and Analysis (FIA) program. We also require that the forest have a minimum area of 1 acre or be in a strip at least 120 feet wide. More details on how we define forest can be found in Brandeis and others (2007) and the FIA field manual (U.S. Department of Agriculture Forest Service 2005). Previously we used a combination of aerial photograph interpretation and classified satellite imagery to estimate forested acreage (Brandeis and others 2007, Kennaway and Helmer 2007, Helmer and Ruzycski 2008). Currently we only use aerial photograph interpretation to assign plots to meaningful strata so that stratified estimation methods can be used to reduce the variance of our estimates and land area stratification estimates based on satellite imagery (see Reams and others 2005, Scott and others 2005, and Woudenberg and others 2010 for more information on the stratified estimation approach used by FIA).

### Field Data Collection and Forest Health Monitoring

The FIA sampling and field plot designs have remained essentially unchanged since the previous forest inventory (U.S. Department of Agriculture Forest Service 2005). We increased the number of plots on Vieques and Culebra to reduce the variance around our estimates for those islands. We also extended our sampling grid to include Mona Island and installed permanent plots there for the first time. We remeasured all plots from the previous inventory except for a small percentage that could not be relocated, usually due to a major change in the forest like land clearing. When the previously installed plot could not be relocated, a new plot was installed where the field crew believed the plot should have been. Table A.1 presents the numbers of sampling points and permanent plots measured in the 2009 forest inventory.

On the remeasured plots, all previously tallied trees were relocated and remeasured. New ingrowth trees were also noted, measured and added to the inventory. Trees that died since the last inventory were noted, measured if still standing, and the cause and date of death estimated. All trees on the plots that were harvested or removed as part of land clearing were also accounted for and their estimated removal dates recorded.

We again assessed indicators of forest health with an assessment of tree crown condition. The FIA methods for assessing and analyzing these forest health indicators are described in detail in the FIA field manual (U.S. Department of Agriculture Forest Service 2007c, a, b) and forest health indicator technical documents (O'Neill and others 2005, Smith and Conkling 2005).





Puerto Rico's forests are important carbon sinks, increasing the amount they store in their aboveground biomass each year.

### Analysis and Statistical Techniques

How we process data collected on forest inventory plots in Puerto Rico changed considerably since 2004. Previously it was necessary to use custom computer programming and statistical analyses to take into account the islands' unique tree species, forest type groups and locally-developed volume and biomass equations, as described in Brandeis and others (2007). Since that time, all of this Caribbean-specific information has been incorporated into the National Information Management System (NIMS) and the FIA database (FIADB) which provide consistent data processing, formatting, and storage for the FIA program nationwide (Woudenberg and others 2010). Processing the Caribbean islands data through NIMS provides us with a wider variety of more accurate forest parameter estimates than were previously possible with the simpler custom programming. These changes in how the data were processed, however, also result in minor, statistically insignificant differences in the results presented previously for the third forest inventory and those presented in this report.

No changes were made to the volume and biomass equations and methods described in Brandeis and others (2007). We use the same suite of allometric equations that predicts total aboveground tree biomass using the measured diameter at breast height (d.b.h.) and total tree height. However, we did make a change to the methods for estimating live tree belowground biomass and carbon. Rather than use the stand-level regression equations from Cairns and others (1997) that were used for the third forest inventory estimates, we used an aboveground to belowground biomass ratio used in the FIA biomass expansion factor methodology called the Component Ratio Method (CRM). Unlike the dry and green biomass weight estimates made in each FIA region using locally developed allometric equations, the CRM estimates are made using a nationally consistent methodology. Finally, the dry biomass estimates are multiplied by 0.5 to derive a carbon estimate. Detailed description of the CRM, conversion coefficients, and ratios can be found in Smith and others (2002), Jenkins and others (2003a, b), and Heath and others (2008).



### Results of the 2009 Forest Inventory

#### Forest Land

Forest area on mainland Puerto Rico held steady, or increased slightly, from 2004 (1,127,416 acres) to 2009 (1,168,291 acres) (table A.2). Expressed in terms of the percent cover of the island, the change was a 1.9 percent increase (52.8 percent in 2004 to 54.7 percent in 2009). This change would seem to indicate that the rate of forest cover increase on mainland Puerto Rico has slowed since the forest inventory began in 1980 (fig. 1). Both Culebra (94.6 percent in 2004 to 90.2 percent in 2009) and Vieques (77.1 percent in 2004 to 74.4 percent in 2009) may have experienced a slight loss in forest cover.

But, in all these instances the sampling errors are sufficiently large to encompass these small changes in forest cover, making it best to state that forest cover on all three islands remained relatively stable from 2004 to 2009. The sampling errors in figure 1 are a percent of total forest land on mainland Puerto Rico in 1980 (1.5 percent), 1985 (2.0 percent), 1990 (1.7 percent), 2001–04 (3.5 percent), and 2006–09 (3.5 percent). The forested acres on the islands of Vieques, Culebra, and Mona are not included in this figure because those islands were not inventoried prior to 2001. Forest area in 2004 and 2009 is presented by forest type group (Holdridge life zone) in figure 2.

Readers will note the difference between the 2004 forest cover estimates made here and

those in the Brandeis and others (2007) publication. For example, we now estimate that mainland Puerto Rico had 1,127,416 acres of forest (53 percent forest cover) at that time while previously we estimated that there were 1,211,687 acres (57 percent forest cover) (Brandeis and others 2007). The forest area estimates differ similarly for Vieques and Culebra. These differences are due to changes in the methods used by FIA to estimate forest area as mentioned in the methodology section.

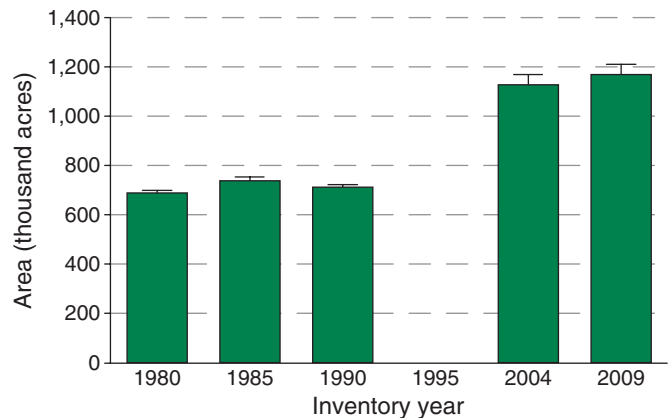


Figure 1—Forest area with sampling errors of mainland Puerto Rico for the 1980, 1990, 1985 (partial update), 2004, and 2009 forest inventories.

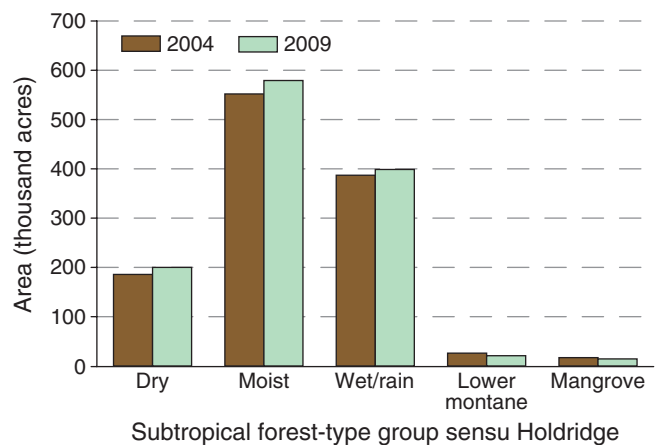


Figure 2—Forest area by forest-type group, Puerto Rico, 2004 and 2009.



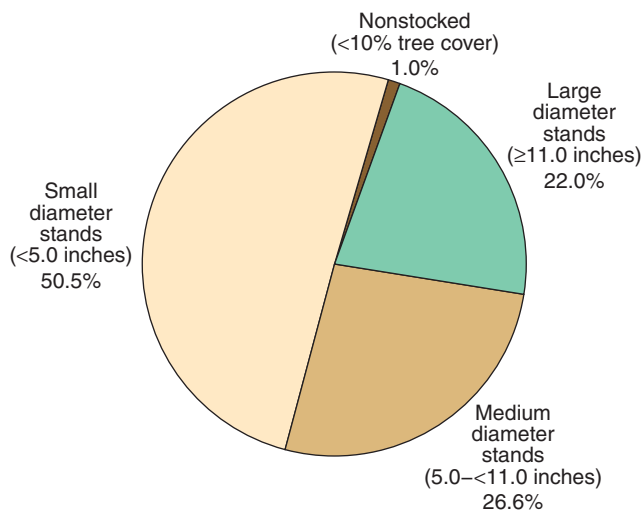
### Forest Ownership

Puerto Rico’s forests are predominately (85 percent) privately owned, but there are also important public forests managed by the Puerto Rico Department of Environmental and Natural Resources (DENR) and Federal agencies (table A.3). Table A.3 presents forest acreage by ownership classes and forest land status and table A.4 presents forest land by forest-type and ownership group. Forest land status is categorized as reserved if the harvest of trees is restricted by law or statute. By default the FIA program assumes that national parks, wildlife refuges, and many other types of public lands are reserved areas. For Puerto Rico, we made the assumption that all Federal and Commonwealth or local government lands would be reserved from timber harvesting and that private land could potentially have harvesting activities. We realize that there are privately-owned lands that are reserved from timber harvesting, such as those owned by nongovernmental organizations that manage lands for conservation purposes (for example, the Conservation Trust of Puerto Rico—Fideicomiso de Conservación de Puerto Rico). But none of our sampling points fell on those lands so they were not represented in this inventory.

### Forest Stand Structure and Tree Species Composition

**Forest Stand Structure**—Forest stands are classified according to the predominant diameter class of live trees present. For the subtropical hardwood forests of Puerto Rico, large diameter stands were those with trees predominately  $\geq 11.0$  inches d.b.h. Medium diameter stands had trees that were mostly 5–10 inches d.b.h. and small diameter stands were made-up of trees  $< 5.0$  inches d.b.h. (table A.5, figs. 3a and b). Nonstocked stands were those that had  $< 10$  percent tree cover. In Puerto Rico, a stand classified as nonstocked was usually due to part of a forested plot that was considered forest land but the trees were not sufficiently regenerated, dense, or developed to fully meet the minimum requirements. These stand-size classifications are considerably different from those used in Brandeis and others (2007) so it is best to compare the distribution of stand-size classes in 2009 to the reprocessed 2004 estimates (figs. 3a and b). Here we see that there have been minor changes in the distribution of stand sizes across the landscape, with a slight tendency toward increasingly larger diameter stands.

(A) 2004



(B) 2009

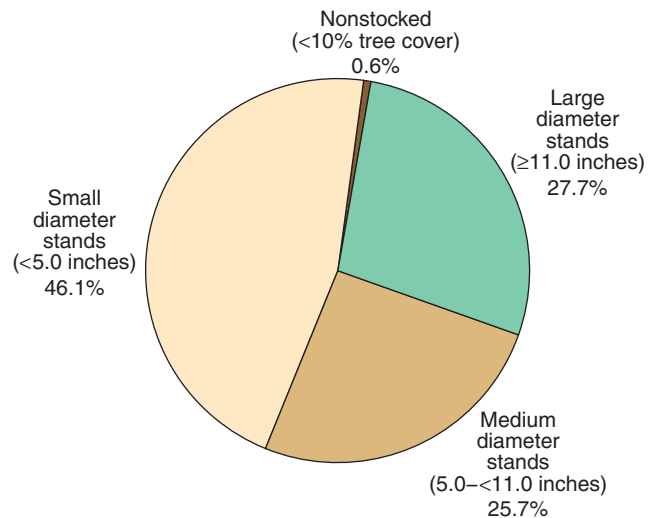


Figure 3—Stand-size class distribution, Puerto Rico, (A) 2004 and (B) 2009 (percentages may not sum to 100 due to rounding).



The forests of Vieques, Culebra, and Mona show distributions of stand-size classes that are different from those on mainland Puerto Rico. All stands surveyed on Culebra were small diameter ones. Mona Island stands were 96 percent small diameter and 4 percent medium diameter. On Vieques, 88 percent of the stands were small diameter, 10 percent were medium diameter and 2 percent were large diameter. We would expect that the forests found on these outlying islands would consist of smaller trees because their flatter topography and lower elevations fall almost entirely in the subtropical dry forest life zone. The predominant stand size varies widely across the forested life zones of Puerto Rico. Small diameter stands predominate in the subtropical dry forests while lower montane wet and rain forests are principally made-up of larger diameter stands (fig. 4).

Stands consisting of predominately larger-sized trees were found on Federal, Commonwealth, and private lands (table A.6). The El Yunque National Forest was 20.0 percent larger diameter stands and 80.0 percent medium diameter stands. Other Federal lands, particularly those

administered by the U.S. Fish and Wildlife Service, were 91.9 percent small diameter stands and 8.1 percent larger and medium ones. Commonwealth forests were 26.7 percent, 10.0 percent, and 63.3 percent large, medium, and small diameter stands while private lands were 28.8 percent, 26.6 percent, and 43.9 percent, respectively, plus a smaller percentage (0.7 percent) of nonstocked acres (table A.6).

**Tree Species Composition**—A total of 298 species were encountered on the forest inventory plots measured from 2006–09 (see the species list in appendix C). The total sampled area of all the plots combined was 44.26 acres. We further explore the “importance” of each tree species relative to each other by calculating their relative density (percent of the total number of stems measured that belong to the species), relative dominance (percent of the total measured basal area that belongs to that species) and relative frequency (percent of plots with that species) for all of Puerto Rico (tables A.7 and A.8) and by each Holdridge life zone (tables A.9–A.18). It is also instructive to separate these analyses into an overstory class (here defined as trees with d.b.h.  $\geq 5.0$  inches and a midstory, or sapling, class (trees with d.b.h.  $< 5.0$  inches but  $> 1.0$  inch).

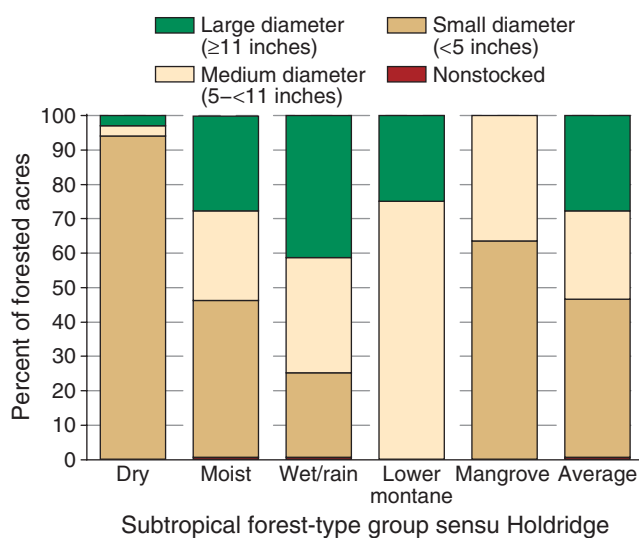


Figure 4—Percent of forested acres by stand-size class and forest-type group, Puerto Rico, 2009.

*Spathodea campanulata*, the African tulip tree, maintains its position as the most frequently encountered tree and the tree with the greatest measured sum total basal area (table A.7). The most important species have not changed much since the previous inventory (Brandeis and others 2007). Comparing which of the larger trees in the overstory species are important to those that are important as saplings in the forest midstory provides insight into forest regeneration and how species composition varies by tree size. For example, we can see that the African tulip tree is not only an important tree in the subtropical moist forest overstory, it also is regenerating well in the midstory as reflected by its high importance there



Unique, low-stature elfin forests are found on the tops of Puerto Rico's highest peaks.

as well (tables A.11 and A.12). In another example, if one were to just look at the species composition of larger trees in subtropical dry forest, one would not see *Leucaena leucocephala* (white leadtree) (table A.9). It is the most important dry forest tree species in the smaller diameter classes (table A.10), however, and plays an important role in these forests. We can see that *Cecropia schreberiana* (pumpwood) and *Guarea guidonia* (American muskwood) are very common trees in Puerto Rico's subtropical wet and rain forests, and that those forests still have a considerable number of trees once used for coffee shade like *Inga vera* (river koko), *Inga laurina* (sacky sac bean), *Erythrina poeppigiana* (mountain immortelle) and others (tables A.13 and A.14). Some of these tree species are also found at higher elevations in the subtropical lower montane wet and rain forests where dense stands of *Prestoea acuminata* (Sierran palm) are often found (tables A.15 and A.16).

## Mona Island

Researchers from Southern Research Station (SRS) FIA, the International Institute of Tropical Forestry, the Puerto Rico DENR, and University of Puerto Rico Río Piedras Campus installed a network of forest inventory and monitoring plots on Mona Island Natural Reserve in April, 2008 (for more details see Brandeis and others 2012). Mona Island's subtropical dry forest ecosystems are particularly unique due to their relative isolation and position at the western limit of Lesser Antillean flora and fauna and the eastern limit for many Greater Antillean species (Cintrón 1991). The island is known for its endemic flora and wildlife, particularly the threatened Mona ground iguana (*Cyclura cornuta stejnegeri*) (García and others 2007) whose habitat is impacted by feral goat and pig grazing (Meléndez-Ackerman and others 2008).



## Results of the 2009 Forest Inventory

In addition to the regular data collection, detailed descriptions of the nonwoody vegetation were also made to provide stakeholders and resource managers with information to guide management decisions.

A total of 104 vascular plot species were found (plus 2 unknown species), 35 of which were forbs/herbs, 26 shrubs, and 43 tree species. The forest vegetation assessment plots fell in what is described by Cintrón and Rogers (1991) as plateau forest, which covers 80 percent of the island. The most common tree and shrub species found, which are typical for the Mona Island plateau forest, were *Bursera simaruba* (gumbo limbo), *Plumeria obtusa* (Singapore graveyard flower), *Tabebuia heterophylla* (white cedar), *Coccoloba microstachya* (puckhout), *Euphorbia petiolaris* (manchineel berry), *Bourreria succulenta* (bodywood), *Reynosa uncinata* (sloe), *Antirhea acutata* (placa chiquitu), *Croton* spp., and *Opuntia repens* (roving prickly pear). The U.S. Federally endangered cactus, *Harrisia*

*portorricensis* (Puerto Rico applecactus), the endemic orchid *Psychilis monensis* (royal peacock orchid), and rare *Ziziphus taylorii* (Taylor's jujube) were also encountered. There were only three introduced species found on Mona Island, *Cereus hildmannianus* (hedge cactus), *Crotalaria berteriana* (Berteron's rattlebox) and *Ipomoea batatas* (sweet potato) and these were each found on <10 percent of the plots.

The forests on Mona Island are less dense, shorter, and have smaller diameters, averaging 1,379 stems per acre with d.b.h.  $\geq 1.0$  inch and 37.9 square feet of basal area per acre, and an average canopy height of only 15.1 feet. These values are typical of Caribbean subtropical dry forests at the drier end of the moisture gradient. Aboveground live tree biomass was notably less on Mona Island, averaging 12.8 tons per acre, when compared to the subtropical dry forests on the outer islands of Puerto Rico (18.2 tons per acre) and the U.S. Virgin Islands (21.2 tons per acre) (Brandeis and others 2007, Brandeis and Oswalt 2007).

Puerto Rico's forest and coastal marine ecosystems are tightly linked and interdependent.





### Number of Live Trees, Volume, Biomass and Carbon

**Number of Live Trees**—We estimate there are 1.46 billion trees with d.b.h.  $\geq 1.0$  inch in Puerto Rico, the vast majority of which are broadleaf “hardwood” trees (table A.19). There is also a minor introduced “softwood” component of about 200,000 pines and other conifers. Previously, we noted the predominance of stands consisting of smaller size trees. The fact that Puerto Rico’s forests are largely formed of smaller-sized trees is reinforced by looking at the size distribution of those 1.46 billion trees. The “reverse-J-shaped” distribution pattern seen in figure 5 is typical for most naturally regenerated, uneven-aged forests (Smith and others 1997). The decrease in numbers of trees  $>1.0$ –2.9-inch class is very steep and indicative of both relatively young stands and forest type groups like subtropical dry forests with small average tree sizes.

**Merchantable Stem Volume**—An important goal of the FIA program nationwide is estimating the amount of merchantable wood volume available for use by the wood products industry. While Puerto Rico’s wood products industries are relatively small-scale and focused on high-quality artisanal products (Kicliter 1997), there is still value in quantifying the amount of useful wood these forests could provide.

Gross merchantable volume is only estimated for trees with d.b.h.  $\geq 5$  inches, and is defined by FIA as being the cubic feet of sound wood in the central tree stem from a 1-foot stump to a minimum 4-inch top diameter or to where the central stem breaks into smaller limbs. A tree’s net volume is the gross volume minus percentages lost due to rot, missing portions of the tree, and deductions for poor form that have been noted by the field crews.

Tables A.20, A.21, A.22 and A.23 present net volume of live trees by: ownership class by land status, forest-type by stand-size

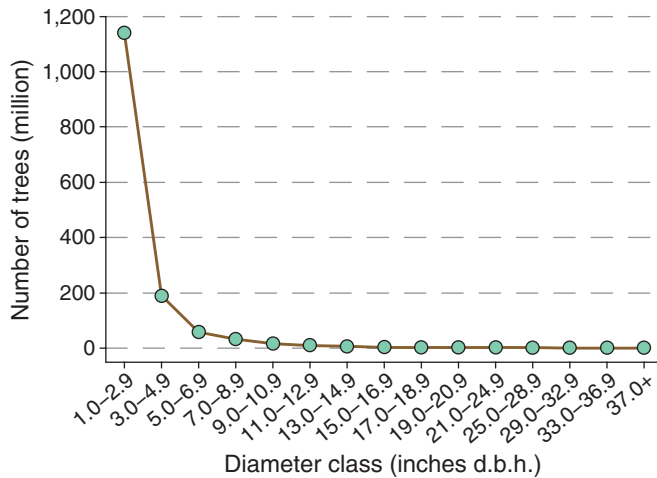


Figure 5—Number of trees with d.b.h.  $\geq 1$  inch by diameter class, Puerto Rico, 2009.

class, species group by ownership group, and species group by diameter class, respectively. We estimate that there are 1.28 billion cubic feet of merchantable wood in Puerto Rico’s forests, 86 percent of which is on unreserved, private lands (table A.20). Even though larger diameter trees make up a relatively small percentage of the total number of trees in the forest, they provide most of the merchantable volume, particularly in the subtropical moist and subtropical lower montane wet and rain forests (table A.21).

**Biomass and Carbon**—Quantities of merchantable wood volume might be of lesser importance to forest stakeholders in Puerto Rico, but total woody biomass and carbon is of growing interest. The quantities and distribution of biomass and carbon stored in Puerto Rico’s forest mimic that of net wood volume. But, unlike the previous volume estimates, biomass and carbon estimates include that held in trees that are too small to be harvested for wood products (i.e., those that are  $<5.0$  inches d.b.h.) and those portions of the tree that are currently considered nonmerchantable, the branches and tops.



The delivery of fresh water, held here by the Rio La Plata dam, is one of the vital ecosystem services delivered by Puerto Rico's forests. (photo by Dr. Humfredo Marcano, Southern Research Station)

We present overall biomass results made using the regional allometric biomass equations described in the Analysis and Statistical Techniques sections. Table A.24 shows the preponderance of aboveground tree biomass is being stored in privately owned, unreserved forests. We previously established the prevalence of smaller trees in the islands' forests and now we can see their importance in terms of biomass and

carbon storage. Twenty-nine percent of the aboveground live tree forest biomass is stored in trees with a d.b.h. between 1 and 4.9 inches (table A.25). This stored biomass and carbon is primarily found in the subtropical moist and wet/rain forests of mainland Puerto Rico because of its greater areal extent and higher concentrations per acre (figs. 6 and 7).

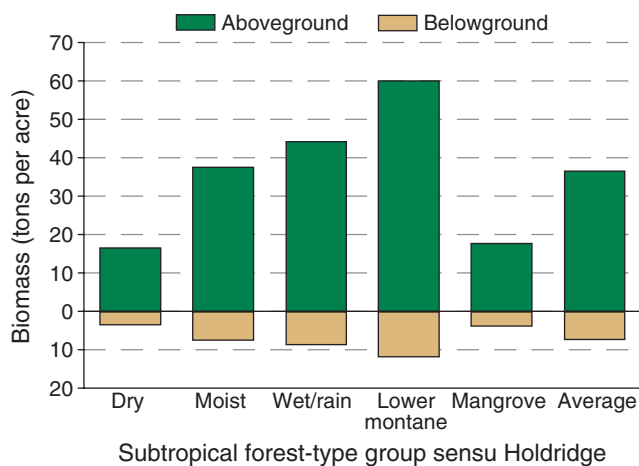


Figure 6—Above- and belowground live-tree biomass by forest-type group, Puerto Rico, 2009.

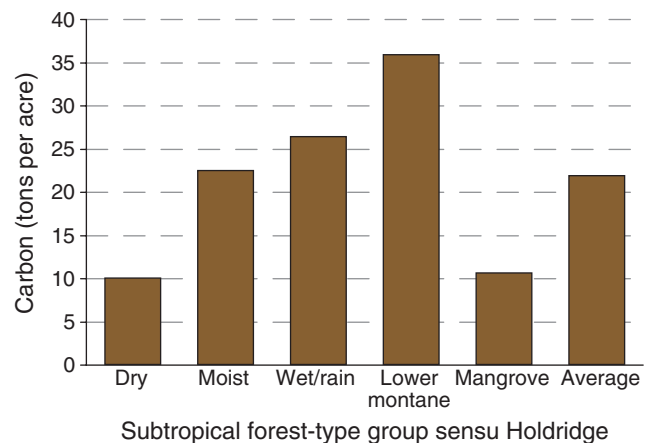


Figure 7—Total live-tree carbon (above- and belowground) by forest-type group, Puerto Rico, 2009.





### Net Growth, Removals, and Mortality

The annualized inventory plots installed from 2001 to 2004 (the third forest inventory) were measured again starting in 2006 and ending in 2009 (the fourth forest inventory). Each plot in the inventory was measured after a 5-year interval unless 1) the area reverted to forest during the intervening period, 2) there had been forest there previously but the area had since been cut and put into a nonforest land use, 3) the original forest plot could not be relocated and a new plot had to be installed in its place, or 4) access to the plot was denied by the landowner during either time period.

Remeasuring the trees on the forest inventory plots allows the estimation of net annual growth on all-live trees, the average annual mortality, and the average annual net removals. All of these estimates are made in terms of tree volume (cubic feet) rather than in numbers of trees. Note that mortality refers to trees that died from natural causes and remained in the forest. Removed trees were those that were cut and used for a timber product, cut and left in the forest, or cut/destroyed as part of the conversion of forest land to some nonforest land use like development or agriculture. Removed trees are not included in the mortality estimates, and vice versa. Net growth, removals, and mortality are presented in tables A.27–A.35.

Puerto Rico’s forest trees grew by 65.7 million cubic feet each year (the sum of net growth and mortality) but lost 31.6 million cubic feet per year to natural mortality (tables A.30–A.32) and another 85,028 cubic feet to removals (tables A.33–A.35), for a net annual gain of 34.0 million cubic feet on average (tables A.27–A.29). This

means a net total gain of 170.0 million cubic feet of wood volume over the entire 5-year period. A total of 425,140 cubic feet of wood were removed from the forests by cutting or land clearance over that same 5-year time period.

The dynamic nature of Puerto Rico’s forests can be further seen by looking at the mortality relative to total growth per acre for each of the forested life zones (fig. 8). Mortality takes almost 79.5 percent of the gross growth each year in subtropical dry forest, while mortality only takes 35.7 percent of gross growth in lower montane wet and rain forests. Annual removals relative to growth and mortality are vanishingly small (fig. 8).

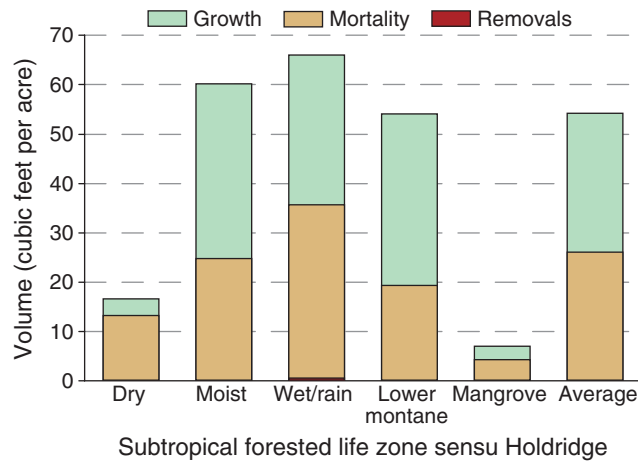


Figure 8—Annual growth, mortality, and removals by forested life zone, Puerto Rico, 2006–09. Note that the removals estimates are very small relative to growth and mortality.



### Forest Health Indicators

**Tree Damage**—For trees with d.b.h.  $\geq 5.0$  inches, 62.0 percent showed some sign of damage or disease. Of that damage 77.6 percent was the presence of conks, fungal fruiting bodies, and other signs of advanced decay (fig. 9). Nearly 96 (95.6) percent of that observed fungus and decay was of minor severity, affecting  $<10$  percent of the tree's roots, stump, or bole. The species with the highest frequency of fungus and decay was African tulip tree with 17.7 percent of occurrences. But this should not be considered an indication of higher than normal fungus and decay occurrence for the species, rather this degree of occurrence is roughly proportional to the frequency with which this species was found on forest inventory plots relative to other species. Overall, there were no indications that any one species was being affected by a certain type of damage more than the other species.

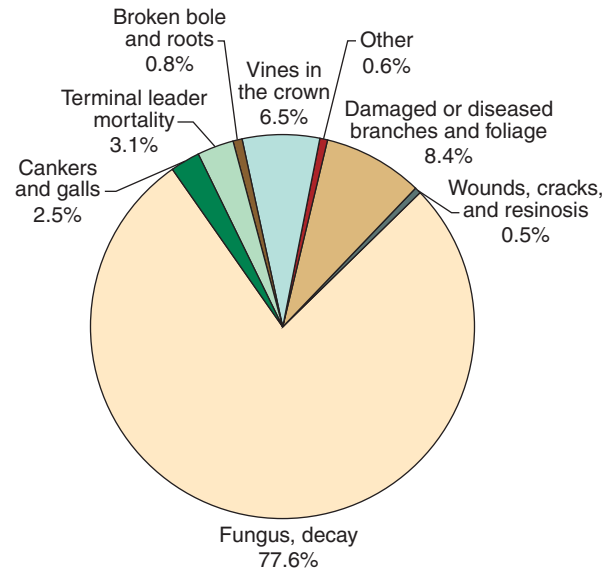


Figure 9—Frequency of tree damage observed in the forest inventory, Puerto Rico, 2009.



A floral component of the lower montane forest understory in the El Yunque National Forest, Puerto Rico.



The other types of damage were much less frequently encountered and also of relatively minor severity. The field crews note the presence of vines in the tree crown as a type of damage only if the vines are considered to be covering the tree's foliage and smothering it. This does not include the very common epiphytic vines typically found in subtropical trees that are not a serious detriment to the tree's growth.

**Tree Crowns**—We assessed tree crown condition on trees with d.b.h.  $\geq 5.0$  inches on the subset of forest inventory plots used for forest health monitoring. Uncompacted crown ratio, crown density (amount of crown stem, branches, twigs, shoots, buds, foliage, and reproductive structures that block light penetration through the crown), and foliage transparency (amount of skylight visible through microholes in the live portion of the crown) were assessed and show values that are generally indicative of normal, healthy trees (figs. 10 and 11). Less than 2 percent of the trees assessed on forest health monitoring plots showed any signs of crown dieback, that is, recent mortality of branches with fine twigs, which begins at the terminal portion of a branch and proceeds toward the trunk. It appears that the lack of widespread recent tree crown damage is in part because Puerto Rico has not experienced any hurricanes that would have caused major forest damage since before the start of the third forest inventory in 2001.

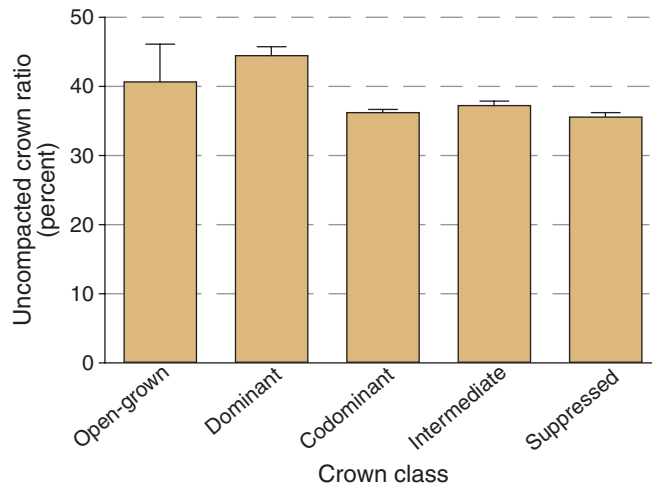


Figure 10—Uncompacted crown ratio with sampling errors by crown class for trees with d.b.h.  $\geq 5.0$  inches, Puerto Rico, 2009.

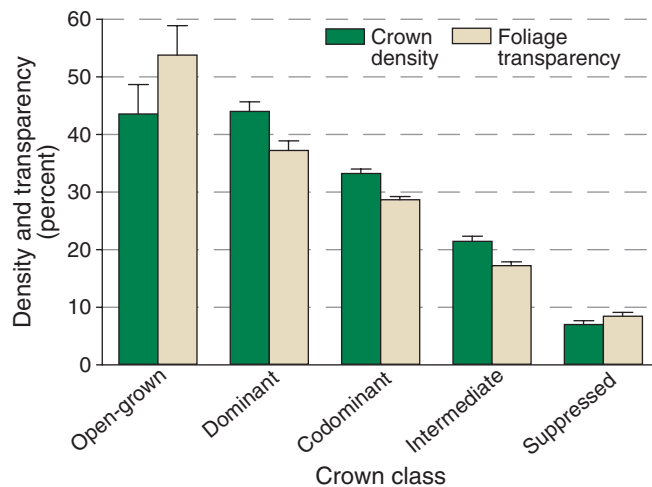


Figure 11—Crown density and foliage transparency with sampling errors for trees with d.b.h.  $\geq 5.0$  inches, Puerto Rico, 2009.



### Conclusions

These first remeasurements of the annualized forest inventory and forest health monitoring plots installed from 2001 to 2004 provide us with valuable insights into not only the current status of the islands' forests, but also their dynamics. From this point forward, barring significant changes to the forest inventory design, we will be able to closely follow the continued recovery and development of these subtropical forests. The study of Puerto Rico's forests by the FIA program and numerous other research efforts has provided valuable examples of the dynamic balance between secondary forest reversion

on abandoned agricultural land and expanding urban development, lessons that can be applied to tropical areas globally.

We have observed the rapid recovery of Puerto Rico's forests, the formation of new plant assemblages of both native and naturalized species from around the world, and the continued structural development of those forests as they mature. We have also seen the role of disturbance, both natural and anthropogenic, in shaping these unique Caribbean forests' development. Continued observation and study will strengthen those insights and provide us with new ones.

View from the Sierra del Luquillo in El Yunque National Forest, Puerto Rico.





## Literature Cited

- Bechtold, W.A.; Scott, C.T. 2005. The forest inventory and analysis plot design. In: Bechtold, W.A.; Patterson, P.L., eds. The enhanced forest inventory and analysis program—national sampling design and estimation procedures. Gen. Tech. Rep. SRS-80. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station: 27–42.
- Birdsey, R.A.; Weaver, P.L. 1982. The forest resources of Puerto Rico. Resour. Bull. SO-85. New Orleans: U.S. Department of Agriculture Forest Service, Southern Forest Experiment Station. 56 p.
- Brandeis, T.J.; Helmer, E.H.; Oswalt, S.N. 2007. The status of Puerto Rico's forests, 2003. Resour. Bull. SRS-119. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 75 p.
- Brandeis, T.J.; Meléndez-Ackerman, E.; Helmer, E.H. 2012. Forest vegetation cover assessment on Mona Island, Puerto Rico. Gen. Tech. Rep. SRS-165. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 24 p.
- Brandeis, T.J.; Oswalt, S.N. 2007. The status of U.S. Virgin Islands' forests, 2004. Resour. Bull. SRS-122. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 61 p.
- Cairns, M.A.; Brown, S.; Helmer, E.H.; Baumgardner, G.A. 1997. Root biomass allocation in the world's upland forests. *Oecologia*. 111: 1–11.
- Cintrón, B.B.; Rogers, L. 1991. Plant communities of Mona Island. *Acta Científica*. 51: 10–64.
- Cintrón, G. 1991. Introduction to Mona Island. *Acta Científica*. 5: 6–9.
- Cost, N.D.; McClure, J.P. 1982. Multiresource inventories: techniques for estimating biomass on a statewide basis. Res. Pap. SE-228. Asheville, NC: U.S. Department of Agriculture Forest Service, Southeastern Forest Experiment Station. 31 p.
- Ewel, J.J.; Whitmore, J.L. 1973. The ecological life zones of Puerto Rico and the U.S. Virgin Islands. Res. Pap. ITF-18. Río Piedras, Puerto Rico: U.S. Department of Agriculture Forest Service, Institute of Tropical Forestry. 72 p.
- García, M.A.; Pérez-Buitrago, N.; Álvarez, A.O.; Tolson, P.J. 2007. Survival, dispersal and reproduction of headstarted Mona Island iguanas, *Cyclura cornuta stejnegeri*. *Applied Herpetology*. 4: 357–363.
- Heath, L.S.; Hansen, M.H.; Smith, J.E. [and others]. 2008. Investigation into calculating tree biomass and carbon in the FIABD using a biomass expansion factor approach. In: Forest inventory and analysis symposium. Park City, UT: U.S. Department of Agriculture Forest Service, Rocky Mountain Research Station: 26.



## Literature Cited

- Helmer, E.H.; Ruzycski, T.S. 2008. Map of land cover and forest formations for Mona Island, Puerto Rico. <http://fsgeodata.fs.fed.us/rastergateway/caribbean/>. Rio Piedras, Puerto Rico: U.S. Department of Agriculture Forest Service, International Institute of Tropical Forestry. [Date accessed: August 2012].
- Holdridge, L.R. 1967. Life zone ecology. Revised edition. San José, Costa Rica: Tropical Science Center. 206 p.
- Jenkins, J.C.; Chojnacky, D.C.; Heath, L.S.; Birdsey, R.A. 2003a. Comprehensive database of diameter-based biomass regressions for North American tree species. Gen. Tech. Rep. NE-319. Newtown Square, PA: U.S. Department of Agriculture Forest Service, Northeastern Research Station. 45 p.
- Jenkins, J.C.; Chojnacky, D.C.; Heath, L.S.; Birdsey, R.A. 2003b. National-scale biomass estimators for United States tree species. *Forest Science*. 49: 12–35.
- Kennaway, T.; Helmer, E. 2007. The forest types and ages cleared for land development in Puerto Rico. *GIScience & Remote Sensing*. 44(4): 356–382.
- Kicliter, V. 1997. Forest products of Puerto Rico. An overview of trends in forest products use. Arecibo, Puerto Rico: El Atlantico RC&D Area, Inc. 61 p. In coordination with: U.S. Forest Service, International Institute of Tropical Forestry and U.S. Natural Resources Conservation Service.
- McClure, J.P.; Knight, H.A. 1984. Empirical yields of timber and forest biomass in the Southeast. Res. Pap. SE-245. Asheville, NC: U.S. Department of Agriculture Forest Service, Southeastern Forest Experiment Station. 75 p.
- McClure, J.P.; Saucier, J.R.; Biesterfeldt, R.C. 1981. Biomass in southeastern forests. Res. Pap. SE-227. Asheville, NC: U.S. Department of Agriculture Forest Service, Southeastern Forest Experiment Station. 38 p.
- Meléndez-Ackerman, E.J.; Cortés, C.; Sustache, J. [and others]. 2008. Diet of feral goats in Mona Island Reserve, Puerto Rico. *Caribbean Journal of Science*. 44(2): 199–205.
- O'Neill, K.P.; Amacher, M.C.; Perry, C.H. 2005. Soils as an indicator of forest health: a guide to the collection, analysis, and interpretation of soil indicator data in the forest inventory and analysis program. Gen. Tech. Rep. NC-258. St. Paul, MN: U.S. Department of Agriculture Forest Service, North Central Research Station. 53 p.
- Reams, G.A.; Smith, W.D.; Hansen, M.H. [and others]. 2005. The forest inventory and analysis sampling frame. In: Bechtold, W.A.; Patterson, P.L., eds. The enhanced forest inventory and analysis program—national sampling design and estimation procedures. Gen. Tech. Rep. SRS-80. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station: 11–26.



- Schomaker, M.E.; Zarnoch, S.J.; Bechtold, W.A. [and others]. 2007. Crown-condition classification: a guide to data collection and analysis. Gen. Tech. Rep. SRS-102. Asheville, NC, U.S. Department of Agriculture Forest Service, Southern Research Station. 78 p.
- Scott, C.T.; Bechtold, W.A.; Reams, G.A. [and others]. 2005. Sample-based estimators used by the forest inventory and analysis national information management system. In: Bechtold, W.A.; Patterson, P.L., eds. The enhanced forest inventory and analysis program—national sampling design and estimation procedures. Gen. Tech. Rep. SRS-80. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station: 43–65
- Smith, D.M.; Larson, B.C.; Kelty, M.J.; Ashton, P.M. 1997. The practice of silviculture: applied forest ecology. 9th ed. New York: John Wiley. 537 p.
- Smith, J.E.; Heath, L.S.; Jenkins, J.C. 2002. Forest volume-to-biomass models and estimates of mass for live and standing dead trees in U.S. forests. Gen. Tech. Rep. NE-298, Newtown Square, PA: U.S. Department of Agriculture Forest Service, Northeastern Research Station. 57 p.
- Smith, W.B.; Miles, P.D.; Vissage, J.S.; Pugh, S.A. 2004. Forest resources of the United States, 2002. Gen. Tech. Rep. NC-241. St. Paul, MN: U.S. Department of Agriculture Forest Service, North Central Research Station. 137 p.
- Smith, W.D.; Conkling, B.L. 2005. Analyzing forest health data. Gen. Tech. Rep. SRS-77. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 33 p.
- U.S. Department of Agriculture Forest Service. 2005. Forest inventory and analysis national core field guide. Volume I: field data collection procedures for phase 2 plots. Version 3.0. Arlington, VA: U.S. Department of Agriculture Forest Service, Forest Inventory and Analysis Program. 203 p. [http://www.fia.fs.fed.us/library/field-guides-methods-proc/docs/2006/core\\_ver\\_3-0\\_10\\_2005.pdf](http://www.fia.fs.fed.us/library/field-guides-methods-proc/docs/2006/core_ver_3-0_10_2005.pdf). [Date accessed unknown].
- U.S. Department of Agriculture Forest Service. 2007. Forest inventory and analysis national core field guide. Volume I: field data collection procedures for phase 2 plots. Version 4.0. Arlington, VA: U.S. Department of Agriculture Forest Service, Forest Inventory and Analysis Program. 208 p. [http://www.fia.fs.fed.us/library/field-guides-methods-proc/docs/core\\_ver\\_4-0\\_10\\_2007\\_p2.pdf](http://www.fia.fs.fed.us/library/field-guides-methods-proc/docs/core_ver_4-0_10_2007_p2.pdf). [Date accessed unknown].
- U.S. Department of Agriculture Forest Service. 2007a. Forest inventory and analysis national core field guide. Phase 3 field guide—crowns: measurements and sampling. Version 4.0. Arlington, VA: U.S. Department of Agriculture Forest Service, Forest Inventory and Analysis Program. 22 p. [http://www.fia.fs.fed.us/library/field-guides-methods-proc/docs/2007/p3\\_4-0\\_sec12\\_10\\_2007.pdf](http://www.fia.fs.fed.us/library/field-guides-methods-proc/docs/2007/p3_4-0_sec12_10_2007.pdf). [Date accessed unknown].



## Literature Cited

- U.S. Department of Agriculture Forest Service. 2007b. Forest inventory and analysis national core field guide. Phase 3 field guide—down woody materials. Version 4.0. Arlington, VA: U.S. Department of Agriculture Forest Service, Forest Inventory and Analysis Program. 32 p. [http://www.fia.fs.fed.us/library/field-guides-methods-proc/docs/2007/p3\\_4-0\\_sec14\\_10\\_2007.pdf](http://www.fia.fs.fed.us/library/field-guides-methods-proc/docs/2007/p3_4-0_sec14_10_2007.pdf). [Date accessed unknown].
- U.S. Department of Agriculture Forest Service. 2007c. Forest inventory and analysis national core field guide. Phase 3 field guide—soil measurements and sampling. Version 4.0. Arlington, VA: U.S. Department of Agriculture Forest Service, Forest Inventory and Analysis Program. 29 p. [http://www.fia.fs.fed.us/library/field-guides-methods-proc/docs/2007/p3\\_4-0\\_sec11\\_10\\_2007.pdf](http://www.fia.fs.fed.us/library/field-guides-methods-proc/docs/2007/p3_4-0_sec11_10_2007.pdf). [Date accessed unknown].
- Woodall, C.; Williams, M.S. 2005. Sampling protocol, estimation and analysis procedures for down woody materials indicator of the FIA program. Gen. Tech. Rep. NC-256, St. Paul, MN: U.S. Department of Agriculture Forest Service, North Central Research Station. 47 p.
- Woudenberg, S.W.; Conkling, B.L.; O'Connell, B.M. [and others]. 2010. The Forest Inventory and Analysis database: database description and user's manual version 4.0 for phase 2. Gen. Tech. Rep. RMRS-GTR-245, Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 336 p.





## Glossary

**All-live trees**—All living trees. All size classes, all tree classes, and both saw-log and nonsaw-log species are included. See FIA tree species list in the field manual.

**Average annual mortality**—Average annual volume of trees  $\geq 5.0$  inches diameter at breast height that died from human and natural causes during the intersurvey period, excluding those removed by harvesting, cultural operations, land clearing or changes in land use.

**Average annual removals**—Average annual volume of trees  $\geq 5.0$  inches diameter at breast height removed from the inventory by harvesting, cultural operations (such as timber-stand improvement), land clearing, or changes in land use during the intersurvey period.

**Average net annual growth**—Average annual net change in volume of trees  $\geq 5.0$  inches diameter at breast height/diameter at root collar without taking into account losses from cutting (gross growth minus mortality) during the intersurvey period.

**Basal area**—The cross sectional area of a tree at breast height or of all the trees in a stand, usually expressed in square feet or square feet per acre.

**Biomass**—For the southern region, total aboveground biomass is estimated using allometric equations and is defined as the aboveground weight of wood and bark in live trees  $\geq 1.0$ -inch diameter at breast height/diameter at root collar from the ground to the tip of the tree, excluding all foliage (leaves, needles, buds, fruit, and limbs  $< 0.5$  inch in diameter). Biomass is expressed as oven-dry weight and the units are short tons (2,000 pounds, or 0.9072 metric tons). Note: the weight of wood and bark in limbs  $< 0.5$  inch in diameter is included in the biomass of small-diameter trees (McClure and others 1981, Cost and McClure 1982, McClure and Knight 1984).

Additionally, biomass in the merchantable stem is estimated regionally, where the main and merchantable stems are defined as follows.

*Main stem*—The central portion of the tree extending from the ground level to the tip for timber species. Woodland species includes from ground level to the tips of all branches of qualifying stems. For timber species trees that fork, the main stem refers to the fork that would yield the most merchantable volume.

*Merchantable stem*—That portion of the main stem of a timber species tree from a 1-foot stump to a minimum 4-inch top diameter inside or outside bark depending on species. That portion of a woodland species tree from the diameter at root collar measurements to the 1.5-inch diameters of all the qualifying stems.

Nationally aboveground and belowground biomass is estimated from each tree's sound volume using a Component Ratio Method that is consistently applied in all FIA regions (Heath and others 2008).

*Gross aboveground biomass*—Total tree biomass excluding foliage and roots with no deductions made for rotten, missing, or broken-top cubic-foot cull.

*Net aboveground biomass*—Gross aboveground biomass minus deductions for missing cull, broken-top, and a reduction for a proportion of rotten cull for live or standing dead trees  $\geq 5.0$  inches d.b.h. (Rotten cull will have a factor to reduce specific gravity separately from sound wood). Live and standing dead trees 1.0–4.9 inches only have deductions for broken-top cull. Additional deductions are made for dead trees  $\geq 1.0$  inch using decay class.

*Belowground biomass*—Coarse roots only.

Further, the total net aboveground biomass estimated using the Component Ratio Method is divided into the following components:



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*Top*—That portion of the main stem of a timber species tree above the 4-inch top. For woodland species, this component of the biomass is included with branches.

*Branches*—All the branches of a timber species tree excluding the main stem. That portion of all the branches of qualifying stems of woodland species above the 1.5-inch diameter ends.

*Bole*—See: Merchantable stem.

*Stump*—That portion of timber species below 1-foot to ground level. That portion of woodland species from all diameter at root collar measurements to ground level.

**Bole**—Trunk or main stem of a tree. (See: Main stem.)

**Census water**—See: Land use.

**Codominant tree**—See: Crown class.

**Compacted live crown ratio**—The percent of the total length of the tree which supports a full, live crown. For trees that have uneven length crowns, lower branches are visually transferred to fill holes in the upper portions of the crown, until a full, even crown is created. (Schomaker and others 2007, U.S. Department of Agriculture Forest Service 2007a.)

**Components of change**—Volume increment and decrement values that explain the change in inventory between two points in time. Components of change are usually expressed in terms of growing-stock or all-live merchantable volume. These components can be expressed as average annual values by dividing the component by the number of years in the measurement cycle.

FIA inventories are designed to measure net change over time, as well as the individual components of change that constitute net change (e.g., growth, removals, mortality). Change estimates are computed for two sequential measurements of each inventory panel. Upon remeasurement, a new initial

inventory is established for remeasurement at the next scheduled inventory. As such, computation of change components is not intended to span more than one inventory cycle. Rather, the change estimation process is repeated cycle by cycle. This simplifies field protocols and ensures that change estimation is based on short and relatively constant time intervals (e.g., 5 years). Change estimates for individual panels are combined across multiple panels in the same manner as panels are combined to obtain current inventory parameters such as total standing volume (Scott and others 2005).

FIA recognizes the following components of change as prescribed core variables; they usually are expressed in terms of growing-stock or all-live volume, where  $t$  is the initial inventory of a measurement cycle, and  $t + 1$  is the terminal inventory:

*Cut*—The volume of trees cut between time  $t$  and time  $t + 1$ . The estimate is based on tree size at the midpoint of the measurement interval (includes cut growth). Tree size at the midpoint is modeled from tree size at time  $t$ . Trees felled or killed in conjunction with a harvest or silvicultural operation (whether they are utilized or not) are included, but trees on land diverted from forest to nonforest (diversions) are excluded.

*Cut growth*—The growth of cut trees between time  $t$  and the midpoint of the measurement interval. Tree size at the midpoint is modeled from tree size at time  $t$ . This term also includes the subsequent growth on ingrowth trees that achieve the minimum diameter threshold prior to being cut.

*Diversion*—The volume of trees on land diverted from forest to nonforest (or, for some analyses, this may also include land diverted to reserved forest land and other forest land), whether utilized or not, between time  $t$  and time  $t + 1$ . The estimate is based on tree size at the midpoint of the measurement interval



(includes diversion growth). Tree size at the midpoint is modeled from tree size at time  $t$ .

*Diversion growth*—The growth of diversion trees from time  $t$  to the midpoint of the measurement interval. Tree size at the midpoint is modeled from tree size at time  $t$ . This term also includes the subsequent growth on ingrowth trees that achieve the minimum diameter threshold prior to diversion.

*Growth on ingrowth*—The growth on trees between the time they grow across the minimum diameter at breast height/diameter at root collar threshold and time  $t+1$ .

*Ingrowth*—The volume of trees at the time that they grow across the minimum diameter at breast height/diameter at root collar threshold between time  $t$  and time  $t+1$ . The estimate is based on the size of trees at the diameter at breast height/diameter at root collar threshold which is 1.0 inch for all-live trees and 5.0 inches for growing-stock trees. This term also includes trees that subsequently die (i.e., ingrowth mortality), are cut (i.e., ingrowth, cut), or diverted to nonforest (i.e., ingrowth diversion); as well as trees that achieve the minimum threshold after an area reverts to a forest land use (i.e., reversion ingrowth).

*Mortality*—The volume of trees that die from human or natural causes between time  $t$  and time  $t+1$ . The estimate is based on tree size at the midpoint of the measurement interval (includes mortality growth). Tree size at the midpoint is modeled from tree size at time  $t$ .

*Mortality growth*—The growth of trees that died from human or natural causes between time  $t$  and the midpoint of the measurement interval. Tree size at the midpoint is modeled from tree size at time  $t$ . This term also includes the subsequent growth on ingrowth trees that achieve the minimum diameter threshold prior to mortality.

*Reversion*—The volume of trees on land that reverts from a nonforest land use to a forest land use (or, for some analyses, land that reverts from any source to timberland) between time  $t$  and time  $t+1$ . The estimate is based on tree size at the midpoint of the measurement interval. Tree size at the midpoint is modeled from tree size at time  $t+1$ .

*Reversion growth*—The growth of reversion trees from the midpoint of the measurement interval to time  $t+1$ . Tree size at the midpoint is modeled from tree size at time  $t+1$ . This term also includes the subsequent growth on ingrowth trees that achieve the minimum diameter threshold after reversion.

*Survivor growth*—The growth on trees tallied at time  $t$  that survive until time  $t+1$ .

The following components of change may be used to further quantify changes in growing-stock (but not all-live) volume:

*Cull decrement*—The net gain in growing-stock volume due to reclassification of cull trees to growing-stock trees between two surveys. Cull decrement is the volume of trees that were cull at time  $t$ , but growing stock at time  $t+1$ . The estimate is based on tree size at the midpoint of the measurement interval. Tree size at the midpoint can be modeled from tree at time  $t$ , time  $t+1$ , or both.

*Cull decrement growth*—The growth from the midpoint of the measurement interval to time  $t+1$  on trees that were cull at time  $t$ , but growing stock at time  $t+1$ . Tree size at the midpoint can be modeled from tree size at time  $t$ , time  $t+1$ , or both.

*Cull increment*—The net reduction in growing-stock volume due to reclassification of growing-stock trees to cull trees between two surveys. Cull increment is the volume of trees that were growing stock at time  $t$ , but cull at time  $t+1$ . The estimate is based on tree size at the midpoint of the measurement



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interval (includes cull increment growth). Tree size at the midpoint can be modeled from tree size at time  $t$ , time  $t+1$ , or both.

*Cull increment growth*—The growth to the midpoint of the measurement interval between time  $t$  and  $t+1$  of trees that were growing stock at time  $t$ , but cull trees at time  $t+1$ . Tree size at the midpoint can be modeled from tree size at time  $t$ , time  $t+1$ , or both.

**Condition class**—The combination of discrete landscape and forest attributes that identify, define, and stratify the area associated with a plot. Examples of such attributes include condition status, forest type, stand origin, stand size, owner group, reserve status and stand density (U.S. Department of Agriculture Forest Service 2007).

**Crown**—The part of a tree or woody plant bearing live branches or foliage (Schomaker and others 2007, U.S. Department of Agriculture Forest Service 2007a).

**Crown class**—A classification of trees based on dominance in relation to adjacent trees in the stand as indicated by crown development and amount of light received from above and the sides (Schomaker and others 2007, U.S. Department of Agriculture Forest Service 2007a). Crown classes recognized by forest inventory and analysis include:

*Dominant*—Trees with crown extending above the general level of the crown canopy and receiving full light from above and partly from the sides. These trees are taller than the average trees in the stand and their crowns are well developed, but they could be somewhat crowded on the sides. Also, trees whose crowns have received full light from above and from all sides during early development and most of their life. Their crown form or shape appears to be free of influence from neighboring trees (U.S. Department of Agriculture Forest Service 2007a).

*Codominant*—Trees with crowns at the general level of the crown canopy. Crowns receive full light from above but little direct sunlight penetrates their sides. Usually they have medium-sized crowns and are somewhat crowded from the sides. In stagnated stands, codominant trees have small-sized crowns and are crowded on the sides.

*Intermediate*—Trees that are shorter than dominants and codominant, but their crowns extend into the canopy of codominant and dominant trees. They receive little direct light from above and none from the sides. As a result, intermediate trees usually have small crowns and are very crowded from the sides.

*Open grown*—Trees with crowns that received full light from above and from all sides throughout most of its life, particularly during its early developmental period.

*Overtopped*—Trees with crowns entirely below the general level of the crown canopy that receive no direct sunlight either from above or the sides.

**Crown cover**—Percentage of the ground surface covered by a vertical projection of crowns from above (Schomaker and others 2007).

**Crown density**—The amount of crown stem, branches, twigs, shoots, buds, foliage, and reproductive structures that block light penetration through the projected crown outline, measured as a percentage (Schomaker and others 2007, U.S. Department of Agriculture Forest Service 2007a).

**Crown dieback**—Recent mortality of branches with fine twigs, which begins at the terminal portion of a branch and proceeds toward the trunk. Dieback is only considered when it occurs in the upper and outer portions of the tree. Dead branches in the lower live crown are not considered



as part of crown dieback, unless there is continuous dieback from the upper and outer crown down to those branches. (Schomaker and others 2007, U.S. Department of Agriculture Forest Service 2007a.)

**Crown light exposure**—Amount of direct sunlight a tree is receiving when the sun is directly overhead. This is done by dividing the tree crown into five sections, four equal vertical quarters (i.e., faces), and the top. (Schomaker and others 2007, U.S. Department of Agriculture Forest Service 2007a.)

**Crown position**—The position of an individual crown relative to the overstory canopy zone (Schomaker and others 2007, U.S. Department of Agriculture Forest Service 2007a). The crown classes are:

*Superstory*—Trees with live-crown tops two times the height of the overstory canopy zone.

*Overstory*—Trees with live-crown tops above the middle of the overstory canopy zone.

*Understory*—Trees with live-crown tops at or below the middle of the overstory canopy zone, or trees with no crown by definition.

*Open canopy*—Trees growing in stands where no overstory canopy zone is evident because the tree crowns are not fully closed (<50 percent cover).

**Crown vigor class**—A visual assessment of the apparent crown vigor of saplings. The purpose is to separate excellent saplings with superior crowns from stressed individuals with poor crowns.

**Cull**—Portions of a tree that are unusable for industrial wood products because of rot, form, or other defect. Cull is further categorized as the following:

*Broken-top cubic-foot cull*—The broken-top proportion of a timber species tree's

merchantable portion from the break to the actual or projected 4-inch top diameter outside bark, or to where the central stem forks, where all forks are <4.0 inches diameter. For trees 1.0–4.9 inches diameter this is the proportion of the main stem missing due to a broken-top.

*Form board-foot cull*—The part of the tree's saw-log portion that is sound but not usable for sawn wood products due to sweep, crook, forking, or other physical culls.

*Missing cubic-foot cull*—The proportion of a tree's merchantable portion that is missing or absent. Does not include any cull deductions above actual length for broken-top timber trees. Does include cull deductions above actual length for broken-top woodland species. Trees with diameter at breast height/diameter at root collar <5.0 inches have a null value in this field.

*Percent board-foot cull*—Percentage of sound and unsound board-foot volume, to the nearest 1 percent.

*Rotten cubic-foot cull*—The proportion of a tree's merchantable portion that is in a decayed state. Does not include any cull deductions above actual length for broken-top timber trees. Does include cull deductions above actual length for broken-top woodland species. Trees <5.0 inches diameter at breast height have a null value in this field.

*Rotten/missing cull*—The part of the tree's merchantable portion that is decayed and/or absent due to other factors.

*Total board-foot cull*—The proportion of a timber species tree's saw-log portion that is rotten, missing, or sound but not usable for sawn wood products due to sweep, crook, forking, or other physical defects (form board-foot cull). Nonsaw-log species and softwoods <9.0 inches diameter at breast height and hardwoods <11.0 inches diameter at breast height have a null value in this field.



**Cull tree**—Live trees that are unsuitable for the production of some roundwood products, now or prospectively. Cull trees can include those with decay (rotten cull) or poor form, limbiness, or splits (rough cull). Rough cull is suitable for pulpwood and other fiber products.

**Cut**—See: Components of change.

**Cutting type**—This category of stand treatment indicates the type of cutting that has occurred on the condition. See: Treatment.

**Decay class**—Qualitative assessment of stage of decay (five classes) of coarse woody debris based on visual assessments of color of wood, presence/absence of twigs and branches, texture of rotten portions, and structural integrity (Woodall and Williams 2005).

**Diameter at breast height (d.b.h.)**—The diameter for tree stem, located at 4.5 feet above the ground (breast height) on the uphill side of a tree. The point of diameter measurement may vary on abnormally formed trees.

**Diameter class**—A classification of trees based on diameter outside bark, measured at breast height (diameter at breast height) above the ground or at root collar (diameter at root collar). Note: Diameter classes are commonly in 2-inch increments, beginning with 2 inches. Each class provides a range of values with the class name being the approximate midpoint. For example, the 6-inch class includes trees 5.0–6.9 inches diameter at breast height

**Diameter inside bark (d.i.b.)**—Diameter measured at any point on a tree or log that excludes the bark.

**Diameter outside bark (d.o.b.)**—Diameter measured at any point on a tree or log that includes the bark.

**Diameter root collar (d.r.c.)**—Diameter measured at the ground line or at the stem root collar.

**Disturbance**—Natural or human-caused disruption that is at least 1.0 acre in size and results in mortality and/or damage to 25 percent of all trees in a stand or 50 percent of an individual species' count or, in the case when the disturbance does not initially affect tree growth or health (e.g., grazing, browsing, flooding, etc.), affects 25 percent of the soil surface or understory vegetation. For initial forest plot establishment the disturbance must be within the last 5 years. For remeasured plots only those disturbances that have occurred since the previous inventory are recognized.

**Diversion**—See: Components of change.

**Dominant tree**—See: Crown class.

**Double sampling for stratification**—A sampling method whereby a large sample of plots are stratified in Phase 1, then a subsample are measured for all attributes in Phase 2. When the strata are homogeneous with respect to the attribute, then the estimators are more accurate versus simple random sampling (Bechtold and Scott 2005).

**Dry weight**—The oven-dry weight of biomass.

**Federal land**—An ownership class of public lands owned by the U.S. Government. See also: Ownership. (Smith and others 2004.)

**Fixed-radius plot**—A circular sampled area with a specified radius in which all trees of a given size, shrubs, or other items are tallied.

**Foliage transparency**—The amount of skylight visible through microholes in the live portion of the crown, i.e., where you see foliage, normal or damaged, or remnants of its recent presence. Recently defoliated branches are included in foliage transparency measurements. Macroholes are excluded unless they are the result of recent defoliation. Dieback and dead branches are always excluded from the estimate. Foliage transparency is different



from crown density because it emphasizes foliage and ignores stems, branches, fruits, and holes in the crown. (Schomaker and others 2007, U.S. Department of Agriculture Forest Service 2007a.)

**Forest industry land**—See: Ownership.

**Forest land**—Land that is at least 10 percent stocked by forest trees of any size, or land formerly having such tree cover, and is not currently developed for a nonforest use. The minimum area for classification as forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width  $\geq 120$  feet wide to qualify as forest land. Unimproved roads and trails, streams and other bodies of water, or natural clearings in forested areas shall be classified as forest, if  $< 120$  feet in width or 1.0 acre in size. Forest land is divided into timberland, reserved forest land, and other forest land (such as woodland). (Smith and others 2004, U.S. Department of Agriculture Forest Service 2007.)

**Forest type**—A classification of forest land based upon and named for the tree species that forms the plurality of live-tree stocking. A forest-type classification for a field location indicates the predominant live-tree species cover for the field location; hardwoods and softwoods are first grouped to determine predominant group, and forest type is selected from the predominant group. (Smith and others 2004.)

**Forest-type group**—A combination of forest types that share closely associated species or site requirements. For the Caribbean we use the following:

*Subtropical dry forest*—Found in areas with 600 to 1100 mm of annual precipitation. *Bursera simaruba* (L.) Sarg., *Bucida buceras* L., *Cephalocereus royenii* (L.) Britton, and *Guaiaacum officinale* L. are species typical of Puerto Rican dry forest. The more heavily-disturbed dry forest areas have numerous, smaller stemmed *Leucaena leucocephala* (Lam.) deWit, *Prosopis juliflora*

(Sw.) DC., *Acacia macracantha* Humb. & Bonpl., and *A. farnesiana* (L.) Willd. individuals.

*Subtropical moist forest*—Found in areas with 1000 to 2200 mm of annual precipitation. The subtropical moist forest-type group is the most extensive on Puerto Rico and covers a wide variety of soil parent materials, topographic classes, and land uses that give rise to highly diverse species mixtures that typically include *Tabebuia heterophylla* (DC.) Britton, *Spathodea campanulata* Beauv., *Guarea guidonia* (L.) Sleumer, *Andira inermis* (W. Wright) Kunth ex DC., *Roystonea borinquena* O.F. Cook, *Mangifera indica* L., *Cecropia peltata* L., *Schefflera morototoni* (Aubl.) Maguire, Steyermark & Frodin, and species of the *Nectandra*, *Ocotea*, and *Coccoloba* genera.

*Subtropical wet and rain forest*—Found in areas with 2000 to 4000 mm of annual precipitation. *Dacryodes excelsa* Vahl., *Sloanea berteriana* Choisy, and *Manilkara bidentata* (A. DC.) A. Chev are species indicative of the tabonuco forest type. *Cecropia peltata* L., *Schefflera morototoni* (Aubl.) Maguire, Steyermark & Frodin, and *Ochroma lagopus* Sw. are also common in wet forest stands in early stages of succession or recovery from disturbance. Wet forest shade coffee plantations hold species such as *Guarea guidonia* (L.) Sleumer, *Inga laurina* (Sw.) Willd., *I. vera* Willd., and *Erythrina poeppigiana* (Walp.) O.F. Cook. Palm forest characterized by *Prestoea acuminata* (Willd.) H.E. Moore var. *montana* (Graham) A. Hend. & G. Galeano occupies higher elevations falling in the subtropical rain forest zone.

*Lower montane wet and rain forest*—Found in areas with elevations between 700 and 1000 m. Forest types and their typical species include the palo colorado forest type (*Cyrilla racemiflora* L., *Ocotea spathulata* Mez., *Micropholis chrysophylloides* Pierre, and *M. garciniaefolia* Pierre), the elfin forest type (*Eugenia borinquensis* Britton, *Tabebuia rigida* Urban,



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*Weinmannia pinnata* L., and *Calycogonium squamulosum* Cogn.), and the palm brake forest type (*Prestoea acuminata* (Willd.) H.E. Moore var. *montana* (Graham) A. Hend. & G. Galeano).

**Mangrove forest**—Mangrove forests comprised of *Rhizophora mangle* L., *Avicennia nitida* Jacq., *Laguncularia racemosa* (L.) Gaertn. f., and *Conocarpus erectus* L. are found along the coastlines and estuaries.

**Nonstocked stands**—Stands <10 percent stocked with live trees.

**Gross aboveground biomass**—See: Biomass.

**Gross board-foot volume**—See: Volume.

**Gross cubic-foot volume**—See: Volume.

**Hardwoods**—Tree species belonging to the botanical divisions Magnoliophyta, Ginkgophyta, Cycadophyta, or Pteridophyta, usually angiospermic, dicotyledonous, broad-leaved, and deciduous.

**Soft hardwoods**—Hardwood species with an average specific gravity of  $\leq 0.50$ , such as gums, yellow-poplar, cottonwoods, red maple, basswoods, and willows.

**Hard hardwoods**—Hardwood species with an average specific gravity  $> 0.50$ , such as oaks, hard maples, hickories, and beech.

**Ingrowth tree**—See: Components of change.

**Intermediate tree**—See: Crown class.

**Land**—The area of dry land and land temporarily or partly covered by water, such as marshes, swamps, and river flood plains.

**Land cover**—The dominant vegetation or other kind of material that covers the land surface. A given land cover may have many land uses.

**Land use**—The purpose of human activity on the land; it is usually, but not always, related to land cover.

Southern regional present land use categories are as follows:

**Accessible timberland**—Land that is within the population of interest, is accessible, is on a subplot that can be occupied at subplot center, can safely be visited, and meets the criteria for forest land (see forest land).

**Accessible other forest land**—Land that meets the definition of accessible forest land, but is incapable of producing 20 cubic feet per acre per year of industrial wood under natural conditions because of adverse site conditions. Adverse conditions include sterile soils, dry climate, poor drainage, high elevation, steepness, and soil rockiness.

**Agricultural land**—Land managed for crops, pasture, or other agricultural use. The area must be  $\geq 1.0$  acre in size and  $\geq 120$ -feet wide (with the exception of windbreak/shelterbelt, which has no minimum width). This land use includes cropland, pasture (improved through cultural practices), idle farmland, orchard, christmas tree plantation, maintained wildlife opening, and windbreak/shelterbelt.

**Rangeland**—Land primarily composed of grasses, forbs, or shrubs. This includes lands vegetated naturally or artificially to provide a plant cover managed like native vegetation and does not meet the definition of pasture. The area must be  $\geq 1.0$  acre in size and  $\geq 120$ -feet wide.

**Developed**—Land used primarily by humans for purposes other than forestry or agriculture. This land use includes cultural (business, industrial/commercial, residential, and other places of intense human activity), rights-of-way (improved roads, railway, power lines, maintained canal), recreation (parks, skiing, golf courses), and mining.





*Other*—Land parcels >1.0 acre in size and >20.0-foot wide, which do not fall into one of the uses described above. Examples include undeveloped beaches, barren land (rock, sand), marshes, bogs, ice, and snow. This land use includes nonvegetated, wetland, beach, and nonforest-chaparral.

*Census water*—Rivers and streams that are  $\geq 200$ -feet wide and bodies of water  $\geq 4.5$  acres in size.

*Noncensus water*—Rivers, streams, and other bodies of water that do not meet the requirements for census water.

*Nonsampled*—Not sampled due to denied access, hazardous conditions, being outside the United States, or other reasons.

**Large-diameter trees**—Softwoods  $\geq 9.0$  inches diameter at breast height and hardwoods  $\geq 11.0$  inches diameter at breast height. These trees were called sawtimber-sized trees in prior surveys. See: Stand-size class.

**Life zone**—The Holdridge life zone model defines ecological life zones using mean annual precipitation and mean annual biotemperature (Holdridge 1967, Ewel and Whitmore 1973). The forested life zones found on the U.S. Virgin Islands are subtropical dry forest, subtropical moist forest, subtropical wet forest, subtropical rain forest, subtropical lower montane wet forest, and subtropical lower montane rain forest.

**Log**—Eight foot (2.4 m) or longer tree segment suitable for processing into lumber, veneer, or other wood products.

**Main stem**—The central portion of the tree extending from the ground level to the tip for timber species. For woodland species the main stem extends from the ground level to the tips of all branches of qualifying stems. For timber species trees that fork, the main stem follows the fork that would yield the most merchantable volume.

**Medium-diameter tree**—Softwood timber species 5.0 to 8.9 inches diameter at breast height and hardwood timber species 5.0 to 10.9 inches diameter at breast height. These trees were called poletimber-sized trees in prior surveys. See: Stand-size class.

**Merchantable portion**—The portion of the main stem of a timber species tree from a 1-foot stump to a minimum 4-inch top diameter inside or outside bark depending on species. The portion of a woodland species tree from the diameter at root collar measurement to the 1.5-inch diameters of all the qualifying stems.

**Microplot**—A circular, fixed-radius plot with a radius of 6.8 feet (0.003 acre) that is used to sample trees <5.0 inches diameter at breast height/diameter at root collar, as well as other vegetation. Point center is 90 degrees and 12 feet offset from point center of each subplot. (Bechtold and Scott 2005.)

**Missing cubic-foot cull**—See: Cull.

**Mortality**—See: Components of change.

**National forest land**—See: Ownership.

**Net aboveground biomass**—See: Biomass.

**Net board-foot volume**—See: Volume.

**Net cubic-foot volume**—See: Volume.

**Noncensus water**—See: Land use.

**Nonforest land**—Land that does not support or has never supported, forests, and lands formerly forested where use for timber management is precluded by development for other uses. Includes areas used for crops, improved pasture, residential areas, city parks, improved roads of any width and adjoining rights-of-way, power line clearings of any width, and noncensus water. If intermingled in forest areas, unimproved roads and nonforest strips must be >120-foot wide, and clearings, etc., >1.0 acre in size, to qualify as nonforest land. (Smith and others 2004.)



**Nonindustrial private forest land**—  
See: Ownership.

**Open grown trees**—See: Crown class.

**Other forest land**—Forest land other than timberland and reserved forest land. It includes available and reserved forest land that is incapable of producing 20 cubic feet per acre per year of wood under natural conditions because of adverse site conditions such as sterile soils, dry climate, poor drainage, high elevation, steepness, or rockiness.

**Other public land**—See: Ownership.

**Other removals**—The volume of trees removed from the inventory by cultural operations such as timber stand improvement, land clearing, and other changes in land use, resulting in the removal of the trees from timberland.

**Overstory canopy zone**—Average live crown height for all trees in a forest. The bottom of the overstory canopy zone is the average height of the live crown bases. The top of the overstory canopy zone is the average height of the live crown tops.

**Overtopped**—See: Crown class.

**Ownership**—A legal entity having control of a parcel or group of parcels of land. An ownership may be an individual; a combination of persons; a legal entity such as corporation, partnership, club, or trust; or a public agency.

*National forest land*—Federal land that has been legally designated as national forests or purchase units, and other land under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III land.

*Forest industry land*—An ownership class of private lands owned by a company or an individual(s) operating a primary wood-processing plant.

*Nonindustrial private forest (NIPF) land*—Privately owned land excluding forest industry land.

*Corporate*—Owned by corporations, including incorporated farm ownerships.

*Individual*—All lands owned by individuals, including farm operators.

*Other public*—An ownership class that includes all public lands except national forests (Smith and others 2004.)

*Miscellaneous Federal land*—Federal land other than national forests.

*State, county, and municipal land*—Land owned by States, counties, and local public agencies or municipalities, or land leased to these governmental units for  $\geq 50$  years (Smith and others 2004).

**Phase 1 (P1)**—Forest inventory and analysis activities related to remote sensing, the primary purpose of which is to label plots and obtain stratum weights for population estimates (Bechtold and Scott 2005).

**Phase 2 (P2)**—Forest inventory and analysis activities conducted on the network of ground plots. The primary purpose is to obtain field data that enable classification and summarization of area, tree, and other attributes associated with forest land uses (Bechtold and Scott 2005).

**Phase 3 (P3)**—A subset of phase 2 plots where additional attributes related to forest health are measured (Bechtold and Scott 2005).

**Plantation**—Stands that currently show evidence of being planted or artificially seeded.

**Poletimber-sized tree**—Softwood timber species 5.0 to 8.9 inches diameter at breast height and hardwood timber species 5.0 to 10.9 inches diameter at breast height. Now referred to as medium-diameter trees.



**Private land**—See: Ownership. (Smith and others 2004.)

**Reserved forest land**—Forest land where management for the production of wood products is prohibited through statute or administrative designation. Examples include national forest wilderness areas and national parks and monuments. (Smith and others 2004.)

**Reversion**—Land that reverts from a nonforest land use to a forest land use. See: Components of change.

**Rotten cubic-foot cull**—See: Cull.

**Rotten cull**—See: Tree class.

**Rotten/missing cull**—See: Cull.

**Rotten trees**—Live timber species (excludes nonsaw-log species) that do not contain at least one 12-foot saw log or two noncontiguous 8-foot merchantable logs now or prospectively primarily because of rotten cull. Less than  $\frac{1}{2}$  of its gross board-foot volume meets size, soundness, and grade requirements and less than one-half of the total board-foot cull is due to form board-foot cull.

**Rough cull**—See: Tree class.

**Sampling error**—The standard error of the mean expressed as a percentage. This percentage format allows the application of confidence intervals to the population values (the most common values presented in FIA reports). Most FIA sampling errors are presented at the 0.6827 level but the 0.95 level can easily be obtained by multiplying the sampling error by 1.96, or higher, appropriate t-value if  $n$  is  $<120$ .

**Sapling**—Live trees 1.0 to 4.9 inches diameter at breast height/diameter at root collar (U.S. Department of Agriculture Forest Service 2007).

**Sawtimber-sized trees**—Softwood timber species  $\geq 9.0$  inches diameter at breast height, and hardwood timber species

$\geq 11.0$  inches diameter at breast height. Now referred to as large-diameter trees.

**Seedling**—Live trees  $<1.0$ -inch diameter at breast height/diameter at root collar that are  $\geq 6$  inches in height for softwoods and  $\geq 12$  inches in height for hardwoods and  $>0.5$ -inch diameter at breast height/diameter at root collar at ground level for longleaf pine.

**Small-diameter trees**—Trees 1.0 to 4.9 inches in diameter at breast height/diameter at root collar. These were called sapling-seedling sized trees in prior surveys. See: Stand-size class.

**Softwoods**—Tree species belonging to the botanical division Coniferophyta, usually evergreen having needles or scale-like leaves (Smith and others 2004).

**Species group**—A collection of species used for reporting purposes.

**Stand**—Vegetation or a group of plants occupying a specific area and sufficiently uniform in species composition, age arrangement, structure, and condition as to be distinguished from the vegetation on adjoining areas.

**Stand age**—Average age of the live dominant and codominant trees in the predominant stand size-class of a condition (U.S. Department of Agriculture Forest Service 2007).

**Stand origin**—A classification of forest stands describing their means of origin.

*Planted*—Planted or artificially seeded.

*Natural*—No evidence of artificial regeneration.

**Stand structure**—The predominant canopy structure for the condition, only considering the vertical position of the dominant and codominant trees in the stand and not considering trees that are intermediate or overtopped. As a rule of



thumb, a different story should comprise 25 percent of the stand.

*Nonstocked*—The condition is <10 percent stocked.

*Single-storied*—Most of the dominant/codominant tree crowns form a single canopy (i.e., most of the trees are approximately the same height).

*Multistoried*—Two or more recognizable levels characterize the crown canopy. Dominant/codominant trees of many sizes (diameters and heights) for a multilevel canopy.

**Standing dead tree**—A dead tree  $\geq 5.0$  inches diameter at breast height that has a bole which has an unbroken actual length of at least 4.5 feet, and lean <45 degrees from vertical as measured from the base of the tree to 4.5 feet.

**Stand-size class**—A classification of forest land based on the diameter-class distribution of live trees in the stand. See definitions of large-, medium-, and small-diameter trees.

*Large-diameter stands*—Stands at least 10 percent stocked with live trees, with one-half or more of total stocking in large- and medium-diameter trees, and with large-diameter tree stocking at least equal to medium-diameter tree stocking.

*Medium-diameter stands*—Stands at least 10 percent stocked with live trees, with one-half or more of total stocking in medium- and large-diameter trees, and with medium-diameter tree stocking exceeding large-diameter tree stocking.

*Small-diameter stands*—Stands at least 10 percent stocked with live trees, in which small-diameter trees account for more than one-half of total stocking.

*Nonstocked stands*—Stands <10 percent stocked with live trees.

**State, county, and municipal land**—  
See: Ownership.

**Stratification**—A statistical tool used to reduce the variance of the attributes of interest by partitioning the population into homogenous strata. It may also involve partitioning a highly variable but small portion of the population.

**Subplot**—A circular area with a fixed horizontal radius of 24.0 feet ( $\frac{1}{24}$  acre), primarily used to sample trees  $\geq 5.0$  inches at diameter at breast height/diameter at root collar (Bechtold and Scott 2005).

**Survivor growth**—See: Components of change.

**Survivor tree**—A sample tree alive at both the current and previous inventories.

**Total length**—The total length of the tree, recorded to the nearest 1.0 foot from ground level to the tip of the apical meristem. Trees growing on a slope are measured on the uphill side of the tree. If the tree has a broken or missing top, the total length is estimated to what the length would be if there were no missing or broken top. Forked trees are treated the same as unforked trees. (U.S. Department of Agriculture Forest Service 2007.)

**Total tree biomass**—See: Biomass.

**Treatment**—Forestry treatments are a form of human disturbance. The term treatment further implies that a silvicultural application has been prescribed. This does not include occasional stumps of unknown origin or sparse removals for firewood, Christmas trees, or other miscellaneous purposes. The area affected by any treatment must be  $\geq 1.0$  acre in size.

*None*—No observable treatment.

*Cutting*—The removal of one or more trees from a stand. SRS-FIA categories are the following:

*Clearcut harvest*—The removal of the majority of the merchantable trees in a stand; residual stand stocking is <50 percent.



*Partial harvest*—Removal primarily consisting of highest quality trees. Residual consists of lower quality trees because of high grading or selection harvest. (e.g., uneven aged, group selection, high grading, species selection)

*Seed-tree/shelterwood harvest*—Crop trees are harvested leaving seed source trees either in a shelterwood or seed tree. Also includes the final harvest of the seed trees.

*Commercial thinning*—The removal of trees (usually of medium diameter) from medium-diameter stands leaving sufficient stocking of growing-stock trees to feature in future stand development. Also included are thinning in large-diameter stands where medium-diameter trees have been removed to improve quality of those trees featured in a final harvest.

*Timber stand improvement (cut trees only)*—The cleaning, release, or other stand improvement involving noncommercial cutting applied to an immature stand that leaves sufficient stocking.

*Salvage cutting*—The harvesting of dead or damaged trees or of trees in danger of being killed by insects, disease, flooding, or other factors in order to save their economic value.

*Site preparation*—Clearing, slash burning, chopping, disking, bedding, or other practices clearly intended to prepare a site for either natural or artificial regeneration.

*Artificial regeneration*—Following a disturbance or treatment (usually cutting), a new stand where at least 50 percent of the live trees present resulted from planting or direct seeding.

*Natural regeneration*—Following a disturbance or treatment (usually cutting), a new stand where at least 50 percent of the live trees present (of

any size) were established through the growth of existing trees and/or natural seeding or sprouting.

*Other silvicultural treatment*—The use of fertilizers, herbicides, girdling, pruning, or other activities designed to improve the commercial value of the residual stand, or chaining, which is a practice used on woodlands to encourage wildlife forage.

**Tree**—A woody perennial plant, typically large, with a single well-defined stem carrying a more or less definite crown; sometimes defined as attaining a minimum diameter of 3 inches and a minimum height of 15 feet at maturity. For FIA, any plant on the tree list in the current field manual is measured as a tree (U.S. Department of Agriculture Forest Service 2005).

**Uncompacted live crown ratio**—The length of a tree that supports live foliage relative to actual tree length. The ratio is determined by dividing the live crown length by the actual tree length, then multiplying by 100 and expressing the ratio as a percentage. (Schomaker and others 2007, U.S. Department of Agriculture Forest Service 2007a.)

**Volume**—A measure of the solid content of the tree stem used to measure wood quantity.

*Gross board-foot volume*—Total board-foot volume of wood inside bark without deductions for total board-foot cull.

*Gross cubic-foot volume*—Total cubic-foot volume of wood inside bark without deductions for rotten, missing, or broken-top cull.

*Net board-foot volume*—Gross board-foot volume minus deductions for total board-foot cull.

*Net cubic-foot volume*—Gross cubic-foot volume minus deductions for rotten, missing, and broken-top cull.



## Appendix A—Detailed Tables

**Table A.1—Number of plots by survey unit and land status, Puerto Rico, 2009**

Survey unit	Total plots	Forest inventory			Forest health monitoring		
		Forested	Non-forest	Non-sampled	Forested	Non-forest	Non-sampled
		<i>number of plots</i>					
Mainland Puerto Rico	371	158	64	10	92	43	4
Culebra	19	9	1	2	4	2	1
Vieques	52	20	3	20	5	1	3
Mona	27	0	0	0	26	1	0
All units	469	187	68	32	127	47	8

**Table A.2—Area by survey unit and land status, Puerto Rico, 2009**

Survey unit	Total area	Land status						Total land area	Forest percent
		All forest	Un-reserved	Reserved	Nonforest land	Census water			
		<i>acres</i>							
Mainland Puerto Rico	3,006,005	1,168,291	1,039,191	129,100	968,867	868,847	2,137,158	54.67	
Culebra	108,048	7,344	6,665	679	801	99,903	8,145	90.17	
Vieques	168,948	24,687	13,288	11,399	8,502	135,759	33,189	74.38	
Mona	93,478	12,883	0	12,883	0	80,594	12,884	99.99	
All units	3,376,479	1,213,205	1,059,144	154,061	978,170	1,185,103	2,191,376	55.36	

Numbers in rows and columns may not sum to totals due to rounding.

0 = no sample for the cell or a value of >0.0 but <0.05.



**Table A.3—Area of forest land by ownership class and land status, Puerto Rico, 2009**

Ownership class	All forest land	Land status	
		Unreserved	Reserved
		<i>acres</i>	
U.S. Forest Service			
National forest	27,088	0	27,088
Total	27,088	0	27,088
Other Federal			
U.S. Fish and Wildlife Service	11,764	0	11,764
Dept. of Defense/Dept. of Energy	6,625	0	6,625
Total	18,389	0	18,389
Commonwealth and local government			
Commonwealth	134,890	0	134,890
Total	134,890	0	134,890
Nonindustrial private			
Undifferentiated private	1,032,838	1,032,838	0
Total	1,032,838	1,032,838	0
All classes	1,213,205	1,032,838	180,367

0 = no sample for the cell or a value of >0.0 but <0.05.

**Table A.4—Area of forest land by forest-type group and ownership group, Puerto Rico, 2009**

Forest-type group	All ownerships	Ownership group				
		U.S. Forest Service	Other Federal	Commonwealth and local government	Forest industry	Nonindustrial private
		<i>acres</i>				
Mangrove	14,898	0	0	4,063	0	10,835
Dry forest	199,691	0	15,028	49,001	0	135,662
Moist forest	578,801	0	3,360	22,790	0	552,650
Wet and rain forest	398,145	10,835	0	59,036	0	328,274
Lower montane wet and rain forest	21,670	16,253	0	0	0	5,418
All forest-type groups	1,213,205	27,088	18,389	134,890	0	1,032,838

Numbers in rows and columns may not sum to totals due to rounding.

0 = no sample for the cell or a value of >0.0 but <0.05.



## Appendix A—Detailed Tables

**Table A.5—Area of forest land by forest-type group and stand-size class, Puerto Rico, 2009**

Forest-type group	All classes	Stand-size class			Non-stocked
		Large diameter	Medium diameter	Small diameter	
<i>acres</i>					
Mangrove	14,898	0	5,418	9,481	0
Dry forest	199,692	5,946	5,914	187,832	0
Moist forest	578,801	160,319	150,065	264,130	4,286
Wet and rain forest	398,145	164,261	133,565	97,386	2,932
Lower montane wet and rain forest	21,670	5,418	16,253	0	0
All forest-type groups	1,213,206	335,944	311,215	558,829	7,218

Numbers in rows and columns may not sum to totals due to rounding.  
 0 = no sample for the cell or a value of >0.0 but <0.05.

**Table A.6—Area of forest land by ownership class and stand-size class, Puerto Rico, 2009**

Ownership class	All classes	Stand-size class			Non-stocked
		Large diameter	Medium diameter	Small diameter	
<i>acres</i>					
U.S. Forest Service					
National forest	27,088	5,418	21,670	0	0
Total	27,088	5,418	21,670	0	0
Other Federal					
U.S. Fish and Wildlife Service	11,764	528	885	10,350	0
Dept. of Defense/Dept. of Energy	6,625	0	0	6,625	0
Total	18,389	528	885	16,975	0
Commonwealth and local government					
Commonwealth	134,890	31,151	12,128	91,612	0
Total	134,890	31,151	12,128	91,612	0
Nonindustrial private					
Undifferentiated private	1,032,838	298,847	276,530	450,242	7,218
Total	1,032,838	298,847	276,530	450,242	7,218
All classes	1,213,205	335,944	311,213	565,132	7,218

Numbers in rows and columns may not sum to totals due to rounding.  
 0 = no sample for the cell or a value of >0.0 but <0.05.





**Table A.7—Tree species with d.b.h.  $\geq$ 5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, Puerto Rico, 2009. (Total stems counted = 4,321; total sum of basal area = 2,264.22 ft<sup>2</sup>; total number of plots = 283.)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Spathodea campanulata</i> P. Beauv.	704	16.29	423.06	18.68	73	5.32	13.43
<i>Guarea guidonia</i> (L.) Sleumer	289	6.69	163.67	7.23	68	4.96	6.29
<i>Bursera simaruba</i> (L.) Sarg.	302	6.99	137.23	6.06	62	4.52	5.86
<i>Cecropia schreberiana</i> Miq.	249	5.76	144.98	6.40	65	4.74	5.64
<i>Andira inermis</i> (W. Wright) Kunth ex DC.	187	4.33	68.09	3.01	63	4.60	3.98
<i>Mangifera indica</i> L.	73	1.69	147.14	6.50	25	1.82	3.34
<i>Tabebuia heterophylla</i> (DC.) Britton	163	3.77	49.94	2.21	42	3.06	3.01
<i>Prestoea acuminata</i> (Willd.) H.E. Moore var. <i>montana</i> (Graham) A. Hend. & G. Galeano	214	4.95	48.94	2.16	19	1.39	2.83
<i>Inga vera</i> Willd.	100	2.31	47.23	2.09	42	3.06	2.49
<i>Syzygium jambos</i> (L.) Alston	127	2.94	39.63	1.75	36	2.63	2.44
<i>Inga laurina</i> (Sw.) Willd.	71	1.64	40.62	1.79	35	2.55	2.00
<i>Schefflera morototoni</i> (Aubl.) Maguire, Steyerm. & Frodin	89	2.06	33.09	1.46	28	2.04	1.85
<i>Guapira fragrans</i> (Dum. Cours.) Little	70	1.62	22.42	0.99	36	2.63	1.75
<i>Zanthoxylum martinicense</i> (Lam.) DC.	62	1.43	28.79	1.27	31	2.26	1.66
<i>Ocotea leucoxydon</i> (Sw.) De Laness.	55	1.27	16.61	0.73	30	2.19	1.40
<i>Roystonea borinquena</i> O.F. Cook	38	0.88	27.58	1.22	25	1.82	1.31
<i>Eucalyptus robusta</i> Sm.	47	1.09	54.59	2.41	5	0.36	1.29
<i>Dacryodes excelsa</i> Vahl	15	0.35	67.65	2.99	6	0.44	1.26
<i>Cordia sulcata</i> DC.	39	0.90	17.14	0.76	25	1.82	1.16
<i>Albizia procera</i> (Roxb.) Benth.	59	1.37	21.20	0.94	14	1.02	1.11
<i>Cinnamomum elongatum</i> (Vahl ex Nees) Kosterm.	32	0.74	19.01	0.84	24	1.75	1.11
<i>Dendropanax arboreus</i> (L.) Decne. & Planch. ex Britton	44	1.02	15.78	0.70	19	1.39	1.03
<i>Prosopis pallida</i> (Humb. & Bonpl. ex Willd.) Kunth	49	1.13	13.59	0.60	17	1.24	0.99
<i>Cordia alliodora</i> (Ruiz & Pav.) Oken	33	0.76	11.43	0.50	22	1.60	0.96
<i>Alchornea latifolia</i> Sw.	36	0.83	19.34	0.85	16	1.17	0.95
<i>Guazuma ulmifolia</i> Lam.	42	0.97	16.45	0.73	14	1.02	0.91
<i>Calophyllum antillanum</i> Britton	24	0.56	29.73	1.31	11	0.80	0.89
<i>Bourreria succulenta</i> Jacq.	34	0.79	8.63	0.38	18	1.31	0.83
<i>Buchenavia tetraphylla</i> (Aubl.) Howard	9	0.21	39.07	1.73	6	0.44	0.79
<i>Micropholis guyanensis</i> (A. DC.) Pierre	36	0.83	24.10	1.06	6	0.44	0.78
<i>Metopium toxiferum</i> (L.) Krug & Urb.	41	0.95	11.16	0.49	10	0.73	0.72
<i>Citrus xsinensis</i> (L.) Osbeck (pro sp.) [maxima $\times$ reticulata]	30	0.69	9.00	0.40	13	0.95	0.68
<i>Erythrina poeppigiana</i> (Walp.) O.F. Cook	17	0.39	18.91	0.83	11	0.80	0.68
<i>Spondias mombin</i> L.	16	0.37	17.95	0.79	11	0.80	0.66
<i>Ficus citrifolia</i> Mill.	15	0.35	14.74	0.65	12	0.88	0.62
<i>Artocarpus altilis</i> (Parkinson) Fosberg	27	0.62	12.49	0.55	9	0.66	0.61

continued



## Appendix A—Detailed Tables

**Table A.7—Tree species with d.b.h.  $\geq 5.0$  inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, Puerto Rico, 2009. (Total stems counted = 4,321; total sum of basal area = 2,264.22 ft<sup>2</sup>; total number of plots = 283.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Clusia rosea</i> Jacq.	24	0.56	8.93	0.39	11	0.80	0.58
<i>Persea americana</i> Mill.	23	0.53	12.28	0.54	9	0.66	0.58
<i>Cupania americana</i> L.	17	0.39	4.20	0.19	15	1.09	0.56
<i>Neolaugeria resinosa</i> (Vahl) Nicolson	27	0.62	7.37	0.33	9	0.66	0.54
<i>Casearia arborea</i> (Rich.) Urb.	20	0.46	4.39	0.19	12	0.88	0.51
<i>Bucida buceras</i> L.	19	0.44	12.32	0.54	7	0.51	0.50
<i>Terminalia catappa</i> L.	19	0.44	12.53	0.55	7	0.51	0.50
<i>Byrsonima spicata</i> (Cav.) Kunth	19	0.44	7.12	0.31	10	0.73	0.49
<i>Hymenaea courbaril</i> L.	21	0.49	13.03	0.58	4	0.29	0.45
<i>Cocos nucifera</i> L.	17	0.39	11.31	0.50	6	0.44	0.44
<i>Tetragastris balsamifera</i> (Sw.) Oken	22	0.51	7.74	0.34	5	0.36	0.41
<i>Coccoloba diversifolia</i> Jacq.	17	0.39	5.09	0.22	7	0.51	0.38
<i>Melicococcus bijugatus</i> Jacq.	15	0.35	5.62	0.25	7	0.51	0.37
<i>Thespesia grandiflora</i> DC.	12	0.28	5.48	0.24	8	0.58	0.37
<i>Cyathea arborea</i> (L.) Sm.	14	0.32	2.59	0.11	9	0.66	0.36
<i>Cedrela odorata</i> L.	5	0.12	14.46	0.64	4	0.29	0.35
<i>Senna siamea</i> (Lam.) Irwin & Barneby	18	0.42	9.31	0.41	3	0.22	0.35
<i>Turpinia occidentalis</i> (Sw.) G. Don	14	0.32	5.52	0.24	6	0.44	0.34
<i>Micropholis garciniifolia</i> Pierre	16	0.37	6.82	0.30	4	0.29	0.32
<i>Samanea saman</i> (Jacq.) Merr.	11	0.25	6.39	0.28	6	0.44	0.32
<i>Thouinia striata</i> Radlk.	13	0.30	3.65	0.16	7	0.51	0.32
<i>Petitia domingensis</i> Jacq.	9	0.21	4.06	0.18	7	0.51	0.30
<i>Ormosia krugii</i> Urb.	18	0.42	5.58	0.25	3	0.22	0.29
<i>Homalium racemosum</i> Jacq.	9	0.21	5.94	0.26	5	0.36	0.28
<i>Delonix regia</i> (Bojer ex Hook.) Raf.	7	0.16	6.09	0.27	5	0.36	0.27
<i>Sloanea berteriana</i> Choisy ex DC.	7	0.16	5.83	0.26	5	0.36	0.26
<i>Pouteria multiflora</i> (A. DC.) Eyma	6	0.14	8.90	0.39	3	0.22	0.25
<i>Zanthoxylum monophyllum</i> (Lam.) P. Wilson	12	0.28	2.57	0.11	5	0.36	0.25
<i>Avicennia germinans</i> (L.) L.	18	0.42	4.90	0.22	1	0.07	0.24
<i>Pisonia subcordata</i> Sw.	16	0.37	4.61	0.20	2	0.15	0.24
<i>Plumeria obtusa</i> L.	9	0.21	2.40	0.11	5	0.36	0.23
<i>Swietenia macrophylla</i> King	7	0.16	7.11	0.31	3	0.22	0.23
<i>Pithecellobium unguis-cati</i> (L.) Benth.	14	0.32	6.27	0.28	1	0.07	0.22
<i>Poitea florida</i> (Vahl) Lavin	18	0.42	4.07	0.18	1	0.07	0.22
<i>Sideroxylon salicifolium</i> (L.) Lam.	7	0.16	3.21	0.14	5	0.36	0.22
<i>Adenantha pavonina</i> L.	13	0.30	4.27	0.19	2	0.15	0.21
<i>Swietenia mahagoni</i> (L.) Jacq.	14	0.32	3.62	0.16	2	0.15	0.21
<i>Ziziphus mauritiana</i> Lam.	8	0.19	1.61	0.07	5	0.36	0.21
<i>Tetrazygia elaeagnoides</i> (Sw.) DC.	7	0.16	1.39	0.06	5	0.36	0.20
<i>Leucaena leucocephala</i> (Lam.) de Wit	7	0.16	1.97	0.09	4	0.29	0.18
<i>Pimenta racemosa</i> (Mill.) J.W. Moore	5	0.12	1.11	0.05	5	0.36	0.18
<i>Pithecellobium dulce</i> (Roxb.) Benth.	8	0.19	4.85	0.21	2	0.15	0.18

continued



**Table A.7—Tree species with d.b.h.  $\geq$ 5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, Puerto Rico, 2009. (Total stems counted = 4,321; total sum of basal area = 2,264.22 ft<sup>2</sup>; total number of plots = 283.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Sapium laurocerasus</i> Desf.	5	0.12	1.53	0.07	5	0.36	0.18
<i>Trichilia hirta</i> L.	5	0.12	0.93	0.04	5	0.36	0.17
<i>Pilosocereus royenii</i> (L.) Byles & Rowley	8	0.19	2.03	0.09	3	0.22	0.16
<i>Chrysophyllum cainito</i> L.	2	0.05	5.62	0.25	2	0.15	0.15
<i>Henriettea squamulosum</i> (Cogn.) W.S. Judd	5	0.12	0.94	0.04	4	0.29	0.15
<i>Krugiodendron ferreum</i> (Vahl) Urb.	8	0.19	1.35	0.06	3	0.22	0.15
<i>Miconia laevigata</i> (L.) D. Don	9	0.21	1.85	0.08	2	0.15	0.15
<i>Miconia tetrandra</i> (Sw.) D. Don	5	0.12	2.54	0.11	3	0.22	0.15
<i>Annona muricata</i> L.	4	0.09	0.90	0.04	4	0.29	0.14
<i>Eugenia biflora</i> (L.) DC.	6	0.14	1.21	0.05	3	0.22	0.14
<i>Guettarda scabra</i> (L.) Vent.	6	0.14	1.34	0.06	3	0.22	0.14
<i>Magnolia portoricensis</i> Bello	4	0.09	2.80	0.12	3	0.22	0.14
<i>Pinus caribaea</i> Morelet	6	0.14	4.51	0.20	1	0.07	0.14
<i>Piscidia carthagenensis</i> Jacq.	6	0.14	1.64	0.07	3	0.22	0.14
<i>Tabernaemontana citrifolia</i> L.	1	0.02	7.07	0.31	1	0.07	0.14
<i>Byrsonima lucida</i> (Mill.) DC.	6	0.14	1.02	0.05	3	0.22	0.13
<i>Coccoloba microstachya</i> Willd.	5	0.12	1.01	0.04	3	0.22	0.13
<i>Ficus trigonata</i> L.	2	0.05	3.48	0.15	2	0.15	0.12
<i>Ocotea floribunda</i> (Sw.) Mez	4	0.09	2.56	0.11	2	0.15	0.12
<i>Cinnamomum montanum</i> (Sw.) Bercht. & J. Presl	3	0.07	2.41	0.11	2	0.15	0.11
<i>Gliricidia sepium</i> (Jacq.) Kunth ex Walp.	5	0.12	1.23	0.05	2	0.15	0.11
<i>Matayba domingensis</i> (DC.) Radlk.	5	0.12	1.52	0.07	2	0.15	0.11
<i>Meliosma herbertii</i> Rolfe	7	0.16	2.12	0.09	1	0.07	0.11
<i>Myrcia splendens</i> (Sw.) DC.	3	0.07	0.86	0.04	3	0.22	0.11
<i>Sideroxylon foetidissimum</i> Jacq.	2	0.05	3.42	0.15	2	0.15	0.11
<i>Vitex divaricata</i> Sw.	3	0.07	4.14	0.18	1	0.07	0.11
<i>Acacia farnesiana</i> (L.) Willd.	4	0.09	1.34	0.06	2	0.15	0.10
<i>Casuarina equisetifolia</i> L.	6	0.14	2.14	0.09	1	0.07	0.10
<i>Croton poecilanthus</i> Urb.	3	0.07	1.89	0.08	2	0.15	0.10
<i>Pseudolmedia spuria</i> (Sw.) Griseb.	4	0.09	1.62	0.07	2	0.15	0.10
<i>Acacia macracantha</i> Humb. & Bonpl. ex Willd.	4	0.09	1.04	0.05	2	0.15	0.09
<i>Chionanthus domingensis</i> Lam.	3	0.07	1.19	0.05	2	0.15	0.09
<i>Clusia clusioides</i> (Griseb.) D'Arcy	3	0.07	1.02	0.05	2	0.15	0.09
<i>Guaiacum officinale</i> L.	3	0.07	1.25	0.06	2	0.15	0.09
<i>Peltophorum pterocarpum</i> (DC.) Backer ex K. Heyne	6	0.14	1.65	0.07	1	0.07	0.09
<i>Adelia ricinella</i> L.	3	0.07	0.59	0.03	2	0.15	0.08
<i>Annona reticulata</i> L.	3	0.07	0.50	0.02	2	0.15	0.08
<i>Coffea liberica</i> W. Bull ex Hiern.	3	0.07	0.54	0.02	2	0.15	0.08

continued



## Appendix A—Detailed Tables

**Table A.7—Tree species with d.b.h.  $\geq$ 5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, Puerto Rico, 2009. (Total stems counted = 4,321; total sum of basal area = 2,264.22 ft<sup>2</sup>; total number of plots = 283.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Conocarpus erectus</i> L.	3	0.07	2.02	0.09	1	0.07	0.08
<i>Daphnopsis americana</i> (Mill.) J.R. Johnst.	2	0.05	1.21	0.05	2	0.15	0.08
<i>Licaria parvifolia</i> (Lam.) Kosterm.	3	0.07	0.86	0.04	2	0.15	0.08
<i>Myrsine coriacea</i> (Sw.) R. Br. ex Roem. & Schult.	3	0.07	0.57	0.03	2	0.15	0.08
<i>Nectandra coriacea</i> (Sw.) Griseb.	3	0.07	0.67	0.03	2	0.15	0.08
<i>Ocotea moschata</i> (Pav. ex Meisn.) Mez	2	0.05	1.26	0.06	2	0.15	0.08
<i>Pisonia albida</i> (Heimerl) Britton ex Standl.	2	0.05	0.86	0.04	2	0.15	0.08
<i>Sideroxylon cubense</i> (Griseb.) T.D. Penn.	3	0.07	0.78	0.03	2	0.15	0.08
<i>Canella winterana</i> (L.) Gaertn.	2	0.05	0.38	0.02	2	0.15	0.07
<i>Chrysophyllum pauciflorum</i> Lam.	2	0.05	0.41	0.02	2	0.15	0.07
<i>Cordia borinquensis</i> Urb.	2	0.05	0.39	0.02	2	0.15	0.07
<i>Hypelate trifoliata</i> Sw.	2	0.05	0.33	0.01	2	0.15	0.07
<i>Magnolia splendens</i> Urb.	1	0.02	2.64	0.12	1	0.07	0.07
<i>Mammea americana</i> L.	2	0.05	1.81	0.08	1	0.07	0.07
<i>Margaritaria nobilis</i> L. f.	4	0.09	1.15	0.05	1	0.07	0.07
<i>Myrsine cubana</i> A. DC.	3	0.07	1.51	0.07	1	0.07	0.07
<i>Symplocos martinicensis</i> Jacq.	3	0.07	1.32	0.06	1	0.07	0.07
<i>Tabebuia rigida</i> Urb.	1	0.02	2.27	0.10	1	0.07	0.07
<i>Trichilia pallida</i> Sw.	2	0.05	0.52	0.02	2	0.15	0.07
<i>Albizia lebbeck</i> (L.) Benth.	2	0.05	1.24	0.05	1	0.07	0.06
<i>Ficus americana</i> Aubl.	1	0.02	1.69	0.07	1	0.07	0.06
<i>Ocotea wrightii</i> (Meisn.) Mez	1	0.02	1.69	0.07	1	0.07	0.06
<i>Pouteria sapota</i> (Jacq.) H.E. Moore & Stearn	2	0.05	1.10	0.05	1	0.07	0.06
<i>Rhizophora mangle</i> L.	3	0.07	0.61	0.03	1	0.07	0.06
<i>Ziziphus taylorii</i> (Britton) M.C. Johnst.	3	0.07	0.57	0.03	1	0.07	0.06
<i>Amyris balsamifera</i> L.	2	0.05	0.50	0.02	1	0.07	0.05
<i>Castilla elastica</i> Sessé	2	0.05	0.47	0.02	1	0.07	0.05
<i>Cordia sebestena</i> L.	2	0.05	0.56	0.02	1	0.07	0.05
<i>Cupania triquetra</i> A. Rich.	2	0.05	0.72	0.03	1	0.07	0.05
<i>Eugenia borinquensis</i> Britton	1	0.02	0.95	0.04	1	0.07	0.05
<i>Henriettea macfadyenii</i> (Triana) Alain	2	0.05	0.63	0.03	1	0.07	0.05
<i>Inga nobilis</i> Willd. ssp. <i>quaternata</i> (Poepp. & Endl.) T.D. Penn.	1	0.02	1.33	0.06	1	0.07	0.05
<i>Ixora ferrea</i> (Jacq.) Benth.	2	0.05	0.85	0.04	1	0.07	0.05
<i>Laguncularia racemosa</i> (L.) C.F. Gaertn.	2	0.05	0.41	0.02	1	0.07	0.05
<i>Lonchocarpus domingensis</i> (Turp. ex Pers.) DC.	1	0.02	1.12	0.05	1	0.07	0.05
<i>Sloanea amygdalina</i> Griseb.	1	0.02	1.48	0.07	1	0.07	0.05
<i>Thespesia populnea</i> (L.) Sol. ex Corrêa	2	0.05	0.38	0.02	1	0.07	0.05

continued



**Table A.7—Tree species with d.b.h.  $\geq$ 5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, Puerto Rico, 2009. (Total stems counted = 4,321; total sum of basal area = 2,264.22 ft<sup>2</sup>; total number of plots = 283.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Acrocomia media</i> O.F. Cook	1	0.02	0.62	0.03	1	0.07	0.04
<i>Alsophila portoricensis</i> (Spreng. ex Kuhn) Conant	1	0.02	0.20	0.01	1	0.07	0.04
<i>Byrsonima wadsworthii</i> Little	1	0.02	0.34	0.02	1	0.07	0.04
<i>Carapa guianensis</i> Aubl.	1	0.02	0.23	0.01	1	0.07	0.04
<i>Casearia decandra</i> Jacq.	1	0.02	0.25	0.01	1	0.07	0.04
<i>Casearia sylvestris</i> Sw.	1	0.02	0.35	0.02	1	0.07	0.04
<i>Cassipourea guianensis</i> Aubl.	1	0.02	0.29	0.01	1	0.07	0.04
<i>Ceiba pentandra</i> (L.) Gaertn.	1	0.02	0.22	0.01	1	0.07	0.04
<i>Cestrum laurifolium</i> L'Hér.	1	0.02	0.22	0.01	1	0.07	0.04
<i>Coccoloba pubescens</i> L.	1	0.02	0.38	0.02	1	0.07	0.04
<i>Cochlospermum vitifolium</i> (Willd.) Willd. ex Spreng.	1	0.02	0.70	0.03	1	0.07	0.04
<i>Cordia rickseckeri</i> Millsp.	1	0.02	0.23	0.01	1	0.07	0.04
<i>Crescentia cujete</i> L.	1	0.02	0.39	0.02	1	0.07	0.04
<i>Dracaena fragrans</i> (L.) Ker Gawl.	1	0.02	0.60	0.03	1	0.07	0.04
<i>Erythroxylum areolatum</i> L.	2	0.05	0.32	0.01	1	0.07	0.04
<i>Eugenia confusa</i> DC.	1	0.02	0.47	0.02	1	0.07	0.04
<i>Eugenia stahlia</i> (Kiaersk.) Krug & Urb.	1	0.02	0.32	0.01	1	0.07	0.04
<i>Miconia racemosa</i> (Aubl.) DC.	1	0.02	0.24	0.01	1	0.07	0.04
<i>Ouratea striata</i> (v. Tiegh.) Urb.	1	0.02	0.40	0.02	1	0.07	0.04
<i>Parathesis crenulata</i> (Vent.) Hook. f.	1	0.02	0.45	0.02	1	0.07	0.04
<i>Podocarpus coriaceus</i> Rich.	1	0.02	0.32	0.01	1	0.07	0.04
<i>Prunus occidentalis</i> Sw.	1	0.02	0.50	0.02	1	0.07	0.04
<i>Senna spectabilis</i> (DC.) Irwin & Barneby	1	0.02	0.32	0.01	1	0.07	0.04
<i>Sterculia apetala</i> (Jacq.) Karst.	1	0.02	0.32	0.01	1	0.07	0.04
<i>Tamarindus indica</i> L.	1	0.02	0.79	0.03	1	0.07	0.04
<i>Triplaris cumingiana</i> Fisch. & C.A. Mey. ex C.A. Mey.	1	0.02	0.40	0.02	1	0.07	0.04
<i>Amyris elemifera</i> L.	1	0.02	0.17	0.01	1	0.07	0.03
<i>Antirhea obtusifolia</i> Urb.	1	0.02	0.20	0.01	1	0.07	0.03
<i>Byrsonima crassifolia</i> (L.) Kunth	1	0.02	0.16	0.01	1	0.07	0.03
<i>Capparis cynophallophora</i> L.	1	0.02	0.18	0.01	1	0.07	0.03
<i>Casearia guianensis</i> (Aubl.) Urb.	1	0.02	0.14	0.01	1	0.07	0.03
<i>Cassine xylocarpa</i> Vent.	1	0.02	0.18	0.01	1	0.07	0.03
<i>Coccoloba sintenisii</i> Urb. ex Lindau	1	0.02	0.14	0.01	1	0.07	0.03
<i>Cojoba arborea</i> (L.) Britton & Rose	1	0.02	0.15	0.01	1	0.07	0.03
<i>Cyathea tenera</i> (J. Sm. ex Hook.) T. Moore	1	0.02	0.14	0.01	1	0.07	0.03
<i>Cyrilla racemiflora</i> L.	1	0.02	0.18	0.01	1	0.07	0.03

continued



## Appendix A—Detailed Tables

**Table A.7—Tree species with d.b.h.  $\geq$ 5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, Puerto Rico, 2009. (Total stems counted = 4,321; total sum of basal area = 2,264.22 ft<sup>2</sup>; total number of plots = 283.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Eugenia ligustrina</i> (Sw.) Willd.	1	0.02	0.15	0.01	1	0.07	0.03
<i>Eugenia monticola</i> (Sw.) DC.	1	0.02	0.14	0.01	1	0.07	0.03
<i>Gymnanthes lucida</i> Sw.	1	0.02	0.14	0.01	1	0.07	0.03
<i>Lonchocarpus glaucifolius</i> Urb.	1	0.02	0.18	0.01	1	0.07	0.03
<i>Maytenus ponceana</i> Britton	1	0.02	0.14	0.01	1	0.07	0.03
<i>Miconia prasina</i> (Sw.) DC.	1	0.02	0.15	0.01	1	0.07	0.03
<i>Pictetia aculeata</i> (Vahl) Urb.	1	0.02	0.16	0.01	1	0.07	0.03
<i>Psidium guajava</i> L.	1	0.02	0.19	0.01	1	0.07	0.03
<i>Sideroxylon obovatum</i> Lam.	1	0.02	0.15	0.01	1	0.07	0.03
<i>Solanum bahamense</i> L. var. <i>bahamense</i>	1	0.02	0.15	0.01	1	0.07	0.03
<i>Spondias purpurea</i> L.	1	0.02	0.18	0.01	1	0.07	0.03

D.b.h. = diameter at breast height; BA = basal area.

Nomenclature based on USDA NRCS PLANTS 2010 database.



**Table A.8—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, Puerto Rico, 2009. (Total stems counted = 3,931; total sum of basal area = 96.03 ft<sup>2</sup>; total number of plots = 300.)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Leucaena leucocephala</i> (Lam.) de Wit	255	6.49	5.51	5.73	41	3.08	5.10
<i>Guarea guidonia</i> (L.) Sleumer	182	4.63	5.35	5.57	59	4.43	4.88
<i>Spathodea campanulata</i> P. Beauv.	181	4.60	6.06	6.31	43	3.23	4.71
<i>Tabebuia heterophylla</i> (DC.) Britton	158	4.02	3.97	4.13	42	3.15	3.77
<i>Casearia guianensis</i> (Aubl.) Urb.	168	4.27	3.03	3.15	47	3.53	3.65
<i>Coccoloba microstachya</i> Willd.	184	4.68	2.95	3.07	30	2.25	3.33
<i>Casearia sylvestris</i> Sw.	149	3.79	2.50	2.60	39	2.93	3.11
<i>Prosopis pallida</i> (Humb. & Bonpl. ex Willd.) Kunth	108	2.75	3.93	4.09	16	1.20	2.68
<i>Bourreria succulenta</i> Jacq.	87	2.21	2.52	2.63	23	1.73	2.19
<i>Bursera simaruba</i> (L.) Sarg.	43	1.09	2.41	2.51	26	1.95	1.85
<i>Eugenia monticola</i> (Sw.) DC.	76	1.93	1.38	1.44	26	1.95	1.78
<i>Andira inermis</i> (W. Wright) Kunth ex DC.	48	1.22	2.18	2.27	24	1.80	1.76
<i>Guettarda scabra</i> (L.) Vent.	79	2.01	1.03	1.08	22	1.65	1.58
<i>Syzygium jambos</i> (L.) Alston	57	1.45	1.77	1.84	19	1.43	1.57
<i>Ocotea leucoxylon</i> (Sw.) De Laness.	45	1.14	1.32	1.38	25	1.88	1.47
<i>Reynosia uncinata</i> Urb.	66	1.68	0.97	1.01	20	1.50	1.40
<i>Inga vera</i> Willd.	36	0.92	1.50	1.56	22	1.65	1.38
<i>Miconia prasina</i> (Sw.) DC.	62	1.58	1.00	1.04	18	1.35	1.32
<i>Myrcia splendens</i> (Sw.) DC.	47	1.20	1.04	1.08	20	1.50	1.26
<i>Guapira fragrans</i> (Dum. Cours.) Little	44	1.12	1.06	1.10	17	1.28	1.17
<i>Erythroxylum rotundifolium</i> Lunan	47	1.20	0.60	0.63	15	1.13	0.98
<i>Ardisia obovata</i> Desv. ex Ham.	45	1.14	0.80	0.83	11	0.83	0.93
<i>Amyris elemifera</i> L.	40	1.02	0.95	0.99	10	0.75	0.92
<i>Acacia farnesiana</i> (L.) Willd.	41	1.04	0.88	0.92	10	0.75	0.90
<i>Cyathea arborea</i> (L.) Sm.	17	0.43	1.45	1.51	10	0.75	0.90
<i>Randia aculeata</i> L.	35	0.89	0.35	0.36	19	1.43	0.89
<i>Coccoloba diversifolia</i> Jacq.	31	0.79	0.84	0.87	13	0.98	0.88
<i>Thouinia striata</i> Radlk.	24	0.61	1.11	1.15	11	0.83	0.86
<i>Eugenia biflora</i> (L.) DC.	28	0.71	0.69	0.72	14	1.05	0.83
<i>Antirhea acutata</i> (DC.) Urb.	48	1.22	0.47	0.49	9	0.68	0.80
<i>Coffea arabica</i> L.	36	0.92	0.44	0.46	13	0.98	0.78
<i>Krugiodendron ferreum</i> (Vahl) Urb.	29	0.74	0.73	0.76	10	0.75	0.75
<i>Zanthoxylum monophyllum</i> (Lam.) P. Wilson	26	0.66	0.85	0.89	9	0.68	0.74
<i>Coffea liberica</i> W. Bull ex Hiern.	28	0.71	0.82	0.86	7	0.53	0.70
<i>Tabebuia haemantha</i> (Bertol. ex Spreng.) DC.	36	0.92	0.60	0.62	7	0.53	0.69
<i>Dendropanax arboreus</i> (L.) Decne. & Planch. ex Britton	23	0.59	0.60	0.62	11	0.83	0.68
<i>Adelia ricinella</i> L.	33	0.84	0.56	0.58	8	0.60	0.67
<i>Psidium guajava</i> L.	28	0.71	0.54	0.56	9	0.68	0.65
<i>Casearia arborea</i> (Rich.) Urb.	25	0.64	0.50	0.52	10	0.75	0.64

continued



## Appendix A—Detailed Tables

**Table A.8—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, Puerto Rico, 2009. (Total stems counted = 3,931; total sum of basal area = 96.03 ft<sup>2</sup>; total number of plots = 300.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count	Relative frequency	Importance value
<i>Pictetia aculeata</i> (Vahl) Urb.	28	0.71	0.59	0.61	8	0.60	0.64
<i>Exostema caribaeum</i> (Jacq.) Schult.	25	0.64	0.46	0.48	10	0.75	0.62
<i>Gymnanthes lucida</i> Sw.	33	0.84	0.38	0.40	8	0.60	0.61
<i>Neolaugeria resinosa</i> (Vahl) Nicolson	19	0.48	0.63	0.66	8	0.60	0.58
<i>Calophyllum antillanum</i> Britton	26	0.66	0.66	0.69	5	0.38	0.57
<i>Cordia alliodora</i> (Ruiz & Pav.) Oken	18	0.46	0.53	0.55	9	0.68	0.56
<i>Plumeria obtusa</i> L.	25	0.64	0.50	0.52	7	0.53	0.56
<i>Tetrazygia elaeagnoides</i> (Sw.) DC.	27	0.69	0.54	0.57	5	0.38	0.54
<i>Cordia sulcata</i> DC.	15	0.38	0.51	0.53	9	0.68	0.53
<i>Myrcianthes fragrans</i> (Sw.) McVaugh	25	0.64	0.33	0.34	8	0.60	0.53
<i>Trichilia pallida</i> Sw.	22	0.56	0.43	0.44	8	0.60	0.53
<i>Nectandra coriacea</i> (Sw.) Griseb.	15	0.38	0.57	0.59	6	0.45	0.48
<i>Inga laurina</i> (Sw.) Willd.	12	0.31	0.38	0.39	8	0.60	0.43
<i>Cecropia schreberiana</i> Miq.	9	0.23	0.48	0.50	7	0.53	0.42
<i>Trichilia hirta</i> L.	17	0.43	0.36	0.38	6	0.45	0.42
<i>Cupania americana</i> L.	13	0.33	0.35	0.37	7	0.53	0.41
<i>Zanthoxylum martinicense</i> (Lam.) DC.	9	0.23	0.38	0.39	8	0.60	0.41
<i>Eugenia rhombea</i> (Berg) Krug & Urb.	16	0.41	0.31	0.33	6	0.45	0.39
<i>Pithecellobium unguis-cati</i> (L.) Benth.	14	0.36	0.26	0.27	7	0.53	0.39
<i>Albizia procera</i> (Roxb.) Benth.	11	0.28	0.42	0.43	5	0.38	0.36
<i>Schefflera morototonii</i> (Aubl.) Maguire, Steyerm. & Frodin	8	0.20	0.34	0.35	7	0.53	0.36
<i>Swietenia mahagoni</i> (L.) Jacq.	13	0.33	0.49	0.51	3	0.23	0.36
<i>Erythrina poeppigiana</i> (Walp.) O.F. Cook	9	0.23	0.30	0.31	7	0.53	0.35
<i>Psychotria berteriana</i> DC.	10	0.25	0.20	0.20	8	0.60	0.35
<i>Citrus xsinensis</i> (L.) Osbeck (pro sp.) [maxima × reticulata]	6	0.15	0.48	0.50	5	0.38	0.34
<i>Croton astroites</i> Dryand.	12	0.31	0.22	0.23	6	0.45	0.33
<i>Myrsine coriacea</i> (Sw.) R. Br. ex Roem. & Schult.	15	0.38	0.30	0.31	4	0.30	0.33
<i>Cinnamomum elongatum</i> (Vahl ex Nees) Kosterm.	7	0.18	0.25	0.26	7	0.53	0.32
<i>Clusia rosea</i> Jacq.	10	0.25	0.32	0.33	5	0.38	0.32
<i>Euphorbia petiolaris</i> Sims	13	0.33	0.10	0.11	7	0.53	0.32
<i>Tetragastris balsamifera</i> (Sw.) Oken	11	0.28	0.37	0.38	4	0.30	0.32
<i>Thouinia striata</i> Radlk. var. portoricensis (Radlk.) Votava & Alain	18	0.46	0.18	0.19	4	0.30	0.32
<i>Erythrina berteriana</i> Urb.	11	0.28	0.55	0.57	1	0.08	0.31
<i>Adenantha pavonina</i> L.	15	0.38	0.44	0.45	1	0.08	0.30
<i>Capparis hastata</i> Jacq.	15	0.38	0.28	0.29	3	0.23	0.30
<i>Casearia decandra</i> Jacq.	8	0.20	0.09	0.10	8	0.60	0.30

continued





**Table A.8—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, Puerto Rico, 2009. (Total stems counted = 3,931; total sum of basal area = 96.03 ft<sup>2</sup>; total number of plots = 300.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Cassine xylocarpa</i> Vent.	15	0.38	0.22	0.23	4	0.30	0.30
<i>Ouratea littoralis</i> Urb.	14	0.36	0.23	0.24	4	0.30	0.30
<i>Byrsonima lucida</i> (Mill.) DC.	14	0.36	0.42	0.43	1	0.08	0.29
<i>Gyminda latifolia</i> (Sw.) Urb.	10	0.25	0.36	0.38	3	0.23	0.29
<i>Homalium racemosum</i> Jacq.	9	0.23	0.26	0.28	5	0.38	0.29
<i>Annona muricata</i> L.	6	0.15	0.36	0.38	4	0.30	0.28
<i>Coccothrinax barbadensis</i> (Lodd. ex Mart.) Becc.	7	0.18	0.42	0.44	3	0.23	0.28
<i>Myrcia citrifolia</i> (Aubl.) Urb.	9	0.23	0.24	0.25	5	0.38	0.28
<i>Ficus citrifolia</i> Mill.	4	0.10	0.40	0.41	4	0.30	0.27
<i>Acacia macracantha</i> Humb. & Bonpl. ex Willd.	4	0.10	0.35	0.37	4	0.30	0.26
<i>Prestoea acuminata</i> (Willd.) H.E. Moore var. <i>montana</i> (Graham) A. Hend. & G. Galeano	4	0.10	0.44	0.46	3	0.23	0.26
<i>Trema micrantha</i> (L.) Blume	9	0.23	0.23	0.24	4	0.30	0.26
<i>Alchornea latifolia</i> Sw.	7	0.18	0.27	0.28	4	0.30	0.25
<i>Capparis cynophallophora</i> L.	10	0.25	0.19	0.20	4	0.30	0.25
<i>Pimenta racemosa</i> (Mill.) J.W. Moore	5	0.13	0.24	0.25	5	0.38	0.25
<i>Guettarda pungens</i> Urb.	13	0.33	0.22	0.23	2	0.15	0.24
<i>Canella winterana</i> (L.) Gaertn.	8	0.20	0.25	0.26	3	0.23	0.23
<i>Quararibea turbinata</i> (Sw.) Poir.	9	0.23	0.23	0.24	3	0.23	0.23
<i>Crossopetalum rhacoma</i> Crantz	13	0.33	0.11	0.12	3	0.23	0.22
<i>Eugenia pseudopsidium</i> Jacq.	10	0.25	0.17	0.17	3	0.23	0.22
<i>Hymenaea courbaril</i> L.	7	0.18	0.33	0.34	2	0.15	0.22
<i>Metopium toxiferum</i> (L.) Krug & Urb.	5	0.13	0.36	0.37	2	0.15	0.22
<i>Miconia laevigata</i> (L.) D. Don	7	0.18	0.18	0.19	4	0.30	0.22
<i>Bucida buceras</i> L.	6	0.15	0.24	0.25	3	0.23	0.21
<i>Comocladia dodonaea</i> (L.) Urb.	9	0.23	0.10	0.10	4	0.30	0.21
<i>Cordia borinquensis</i> Urb.	5	0.13	0.13	0.14	5	0.38	0.21
<i>Pisonia albida</i> (Heimerl) Britton ex Standl.	6	0.15	0.32	0.33	2	0.15	0.21
<i>Poitea florida</i> (Vahl) Lavin	6	0.15	0.23	0.24	3	0.23	0.21
<i>Schaefferia frutescens</i> Jacq.	7	0.18	0.08	0.08	5	0.38	0.21
<i>Sloanea berteriana</i> Choisy ex DC.	8	0.20	0.27	0.28	2	0.15	0.21
<i>Coccoloba krugii</i> Lindau	15	0.38	0.13	0.13	1	0.08	0.20
<i>Licaria parvifolia</i> (Lam.) Kosterm.	7	0.18	0.19	0.20	3	0.23	0.20
<i>Coccoloba venosa</i> L.	8	0.20	0.21	0.22	2	0.15	0.19
<i>Faramea occidentalis</i> (L.) A. Rich.	5	0.13	0.08	0.08	5	0.38	0.19
<i>Miconia impetiolaris</i> (Sw.) D. Don ex DC.	7	0.18	0.09	0.09	4	0.30	0.19
<i>Micropholis guyanensis</i> (A. DC.) Pierre	6	0.15	0.18	0.19	3	0.23	0.19
<i>Piper amalago</i> L.	8	0.20	0.07	0.07	4	0.30	0.19
<i>Savia sessiliflora</i> (Sw.) Willd.	8	0.20	0.22	0.23	2	0.15	0.19

continued



## Appendix A—Detailed Tables

**Table A.8—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, Puerto Rico, 2009. (Total stems counted = 3,931; total sum of basal area = 96.03 ft<sup>2</sup>; total number of plots = 300.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count	Relative frequency	Importance value
<i>Avicennia germinans</i> (L.) L.	9	0.23	0.15	0.15	2	0.15	0.18
<i>Capparis baducca</i> L.	4	0.10	0.14	0.14	4	0.30	0.18
<i>Chrysobalanus icaco</i> L.	11	0.28	0.19	0.20	1	0.08	0.18
<i>Coccoloba rugosa</i> Desf.	12	0.31	0.14	0.15	1	0.08	0.18
<i>Guarea glabra</i> Vahl	5	0.13	0.10	0.10	4	0.30	0.18
<i>Miconia tetrandra</i> (Sw.) D. Don	6	0.15	0.17	0.18	3	0.23	0.18
<i>Spondias mombin</i> L.	4	0.10	0.13	0.14	4	0.30	0.18
<i>Thespesia grandiflora</i> DC.	6	0.15	0.16	0.17	3	0.23	0.18
<i>Gliricidia sepium</i> (Jacq.) Kunth ex Walp.	5	0.13	0.08	0.09	4	0.30	0.17
<i>Henriettea squamulosum</i> (Cogn.) W.S. Judd	7	0.18	0.09	0.09	3	0.23	0.17
<i>Mangifera indica</i> L.	4	0.10	0.18	0.19	3	0.23	0.17
<i>Piscidia carthagenensis</i> Jacq.	4	0.10	0.25	0.26	2	0.15	0.17
<i>Laguncularia racemosa</i> (L.) C.F. Gaertn.	8	0.20	0.20	0.21	1	0.08	0.16
<i>Alsophila portoricensis</i> (Spreng. ex Kuhn) Conant	3	0.08	0.22	0.23	2	0.15	0.15
<i>Guazuma ulmifolia</i> Lam.	3	0.08	0.21	0.22	2	0.15	0.15
<i>Guettarda elliptica</i> Sw.	7	0.18	0.12	0.12	2	0.15	0.15
<i>Pithecellobium dulce</i> (Roxb.) Benth.	6	0.15	0.06	0.07	3	0.23	0.15
<i>Eugenia ligustrina</i> (Sw.) Willd.	8	0.20	0.07	0.07	2	0.15	0.14
<i>Melicoccus bijugatus</i> Jacq.	6	0.15	0.05	0.05	3	0.23	0.14
<i>Myrcia deflexa</i> (Poir.) DC.	4	0.10	0.08	0.08	3	0.23	0.14
<i>Petitia domingensis</i> Jacq.	6	0.15	0.11	0.11	2	0.15	0.14
<i>Rondeletia inermis</i> (Spreng.) Krug & Urb.	8	0.20	0.06	0.06	2	0.15	0.14
<i>Sideroxylon salicifolium</i> (L.) Lam.	4	0.10	0.10	0.10	3	0.23	0.14
<i>Exothea paniculata</i> (Juss.) Radlk.	6	0.15	0.09	0.10	2	0.15	0.13
<i>Terminalia catappa</i> L.	2	0.05	0.17	0.17	2	0.15	0.13
<i>Capparis flexuosa</i> (L.) L.	5	0.13	0.09	0.09	2	0.15	0.12
<i>Croton poecilanthus</i> Urb.	3	0.08	0.11	0.12	2	0.15	0.12
<i>Eugenia borinquensis</i> Britton	4	0.10	0.03	0.03	3	0.23	0.12
<i>Pilosocereus royenii</i> (L.) Byles & Rowley	3	0.08	0.21	0.22	1	0.08	0.12
<i>Senna siamea</i> (Lam.) Irwin & Barneby	3	0.08	0.14	0.15	2	0.15	0.12
<i>Urera baccifera</i> (L.) Gaudich.	4	0.10	0.04	0.04	3	0.23	0.12
<i>Cestrum diurnum</i> L.	4	0.10	0.16	0.16	1	0.08	0.11
<i>Chrysophyllum argenteum</i> Jacq.	3	0.08	0.02	0.03	3	0.23	0.11
<i>Eugenia confusa</i> DC.	3	0.08	0.10	0.11	2	0.15	0.11
<i>Micropholis garciniifolia</i> Pierre	3	0.08	0.17	0.18	1	0.08	0.11
<i>Myrciaria floribunda</i> (West ex Willd.) Berg	5	0.13	0.12	0.13	1	0.08	0.11
<i>Myrsine cubana</i> A. DC.	3	0.08	0.09	0.09	2	0.15	0.11
<i>Piper aduncum</i> L.	4	0.10	0.07	0.07	2	0.15	0.11
<i>Byrsonima spicata</i> (Cav.) Kunth	2	0.05	0.09	0.09	2	0.15	0.10
<i>Casearia aculeata</i> Jacq.	4	0.10	0.03	0.04	2	0.15	0.10
<i>Colubrina arborescens</i> (Mill.) Sarg.	4	0.10	0.04	0.04	2	0.15	0.10

continued



**Table A.8—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, Puerto Rico, 2009. (Total stems counted = 3,931; total sum of basal area = 96.03 ft<sup>2</sup>; total number of plots = 300.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Croton flavens</i> L.	4	0.10	0.05	0.05	2	0.15	0.10
<i>Ocotea floribunda</i> (Sw.) Mez	3	0.08	0.07	0.07	2	0.15	0.10
<i>Pseudolmedia spuria</i> (Sw.) Griseb.	4	0.10	0.13	0.14	1	0.08	0.10
<i>Rochefortia acanthophora</i> (DC.) Griseb.	4	0.10	0.12	0.13	1	0.08	0.10
<i>Ziziphus taylorii</i> (Britton) M.C. Johnst.	3	0.08	0.06	0.07	2	0.15	0.10
<i>Lawsonia inermis</i> L.	3	0.08	0.04	0.04	2	0.15	0.09
<i>Myrcia fallax</i> (Rich.) DC.	2	0.05	0.06	0.06	2	0.15	0.09
<i>Nectandra turbacensis</i> (Kunth) Nees	3	0.08	0.05	0.05	2	0.15	0.09
<i>Podocarpus coriaceus</i> Rich.	5	0.13	0.07	0.07	1	0.08	0.09
<i>Annona reticulata</i> L.	3	0.08	0.08	0.08	1	0.08	0.08
<i>Dacryodes excelsa</i> Vahl	2	0.05	0.05	0.05	2	0.15	0.08
<i>Guettarda ovalifolia</i> Urb.	1	0.03	0.13	0.13	1	0.08	0.08
<i>Henriettea macfadyenii</i> (Triana) Alain	4	0.10	0.05	0.05	1	0.08	0.08
<i>Ilex nitida</i> (Vahl) Maxim.	2	0.05	0.04	0.05	2	0.15	0.08
<i>Matayba domingensis</i> (DC.) Radlk.	1	0.03	0.13	0.14	1	0.08	0.08
<i>Miconia racemosa</i> (Aubl.) DC.	3	0.08	0.03	0.03	2	0.15	0.08
<i>Persea americana</i> Mill.	2	0.05	0.04	0.04	2	0.15	0.08
<i>Picramnia pentandra</i> Sw.	2	0.05	0.03	0.03	2	0.15	0.08
<i>Pisonia subcordata</i> Sw.	2	0.05	0.03	0.03	2	0.15	0.08
<i>Pouteria multiflora</i> (A. DC.) Eyma	2	0.05	0.05	0.05	2	0.15	0.08
<i>Solanum rugosum</i> Dunal	4	0.10	0.06	0.06	1	0.08	0.08
<i>Ceiba pentandra</i> (L.) Gaertn.	1	0.03	0.11	0.12	1	0.08	0.07
<i>Cestrum laurifolium</i> L'Hér.	2	0.05	0.02	0.02	2	0.15	0.07
<i>Chrysophyllum pauciflorum</i> Lam.	3	0.08	0.06	0.06	1	0.08	0.07
<i>Daphnopsis americana</i> (Mill.) J.R. Johnst.	4	0.10	0.03	0.04	1	0.08	0.07
<i>Eugenia xerophytica</i> Britton	4	0.10	0.03	0.03	1	0.08	0.07
<i>Miconia serrulata</i> (DC.) Naud.	2	0.05	0.07	0.07	1	0.08	0.07
<i>Plumeria alba</i> L.	3	0.08	0.06	0.06	1	0.08	0.07
<i>Rauvolfia nitida</i> Jacq.	2	0.05	0.02	0.02	2	0.15	0.07
<i>Rhizophora mangle</i> L.	4	0.10	0.03	0.03	1	0.08	0.07
<i>Chrysophyllum cainito</i> L.	1	0.03	0.07	0.07	1	0.08	0.06
<i>Erythroxylum areolatum</i> L.	2	0.05	0.05	0.05	1	0.08	0.06
<i>Hibiscus elatus</i> Sw.	2	0.05	0.05	0.05	1	0.08	0.06
<i>Mammea americana</i> L.	2	0.05	0.05	0.05	1	0.08	0.06
<i>Manilkara bidentata</i> (A. DC.) A. Chev	2	0.05	0.06	0.07	1	0.08	0.06
<i>Swietenia macrophylla</i> King	1	0.03	0.08	0.08	1	0.08	0.06
<i>Annona squamosa</i> L.	2	0.05	0.02	0.02	1	0.08	0.05
<i>Bourreria virgata</i> (Sw.) G. Don	2	0.05	0.03	0.03	1	0.08	0.05
<i>Citharexylum caudatum</i> L.	2	0.05	0.03	0.03	1	0.08	0.05
<i>Citrus xlimon</i> (L.) Burm. f. (pro sp.) [medica × aurantifolia]	2	0.05	0.01	0.02	1	0.08	0.05
<i>Coccoloba uvifera</i> (L.) L.	2	0.05	0.04	0.04	1	0.08	0.05

continued



## Appendix A—Detailed Tables

**Table A.8—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, Puerto Rico, 2009. (Total stems counted = 3,931; total sum of basal area = 96.03 ft<sup>2</sup>; total number of plots = 300.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count	Relative frequency	Importance value
<i>Conocarpus erectus</i> L.	2	0.05	0.03	0.03	1	0.08	0.05
<i>Delonix regia</i> (Bojer ex Hook.) Raf.	2	0.05	0.02	0.02	1	0.08	0.05
<i>Dittha myricoides</i> Griseb.	2	0.05	0.04	0.04	1	0.08	0.05
<i>Erithalis fruticosa</i> L.	2	0.05	0.02	0.02	1	0.08	0.05
<i>Eugenia stahlia</i> (Kiaersk.) Krug & Urb.	2	0.05	0.02	0.02	1	0.08	0.05
<i>Guaiacum officinale</i> L.	2	0.05	0.02	0.02	1	0.08	0.05
<i>Guapira obtusata</i> (Jacq.) Little	2	0.05	0.03	0.03	1	0.08	0.05
<i>Hirtella rugosa</i> Thuill. ex Pers.	2	0.05	0.02	0.02	1	0.08	0.05
<i>Miconia pycnoneura</i> Urb.	2	0.05	0.02	0.02	1	0.08	0.05
<i>Prunus occidentalis</i> Sw.	2	0.05	0.02	0.02	1	0.08	0.05
<i>Psychotria brachiata</i> Sw.	2	0.05	0.02	0.02	1	0.08	0.05
<i>Sideroxylon cubense</i> (Griseb.) T.D. Penn.	1	0.03	0.04	0.04	1	0.08	0.05
<i>Xylosma pachyphylla</i> (Krug & Urb.) Urb.	1	0.03	0.05	0.05	1	0.08	0.05
<i>Zanthoxylum flavum</i> Vahl	2	0.05	0.01	0.01	1	0.08	0.05
<i>Artocarpus altilis</i> (Parkinson) Fosberg	1	0.03	0.01	0.01	1	0.08	0.04
<i>Byrsonima wadsworthii</i> Little	1	0.03	0.01	0.01	1	0.08	0.04
<i>Calyptanthes pallens</i> Griseb.	1	0.03	0.01	0.01	1	0.08	0.04
<i>Cedrela odorata</i> L.	1	0.03	0.02	0.02	1	0.08	0.04
<i>Chionanthus domingensis</i> Lam.	1	0.03	0.01	0.01	1	0.08	0.04
<i>Citrus xparadisi</i> Macfad. (pro sp.) [maxima × sinensis]	1	0.03	0.03	0.03	1	0.08	0.04
<i>Cochlospermum vitifolium</i> (Willd.) Willd. ex Spreng.	1	0.03	0.01	0.01	1	0.08	0.04
<i>Cojoba arborea</i> (L.) Britton & Rose	1	0.03	0.01	0.01	1	0.08	0.04
<i>Comocladia glabra</i> (Schult.) Spreng.	1	0.03	0.01	0.01	1	0.08	0.04
<i>Cordia collococca</i> L.	1	0.03	0.01	0.01	1	0.08	0.04
<i>Daphnopsis philippiana</i> Krug & Urb.	1	0.03	0.02	0.02	1	0.08	0.04
<i>Drypetes glauca</i> Vahl	1	0.03	0.01	0.01	1	0.08	0.04
<i>Erythroxylum rufum</i> Cav.	1	0.03	0.01	0.01	1	0.08	0.04
<i>Guatteria caribaea</i> Urb.	1	0.03	0.01	0.01	1	0.08	0.04
<i>Hernandia sonora</i> L.	1	0.03	0.01	0.01	1	0.08	0.04
<i>Hibiscus rosa-sinensis</i> L.	1	0.03	0.01	0.01	1	0.08	0.04
<i>Leandra krugiana</i> (Cogn.) W.S. Judd & Skean	1	0.03	0.01	0.01	1	0.08	0.04
<i>Lonchocarpus domingensis</i> (Turp. ex Pers.) DC.	1	0.03	0.01	0.01	1	0.08	0.04
<i>Myrcia leptoclada</i> DC.	1	0.03	0.01	0.01	1	0.08	0.04
<i>Nectandra hihua</i> (Ruiz & Pav.) Rohwer	1	0.03	0.02	0.02	1	0.08	0.04
<i>Neea buxifolia</i> (Hook. f.) Heimerl	1	0.03	0.01	0.01	1	0.08	0.04
<i>Ocotea spathulata</i> Mez	1	0.03	0.01	0.01	1	0.08	0.04
<i>Ormosia krugii</i> Urb.	1	0.03	0.01	0.01	1	0.08	0.04
<i>Palicourea crocea</i> (Sw.) Schult.	1	0.03	0.01	0.01	1	0.08	0.04
<i>Rondeletia pilosa</i> Sw.	1	0.03	0.01	0.01	1	0.08	0.04

continued



**Table A.8—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, Puerto Rico, 2009. (Total stems counted = 3,931; total sum of basal area = 96.03 ft<sup>2</sup>; total number of plots = 300.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Schoepfia obovata</i> C. Wright	1	0.03	0.01	0.01	1	0.08	0.04
<i>Tabebuia schumanniana</i> Urb.	1	0.03	0.02	0.02	1	0.08	0.04
<i>Vitex divaricata</i> Sw.	1	0.03	0.01	0.01	1	0.08	0.04
<i>Zanthoxylum caribaeum</i> Lam.	1	0.03	0.01	0.01	1	0.08	0.04
<i>Ziziphus mauritiana</i> Lam.	1	0.03	0.02	0.02	1	0.08	0.04
<i>Ziziphus reticulata</i> (Vahl) DC.	1	0.03	0.03	0.03	1	0.08	0.04

Nomenclature based on USDA NRCS PLANTS 2010 database.

D.b.h. = diameter at breast height; BA = basal area.



## Appendix A—Detailed Tables

**Table A.9—Tree species with d.b.h.  $\geq$ 5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, subtropical dry forest, Puerto Rico, 2009. (Total stems counted = 448; total sum of basal area = 163.53 ft<sup>2</sup>; total number of plots = 59.)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Bursera simaruba</i> (L.) Sarg.	194	43.30	70.61	43.18	36	26.28	37.59
<i>Prosopis pallida</i> (Humb. & Bonpl. ex Willd.) Kunth	42	9.38	12.30	7.52	13	9.49	8.80
<i>Metopium toxiferum</i> (L.) Krug & Urb.	41	9.15	11.16	6.82	10	7.30	7.76
<i>Bourreria succulenta</i> Jacq.	25	5.58	6.41	3.92	11	8.03	5.84
<i>Guapira fragrans</i> (Dum. Cours.) Little	18	4.02	6.96	4.26	6	4.38	4.22
<i>Bucida buceras</i> L.	14	3.13	9.26	5.66	5	3.65	4.15
<i>Pithecellobium unguis-cati</i> (L.) Benth.	14	3.13	6.27	3.84	1	0.73	2.56
<i>Cocos nucifera</i> L.	8	1.79	5.71	3.49	1	0.73	2.00
<i>Andira inermis</i> (W. Wright) Kunth ex DC.	4	0.89	4.07	2.49	3	2.19	1.86
<i>Guazuma ulmifolia</i> Lam.	4	0.89	4.44	2.71	2	1.46	1.69
<i>Pithecellobium dulce</i> (Roxb.) Benth.	6	1.34	4.12	2.52	1	0.73	1.53
<i>Tabebuia heterophylla</i> (DC.) Britton	5	1.12	0.84	0.51	4	2.92	1.52
<i>Piscidia carthagenensis</i> Jacq.	6	1.34	1.64	1.00	3	2.19	1.51
<i>Samanea saman</i> (Jacq.) Merr.	5	1.12	2.50	1.53	2	1.46	1.37
<i>Pilosocereus royenii</i> (L.) Byles & Rowley	7	1.56	1.72	1.05	2	1.46	1.36
<i>Ficus citrifolia</i> Mill.	4	0.89	1.51	0.92	3	2.19	1.34
<i>Acacia farnesiana</i> (L.) Willd.	4	0.89	1.34	0.82	2	1.46	1.06
<i>Guaiacum officinale</i> L.	3	0.67	1.25	0.76	2	1.46	0.96
<i>Ocotea floribunda</i> (Sw.) Mez	3	0.67	1.84	1.12	1	0.73	0.84
<i>Zanthoxylum monophyllum</i> (Lam.) P. Wilson	3	0.67	0.60	0.37	2	1.46	0.83
<i>Terminalia catappa</i> L.	4	0.89	1.19	0.72	1	0.73	0.78
<i>Coccoloba microstachya</i> Willd.	2	0.45	0.49	0.30	2	1.46	0.74
<i>Cordia alliodora</i> (Ruiz & Pav.) Oken	2	0.45	0.45	0.28	2	1.46	0.73
<i>Canella winterana</i> (L.) Gaertn.	2	0.45	0.38	0.23	2	1.46	0.71
<i>Hypelate trifoliata</i> Sw.	2	0.45	0.33	0.20	2	1.46	0.70
<i>Melicoccus bijugatus</i> Jacq.	3	0.67	1.01	0.62	1	0.73	0.67
<i>Ziziphus taylorii</i> (Britton) M.C. Johnst.	3	0.67	0.57	0.35	1	0.73	0.58
<i>Cordia sebestena</i> L.	2	0.45	0.56	0.34	1	0.73	0.51
<i>Tamarindus indica</i> L.	1	0.22	0.79	0.48	1	0.73	0.48
<i>Thespesia populnea</i> (L.) Sol. ex Corrêa	2	0.45	0.38	0.23	1	0.73	0.47
<i>Erythroxylum areolatum</i> L.	2	0.45	0.32	0.19	1	0.73	0.46
<i>Krugiodendron ferreum</i> (Vahl) Urb.	2	0.45	0.33	0.20	1	0.73	0.46
<i>Coccoloba pubescens</i> L.	1	0.22	0.38	0.23	1	0.73	0.39
<i>Zanthoxylum martinicense</i> (Lam.) DC.	1	0.22	0.25	0.15	1	0.73	0.37
<i>Capparis cynophallophora</i> L.	1	0.22	0.18	0.11	1	0.73	0.36
<i>Chrysophyllum pauciflorum</i> Lam.	1	0.22	0.19	0.12	1	0.73	0.36
<i>Pisonia albida</i> (Heimerl) Britton ex Standl.	1	0.22	0.21	0.13	1	0.73	0.36
<i>Amyris elemifera</i> L.	1	0.22	0.17	0.10	1	0.73	0.35
<i>Byrsonima crassifolia</i> (L.) Kunth	1	0.22	0.16	0.10	1	0.73	0.35
<i>Cassine xylocarpa</i> Vent.	1	0.22	0.18	0.11	1	0.73	0.35
<i>Coccoloba diversifolia</i> Jacq.	1	0.22	0.15	0.09	1	0.73	0.35
<i>Trema micrantha</i> (L.) Blume	1	0.22	0.15	0.09	1	0.73	0.35
<i>Trichilia hirta</i> L.	1	0.22	0.18	0.11	1	0.73	0.35

Nomenclature based on USDA NRCS PLANTS 2010 database.

D.b.h. = diameter at breast height; BA = basal area.



**Table A.10—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, subtropical dry forest, Puerto Rico, 2009. (Total stems counted = 1,309; total sum of basal area = 26.13 ft<sup>2</sup>; total number of plots = 74.)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Leucaena leucocephala</i> (Lam.) de Wit	188	14.36	3.88	14.83	23	7.01	12.07
<i>Coccoloba microstachya</i> Willd.	165	12.61	2.45	9.38	26	7.93	9.97
<i>Prosopis pallida</i> (Humb. & Bonpl. ex Willd.) Kunth	90	6.88	2.84	10.87	13	3.96	7.24
<i>Tabebuia heterophylla</i> (DC.) Britton	72	5.50	1.52	5.80	17	5.18	5.50
<i>Bourreria succulenta</i> Jacq.	65	4.97	1.65	6.31	16	4.88	5.39
<i>Reynosa uncinata</i> Urb.	66	5.04	0.97	3.72	20	6.10	4.95
<i>Bursera simaruba</i> (L.) Sarg.	17	1.30	1.20	4.61	12	3.66	3.19
<i>Acacia farnesiana</i> (L.) Willd.	38	2.90	0.83	3.19	7	2.13	2.74
<i>Antirhea acutata</i> (DC.) Urb.	48	3.67	0.47	1.80	9	2.74	2.74
<i>Exostema caribaeum</i> (Jacq.) Schult.	25	1.91	0.46	1.77	10	3.05	2.24
<i>Amyris elemifera</i> L.	29	2.22	0.61	2.32	6	1.83	2.12
<i>Pictetia aculeata</i> (Vahl) Urb.	25	1.91	0.56	2.14	6	1.83	1.96
<i>Adelia ricinella</i> L.	29	2.22	0.50	1.90	5	1.52	1.88
<i>Erythroxylum rotundifolium</i> Lunan	29	2.22	0.34	1.28	7	2.13	1.88
<i>Myrcianthes fragrans</i> (Sw.) McVaugh	24	1.83	0.31	1.20	7	2.13	1.72
<i>Plumeria obtusa</i> L.	24	1.83	0.37	1.42	6	1.83	1.69
<i>Randia aculeata</i> L.	17	1.30	0.14	0.54	9	2.74	1.53
<i>Eugenia monticola</i> (Sw.) DC.	24	1.83	0.30	1.15	5	1.52	1.50
<i>Gymnanthes lucida</i> Sw.	24	1.83	0.30	1.14	4	1.22	1.40
<i>Guapira fragrans</i> (Dum. Cours.) Little	11	0.84	0.38	1.46	4	1.22	1.17
<i>Pithecellobium unguis-cati</i> (L.) Benth.	10	0.76	0.23	0.90	6	1.83	1.16
<i>Thouinia striata</i> Radlk. var. portoricensis (Radlk.) Votava & Alain	18	1.38	0.18	0.70	4	1.22	1.10
<i>Krugiodendron ferreum</i> (Vahl) Urb.	14	1.07	0.17	0.66	5	1.52	1.08
<i>Cassine xylocarpa</i> Vent.	15	1.15	0.22	0.83	4	1.22	1.07
<i>Zanthoxylum monophyllum</i> (Lam.) P. Wilson	9	0.69	0.33	1.25	4	1.22	1.05
<i>Capparis hastata</i> Jacq.	15	1.15	0.28	1.06	3	0.91	1.04
<i>Euphorbia petiolaris</i> Sims	12	0.92	0.09	0.35	6	1.83	1.03
<i>Byrsonima lucida</i> (Mill.) DC.	14	1.07	0.42	1.60	1	0.30	0.99
<i>Capparis cynophallophora</i> L.	10	0.76	0.19	0.74	4	1.22	0.91
<i>Metopium toxiferum</i> (L.) Krug & Urb.	5	0.38	0.36	1.37	2	0.61	0.79
<i>Crossopetalum rhacoma</i> Crantz	13	0.99	0.11	0.44	3	0.91	0.78
<i>Pisonia albida</i> (Heimerl) Britton ex Standl.	6	0.46	0.32	1.23	2	0.61	0.77
<i>Comocladia dodonaea</i> (L.) Urb.	9	0.69	0.10	0.38	4	1.22	0.76
<i>Coccoloba krugii</i> Lindau	15	1.15	0.13	0.49	1	0.30	0.65
<i>Inga vera</i> Willd.	4	0.31	0.10	0.36	4	1.22	0.63
<i>Piscidia carthagenensis</i> Jacq.	4	0.31	0.25	0.97	2	0.61	0.63
<i>Trema micrantha</i> (L.) Blume	7	0.53	0.18	0.69	2	0.61	0.61
<i>Bucida buceras</i> L.	5	0.38	0.21	0.80	2	0.61	0.60
<i>Pithecellobium dulce</i> (Roxb.) Benth.	6	0.46	0.06	0.25	3	0.91	0.54
<i>Guettarda elliptica</i> Sw.	7	0.53	0.12	0.45	2	0.61	0.53

continued



## Appendix A—Detailed Tables

**Table A.10—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, subtropical dry forest, Puerto Rico, 2009. (Total stems counted = 1,309; total sum of basal area = 26.13 ft<sup>2</sup>; total number of plots = 74.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Guettarda scabra</i> (L.) Vent.	6	0.46	0.05	0.21	3	0.91	0.53
<i>Gyminda latifolia</i> (Sw.) Urb.	5	0.38	0.15	0.57	2	0.61	0.52
<i>Capparis flexuosa</i> (L.) L.	5	0.38	0.09	0.35	2	0.61	0.45
<i>Pilosocereus royenii</i> (L.) Byles & Rowley	3	0.23	0.21	0.80	1	0.30	0.44
<i>Casearia guianensis</i> (Aubl.) Urb.	4	0.31	0.09	0.35	2	0.61	0.42
<i>Thouinia striata</i> Radlk.	5	0.38	0.05	0.18	2	0.61	0.39
<i>Cordia alliodora</i> (Ruiz & Pav.) Oken	2	0.15	0.10	0.37	2	0.61	0.38
<i>Eugenia rhombea</i> (Berg) Krug & Urb.	5	0.38	0.11	0.41	1	0.30	0.37
<i>Rochefortia acanthophora</i> (DC.) Griseb.	4	0.31	0.12	0.46	1	0.30	0.36
<i>Ziziphus taylorii</i> (Britton) M.C. Johnst.	3	0.23	0.06	0.24	2	0.61	0.36
<i>Coccoloba diversifolia</i> Jacq.	4	0.31	0.03	0.12	2	0.61	0.35
<i>Colubrina arborescens</i> (Mill.) Sarg.	4	0.31	0.04	0.14	2	0.61	0.35
<i>Myrcia citrifolia</i> (Aubl.) Urb.	3	0.23	0.05	0.18	2	0.61	0.34
<i>Croton astroites</i> Dryand.	3	0.23	0.04	0.14	2	0.61	0.33
<i>Lawsonia inermis</i> L.	3	0.23	0.04	0.14	2	0.61	0.33
<i>Terminalia catappa</i> L.	1	0.08	0.13	0.50	1	0.30	0.29
<i>Schaefferia frutescens</i> Jacq.	2	0.15	0.02	0.09	2	0.61	0.28
<i>Canella winterana</i> (L.) Gaertn.	4	0.31	0.06	0.21	1	0.30	0.27
<i>Plumeria alba</i> L.	3	0.23	0.06	0.23	1	0.30	0.26
<i>Eugenia xerophytica</i> Britton	4	0.31	0.03	0.10	1	0.30	0.24
<i>Tabebuia haemantha</i> (Bertol. ex Spreng.) DC.	4	0.31	0.03	0.10	1	0.30	0.24
<i>Ardisia obovata</i> Desv. ex Ham.	2	0.15	0.06	0.22	1	0.30	0.23
<i>Ficus citrifolia</i> Mill.	1	0.08	0.06	0.24	1	0.30	0.21
<i>Rondeletia inermis</i> (Spreng.) Krug & Urb.	3	0.23	0.03	0.10	1	0.30	0.21
<i>Spondias mombin</i> L.	1	0.08	0.07	0.26	1	0.30	0.21
<i>Coccoloba uvifera</i> (L.) L.	2	0.15	0.04	0.14	1	0.30	0.20
<i>Xylosma pachyphylla</i> (Krug & Urb.) Urb.	1	0.08	0.05	0.19	1	0.30	0.19
<i>Erithalis fruticosa</i> L.	2	0.15	0.02	0.08	1	0.30	0.18
<i>Guaiaacum officinale</i> L.	2	0.15	0.02	0.08	1	0.30	0.18
<i>Capparis baducca</i> L.	1	0.08	0.03	0.12	1	0.30	0.17
<i>Eugenia pseudopsidium</i> Jacq.	2	0.15	0.01	0.05	1	0.30	0.17
<i>Ziziphus reticulata</i> (Vahl) DC.	1	0.08	0.03	0.10	1	0.30	0.16
<i>Cochlospermum vitifolium</i> (Willd.) Willd. ex Spreng.	1	0.08	0.01	0.05	1	0.30	0.14
<i>Eugenia biflora</i> (L.) DC.	1	0.08	0.01	0.03	1	0.30	0.14
<i>Neea buxifolia</i> (Hook. f.) Heimerl	1	0.08	0.01	0.03	1	0.30	0.14
<i>Rauvolfia nitida</i> Jacq.	1	0.08	0.01	0.03	1	0.30	0.14
<i>Guatteria caribaea</i> Urb.	1	0.08	0.01	0.02	1	0.30	0.13
<i>Hernandia sonora</i> L.	1	0.08	0.01	0.02	1	0.30	0.13

Nomenclature based on USDA NRCS PLANTS 2010 database.

D.b.h. = diameter at breast height; BA = basal area.





**Table A.11—Tree species with d.b.h.  $\geq$ 5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, subtropical moist forest, Puerto Rico, 2009. (Total stems counted = 1,982; total sum of basal area = 1,019.72 ft<sup>2</sup>; total number of plots = 137.)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Spathodea campanulata</i> P. Beauv.	469	23.66	270.33	26.51	44	6.79	18.99
<i>Andira inermis</i> (W. Wright) Kunth ex DC.	148	7.47	52.41	5.14	44	6.79	6.47
<i>Guarea guidonia</i> (L.) Sleumer	116	5.85	58.28	5.71	30	4.63	5.40
<i>Bursera simaruba</i> (L.) Sarg.	103	5.20	65.40	6.41	25	3.86	5.16
<i>Mangifera indica</i> L.	43	2.17	71.70	7.03	15	2.31	3.84
<i>Tabebuia heterophylla</i> (DC.) Britton	79	3.99	22.96	2.25	26	4.01	3.42
<i>Cecropia schreberiana</i> Miq.	60	3.03	32.60	3.20	17	2.62	2.95
<i>Guapira fragrans</i> (Dum. Cours.) Little	43	2.17	13.62	1.34	23	3.55	2.35
<i>Zanthoxylum martinicense</i> (Lam.) DC.	41	2.07	16.04	1.57	20	3.09	2.24
<i>Albizia procera</i> (Roxb.) Benth.	57	2.88	19.82	1.94	12	1.85	2.22
<i>Roystonea borinquena</i> O.F. Cook	31	1.56	21.09	2.07	19	2.93	2.19
<i>Syzygium jambos</i> (L.) Alston	51	2.57	13.31	1.31	11	1.70	1.86
<i>Inga laurina</i> (Sw.) Willd.	32	1.61	17.02	1.67	13	2.01	1.76
<i>Inga vera</i> Willd.	33	1.66	12.75	1.25	15	2.31	1.74
<i>Cinnamomum elongatum</i> (Vahl ex Nees) Kosterm.	23	1.16	14.64	1.44	16	2.47	1.69
<i>Calophyllum antillanum</i> Britton	17	0.86	25.93	2.54	8	1.23	1.54
<i>Cordia alliodora</i> (Ruiz & Pav.) Oken	25	1.26	8.98	0.88	15	2.31	1.49
<i>Guazuma ulmifolia</i> Lam.	30	1.51	9.82	0.96	9	1.39	1.29
<i>Artocarpus altilis</i> (Parkinson) Fosberg	23	1.16	10.51	1.03	7	1.08	1.09
<i>Cupania americana</i> L.	14	0.71	3.51	0.34	12	1.85	0.97
<i>Ficus citrifolia</i> Mill.	9	0.45	12.45	1.22	8	1.23	0.97
<i>Neolaugeria resinosa</i> (Vahl) Nicolson	23	1.16	6.73	0.66	7	1.08	0.97
<i>Persea americana</i> Mill.	19	0.96	9.90	0.97	6	0.93	0.95
<i>Spondias mombin</i> L.	10	0.50	12.69	1.24	7	1.08	0.94
<i>Hymenaea courbaril</i> L.	19	0.96	12.74	1.25	3	0.46	0.89
<i>Terminalia catappa</i> L.	14	0.71	10.89	1.07	5	0.77	0.85
<i>Ocotea leucoxydon</i> (Sw.) De Laness.	16	0.81	4.68	0.46	8	1.23	0.83
<i>Thespesia grandiflora</i> DC.	12	0.61	5.48	0.54	8	1.23	0.79
<i>Coccoloba diversifolia</i> Jacq.	16	0.81	4.95	0.49	6	0.93	0.74
<i>Melicoccus bijugatus</i> Jacq.	12	0.61	4.61	0.45	6	0.93	0.66
<i>Schefflera morototonii</i> (Aubl.) Maguire, Steyerf. & Frodin	10	0.50	4.38	0.43	6	0.93	0.62
<i>Thouinia striata</i> Radlk.	12	0.61	3.39	0.33	6	0.93	0.62
<i>Dendropanax arboreus</i> (L.) Decne. & Planch. ex Britton	10	0.50	2.47	0.24	7	1.08	0.61
<i>Clusia rosea</i> Jacq.	10	0.50	3.91	0.38	6	0.93	0.60
<i>Eucalyptus robusta</i> Sm.	12	0.61	10.22	1.00	1	0.15	0.59
<i>Bourreria succulenta</i> Jacq.	9	0.45	2.22	0.22	7	1.08	0.58
<i>Delonix regia</i> (Bojer ex Hook.) Raf.	7	0.35	6.09	0.60	5	0.77	0.57
<i>Cedrela odorata</i> L.	4	0.20	9.55	0.94	3	0.46	0.53
<i>Erythrina poeppigiana</i> (Walp.) O.F. Cook	4	0.20	7.75	0.76	4	0.62	0.53

continued



## Appendix A—Detailed Tables

**Table A.11—Tree species with d.b.h.  $\geq 5.0$  inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, subtropical moist forest, Puerto Rico, 2009. (Total stems counted = 1,982; total sum of basal area = 1,019.72 ft<sup>2</sup>; total number of plots = 137.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count	Relative frequency	Importance value
<i>Buchenavia tetraphylla</i> (Aubl.) Howard	1	0.05	13.15	1.29	1	0.15	0.50
<i>Cordia sulcata</i> DC.	6	0.30	2.70	0.26	6	0.93	0.50
<i>Poitea florida</i> (Vahl) Lavin	18	0.91	4.07	0.40	1	0.15	0.49
<i>Cocos nucifera</i> L.	7	0.35	4.54	0.45	4	0.62	0.47
<i>Senna siamea</i> (Lam.) Irwin & Barneby	14	0.71	4.12	0.40	2	0.31	0.47
<i>Pisonia subcordata</i> Sw.	15	0.76	4.47	0.44	1	0.15	0.45
<i>Ziziphus mauritiana</i> Lam.	8	0.40	1.61	0.16	5	0.77	0.44
<i>Samanea saman</i> (Jacq.) Merr.	6	0.30	3.89	0.38	4	0.62	0.43
<i>Tetrazygia elaeagnoides</i> (Sw.) DC.	7	0.35	1.39	0.14	5	0.77	0.42
<i>Byrsonima spicata</i> (Cav.) Kunth	8	0.40	3.42	0.33	3	0.46	0.40
<i>Citrus xsinensis</i> (L.) Osbeck (pro sp.) [maxima $\times$ reticulata]	9	0.45	2.52	0.25	3	0.46	0.39
<i>Leucaena leucocephala</i> (Lam.) de Wit	7	0.35	1.97	0.19	4	0.62	0.39
<i>Sideroxylon salicifolium</i> (L.) Lam.	6	0.30	2.13	0.21	4	0.62	0.38
<i>Adenanthera pavonina</i> L.	12	0.61	3.72	0.37	1	0.15	0.37
<i>Zanthoxylum monophyllum</i> (Lam.) P. Wilson	9	0.45	1.98	0.19	3	0.46	0.37
<i>Petitia domingensis</i> Jacq.	5	0.25	1.71	0.17	4	0.62	0.35
<i>Annona muricata</i> L.	4	0.20	0.90	0.09	4	0.62	0.30
<i>Guettarda scabra</i> (L.) Vent.	6	0.30	1.34	0.13	3	0.46	0.30
<i>Pinus caribaea</i> Morelet	6	0.30	4.51	0.44	1	0.15	0.30
<i>Tetragastris balsamifera</i> (Sw.) Oken	6	0.30	1.45	0.14	3	0.46	0.30
<i>Trichilia hirta</i> L.	4	0.20	0.75	0.07	4	0.62	0.30
<i>Bucida buceras</i> L.	5	0.25	3.07	0.30	2	0.31	0.29
<i>Prosopis pallida</i> (Humb. & Bonpl. ex Willd.) Kunth	6	0.30	1.15	0.11	3	0.46	0.29
<i>Sideroxylon foetidissimum</i> Jacq.	2	0.10	3.42	0.33	2	0.31	0.25
<i>Krugiodendron ferreum</i> (Vahl) Urb.	6	0.30	1.02	0.10	2	0.31	0.24
<i>Chrysophyllum cainito</i> L.	1	0.05	4.91	0.48	1	0.15	0.23
<i>Cinnamomum montanum</i> (Sw.) Bercht. & J. Presl	3	0.15	2.41	0.24	2	0.31	0.23
<i>Pimenta racemosa</i> (Mill.) J.W. Moore	3	0.15	0.63	0.06	3	0.46	0.23
<i>Eugenia biflora</i> (L.) DC.	5	0.25	1.06	0.10	2	0.31	0.22
<i>Pseudolmedia spuria</i> (Sw.) Griseb.	4	0.20	1.62	0.16	2	0.31	0.22
<i>Peltophorum pterocarpum</i> (DC.) Backer ex K. Heyne	6	0.30	1.65	0.16	1	0.15	0.21
<i>Plumeria obtusa</i> L.	4	0.20	1.35	0.13	2	0.31	0.21
<i>Acacia macracantha</i> Humb. & Bonpl. ex Willd.	4	0.20	1.04	0.10	2	0.31	0.20
<i>Trema micrantha</i> (L.) Blume	4	0.20	1.00	0.10	2	0.31	0.20
<i>Licaria parvifolia</i> (Lam.) Kosterm.	3	0.15	0.86	0.08	2	0.31	0.18
<i>Nectandra coriacea</i> (Sw.) Griseb.	3	0.15	0.67	0.07	2	0.31	0.18
<i>Sideroxylon cubense</i> (Griseb.) T.D. Penn.	3	0.15	0.78	0.08	2	0.31	0.18

continued



**Table A.11—Tree species with d.b.h.  $\geq$ 5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, subtropical moist forest, Puerto Rico, 2009. (Total stems counted = 1,982; total sum of basal area = 1,019.72 ft<sup>2</sup>; total number of plots = 137.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Swietenia mahagoni</i> (L.) Jacq.	5	0.25	1.37	0.13	1	0.15	0.18
<i>Adelia ricinella</i> L.	3	0.15	0.59	0.06	2	0.31	0.17
<i>Annona reticulata</i> L.	3	0.15	0.50	0.05	2	0.31	0.17
<i>Myrsine coriacea</i> (Sw.) R. Br. ex Roem. & Schult.	3	0.15	0.57	0.06	2	0.31	0.17
<i>Margaritaria nobilis</i> L. f.	4	0.20	1.15	0.11	1	0.15	0.16
<i>Myrsine cubana</i> A. DC.	3	0.15	1.51	0.15	1	0.15	0.15
<i>Alchornea latifolia</i> Sw.	3	0.15	1.25	0.12	1	0.15	0.14
<i>Mammea americana</i> L.	2	0.10	1.81	0.18	1	0.15	0.14
<i>Symplocos martinicensis</i> Jacq.	3	0.15	1.32	0.13	1	0.15	0.14
<i>Albizia lebeck</i> (L.) Benth.	2	0.10	1.24	0.12	1	0.15	0.13
<i>Homalium racemosum</i> Jacq.	2	0.10	1.26	0.12	1	0.15	0.13
<i>Coccoloba microstachya</i> Willd.	3	0.15	0.51	0.05	1	0.15	0.12
<i>Ficus trigonata</i> L.	1	0.05	1.45	0.14	1	0.15	0.12
<i>Pouteria sapota</i> (Jacq.) H.E. Moore & Stearn	2	0.10	1.10	0.11	1	0.15	0.12
<i>Cupania triquetra</i> A. Rich.	2	0.10	0.72	0.07	1	0.15	0.11
<i>Inga nobilis</i> Willd. ssp. <i>quaternata</i> (Poepp. & Endl.) T.D. Penn.	1	0.05	1.33	0.13	1	0.15	0.11
<i>Pithecellobium dulce</i> (Roxb.) Benth.	2	0.10	0.73	0.07	1	0.15	0.11
<i>Amyris balsamifera</i> L.	2	0.10	0.50	0.05	1	0.15	0.10
<i>Byrsonima lucida</i> (Mill.) DC.	2	0.10	0.38	0.04	1	0.15	0.10
<i>Casearia arborea</i> (Rich.) Urb.	2	0.10	0.50	0.05	1	0.15	0.10
<i>Castilla elastica</i> Sessé	2	0.10	0.47	0.05	1	0.15	0.10
<i>Coffea liberica</i> W. Bull ex Hiern.	2	0.10	0.33	0.03	1	0.15	0.10
<i>Cyathea arborea</i> (L.) Sm.	2	0.10	0.31	0.03	1	0.15	0.10
<i>Lonchocarpus domingensis</i> (Turp. ex Pers.) DC.	1	0.05	1.12	0.11	1	0.15	0.10
<i>Acrocomia media</i> O.F. Cook	1	0.05	0.62	0.06	1	0.15	0.09
<i>Cochlospermum vitifolium</i> (Willd.) Willd. ex Spreng.	1	0.05	0.70	0.07	1	0.15	0.09
<i>Ocotea floribunda</i> (Sw.) Mez	1	0.05	0.72	0.07	1	0.15	0.09
<i>Carapa guianensis</i> Aubl.	1	0.05	0.23	0.02	1	0.15	0.08
<i>Casearia decandra</i> Jacq.	1	0.05	0.25	0.02	1	0.15	0.08
<i>Ceiba pentandra</i> (L.) Gaertn.	1	0.05	0.22	0.02	1	0.15	0.08
<i>Cestrum laurifolium</i> L'Hér.	1	0.05	0.22	0.02	1	0.15	0.08
<i>Chionanthus domingensis</i> Lam.	1	0.05	0.27	0.03	1	0.15	0.08
<i>Chrysophyllum pauciflorum</i> Lam.	1	0.05	0.22	0.02	1	0.15	0.08
<i>Cordia rickseckeri</i> Millsp.	1	0.05	0.23	0.02	1	0.15	0.08
<i>Crescentia cujete</i> L.	1	0.05	0.39	0.04	1	0.15	0.08
<i>Gliricidia sepium</i> (Jacq.) Kunth ex Walp.	1	0.05	0.38	0.04	1	0.15	0.08
<i>Pilosocereus royenii</i> (L.) Byles & Rowley	1	0.05	0.32	0.03	1	0.15	0.08

continued



## Appendix A—Detailed Tables

**Table A.11—Tree species with d.b.h.  $\geq$ 5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, subtropical moist forest, Puerto Rico, 2009. (Total stems counted = 1,982; total sum of basal area = 1,019.72 ft<sup>2</sup>; total number of plots = 137.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count	Relative frequency	Importance value
<i>Prunus occidentalis</i> Sw.	1	0.05	0.50	0.05	1	0.15	0.08
<i>Senna spectabilis</i> (DC.) Irwin & Barneby	1	0.05	0.32	0.03	1	0.15	0.08
<i>Sterculia apetala</i> (Jacq.) Karst.	1	0.05	0.32	0.03	1	0.15	0.08
<i>Swietenia macrophylla</i> King	1	0.05	0.26	0.03	1	0.15	0.08
<i>Trichilia pallida</i> Sw.	1	0.05	0.33	0.03	1	0.15	0.08
<i>Antirhea obtusifolia</i> Urb.	1	0.05	0.20	0.02	1	0.15	0.07
<i>Casearia guianensis</i> (Aubl.) Urb.	1	0.05	0.14	0.01	1	0.15	0.07
<i>Coccoloba sintenisii</i> Urb. ex Lindau	1	0.05	0.14	0.01	1	0.15	0.07
<i>Cojoba arborea</i> (L.) Britton & Rose	1	0.05	0.15	0.02	1	0.15	0.07
<i>Daphnopsis americana</i> (Mill.) J.R. Johnst.12	1	0.05	0.20	0.02	1	0.15	0.07
<i>Eugenia ligustrina</i> (Sw.) Willd.	1	0.05	0.15	0.01	1	0.15	0.07
<i>Eugenia monticola</i> (Sw.) DC.	1	0.05	0.14	0.01	1	0.15	0.07
<i>Gymnanthes lucida</i> Sw.	1	0.05	0.14	0.01	1	0.15	0.07
<i>Lonchocarpus glaucifolius</i> Urb.	1	0.05	0.18	0.02	1	0.15	0.07
<i>Maytenus ponceana</i> Britton	1	0.05	0.14	0.01	1	0.15	0.07
<i>Pictetia aculeata</i> (Vahl) Urb.	1	0.05	0.16	0.02	1	0.15	0.07
<i>Prestoea acuminata</i> (Willd.) H.E. Moore var. <i>montana</i> (Graham) A. Hend. & G. Galeano	1	0.05	0.18	0.02	1	0.15	0.07
<i>Solanum bahamense</i> L. var. <i>bahamense</i>	1	0.05	0.15	0.01	1	0.15	0.07
<i>Spondias purpurea</i> L.	1	0.05	0.18	0.02	1	0.15	0.07
<i>Turpinia occidentalis</i> (Sw.) G. Don	1	0.05	0.20	0.02	1	0.15	0.07

Nomenclature based on USDA NRCS PLANTS 2010 database.

D.b.h. = diameter at breast height; BA = basal area.



**Table A.12—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, subtropical moist forest, Puerto Rico, 2009. (Total stems counted = 1,743; total sum of basal area = 46.11 ft<sup>2</sup>; total number of plots = 139.)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count	Relative frequency	Importance value
<i>Spathodea campanulata</i> P. Beauv.	131	7.52	4.81	10.42	30	4.78	7.57
<i>Casearia guianensis</i> (Aubl.) Urb.	140	8.03	2.48	5.39	37	5.89	6.44
<i>Guarea guidonia</i> (L.) Sleumer	84	4.82	2.73	5.93	32	5.10	5.28
<i>Casearia sylvestris</i> Sw.	99	5.68	1.59	3.45	26	4.14	4.42
<i>Leucaena leucocephala</i> (Lam.) de Wit	67	3.84	1.63	3.53	18	2.87	3.41
<i>Andira inermis</i> (W. Wright) Kunth ex DC.	42	2.41	1.94	4.20	21	3.34	3.32
<i>Tabebuia heterophylla</i> (DC.) Britton	54	3.10	1.36	2.94	17	2.71	2.92
<i>Eugenia monticola</i> (Sw.) DC.	43	2.47	0.96	2.08	19	3.03	2.53
<i>Guettarda scabra</i> (L.) Vent.	45	2.58	0.59	1.29	14	2.23	2.03
<i>Bursera simaruba</i> (L.) Sarg.	25	1.43	1.16	2.52	13	2.07	2.01
<i>Ardisia obovata</i> Desv. ex Ham.	42	2.41	0.70	1.51	9	1.43	1.78
<i>Coccoloba diversifolia</i> Jacq.	27	1.55	0.81	1.75	11	1.75	1.68
<i>Guapira fragrans</i> (Dum. Cours.) Little	30	1.72	0.53	1.15	11	1.75	1.54
<i>Bourreria succulenta</i> Jacq.	22	1.26	0.87	1.89	7	1.11	1.42
<i>Myrcia splendens</i> (Sw.) DC.	27	1.55	0.59	1.28	8	1.27	1.37
<i>Eugenia biflora</i> (L.) DC.	21	1.20	0.50	1.09	10	1.59	1.30
<i>Tabebuia haemantha</i> (Bertol. ex Spreng.) DC.	31	1.78	0.57	1.23	5	0.80	1.27
<i>Inga vera</i> Willd.	15	0.86	0.71	1.55	8	1.27	1.23
<i>Psidium guajava</i> L.	24	1.38	0.49	1.07	7	1.11	1.19
<i>Tetrazygia elaeagnoides</i> (Sw.) DC.	27	1.55	0.54	1.18	5	0.80	1.18
<i>Miconia prasina</i> (Sw.) DC.	22	1.26	0.48	1.05	7	1.11	1.14
<i>Thouinia striata</i> Radlk.	12	0.69	0.56	1.22	8	1.27	1.06
<i>Prosopis pallida</i> (Humb. & Bonpl. ex Willd.) Kunth	15	0.86	0.91	1.98	2	0.32	1.05
<i>Nectandra coriacea</i> (Sw.) Griseb.	15	0.86	0.57	1.24	6	0.96	1.02
<i>Randia aculeata</i> L.	18	1.03	0.21	0.45	10	1.59	1.02
<i>Zanthoxylum monophyllum</i> (Lam.) P. Wilson	17	0.98	0.53	1.14	5	0.80	0.97
<i>Erythroxylum rotundifolium</i> Lunan	18	1.03	0.27	0.58	8	1.27	0.96
<i>Krugiodendron ferreum</i> (Vahl) Urb.	15	0.86	0.56	1.22	5	0.80	0.96
<i>Coccoloba microstachya</i> Willd.	19	1.09	0.50	1.08	4	0.64	0.94
<i>Syzygium jambos</i> (L.) Alston	11	0.63	0.64	1.39	5	0.80	0.94
<i>Trichilia pallida</i> Sw.	18	1.03	0.36	0.79	6	0.96	0.92
<i>Trichilia hirta</i> L.	17	0.98	0.36	0.79	6	0.96	0.91
<i>Neolaugeria resinosa</i> (Vahl) Nicolson	10	0.57	0.48	1.05	6	0.96	0.86
<i>Cordia alliodora</i> (Ruiz & Pav.) Oken	14	0.80	0.41	0.89	5	0.80	0.83
<i>Cupania americana</i> L.	12	0.69	0.34	0.73	6	0.96	0.79
<i>Albizia procera</i> (Roxb.) Benth.	11	0.63	0.42	0.90	5	0.80	0.78
<i>Calophyllum antillanum</i> Britton	16	0.92	0.46	0.99	2	0.32	0.74
<i>Dendropanax arboreus</i> (L.) Decne. & Planch. ex Britton	12	0.69	0.26	0.55	5	0.80	0.68
<i>Coffea arabica</i> L.	16	0.92	0.20	0.43	4	0.64	0.66

continued



## Appendix A—Detailed Tables

**Table A.12—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, subtropical moist forest, Puerto Rico, 2009. (Total stems counted = 1,743; total sum of basal area = 46.11 ft<sup>2</sup>; total number of plots = 139.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Erythrina berteriana</i> Urb.	11	0.63	0.55	1.19	1	0.16	0.66
<i>Adenantha pavonina</i> L.	15	0.86	0.44	0.94	1	0.16	0.65
<i>Ouratea littoralis</i> Urb.	14	0.80	0.23	0.49	4	0.64	0.64
<i>Eugenia rhombea</i> (Berg) Krug & Urb.	11	0.63	0.21	0.45	5	0.80	0.62
<i>Coccothrinax barbadensis</i> (Lodd. ex Mart.) Becc.	7	0.40	0.42	0.92	3	0.48	0.60
<i>Annona muricata</i> L.	6	0.34	0.36	0.78	4	0.64	0.59
<i>Amyris elemifera</i> L.	10	0.57	0.32	0.69	3	0.48	0.58
<i>Myrsine coriacea</i> (Sw.) R. Br. ex Roem. & Schult.	13	0.75	0.24	0.53	3	0.48	0.58
<i>Acacia macracantha</i> Humb. & Bonpl. ex Willd.	4	0.23	0.35	0.76	4	0.64	0.54
<i>Guettarda pungens</i> Urb.	13	0.75	0.22	0.49	2	0.32	0.52
<i>Croton astroites</i> Dryand.	9	0.52	0.18	0.39	4	0.64	0.51
<i>Swietenia mahagoni</i> (L.) Jacq.	8	0.46	0.31	0.68	2	0.32	0.49
<i>Casearia decandra</i> Jacq.	6	0.34	0.06	0.13	6	0.96	0.48
<i>Hymenaea courbaril</i> L.	7	0.40	0.33	0.71	2	0.32	0.48
<i>Gymnanthes lucida</i> Sw.	9	0.52	0.08	0.18	4	0.64	0.44
<i>Poitea florida</i> (Vahl) Lavin	6	0.34	0.23	0.51	3	0.48	0.44
<i>Cinnamomum elongatum</i> (Vahl ex Nees) Kosterm.	4	0.23	0.20	0.42	4	0.64	0.43
<i>Licaria parvifolia</i> (Lam.) Kosterm.	7	0.40	0.19	0.41	3	0.48	0.43
<i>Piper amalago</i> L.	8	0.46	0.07	0.16	4	0.64	0.42
<i>Savia sessiliflora</i> (Sw.) Willd.	8	0.46	0.22	0.48	2	0.32	0.42
<i>Coccoloba venosa</i> L.	8	0.46	0.21	0.46	2	0.32	0.41
<i>Quararibea turbinata</i> (Sw.) Poir.	8	0.46	0.20	0.44	2	0.32	0.41
<i>Chrysobalanus icaco</i> L.	11	0.63	0.19	0.41	1	0.16	0.40
<i>Thespesia grandiflora</i> DC.	6	0.34	0.16	0.35	3	0.48	0.39
<i>Zanthoxylum martinicense</i> (Lam.) DC.	4	0.23	0.21	0.46	3	0.48	0.39
<i>Coccoloba rugosa</i> Desf.	12	0.69	0.14	0.30	1	0.16	0.38
<i>Eugenia pseudopsidium</i> Jacq.	8	0.46	0.15	0.33	2	0.32	0.37
<i>Gliricidia sepium</i> (Jacq.) Kunth ex Walp.	5	0.29	0.08	0.18	4	0.64	0.37
<i>Canella winterana</i> (L.) Gaertn.	4	0.23	0.19	0.42	2	0.32	0.32
<i>Casearia arborea</i> (Rich.) Urb.	5	0.29	0.09	0.19	3	0.48	0.32
<i>Pimenta racemosa</i> (Mill.) J.W. Moore	3	0.17	0.15	0.32	3	0.48	0.32
<i>Eugenia ligustrina</i> (Sw.) Willd.	8	0.46	0.07	0.15	2	0.32	0.31
<i>Gymina latifolia</i> (Sw.) Urb.	5	0.29	0.22	0.47	1	0.16	0.31
<i>Melicoccus bijugatus</i> Jacq.	6	0.34	0.05	0.10	3	0.48	0.31
<i>Petitia domingensis</i> Jacq.	6	0.34	0.11	0.23	2	0.32	0.30
<i>Sideroxylon salicifolium</i> (L.) Lam.	4	0.23	0.10	0.21	3	0.48	0.30
<i>Capparis baducca</i> L.	3	0.17	0.11	0.23	3	0.48	0.29
<i>Clusia rosea</i> Jacq.	4	0.23	0.07	0.15	3	0.48	0.29
<i>Exothea paniculata</i> (Juss.) Radlk.	6	0.34	0.09	0.21	2	0.32	0.29
<i>Schaefferia frutescens</i> Jacq.	5	0.29	0.06	0.12	3	0.48	0.29

continued



**Table A.12—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, subtropical moist forest, Puerto Rico, 2009. (Total stems counted = 1,743; total sum of basal area = 46.11 ft<sup>2</sup>; total number of plots = 139.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Adelia ricinella</i> L.	4	0.23	0.06	0.14	3	0.48	0.28
<i>Mangifera indica</i> L.	3	0.17	0.15	0.33	2	0.32	0.27
<i>Inga laurina</i> (Sw.) Willd.	3	0.17	0.06	0.14	3	0.48	0.26
<i>Acacia farnesiana</i> (L.) Willd.	3	0.17	0.04	0.10	3	0.48	0.25
<i>Fareamea occidentalis</i> (L.) A. Rich.	3	0.17	0.04	0.09	3	0.48	0.25
<i>Tetragastris balsamifera</i> (Sw.) Oken	2	0.11	0.15	0.33	2	0.32	0.25
<i>Cestrum diurnum</i> L.	4	0.23	0.16	0.34	1	0.16	0.24
<i>Citrus xsinensis</i> (L.) Osbeck (pro sp.) [maxima x reticulata]	2	0.11	0.20	0.44	1	0.16	0.24
<i>Myrciaria floribunda</i> (West ex Willd.) Berg	5	0.29	0.12	0.27	1	0.16	0.24
<i>Chrysophyllum argenteum</i> Jacq.	3	0.17	0.02	0.05	3	0.48	0.23
<i>Croton flavens</i> L.	4	0.23	0.05	0.10	2	0.32	0.22
<i>Erythrina poeppigiana</i> (Walp.) O.F. Cook	3	0.17	0.08	0.18	2	0.32	0.22
<i>Guazuma ulmifolia</i> Lam.	2	0.11	0.18	0.39	1	0.16	0.22
<i>Miconia impetolaris</i> (Sw.) D. Don ex DC.	4	0.23	0.05	0.11	2	0.32	0.22
<i>Pseudolmedia spuria</i> (Sw.) Griseb.	4	0.23	0.13	0.28	1	0.16	0.22
<i>Schefflera morototoni</i> (Aubl.) Maguire, Steyer. & Frodin	2	0.11	0.10	0.23	2	0.32	0.22
<i>Byrsonima spicata</i> (Cav.) Kunth	2	0.11	0.09	0.19	2	0.32	0.21
<i>Casearia aculeata</i> Jacq.	4	0.23	0.03	0.08	2	0.32	0.21
<i>Ocotea floribunda</i> (Sw.) Mez	3	0.17	0.07	0.15	2	0.32	0.21
<i>Nectandra turbacensis</i> (Kunth) Nees	3	0.17	0.05	0.10	2	0.32	0.20
<i>Cordia sulcata</i> DC.	2	0.11	0.05	0.11	2	0.32	0.18
<i>Pictetia aculeata</i> (Vahl) Urb.	3	0.17	0.03	0.06	2	0.32	0.18
<i>Alsophila portoricensis</i> (Spreng. ex Kuhn) Conant	1	0.06	0.13	0.28	1	0.16	0.17
<i>Annona reticulata</i> L.	3	0.17	0.08	0.16	1	0.16	0.17
<i>Ficus citrifolia</i> Mill.	1	0.06	0.13	0.28	1	0.16	0.17
<i>Ocotea leucoxydon</i> (Sw.) De Laness.	2	0.11	0.11	0.23	1	0.16	0.17
<i>Rondeletia inermis</i> (Spreng.) Krug & Urb.	5	0.29	0.03	0.07	1	0.16	0.17
<i>Solanum rugosum</i> Dunal	4	0.23	0.06	0.13	1	0.16	0.17
<i>Pisonia subcordata</i> Sw.	2	0.11	0.03	0.06	2	0.32	0.16
<i>Senna siamea</i> (Lam.) Irwin & Barneby	1	0.06	0.12	0.25	1	0.16	0.16
<i>Ceiba pentandra</i> (L.) Gaertn.	1	0.06	0.11	0.24	1	0.16	0.15
<i>Chrysophyllum pauciflorum</i> Lam.	3	0.17	0.06	0.12	1	0.16	0.15
<i>Cyathea arborea</i> (L.) Sm.	1	0.06	0.11	0.24	1	0.16	0.15
<i>Daphnopsis americana</i> (Mill.) J.R. Johnst.	4	0.23	0.03	0.07	1	0.16	0.15
<i>Pithecellobium unguis-cati</i> (L.) Benth.	4	0.23	0.03	0.06	1	0.16	0.15
<i>Manilkara bidentata</i> (A. DC.) A. Chev	2	0.11	0.06	0.14	1	0.16	0.14
<i>Myrcia citrifolia</i> (Aubl.) Urb.	3	0.17	0.04	0.08	1	0.16	0.14
<i>Myrsine cubana</i> A. DC.	2	0.11	0.07	0.15	1	0.16	0.14
<i>Cordia borinquensis</i> Urb.	1	0.06	0.08	0.17	1	0.16	0.13
<i>Hibiscus elatus</i> Sw.	2	0.11	0.05	0.10	1	0.16	0.13

continued



## Appendix A—Detailed Tables

**Table A.12—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, subtropical moist forest, Puerto Rico, 2009. (Total stems counted = 1,743; total sum of basal area = 46.11 ft<sup>2</sup>; total number of plots = 139.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Mammea americana</i> L.	2	0.11	0.05	0.11	1	0.16	0.13
<i>Swietenia macrophylla</i> King	1	0.06	0.08	0.17	1	0.16	0.13
<i>Chrysophyllum cainito</i> L.	1	0.06	0.07	0.14	1	0.16	0.12
<i>Erythroxylum areolatum</i> L.	2	0.11	0.05	0.10	1	0.16	0.12
<i>Guapira obtusata</i> (Jacq.) Little	2	0.11	0.03	0.07	1	0.16	0.12
<i>Bourreria virgata</i> (Sw.) G. Don	2	0.11	0.03	0.07	1	0.16	0.11
<i>Coffea liberica</i> W. Bull ex Hiern.	2	0.11	0.03	0.07	1	0.16	0.11
<i>Eugenia stahlia</i> (Kiaersk.) Krug & Urb.	2	0.11	0.02	0.05	1	0.16	0.11
<i>Homalium racemosum</i> Jacq.	1	0.06	0.05	0.11	1	0.16	0.11
<i>Prunus occidentalis</i> Sw.	2	0.11	0.02	0.04	1	0.16	0.11
<i>Bucida buceras</i> L.	1	0.06	0.03	0.07	1	0.16	0.10
<i>Citrus xlimon</i> (L.) Burm. f. (pro sp.) [medica × aurantifolia]	2	0.11	0.01	0.03	1	0.16	0.10
<i>Delonix regia</i> (Bojer ex Hook.) Raf.	2	0.11	0.02	0.03	1	0.16	0.10
<i>Eugenia borinquensis</i> Britton	2	0.11	0.01	0.03	1	0.16	0.10
<i>Psychotria brachiata</i> Sw.	2	0.11	0.02	0.03	1	0.16	0.10
<i>Sideroxylon cubense</i> (Griseb.) T.D. Penn.	1	0.06	0.04	0.08	1	0.16	0.10
<i>Terminalia catappa</i> L.	1	0.06	0.04	0.08	1	0.16	0.10
<i>Trema micrantha</i> (L.) Blume	1	0.06	0.03	0.07	1	0.16	0.10
<i>Zanthoxylum flavum</i> Vahl	2	0.11	0.01	0.03	1	0.16	0.10
<i>Citrus xparadisi</i> Macfad. (pro sp.) [maxima × sinensis]	1	0.06	0.03	0.07	1	0.16	0.09
<i>Piper aduncum</i> L.	1	0.06	0.02	0.05	1	0.16	0.09
<i>Ziziphus mauritiana</i> Lam.	1	0.06	0.02	0.05	1	0.16	0.09
<i>Cecropia schreberiana</i> Miq.	1	0.06	0.02	0.03	1	0.16	0.08
<i>Cojoba arborea</i> (L.) Britton & Rose	1	0.06	0.01	0.01	1	0.16	0.08
<i>Comocladia glabra</i> (Schult.) Spreng.	1	0.06	0.01	0.02	1	0.16	0.08
<i>Cordia collococca</i> L.	1	0.06	0.01	0.03	1	0.16	0.08
<i>Erythroxylum rufum</i> Cav.	1	0.06	0.01	0.03	1	0.16	0.08
<i>Euphorbia petiolaris</i> Sims	1	0.06	0.01	0.03	1	0.16	0.08
<i>Lonchocarpus domingensis</i> (Turp. ex Pers.) DC.	1	0.06	0.01	0.01	1	0.16	0.08
<i>Miconia laevigata</i> (L.) D. Don	1	0.06	0.01	0.01	1	0.16	0.08
<i>Miconia racemosa</i> (Aubl.) DC.	1	0.06	0.01	0.02	1	0.16	0.08
<i>Myrcianthes fragrans</i> (Sw.) McVaugh	1	0.06	0.01	0.02	1	0.16	0.08
<i>Palicourea crocea</i> (Sw.) Schult.	1	0.06	0.01	0.02	1	0.16	0.08
<i>Persea americana</i> Mill.	1	0.06	0.01	0.02	1	0.16	0.08
<i>Picramnia pentandra</i> Sw.	1	0.06	0.02	0.03	1	0.16	0.08
<i>Rauvolfia nitida</i> Jacq.	1	0.06	0.01	0.02	1	0.16	0.08
<i>Rondeletia pilosa</i> Sw.	1	0.06	0.01	0.02	1	0.16	0.08
<i>Spondias mombin</i> L.	1	0.06	0.01	0.03	1	0.16	0.08
<i>Urera baccifera</i> (L.) Gaudich.	1	0.06	0.01	0.02	1	0.16	0.08
<i>Zanthoxylum caribaeum</i> Lam.	1	0.06	0.01	0.03	1	0.16	0.08

Nomenclature based on USDA NRCS PLANTS 2010 database.

D.b.h. = diameter at breast height; BA = basal area.





**Table A.13—Tree species with d.b.h.  $\geq 5.0$  inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, subtropical wet and rain forest, Puerto Rico, 2009. (Total stems counted = 1,704; total sum of basal area = 1,003.53 ft<sup>2</sup>; total number of plots = 80.)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Spathodea campanulata</i> P. Beauv.	235	13.79	152.74	15.22	29	5.32	11.44
<i>Guarea guidonia</i> (L.) Sleumer	173	10.15	105.40	10.50	38	6.97	9.21
<i>Cecropia schreberiana</i> Miq.	161	9.45	95.34	9.50	43	7.89	8.95
<i>Prestoea acuminata</i> (Willd.) H.E. Moore var. <i>montana</i> (Graham) A. Hend. & G. Galeano	125	7.34	29.59	2.95	14	2.57	4.28
<i>Schefflera morototonii</i> (Aubl.) Maguire, Steyerm. & Frodin	79	4.64	28.70	2.86	22	4.04	3.84
<i>Inga vera</i> Willd.	64	3.76	29.68	2.96	26	4.77	3.83
<i>Syzygium jambos</i> (L.) Alston	75	4.40	25.96	2.59	24	4.40	3.80
<i>Mangifera indica</i> L.	30	1.76	75.44	7.52	10	1.83	3.70
<i>Tabebuia heterophylla</i> (DC.) Britton	79	4.64	26.13	2.60	12	2.20	3.15
<i>Dacryodes excelsa</i> Vahl	15	0.88	67.65	6.74	6	1.10	2.91
<i>Inga laurina</i> (Sw.) Willd.	38	2.23	22.18	2.21	21	3.85	2.76
<i>Ocotea leucoxydon</i> (Sw.) De Laness.	38	2.23	11.65	1.16	21	3.85	2.41
<i>Eucalyptus robusta</i> Sm.	35	2.05	44.37	4.42	4	0.73	2.40
<i>Cordia sulcata</i> DC.	32	1.88	13.82	1.38	18	3.30	2.19
<i>Andira inermis</i> (W. Wright) Kunth ex DC.	35	2.05	11.60	1.16	16	2.94	2.05
<i>Alchornea latifolia</i> Sw.	31	1.82	17.12	1.71	13	2.39	1.97
<i>Micropholis guyanensis</i> (A. DC.) Pierre	36	2.11	24.10	2.40	6	1.10	1.87
<i>Dendropanax arboreus</i> (L.) Decne. & Planch. ex Britton	34	2.00	13.31	1.33	12	2.20	1.84
<i>Zanthoxylum martinicense</i> (Lam.) DC.	20	1.17	12.50	1.25	10	1.83	1.42
<i>Buchenavia tetraphylla</i> (Aubl.) Howard	8	0.47	25.92	2.58	5	0.92	1.32
<i>Casearia arborea</i> (Rich.) Urb.	18	1.06	3.90	0.39	11	2.02	1.15
<i>Citrus xsinensis</i> (L.) Osbeck (pro sp.) [maxima $\times$ reticulata]	20	1.17	5.41	0.54	9	1.65	1.12
<i>Erythrina poeppigiana</i> (Walp.) O.F. Cook	13	0.76	11.15	1.11	7	1.28	1.05
<i>Cinnamomum elongatum</i> (Vahl ex Nees) Kosterm.	9	0.53	4.37	0.44	8	1.47	0.81
<i>Cyathea arborea</i> (L.) Sm.	12	0.70	2.28	0.23	8	1.47	0.80
<i>Byrsonima spicata</i> (Cav.) Kunth	11	0.65	3.71	0.37	7	1.28	0.77
<i>Turpinia occidentalis</i> (Sw.) G. Don	13	0.76	5.31	0.53	5	0.92	0.74
<i>Ormosia krugii</i> Urb.	18	1.06	5.58	0.56	3	0.55	0.72
<i>Roystonea borinquena</i> O.F. Cook	7	0.41	6.49	0.65	6	1.10	0.72
<i>Guapira fragrans</i> (Dum. Cours.) Little	9	0.53	1.83	0.18	7	1.28	0.66
<i>Tetragastris balsamifera</i> (Sw.) Oken	16	0.94	6.29	0.63	2	0.37	0.64
<i>Clusia rosea</i> Jacq.	13	0.76	3.68	0.37	4	0.73	0.62
<i>Pouteria multiflora</i> (A. DC.) Eyma	6	0.35	8.90	0.89	3	0.55	0.60
<i>Homalium racemosum</i> Jacq.	7	0.41	4.68	0.47	4	0.73	0.54
<i>Spondias mombin</i> L.	6	0.35	5.26	0.52	4	0.73	0.54
<i>Cordia alliodora</i> (Ruiz & Pav.) Oken	6	0.35	1.99	0.20	5	0.92	0.49

continued



## Appendix A—Detailed Tables

**Table A.13—Tree species with d.b.h.  $\geq 5.0$  inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, subtropical wet and rain forest, Puerto Rico, 2009. (Total stems counted = 1,704; total sum of basal area = 1,003.53 ft<sup>2</sup>; total number of plots = 80.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Swietenia macrophylla</i> King	6	0.35	6.85	0.68	2	0.37	0.47
<i>Calophyllum antillanum</i> Britton	7	0.41	3.81	0.38	3	0.55	0.45
<i>Sapium laurocerasus</i> Desf.	5	0.29	1.53	0.15	5	0.92	0.45
<i>Sloanea berteriana</i> Choisy ex DC.	6	0.35	1.91	0.19	4	0.73	0.43
<i>Guazuma ulmifolia</i> Lam.	8	0.47	2.19	0.22	3	0.55	0.41
<i>Miconia tetrandra</i> (Sw.) D. Don	5	0.29	2.54	0.25	3	0.55	0.37
<i>Miconia laevigata</i> (L.) D. Don	9	0.53	1.85	0.18	2	0.37	0.36
<i>Magnolia portoricensis</i> Bello	4	0.23	2.80	0.28	3	0.55	0.35
<i>Persea americana</i> Mill.	4	0.23	2.39	0.24	3	0.55	0.34
<i>Petitia domingensis</i> Jacq.	4	0.23	2.35	0.23	3	0.55	0.34
<i>Plumeria obtusa</i> L.	5	0.29	1.05	0.10	3	0.55	0.32
<i>Tabernaemontana citrifolia</i> L.	1	0.06	7.07	0.70	1	0.18	0.32
<i>Senna siamea</i> (Lam.) Irwin & Barneby	4	0.23	5.19	0.52	1	0.18	0.31
<i>Swietenia mahagoni</i> (L.) Jacq.	9	0.53	2.25	0.22	1	0.18	0.31
<i>Henriettea squamulosum</i> (Cogn.) W.S. Judd	4	0.23	0.72	0.07	3	0.55	0.29
<i>Artocarpus atilis</i> (Parkinson) Fosberg	4	0.23	1.98	0.20	2	0.37	0.27
<i>Cupania americana</i> L.	3	0.18	0.69	0.07	3	0.55	0.27
<i>Matayba domingensis</i> (DC.) Radlk.	5	0.29	1.52	0.15	2	0.37	0.27
<i>Meliosma herbertii</i> Rolfe	7	0.41	2.12	0.21	1	0.18	0.27
<i>Myrcia splendens</i> (Sw.) DC.	3	0.18	0.86	0.09	3	0.55	0.27
<i>Vitex divaricata</i> Sw.	3	0.18	4.14	0.41	1	0.18	0.26
<i>Casuarina equisetifolia</i> L.	6	0.35	2.14	0.21	1	0.18	0.25
<i>Cedrela odorata</i> L.	1	0.06	4.91	0.49	1	0.18	0.24
<i>Byrsonima lucida</i> (Mill.) DC.	4	0.23	0.64	0.06	2	0.37	0.22
<i>Neolaugeria resinosa</i> (Vahl) Nicolson	4	0.23	0.64	0.06	2	0.37	0.22
<i>Albizia procera</i> (Roxb.) Benth.	2	0.12	1.38	0.14	2	0.37	0.21
<i>Bursera simaruba</i> (L.) Sarg.	5	0.29	1.22	0.12	1	0.18	0.20
<i>Ocotea moschata</i> (Pav. ex Meisn.) Mez	2	0.12	1.26	0.13	2	0.37	0.20
<i>Pimenta racemosa</i> (Mill.) J.W. Moore	2	0.12	0.48	0.05	2	0.37	0.18
<i>Gliricidia sepium</i> (Jacq.) Kunth ex Walp.	4	0.23	0.85	0.08	1	0.18	0.17
<i>Ficus trigonata</i> L.	1	0.06	2.03	0.20	1	0.18	0.15
<i>Cocos nucifera</i> L.	2	0.12	1.06	0.11	1	0.18	0.14
<i>Ocotea wrightii</i> (Meisn.) Mez	1	0.06	1.69	0.17	1	0.18	0.14
<i>Chionanthus domingensis</i> Lam.	2	0.12	0.92	0.09	1	0.18	0.13
<i>Ficus citrifolia</i> Mill.	2	0.12	0.78	0.08	1	0.18	0.13
<i>Ixora ferrea</i> (Jacq.) Benth.	2	0.12	0.85	0.09	1	0.18	0.13
<i>Sloanea amygdalina</i> Griseb.	1	0.06	1.48	0.15	1	0.18	0.13
<i>Sideroxylon salicifolium</i> (L.) Lam.	1	0.06	1.08	0.11	1	0.18	0.12
<i>Daphnopsis americana</i> (Mill.) J.R. Johnst.	1	0.06	1.01	0.10	1	0.18	0.11
<i>Eugenia borinquensis</i> Britton	1	0.06	0.95	0.09	1	0.18	0.11
<i>Hymenaea courbaril</i> L.	2	0.12	0.30	0.03	1	0.18	0.11

continued



**Table A.13—Tree species with d.b.h.  $\geq$ 5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, subtropical wet and rain forest, Puerto Rico, 2009. (Total stems counted = 1,704; total sum of basal area = 1,003.53 ft<sup>2</sup>; total number of plots = 80.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Adenanthera pavonina</i> L.	1	0.06	0.55	0.05	1	0.18	0.10
<i>Dracaena fragrans</i> (L.) Ker Gawl.	1	0.06	0.60	0.06	1	0.18	0.10
<i>Eugenia confusa</i> DC.	1	0.06	0.47	0.05	1	0.18	0.10
<i>Micropholis garciniifolia</i> Pierre	1	0.06	0.57	0.06	1	0.18	0.10
<i>Parathesis crenulata</i> (Vent.) Hook. f.	1	0.06	0.45	0.05	1	0.18	0.10
<i>Pisonia albida</i> (Heimerl) Britton ex Standl.	1	0.06	0.65	0.06	1	0.18	0.10
<i>Terminalia catappa</i> L.	1	0.06	0.45	0.05	1	0.18	0.10
<i>Alsophila portoricensis</i> (Spreng. ex Kuhn) Conant	1	0.06	0.20	0.02	1	0.18	0.09
<i>Casearia sylvestris</i> Sw.	1	0.06	0.35	0.03	1	0.18	0.09
<i>Cassipourea guianensis</i> Aubl.	1	0.06	0.29	0.03	1	0.18	0.09
<i>Clusia clusioides</i> (Griseb.) D'Arcy	1	0.06	0.19	0.02	1	0.18	0.09
<i>Coffea liberica</i> W. Bull ex Hiern.	1	0.06	0.21	0.02	1	0.18	0.09
<i>Cyathea tenera</i> (J. Sm. ex Hook.) T. Moore	1	0.06	0.14	0.01	1	0.18	0.09
<i>Eugenia biflora</i> (L.) DC.	1	0.06	0.15	0.01	1	0.18	0.09
<i>Eugenia stahlia</i> (Kiaersk.) Krug & Urb.	1	0.06	0.32	0.03	1	0.18	0.09
<i>Miconia prasina</i> (Sw.) DC.	1	0.06	0.15	0.01	1	0.18	0.09
<i>Miconia racemosa</i> (Aubl.) DC.	1	0.06	0.24	0.02	1	0.18	0.09
<i>Ouratea striata</i> (v. Tiegh.) Urb.	1	0.06	0.40	0.04	1	0.18	0.09
<i>Pisonia subcordata</i> Sw.	1	0.06	0.14	0.01	1	0.18	0.09
<i>Podocarpus coriaceus</i> Rich.	1	0.06	0.32	0.03	1	0.18	0.09
<i>Psidium guajava</i> L.	1	0.06	0.19	0.02	1	0.18	0.09
<i>Sideroxylon obovatum</i> Lam.	1	0.06	0.15	0.02	1	0.18	0.09
<i>Thouinia striata</i> Radlk.	1	0.06	0.25	0.03	1	0.18	0.09
<i>Trichilia pallida</i> Sw.	1	0.06	0.19	0.02	1	0.18	0.09
<i>Triplaris cumingiana</i> Fisch. & C.A. Mey. ex C.A. Mey.	1	0.06	0.40	0.04	1	0.18	0.09

Nomenclature based on USDA NRCS PLANTS 2010 database.

D.b.h. = diameter at breast height; BA = basal area.



## Appendix A—Detailed Tables

**Table A.14—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency and importance value, subtropical wet and rain forest, Puerto Rico, 2009. (Total stems counted = 814; total sum of basal area = 22.04 ft<sup>2</sup>; total number of plots = 78.)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Guarea guidonia</i> (L.) Sleumer	98	12.04	2.61	11.86	27	7.69	10.53
<i>Ocotea leucoxylon</i> (Sw.) De Laness.	41	5.04	1.20	5.43	23	6.55	5.67
<i>Spathodea campanulata</i> P. Beauv.	50	6.14	1.25	5.67	13	3.70	5.17
<i>Syzygium jambos</i> (L.) Alston	46	5.65	1.13	5.11	14	3.99	4.92
<i>Casearia sylvestris</i> Sw.	50	6.14	0.91	4.13	13	3.70	4.66
<i>Tabebuia heterophylla</i> (DC.) Britton	32	3.93	1.10	4.97	8	2.28	3.73
<i>Cyathea arborea</i> (L.) Sm.	16	1.97	1.34	6.06	9	2.56	3.53
<i>Miconia prasina</i> (Sw.) DC.	40	4.91	0.52	2.34	11	3.13	3.46
<i>Coffea liberica</i> W. Bull ex Hiern.	26	3.19	0.79	3.59	6	1.71	2.83
<i>Myrcia splendens</i> (Sw.) DC.	20	2.46	0.44	2.02	12	3.42	2.63
<i>Inga vera</i> Willd.	16	1.97	0.67	3.03	9	2.56	2.52
<i>Casearia guianensis</i> (Aubl.) Urb.	24	2.95	0.45	2.06	8	2.28	2.43
<i>Guettarda scabra</i> (L.) Vent.	28	3.44	0.39	1.75	5	1.42	2.20
<i>Casearia arborea</i> (Rich.) Urb.	20	2.46	0.41	1.87	7	1.99	2.11
<i>Cordia sulcata</i> DC.	13	1.60	0.46	2.07	7	1.99	1.89
<i>Coffea arabica</i> L.	16	1.97	0.17	0.76	7	1.99	1.57
<i>Dendropanax arboreus</i> (L.) Decne. & Planch. ex Britton	11	1.35	0.34	1.54	6	1.71	1.53
<i>Psychotria berteriana</i> DC.	10	1.23	0.20	0.89	8	2.28	1.46
<i>Inga laurina</i> (Sw.) Willd.	9	1.11	0.31	1.42	5	1.42	1.32
<i>Cecropia schreberiana</i> Miq.	5	0.61	0.35	1.57	5	1.42	1.20
<i>Thouinia striata</i> Radlk.	7	0.86	0.49	2.24	1	0.28	1.13
<i>Schefflera morototonii</i> (Aubl.) Maguire, Steyerm. & Frodin	6	0.74	0.23	1.05	5	1.42	1.07
<i>Erythrina poeppigiana</i> (Walp.) O.F. Cook	6	0.74	0.21	0.97	5	1.42	1.04
<i>Homalium racemosum</i> Jacq.	8	0.98	0.21	0.96	4	1.14	1.03
<i>Calophyllum antillanum</i> Britton	10	1.23	0.20	0.93	3	0.85	1.00
<i>Citrus xsinensis</i> (L.) Osbeck (pro sp.) [maxima × reticulata]	4	0.49	0.28	1.27	4	1.14	0.97
<i>Zanthoxylum martinicense</i> (Lam.) DC.	5	0.61	0.17	0.76	5	1.42	0.93
<i>Andira inermis</i> (W. Wright) Kunth ex DC.	6	0.74	0.24	1.10	3	0.85	0.90
<i>Tetragastris balsamifera</i> (Sw.) Oken	9	1.11	0.22	1.00	2	0.57	0.89
<i>Clusia rosea</i> Jacq.	6	0.74	0.25	1.12	2	0.57	0.81
<i>Micropholis guyanensis</i> (A. DC.) Pierre	6	0.74	0.18	0.83	3	0.85	0.81
<i>Eugenia biflora</i> (L.) DC.	6	0.74	0.18	0.81	3	0.85	0.80
<i>Miconia laevigata</i> (L.) D. Don	6	0.74	0.17	0.79	3	0.85	0.79
<i>Miconia tetrandra</i> (Sw.) D. Don	6	0.74	0.17	0.77	3	0.85	0.79
<i>Neolaugeria resinosa</i> (Vahl) Nicolson	9	1.11	0.15	0.66	2	0.57	0.78
<i>Eugenia monticola</i> (Sw.) DC.	9	1.11	0.12	0.56	2	0.57	0.74
<i>Guarea glabra</i> Vahl	5	0.61	0.10	0.43	4	1.14	0.73
<i>Alchornea latifolia</i> Sw.	4	0.49	0.16	0.72	3	0.85	0.69

continued



**Table A.14—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency and importance value, subtropical wet and rain forest, Puerto Rico, 2009. (Total stems counted = 814; total sum of basal area = 22.04 ft<sup>2</sup>; total number of plots = 78.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Sloanea berteriana</i> Choisy ex DC.	5	0.61	0.21	0.93	1	0.28	0.61
<i>Ficus citrifolia</i> Mill.	2	0.25	0.20	0.91	2	0.57	0.58
<i>Prestoea acuminata</i> (Willd.) H.E. Moore var. <i>montana</i> (Graham) A. Hend. & G. Galeano	2	0.25	0.19	0.87	2	0.57	0.56
<i>Swietenia mahagoni</i> (L.) Jacq.	5	0.61	0.17	0.79	1	0.28	0.56
<i>Myrcia citrifolia</i> (Aubl.) Urb.	3	0.37	0.15	0.70	2	0.57	0.55
<i>Guapira fragrans</i> (Dum. Cours.) Little	3	0.37	0.15	0.66	2	0.57	0.53
<i>Cinnamomum elongatum</i> (Vahl ex Nees) Kosterm.	3	0.37	0.05	0.24	3	0.85	0.49
<i>Cordia borinquensis</i> Urb.	3	0.37	0.04	0.20	3	0.85	0.47
<i>Eugenia confusa</i> DC.	3	0.37	0.10	0.46	2	0.57	0.47
<i>Trichilia pallida</i> Sw.	4	0.49	0.06	0.29	2	0.57	0.45
<i>Psidium guajava</i> L.	4	0.49	0.05	0.21	2	0.57	0.42
<i>Pimenta racemosa</i> (Mill.) J.W. Moore	2	0.25	0.09	0.41	2	0.57	0.41
<i>Podocarpus coriaceus</i> Rich.	5	0.61	0.07	0.31	1	0.28	0.40
<i>Miconia impetiolaris</i> (Sw.) D. Don ex DC.	3	0.37	0.03	0.15	2	0.57	0.36
<i>Myrcia fallax</i> (Rich.) DC.	2	0.25	0.06	0.28	2	0.57	0.36
<i>Spondias mombin</i> L.	2	0.25	0.06	0.25	2	0.57	0.36
<i>Urera baccifera</i> (L.) Gaudich.	3	0.37	0.03	0.15	2	0.57	0.36
<i>Pouteria multiflora</i> (A. DC.) Eyma	2	0.25	0.05	0.22	2	0.57	0.35
<i>Dacryodes excelsa</i> Vahl	2	0.25	0.05	0.21	2	0.57	0.34
<i>Henriettea macfadyenii</i> (Triana) Alain	4	0.49	0.05	0.24	1	0.28	0.34
<i>Ilex nitida</i> (Vahl) Maxim.	2	0.25	0.04	0.20	2	0.57	0.34
<i>Casearia decandra</i> Jacq.	2	0.25	0.04	0.16	2	0.57	0.33
<i>Faramea occidentalis</i> (L.) A. Rich.	2	0.25	0.04	0.16	2	0.57	0.33
<i>Guettarda ovalifolia</i> Urb.	1	0.12	0.13	0.57	1	0.28	0.33
<i>Matayba domingensis</i> (DC.) Radlk.	1	0.12	0.13	0.59	1	0.28	0.33
<i>Plumeria obtusa</i> L.	1	0.12	0.13	0.57	1	0.28	0.33
<i>Myrcia deflexa</i> (Poir.) DC.	2	0.25	0.03	0.14	2	0.57	0.32
<i>Alsophila portoricensis</i> (Spreng. ex Kuhn) Conant	2	0.25	0.09	0.39	1	0.28	0.31
<i>Cestrum laurifolium</i> L'Hér.	2	0.25	0.02	0.09	2	0.57	0.30
<i>Cordia alliodora</i> (Ruiz & Pav.) Oken	2	0.25	0.02	0.09	2	0.57	0.30
<i>Eugenia borinquensis</i> Britton	2	0.25	0.02	0.07	2	0.57	0.30
<i>Miconia serrulata</i> (DC.) Naud.	2	0.25	0.07	0.32	1	0.28	0.28
<i>Piper aduncum</i> L.	3	0.37	0.04	0.19	1	0.28	0.28
<i>Myrsine coriacea</i> (Sw.) R. Br. ex Roem. & Schult.	2	0.25	0.06	0.26	1	0.28	0.26
<i>Citharexylum caudatum</i> L.	2	0.25	0.03	0.12	1	0.28	0.22
<i>Annona squamosa</i> L.	2	0.25	0.02	0.10	1	0.28	0.21
<i>Hirtella rugosa</i> Thuill. ex Pers.	2	0.25	0.02	0.09	1	0.28	0.21
<i>Senna siamea</i> (Lam.) Irwin & Barneby	2	0.25	0.02	0.11	1	0.28	0.21

continued



## Appendix A—Detailed Tables

**Table A.14—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency and importance value, subtropical wet and rain forest, Puerto Rico, 2009. (Total stems counted = 814; total sum of basal area = 22.04 ft<sup>2</sup>; total number of plots = 78.) (continued)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Ardisia obovata</i> Desv. ex Ham.	1	0.12	0.04	0.19	1	0.28	0.20
<i>Bursera simaruba</i> (L.) Sarg.	1	0.12	0.04	0.19	1	0.28	0.20
<i>Miconia racemosa</i> (Aubl.) DC.	2	0.25	0.02	0.08	1	0.28	0.20
<i>Amyris elemifera</i> L.	1	0.12	0.03	0.12	1	0.28	0.18
<i>Guazuma ulmifolia</i> Lam.	1	0.12	0.03	0.14	1	0.28	0.18
<i>Mangifera indica</i> L.	1	0.12	0.03	0.12	1	0.28	0.18
<i>Persea americana</i> Mill.	1	0.12	0.03	0.14	1	0.28	0.18
<i>Quararibea turbinata</i> (Sw.) Poir.	1	0.12	0.03	0.13	1	0.28	0.18
<i>Cedrela odorata</i> L.	1	0.12	0.02	0.09	1	0.28	0.17
<i>Cupania americana</i> L.	1	0.12	0.02	0.08	1	0.28	0.16
<i>Daphnopsis philippiana</i> Krug & Urb.	1	0.12	0.02	0.08	1	0.28	0.16
<i>Drypetes glauca</i> Vahl	1	0.12	0.01	0.06	1	0.28	0.16
<i>Henriettea squamulosum</i> (Cogn.) W.S. Judd	1	0.12	0.02	0.07	1	0.28	0.16
<i>Nectandra hihua</i> (Ruiz & Pav.) Rohwer	1	0.12	0.02	0.08	1	0.28	0.16
<i>Tabebuia schumanniana</i> Urb.	1	0.12	0.02	0.08	1	0.28	0.16
<i>Trema micrantha</i> (L.) Blume	1	0.12	0.02	0.08	1	0.28	0.16
<i>Artocarpus atilis</i> (Parkinson) Fosberg	1	0.12	0.01	0.04	1	0.28	0.15
<i>Calypttranthes pallens</i> Griseb.	1	0.12	0.01	0.05	1	0.28	0.15
<i>Chionanthus domingensis</i> Lam.	1	0.12	0.01	0.04	1	0.28	0.15
<i>Hibiscus rosa-sinensis</i> L.	1	0.12	0.01	0.03	1	0.28	0.15
<i>Leandra krugiana</i> (Cogn.) W.S. Judd & Skean	1	0.12	0.01	0.03	1	0.28	0.15
<i>Ormosia krugii</i> Urb.	1	0.12	0.01	0.04	1	0.28	0.15
<i>Picramnia pentandra</i> Sw.	1	0.12	0.01	0.05	1	0.28	0.15
<i>Schoepfia obovata</i> C. Wright	1	0.12	0.01	0.06	1	0.28	0.15
<i>Tabebuia haemantha</i> (Bertol. ex Spreng.) DC.	1	0.12	0.01	0.03	1	0.28	0.15
<i>Vitex divaricata</i> Sw.	1	0.12	0.01	0.04	1	0.28	0.15
<i>Myrcia leptoclada</i> DC.	1	0.12	0.01	0.02	1	0.28	0.14
<i>Ocotea spathulata</i> Mez	1	0.12	0.01	0.02	1	0.28	0.14

Nomenclature based on USDA NRCS PLANTS 2010 database.

D.b.h. = diameter at breast height; BA = basal area.



**Table A.15—Tree species with d.b.h.  $\geq$ 5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, subtropical lower montane wet and rain forest, Puerto Rico, 2009. (Total stems counted = 157; total sum of basal area = 67.64 ft<sup>2</sup>; total number of plots = 4.)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Prestoea acuminata</i> (Willd.) H.E. Moore var. <i>montana</i> (Graham) A. Hend. & G. Galeano	88	56.05	19.18	28.35	4	12.12	32.17
<i>Cecropia schreberiana</i> Miq.	26	16.56	15.57	23.03	3	9.09	16.23
<i>Micropholis garciniifolia</i> Pierre	15	9.55	6.25	9.24	3	9.09	9.30
<i>Inga vera</i> Willd.	3	1.91	4.80	7.09	1	3.03	4.01
<i>Croton poecilanthus</i> Urb.	3	1.91	1.89	2.80	2	6.06	3.59
<i>Sloanea berteriana</i> Choisy ex DC.	1	0.64	3.92	5.79	1	3.03	3.15
<i>Cordia borinquensis</i> Urb.	2	1.27	0.39	0.57	2	6.06	2.64
<i>Magnolia splendens</i> Urb.	1	0.64	2.64	3.90	1	3.03	2.52
<i>Tabebuia rigida</i> Urb.	1	0.64	2.27	3.36	1	3.03	2.34
<i>Ficus americana</i> Aubl.	1	0.64	1.69	2.50	1	3.03	2.05
<i>Inga laurina</i> (Sw.) Willd.	1	0.64	1.41	2.09	1	3.03	1.92
<i>Clusia rosea</i> Jacq.	1	0.64	1.34	1.99	1	3.03	1.88
<i>Clusia clusioides</i> (Griseb.) D'Arcy	2	1.27	0.83	1.23	1	3.03	1.85
<i>Citrus xsinensis</i> (L.) Osbeck (pro sp.) [ <i>maxima</i> $\times$ <i>reticulata</i> ]	1	0.64	1.07	1.58	1	3.03	1.75
<i>Henriettea macfadyenii</i> (Triana) Alain	2	1.27	0.63	0.93	1	3.03	1.75
<i>Alchornea latifolia</i> Sw.	1	0.64	0.72	1.07	1	3.03	1.58
<i>Chrysophyllum cainito</i> L.	1	0.64	0.71	1.05	1	3.03	1.57
<i>Cordia sulcata</i> DC.	1	0.64	0.61	0.91	1	3.03	1.52
<i>Syzygium jambos</i> (L.) Alston	1	0.64	0.37	0.54	1	3.03	1.40
<i>Byrsonima wadsworthii</i> Little	1	0.64	0.34	0.50	1	3.03	1.39
<i>Trema micrantha</i> (L.) Blume	1	0.64	0.32	0.48	1	3.03	1.38
<i>Ocotea leucoxydon</i> (Sw.) De Laness.	1	0.64	0.28	0.42	1	3.03	1.36
<i>Henriettea squamulosum</i> (Cogn.) W.S. Judd	1	0.64	0.22	0.32	1	3.03	1.33
<i>Cyrilla racemiflora</i> L.	1	0.64	0.18	0.26	1	3.03	1.31

Nomenclature based on USDA NRCS PLANTS 2010 database.

D.b.h. = diameter at breast height; BA = basal area.



## Appendix A—Detailed Tables

**Table A.16—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, subtropical lower montane wet and rain forest, Puerto Rico, 2009. (Total stems counted = 37; total sum of basal area = 1.11 ft<sup>2</sup>; total number of plots = 4.)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Henriettea squamulosum</i> (Cogn.) W.S. Judd	6	16.22	0.07	6.55	2	11.76	11.51
<i>Prestoea acuminata</i> (Willd.) H.E. Moore var. <i>montana</i> (Graham) A. Hend. & G. Galeano	2	5.41	0.25	22.20	1	5.88	11.16
<i>Croton poecilanthus</i> Urb.	3	8.11	0.11	10.33	2	11.76	10.07
<i>Micropholis garciniifolia</i> Pierre	3	8.11	0.17	15.40	1	5.88	9.80
<i>Cecropia schreberiana</i> Miq.	3	8.11	0.11	10.35	1	5.88	8.11
<i>Alchornea latifolia</i> Sw.	3	8.11	0.11	9.71	1	5.88	7.90
<i>Sloanea berteriana</i> Choisy ex DC.	3	8.11	0.06	5.70	1	5.88	6.57
<i>Coffea arabica</i> L.	3	8.11	0.05	4.17	1	5.88	6.05
<i>Myrcia deflexa</i> (Poir.) DC.	2	5.41	0.05	4.25	1	5.88	5.18
<i>Ditta myricoides</i> Griseb.	2	5.41	0.04	3.22	1	5.88	4.84
<i>Miconia pycnoneura</i> Urb.	2	5.41	0.02	1.94	1	5.88	4.41
<i>Ocotea leucoxylon</i> (Sw.) De Laness.	2	5.41	0.02	1.94	1	5.88	4.41
<i>Inga vera</i> Willd.	1	2.70	0.02	2.17	1	5.88	3.58
<i>Byrsonima wadsworthii</i> Little	1	2.70	0.01	1.11	1	5.88	3.23
<i>Cordia borinquensis</i> Urb.	1	2.70	0.01	0.96	1	5.88	3.18

Nomenclature based on USDA NRCS PLANTS 2010 database.

D.b.h. = diameter at breast height; BA = basal area.

**Table A.17—Tree species with d.b.h. ≥5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, mangrove forest, Puerto Rico, 2009. (Total stems counted = 26; Total sum of basal area = 7.95 ft<sup>2</sup>; Total number of plots = 1.)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Avicennia germinans</i> (L.) L.	18	69.23	4.90	61.61	1	25.00	51.95
<i>Conocarpus erectus</i> L.	3	11.54	2.02	25.47	1	25.00	20.67
<i>Rhizophora mangle</i> L.	3	11.54	0.61	7.72	1	25.00	14.75
<i>Laguncularia racemosa</i> (L.) C.F. Gaertn.	2	7.69	0.41	5.20	1	25.00	12.63

Nomenclature based on USDA NRCS PLANTS 2010 database.

D.b.h. = diameter at breast height; BA = basal area.





**Table A.18—Tree species with d.b.h. <5.0 inches, number of individuals tallied, relative density, species sum total basal area, relative dominance, number of plots where species was found, relative frequency, and importance value, mangrove forest, Puerto Rico, 2009. (Total stems counted = 23; total sum of basal area = 0.41 ft<sup>2</sup>; total number of plots = 2.)**

Scientific name	Species number	Relative density	Species BA sq. ft.	Relative dominance	Species plot count number	Relative frequency	Importance value
<i>Avicennia germinans</i> (L.) L.	9	39.13	0.15	35.63	2	40.00	38.25
<i>Laguncularia racemosa</i> (L.) C.F. Gaertn.	8	34.78	0.20	49.29	1	20.00	34.69
<i>Rhizophora mangle</i> L.	4	17.39	0.03	7.41	1	20.00	14.93
<i>Conocarpus erectus</i> L.	2	8.70	0.03	7.66	1	20.00	12.12

Nomenclature based on USDA NRCS PLANTS 2010 database.  
D.b.h. = diameter at breast height; BA = basal area.

**Table A.19—Number of live trees on forest land by species group and diameter class, Puerto Rico, 2009**

Species group	All classes	Diameter class														
		1.0–2.9	3.0–4.9	5.0–6.9	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–24.9	25.0–28.9	29.0–32.9	33.0–36.9	37.0+
<i>million trees</i>																
Softwood																
Tropical and subtropical pines	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total softwoods	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hardwood																
Eastern noncommercial hardwoods	99.1	70.4	16.0	4.3	2.6	2.1	1.1	0.6	0.7	0.2	0.3	0.4	0.2	0.1	0.0	0.2
Woodland hardwoods	4.9	3.5	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tropical and subtropical palms	7.7	5.6	1.3	0.4	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tropical and subtropical hardwoods	1,347.7	1,059.5	169.8	52.9	29.6	14.4	8.7	5.0	2.6	1.8	1.2	1.2	0.5	0.3	0.1	0.2
Total hardwoods	1,459.5	1,139.0	188.5	57.5	32.4	16.6	9.9	5.6	3.3	2.0	1.5	1.6	0.7	0.4	0.1	0.4
All species	1,459.7	1,139.0	188.5	57.5	32.4	16.6	10.0	5.7	3.3	2.0	1.5	1.6	0.7	0.4	0.1	0.4

Numbers in rows and columns may not sum to totals due to rounding.  
0.0 = no sample for the cell or a value of >0.0 but <0.05.



## Appendix A—Detailed Tables

**Table A.20—Net<sup>a</sup> volume of live trees on forest land by ownership class and land status, Puerto Rico, 2009**

Ownership class	All forest land	Land status	
		Unreserved	Reserved
<i>million cubic feet</i>			
U.S. Forest Service			
National forest	41.0	0.0	41.0
Total	41.0	0.0	41.0
Other Federal			
U.S. Fish and Wildlife Service	4.0	0.0	4.0
Dept. of Defense/Dept. of Energy	0.6	0.0	0.6
Total	4.6	0.0	4.6
Commonwealth and local government			
Commonwealth	132.3	0.0	132.3
Total	132.3	0.0	132.3
Nonindustrial private			
Undifferentiated private	1,097.8	1,097.8	0.0
Total	1,097.8	1,097.8	0.0
All classes	1,275.7	1,097.8	177.9

0.0 = no sample for the cell or a value of >0.0 but <0.05.

<sup>a</sup> Excludes rotten, missing, and form cull defects volume.

**Table A.21—Net<sup>a</sup> volume of live trees on forest land by forest-type group and stand-size class, Puerto Rico, 2009**

Forest-type group	All classes	Stand-size class			Non-stocked
		Large diameter	Medium diameter	Small diameter	
<i>million cubic feet</i>					
Mangrove	3.2	0.0	3.2	0.0	0.0
Dry forest	47.9	6.7	5.5	35.7	0.0
Moist forest	605.4	382.2	161.1	61.8	0.3
Wet and rain forest	588.4	415.8	152.6	20.0	0.0
Lower montane wet and rain forest	30.8	13.0	17.8	0.0	0.0
All forest-type groups	1,275.7	817.7	340.2	117.5	0.3

0.0 = no sample for the cell or a value of >0.0 but <0.05.

<sup>a</sup> Excludes rotten, missing, and form cull defects volume.



**Table A.22—Net<sup>a</sup> volume of live trees on forest land by species group and ownership group, Puerto Rico, 2009**

Species group	Ownership group					
	All ownerships	U.S. Forest Service	Other Federal	Commonwealth and local government	Forest industry	Nonindustrial private
	<i>million cubic feet</i>					
<b>Softwood</b>						
Tropical and subtropical pines	3.7	0.0	0.0	0.0	0.0	3.7
Total softwoods	3.7	0.0	0.0	0.0	0.0	3.7
<b>Hardwood</b>						
Eastern noncommercial hardwoods	184.4	1.4	2.1	38.5	0.0	142.4
Woodland hardwoods	0.6	0.0	0.0	0.6	0.0	0.0
Tropical and subtropical palms	5.2	0.0	0.0	0.0	0.0	5.2
Tropical and subtropical hardwoods	1,081.8	39.6	2.5	93.2	0.0	946.5
Total hardwoods	1,272.0	41.0	4.6	132.3	0.0	1,094.1
All species	1,275.7	41.0	4.6	132.3	0.0	1,097.8

0.0 = no sample for the cell or a value of >0.0 but <0.05.

<sup>a</sup> Excludes rotten, missing, and form cull defects volume.

**Table A.23—Net<sup>a</sup> volume of live trees on forest land by species group and diameter class, Puerto Rico, 2009**

Species group	All classes	Diameter class												
		5.0– 6.9	7.0– 8.9	9.0– 10.9	11.0– 12.9	13.0– 14.9	15.0– 16.9	17.0– 18.9	19.0– 20.9	21.0– 24.9	25.0– 28.9	29.0– 32.9	33.0– 36.9	37.0+
	<i>million cubic feet</i>													
<b>Softwood</b>														
Tropical and subtropical pines	3.7	0.1	0.0	0.0	1.8	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total softwoods	3.7	0.1	0.0	0.0	1.8	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Hardwood</b>														
Eastern noncommercial hardwoods	184.4	9.2	12.1	16.8	13.6	11.5	18.6	5.7	11.1	24.8	16.7	10.3	3.5	30.5
Woodland hardwoods	0.6	0.1	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tropical and subtropical palms	5.2	0.9	1.3	1.4	0.9	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tropical and subtropical hardwoods	1,081.9	117.9	151.7	144.5	136.0	117.1	83.5	78.5	63.8	77.9	41.3	27.5	18.5	23.8
Total hardwoods	1,272.2	128.1	165.3	163.0	150.5	129.4	102.1	84.2	74.9	102.7	58.0	37.8	22.0	54.3
All species	1,275.9	128.2	165.3	163.0	152.3	131.2	102.1	84.2	74.9	102.7	58.0	37.8	22.0	54.3

0.0 = no sample for the cell or a value of >0.0 but <0.05.

<sup>a</sup> Excludes rotten, missing, and form cull defects volume.



## Appendix A—Detailed Tables

**Table A.24—Aboveground dry weight of live trees on forest land by ownership class and land status, Puerto Rico, 2009**

Ownership class	All forest land	Land status	
		Unreserved	Reserved
		<i>thousand tons</i>	
U.S. Forest Service			
National forest	1,435.9	0.0	1,435.9
Total	1,435.9	0.0	1,435.9
Other Federal			
U.S. Fish and Wildlife Service	353.8	0.0	353.8
Dept. of Defense/Dept. of Energy	148.2	0.0	148.2
Total	502.1	0.0	502.1
Commonwealth and local government			
Commonwealth	5,722.8	0.0	5,722.8
Total	5,722.8	0.0	5,722.8
Nonindustrial private			
Undifferentiated private	37,414.6	37,414.6	0.0
Total	37,414.6	37,414.6	0.0
All classes	45,075.4	37,414.6	7,660.8

Numbers in rows and columns may not sum to totals due to rounding.  
0.0 = no sample for the cell or a value of >0.0 but <0.05.



Table A.25—Aboveground dry weight of live trees on forest land by species group and diameter class, Puerto Rico, 2009

Species group	All classes	Diameter class														
		1.0–2.9	3.0–4.9	5.0–6.9	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–24.9	25.0–28.9	29.0–32.9	33.0–36.9	37.0+
<i>thousand tons</i>																
Softwood																
Tropical and subtropical pines	81.6	0.0	0.0	4.0	0.0	0.0	41.0	36.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total softwoods	81.6	0.0	0.0	4.0	0.0	0.0	41.0	36.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hardwood																
Eastern noncommercial hardwoods	5,465.9	473.1	529.8	342.5	374.3	453.4	349.0	277.2	410.6	107.2	243.7	538.6	356.8	200.0	58.6	751.0
Woodland hardwoods	123.7	21.5	84.3	3.4	6.3	8.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tropical and subtropical palms	198.5	21.1	39.1	31.7	33.7	34.0	20.7	18.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tropical and subtropical hardwoods	39,205.8	6,725.8	5,252.3	4,120.9	4,237.5	3,527.7	3,054.6	2,478.3	1,737.9	1,558.1	1,302.2	1,637.9	1,031.4	626.4	329.8	1,584.9
Total hardwoods	44,993.8	7,241.5	5,905.5	4,498.6	4,651.8	4,023.3	3,424.3	2,773.7	2,148.5	1,665.3	1,545.9	2,176.5	1,388.2	826.4	388.4	2,335.9
All species	45,075.4	7,241.5	5,905.5	4,502.6	4,651.8	4,023.3	3,465.3	2,810.3	2,148.5	1,665.3	1,545.9	2,176.5	1,388.2	826.4	388.4	2,335.9

Numbers in rows and columns may not sum to totals due to rounding.  
 0.0 = no sample for the cell or a value of >0.0 but <0.05.



## Appendix A—Detailed Tables

**Table A.26—Above- and belowground dry weight and carbon of live trees on forest land by survey unit and forest-type group, Puerto Rico, 2009**

Survey unit and forest-type group	Total		Biomass	
	Carbon	Biomass	Above-ground	Below-ground
	<i>thousand tons</i>			
<b>Mainland Puerto Rico</b>				
Mangrove	160	319	265	55
Dry forest	2,007	4,014	3,321	693
Moist forest	13,053	26,107	21,779	4,328
Wet and rain forest	10,545	21,089	17,628	3,461
Lower montane wet and rain forest	778	1,556	1,301	255
All forest-type groups	26,543	53,086	44,293	8,792
<b>Culebra</b>				
Dry forest	70	140	115	25
All forest-type groups	70	140	115	25
<b>Vieques</b>				
Dry forest	140	281	232	49
Moist forest	160	319	265	54
All forest-type groups	300	600	497	103
<b>Mona</b>				
Dry forest	103	207	170	36
All forest-type groups	103	207	170	36
<b>Total</b>	<b>27,016</b>	<b>54,032</b>	<b>45,075</b>	<b>8,957</b>

Numbers in rows and columns may not sum to totals due to rounding.



**Table A.27—Average annual net growth of live trees by ownership class and land status, Puerto Rico, 2009 (2004–09)**

Ownership class	All forest land	Land status	
		Unreserved	Reserved
		<i>cubic feet</i>	
U.S. Forest Service			
National forest	988,876	0	988,876
Total	988,876	0	988,876
Other Federal			
U.S. Fish and Wildlife Service	245,015	0	245,015
Dept. of Defense/Dept. of Energy	45,579	0	45,579
Total	290,594	0	290,594
Commonwealth and local government			
Commonwealth	519,038	0	519,038
Total	519,038	0	519,038
Nonindustrial private			
Undifferentiated private	32,200,663	32,200,663	0
Total	32,200,663	32,200,663	0
All classes	33,999,171	32,200,663	1,798,508

0 = no sample for the cell or a value of >0.0 but <0.05.

**Table A.28—Average annual net growth of live trees on forest land by forest type and stand-size class, Puerto Rico, 2009 (2004–09)**

Forest-type	All classes	Stand-size class			
		Large diameter	Medium diameter	Small diameter	Non-stocked
		<i>cubic feet</i>			
Softwood					
Total softwoods	0	0	0	0	0
Hardwood					
Mangrove	40,651	0	32,335	8,316	0
Dry forest	680,147	-1,615,501	-49,890	1,547,101	798,436
Moist forest	20,516,742	1,877,234	13,501,460	5,138,048	0
Wet and rain forest	12,008,403	2,763,790	5,984,791	3,277,481	-17,660
Lower montane wet and rain forest	753,228	430,173	323,055	0	0
Total hardwoods	33,999,171	3,455,697	19,791,751	9,970,947	780,777
All forest types	33,999,171	3,455,697	19,791,751	9,970,947	780,777

Numbers in rows and columns may not sum to totals due to rounding.

0 = no sample for the cell or a value of >0.0 but <0.05.



## Appendix A—Detailed Tables

**Table A.29—Average annual net growth of live trees on forest land by species group and ownership group, Puerto Rico, 2009 (2004–09)**

Species group	Ownership group					
	All ownerships	U.S. Forest Service	Other Federal	Commonwealth and local government	Forest industry	Nonindustrial private
	<i>cubic feet</i>					
<b>Softwood</b>						
Tropical and subtropical pines	191,260	0	0	0	0	191,260
Total softwoods	191,260	0	0	0	0	191,260
<b>Hardwood</b>						
Eastern noncommercial hardwoods	1,398,536	-130,152	87,171	545,218	0	896,298
Woodland hardwoods	5,352	0	0	5,352	0	0
Tropical and subtropical palms	323,416	0	0	0	0	323,416
Tropical and subtropical hardwoods	32,080,607	1,119,027	203,424	-31,533	0	30,789,689
Total hardwoods	33,807,911	988,875	290,595	519,037	0	32,009,403
<b>All species</b>	<b>33,999,171</b>	<b>988,875</b>	<b>290,595</b>	<b>519,037</b>	<b>0</b>	<b>32,200,663</b>

Numbers in rows and columns may not sum to totals due to rounding.

0 = no sample for the cell or a value of >0.0 but <0.05.

**Table A.30—Average annual mortality of live trees by ownership class and land status, Puerto Rico, 2009 (2004–09)**

Ownership class	All forest land	Land status	
		Unreserved	Reserved
	<i>cubic feet</i>		
<b>U.S. Forest Service</b>			
National forest	556,231	0	556,231
Total	556,231	0	556,231
<b>Other Federal</b>			
U.S. Fish and Wildlife Service	2,177	0	2,177
Total	2,177	0	2,177
<b>Commonwealth and local government</b>			
Commonwealth	3,129,109	0	3,129,109
Total	3,129,109	0	3,129,109
<b>Nonindustrial private</b>			
Other	27,946,832	27,946,832	0
Total	27,946,832	27,946,832	0
<b>All classes</b>	<b>31,634,349</b>	<b>27,946,832</b>	<b>3,687,517</b>

0 = no sample for the cell or a value of >0.0 but <0.05.





**Table A.31—Average annual mortality of live trees on forest land by forest type and stand-size class, Puerto Rico, 2009 (2004–09)**

Forest type	All classes	Stand-size class			Non-stocked
		Large diameter	Medium diameter	Small diameter	
<i>cubic feet</i>					
Softwood					
Total softwoods	0	0	0	0	0
Hardwood					
Mangrove	63,911	0	63,911	0	0
Dry forest	2,638,808	2,173,227	169,139	296,443	0
Moist forest	14,328,330	8,407,638	3,593,574	2,327,119	0
Wet and rain forest	14,184,325	8,572,125	4,149,242	1,442,826	20,132
Lower montane wet and rain forest	418,974	196,349	222,625	0	0
Total hardwoods	31,634,349	19,349,339	8,198,491	4,066,388	20,132
All forest types	31,634,349	19,349,339	8,198,491	4,066,388	20,132

Numbers in rows and columns may not sum to totals due to rounding.

0 = no sample for the cell or a value of >0.0 but <0.05.

**Table A.32—Average annual mortality of live trees on forest land by species group and ownership group, Puerto Rico, 2009 (2004–09)**

Species group	All ownerships	Ownership group				
		U.S. Forest Service	Other Federal	Commonwealth and local government	Forest industry	Nonindustrial private
<i>cubic feet</i>						
Softwood						
Tropical and subtropical pines	0	0	0	0	0	0
Total softwoods	0	0	0	0	0	0
Hardwood						
Eastern noncommercial hardwoods	1,280,977	0	0	616,849	0	664,128
Woodland hardwoods	14,955	0	0	0	0	14,955
Tropical and subtropical palms	0	0	0	0	0	0
Tropical and subtropical hardwoods	30,338,417	556,231	2,177	2,512,260	0	27,267,749
Total hardwoods	31,634,349	556,231	2,177	3,129,109	0	27,946,832
All species	31,634,349	556,231	2,177	3,129,109	0	27,946,832

0 = no sample for the cell or a value of >0.0 but <0.05.



## Appendix A—Detailed Tables

**Table A.33—Average annual net removals of live trees by ownership class and land status, Puerto Rico, 2009 (2004–09)**

Ownership class	Forest land <i>cubic feet</i>
Nonindustrial private	
Other	85,028
Total	85,028
All classes	85,028

**Table A.34—Average annual removals of live trees on forest land by forest type and stand-size class, Puerto Rico, 2009 (2004–09)**

Forest type	Stand-size class				Non-stocked
	All classes	Large diameter	Medium diameter	Small diameter	
<i>cubic feet</i>					
Softwood					
Total softwoods	0	0	0	0	0
Hardwood					
Mangrove	0	0	0	0	0
Dry forest	0	0	0	0	0
Moist forest	11,833	0	0	11,833	0
Wet and rain forest	73,195	0	73,195	0	0
Lower montane wet and rain forest	0	0	0	0	0
Total hardwoods	85,028	0	73,195	11,833	0
All forest types	85,028	0	73,195	11,833	0

0 = no sample for the cell or a value of >0.0 but <0.05.



**Table A.35—Average annual removals of live trees on forest land by species group and ownership group, Puerto Rico, 2009 (2004–09)**

Species group	Ownership group					
	All ownerships	U.S. Forest Service	Other Federal	Commonwealth and local government	Forest industry	Nonindustrial private
	<i>cubic feet</i>					
Softwood						
Tropical and subtropical pines	0	0	0	0	0	0
Total softwoods	0	0	0	0	0	0
Hardwood						
Eastern noncommercial hardwoods	0	0	0	0	0	0
Woodland hardwoods	0	0	0	0	0	0
Tropical and subtropical palms	0	0	0	0	0	0
Tropical and subtropical hardwoods	85,028	0	0	0	0	85,028
Total hardwoods	85,028	0	0	0	0	85,028
All species	85,028	0	0	0	0	85,028

0 = no sample for the cell or a value of >0.0 but <0.05.



### Reliability of the Data

In contrast to the previous Puerto Rico inventory report (Brandeis and others 2007) we have chosen to present the information on the statistical reliability of estimates presented here in a more condensed form and in different terms. Brandeis and others (2007) presented the standard error of the mean associated with each estimate. Here we present a sampling error calculated from the standard error of the mean and expressed as a percentage in summary table form for forest land acreage, numbers of live trees, aboveground biomass and all-live tree volume (table B.1). This percentage format allows the application of confidence intervals to the population values (the most common values presented in Forest Inventory and Analysis (FIA) reports). Most FIA sampling errors are presented at the 0.6827 level but the 0.95 level can easily be obtained by multiplying the sampling error by 1.96 or higher, appropriate t-value if the sample size  $n$  is  $<120$ .

Sampling error is associated with the natural and expected deviation of the sample from the true population mean. This deviation is susceptible to a mathematical evaluation of the probability of error. Sampling errors for State totals are based on one standard deviation. That is, there is a 68.27-percent probability that the confidence interval given for each sample estimate will cover the true population mean.

The size of the sampling error generally increases as the size of the area examined decreases. Also, as area or volume totals are stratified by forest type, species, diameter class, ownership, or other subunits, the sampling error may increase and be greatest for the smallest divisions. However, there may be instances where a smaller component does not have a proportionately larger sampling error. This can happen when the post-defined strata are more homogeneous than the larger strata, thereby having a smaller variance.

**Table B.1—Sampling error, at one standard error, of the estimates of forest land area, number of trees, aboveground live biomass and all-live volume, Puerto Rico, 2009**

Item	Sample estimate	Confidence interval (+/-)	Sampling error percent
Forest land ( <i>acres</i> )	1,213,205	39,672	3.27
Number of trees ( <i>millions</i> )	145.97	8.25	5.65
Aboveground live biomass ( <i>thousand tons</i> )	45,075.00	5,711.00	12.67
All live volume ( <i>million cubic feet</i> )			
Inventory	1,275.70	101.16	7.93
Net annual growth	34.00	7.22	21.24
Annual mortality	31.63	5.08	16.06
Annual removals	.09	.07	85.34

Sampling errors calculated by the U.S. Department of Agriculture, Forest Service EVALIDator on-line Forest Inventory and Analysis database query tool, version 1.5.1.2a, <http://apps.fs.fed.us/Evalidator/tmattribute.jsp>, accessed on July 20, 2012.



Agricultural activities, like the cultivation of ñame yams, are less common in Puerto Rico's rural landscape than in the past and many such areas have naturally reverted back to forest. (photo by Dr. Humfredo Marcano, Southern Research Station)



For specific post-defined strata the sampling error is available from online retrievals using the U.S. Department of Agriculture Forest Service EVALIDator Online FIA database query tool (Version 1.5.1.2a, <http://apps.fs.fed.us/Evalidator/tmattribute.jsp>) or can be calculated using the following formula:

$$SE_s = SE_t \frac{\sqrt{X_t}}{\sqrt{X_s}}$$

where

$SE_s$  = sampling error for subdivision of Commonwealth total

$SE_t$  = sampling error for Commonwealth total

$X_s$  = sum of values for the variable of interest (area or volume) for subdivision of Commonwealth

$X_t$  = total area or volume for Commonwealth

For example, the sampling error for the estimate of subtropical dry forest acreage, (199,691 acres) would be calculated based on the total forested acreage in Puerto Rico (1,213,205 acres) and its associated sampling error (3.27 percent):

$$SE_s = 3.27 \frac{\sqrt{1,213,205}}{\sqrt{199,691}} = 8.06$$

Thus, the sampling error is 8.06 percent, and the resulting 67-percent confidence interval for subtropical dry forest acreage would be 199,691 acres  $\pm$  16,095 acres.

Sampling errors obtained by this method are only approximations of reliability because this process assumes constant variance across all subdivisions of totals. The resulting errors derived by this approximation method should be considered very liberal, i.e. it usually produces sampling errors much better than those derived by the actual random sampling formula. Users are free to use more conservative variance estimators based on their specific applications.



## Appendix C—Species List

**Table C.1—List of tree species encountered by scientific name, common name, family, and number measured, Puerto Rico, 2009**

Scientific name <sup>a</sup>	Common name	Family	N
<i>Acacia farnesiana</i> (L.) Willd.	Sweet acacia	Fabaceae	45
<i>A. macracantha</i> Humb. & Bonpl. ex Willd.	Porknut	Fabaceae	8
<i>Acrocomia media</i> O.F. Cook	Grugru palm	Arecaceae	1
<i>Adelia ricinella</i> L.	Wild lime	Euphorbiaceae	36
<i>Adenanthera pavonina</i> L.	Red beadtrees	Fabaceae	28
<i>Albizia lebbek</i> (L.) Benth.	Woman's tongue	Fabaceae	2
<i>A. procera</i> (Roxb.) Benth.	Tall albizia	Fabaceae	70
<i>Alchornea latifolia</i> Sw.	Achiotillo	Euphorbiaceae	43
<i>Alsophila portoricensis</i> (Spreng. ex Kuhn) Conant	Puerto Rico alsophila	Cyatheaceae	4
<i>Amyris balsamifera</i> L.	Balsam torchwood	Rutaceae	2
<i>A. elemifera</i> L.	Sea torchwood	Rutaceae	41
<i>Andira inermis</i> (W. Wright) Kunth ex DC.	Cabbagebark tree	Fabaceae	235
<i>Annona muricata</i> L.	Soursop	Annonaceae	10
<i>A. reticulata</i> L.	Custard apple	Annonaceae	6
<i>A. squamosa</i> L.	Sugar apple	Annonaceae	2
<i>Antirhea acutata</i> (DC.) Urb.	Placa chiquitu	Rubiaceae	48
<i>Antirhea obtusifolia</i> Urb.	Quina roja	Rubiaceae	1
<i>Ardisia obovata</i> Desv. ex Ham.	Guadeloupe marlberry	Myrsinaceae	45
<i>Artocarpus altilis</i> (Parkinson) Fosberg	Breadfruit	Moraceae	28
<i>Avicennia germinans</i> (L.) L.	Black mangrove	Verbenaceae	27
<i>Bourreria succulenta</i> Jacq.	Bodywood	Boraginaceae	121
<i>B. virgata</i> (Sw.) G. Don	Roble de guayo	Boraginaceae	2
<i>Buchenavia tetraphylla</i> (Aubl.) Howard	Fourleaf buchenavia	Combretaceae	9
<i>Bucida buceras</i> L.	Gregorywood	Combretaceae	25
<i>Bursera simaruba</i> (L.) Sarg.	Gumbo limbo	Burseraceae	345
<i>Byrsonima crassifolia</i> (L.) Kunth	Maricao cimun	Malpighiaceae	1
<i>B. lucida</i> (Mill.) DC.	Long Key locustberry	Malpighiaceae	20
<i>B. spicata</i> (Cav.) Kunth	doncella	Malpighiaceae	21
<i>B. wadsworthii</i> Little	almendrillo	Malpighiaceae	2
<i>Calophyllum antillanum</i> Britton	Antilles calophyllum	Clusiaceae	50
<i>Calyptanthes pallens</i> Griseb.	Pale lidflower	Myrtaceae	1
<i>Canella winterana</i> (L.) Gaertn.	Wild cinnamon	Canellaceae	10
<i>Capparis baducca</i> L.	Caper	Capparaceae	4
<i>C. cynophallophora</i> L.	Jamaican caper	Capparaceae	11
<i>C. flexuosa</i> (L.) L.	Falseteeth	Capparaceae	5
<i>C. hastata</i> Jacq.	Broadleaf caper	Capparaceae	15
<i>Carapa guianensis</i> Aubl.	Crabwood	Meliaceae	1
<i>Casearia aculeata</i> Jacq.	Rabo de ranton	Flacourtiaceae	4
<i>C. arborea</i> (Rich.) Urb.	Gia verde	Flacourtiaceae	45
<i>C. decandra</i> Jacq.	Wild honeytree	Flacourtiaceae	9
<i>C. guianensis</i> (Aubl.) Urb.	Guyanese wild coffee	Flacourtiaceae	169
<i>C. sylvestris</i> Sw.	Crackopen	Flacourtiaceae	150
<i>Cassine xylocarpa</i> Vent.	Marbletree	Celastraceae	16
<i>Cassipourea guianensis</i> Aubl.	Goatwood	Rhizophoraceae	1
<i>Castilla elastica</i> Sessé	Panama rubber tree	Moraceae	2
<i>Casuarina equisetifolia</i> L.	Beach sheoak	Casuarinaceae	6
<i>Cecropia schreberiana</i> Miq.	Pumpwood	Cecropiaceae	258
<i>Cedrela odorata</i> L.	Spanish cedar	Meliaceae	6
<i>Ceiba pentandra</i> (L.) Gaertn.	Kapoktree	Bombacaceae	2
<i>Cestrum diurnum</i> L.	Day jessamine	Solanaceae	4

continued



**Table C.1—List of tree species encountered by scientific name, common name, family, and number measured, Puerto Rico, 2009 (continued)**

Scientific name <sup>a</sup>	Common name	Family	N
<i>Cestrum laurifolium</i> L'Hér.	Galen del monte	Solanaceae	3
<i>Chionanthus domingensis</i> Lam.	White rosewood	Oleaceae	4
<i>Chrysobalanus icaco</i> L.	Coco plum	Chrysobalanaceae	11
<i>Chrysophyllum argenteum</i> Jacq.	Bastard redwood	Sapotaceae	3
<i>Chrysophyllum cainito</i> L.	Star apple	Sapotaceae	3
<i>Chrysophyllum pauciflorum</i> Lam.	Camito de perro	Sapotaceae	5
<i>Cinnamomum elongatum</i> (Vahl ex Nees) Kosterm.	Laurel avispillo	Lauraceae	39
<i>Cinnamomum montanum</i> (Sw.) Bercht. & J. Presl	Avispillo	Lauraceae	3
<i>Citharexylum caudatum</i> L.	Juniper berry	Verbenaceae	2
<i>Citrus xlimon</i> (L.) Burm. f. (pro sp.) [medica x aurantifolia]	Lemon	Rutaceae	2
<i>Citrus xparadisi</i> Macfad. (pro sp.) [maxima x sinensis]	Grapefruit	Rutaceae	1
<i>Citrus xsinensis</i> (L.) Osbeck (pro sp.) [maxima x reticulata]	Sweet orange	Rutaceae	36
<i>Clusia clusioides</i> (Griseb.) D'Arcy	Cupeillo	Clusiaceae	3
<i>Clusia rosea</i> Jacq.	Scotch attorney	Clusiaceae	34
<i>Coccoloba diversifolia</i> Jacq.	Tietongue	Polygonaceae	48
<i>Coccoloba krugii</i> Lindau	Whitewood	Polygonaceae	15
<i>Coccoloba microstachya</i> Willd.	Puckhout	Polygonaceae	189
<i>Coccoloba pubescens</i> L.	Grandleaf seagrape	Polygonaceae	1
<i>Coccoloba rugosa</i> Desf.	Ortegon	Polygonaceae	12
<i>Coccoloba sintenisii</i> Urb. ex Lindau	Uvero de monte	Polygonaceae	1
<i>Coccoloba uvifera</i> (L.) L.	Seagrape	Polygonaceae	2
<i>Coccoloba venosa</i> L.	False chiggergrape	Polygonaceae	8
<i>Coccothrinax barbadensis</i> (Lodd. ex Mart.) Becc.	Puerto Rico silver palm	Arecaceae	7
<i>Cochlospermum vitifolium</i> (Willd.) Willd. ex Spreng.	Silk cottontree	Bixaceae	2
<i>Cocos nucifera</i> L.	Coconut palm	Arecaceae	17
<i>Coffea arabica</i> L.	Arabian coffee	Rubiaceae	36
<i>Coffea liberica</i> W. Bull ex Hiern.	Liberian coffee	Rubiaceae	31
<i>Cojoba arborea</i> (L.) Britton & Rose	Wild tamarind	Fabaceae	2
<i>Colubrina arborescens</i> (Mill.) Sarg.	Greenheart	Rhamnaceae	4
<i>Comocladia dodonaea</i> (L.) Urb.	Poison ash	Anacardiaceae	9
<i>C. glabra</i> (Schult.) Spreng.	Carrasco	Anacardiaceae	1
<i>Conocarpus erectus</i> L.	Button mangrove	Combretaceae	5
<i>Cordia alliodora</i> (Ruiz & Pav.) Oken	Spanish elm	Boraginaceae	51
<i>C. borinquensis</i> Urb.	Muneco	Boraginaceae	7
<i>C. collococca</i> L.	Red manjack	Boraginaceae	1
<i>C. rickseckeri</i> Millsp.	San Bartolome	Boraginaceae	1
<i>C. sebestena</i> L.	Largeleaf geigertree	Boraginaceae	2
<i>C. sulcata</i> DC.	Mucilage manjack	Boraginaceae	54
<i>Crescentia cujete</i> L.	Common calabash tree	Bignoniaceae	1
<i>Crossopetalum rhacoma</i> Crantz	Maidenberry	Celastraceae	13
<i>Croton astroites</i> Dryand.	Wild marrow	Euphorbiaceae	12
<i>C. flavens</i> L.	Yellow balsam	Euphorbiaceae	4
<i>C. poecilanthus</i> Urb.	Sabinon	Euphorbiaceae	6
<i>Cupania americana</i> L.	Wild ackee	Sapindaceae	30
<i>C. triquetra</i> A. Rich.	Guara blanca	Sapindaceae	2
<i>Cyathea arborea</i> (L.) Sm.	West Indian treefern	Cyatheaceae	31
<i>C. tenera</i> (J. Sm. ex Hook.) T. Moore	Helecho gigante	Cyatheaceae	1
<i>Cyrilla racemiflora</i> L.	Swamp titi	Cyrtillaceae	1
<i>Dacryodes excelsa</i> Vahl	Candletree	Burseraceae	17
<i>Daphnopsis americana</i> (Mill.) J.R. Johnst.	Burn nose	Thymelaeaceae	6

continued



## Appendix C—Species List

**Table C.1—List of tree species encountered by scientific name, common name, family, and number measured, Puerto Rico, 2009 (continued)**

Scientific name <sup>a</sup>	Common name	Family	N
<i>Daphnopsis philippiana</i> Krug & Urb.	Emajagua de sierra	Thymelaeaceae	1
<i>Delonix regia</i> (Bojer ex Hook.) Raf.	Royal poinciana	Fabaceae	9
<i>Dendropanax arboreus</i> (L.) Decne. & Planch. ex Britton	Angelica tree	Araliaceae	67
<i>Dittha myricoides</i> Griseb.	Jaboncillo	Euphorbiaceae	2
<i>Dracaena fragrans</i> (L.) Ker Gawl.	Fragrant dracaena	Agavaceae	1
<i>Drypetes glauca</i> Vahl	Varital	Euphorbiaceae	1
<i>Erithalis fruticosa</i> L.	Blacktorch	Rubiaceae	2
<i>Erythrina berteriana</i> Urb.	Machete	Fabaceae	11
<i>E. poeppigiana</i> (Walp.) O.F. Cook	Mountain immortelle	Fabaceae	26
<i>Erythroxylum areolatum</i> L.	Swamp-redwood	Erythroxylaceae	4
<i>E. rotundifolium</i> Lunan	Ratwood	Erythroxylaceae	47
<i>E. rufum</i> Cav.	Rufous false cocaine	Erythroxylaceae	1
<i>Eucalyptus robusta</i> Sm.	Swampmahogany	Myrtaceae	47
<i>Eugenia biflora</i> (L.) DC.	Blackrodwood	Myrtaceae	34
<i>E. borinquensis</i> Britton	Guayabota de sierra	Myrtaceae	5
<i>E. confusa</i> DC.	Redberry stopper	Myrtaceae	4
<i>E. ligustrina</i> (Sw.) Willd.	Privet stopper	Myrtaceae	9
<i>E. monticola</i> (Sw.) DC.	Birdcherry	Myrtaceae	77
<i>E. pseudopsidium</i> Jacq.	Christmas cherry	Myrtaceae	10
<i>E. rhombea</i> (Berg) Krug & Urb.	Red stopper	Myrtaceae	16
<i>E. stahlii</i> (Kiaersk.) Krug & Urb.	Stahl's stopper	Myrtaceae	3
<i>E. xerophytica</i> Britton	Aridland stopper	Myrtaceae	4
<i>Euphorbia petiolaris</i> Sims	Manchineel berry	Euphorbiaceae	13
<i>Exostema caribaeum</i> (Jacq.) Schult.	Caribbean princewood	Rubiaceae	25
<i>Exothea paniculata</i> (Juss.) Radlk.	Butterbough	Sapindaceae	6
<i>Faramea occidentalis</i> (L.) A. Rich.	False coffee	Rubiaceae	5
<i>Ficus americana</i> Aubl.	Jamaican cherry fig	Moraceae	1
<i>F. citrifolia</i> Mill.	Wild banyantree	Moraceae	19
<i>F. trigonata</i> L.	Jaguey blanco	Moraceae	2
<i>Gliricidia sepium</i> (Jacq.) Kunth ex Walp.	Quickstick	Fabaceae	10
<i>Guaiaacum officinale</i> L.	Lignum-vitae	Zygophyllaceae	5
<i>Guapira fragrans</i> (Dum. Cours.) Little	Black mampoo	Nyctaginaceae	114
<i>G. obtusata</i> (Jacq.) Little	Corcho prieto	Nyctaginaceae	2
<i>Guarea glabra</i> Vahl	Alligatorwood	Meliaceae	5
<i>G. guidonia</i> (L.) Sleumer	American muskwood	Meliaceae	471
<i>Guatteria caribaea</i> Urb.	Haya blanca	Annonaceae	1
<i>Guazuma ulmifolia</i> Lam.	Bastardcedar	Sterculiaceae	45
<i>Guettarda elliptica</i> Sw.	Hammock velvetseed	Rubiaceae	7
<i>G. ovalifolia</i> Urb.	Cucubano	Rubiaceae	1
<i>G. pungens</i> Urb.	Roseta	Rubiaceae	13
<i>G. scabra</i> (L.) Vent.	Wild guave	Rubiaceae	85
<i>Gyminda latifolia</i> (Sw.) Urb.	West Indian false box	Celastraceae	10
<i>Gymnanthes lucida</i> Sw.	Oysterwood	Euphorbiaceae	34
<i>Henriettea macfadyenii</i> (Triana) Alain	MacFadyen's camasey	Melastomataceae	6
<i>H. squamulosum</i> (Cogn.) W.S. Judd	Jusillo	Melastomataceae	12
<i>Hernandia sonora</i> L.	Mago	Hernandiaceae	1
<i>Hibiscus elatus</i> Sw.	Mahoe	Malvaceae	2
<i>H. rosa-sinensis</i> L.	Shoebblackplant	Malvaceae	1
<i>Hirtella rugosa</i> Thuill. ex Pers.	Teta de burra cinarron	Chrysobalanaceae	2
<i>Homalium racemosum</i> Jacq.	White cogwood	Flacourtiaceae	18

*continued*





**Table C.1—List of tree species encountered by scientific name, common name, family, and number measured, Puerto Rico, 2009 (continued)**

Scientific name <sup>a</sup>	Common name	Family	N
<i>Hymenaea courbaril</i> L.	Stinkingtoe	Fabaceae	28
<i>Hypelate trifoliata</i> Sw.	Inkwood	Sapindaceae	2
<i>Ilex nitida</i> (Vahl) Maxim.	Puerto Rico holly	Aquifoliaceae	2
<i>Inga laurina</i> (Sw.) Willd.	Sacky sac bean	Fabaceae	83
<i>I. nobilis</i> Willd. ssp. <i>quaternata</i> (Poepp. & Endl.) T.D. Penn.	Guama venezolano	Fabaceae	1
<i>I. vera</i> Willd.	River koko	Fabaceae	136
<i>Ixora ferrea</i> (Jacq.) Benth.	Palo de hierro	Rubiaceae	2
<i>Krugiodendron ferreum</i> (Vahl) Urb.	Leadwood	Rhamnaceae	37
<i>Laguncularia racemosa</i> (L.) C.F. Gaertn.	White mangrove	Combretaceae	10
<i>Lawsonia inermis</i> L.	Henna	Lythraceae	3
<i>Leandra krugiana</i> (Cogn.) W.S. Judd & Skee	Krug's roughleaf	Melastomataceae	1
<i>Leucaena leucocephala</i> (Lam.) de Wit	White leadtree	Fabaceae	262
<i>Licaria parvifolia</i> (Lam.) Kosterm.	Puerto Rico cinnamon	Lauraceae	10
<i>Lonchocarpus domingensis</i> (Turp. ex Pers.) DC.	Geno geno	Fabaceae	2
<i>L. glaucifolius</i> Urb.	Geno	Fabaceae	1
<i>Magnolia portoricensis</i> Bello	Puerto Rico magnolia	Magnoliaceae	4
<i>M. splendens</i> Urb.	Laurel magnolia	Magnoliaceae	1
<i>Mammea americana</i> L.	Mammee apple	Clusiaceae	4
<i>Mangifera indica</i> L.	Mango	Anacardiaceae	77
<i>Manilkara bidentata</i> (A. DC.) A. Chev	Bulletwood	Sapotaceae	2
<i>Margaritaria nobilis</i> L. f.	Bastard hogberry	Euphorbiaceae	4
<i>Matayba domingensis</i> (DC.) Radlk.	Negra lora	Sapindaceae	6
<i>Maytenus ponceana</i> Britton	Ponce mayten	Celastraceae	1
<i>Melicoccus bijugatus</i> Jacq.	Spanish lime	Sapindaceae	21
<i>Meliosma herbertii</i> Rolfe	Aguacatillo	Sabiaceae	7
<i>Metopium toxiferum</i> (L.) Krug & Urb.	Florida poisontree	Anacardiaceae	46
<i>Miconia impetolaris</i> (Sw.) D. Don ex DC.	Camasey de costilla	Melastomataceae	7
<i>M. laevigata</i> (L.) D. Don	Smooth johnnyberry	Melastomataceae	16
<i>M. prasina</i> (Sw.) DC.	Granadillo bobo	Melastomataceae	63
<i>M. pycnoneura</i> Urb.	Ridge johnnyberry	Melastomataceae	2
<i>M. racemosa</i> (Aubl.) DC.	Camasey felpa	Melastomataceae	4
<i>M. serrulata</i> (DC.) Naud.	Jau jau	Melastomataceae	2
<i>M. tetrandra</i> (Sw.) D. Don	Rajador	Melastomataceae	11
<i>Micropholis garciniifolia</i> Pierre	Caimitillo verde	Sapotaceae	19
<i>M. guyanensis</i> (A. DC.) Pierre	Wild balata	Sapotaceae	42
<i>Myrcia citrifolia</i> (Aubl.) Urb.	Red rodwood	Myrtaceae	9
<i>M. deflexa</i> (Poir.) DC.	Cieneguillo	Myrtaceae	4
<i>M. fallax</i> (Rich.) DC.	Curame	Myrtaceae	2
<i>M. leptoclada</i> DC.	Guayabacon	Myrtaceae	1
<i>M. splendens</i> (Sw.) DC.	Punchberry	Myrtaceae	50
<i>Myrcianthes fragrans</i> (Sw.) McVaugh	Twinberry	Myrtaceae	25
<i>Myrciaria floribunda</i> (West ex Willd.) Berg	Guavaberry	Myrtaceae	5
<i>Myrsine coriacea</i> (Sw.) R. Br. ex Roem. & Schult.	Leathery colicwood	Myrsinaceae	18
<i>M. cubana</i> A. DC.	Guianese colicwood	Myrsinaceae	6
<i>Nectandra coriacea</i> (Sw.) Griseb.	Lancewood	Lauraceae	18
<i>N. hihua</i> (Ruiz & Pav.) Rohwer	Shinglewood	Lauraceae	1
<i>N. turbacensis</i> (Kunth) Nees	Laurel amarillo	Lauraceae	3
<i>Neea buxifolia</i> (Hook. f.) Heimerl	Saltwood	Nyctaginaceae	1
<i>Neolaugeria resinosa</i> (Vahl) Nicolson	Aquilon	Rubiaceae	46
<i>Ocotea floribunda</i> (Sw.) Mez	Laurel espada	Lauraceae	7

continued



## Appendix C—Species List

**Table C.1—List of tree species encountered by scientific name, common name, family, and number measured, Puerto Rico, 2009 (continued)**

Scientific name <sup>a</sup>	Common name	Family	N
<i>Ocotea leucoxylo</i> (Sw.) De Laness.	Loblolly sweetwood	Lauraceae	100
<i>O. moschata</i> (Pav. ex Meisn.) Mez	Nemoca	Lauraceae	2
<i>O. spathulata</i> Mez	Nemoca cimarrona	Lauraceae	1
<i>O. wrightii</i> (Meisn.) Mez	Wright's laurel canelon	Lauraceae	1
<i>Ormosia krugii</i> Urb.	Peronia	Fabaceae	19
<i>Ouratea littoralis</i> Urb.	Abey amarillo	Ochnaceae	14
<i>O. striata</i> (v. Tiegh.) Urb.	Guanabanilla	Ochnaceae	1
<i>Palicourea crocea</i> (Sw.) Schult.	Red cappel	Rubiaceae	1
<i>Parathesis crenulata</i> (Vent.) Hook. f.	Scratchthroat	Myrsinaceae	1
<i>Peltophorum pterocarpum</i> (DC.) Backer ex K. Heyne	Peltophorum	Fabaceae	6
<i>Persea americana</i> Mill.	Avocado	Lauraceae	25
<i>Petitia domingensis</i> Jacq.	Bastard stopper	Verbenaceae	15
<i>Picramnia pentandra</i> Sw.	Florida bitterbush	Simaroubaceae	2
<i>Pictetia aculeata</i> (Vahl) Urb.	Fustic	Fabaceae	29
<i>Pilosocereus royenii</i> (L.) Byles & Rowley	Royen's tree cactus	Cactaceae	11
<i>Pimenta racemosa</i> (Mill.) J.W. Moore	Bayrumtree	Myrtaceae	10
<i>Pinus caribaea</i> Morelet	Caribbean pine	Pinaceae	6
<i>Piper aduncum</i> L.	Higuillo de hoja menuda	Piperaceae	4
<i>P. amalago</i> L.	Higuillo de limon	Piperaceae	8
<i>Piscidia carthagenensis</i> Jacq.	Stinkwood	Fabaceae	10
<i>Pisonia albida</i> (Heimerl) Britton ex Standl.	Corcho bobo	Nyctaginaceae	8
<i>P. subcordata</i> Sw.	Water mampoo	Nyctaginaceae	18
<i>Pithecellobium dulce</i> (Roxb.) Benth.	Monkeypod	Fabaceae	14
<i>P. unguis-cati</i> (L.) Benth.	Catclaw blackbead	Fabaceae	28
<i>Plumeria alba</i> L.	Nosegaytree	Apocynaceae	3
<i>P. obtusa</i> L.	Singapore graveyard flower	Apocynaceae	34
<i>Podocarpus coriaceus</i> Rich.	Yucca plum pine	Podocarpaceae	6
<i>Poitea florida</i> (Vahl) Lavin	Wattapama	Fabaceae	24
<i>Pouteria multiflora</i> (A. DC.) Eyma	Bullytree	Sapotaceae	8
<i>P. sapota</i> (Jacq.) H.E. Moore & Stearn	Mammee sapote	Sapotaceae	2
<i>Prestoea acuminata</i> (Willd.) H.E. Moore var. <i>montana</i> (Graham) A. Hend. & G. Galeano	Sierran palm	Arecaceae	218
<i>Prosopis pallida</i> (Humb. & Bonpl. ex Willd.) Kunth	Kiawe	Fabaceae	157
<i>Prunus occidentalis</i> Sw.	Western cherry laurel	Rosaceae	3
<i>Pseudolmedia spuria</i> (Sw.) Griseb.	False breadnut	Moraceae	8
<i>Psidium guajava</i> L.	Guava	Myrtaceae	29
<i>Psychotria berteriana</i> DC.	Cachimbo-cumun	Rubiaceae	10
<i>Psychotria brachiata</i> Sw.	Palo de cachimbo	Rubiaceae	2
<i>Quararibea turbinata</i> (Sw.) Poir.	Swizzlestick tree	Bombacaceae	9
<i>Randia aculeata</i> L.	White indigoberry	Rubiaceae	35
<i>Rauvolfia nitida</i> Jacq.	Palo amargo	Apocynaceae	2
<i>Reynosia uncinata</i> Urb.	Sloe	Rhamnaceae	66
<i>Rhizophora mangle</i> L.	Red mangrove	Rhizophoraceae	7
<i>Rochefortia acanthophora</i> (DC.) Griseb.	Greenheart ebony	Boraginaceae	4
<i>Rondeletia inermis</i> (Spreng.) Krug & Urb.	Cordobancillo	Rubiaceae	8
<i>R. pilosa</i> Sw.	Cordobancillo peludo	Rubiaceae	1
<i>Roystonea borinquena</i> O.F. Cook	Puerto Rico royal palm	Arecaceae	38
<i>Samanea saman</i> (Jacq.) Merr.	Raintree	Fabaceae	11
<i>Sapium laurocerasus</i> Desf.	Milktree	Euphorbiaceae	5
<i>Savia sessiliflora</i> (Sw.) Willd.	Amansa guapo	Euphorbiaceae	8

*continued*



**Table C.1—List of tree species encountered by scientific name, common name, family, and number measured, Puerto Rico, 2009 (continued)**

Scientific name <sup>a</sup>	Common name	Family	N
<i>Schaefferia frutescens</i> Jacq.	Florida boxwood	Celastraceae	7
<i>Schefflera morototonii</i> (Aubl.) Maguire, Steyerf. & Frodin	Matchwood	Araliaceae	97
<i>Schoepfia obovata</i> C. Wright	White beefwood	Olacaceae	1
<i>Senna siamea</i> (Lam.) Irwin & Barneby	Siamese cassia	Fabaceae	21
<i>Senna spectabilis</i> (DC.) Irwin & Barneby	Casia amarilla	Fabaceae	1
<i>Sideroxylon cubense</i> (Griseb.) T.D. Penn.	Espejuelo	Sapotaceae	4
<i>S. foetidissimum</i> Jacq.	False mastic	Sapotaceae	2
<i>S. obovatum</i> Lam.	Breakbill	Sapotaceae	1
<i>S. salicifolium</i> (L.) Lam.	White bully	Sapotaceae	11
<i>Sloanea amygdalina</i> Griseb.	Motillo	Elaeocarpaceae	1
<i>S. berteriana</i> Choisy ex DC.	Bullwood	Elaeocarpaceae	15
<i>Solanum bahamense</i> L. var. <i>bahamense</i>	Bahama nightshade	Solanaceae	1
<i>S. rugosum</i> Dunal	Tabacon aspero	Solanaceae	4
<i>Spathodea campanulata</i> P. Beauv.	African tuliptree	Bignoniaceae	885
<i>Spondias mombin</i> L.	Yellow mombin	Anacardiaceae	20
<i>S. purpurea</i> L.	Purple mombin	Anacardiaceae	1
<i>Sterculia apetala</i> (Jacq.) Karst.	Panama tree	Sterculiaceae	1
<i>Swietenia macrophylla</i> King	Honduras mahogany	Meliaceae	8
<i>S. mahagoni</i> (L.) Jacq.	West Indian mahogany	Meliaceae	27
<i>Symplocos martinicensis</i> Jacq.	Martinique sweetleaf	Symplocaceae	3
<i>Syzygium jambos</i> (L.) Alston	Malabar plum	Myrtaceae	184
<i>Tabebuia haemantha</i> (Bertol. ex Spreng.) DC.	Roble cimarron	Bignoniaceae	36
<i>T. heterophylla</i> (DC.) Britton	White cedar	Bignoniaceae	321
<i>Tabebuia rigida</i> Urb.	Roble de sierra	Bignoniaceae	1
<i>T. schumanniana</i> Urb.	Roble colorado	Bignoniaceae	1
<i>Tabernaemontana citrifolia</i> L.	Milkwood	Apocynaceae	1
<i>Tamarindus indica</i> L.	Tamarind	Fabaceae	1
<i>Terminalia catappa</i> L.	Tropical almond	Combretaceae	21
<i>Tetragastris balsamifera</i> (Sw.) Oken	Masa	Burseraceae	33
<i>Tetrazygia elaeagnoides</i> (Sw.) DC.	Krekre	Melastomataceae	34
<i>Thespesia grandiflora</i> DC.	Maga	Malvaceae	18
<i>T. populnea</i> (L.) Sol. ex Corrêa	Portia tree	Malvaceae	2
<i>Thouinia striata</i> Radlk.	Ceboruquillo	Sapindaceae	37
<i>T. striata</i> Radlk. var. <i>portoricensis</i> (Radlk.) Votava & Alain	Puerto Rico ceboruquillo	Sapindaceae	18
<i>Trema micrantha</i> (L.) Blume	Jamaican nettletree	Ulmaceae	15
<i>Trichilia hirta</i> L.	Broomstick	Meliaceae	22
<i>T. pallida</i> Sw.	Gaita	Meliaceae	24
<i>Triplaris cumingiana</i> Fisch. & C.A. Mey. ex C.A. Mey.	Ant tree	Polygonaceae	1
<i>Turpinia occidentalis</i> (Sw.) G. Don	Muttonwood	Staphyleaceae	14
<i>Urera baccifera</i> (L.) Gaudich.	Scratchbush	Urticaceae	4
<i>Vitex divaricata</i> Sw.	Higuerillo	Verbenaceae	4
<i>Xylosma pachyphylla</i> (Krug & Urb.) Urb.	Spiny logwood	Flacourtiaceae	1
<i>Zanthoxylum caribaeum</i> Lam.	Prickly yellow	Rutaceae	1
<i>Z. flavum</i> Vahl	West Indian satinwood	Rutaceae	2
<i>Z. martinicense</i> (Lam.) DC.	White pricklyash	Rutaceae	71
<i>Z. monophyllum</i> (Lam.) P. Wilson	Yellow prickle	Rutaceae	38
<i>Ziziphus mauritiana</i> Lam.	Indian jujube	Rhamnaceae	9
<i>Z. reticulata</i> (Vahl) DC.	Cacao rojo	Rhamnaceae	1
<i>Z. taylorii</i> (Britton) M.C. Johnst.	Taylor's jujube	Rhamnaceae	6

N = number measured.

<sup>a</sup> Nomenclature based on USDA NRCS PLANTS 2010 database.







**Brandeis, Thomas J.; Turner, Jeffery A.** 2013. Puerto Rico's forests, 2009. Resour. Bull. SRS-191. Asheville, NC. U.S. Department of Agriculture Forest Service, Southern Research Station. 85 p.

This report presents the results of the fourth forest inventory of the islands of the Commonwealth of Puerto Rico. Forest area on mainland Puerto Rico held steady, or increased slightly, from 2004 to 2009. This change would seem to indicate that the rate of forest cover increase on mainland Puerto Rico has slowed since the forest inventory began in 1980. But the sampling errors are sufficiently large to encompass these small changes in forest cover, making it best to state that forest cover remained relatively stable from 2004 to 2009. There are 1.28 billion cubic feet of merchantable wood in Puerto Rico's forests, 86 percent of which is on unreserved, private lands. There are 54.0 million tons of above and belowground live tree biomass, which converts to about 27.0 million tons of carbon. Puerto Rico's forest trees grew by 65.6 million cubic feet each year but lost 31.6 million cubic feet per year to natural mortality and another 85,028 cubic feet to removals from harvesting and land clearance, for a net annual gain of 34.0 million cubic feet on average from 2004 to 2009. A total of 298 species were encountered on the forest inventory plots measured from 2006 to 2009. The most important species have not changed much since the previous inventory.

**Keywords:** Caribbean, FIA, forest growth, forest inventory, Puerto Rico, secondary forest, tree mortality, tropical forest.



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Nonindigenous Cuban tree frogs (*Osteopilus septentrionalis*) are now found in the forests of Puerto Rico where they interact with the native amphibians. (photo by Dr. Humfredo Marcano, Southern Research Station)



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Puerto Rico's Forests, 2009

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