USDA United States Department of Agriculture

U.S. Virgin Islands, 2009

Thomas J. Brandeis and Jeffery A. Turner

FOREST INVENTORY & ANALYSIS FACTSHEET

Issue—September 2013

Spanish lady (*Opuntia triacantha*) on Buck Island, St. Croix, U.S. Virgin Islands. (photo courtesy of Dan Clark, USDI National Park, Bugwood.org)

Forest Land Area

Forest area on the USVI decreased by 3.0 percent (46,564 to 45,163) from 2004 to 2009 (table 1). That represents a total percentage of change in forest cover from 56.7 percent in 2004 to 55.0 percent in 2009. The sampling errors are relatively high, however, in measuring 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 percentage of the USVI's total forest cover in 1994 (5.1 percent), 2004 (8.3 percent), and 2009 (9.4 percent). There were 26,179 acres of forest on St. Croix (49.6 percent of the land area), 10,343 acres of forest on St. John (85.5 percent of the land area), and 8,641 acres of forest on St. Thomas (50.1 percent of the land area) (table 1). The high percentage of forest cover on St. John reflects the presence of Virgin Islands National Park.

Table 1—Area by survey unit and land status, U.S. Virgin Islands, 2009

Survey unit	Total area	All forest	Unreserved	Reserved	Nonforest land	Total land area	Percent forest
			acres				
St. Croix	52,819	26,179	25,189	990	26,639	52,819	49.56
St. John	12,096	10,343	2,800	7,542	1,753	12,096	85.51
St. Thomas	17,249	8,641	8,641	0	8,608	17,249	50.10
All survey units	82,164	45,163	36,630	8,533	37,001	82,164	54.97

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

The U.S. Virgin Islands' Second Forest Inventory

The second forest inventory of the three main islands of the U.S. Virgin Islands (USVI) was completed in 2009 by the U.S. Department of Agriculture Forest Service's Southern Research Station, Forest Inventory and Analysis (FIA) program, and by the International Institute of Tropical Forestry, in collaboration with the Virgin Islands Department of Agriculture. Objectives of this inventory were to:

- Estimate the status of and change in forest land on the islands of St. Croix, St. John, and St. Thomas.
- Estimate the number of trees, their size distributions, their quantity of merchantable wood, and the amount of carbon stored in their biomass.
- Assess and monitor stand-age class structure to see how forests are recovering from past land clearance, recent hurricanes, and continuing human pressures.
- Estimate net tree growth, removals, and mortality.
- Contribute to a broader understanding of the species composition, regeneration trends, successional processes, and dynamics.
- Assess tree health by looking for damage resulting from pests and pathogens, breakage by hurricanes, or other factors that might cause loss of tree vigor.

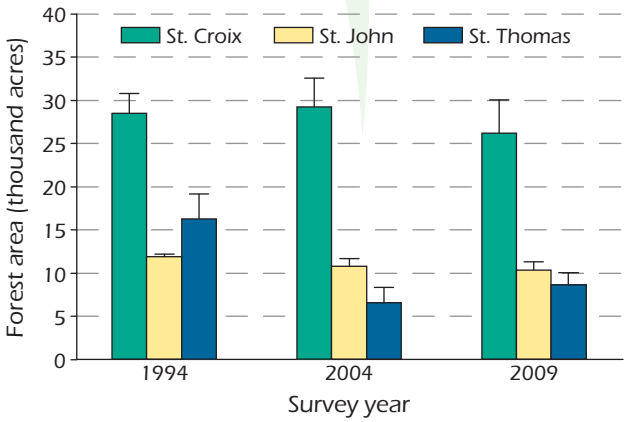

Figure 1—Forest area of the U.S. Virgin Islands for the 1994 aerial photograph estimation, and the 2004 and 2009 forest inventories. Error bars represent one standard deviation. (No data from 1995 to 2004.)

Forest Stand Structure

Forest stands are classified according to the predominant diameter class of live trees present. For the subtropical hardwood forests of the USVI, large-diameter stands are those with trees predominately ≥11.0 inches diameter at breast height (d.b.h.). Medium-diameter stands have trees that are mostly 5 to <11.0 inches d.b.h., and small-diameter stands were made up of trees <5.0 inches d.b.h. As shown in figure 2, forests of the USVI consist mostly of small-diameter stands.

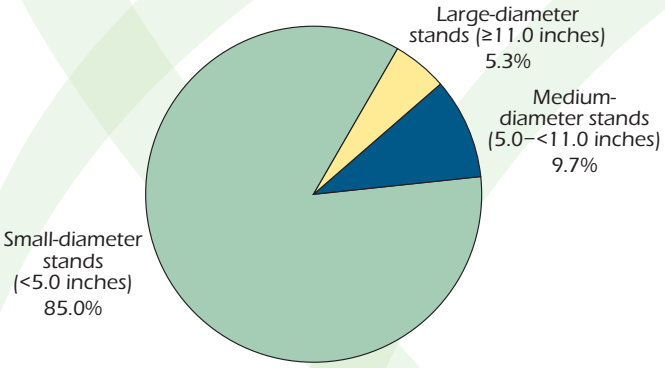

Figure 2—Stand-size class distribution, U.S. Virgin Islands, 2009.

Biomass, Carbon, and Volume

We estimate there to be 85.1 million trees with a d.b.h. ≥1.0 inch in the USVI, containing 1.2 million tons of aboveground woody biomass (table 2). If the belowground portion of the tree, which was estimated to be between 20 and 21 percent of the aboveground biomass, is taken into account, total live tree dry biomass increases to 1.5 million tons, or 737,000 tons of carbon stored in the trees of the USVI (table 2). On average, an acre of subtropical moist forest holds more biomass (41.6 tons vs. 27.6 tons, fig. 3) and carbon (17.2 tons vs. 11.4 tons) than does an acre of subtropical dry forest. Dry and moist forest types presented here correspond to subtropical dry and moist forest life zones described in Holdridge (1967).

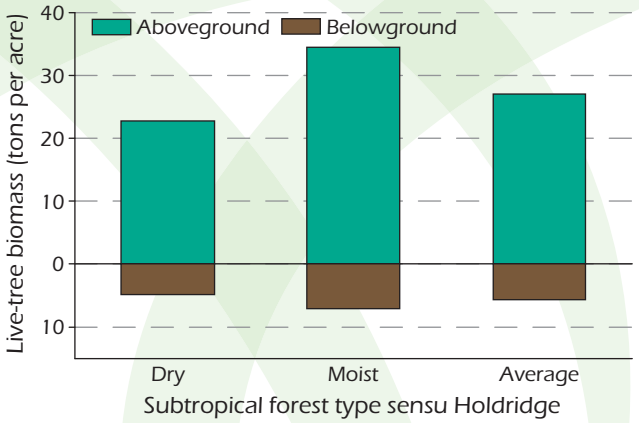

Figure 3—Above- and belowground live-tree biomass by forest type, U.S. Virgin Islands, 2009.

A portion of this woody biomass can be used for wood products. We estimated a total of 14.5 million cubic feet of merchantable wood (table 3). More than one-half (58 percent) of the available merchantable volume is found in trees with a d.b.h. <11.0 inches, typically viewed as the minimum diameter for a tree to be considered for use as sawtimber. The remaining volume is found in larger diameter trees that could be turned into sawn wood products, assuming they are a commercially valuable species of acceptable quality.

Table 2—Above- and belowground dry weight and carbon of live trees on forest land by survey unit and forest type, U.S. Virgin Islands, 2009

Survey unit and forest type	Total		Biomass	
	Carbon	Biomass	Above-ground	Below-ground
	thousand tons			
St. Croix				
Dry forest	241.4	482.7	398.1	84.7
Moist forest	87.9	175.8	145.9	29.9
All forest types	329.3	658.5	544.0	114.5
St. John				
Dry forest	120.0	240.0	198.4	41.6
Moist forest	146.3	292.5	242.7	49.8
All forest types	266.3	532.5	441.1	91.4
St. Thomas				
Dry forest	37.4	74.8	62.1	12.7
Moist forest	104.2	208.4	171.8	36.6
All forest types	141.6	283.2	233.9	49.4
Total	737.0	1,474.0	1,218.9	255.0

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

Table 3—Total volume, average annual net growth, mortality, and removals of live trees on forest land by forest type, U.S. Virgin Islands, 2009 (2004–09)

Forest type	Total volume	Net growth	Mortality	Removals
	cubic feet			
Dry forest	7,094,358	481,382	50,031	16,264
Moist forest	7,453,950	454,269	105,190	24,300
Total hardwoods	14,548,308	935,651	155,221	40,564
All forest types	14,548,308	935,651	155,221	40,564

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

Net Growth, Removals, and Mortality

The inventory plots installed in 2004 (the first plot-based forest inventory) were remeasured starting in 2009 (the second forest inventory). Remeasuring the trees on the same plots allows the estimation of net annual growth on all-live trees, average annual mortality, and average annual net removals. Mortality refers to trees that died from natural causes and remained in the forest. Removed trees are 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 a nonforest land use such as development or agriculture. Removed trees are not included in the mortality estimates, and vice versa. Net growth, removals, and mortality are presented in table 3. The USVI forest trees grew by 1.1 million cubic feet each year (the sum of net growth and mortality) but lost 155,221 cubic feet per year to natural mortality and another 40,564 cubic feet to removals, for a net annual gain of 935,651 cubic feet on average (table 3). This represents a net total gain of 4.7 million cubic feet of wood volume over the entire 5-year period. In total, 202,820 cubic feet of wood were removed from the forests by cutting or land clearing over that same 5-year period. Figure 4 shows annual net growth, mortality, and removals on a per-acre basis for subtropical dry and moist forests and on average for both forest types.

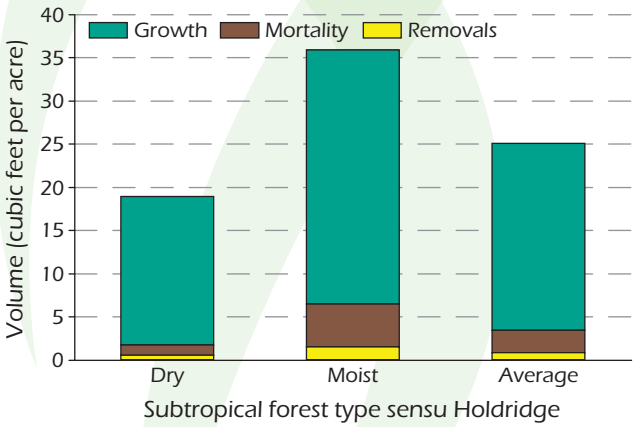

Figure 4—Annual net growth, mortality, and removals by forested life zone, U.S. Virgin Islands, 2004–09. Note that the removals estimates are very small relative to mortality.

Forest Stand Structure and Tree Species Composition

In total 118 species were encountered on the forest inventory plots measured in 2009. We characterize the importance of each tree species relative to other species by calculating the sum of its relative density (percentage of the total number of stems measured that belong to that species), relative dominance (percentage of the total measured basal area that belongs to that species), and relative frequency (percentage of plots containing that species) for all of the USVI. Tables 4 and 5 respectively list the 20 most important species in the forest overstory (here defined as trees with d.b.h. ≥5.0 inches) and the midstory, or sapling class (trees with d.b.h. <5.0 inches but ≥1.0 inch).

Interestingly, *Swietenia mahagoni*, the West Indian mahogany, replaced *Guapira fragrans*, black mampoo, as the tree with the highest importance value (table 4). Otherwise, the most important species have not changed much since the previous inventory (Brandeis and Oswalt 2007). We continue to see the prevalence of smaller (1.0 to 4.9 inches) white leadtrees, tan-tan, (*Leucaena leucocephala*) in both the subtropical dry and moist forests (table 5).

Table 4—Twenty tree species with d.b.h. ≥5.0 inches and greatest importance value (average of relative density, relative dominance, and relative frequency), U.S. Virgin Islands, 2009

Scientific name	Common name	Importance value
Swietenia mahagoni (L.) Jacq.	West Indian mahogany, small leaf mahogany, mahogany	23.17
Guapira fragrans (Dum. Cours.) Little	Mampoo, black mampoo	14.48
Bursera simaruba (L.) Sarg.	Gumbo limbo, turpentine tree, tourist tree	8.55
Bourreria succulenta Jacq.	Pigeon berry, bodywood	8.04
Melicoccus bijugatus Jacq.	Kenip, genip, ginep, Spanish lime	4.90
Pisonia subcordata Sw.	Water mampoo	3.88
Acacia muricata (L.) Willd.	Amaret, wild tamarind, spineless acacia, spineless wattle	3.58
Tabebuia heterophylla (DC.) Britton	Pink or white cedar, pink poui	3.08
Maytenus laevigata (Vahl) Griseb. ex Eggers	White cinnamon	2.63
Chrysophyllum pauciflorum Lam.	Palmet, wild mesple, camito de perro	2.51
Acacia farnesiana (L.) Willd.	Casha, kasha, sweet acacia	1.90
Cordia alliodora (Ruiz & Pav.) Oken	Manjack, copper, capa, onion cordia, Spanish elm	1.52
Andira inermis (W. Wright) Kunth ex DC.	Dog almond, hog turd, false mahogany, cabbagebark tree	1.42
Coccoloba microstachya Willd.	Uverillo, puckhout	1.35
Cordia rickseckeri Millsp.	San Bartolome	1.29
Citharexylum spinosum L.	Spiny fiddlewood	1.12
Krugiodendron ferreum (Vahl) Urb.	Ironwood, leadwood	0.99
Tamarindus indica L.	Tamarind, taman	0.85
Albizia lebbeck (L.) Benth.	Mother-in-law tongue, tibet, woman's tongue	0.76
Albizia procera (Roxb.) Benth.	Tall albizia	0.76

D.b.h. = diameter at breast height.
Nomenclature based on USDA NRCS Plants 2010 database.

Table 5—Twenty tree species with d.b.h. <5.0 inches and greatest importance value (average of relative density, relative dominance, and relative frequency), U.S. Virgin Islands, 2009

Scientific name	Common name	Importance value
Leucaena leucocephala (Lam.) de Wit	Tan tan, wild tamarind, wild taman, white leadtree	17.26
Bourreria succulenta Jacq.	Pigeon berry, bodywood	8.47
Guapira fragrans (Dum. Cours.) Little	Mampoo, black mampoo	6.00
Swietenia mahagoni (L.) Jacq.	West Indian mahogany, small leaf mahogany, mahogany	3.51
Acacia muricata (L.) Willd.	Amaret, wild tamarind, spineless acacia, spineless wattle	2.92
Maytenus laevigata (Vahl) Griseb. ex Eggers	White cinnamon	2.78
Trema micrantha (L.) Blume	Jamaican nettletree	2.63
Guettarda scabra (L.) Vent.	Green heart, velvet seed, wild guave	2.42
Citharexylum spinosum L.	Spiny fiddlewood	2.23
Myrciaria floribunda (West ex Willd.) Berg	Guavaberry	2.09
Chrysophyllum pauciflorum Lam.	Palmet, wild mesple, camito de perro	2.04
Eugenia procera (Sw.) Poir.	Rockmyrtle	2.02
Erythroxylum rotundifolium Lunan	Brisslet, ratwood	1.99
Eugenia monticola (Sw.) DC.	Skunk cherry, black cherry, bunch berry, birdcherry	1.87
Gymnanthes lucida Sw.	Crab wood, goat wood, oyster wood	1.65
Bursera simaruba (L.) Sarg.	Gumbo limbo, turpentine tree, tourist tree	1.52
Capparis cynophallophora L.	Jamaican caper, black caper, black willie, black witty, liguam	1.50
Chionanthus compactus Sw.	Bridgotree	1.45
Eugenia axillaris (Sw.) Willd.	White stopper	1.32
Adelia ricinella L.	Adelia, wild lime	1.27

D.b.h. = diameter at breast height.
Nomenclature based on USDA NRCS Plants 2010 database.

Forest Health

For trees with d.b.h. >5.0 inches, 45 percent showed some sign of damage or disease. Of that damage, 60 percent was in the form of conks, fungal fruiting bodies, and other signs of advanced decay (fig. 5). All of the observed fungus, decay, and other damage noted by the field crew was of minor severity, affecting <10 percent of the tree's roots, stump, or bole. Overall, there were no indications that any one species was being affected by a certain type of damage more than other species. Uncompacted crown ratio, crown density, and foliage transparency were assessed, and show values that are generally indicative of normal, healthy trees. Only 3 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.

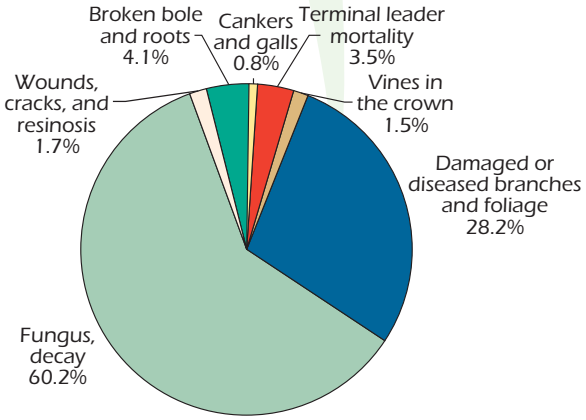

Figure 5—Frequency of tree damage and disease observed in the forest inventory, U.S. Virgin Islands, 2009.

Conclusions

As the USVI forest inventory moves from initial measurement to remeasurement of established permanent plots, we gain information on tree growth, mortality, and fluxes in and out of forest ecosystem carbon pools. In the future, we can expect to detect more subtle changes in the forests than we were able to observe in the past due to the shorter periods between remeasurements. Resource managers and policymakers will have more current information upon which to base their decisions; moreover, the data will be updated more frequently, allowing changes to be detected earlier and interventions planned before situations grow too large or complex to address easily.

Our goal with this report has been to provide stakeholders with summaries of important information that could be extracted from this large, complex dataset. Our hope is to generate further interest and deepen appreciation of the valuable and unique forest resources of the U.S. Virgin Islands. We welcome further inquiry into the state of the resource via the FIA program's online tools and publicly accessible data.

Literature Cited

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.

Holdridge, L.R. 1967. Life zone ecology. Revised edition. San José, Costa Rica: Tropical Science Center. 206 p.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2013. The PLANTS database. Greensboro, NC: National Plant Data Team. http://plants.usda.gov. [Date accessed: June 2013].

How to Cite This Publication

Brandeis, T.J.; Turner, J.A. 2013. U.S. Virgin Islands, 2009—forest inventory and analysis factsheet. e-Science Update SRS–077. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 5 p.

How do you rate this publication?
Scan this code to submit your feedback
or go to www.srs.fs.usda.gov/pubeval

You may request additional copies of this publication by email at pubrequest@fs.fed.us. Please limit requests to two copies per individual.

Gullfeed (*Scaevola plumieri*) Buck Island, St. Croix, U.S. Virgin Islands. (photo courtesy of Dan Clark, USDI National Park, Bugwood.org)

Contact Information

Thomas J. Brandeis, Research Forester
4700 Old Kingston Pike
Knoxville, TN 37919
Phone: 865-862-2000 / Fax: 865-862-0262
Email: tjbrandeis@fs.fed.us
Southern FIA: http://srsfia2.fs.fed.us
National FIA: http://fia.fs.fed.us

Jeffery A. Turner, Forester
4700 Old Kingston Pike
Knoxville, TN 37919
Phone: 865-862-2000 / Fax: 865-862-0262
Email: jturner02@fs.fed.us
Southern FIA: http://srsfia2.fs.fed.us
National FIA: http://fia.fs.fed.us