

RAPID ASSESSMENT OF FOUR ENGANGERED PLANT POPULATIONS OF ST. CROIX, US VIRGIN ISLANDS

*A rapid assessment and inventory was completed on three populations of the federally endangered *Buxus vahlii* and St. Croix's only know population of *Catesbaea melanocarpa*. Plant height, and basal stem caliper were measured and phenology was recorded. Individual plant health was assessed at each point and observations on canopy characteristics and associated species were collected at each location. Data was collected using Trimble Junos hand held units with external ProXH antennae. These data will assist in creating better definitions of critical habitat and improving existing recovery plans.*

*Buxus.vVahlii and
Catesbaea
melanocarpa*



Geographic Consulting
Natural Resource Management

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Introduction

The status of federally endangered plants of St. Croix, US Virgin Islands has not been evaluated in the recent past. Their range, the number of individuals in the populations and the plants' health are estimated at times, but not assessed systematically. This project is an attempt to describe each of the four populations at a single point in time using highly spatially accurate equipment.

The plants *Buxus vahlii* and *Catesbaea melanocarpa* are federally protected, endangered species. There are three known populations of *B. vahlii* on St. Croix and one population of *C. melanocarpa*. Locally, botanists and naturalists informally monitor these plant populations, but there is virtually no data on the overall area of the populations, number of the plants, health of the living plants or formal assessment of the habitat. All three populations of *B. vahlii* have roads cut through the stand, indicating there is a problem with the existing system intended to protect federally endangered species in the US Virgin Islands. The only known population of *C. melanocarpa* is in a degraded pasture near the road to Ha' Penny Beach and is subject to wildfire regularly.

How to Use this Data

The information contained in this report may be used to coarsely estimate the likelihood of occurrence for the two tree species. However, some caveats must be strongly emphasized before using the data in this way. We state clearly in the report on each species population that we have surveyed a percentage of the individual plants present and that the populations' areas extend further than we were able to survey. The possible exception is the *Buxus vahlii* population in Sandy Point, where we have most likely identified the boundaries of the population correctly. All other populations surely extend beyond the points we have mapped. In cases where we observed more individual plants than we could we described the direction and density.

The data presented here is point data with measurements of individual plants. This is a preferred data type for many applications, such as when US Fish and Wildlife Service designates critical habitat. A mere observation is often not sufficient confirmation of the presence of the plant, where a spatially explicit measure of plant height and stem diameter on a specific date is irrefutable. In addition, if there is a violation of the Endangered Species Act and some of these plants are illegally destroyed, this document is the record of their existence. Fines could be levied based on the number of plants destroyed. An area designation would not be effective in such a case

We suggest this data could be used to predict where endangered plants are most likely to occur in two ways. The first is by creating a 1 kilometer buffer around all of the surveyed plants. If an area adjacent to a known plant is surveyed and there are no additional plants, than the buffer could be eliminated or modified in that particular section. Secondly, it has been our experience that hilltops are the best refugia of native biodiversity in the US Virgin Islands. The steep slopes around hilltops were cleared for agriculture less often or not at all in some cases. Steep terrain and exposed rocks that are common to

hilltops in the Virgin Islands make them even less suitable for human uses and even more likely to be the places which still contain rare species. Hilltops should always require a survey prior to clearing or development of any kind.

Methods

This project is a rapid assessment of the four known, separate populations of these two species. There was only sufficient funding to spend a single field day on each of the four populations. We explicitly acknowledge that this is only a starting point and that many plants in each population were not assessed and their locations not recorded. We collected spatially accurate data on individual plants rather than attempt to estimate the range in which the plants grow. Collecting point data means that we have actual height and basal measurements at specific points in time and allows for repeated measures in the future. The ‘area estimate’ frequently used by some field ecologists is helpful in that a certain area can be considered a ‘red flag’ for development, but little if any quantitative data on individual plants tends to be collected in an areas estimate. Therefore, there is little to no way of determining whether the plant population is expanding, reproducing or if individuals are dying. Representatives from Kew Botanical Garden advocated collecting spatially explicit field measurements of individual plants during a recent Plant Conservation Workshop hosted by the University of Puerto Rico in Mayaguez. This project is a product of that meeting.

Data Collection: Quantitative measures, classified variables and qualitative descriptions were recorded for individual plants and the general population (Figure 1). All data is field collected using Trimble Pro XH external GPS antennae and Trimble Juno Handheld units connected to antennae via blue tooth. With WAS corrected and post processing, the accuracy tends to be within 40 cm Raw data including average accuracy of the points is provided in Appendix 1. A waypoint was created at each single plant encountered. In cases where closely spaced clusters of plants were found, a single point was created, a representative plant was measured and all stems were counted and associated with this point. No single point contains more than 10 individual plants. All plants were marked with a numbered aluminum tag, flagged with surveyors flagging and a GPS point recorded at each location and stored in a personal geodatabase using ArcGIS 9.3.1.

Variable	Data type	Detail
Plant number	Sequential #	
Date	date	Dd/mm/yyyy
Species	Multiple choice	Buxus vahlii or Catesbaea melanocarpa
Height (meter)	Numeral	Measured to base of highest leaf. In groups the tallest tree is measured
Number of stems	Numeral	Each stem is an individual plant. In groups the largest tree is measured
Caliper (inches)	Numeral	Taken at base, not dbh
health	1-5	1=very low,2=low, 3=fair, 4=good, 5=very good
Phenology	1-5	1= new leaves, 2=flower bud, 3=flowers, 4= green fruit, 5=fruit

Seedlings in a 1m diameter	Numeral	Plants under 50 cm growing w/in 1 m of the stem This roughly represents last year's reproduction
Comment	Text	General comments

Figure 1 Descriptions of the data variables collected in the field

Findings: The points depicted in the maps are intentionally imprecise due to concerns over providing exact locations of federally endangered species. The points provide context as well as a sense of the density and distribution of the population that was surveyed. Exact geographic coordinates are provided in separate tables at the end of this document as appendices. These exact locations will not be contained in the version of this report that is intended for the public.

In addition to locations, we also provide a summary of the entire population in terms of its average height, number of total plants surveyed, health rating and associated species. In conclusion, we describe and address the unique threats facing each of the populations.

Results

Buxus vahlii, Vahls Boxwood

There are three known populations of *B. vahlii* on St. Croix. They range from a coastal population on the west end to hilltop locations on the dry east end of St. Croix. The Sandy Point National Wildlife Refuge (SPNWR) population is on federal land protected and maintained by the US Fish and Wildlife Service. The other two are on private land in residential areas currently under development. The Sandy Point population had a bull dozer plow through the population, killing an unknown number of individuals. Both east end populations have a road running through the middle of the population. Both roads begin as residential and continue uphill to provide access to telecommunications towers.

B. vahlii is known to produce multiple seed crops a year, but the primary fruiting is in March (Figure 2). Unpublished analyses (Daley 2000 & 2006) measured 30 unique seed lots and found the average fruit weight to be 0.086 g or 11,750 fruit/Kg. Average seed weight was 3 mg or 382,000 seeds/kg. Germination is variable, but is often only 10% initially. The seeds remain viable for several months and continue to germinate sporadically. One attempt of withholding water for 45 days and then re-watering resulted in 39% germination after 120 days.



Figure 2 Flowers of *B. vahlii* at left and dried, ripe, indehiscent fruit at right.

Spyglass Hill Population

This population was first recorded after 1995 when an overgrown access road below the antenea (east of the mapped plants) was re-cleared and the plants were observed from the clearing (Rudy O'Reilly, personal communication). Field work for this site was conducted by Brian Daley, Jennifer Valiulis and Hema Balkaran of Geographic Consulting on December 20, 2012. The stand is easily accessed by taking the road to Spyglass Hill, passing all the residential developments until the road becomes a single lane, access road leading to the telecommunications tower. There is a smaller access road that branches off to the left of this road. This smaller road was constructed through the middle of the *B. vahlii* population. The plant occurs on both sides of this access road (Figure 3).

This stand is a mature population with individuals of varying size classes. They are mixed with a diverse population of native dry forest species and a concentration of *Leucaena leucocephala* near the edge of the access road. Species include *Tecoma stans*, *Capparis cynophallaphora*, *C. indica*, *Bucida buceras*, *Pisonia subcordata*, *Krugiodendron ferrum* and the cactus *Pilocereus royenii*. The forest canopy is diverse, includes many climbing vines and is growing on a rocky steep slope with a canopy roughly 3 to 4 meters tall.

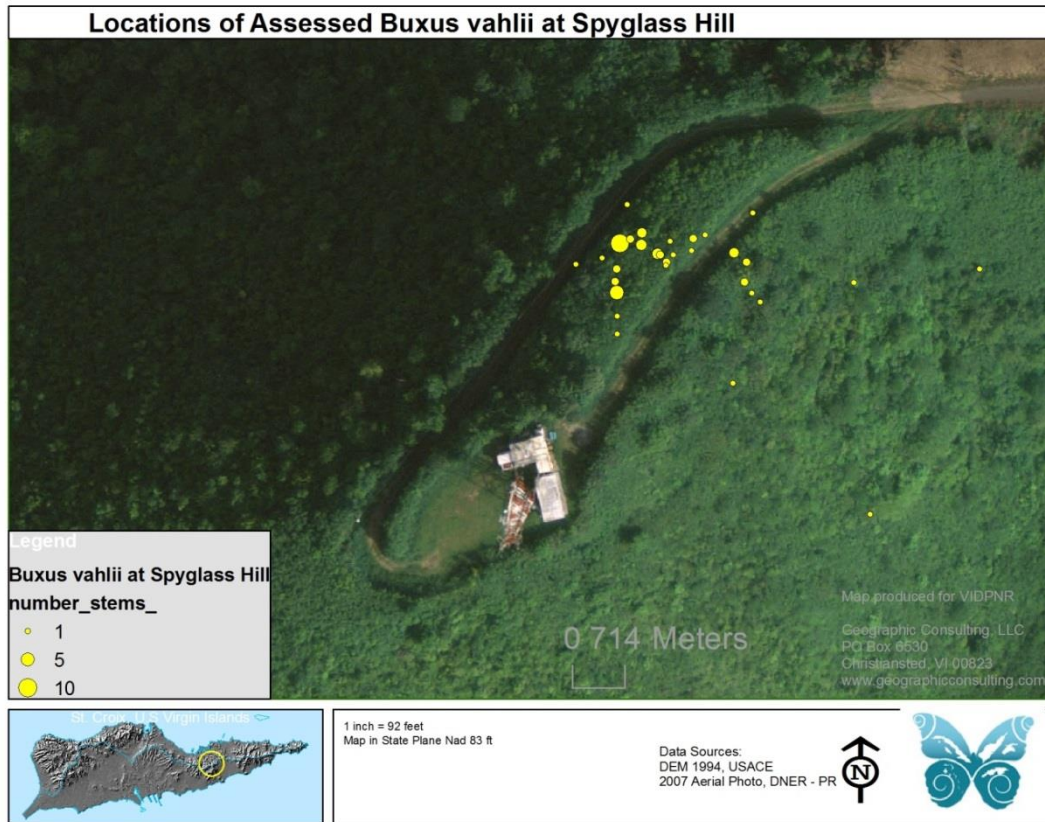


Figure 3 Individuals and clusters of *B. vahlii* growing on Spyglass Hill near the telecommunications tower

A total of 55 plants were assessed and marked with 24 unique waypoints. Plant heights ranged from 0.7 m to 2.2 m with an average height of 1.73 m tall. Basal stem caliper measures ranged from 0.6 cm to 2.5 cm with an average of 1.42 cm. Nearly all plants were observed to be in good health. Those that were assessed to be in fair health were either toppled over from a small rock slide or were covered in vines. No significant diseases or insect infestations were observed. The adult trees were in various stages of phenology, with flowers, green fruit and small numbers of ripe fruit observed. This population was interesting because only 6 total seedlings were observed.

We estimate that this is the second largest of the three *B. vahlii* populations on St. Croix. During our rapid assessment we tagged most, if not all, plants in the survey area, which appears as a cluster of points in Figure 3. The population spread to the south east, from that point along a 30% slope with eastern and southern exposures. Multiple clusters of plants with dozens of mature and young plants were visible on this hillside, mixed in with cactus, boulders and climbing vines.

Threats. The steep slopes and rocky terrain are working to protect this population. The Spyglass Hill is still subject to the threat of development, as evidenced from the access road constructed through the center of the population. However, the plants are far from the nearest residential development. Wildfire does not appear to be a serious concern.

Sandy Point National Wildlife Refuge Population

This population was first discovered by Mike Evans and Rudy O’Reilly some time between 1993 and 1995 (Rudy O’Reilly, personal communication). The field work for this site was conducted by Brian Daley, Jennifer Valiulis and Hema Balkaran of Geographic Consulting on December 12, 2013. The stand is accessed from a meandering but well-known and well-marked foot path off of the main road.

The stand appears mature and relatively dense. In some patches *B. vahlii* is the dominant component of the canopy. Figure 4 shows the distribution of the individuals mapped. Larger points indicate groups of up to 10 trees. The forest canopy is comprised of primarily native species, including *Comocladia dodonaea*, *Crossopetalum rhacoma*, *Pisonia subcordata*, *Jacquinia arborea* and smaller numbers of *Tecoma stans*.

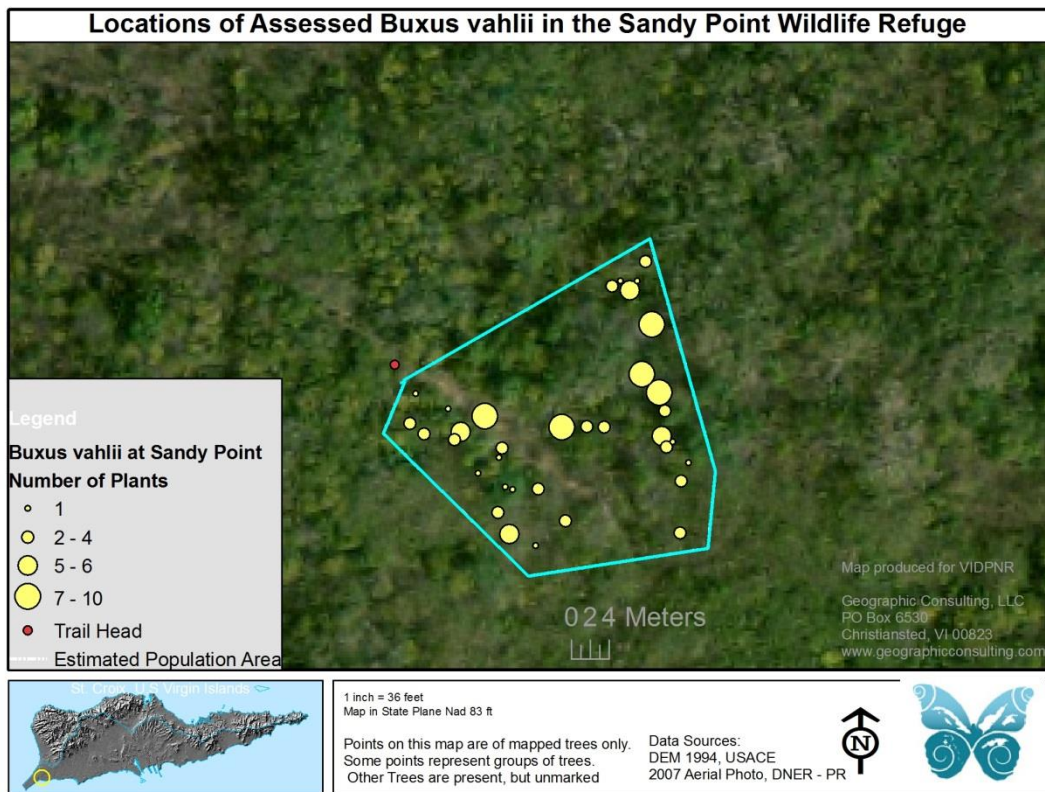


Figure 4 Numbers of plants and general distribution of *Buxus vahlii* at Sandy Point National Wildlife Refuge, St. Croix, US Virgin Islands

A total of 135 plants were surveyed and assessed for health. Plant height ranges from 0.5 to slightly over 4.0 m with the average height 2.69 m. Stem caliper measures taken at the base of the trunk ranged from 0.26 cm to 3.2 cm with an average of 1.45 cm. Nearly all trees were observed to be in good health. All but 5 plants received a “good” or “excellent” overall health rating. No significant infestations of insects

or disease were observed. Nearly all plants in the population had abundant quantities of immature green fruit and some trees still had open flowers. No mature fruit or seeds were observed.

Interestingly, only eight (8) total seedlings/saplings were observed during the entire field day. This is surprising because nearly all of the adult trees were reproducing and appeared healthy. Brian Daley conducted germination trials on seeds collected from this population in March of 2000. Seeds did not begin germination until 120 days after being sown and germinated at a rate of 18%.

We estimate that we have tagged the majority of the individuals in this population. No additional trees could be located in the northeast corner of this group. Likewise, the plants marked on the western edge of Figure 4 are likely the actual end of their range here. We observed more plants that we did not have time to tag and assess, but they most likely occur within the area demarked by the white line in Figure 4. We estimate that there are roughly 200 plants in the Sandy Point *Buxus* population.

Threats The land where these plants are growing is within the borders of the Sandy Point Wildlife Refuge and therefore receive federal protection.

Seven Flags Hill Population

This stand was first discovered on January 15, 2009. It was reported to Marelisa Rivera of the US Fish and Wildlife Service in Puerto Rico on May 1, 2009 (Rudy O'Reilly, personal communication). The field work for this site was conducted by Brian Daley and Jennifer Valiulis of Geographic Consulting and Michael Morgan of the University of the Virgin Islands on January 8, 2012. The site is easily accessed by taking the Seven Flags Hill Road up through the residential developments, bearing left wherever possible. Eventually the road narrows to a single paved lane, there are no more homes and the road begins to climb. The *B. vahlii* are on both sides of the road which was constructed through the center of a dense portion of this stand of endangered plants (Figure 5). Utility poles can also be used as a reference. The nearest utility pole to the site is numbered 2-027443.

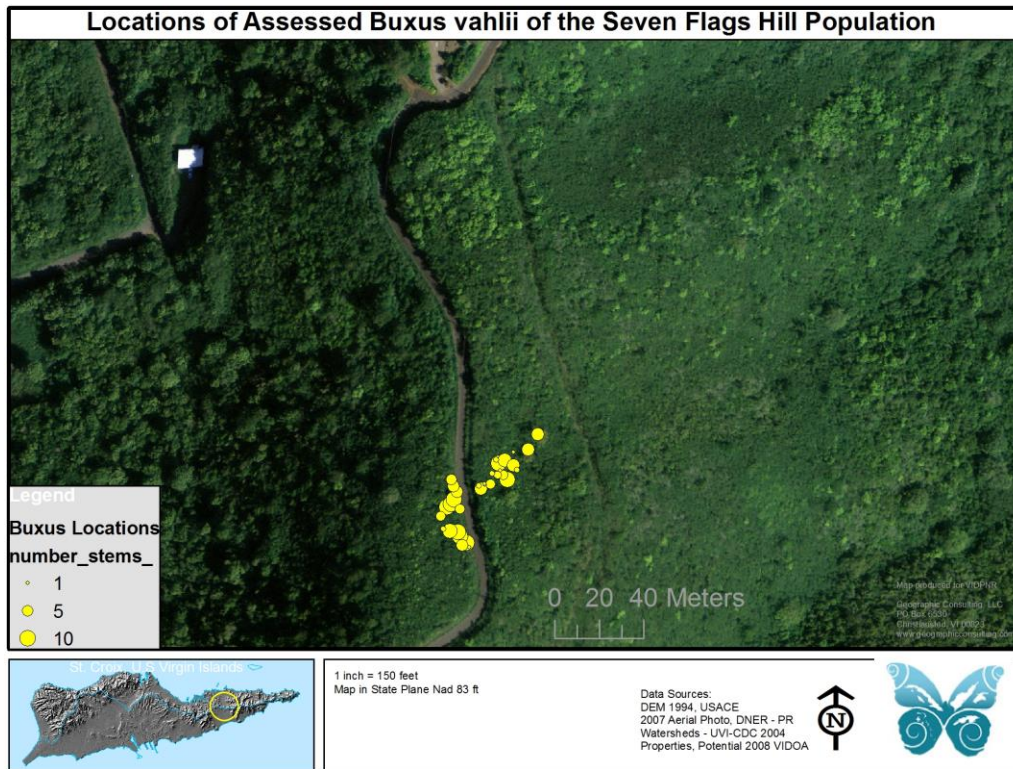


Figure 5 Distribution of individual *B. vahlii* plants and clusters

The stand is mature, healthy and reproducing and contains individuals of all size classes. A total of 182 plants were surveyed at 33 unique waypoints. Most occurred in dense clusters, but no more than 10 plants were ever grouped together. Plant heights ranged from 0.5 m to 3.2 m with an average height of 1.77 m height. Basal stem caliper measurements ranged from 0.3 cm to 1.9 cm with an average of 1.19 cm diameter. All but 2 trees were assessed to be in good or very good health. Two trees were assessed to be in fair condition and grew in dense understory shade and had few leaves on their lower branches. No pests or disease of any kind were observed. Roughly half of the plants had ripe fruit, but dozens of adult trees adjacent to them were not bearing fruit. Small numbers of solitary individuals were still in flower.

A total of 52 individual seedlings were recorded in the understory. Their distribution was patchy, in groups of 10 under some trees, solitary and none under others.

We estimate that we tagged most or all of the individuals within the area surveyed, but that the population extends far to the east and south from where we surveyed. We estimate this to be the largest known population of *B. vahlii* on St. Croix. In figure 5, a faint line of a dirt road running north to south can be seen to the east of the addressed plants. We hiked this area and observed *B. Vahlia* in

dense patches up to the road clearing. At a later date, Micheal Morgan walked to the east side of this road and found the populations stretched well beyond previously believed.

Threats This population is located near a residential development and is easily accessed by a paved road. A paved road and dirt road have already been built through dense stands of *B. vahlii* here, confirming the threat of development. It is still unknown if these two roads were permitted.

Catesbaea melanocarpa,

Catesbaea melanocarpa is known in two populations in Puerto Rico and one population at Ha' Penny Beach in St. Croix, US Virgin Islands. The St. Croix population was discovered by Rudy O'Reilly in 1988, and later estimated at 24 individuals. An informal survey in 2002 (Lombard) estimated the population at 100 individuals.

In 2006 Brian Daley, Claudia Lombard, Rudy O'Reilly, David Hamada and Lisa Yntema conducted a more formal survey using GPS units to establish parallel transects. Plants were located, marked with flagging tape and data was recorded on the number of individual *C. melanocarpa* plants at each point, their phenology, height, stem diameter, and associated species. A total of 187 individual plants were found but the data collected did not easily distinguish between adult trees and seedlings. This effort was completed by volunteers over a 2 day period, but there was no funding to complete a report or analyze any data. The results were informally communicated to the Virgin Islands Department of Planning and Natural Resources in 2006.

Brian Daley obtained a VIDPNR permit to collect ripe fruit to grow plants from seeds in 2006. Three sets of seeds were collected on three separate dates and germinated. The handling method was improved each time, with the final trial resulting in 80% germination. A description of the process used will appear in an upcoming publication; The USDA Forest Service, Tropical Nursery Handbook.

Ha' Penny Beach Population

The field work for this site was conducted by Brian Daley and Jennifer Valiulis of Geographic Consulting, Michael Morgan of the University of the Virgin Islands and David Hamada of the St George Village Botanical Garden on January 17, 2013. The site is easily accessed via the unimproved beach access road. There is former pasture on both sides of the road and *C. melanocarpa* is known to occur on both sides of the road. On the west side of the road there are a few plants near the Ha' Penny Road under tamarind trees and additional plants, further to the west in a fence line along a long driveway to the large house on the beach. The plants on the east side of the road are larger and the population is greater and denser, so we concentrated our one day survey to the east side of the road (Figure 6).

This site has a complex land use history. It is impossible to know if the current distribution of the plant is due to 1) the plants preference for understory habitat, 2) bird dispersed seeds are primarily deposited

under trees that are bird perches or 3) trees and seeds are evenly dispersed across the landscape, but grazing and wildfire and competition with grasses have killed the plants growing in open habitat.

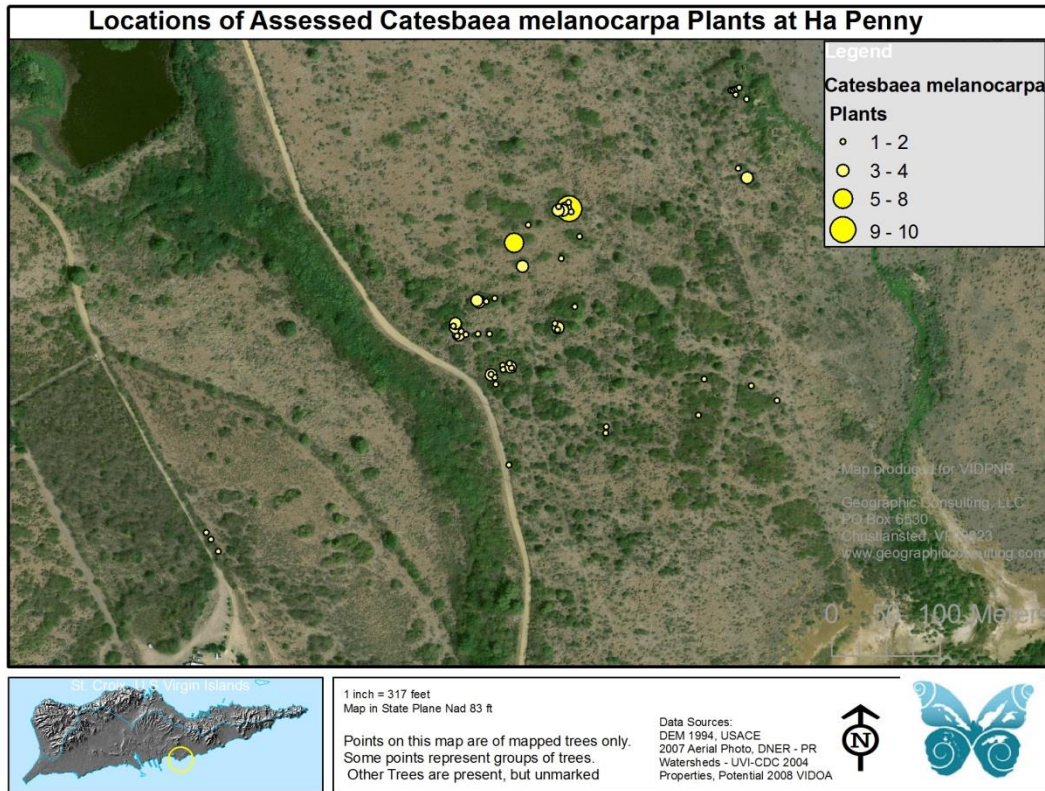


Figure 6 Number of plants and general distribution of assessed *Catesbaea melanocarpa* plants at Ha' Penny Beach, St. Croix, US Virgin Islands

A total of 72 adult plants were surveyed and 92 seedlings (under 30 cm height). Their distribution is patchy in the dry scrub growing in this former pasture. Figure 5 shows this distribution with larger point representing clusters of plants at a single point. Every plant observed occurred under a larger tree or in association with a clump of scrub and trees. Tamarind trees were the most common type of association. Adult plant heights ranged from 30 cm to 250 cm in height with an average height of 133 cm. Plants were found both singly and in groups. The assessed plants were observed to be in overall good health with only three individuals being graded as fair and all the rest were good or very good. Sooty mold was observed on the leaves and stems of four plants. Two trees had flowers, 15 had green fruit, and eleven trees contained ripe fruit (Figure 7). Seedlings were commonly observed, but their distribution was patchy. The seedlings also ranged in height from under 10 cm to 29 cm, indicating they are from multiple years/seasons of fruit (Figure 8).



Figure 7 Ripe fruit among the thorns of a *Cateasbaea melanocarpa* branch

There were insufficient resources to map this entire population. Figure 6 shows the distribution of plants observed within the area surveyed, but more survey work needs to be completed to fully map the extent of the population. It is likely that the population extends further south and north. A fence and waterway prevented us from surveying further to the east, but additional plants may be present there as well. Finally, we have observed five additional plants in two separate locations on the west side of Ha' Penny Road. There is insufficient data available today to say the true extent of the population. We crudely estimate the number to be 200 adults.



Figure 8 Dozens of seedlings grow under an adult *C. melanocarpa* tree

Threats: This population is the most threatened of the four populations we surveyed and there is a real possibility of extirpation. Previously, the primary threat to *C. melanocarpa* was grazing, but this threat has been removed. Today *C. melanocarpa* remains in serious peril from wildfire. The fields on the southshore of St. Croix experience wildfire every dry season and the proximity to the main road increases the risk. The fuel load is greater now that the grazing has stopped. The fires tend to be fast moving grass fires that often leave woody plants singed, but alive. *C. melanocarpa* is also threatened by an aggressively spreading noxious weed, cattail (*Typha latifolia*) from the adjacent property. Cattail has spread across the fence line in the northeast corner of the mapped population. There is a serious erosion problem and a growing head cut. Finally, there is a newly established plot of giant king grass that is currently being expanded. The grass is notoriously water demanding, but likely does not pose a serious threat to the *C. melanocarpa*. However, land clearing for planting or any other reason is a common way for endangered plants to be destroyed.

Update: After the field data was collected and during the preparation of this document there was a wildfire at the Ha' Penny site. It was a fast moving grass fire that passed directly through the center of this population. An informal post-fire assessment found many plants unharmed under their parent trees. At least three individuals had their leaves completely singed, but the wood did not burn and it is possible these plants will grow new leaves. At least six others were burned and appear dead. Finally,

additional land has been cleared for the giant king grass project that is now within 50 feet of individual *C. melanocarpa* plants.



Figure 9 Two surveyed, adult *Catesbaea melanocarpa* plants and the seedlings below them are burned from a recent fire.

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