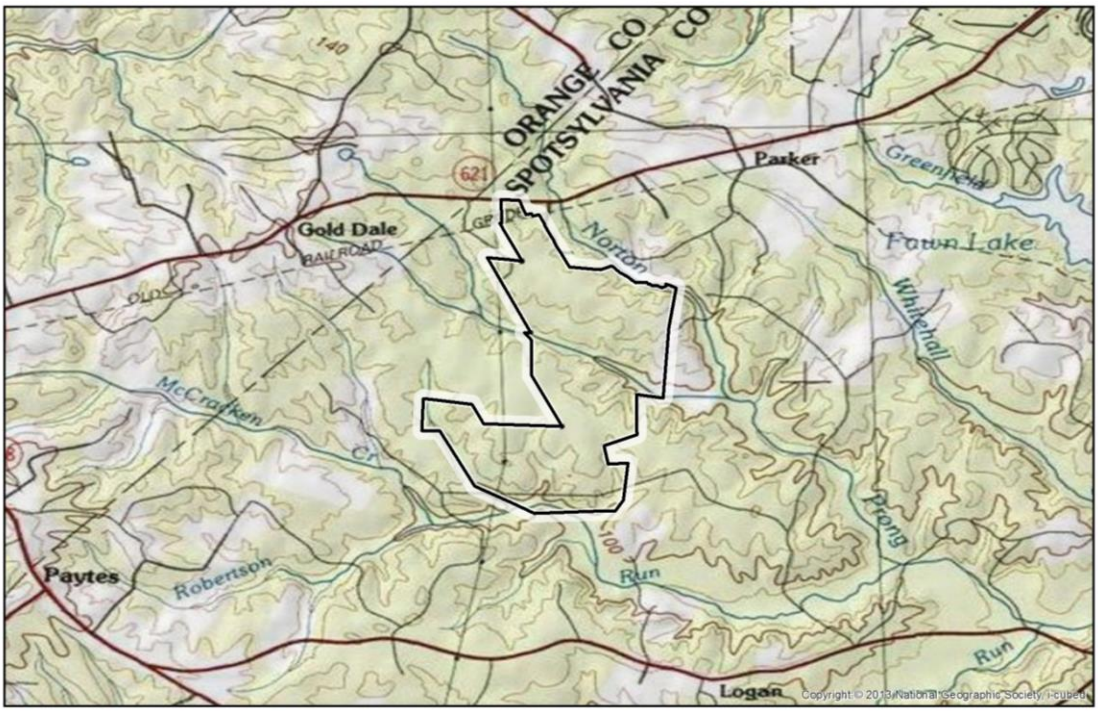
SURVEY & HABITAT ASSESSMENT FOR THE SMALL WHORLED POGONIA

Spotsylvania Solar Energy Center
Orange Plank Road, Spotsylvania, Virginia



Prepared for:
Kimley-Horn
4525 Main Street, Suite 1000
Virginia Beach, Virginia 23462

Prepared by:
Kory Steele
697 Hogan Drive
Newport News, Virginia 23606

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SUMMARY

Mr. Kory Steele, independent contractor, conducted a survey and habitat assessment for the federally threatened Small Whorled Pogonia (*Isotria medeoloides*). The study site (Figure 1) was compared to the habitat requirements and associations found in scientific literature for the species to determine the study site's suitability. A survey was conducted thereafter to look for individuals of Small Whorled Pogonia.

No Small Whorled Pogonia were found. Only half of the individual habitat components that were assessed were rated as positive indicators for Small Whorled Pogonia habitat. The habitat components that were neutral or negative indicators on the study site were substantial enough to warrant the exclusion of most of the study site from a suitable habitat designation for the Small Whorled Pogonia.

However, based upon the available literature and on-site observations, it was determined that a 0.5-acre area of suitable habitat is present in the southwestern corner of the property (Figure 1). The remainder of the study site is composed of low to medium-quality habitat that are excluded primarily due to a dense understory and groundcover.

TABLE OF CONTENTS

SPECIES DESCRIPTION

Small Whorled Pogonia is a small, herbaceous perennial up to 10 inches in height. A whorl of 5 or 6 leaves is produced at the top of the stem. The arrangement of the leaves beneath the flowers gives the plant its common name. Flowering occurs from mid-May to mid-June, with the flowers lasting only a few days to a week. Individual plants may not flower on an annual basis, and extended dormancy is purported to occur under certain conditions. Some of the largest populations in Virginia are in the Williamsburg area.

SITE DESCRIPTION

Terminology- A habitat assessment and survey were conducted on a portion of a property that excluded developed and disturbed areas that are very unlikely to be potential Small Whorled Pogonia habitat. "**Study site**" is used when referring to the portion of the property that was assessed and surveyed. "**Property**" is used when referring to all of the parcels at the location above (Figure 1).

Location- The property (Figure 1) is located in the northwestern corner of Spotsylvania, Virginia and comprises multiple parcels and portions of other parcels, with no specific address. The property has numerous points of access but is primarily accessed from Orange Plank Road. It is intersected by Shanty Bridge Creek, Norton Prong, and Robertson Run streams, which are tributaries of the Po River (Figure 1). It is approximately 18 miles from the Exit 130 on Interstate 95. The property can be viewed on Google Maps at this link: **goo.gl/maps/5ezhRGnWRKS2**

Setting- Most developed adjacent properties are single-family homes. An electrical substation is located west of the property. The rest of the property is bordered by forests or recently clear-cut land. Spotsylvania County is a part of Northern Virginia, which is part of the Baltimore–Washington metropolitan area. The property is approximately 28 miles from Fort A.P. Hill. Spotsylvania is considered to be 32.2% rural.

Characteristics- The property is composed of 1,758 acres that consists of 1,450 acres of recently logged areas and 308 acres of intact forest. No structures are on the property, but there are high voltage powerlines that run through portions of the western side of the property.

Topography- Elevations on the property range from 310 to 420 feet. The forested areas are generally only associated with streams and are adjacent to ravines. These ravines often have slopes greater than 25%, with some greater than 60% (Figure 2)

Wetlands- A wetland delineation was conducted by Kimley-Horn (Figure 2). Three streams cross the property in the north (Norton Prong), middle (Shanty Bridge Creek), and south (Robertson Run), generally flowing from west to east. No isolated wetlands occur on the property. Most wetlands on the property are intermittent or perennial streams.

Property Visit- A habitat assessment was conducted from April 15-16, 2018 to determine if potential habitat was present on the property. This assessment was limited to areas that were not highly disturbed, discernible wetlands, or stands of pine.

A second visit was made on June 4 and 5, 2018, to evaluate the previously identified potential habitat. The term *potential habitat* is used to describe patches of habitat that may be suitable for Small Whorled Pogonia but cannot be fully assessed until the foliage emerges on deciduous vegetation, which provides critical insight as to sun exposure. With the additional information pertaining to exposure gleaned post-emergence of foliage, potential habitat can be determined to be suitable habitat, or it can be excluded entirely from further consideration of Small Whorled Pogonia habitat. The second site visit was used to delineate suitable habitat post leaf-out, locate colonies of Small Whorled Pogonia, and identify any similar-appearing species. Sufficient sunlight was present to evaluate sunlight on the forest floor. Access to the areas of potential habitat, and even within intact forested areas, was limited by recent clearcutting, and tree falls indirectly from clearcutting. The second site visit was not intended to revisit all areas during the habitat assessment. Therefore, some representative photos of the property are from the April site visit.

SURVEY METHODOLOGY

A survey was conducted on the study site on June 4 and 5, 2018, dates that are within the accepted timeframe specified by USFWS for Small Whorled Pogonia surveys north of Caroline County. The survey was focused at previously identified potential habitat for the visible vegetative phase of the Small Whorled Pogonia. Habitat that was surveyed are referred to as “Searched Areas” and are numbered in a sequence, as shown on Figure 1. An additional objective of the survey was to document any occurrences of similar appearing species with the Small Whorled Pogonia, namely Indian cucumber root (*Medeola virginiana*) and large whorled pogonia (*Isotria verticillata*).

When suitable habitat was encountered, Kory Steele a certified Small Whorled Pogonia surveyor by the U.S. Fish and Wildlife Service, with a field assistant from Kimley-Horn walked parallel transects through the habitat. The distance between surveyors depended on the density of the ground layer vegetation and ranged from 5 to 20 feet. Sufficient visual overlap of each transects were maintained. Transects followed a zig-zag pattern, when necessary, and were recorded with a track log on a recreation grade GPS receiver to ensure thorough coverage on the study site. The surveyors searched for Small Whorled Pogonia and similar looking species, regardless of habitat suitability, but only suitable habitat patches received the intensive and thorough searches described above.

SURVEY RESULTS

No Small Whorled Pogonia was found on the study site at the time of the site visits.

The surveyed areas differed from the potential habitat identified from the habitat assessment in that a small area east of Searched Area 5 (Figure 1) had been clear-cut since the last visit in April. Searched Area 4 was not identified as potential habitat previously, but it was opportunistically surveyed since it provided the best access for walking to Searched Area 5 (Figure 1) and is included in this report.

Photo 1- Indian cucumber root with flowers; Searched Area 5; June 2018.

Similar appearing species were encountered in three of the five areas identified as potential habitat. Indian cucumber root (Photo 1) was found in nine distinct colonies, and large whorled pogonia (Photo 2) was found in three distinct colonies. At two locations, both species were found growing together (Figure 1). Every stem at each colony was individually inspected for positive characteristics for the similar appearing species. A colony of Indian cucumber root in Searched Area 5 could not be thoroughly inspected because a recent tree had fallen on the area preventing access to each of the stems. Only Indian cucumber root was found with flowers (Photo 1). In all but three colonies, the look-alike species had stem counts above 20, which would be atypical for Small Whorled Pogonia (USFW, 2000).

The habitat assessment was conducted before the deciduous vegetation at the site had started to produce leaves, thereby limiting the assessment of the density of vegetation and the various strata. As a result of revisiting the site for the survey, which allowed observation of vegetation post-emergence of foliage, only Searched Area 3 has been identified as suitable habitat (Figure 1), and the other areas of potential habitat have been excluded (See Conclusion section, page 13).

Photo 2- Large whorled pogonia stem; Searched Area 3; June 2018.

FORMAT OF THE HABITAT ASSESSMENT

The following habitat assessment uses relevant criteria to evaluate potential habitat for the Small Whorled Pogonia. The criteria used are based upon scientific literature and what is reasonably assessable in the field.

Each habitat component has separate paragraphs for observations on the project site, analysis of the observations compared with the literature, and literature citations. These are analogous to a results and discussion section in a peer-reviewed manuscript. Unless otherwise noted, habitat components are evaluated independently from one another. Since habitat components are not evaluated relative to others, there can be conflicting ratings. Any conflicts are resolved in the Conclusion section.

A simple "plus" and "minus" system is used to denote if the components found on the project site correspond to the components that are necessary or ideal for the occurrence and viability of the species. A "**+**" symbol is used for positive associations, where the conditions observed on the site are conducive to the occurrence of the species. An "**o**" symbol is used to denote if the attributes of criteria have neither profound positive nor negative benefit to the species. A "**–**" symbol is used for conditions observed on the site that are detrimental to the occurrence of the species.

– = indicates a negative association

o = indicates a neutral association

+ = indicates a positive association

o Historic Land Use

The oldest available aerial imagery for the study site is from 2002 on the Spotsylvania County GIS website (**gis.spotsylvania.va.us/Spotsylvania**). Evidence of tree farming on portions of the site include dense stands of pines planted in straight lines, as well as ones that had recently been cut in the 2002 aerial. Hardwood forests on the property often had trees that were over 100 years in age. No other evidence of historical land use was observed.

Small Whorled Pogonia has been known to grow in regenerating fields that were formerly used for agriculture and may even have a preference for such a habitat. Portions of the property that would not be excluded due to the presence of pine stands, may have been left undisturbed for over 100 years. Although the possibility of previous agriculture use cannot be readily ruled out, the evidence of previous use does not include any particular negatives or positives.

References: USFWS 1992, Ware 1991, Ware 2000

o Current Anthropogenic Disturbances

Approximately 82% of the property has been recently clear-cut (Photo 3). It is important to note that the clear-cut areas in Figure 1 do not fully represent the limits of disturbance, since some logging activity encroached within the remaining forested areas, and many of the remaining mature trees have fallen over in subsequent storms. Many deer stands (>12) were seen on intact trees throughout the property.

Small Whorled Pogonia is a small herbaceous plant that is very sensitive to trampling and direct physical disturbance. Foot traffic from hunters, hikers, and photographers can easily damage the plant any time it is not dormant. It is unknown if logging activities will continue. Deer hunting season in Virginia begins in autumn and is not likely to result in trampling by hunters. Since no evidence of human activity was observed in the intact forested areas, but it is unknown if logging will continue, this habitat characteristic is rated as neutral.

Photo 3- View of recent clear-cutting on the property; north of Searched Area 2; April 2018.

References: USFWS 1992, Ware 2000, White 1998,

+ Topography

Elevations on the property range from 310 to 420 feet, with a range of slopes from 2% to over 60% (Appendix B). Generally, slopes are evenly distributed throughout the property and slopes are available in all compass directions (Figure 1). Nearly level terrain can be found in each of the areas that were surveyed.

Small Whorled Pogonia has been found on a variety of slope degrees, slope positions, and compass directions throughout its range, but most colonies in Virginia are on north to eastern facing slopes. However, aspect may only be critical at the extremes of the Small Whorled Pogonia range. Small Whorled Pogonia are typically found on level terrain near slopes or gentle to moderate slopes, while occupancy on steep slopes is less frequently observed. The study site appears to have the typographic features that coincide with other known Small Whorled Pogonia colonies in Virginia.

References: Montgomery 2014, USFWS 1992, Ware 1991, Ware 2000

O Soils

According to the USDA Web Soil Survey (an abridged version is in Appendix A), the study site consists mostly of sandy loam and silt loam soil. The depth to a restrictive layer is 40 inches to more than 80 inches. Soil acidity on the study site ranged from a pH of 4.6-5.5 and is considered to be "very strongly acid" to "strongly acid".

One of the primary requirements of the Small Whorled Pogonia is acidic soil, with a pH of 4 to 5, but up to 5.5. Also typical of Small Whorled Pogonia habitats is high soil moisture from an impermeable layer (fragipan) averaging 20 inches under the acidic soils (in southern states). The preferred soil texture is sandy loam. Although the typical acidity of the soils on the study site is within the Small Whorled Pogonia preferences, the deep fragipan layer may result in soils that are too dry for the shallow roots exhibited by Small Whorled Pogonia. Since one important soil characteristic is present (low pH) and the other is not (proximate fragipan), this habitat component is rated neutral.

References: Montgomery 2014, USFWS 1992, Ware 2000

O Age of Trees

Age was inferred by the relative height and diameter of the trees, and opportunistically examining previously cut trees. The diameter turned out to be a deceptive metric because of very closely spaced growth rings, often making it impossible to accurately count the rings. Some trees were well over 100 years old when they were recently cut, and some were older than 50 years old.

Small Whorled Pogonia has been found in mid-successional / maturing stands with an age range of 60 to 80 years. A portion of the trees on the study site is

older than this habitat characteristic, although stands of trees in the 60 to 80 year range are present.

References: Montgomery 2014, USFWS 1992, Ware 2000

+ Composition of Canopy

Tulip poplar (*Liriodendron tulipifera*) and red maple (*Acer rubrum*) were codominant in the canopy layer of the study site. Other species that were present in the canopy stratum include:

- bitternut hickory (*Carya cordiformis*)
- white oak (*Quercus alba*)
- red oak (*Quercus rubra.*)
- sweet gum (*Liquidambar styraciflua*)
- Loblolly pine (*Pinus taeda*) was prominent in stands in the extreme north and south ends of the property. A large stand of Virginia pine (*Pinus virginiana*) was east of Searched Area 5 prior to being clear-cut after the April site visit.

Although Small Whorled Pogonia is known to grow in mixed hardwood and pine forests in parts of its range outside of Virginia, it is not known to grow among pine trees that dominate the canopy stratum in Virginia. However, the strong presence of pine trees in southern populations indicates Small Whorled Pogonia may also be tolerant of pines in alternate habitats. On the study site, pines were limited to locally abundant pockets and were sporadic elsewhere they occurred. The dominant species in the canopy are all common tree species associated with Small Whorled Pogonia. Therefore, the composition of tree species on the study site are indicators for Small Whorled Pogonia habitat.

References: Van Alstine *et al* 1996, Montgomery 2014, USFWS 1992, Ware 2000

O Canopy Openings

The recent clear-cutting has created abundant persistent canopy openings along the edges of the forests left intact. A lack of sunlight under the canopy was noted in Searched Area 5. Dappled sun was abundant in Searched Areas 1 and 3 (Photo 4).

Photo 4- Example of dappled sunlight on forest floor; Searched Area 1; June 2018.

Small Whorled Pogonia often grows in proximity to features that create a persistent break in the canopy, such as logging roads or streams. However, temporary breaks in the canopy, such as those created by a fallen tree, have also been shown to benefit

the Small Whorled Pogonia as it takes advantage of the additional sunlight reaching the forest floor. Since individual dormancy of Small Whorled Pogonia has been documented for up to three years in Virginia, and seven years in other parts of the species range, Small Whorled Pogonia may be able to survive through short periods of low sunlight intensity until other canopy openings appear. Receiving sufficient light at the forest floor, but still being mostly shaded by the canopy, is likely the greatest limiting factor for the Small Whorled Pogonia. Although the recent clear-cutting will expose previously shaded forest floors, it is likely to include intense sunlight that will dry out the soil and encourage weedy species. This scenario was already evident by several stems of Indian cucumber root wilting from exposure to full sunlight (Photo 5) along the northside edge of Searched Area 2. Although much of the study site will now have too much sun for Small Whorled Pogonia to thrive, the level of sun and shade present in a portion of Searched Area 3 is not likely to be a limiting factor.

Photo 5- Indian cucumber root wilting from exposure to full sunlight; northside of Searched Area 2; June 2018.

References: Brumback *et al* 2011, Montgomery 2014, USFWS 1992, Ware 1991, Ware 2000, White 1998

+ Composition of Understory

American holly (*Ilex opaca)* was prevalent throughout the study site and was frequently among the dominant species in the understory. Other frequently encountered species include:

- highbush blueberry (*Vaccinium fuscatum*)
- white oak (*Quercus alba*)
- red oak (*Quercus rubra.*)
- red maple (*Acer rubrum*)
- mountain laurel (*Kalmia latifolia*) was locally abundant in Searched Areas 2 and 5.

Small Whorled Pogonia is known to occur in habitats in which American holly and mountain laurel are present. The understory characteristics of the study site are similar to other known habitats of the Small Whorled Pogonia.

References: Montgomery 2014, USFWS 1992, Ware 2000

o Understory Density

Dense stands of American holly, mountain laurel, and highbush blueberry were present in all surveyed areas except Area 5. In all of these stands, almost no sunlight reached the forest floor beneath them. Recent tree falls have temporarily added a considerable amount of shade to directly above the forest floor.

Photo 6- Typical of dense understory; Searched Area 2; June 2018.

Small Whorled Pogonia prefers a relatively open understory, which allows light to penetrate to the forest floor. Although three out of the four areas identified as potential habitat had patches of dense understory, likely excluding Small Whorled Pogonia, a patch with a suitable understory is present in Searched Area 3.

Reference: Montgomery 2014, USFWS 1992

+ Composition of Ground Cover

Species frequently encountered included (known associates are marked with "*"):

- *early lowbush blueberry (*Vaccinium pallidum*)
- southern lady fern (*Athyrium asplenioides*)
- *common running cedar (*Diphasiastrum digitatum*)
- *partridge berry (*Mitchella repens*)
- *Virginia creeper (*Parthenocissus quinquefolia*) (single-stemmed)
- American holly (*Ilex opaca*)
- roundleaf greenbrier (*Smilax rotundifolia*)
- red maple (*Acre rubrum*)
- *spotted wintergreen (*Chimaphila maculata*)
- sassafras (*Sassafras albidum*) (intact forest and clear-cut areas)
- red oak (*Quercus sp.*)
- *rattlesnake plaintain (*Goodyera pubescens*)
- strawberry bush (*Euonymus americanus*)
- *pink lady slipper (*Cypripedium acaule*) (Searched Area 3 only)
- *Christmas fern (*Polystichum acrostichoides*) (sparse colonies mostly in Searched Area 5)

Several species of groundcover encountered on the study site are commonly associated species with Small Whorled Pogonia. The presence of other orchids (pink lady slipper and rattlesnake plantain) may indicate suitable habitat, and the groundcover characteristics of the study site are similar to other known colonies of the Small Whorled Pogonia.

References: Montgomery 2014, USFWS 1992, Ware 2000

Groundcover Density

The study site can be generally best described as having dense stands of herbaceous plants comprising one of three species at any one location. The most commonly encountered plants in the herbaceous layer on the study site was the early lowbush blueberry (*Vaccinium pallidum*), which formed dense stands typical of the species that excluded other herbaceous plants (Photo 7).

Photo 7- Example of dense early lowbush blueberry stands; Searched Area 3; April 2018.

The second most common species to form dense stands were southern lady ferns (*Athyrium asplenioides*), which also frequently excluded other plants, and it grew equally in the intact forests and in the recent clear-cut areas (Photo 8).

Photo 9- Example of southern lady fern dense stands; Searched Area 2; June 2018.

Photo 8- Example of sparse ground cover; Searched Area 3; June 2018.

The third most common plant was the common running cedar (*Diphasiastrum digitatum*), which did not exclude other plants and Indian cucumber root was found growing among it in two colonies in Searched Area 5 (Figure 1). Searched Areas of absent or sparse groundcover were very limited on the study site. Absent groundcover was only observed in pine stands. The area marked as suitable habitat on Figure 1 is the only area that had sparse groundcover (Photo 9).

Small Whorled Pogonia prefers habitats with sparse to absent groundcover in the immediate vicinity of the plant, with the notable exception of certain fern species.

The relative high density of groundcover observed on the study site, except in the areas noted above, is not consistent with the preferences of the Small Whorled Pogonia.

References: Merhoff 1989, Montgomery 2014, Sperduto & Congalton 1996, USFWS 1992

+ Coarse Woody Debris

Fallen trees and limbs were moderately abundant throughout the study site. There were very few locations where coarse woody debris could not be found within 50 feet. However, loggers have left behind many smaller trees within the forest's perimeter, and dozens of trees have fallen naturally from the forest edges and into the interior of the forest.

The presence of decaying vegetation may be very important indirectly to the Small Whorled Pogonia. It is often found in nutrient poor soils, and decaying vegetation may be a food source for symbiotic mycorrhizal fungi that Small Whorled Pogonia is strongly associated with. It is usually found within 3 feet of a major decaying item (i.e. logs or stand dead timber) in Virginia colonies. The amount of decaying coarse wood debris on the study site is not inadequate, and near-future supply of decomposing logs will likely benefit Small Whorled Pogonia.

References: Brumback & Fyler 1983, Grimes 1921, Rock-Blake *et al* 2017, USFWS 1992, Ware 2000

+ Leaf Litter / Duff Layer

Leaf litter was usually thin, ranging from 1 to 3 inches in thickness. Bare ground absent of coarse leaf litter was not encountered in any notable frequency. The duff layer of decomposing organic matter immediately below the leaf litter was relatively thick at a minimum of 2 inches and up to 4 inches.

Similar to the importance of coarse woody debris in the previous habitat component, Small Whorled Pogonia usually prefers areas covered with leaf litter, but it is not uncommon for patches of bare soil to be present in the vicinity and it may be required for germination. The duff layer is an important stratum for retaining moisture, which directly benefits Small Whorled Pogonia. Although the amount of leaf litter on the study site is thin, the thickness of the duff layer appears to be adequate for the Small Whorled Pogonia.

References: Brumback & Fyler 1983, Grimes 1921, Rock-Blake *et al* 2017, USFWS 1992, Ware 2000

+ White-Tailed Deer Activity

Droppings from white-tailed deer (*Odocoileus virginianus*) were routinely encountered throughout the study site during the April site visit. During the June site visit deer were seen on several occasions browsing on the vegetation in the

clear-cut areas. No conclusive evidence of browsing in the forested areas were observed.

Grazing by white-tailed deer is a primary threat to some populations of Small Whorled Pogonia in Virginia. The following are general indicators of deer activity: hoof prints, scat, bedding areas, antler rub lines, and the bite marks on defoliated vegetation. It is possible the recent clear cutting has created abundant food sources from the tender new growth of regenerating vegetation. Colonies of Small Whorled Pogonia may avoid predation by deer because of the abundant food sources that are better alternatives to browsing in areas with sparse herbaceous vegetation.

References: Brumback *et al* 2011, USFWS 1992, Ware 1991, Ware 2000

CONCLUSION

Table 1- Summary of Habitat Component Ratings

+ Positive Indicators	O Neutral Indicators	– Negative Indicators
	Historic Land Use	
	Current Anthropogenic Disturbances	
Topography		
	Soils	
	Age of Trees	
Composition of Trees		
	Canopy Openings	
Composition of Understory		
	Understory Density	
Composition of Ground Cover		
		Groundcover Density
Coarse Woody Debris		
Leaf Litter / Duff Layer		
White-Tailed Deer Activity		
7 Total	**6 Total**	**1 Total**

For this assessment, a total of 7 out of 14 (50%) positive habitat components were identified by the habitat assessment and survey. The remaining 50% of habitat components were ranked as either negative or neutral and do not align with known Small Whorled Pogonia habitat (Table 1). Some of the assessed habitat components are considered to be more important to the Small Whorled

Pogonia than others. Specifically, persistent canopy openings, low understory and groundcover density, and an abundant amount of decaying vegetation (essential to the Small Whorled Pogonia symbiotic mycorrhizal fungi) are considered to be critical components in determining the presence of Small Whorled Pogonia.

There are several habitat components that were rated as negative, or partially consisted of negative factors, for the study site (Table 1) that are typically listed as habitat requirements for the Small Whorled Pogonia. Canopy openings and an open understory are important characteristics that allow sunlight to reach Small Whorled Pogonia on the forest floor are only present in patches on the study site. A primary characteristic of suitable habitat is an absent to sparse groundcover density. This habitat component was infrequently encountered on the study site, and when groundcover density was low, it seldom coexisted with other habitat requirements. These habitat components contribute the most to the general lack of suitable habitat on the study site.

Delineation of suitable Small Whorled Pogonia habitat in the field generally followed patches that were flat or gently sloping with an absent or minimal understory and ground cover layers, and areas with noticeably greater sunlight reaching the forest floor. Patches were excluded in areas that were: densely shaded by American Hollies in the understory; pine trees dominating the canopy layer or leaf litter; and areas that are now exposed to direct sunlight as a result of recent clear-cutting. These considerations were factored into the one suitable habitat patch shown on Figure 1 in the southwest corner of the property.

The descriptions below are used to categorize the habitats on the study site:

1. **Low-quality habitat** areas are defined as areas that have little or no potential to support Small Whorled Pogonia due to one or more unfavorable characteristics, such as: treeless areas; patches comprised of a very young forest canopy; dense shrub/sapling or understory vegetation; dense groundcover (with exceptions); forests dominated by pines; very steep slopes; or wet soil conditions. Habitats that show these characteristics are initially considered “low-quality” unless most other habitat parameters are favorable for the species.
2. **Medium-quality habitat** areas provide conditions approaching the favorable conditions for Small Whorled Pogonia in Virginia, as described in the literature, but are lacking a critical positive habitat component.
3. **High-quality habitat** areas provide conditions similar to those described for typical Small Whorled Pogonia colonies in Virginia. Chief among the factors considered as optimal habitat characteristics are: a sparse to absent ground cover (with exceptions); open shrub layer; canopy openings that allow sunlight to reach the forest floor; abundant decaying coarse woody debris (i.e. stand dead timber, fallen logs), and specific plant species typically indicative of suitable habitat or are otherwise associated with Small Whorled Pogonia.

Based on all the factors evaluated in this habitat assessment, it is the author's opinion that the study site consists of equal ratios of low- and medium-quality habitat. Many areas that were surveyed would have a very low likelihood of supporting Small Whorled Pogonia. The medium-quality areas typically lacked more than one of the primary habitat components.

Only one 0.5 acre patch was determined to have suitable habitat (Photo 10) that approached a “high-quality” habitat designation, which is shown on Figure 1 within Searched Area 3 of the surveyed areas.

Photo 10- Suitable habitat; Searched Area 3; June 2018.

This particular patch had many positive indicators of suitable habitat consistent with Small Whorled Pogonia colonies in Virginia and throughout the species range, including:

- Topography- relatively flat
- Age of Trees- maturing hardwoods
- Composition of Trees- oaks and red maple
- Canopy Openings- abundant dappled light with some moderate sized openings
- Composition of Understory- red maple and sourwood
- Understory Density- very sparse and consisting of very few species
- Composition of Ground Cover- 47 stems of large whorled pogonia, 15 Pink Lady Slipper, Partridge Berry
- Groundcover Density- sparse to moderate density
- Coarse Woody Debris- fallen limbs and trunks were rated as high
- Leaf Litter / Duff Layer- the thickest of the study site, 4 inches of leaf litter and 2 inches of duff.
- White-Tailed Deer Activity- no evidence encountered

Disclaimer

Small Whorled Pogonia on the site may be dormant (underground) and undetectable by conventional survey methods during the time of the site visits. Subsequent surveys may locate Small Whorled Pogonia that were previously dormant.

Prepared by:

Kory Steele
USFWS Certified Small Whorled Pogonia Surveyor
File # sec 7-3568 - September 28, 2005
697 Hogan Drive
Newport News, Virginia 23606
Mobile: (757) 880-3948
colchicine@gmail.com

LITERATURE CITED

Brumback, W. E., S. Cairns, M. B. Sperduto, and C. W. Fyler. 2011. Response of an *Isotria medeoloides* Population to Canopy Thinning. Northeastern Naturalist. 18(2):185-196.

Brumback, W.E., & C.W. Fyler. 1983. Monitoring Study of *Isotria medeoloides* in East Alton, New Hampshire. Unpublished report, New England Wildflower Society, Inc., Framingham, Massachusetts, 23 pp.

Mehrhoff, L.A. (1989). The dynamics of declining populations of an endangered orchid, Isotria medeoloides. Ecology, 70(3), 783-786.

Montgomery, A.D. 2014. Predicting threatened orchid (*Isotria medeoloides* [Pursh] Raf.) habitat in the southern Appalachian region using Maxent model. Western Carolina University. 93pp. (master's thesis)

Rock-Blake, R., M.K. McCormick, H.E.A. Brooks, C.S. Jones, and D.F. Whigham. 2017. Symbiont abundance can affect host plant population dynamics. Am. J. Bot. 104(1):72-82.

Sperduto, M. B., & R.G. Congalton. 1996. Predicting rare orchid (small whorled pogonia) habitat using GIS. Photogrammetric Engineering & Remote Sensing, 62(11), 1269–1279.

U.S. Fish and Wildlife Service. 1992. Small Whorled Pogonia (*Isotria medeoloides*) Recovery Plan, First Revision. Newton Corner, Massachusetts. 75pp.

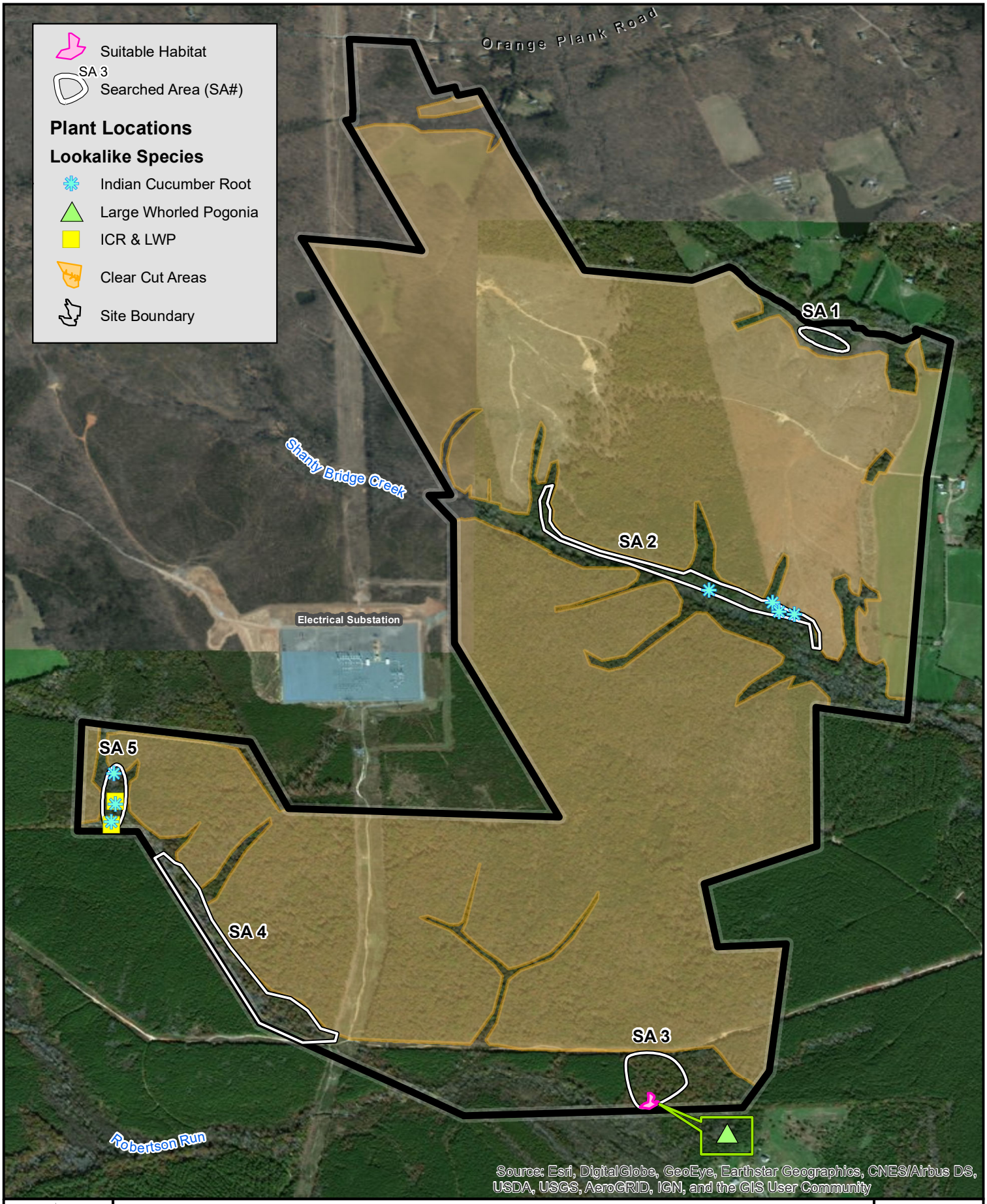
U.S. Fish and Wildlife Service. 2007. Small Whorled Pogonia (Isotria medeoloides) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, New England Office: Concord, New Hampshire.

Van Alstine, N.E., W.H. Moorhead III, A. Belden, Jr., T.J. Rawinski, J.C. Ludwig. 1996. Recently Discovered Populations of Small Whorled Pogonia (*Isotria medeoloides*) in Virginia. Banistera. 7:5-7pp.

Ware, D.M.E. 1991. Small Whorled Pogonia. *in* K. Terwilliger, ed. Virginia's Endangered Species, Proceedings of a Symposium. McDonald and
Woodward Publishing Company, Blacksburg, Virginia. Pages 95-97.

Ware, D.M.E. 2000. A Recovery Plan for the Small Whorled Pogonia at Fort A.P. Hill. Unpublished report. 106pp.

White, D.J. 1998. Update COSEWIC Status Report on the Small Whorled Pogonia *Isotria medeoloides* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1-6pp.



N

0 500 1,000
Feet

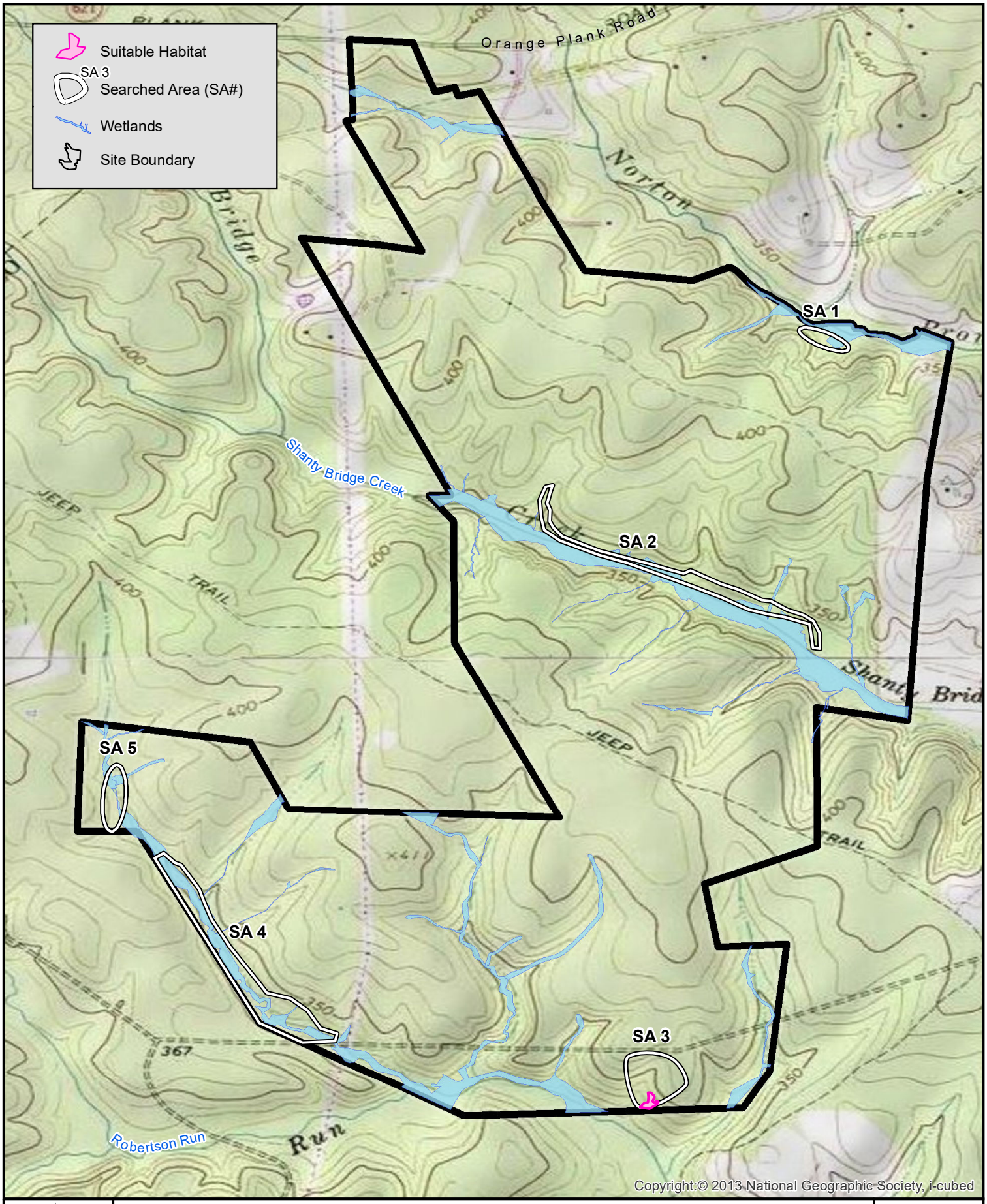
LOCATIONS OF SUITABLE HABITAT & SIMILAR PLANTS

Small Whorled Pogonia Survey

Spotsylvania Solar Energy Center, Spotsylvania, Virginia

Kory Steele | colchicine@gmail.com | 757-880-3948 | June 14, 2018

Figure 1



N

0 500 1,000
Feet

TOPOGRAPHY AND WETLANDS

Small Whorled Pogonia Survey

Spotsylvania Solar Energy Center, Spotsylvania, Virginia

Kory Steele | colchicine@gmail.com | 757-880-3948 | June 14, 2018

Figure 2

Appendix A

United States Department of Agriculture

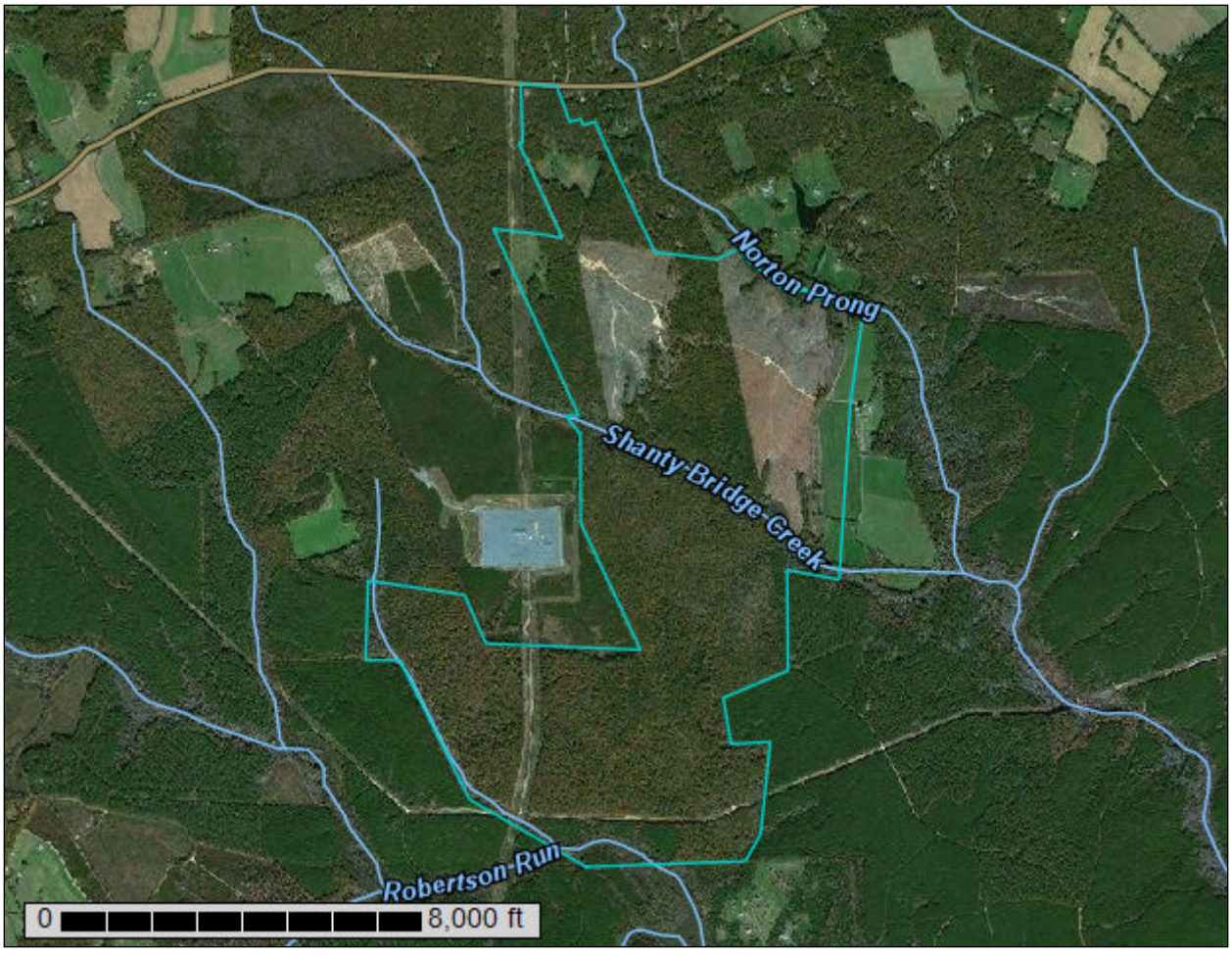
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

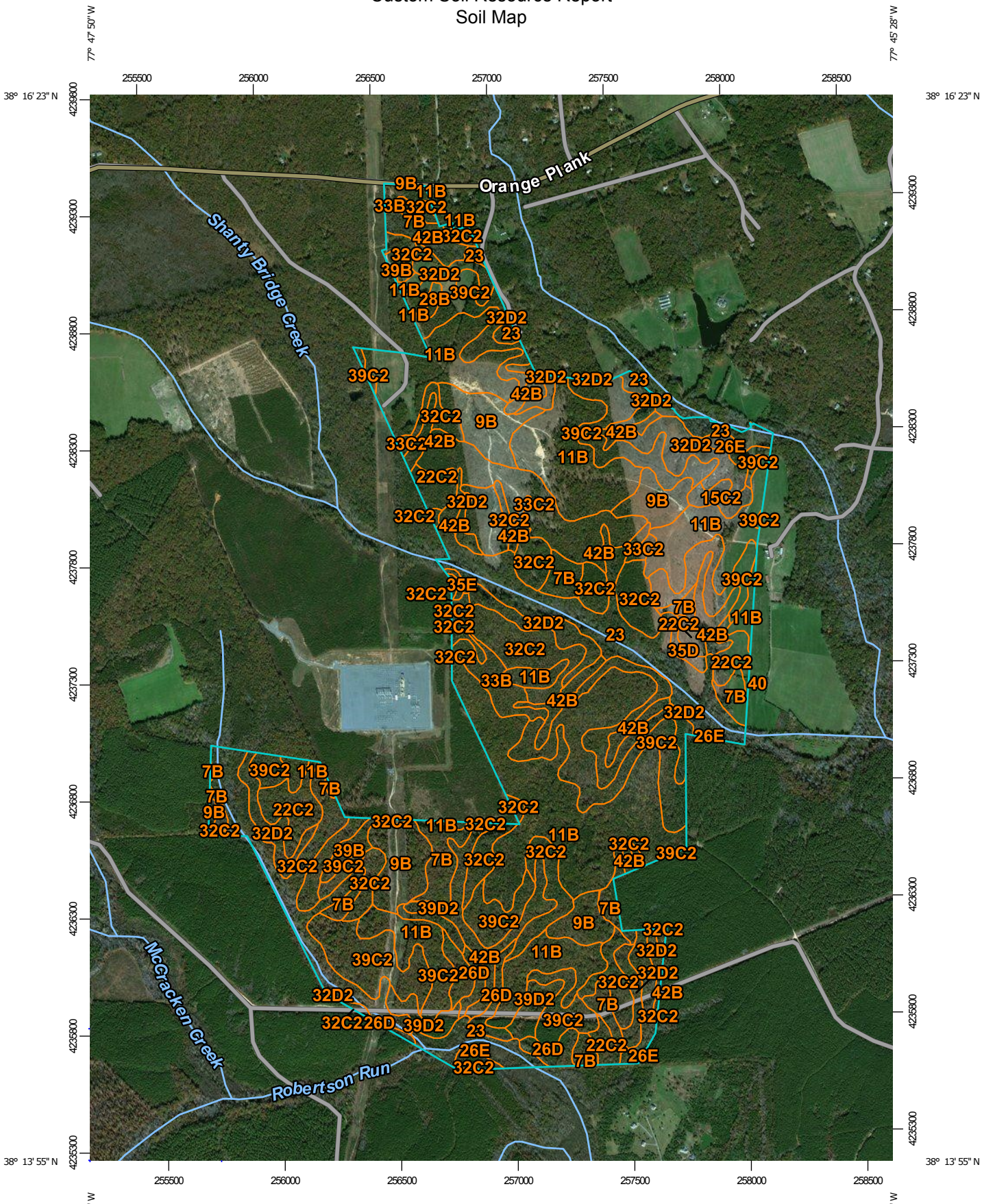
Custom Soil Resource Report for Spotsylvania County, Virginia

Note: The original soil report is 88 pages. An abridged version with only relevant maps and soil characteristics is presented here.



April 19, 2018

Custom Soil Resource Report
Soil Map



Map Scale: 1:22,200 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 300 600 1200 1800

Feet: 0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

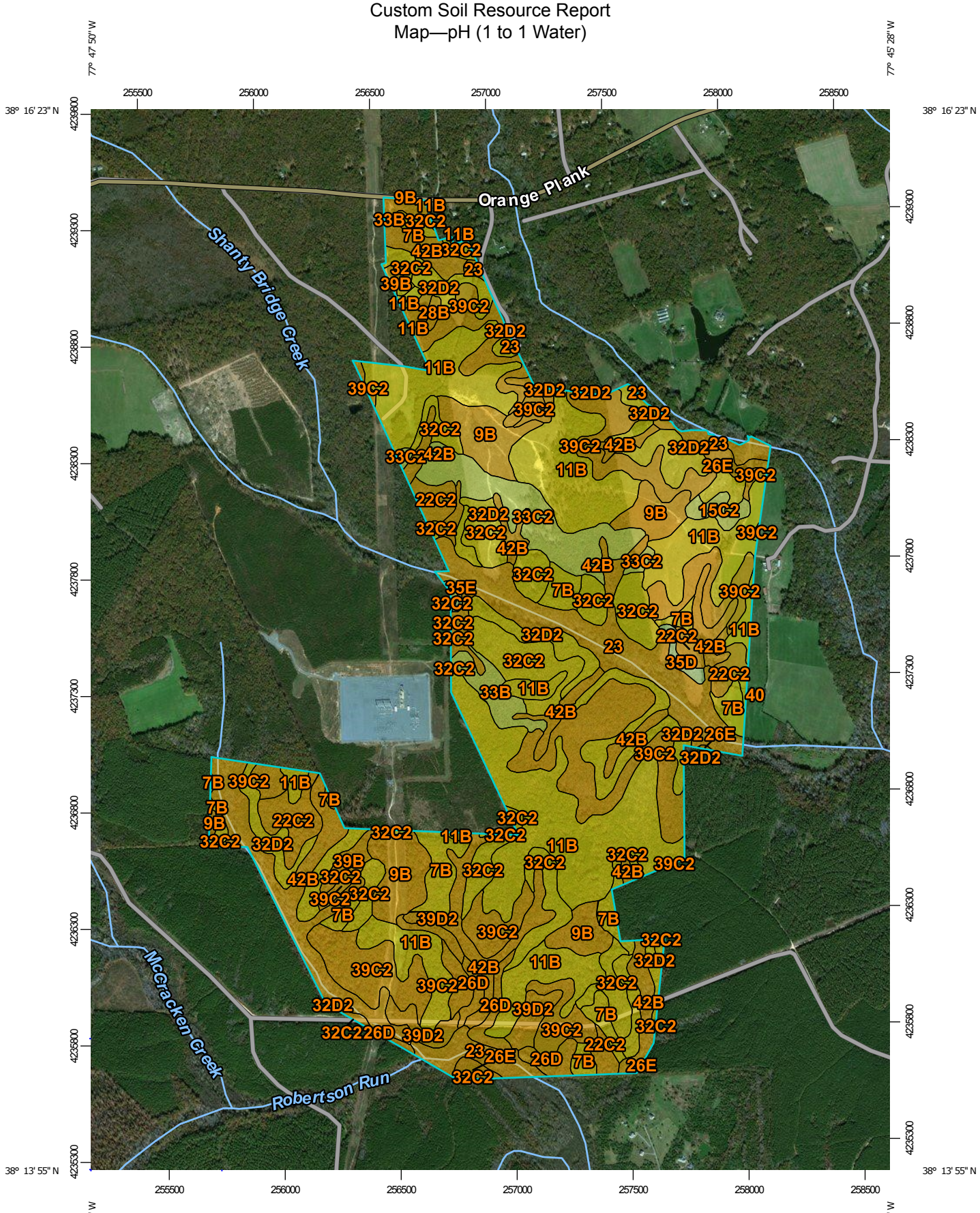
This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Spotsylvania County, Virginia
Survey Area Data: Version 11, Oct 5, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 15, 2012—Mar 10, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.


77° 47' 50" W
77° 45' 28" W
38° 16' 23" N
38° 13' 55" N
255500
256000
256500
257000
257500
258000
258500
4239800
4239300
4238800
4238300
4237800
4237300
4236800
4236300
4235800
4235300
Orange Plank
Shanty Bridge Creek
McCracken Creek
Robertson Run
9B 11B 33B 32C2 7B 11B 42B 32C2 32C2 23 39B 32D2 11B 28B 39C2 11B 32D2 23 11B 39C2 32D2 32D2 23 39C2 32D2 32C2 9B 39C2 42B 23 33C2 42B 32D2 11B 26E 39C2 22C2 32D2 33C2 9B 15C2 32C2 32C2 11B 39C2 42B 42B 33C2 32C2 35E 7B 39C2 32C2 32C2 32C2 32C2 7B 11B 32C2 32D2 22C2 42B 23 32C2 35D 22C2 33B 11B 40 42B 7B 42B 32D2 26E 39C2 32D2 7B 39C2 11B 7B 7B 9B 22C2 32C2 32C2 11B 32C2 11B 32C2 32D2 11B 39B 32C2 42B 9B 7B 32C2 32C2 39C2 39C2 32C2 7B 39D2 7B 11B 9B 39C2 32C2 32D2 39C2 42B 11B 39C2 26D 32C2 42B 32D2 26D 39D2 7B 39C2 32C2 32C2 26D 39D2 22C2 23 26E 26D 7B 26E 32C2
Map Scale: 1:22,200 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 300 600 1200 1800
Feet
0 1000 2000 4000 6000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Ultra acid (ph < 3.5)
- Extremely acid (pH 3.5 - 4.4)
- Very strongly acid (pH 4.5 - 5.0)
- Strongly acid (pH 5.1 - 5.5)
- Moderately acid (pH 5.6 - 6.0)
- Slightly acid (pH 6.1 - 6.5)
- Neutral (pH 6.6 - 7.3)
- Slightly alkaline (pH 7.4 - 7.8)
- Moderately alkaline (pH 7.9 - 8.4)
- Strongly alkaline (pH 8.5 - 9.0)
- Very strongly alkaline (pH > 9.0)
- Not rated or not available

Soil Rating Lines

- Ultra acid (ph < 3.5)
- Extremely acid (pH 3.5 - 4.4)
- Very strongly acid (pH 4.5 - 5.0)
- Strongly acid (pH 5.1 - 5.5)
- Moderately acid (pH 5.6 - 6.0)
- Slightly acid (pH 6.1 - 6.5)
- Neutral (pH 6.6 - 7.3)
- Slightly alkaline (pH 7.4 - 7.8)
- Moderately alkaline (pH 7.9 - 8.4)
- Strongly alkaline (pH 8.5 - 9.0)
- Very strongly alkaline (pH > 9.0)
- Not rated or not available

Soil Rating Points

- Ultra acid (ph < 3.5)
- Extremely acid (pH 3.5 - 4.4)
- Very strongly acid (pH 4.5 - 5.0)
- Strongly acid (pH 5.1 - 5.5)
- Moderately acid (pH 5.6 - 6.0)
- Slightly acid (pH 6.1 - 6.5)
- Neutral (pH 6.6 - 7.3)
- Slightly alkaline (pH 7.4 - 7.8)
- Moderately alkaline (pH 7.9 - 8.4)
- Strongly alkaline (pH 8.5 - 9.0)
- Very strongly alkaline (pH > 9.0)
- Not rated or not available

Water Features

- Streams and Canals

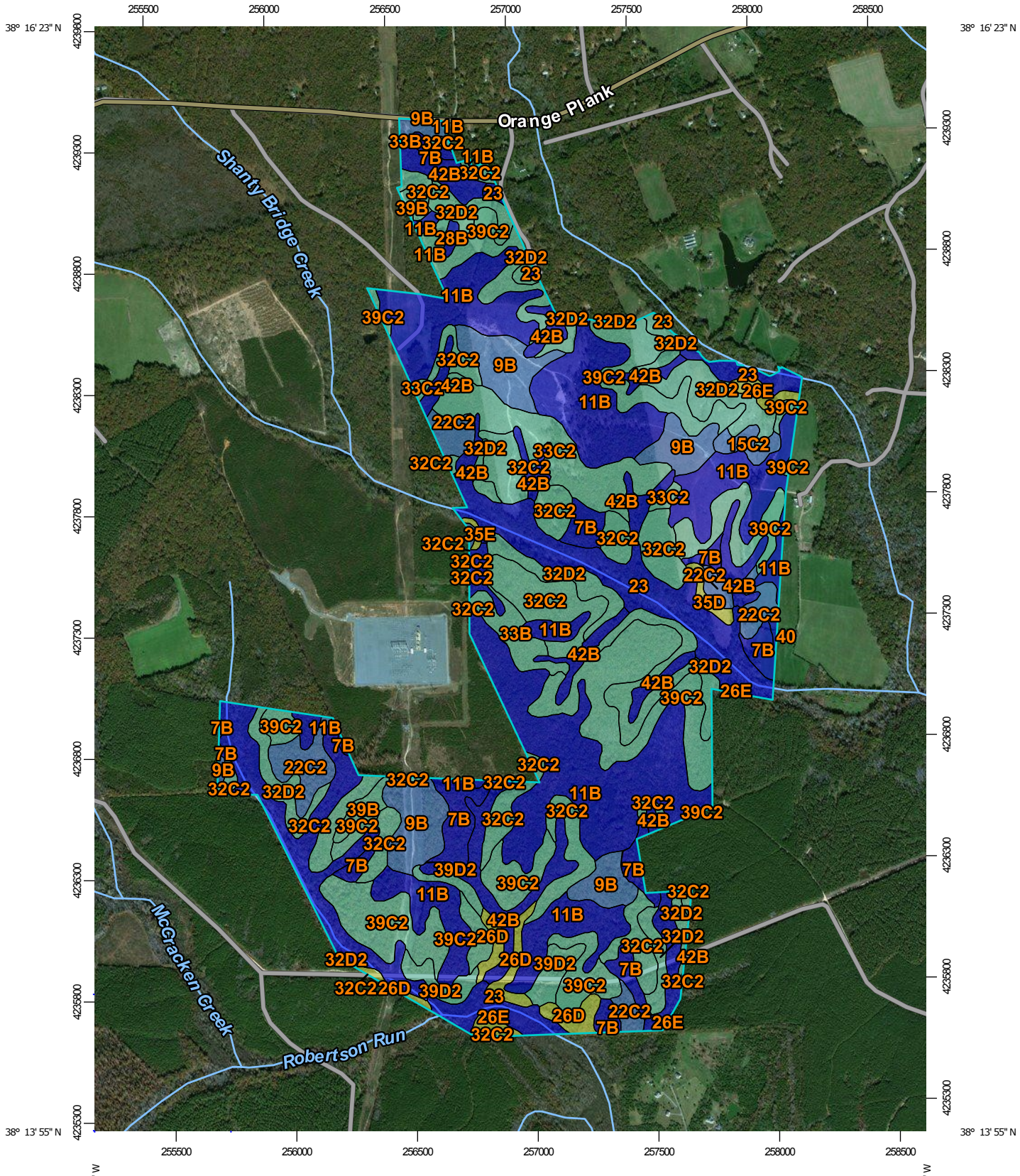
Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

Custom Soil Resource Report
Map—Depth to Any Soil Restrictive Layer



Map Scale: 1:22,200 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 300 600 1200 1800

Feet: 0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Date(s) aerial images were photographed: Apr 15, 2012—Mar 10, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Soil Report Summary

Dominate soil in each of the search areas (Figure 1), with relevant soil characteristics.

Area 1

Map Unit Symbol: **32D2**
Texture: Silt Loam
pH 5.5 strongly acidic
Slope: 15 to 25 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water: Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.3 inches)

Area 2

Map Unit Symbol: **23**
Texture: Sandy Loam
pH 5.0 very strongly acidic
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water: Moderately low to very high (0.06 to 19.98 in/hr)
Depth to water table: About 0 to 36 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.5 inches)

Area 3

Map Unit Symbol: **7B**
Texture: Loam
pH 5.3 strongly acidic
Slope: 2 to 7 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water: Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 12 to 36 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: High (about 10.2 inches

Soil Report Summary

Area 5

Map Unit Symbol: **42B**
Texture: Silt Loam
pH 4.6 very strongly acidic
Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water: Very low to moderately high (0.00 to 0.57 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: High (about 10.0 inches)