

# Flag Ponds Comparative Habitat Study: 1990 to 2015/2016

Directed and Edited by  
Karyn Molines, Chief  
Calvert County Natural Resources Division

Compiled by Mary and Gordon Burton

With the technical assistance of  
Calvert County Technology Services, and  
Heather Quinn, Maryland Geological Survey

## And Volunteers:

Wilpers, Michael

Willette, Joseph

Stasz, Jim

Sierra, Mary Stuart

Sarvis, Pam

Salo, Matt

Miller, Elizabeth

Metzger, Joe

Makrakis, Chris

Marckel, Vicki

Markhan, Roseanne

Kladitis, Gale

Knight, Alex

Hollister, Lindsay

Ford, Josh

Davis, Matt

Casimer, Ritchie

Brewer-Pecson, Dorothy

Bravo, Cynthia

Barnhart, Cindy

And other one-time participants in the 2015 habitat surveys

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# I. Introduction to a General Comparison of Flag Ponds Habitat Surveys of 1990 and 2016

In 1990 Calvert County Department of Planning and Zoning contracted with John Hench, PhD. to study the natural resources and habitat of the Flag Ponds area.<sup>1</sup> The objective of the study was to give a general picture of the Flag Ponds habitat by the development of maps as well as a *permanent* survey of the plants of thirty randomly selected sites based on a 500-foot grid interval. Fifteen upland sites above 25 feet elevation (designated B) and 15 coastal sites less than 25 feet elevation (designated A) were surveyed. Appendix D is a general map of Flag Ponds showing the distribution of the 1990 sites. The thirty permanent sites were marked with either metal tree tags or six foot metal stakes. These habitat site studies included a 10 meter radius study of trees, a 4 meter square plot shrub study located SE of the center site of the tree survey, and two 1 square meter herbaceous plot studies located at the northeast and southwest corners of the 4 meter square. (For more details see Hench's Report, p. 4). A copy of this report is available online from the Government Printing Office at "<https://www.gpo.gov/fdsys/pkg/CZIC-qk63-h46-1990/html/CZIC-qk63-h46-1990.htm>".

The objective of the 2016 volunteer conducted survey, initiated by Karyn Molines, Calvert County Natural Resources Division Chief, was much less extensive. The goal was to simply find the original thirty sites and to do a cursory evaluation of the change or lack of change in the habitats.

It must be noted that many changes have occurred in mapping technology in the intervening 26 years. Earlier maps were based on the Maryland State Grid, which has been updated over the years. The North American Datum 27 (NAD 27) was supplanted in 1986 by NAD 83 using improved data, with a five-year overlap designated for transition. The 1990 Report does not designate which Grid was used. However, using the original 1990 survey map and property boundaries, Calvert County Technology Services updated the site locations to meet 2016 standards, (assuming the NAD 83 Plane Grid) and to provide geographic coordinates for the original survey grid. The question of which Base was used was resolved in early 2018 when a contract survey was conducted for the northeast coast of Flag Ponds in preparation for "The Living Shoreline Project" for erosion control. At the south end of the adjoining community of Long Beach, a survey stake was emplaced and an old Maryland Geological Survey (MGS) Benchmark was found 45 feet away. Contact with MGS resulted in the determination that the 1990 survey was based on NAD 27, while the 2015 computed points assumed NAD 83. As a result the 2015 computed points (NAD 83) are not an accurate conversion of the 1990 NAD 27 points. In 2018 using Corpscon software the 1990 sites were properly converted to NAD 83 values, and then compared to the 2015 calculated data. Longitude variances were generally less than 10 feet, while latitudes were mostly less than 25 feet, with only a few exceptions. The data clearly prove that the 2016 generalized field observations for each site were in the proximity of the intended 1990 permanent plots.<sup>2</sup> A copy of computations is included as Appendix B. Presumably, the 1990 survey points were generally found in the field via study of terrain, compass coordinates and topographic maps.

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<sup>1</sup> Hench, John, "Natural Resources Mapping and Studies of Floristic and Physiognomy at Flag Ponds Natural Area, Calvert County, Maryland," December 24, 1990

<sup>2</sup>This would not be valid for the detailed 10 meter plot studies in Appendix A.

For this report, information was collected using a Garmin GPSMap 64st unit, as well as the original 1990 maps. Volunteers attempted to find the original sites as determined by these calculated Lat/Long coordinates based on the 2015 NAD 83 computations. The 1990 intended locations were generally determined within 10 feet, and a 2-foot rebar wrapped in aluminum tape was placed with an embossed tag attached.

In this current study listings of Herbaceous and Woody plants are followed by site-by-site descriptions which provide maps, pictures, and 1990/2016 survey comparisons. Also included are discussions of Environmental and Habitat changes. Appendix A summarizes the supplementary 10-Meter surveys conducted by Karyn Molines in 2015-2016.

## **II Listing of Herbaceous and Woody Plants found at Flag Ponds in 1990 and 2013-2017**

## II A. Herbaceous Plants

Legend: Red: entry of concern or significance. \* Non-native \*\*Non-native invasive

	COMMON NAME	1990 PLOTS	2016 PLOTS	2016 ALTERNATE PLOTS	Observations Not in Plots
<i>Achillea borealis</i> (formerly <i>A. millefolium</i> )*	American Yarrow				2014
<i>Allium</i> sp.	Wild Garlic	A/K6, B/E6, B/I10		B/E6	2013-16
<i>Ammophila breviligulata</i>	American Beachgrass				1990
<i>Andropogon virginicus</i>	Broomsedge bluestem				2013-16
<i>Antennaria</i> sp.	Pussytoes				2014
<i>Aplectrum hyemale</i>	Puttyroot				2013-16
<i>Aquilegia canadensis</i>	Wild/ Red Columbine				2014
<i>Arisaema atrorubens</i> (Currently combined with <i>A. triphyllum</i> )	Jack-in-the-pulpit	B/C5			
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	B/C5			2013-16
<i>Arisaema</i> sp.	Indian Turnip/ Jack in the pulpit	B/C6, B/E6, B/F3, B/F4, B/I8		B/H9	
<i>Asplenium platyneuron</i> (Erroneously called <i>Athyrium platyneuron</i> in 1990)	Ebony spleenwort	B/F4			2014
<i>Aster</i> sp.	Aster	B/B5, B/C5, B/C6, B/E6, B/F3, B/F4, B/I10, B/J10		B/H10	2013-16
<i>Barbarea verna</i> *	Early Yellow Rocket or Early Wintercress				2013
<i>Boehmeria cylindrica</i>	Small spiked False Nettle				2013-16
<i>Botrychium</i> sp.	Grapefern				2014
<i>Botrypus virginianus</i>	Rattlesnake fern				2014
<i>Caltha palustris</i> (This may be an error in ID)	Marsh marigold	B/C6, B/H10			
<i>Cardamine concatenata</i> Formerly <i>Dentata laciniata</i>	Cut leaf toothwart				2014

Cardamine diphylla Formerly Dentata Dentata diphylla. This is a more common plant north of the Coastal Plain. It is not common to Flag Ponds whereas C. concatenate is. Hench may have miscalled this plant.	Broadleaf or Two leaf toothwart	B/F3, B/F4, B/I8			
Cardamine hirsuta*	Hairy Bittercress				2014
Cardamine pennsylvanica	Pennsylvania Bittercress				2013
Carex blanda	Eastern Woodland Sedge				2014
Carex pennsylvanica	Pennsylvania Sedge				2014
Carex sp.	Sedge	A/K8, B/H7	B/E5	B/H9	2015
Cenchrus tribuloides	Dune sandbar				1990
Ceratophyllum demersum	Honewort	B/B5			
Chimaphila maculata	Striped wintergreen		A/K8		2013-16
Claytonia virginica	Virginia springbeauty				2013-16
Conyza canadensis (formerly Erigeron canadensis)	Horseweed				
Cryptotaenia canadensis	Canadian honewort / Wild chervil	B/C6			
Decodon verticillatus	Swamp loosestrife / Water willow				2014
Dendrolycopodium obscurum (formerly Lycopodium obscurum)	Flat-branched Tree Clubmoss/ Groundpine	B/H9			
Dennstaedtia punctilobula	Eastern Hayscent Fern				2013-16
Hyloscymum nudiflorum (formerly Desmodium nudiflorum)	Naked-leaved tick-trefoil	B/C5, B/E6			
Dichanthelium clandestinum	Deertongue				2013-16
Dicentra cucullaria	Dutchman's Breeches				2014
Digitaria sp.	Crabgrass				1990

Diodia teres	Buttonweed/ Poorjoe				1990
Duchesnea indica*	Indian strawberry				2013
Equisetum sp.	Scouring rush/ Horsetail	B/B5			2014
Eupatorium sp,	Thoroughwort/ Boneset	A/J7, B/H10			
<b>Euphorbia maculata (1990)/ E. nutans is Eyebane, E. maculata is Spotted sandmat</b>	/ Spotted sandmat/ Eyebane (1990)				1990
Fragaria virginiana	Wild strawberry	B/I10			2015
Galearis spectabilis	Showy orchis	B/C5			2014
Galium aparine	Cleavers				2014
Galium circaezans	Licorice bedstraw	B/C5, B/H7, B/I8, B/I10			
Galium sp.	Cleavers bedstraw	A/K6, A/K8, B/B5, B/F3, B/F4, B/I8			
Geum canadense	White avens				2013
Hibiscus moscheutos	Crimson-eyed Rose mallow	A/G2, A/G4, A/H3, A/H4, A/J7			2013-16
Hydrocotyle umbellata	Many flowered Marsh Pennywort				2014
Impatiens capensis	Spotted touch-me-not	B/B5, B/C6			
Iris versicolor	Harlequin Blue flag iris				2014
Juncus effusus	Soft rush				2013
Krigia sp.	Dandelion		A/J5	B/H10	2013-16
<b>Lathyrus japonicus (not found in MD Plant Atlas)</b>	Beach pea				1990
Leersia oryzoides	Rice cutgrass				2014
Lemna minor	Common duckweed	A/K7			
<b>Lemna trisulca S1 State listed species</b>	Star duckweed	A/G2, A/G4, A/H3, A/H4, A/I5, A/J7, A/J8	A/G4?, A/H3?		
Lemna sp.	Duckweed	A/G2, A/G4, A/H4	A/G4		2014
Luzula multiflora	Common Woodrush				2014
Marchantia sp. (probably M. Polymorpha as it is the only one listed in MD)	Liverwort				2014
Menispermum canadense	Canada moonseed	A/K6			2013-16



Micranthes virginiana (formerly Saxifrage virginiana)	Small-Early Saxifrage				2014
Microstegium vimineum**	Japanese stiltgrass				2013-16
Mitchella repens	Twin-berry/ Partridgeberry	A/K9, B/E5, B/F4, B/F5, B/J10	B/E5, B/F5 (near), B/J10	B/H9	2013-16
Myosotis macrosperma S3S4	Largeseed Forget-me-not				2014
Nabalus sp. (formerly Prenanthes sp.)	Rattlesnake root (formerly Wild Lettuce)				2014
Onoclea sensibilis	Sensitive fern				2014
Osmorhiza claytonii	Sweet Cicely				2013-16
Oxalis dillenii (formerly O. stricta)	Slender Yellow Woodsorrel				2014
Oxalis violacea	Violet Woodsorrel				2014
Oxalis sp.	Wood-sorrel	B/F4			
Peltandra virginica	Green Arrow Arum				2014
Perilla frutescens**	Beefsteak plant				2014
Persicaria maculosa (formerly Polygonum persicaria)*	Spotted Lady's Thumb	B/B5			
Persicaria sagittata (formerly Polygonum sagittatum)	Arrow-leaved Tearthumb				2014
Persicaria virginiana (formerly Polyganum virginiana and Tovara virginiana)	Jumpseed (formerly called Virginia jumpseed or Virginia knotweed)	B/B5, B/C6			1990
Phegopteris hexagonoptera	Broad Beech Fern				2014
Phragmites australis**	Wild reed	A/G2, A/J5	A/G2, A/G4, A/H3, A/J8. A/K7		2013-16
Pilea sp. (check for species, P. fontana is S3, P. pumila is not)	Clearweed				2013-16
Podophyllum peltatum	May-apple	B/B5, B/C5, B/E6, B/F3, B/I8			2013-16

Polystichum acrostichoides	Christmas fern	B/E6, B/F3, B/H7, B/J10	B/E5, B/F4, B/F5. B/H7, B/J10	2013-16
Potentilla canadensis	Dwarf Cinquefoil			2014
Ranunculus abortivus	Little leaved buttercup (formerly Kidney-leaved crowfoot/ Kidney leaved buttercup)	B/C5, B/F3		2014
Ranunculus hispidus var. hispidus (1990 survey was R.septentrionalis . Now a subspecies of R. hispidus)	Hispid Buttercup (formerly Swamp buttercup/			1990
Ranunculus sp.	Buttercup	B/B5, B/C6, B/H9		
Salvia lyrata	Lyre-leaved Sage			2014
Sanguinaria canadensis	Bloodroot			2014
Sanicula sp.	Snakeroot / Sanicula			2015
Saururus cernuus	Water dragon/ Lizard's Tail	B/B5, B/C6		2014
Scirpus sp.	Bulrush			1990
Sisyrinchium sp	Blue eyed grass			2014
Solidago sp.	Goldenrod			2013
Sporobolus sp.	Dropseed			1990
Stellaria media*	Common chickweed			2013-16
Stellaria sp.	Chickweed		B/H10	2016
Symphyotrichum urophyllum (formerly Aster sagittifolius)	White Arrow-leaved aster	B.J10		2016
Symplocarpus foetidus	Skunk cabbage	B/B5, B/C6	B/B5, B/C6	
Taraxacum officinale*	Common dandelion		B/E5	2013-16
Tipularia discolor	Cranefly orchis		B/F5, B/J10	2013-16
Triodanis perfoliata	Clasping Venus Looking Glass			2014
Typha angustifolia	Narrow-leaved cattail	A/G4, A/H3, A/J7		
Typha latifolia	Broad-leaved cattail/ Common cattail	A/J7		
	Unknown fern		B/I8	
	Unknown SAV		A/H3	
Uvularia sessilifolia	Sessile -leaved Bellewort			2014

Verbascum thapsus**	Common Mullein				2013-16
Viola sp.	Violet	A/K9, B/B5, B/C5, B/C6, B/H8, B/I10, B/J10	B/C6		
Viola labradorica (formerly V. conspersa)	Alpine Violet/ American Dog Violet	B/E6, B/I10, B/J10			
Viola pubescens	Downy Yellow Violet				2014
Viola rotundifolia	Round-leaved yellow violet	B/F3			
Viola sp.	Violet	A/K9, B/B5, B/C5, B/C6, B/H8, B/I10, B/J10	B/C6		2014
Xanthium sp.*	Cocklebur				1990

## II B. Woody Plants

Legend: Red: Entry of concern or significance. \* Non-native. \*\* Non-native, invasive

LATIN NAME *= Non-native **= Invasive	COMMON NAME	1990 PLOTS	2016 PLOTS	2016 ALTERNATE PLOTS	Observations Out of Plots
<i>Acer rubrum</i>	Red Maple	A/G2, A/H4, A/I5, A/I6, A/I7, A/J7, A/J8, B/B5, B/C5, B/C6, B/E5, B/E6, B/F4, B/F5, B/H7, B/H8, B/H9, B/H10, B/J10	A/G2?, A/G4, A/I5, A/I7, B/B5, B/C6, B/F4, B/F5, B/H7, B/H9, B/I8, B/J10	B/E6	
<i>Acer saccharinum</i>					2013-16
<i>Ailanthus altissima</i> **	Tree of heaven				2013
<i>Amelanchier</i> sp.	Shadbush	B/E5, B/H8			
<i>Aralia spinosa</i>	Devil's walking stick				2014
<i>Asimina triloba</i>	Pawpaw	A/K8, B/B5, B/C6, B/E6, B/F3, B/F4, B/F5, B/H7, B/H10, B/I8	A/I7, B/B5, B/F4, B/F5	B/E6	2013-16
<i>Berberis bealei</i> (formerly <i>Mahonia bealei</i> )*	Leatherleaf Mahonia or Barberry				2014
<i>Berberis thunbergii</i> **	Japanese Barberry				2013-16
<i>Betula nigra</i>	River birch				2014
<i>Campsis radicans</i>	Trumpet Creeper	A/J8, A/K6, B/C6, B/H8			
<i>Carpinus caroliniana</i>	American Hornbeam	B/B5, B/C5, B/C6, B/E5, B/E6, B/F3, B/F4, B/H7, B/H9, B/I10, B/J10	B/B5, B/C5, B/F4	B/E6, B/H7, B/H10	2013-16
<i>Carya cordiformis</i>	Bitternut hickory				2014
<i>Carya</i> sp.	Hickory sp.	B/H9	A/K8, A/K9		
<i>Carya glabra</i>	Pignut Hickory	B/C5, B/F4, B/F5, B/H7, B/H8, B/J10	B/F4, B/F5?		
<i>Celtis occidentalis</i>	Hackberry				2013-16

<i>Cephalanthus occidentalis</i>	Button Bush	A/G4, A/J7			2014
<i>Cercis canadensis</i>	Redbud			A/K8	2015
<i>Chamaecyparis thyoides</i>	Atlantic white cedar				2013-16
<i>Cornus amomum</i>	Silky Dogwood				2014
<i>Cornus florida</i>	Flowering Dogwood	A/K6, B/B5, B/E5, B/E6, B/F3, B/F4, B/F5, B/H7, B/H8, B/H9, B/H10, B/I8, B/I10, B/J10	A/J5, B/B5, B/H7	B/E6, B/F3	2013-16
<i>Cornus stolonifera</i>	Red Osier	A/I5	A/I5?		
<i>Diospyros virginiana</i>	Common Persimmon	A/K9, B/H10	A/I5, A/K9, B/C6		2013-16
<i>Euonymus americanus</i>	Strawberry Bush	A/K9, B/H9	B/C5	B/E6	2013-16
<i>Fagus grandifolia</i>	Beech	A/K8, A/K9, B/C5, B/C6, B/E5, B/E6, B/F3, B/F4, B/F5, B/H7	A/K9, B/C5, B/F4, B/F5, B/H7	B/E6, B/F3, B/H10	2013-16
<i>Fraxinus pennsylvanica</i>	Green Ash	A/H4, A/I5, A/I6, A/I7, A/J7, A/J8, A/K6, A/K7, A/K9, B/B5, B/C6, B/F3	A/G2?, A/I7?, A/J5?, A/K6?, B/B5, B/C6		
<i>Fraxinus</i> sp.	Ash				2013-16
<i>Ilex opaca</i>	American Holly	B/B5, B/C5, B/E5, B/E6, B/F5, B/H7, B/H8, B/H9, B/H10, B/I8, B/I10, B/J10	A/I5, A/J5, A/K8, A/K9, B/B5, B/C5, B/E6, B/F4, B/F5, B/H8, B/H9, B/I8, B/I10, B/J10	B/E6	2013-16
<i>Ilex verticillata</i>	Winterberry (Referred to as Black Alder in 1990 report)	A/I7	A/I7		2016
<i>Juglans nigra</i>	Black Walnut				2013-16
<i>Juniperis virginiana</i>	Red Cedar	A/K9	A/I5, A/K9, B/H10, B/J10	B/H10	2013-16
<i>Kalmia latifolia</i>	Mountain Laurel	B/H7	B/B5, B/C5		2013-16
<i>Lindera benzoin</i>	Spicebush	A/K9, B/B5, B/C5, B/C6, B/I8, B/I10	A/K9?, B/C5		2013-16

Liquidambar styraciflua	Sweetgum	A/H4, A/I5, A/I6, A/I7, A/J7, A/J8, A/K6, A/K8, A/K9, B/B5, B/C5, B/C6, B/E5, B/E6, B/F3, B/F4, B/F5, B/H7, B/H8, B/H9, B/H10, B/I8, B/I10, B/J10	A/I7, A/K8, A/K9, B/C5	B/F3	2013-16
Liriodendron tulipifera	Tulip Tree	B/B5, B/C5, B/E5, B/F3, B/F4, B/F5, B/H7, B/H8, B/H9, B/H10, B/I8, B/I10, B/J10	B/B5?, B/C5, B/F4, B/F5(near), B/H7, B/I10, B/J10	B/E6	2013-16
Lonicera japonica**	Japanese Honeysuckle		A/K8, A/K9, A/I7, B/F4	B/H10	
Morella cerifera (formerly Myrica cerifera)	Wax-myrtle	A/J7, A/K6, A/K8, A/K9	A/G2?, A/I5?, A/J5, A/J7, A/K6, A/K8, A/K9, A/L9		
Nyssa sylvatica	Black Gum	A/J7, A/J8, A/K6, A/K8, A/K9, B/C5, B/C6, B/E5	A/K6, A/K8, A/K9, B/C5?		2013-16
Ostrya virginiana, may be mistaken for Carpinus caroliniana	Ironwood	B/H9			
Parthenocissus quinquefolia	Virginia Creeper	A/K6, B/H8, B/I8		B/H9	
Paulownia tomentosa*	Princess tree				2013-16
Pinus sp.			A/L9		
Pinus rigida	Pitch Pine	A/K8, A/K9			
Pinus strobus	Eastern White Pine				2013
Pinus taeda	Loblolly Pine	A/K6, A/K8, A/K9, B/H7, B/H9, B/H10, B/I8	A/K8, A/K9, B/E5, B/H7, B/I8		2013-16
Pinus virginiana	Virginia Pine	B/E5, B/F5, B/H9, B/H10	A/K8, A/K9, B/E5, B/H7, B/I8	B/E5(logs)	2015
Platanus occidentalis	Sycamore	A/I7, A/K8	A/K8, A/K9, B/E5, B/H7, B/I8		
Populus deltoides	Eastern Cottonwood				2014
Prunus serotina	Black Cherry			B/H10	1990, 2015

Prunus virginiana	Choke Cherry	B/B5, B/E5, B/E6, B/F3, B/F4, B/F5, B/H7, B/H8, B/H9, B/H10, B/I8, B/I10, B/J10		B/E6	2015
Quercus alba	White Oak	B/F5, B/H7	B/F5, B/H7?		2013-16
Quercus falcata	Spanish Oak/ Southern Red Oak	A/K9, B/E5, B/F4, B/F5, B/H8	A/K8?, A/K9?, B/F4, B/F5		2013-16
Quercus marilandica	Black Jack Oak	A/K8			
Quercus michauxii	Swamp Chestnut oak				2013
Quercus muehlenbergii	Chinkapin Oak				2014
Quercus phellos	Willow Oak				1990
Quercus prinus	Chestnut Oak	B/C5, B/F5, B/H7	B/C5?, B/F5?, B/H7?		2015
Quercus rubra	Red Oak	B/E6, B/F3, B/F4, B/F5, B/J10	B/F4, B/F5, B/J10	B/E6, B/F3	2013-16
Quercus sp.	Oak	B/H9			2015
Rhus copallina	Winged Sumac or Dwarf Sumac	A/K8			
Toxicodendron radicans (formerly Rhus radicans)	Poison Ivy	A/J8, A/K6, B/C6, B/H8	A/K8, A/K9, B/C6		2013-16
Robinia pseudo-acacia	Black Locust	B/H9			2013-16
Rosa palustris	Swamp rose				2013-16
Rosa sp.	Rose				2013-16
Rubus phoenicolasius*	Japanese Wineberry		B/I8, B/J10	B/H9, B/H10	2013-16
Rubus sp.	Blackberry				2013-16
Salix nigra	Black willow	A/J7			
Sambucus canadensis	Common Elder				1990
Sassafras albidum	Sassafras	B/F5, B/H7, B/H8, B/H9			2013-16
Smilax bonanox S3 State watch list	Saw Greenbrier				2013-16
Smilax glauca	Glaucus Greenbrier				2013-16

Smilax rotundifolia	Common Greenbrier	A/J8, B/C6, B/F5, B/H8, B/H9, B/H10, B/I8	A/I5, B/F5, B/I8		2013-16
Smilax sp.	Greenbrier		A/I7, A/J5, A/K8, A/K9, B/J10	B/H10	
Ulmus americana	American Elm	A/I6, A/I7, A/K8, B/B5			
Ulmus rubra	Slippery Elm			B/E6, A/K9	1990, 2013-16
Ulmus sp.	Elm				2015
Vaccinium corymbosum	Highbush Blueberry	B/H9			
Vaccinium sp.	Blueberry				2015
Viburnum acerifolium	Maple-leaved Viburnum	B/C5, B/E5, B/E6, B/F4, B/H8		B/E6	
Viburnum prunifolium	Blackhaw	A/J7, B/H7			
Vitis vulpina	Frost Grape or Winter Grape				2013
Vitis sp.	Grape	A/K8		B/H9	2014



**Site Descriptions of 2016 Survey**

**A. Coastal Sites (pp. 16-49)**

**B. Upland Sites (pp. 50-94)**

**(With Maps, Pictures, Comparisons, and Plant Lists)**

**(Based on 2015 NAD 83)**



**Site Description (Date Located 4/8/2016):**

Site is located 47 feet east of the shore line in the Bay, and is indicated by a marker pole at the beach-vegetation edge. Access from both north and south is very difficult due to the many downed and washed up trees along the shore. Route requires climbing over many downed trees to get there, with access from the south taking up to 1 1/2 hours. Closer access is from the north, but still difficult, and should only be attempted at low tide. A general review of the near vicinity indicated no correlation with the 1990 plant survey, as the coast line has retreated westward in excess of 100 feet since that time. What was woodlands in 1990 is now downed trees, or, in many cases, still standing dead tree trunks. Comparative pictures taken just the previous year illustrate the dynamic erosion still taking place, with a large downed tree extending into the Bay totally disappearing.

G2 Species (Herbaceous)	1990	2016	2016 alt.
<i>Hibiscus moscheutos</i>	X		
<i>Lemna sp.</i>	X		
<i>Lemna trisulca</i>	X		
<i>Phragmites australis</i>	X	X	

G2 Species (Trees, Shrubs, & Vines)	1990	2016	2016 alt.
<i>Acer rubrum</i>	X	?	
<i>Fraxinus sp.</i>		?	
<i>Morella cerifera (formerly Myrica cerifera)</i>		?	

A/ G2

Latitude: 38 27.411N  
Longitude -76 27.818W



1990 - 2016 Grid Site

Views from Grid Point 4/8/2016



View North

View West



View South



4/8/16

View East

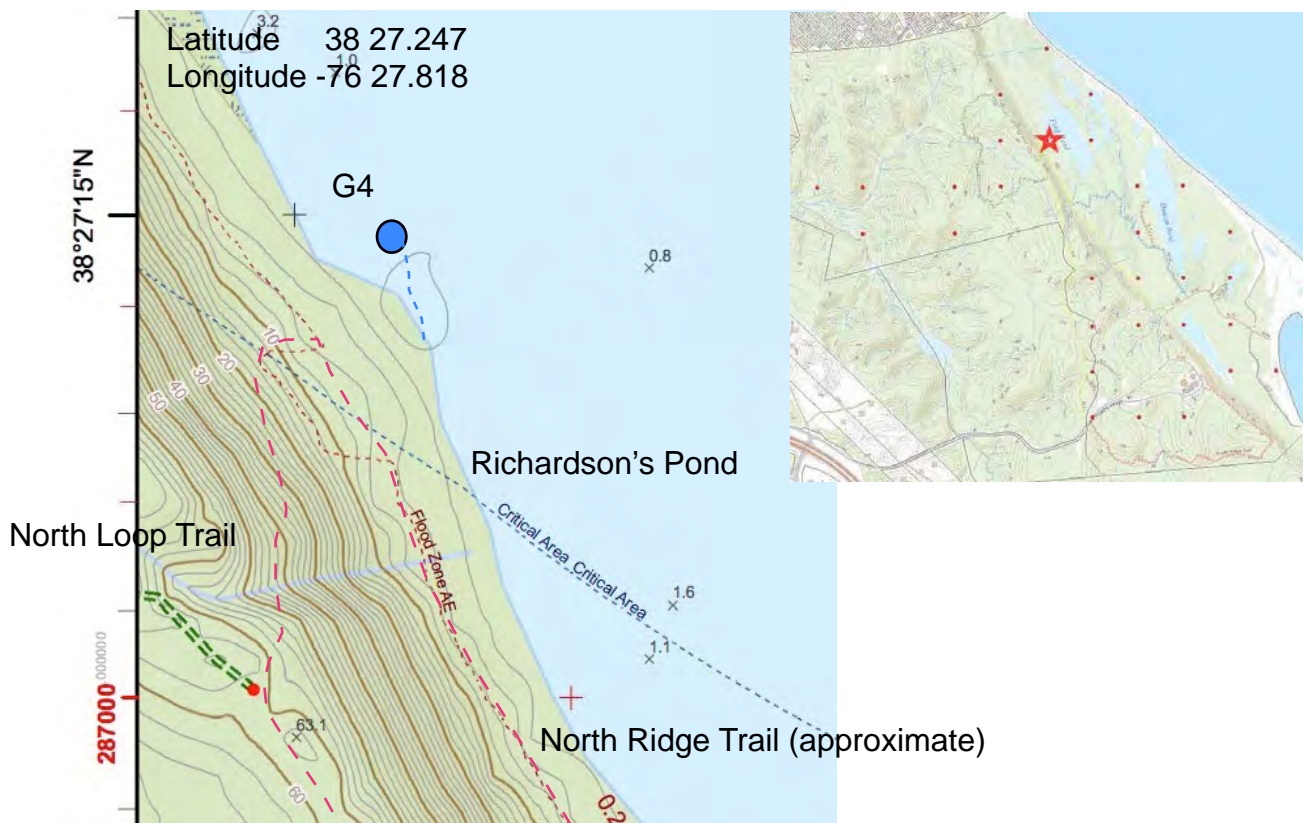


3/13/15



Tree downed on beach is gone  
by 2016

A/G4 (1990-2016 Site)



**Site Description (Dates Located 3/16/2015, 3/6/2016):**

Follow the lower path of North Ridge Trail to its northern limit where it then ascends the cliff. Continue along the shoreline to its closest approach to Richardson's Pond. The site lies 90 feet east in the pond and is inaccessible. Using Google Earth to evaluate previous base maps, all have shown the site to be in a pond. In 2015 Karyn Molines conducted a 10-meter square habitat plot at the pond's edge. This survey data is not included here.

Habitat listed for 2016 as viewed through binoculars:

G4 Species (Herbaceous)	1990	2016	2016 alt.
<i>Hibiscus moscheutos</i>	X		
<i>Lemna sp</i>	X	X	
<i>Lemna triscula</i>	X	?	
<i>Phragmites australis</i>		X	
<i>Typha angustifolia</i>	X		

G4 Species (Trees, Shrubs, & Vines)	1990	2016	2016 alt.
<i>Cephalanthus occidentalis</i>	X		
<i>Acer rubrum</i>		X	

A/G4 Latitude: 38 27.247N  
Longitude -76 27.818W

1990 - 2016 Grid Site

View East from Marker Post at closest trail approach 3/6/2016



## A/H3 (1990-2016 Site)



### Site Description (Date Located 4/8/2016):

Site is located just west of the first dune on open sand at the north end of a pond. To the south an eagle's nest can be seen in the furthest visible tree line. Access from both north and south is very difficult due to the many downed and washed up trees along the shore. Route requires climbing over many downed trees to get there, with access in either direction taking up to 1 hour, to be attempted only at low tide. A general review of the near vicinity indicated a poor correlation with the 1990 plant survey as the coast line has been heavily eroded since the original 1990 survey. Comparative pictures taken on 3/13/2015 illustrate the dynamic erosion/deposition taking place.

Despite the extraordinary changes occurring along the coast, H3 represents one of the more compatible sites in plant life when compared with the 1990 survey. There were no woody plants listed in the 1990 survey and none were found in 2016. The original survey listed three herbaceous plants, *Hibiscus moscheutos*, *Lemna triscula* and *Typha angustifolia*. Neither the *Hibiscus*, nor the *Typha* were found in 2016; however there was an apparent *Lemna* species along the edges of the pond. (Identification was not determined.) Two major changes should be noted. First, the 1990 stake may have been located in the pond itself. Second, and related is the abundant presence of *Phragmites australis* which dominates the site and apparently was not present in 1990. (It must also be noted that the only herbaceous plants listed in 1990 were within the one meter squares and the survey may have therefore simply ignored the presence of *Phragmites*.)

<b>H3 Species (Herbaceous)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Hibiscus moscheutos</i>	X		
<i>Lemna triscula</i>	X	?	
<i>Typha angustifolia</i>	X		
<i>Phragmites australis</i>		X	
Unknown SAV		X	

<b>H3 Species (Trees, Shrubs, &amp; Vines)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
None	X	X	

A/H3 Latitude: 38 27.329N  
Longitude -76 27.719W



1990 - 2016  
Grid Site

Views from  
Grid Point  
4/8/2016



View North



View West



View East



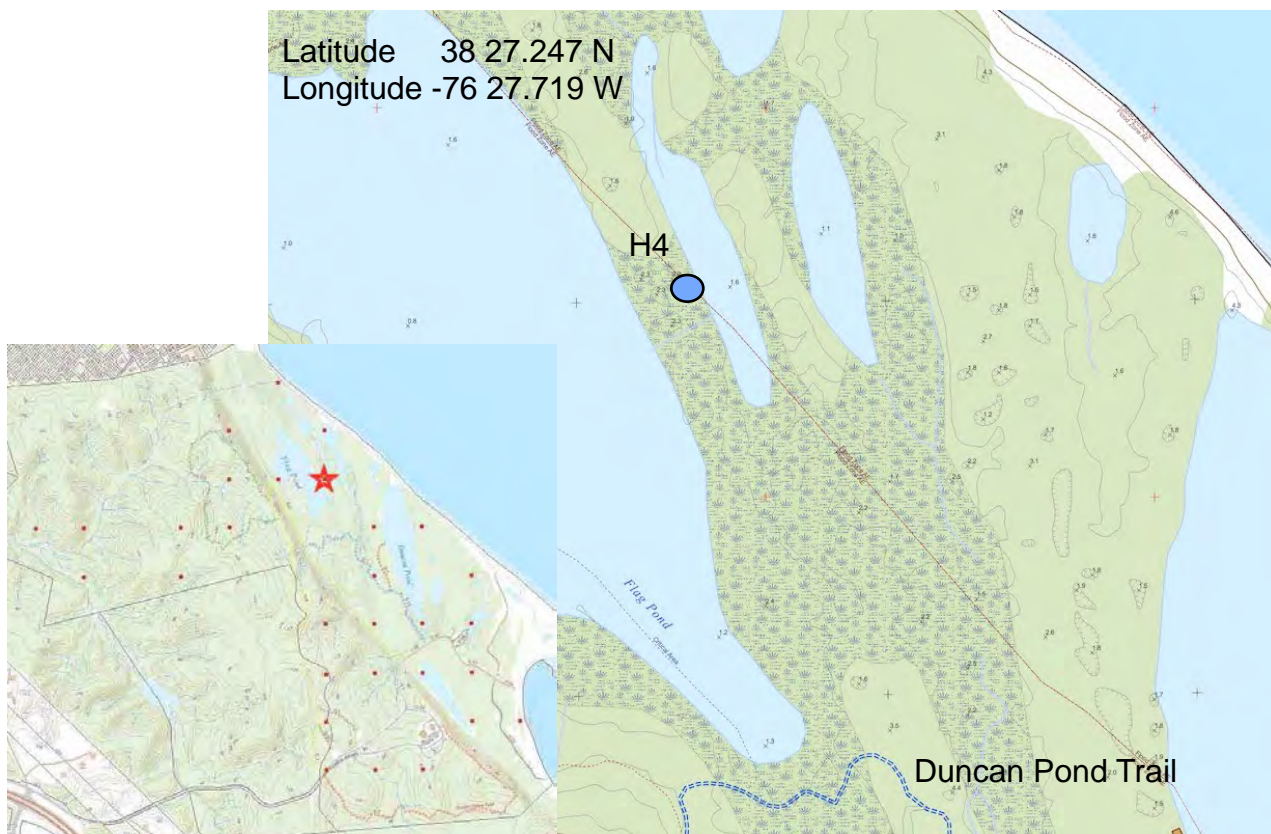
View South 4/8/16



View South 3/13/15



A/H4 (1990-2016 Site)



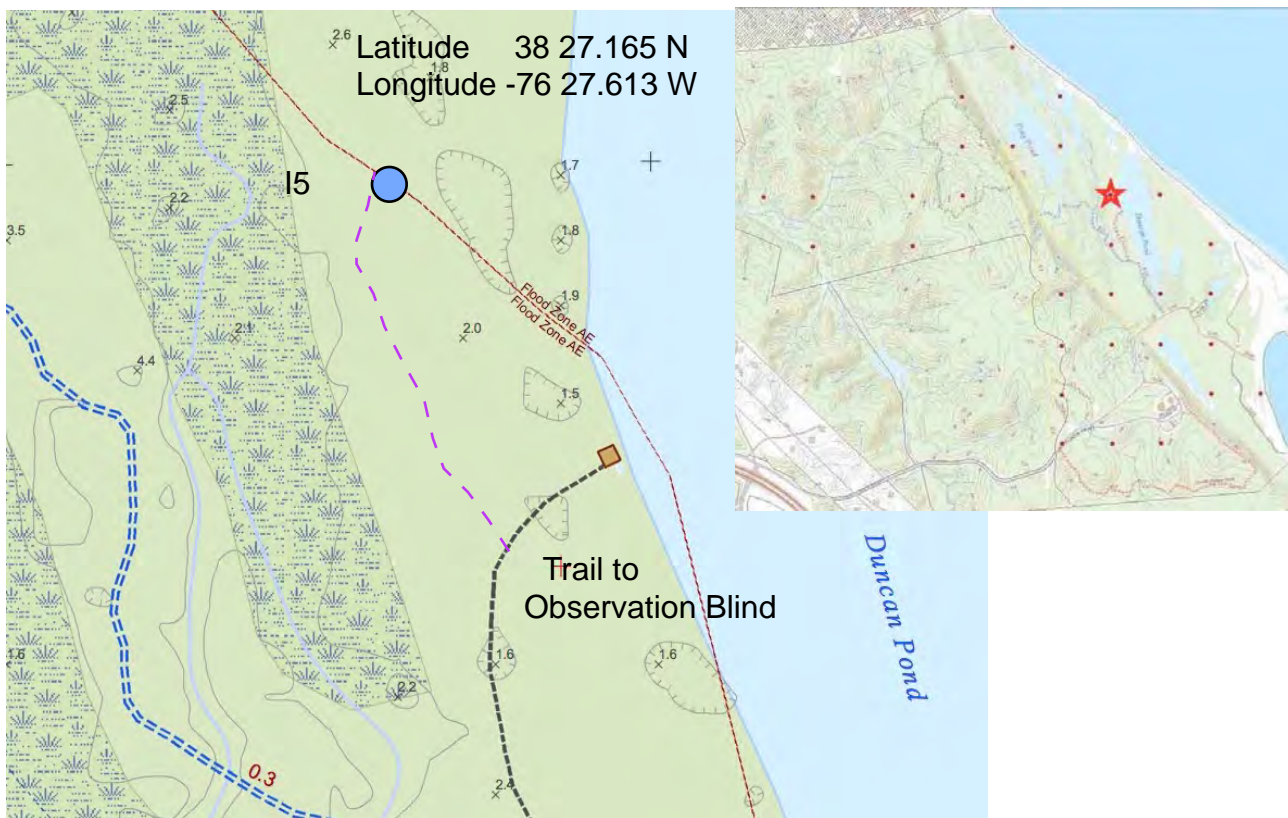
**Site Description (Date Located 2015-2016):**

After repeated reconnaissance over two years from all directions, the site remains unaccessible. It is surrounded by ponds, dense undergrowth, and impenetrable walls of *Phragmites* (which did not exist in 1990). Using Google Earth to evaluate previous base maps, all have shown the site to be on land, and not in a pond.

H4 Species (Herbaceous)	1990	2016	2016 alt.

H4 Species (Trees, Shrubs, & Vines)	1990	2016	2016 alt.

A/I5 (1990-2016 Site)



**Site Description (Date Located 3/5/2016):**

Site is located about 200 feet northwest of the observation blind on Duncan Pond. Just west of blind, follow narrow deer trail northward roughly paralleling Duncan Pond. Stake lies a few feet west of deer trail. Route is through heavy brush and greenbrier. A general review of the near vicinity indicated no correlation with the 1990 plant survey.

I5 Species (Herbaceous)	1990	2016	2016 alt.
<i>Lemna triscula</i>	X		

I5 Species (Trees, Shrubs, & Vines)	1990	2016	2016 alt.
<i>Acer rubrum</i>	X	X	
<i>Cornus stolonifera</i>	X	?	
<i>Diospyros virginiana</i>		X	
<i>Fraxinus pennsylvanica</i>	X		
<i>Ilex opaca</i>		X	
<i>Juniperus virginiana</i>		X	
<i>Liquidambar styraciflua</i>	X		
<i>Morella cerifera</i> (formerly <i>Myrica cerifera</i> )		?	
<i>Smilax rotundifolia</i>		X	

A/I5  
Latitude: 38 27.165N  
Longitude -76 27.613W



1990 - 2016 Grid Site  
Views from Grid Point 3/6/2016



View North



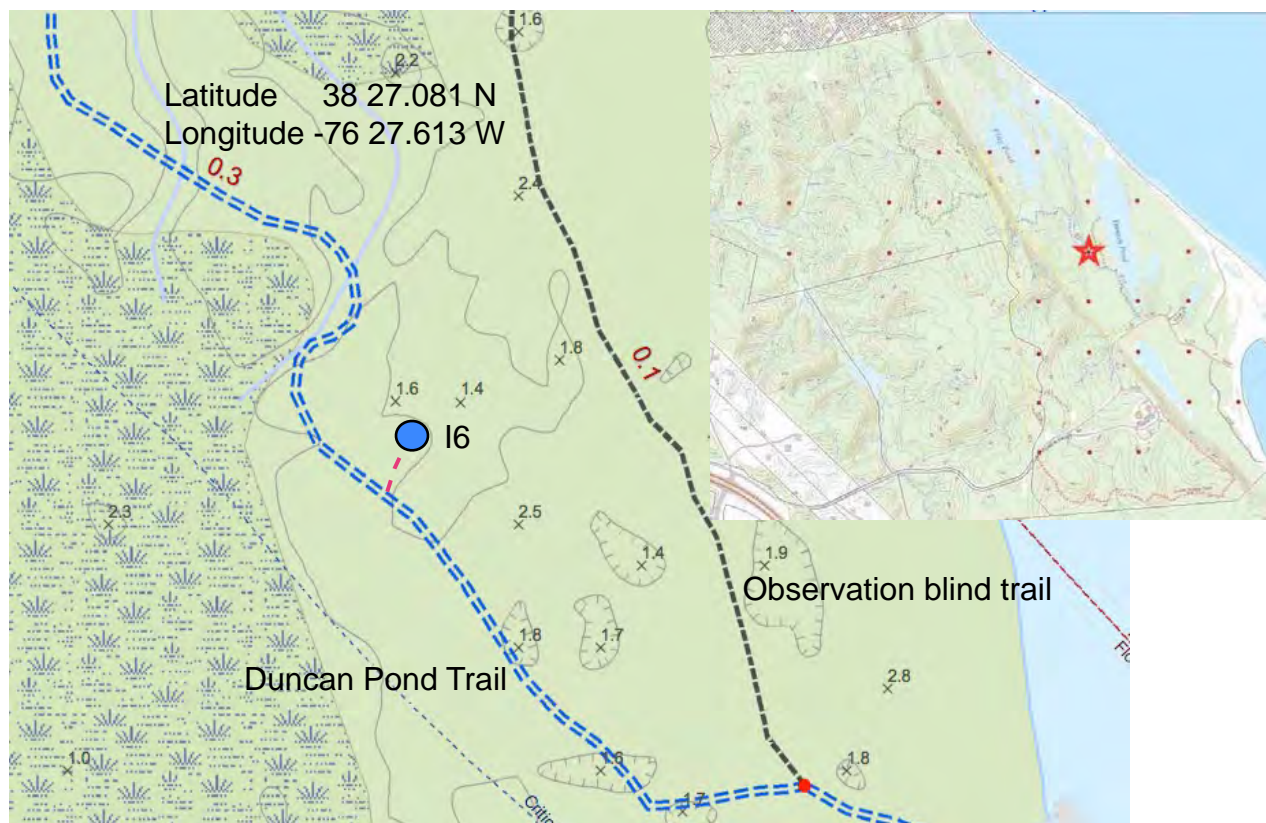
View West



View East

View South





**Site Description (Date Located 2/21/16):**

Follow Duncan Pond Trail past the junction with the path to the observation blind. The site lies about 17 feet north of the trail surrounded by dense greenbrier. Due to lateness of day, habitat was not surveyed. In 2015 Karyn Molines conducted a 10-meter square habitat plot in the vicinity of this site. The data from that survey are not included in this report. There are no other data available.

I6 Species (Herbaceous)	1990	2016	2016 alt.
None	X	X	

I6 Species (Trees, Shrubs, & Vines)	1990	2016	2016 alt.
<i>Acer rubrum</i>	X		
<i>Fraxinus pennsylvanica</i>	X		
<i>Liquidambar styraciflua</i>	X		
<i>Ulmus americana</i>	X		

A/16  
Latitude: 38 27.081N  
Longitude -76 27.613W



1990 - 2016 Grid Site  
Views from Grid Point (2/21/2016)



View North



View West

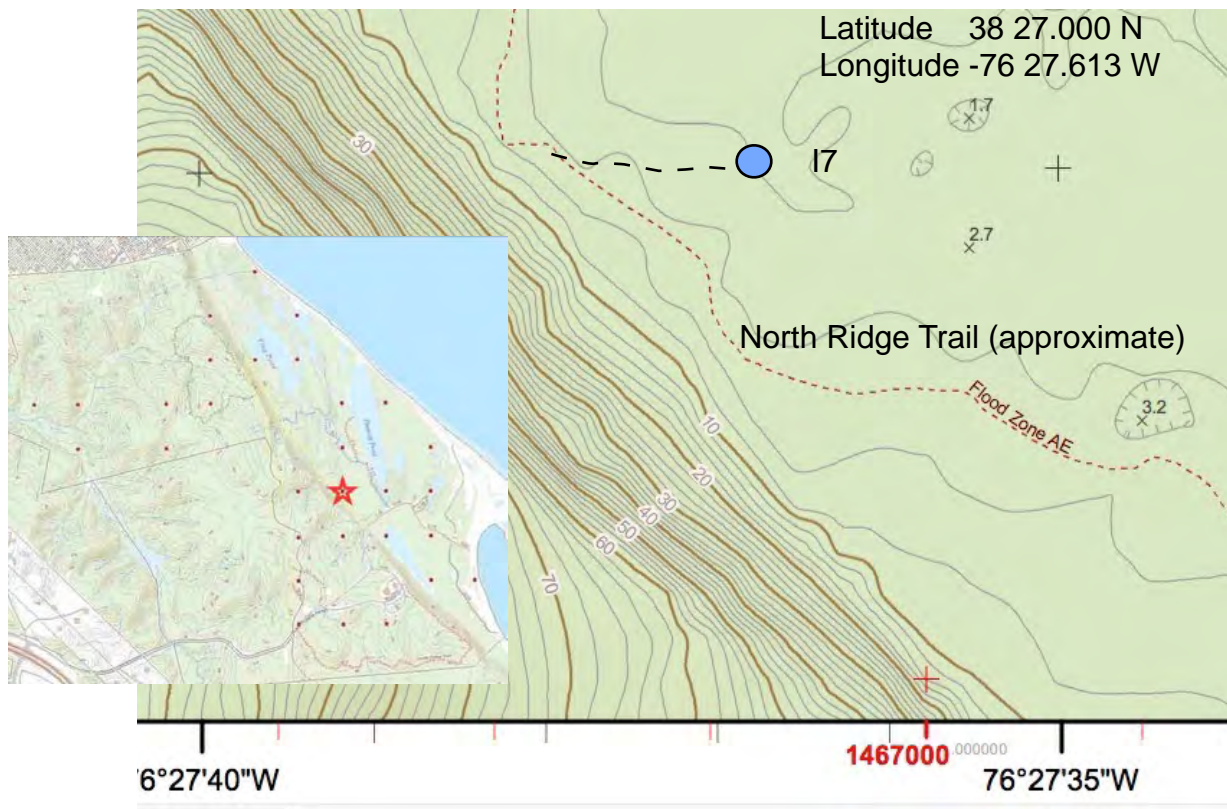


View East

View South



A/I7 (1990-2016 Site)



**Site Description (Dates Located: 3/16/2015-3/6/2016):**

Follow lower North Ridge Trail to a sharp bend a bit south of a ravine to the west. The site lies about 100 feet east of the trail.

I7 Species (Herbaceous)	1990	2016	2016 alt.
None		X	

I7 Species (Trees, Shrubs, & Vines)	1990	2016	2016 alt.
<i>Acer rubrum</i>	X	X	
<i>Asimina triloba</i>		X	
<i>Fraxinus pennsylvanica</i>	X	?	
<i>Ilex verticillata</i>	X	?	
<i>Liquidambar styraciflua</i>	X	X	
<i>Lonicera japonica</i>		X	
<i>Smilax sp.</i>		X	
<i>Ulmus americana</i>	X		

A/I7  
Latitude: 38 27.000N  
Longitude -76 27.613W



1990 - 2016 Grid Site  
Views from Grid Point (3/6/2016)



View North



View West

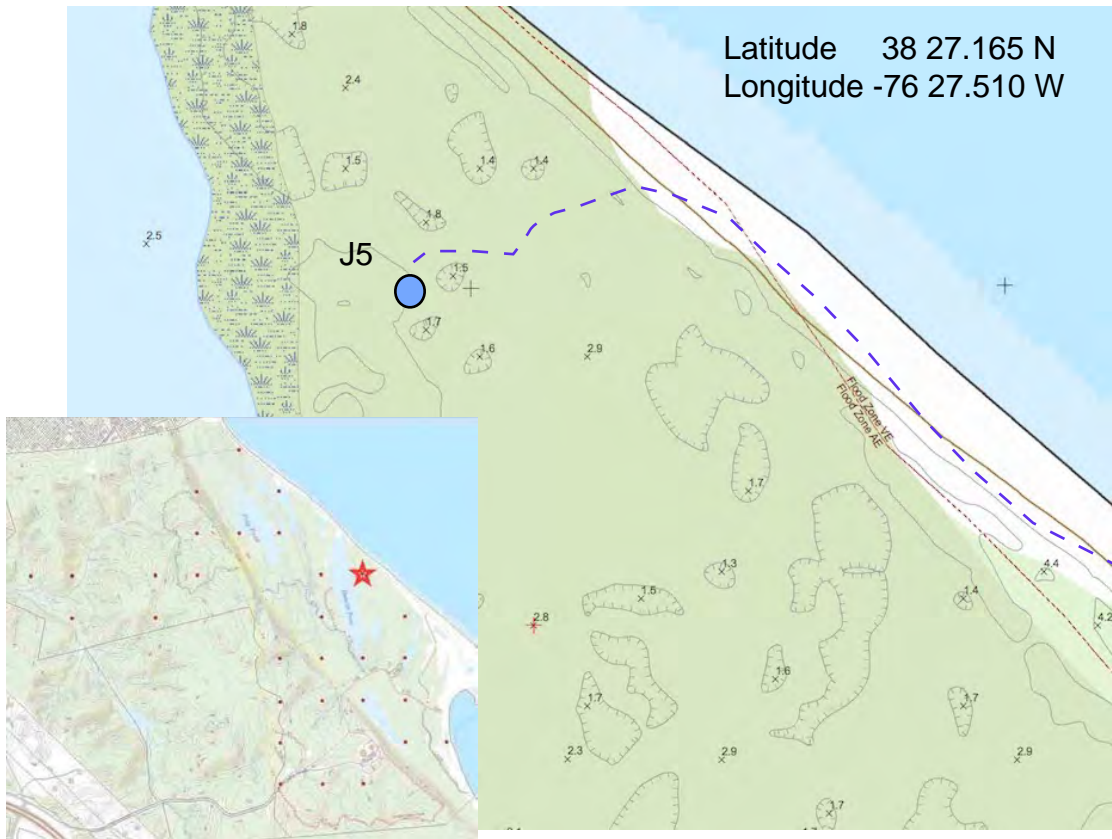


View East

View South



A/J5 (1990-2016 Site)



**Site Description (Dates Located 3/9/2015, 3/28/2016):**

Site is located about 100 feet east of Duncan Pond, and about 200 feet west of beach. Route is through heavy brush, downed trees, with greenbrier common. A general review of the near vicinity indicated no correlation with the 1990 plant survey. Although there was no *Phragmites* found on the site in 2016, the area was surrounded by the invasive.

J5 Species (Herbaceous)	1990	2016	2016 alt.
<i>Phragmites australis</i>	X		
<i>Krigia sp</i>		X	

J5 Species (Trees, Shrubs, & Vines)	1990	2016	2016 alt.
<i>Cornus florida</i>		X	
<i>Fraxinus pennsylvanica</i>		?	
<i>Ilex opaca</i>		X	
<i>Morella cerifera</i> (formerly <i>Myrica cerifera</i> )		X	
<i>Smilax sp.</i>		X	



A/J5  
Latitude: 38 27.165N  
Longitude -76 27.510W



1990 - 2016 Grid Site  
Views from Grid Point (3/28/2016)



View North



View West



View East

View South





**Site Description (Dates Located 3/9/2015 - 2/21/16):**

Follow Duncan Pond Trail northward for 250 feet. Site lies in Duncan Pond 60 feet to the east, with heavy brambles between trail and pond. There is no correlation with the 1990 survey. In 2015 Karyn Molines conducted a 10-meter square habitat plot in the vicinity of this site along the shoreline. The data from this habitat plot are not included in this report.

J7 Species (Herbaceous)	1990	2016	2016 alt.
<i>Eupatorium sp.</i>	X		
<i>Hibiscus moscheutos</i>	X		
<i>Lemna triscula</i>	X		
<i>Typha angustifolia</i>	X		
<i>Typha latifolia</i>	X		

J7 Species (Trees, Shrubs, & Vines)	1990	2016	2016 alt.
<i>Acer rubrum</i>	X		
<i>Cephalanthus occidentalis</i>	X		
<i>Fraxinus pennsylvanica</i>	X		
<i>Liquidambar styraciflua</i>	X		
<i>Morella cerifera</i> (formerly <i>Myrica cerifera</i> )		X	
<i>Nyssa sylvatica</i>	X		
<i>Salix nigra</i>	X		
<i>Viburnum prunifolium</i>	X		

A/J7 (nearest approach)

Latitude: 38 27.000N

Longitude -76 27.510W



1990 - 2016 Grid Site

Views from Grid Point (2/21/2016)



View North



View West

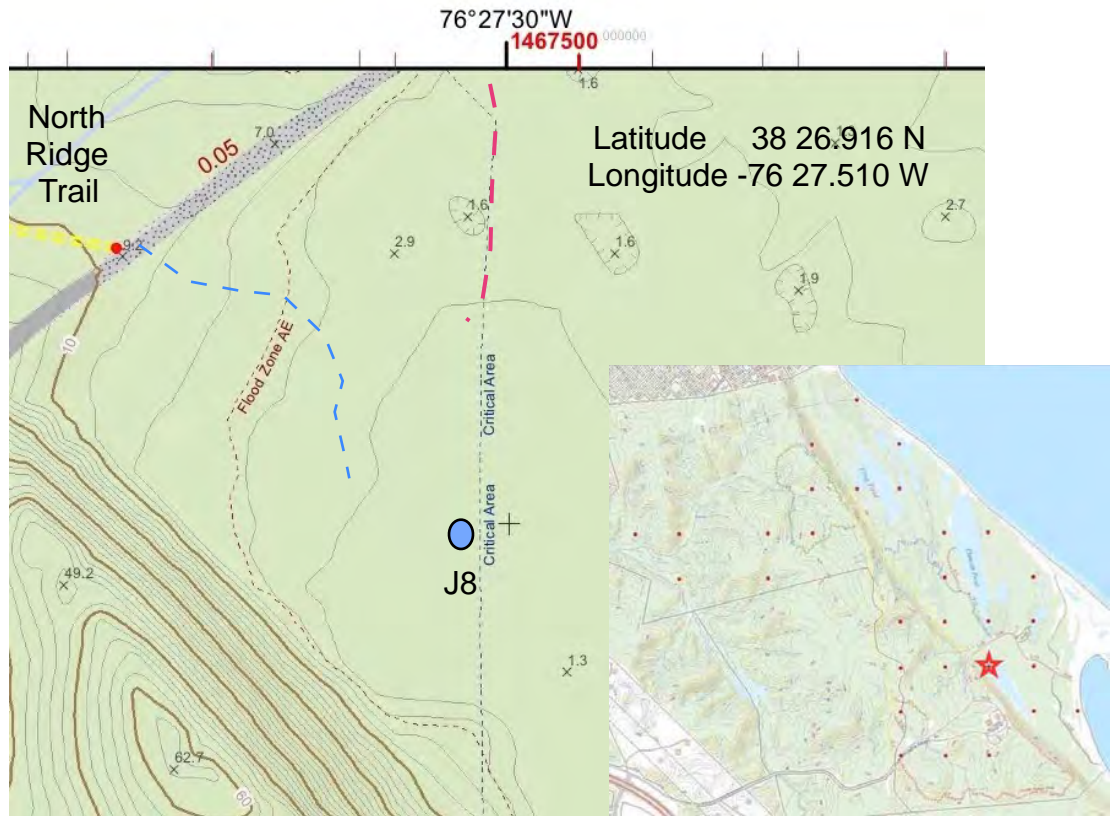


View East

View South



## A/J8 (1990-2016 Site)



### Site Description (Dates Located 3/4/2015 - 2/27/2016 and probably March 2016):

The site may have been accessible in 1990, but it is now flooded woodland, with many dead trees still standing, but with others downed or submerged. Rubber boots are necessary to even reach the closest vantage point, but the water quickly becomes too deep for ordinary waders. The nearest access was attained in March 2015 over a frozen surface. The route marked in blue permits the closest practical approach, but in the summer requires maneuvering around or through areas abundant with Japanese wineberry. Large downed unidentified trees are encountered in the area. A third try was made with Karyn Molines when the water was lower and we were able to more nearly access the site and were able to identify more plants in or near the site.

<b>J8 Species (Herbaceous)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Lemna triscula</i>	X		
<i>Phragmites australis</i>		X	
<i>Saururus cernuus</i>		X	
<i>Carex sp.</i>		X	
<i>Microstegium vimineum</i>		X	

<b>J8 Species (Trees, Shrubs, &amp; Vines)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Acer rubrum</i>	X	X	
<i>Asimina triloba</i>		X	
<i>Campsis radicans</i>	X		
<i>Fraxinus pennsylvanica</i>	X	X	
<i>Liquidambar styraciflua</i>	X	X	
<i>Nyssa sylvatica</i>	X		
<i>Platanus occidentalis</i>		X	
<i>Toxicodendron radicans</i> (formerly <i>Rhus radicans</i> )	X	X	
<i>Smilax rotundifolia</i>	X		
<i>Ulmus rubra</i>		X	
<i>Viburnum prunifolium</i>		X	

A/J8 (closest approach)

Latitude: 38 26.916N

Longitude -76 27.510W

1990 - 2016 Grid Site

Views from Grid Point (2/27/2016) is unavailable as we were unable to reach site. Pictures are near determined site.



View North



View West

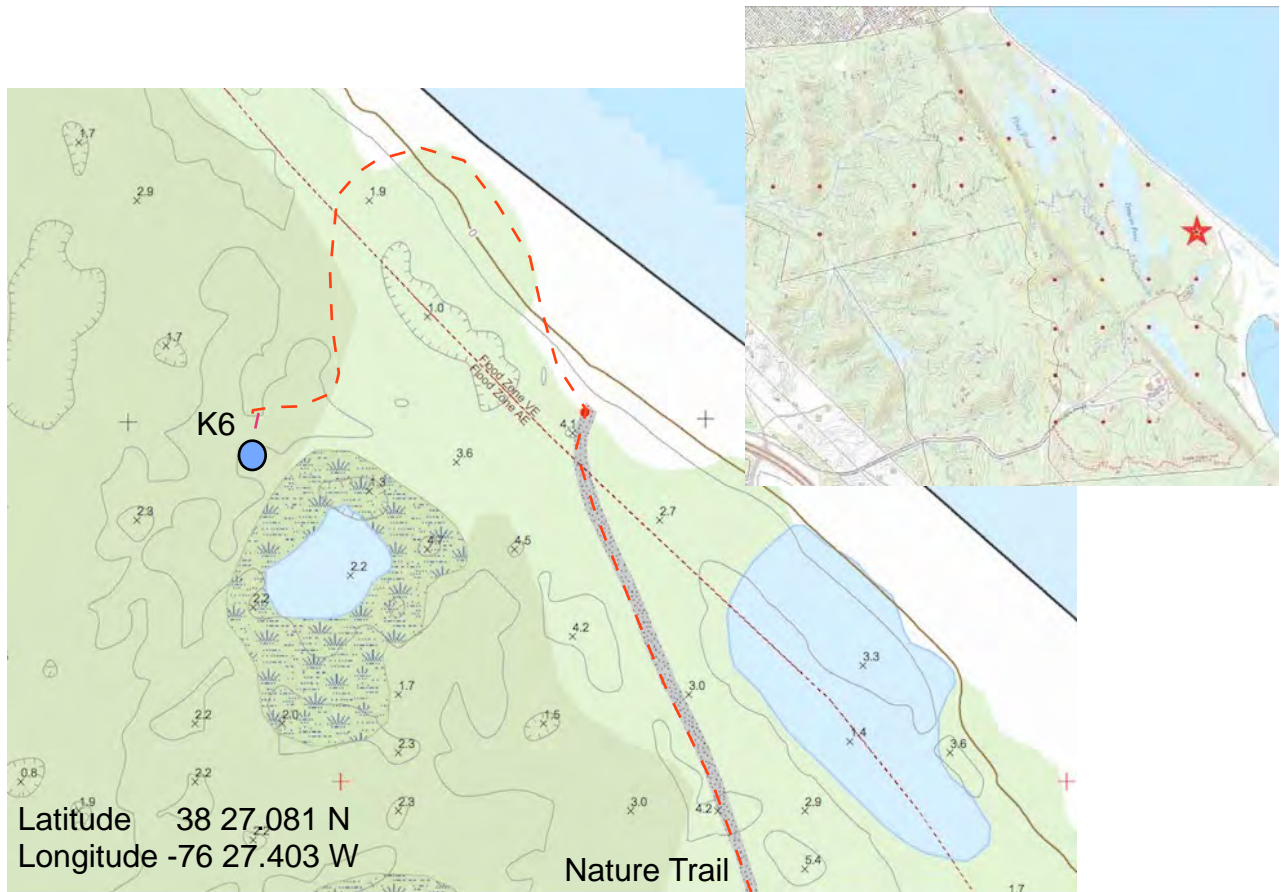


View East

View South



A/K6 (1990-2016 Site)



**Site Description (Dates Located 3/9/2015- 2/7/2016):**

Site is located about 150 feet west of beach, but is extremely difficult to get to because of heavy brush and downed trees, with greenbrier common. Follow the Nature Trail to the beach and continue along beach to a bit of clearing into the brush (a sign is posted to a tree). A general review of the near vicinity indicated no correlation with the 1990 plant survey. Herbaceous plants may not be identified as 2016 survey was done in February and March.

K6 Species (Herbaceous)	1990	2016	2016 alt.
<i>Allium sp.</i>	X		
<i>Galium sp.</i>	X		
<i>Menispermum canadense</i>	X		

<b>K6 Species (Trees, Shrubs, &amp; Vines)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Campsis radicans</i>	X		
<i>Cornus florida</i>	X		
<i>Fraxinus pennsylvanica</i>	X	?	
<i>Liquidambar styraciflua</i>	X		
<i>Morella cerifera</i> (formerly <i>Myrica</i> <i>cerifera</i> )	X	X	
<i>Nyssa sylvatica</i>	X	X	
<i>Parthenocissus</i> <i>quinquifolia</i>	X		
<i>Pinus taeda</i>	X		
<i>Toxicodendron radicans</i> (formerly <i>Rhus radicans</i> )	X		



A/K6  
Latitude: 38 27.081N  
Longitude -76 27.403W



1990 - 2016 Grid Site  
Views from Grid Point (2/27/2016)



View North



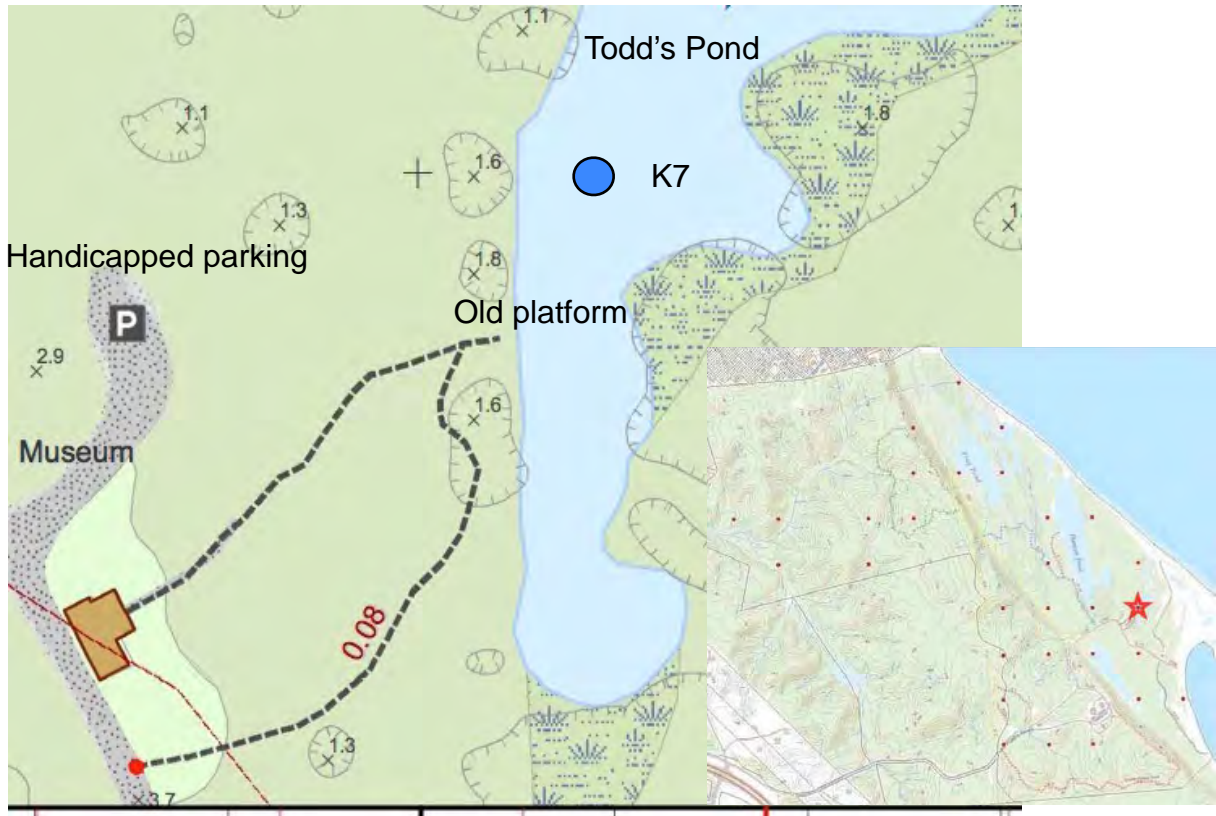
View West



View East

View South





**Site Description (Date Located 2/27/16):**

Site lies in Todd's Pond about 70 feet northeast of the old platform at the eastern end of the boardwalk east of the old fishing hut museum.

K7 Species (Herbaceous)	1990	2016	2016 alt.
<i>Lemna sp.</i>	X		
<i>Phragmites australis</i>		X	

K7 Species (Trees, Shrubs, & Vines)	1990	2016	2016 alt.
<i>Fraxinus pennsylvanica</i>	X		

A/K7

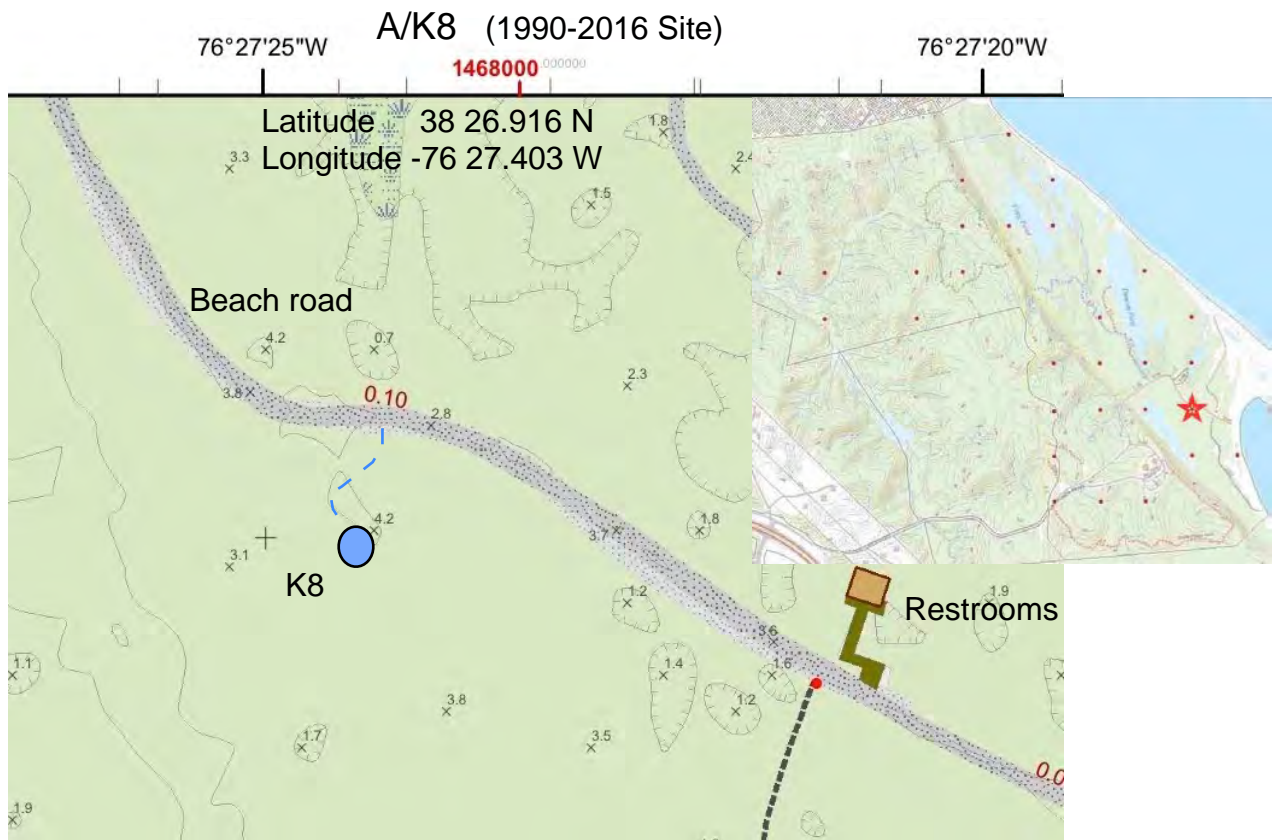
Latitude: 38 27.0001N  
Longitude -76 27.403W

1990 - 2016 Grid Site

View from old platform at edge of Todd's Pond; 1990 site now located in middle of Todd's Pond (2/27/2016).

View Northeast





**Site Description (Dates Located 3/21/2015 - 2/7/2016)**

This site is easily accessible from the beach road. Just east of the picnic table, the stake is found 95 feet south of the road on the south side of the foundation remains of an old building. In 2015 Karyn Molines conducted a 10-meter square habitat plot in the nearby vicinity. The data from this survey are not included in this report.

K8 Species (Herbaceous)	1990	2016	2016 alt.
<i>Carex sp.</i>	X		
<i>Chimaphila maculata</i>		X	
<i>Galium sp.</i>	X		

<b>K8 Species (Trees, Shrubs, &amp; Vines)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Asimina triloba</i>	X		
<i>Carya sp.</i>		X	
<i>Fagus grandifolia</i>	X		
<i>Ilex opaca</i>		X	
<i>Liquidambar styraciflua</i>	X	X	
<i>Lonicera japonica</i>		X	
<i>Morella cerifera</i> (formerly <i>Myrica perifera</i> )	X	X	
<i>Nyssa sylvatica</i>	X	X	
<i>Pinus rigida</i>	X		
<i>Pinus taeda</i>	X	X	
<i>Quercus falcata</i>	X	?	
<i>Toxicodendron radicans</i> (formerly <i>Rhus radicans</i> )		X	
<i>Smilax sp.</i>		X	

A/K8  
Latitude: 38 26.916N  
Longitude -76 27.403W



1990 - 2016 Grid Site  
Views from Grid Point (2/7/2016)



View North



View West

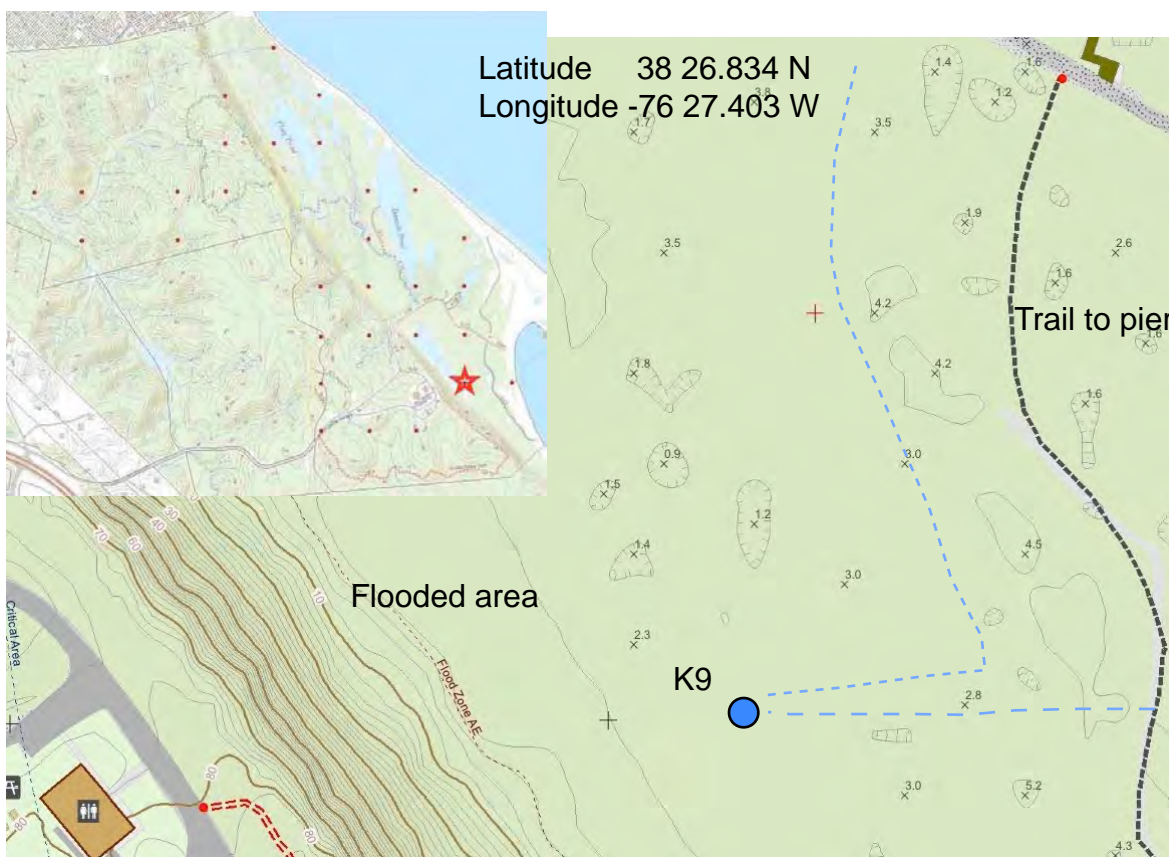


View East

View South



A/K9 (1990-2016 Site)



**Site Description (Dates Located 3/8/2015 - 2/7/2016):**

The site can be accessed by coming south from K8 along an old trail observable as an opening through the woods along a slight raised ridge which parallels the trail to the pier. It can also be accessed by following the trail to the pier to a stake on the west side of the trail near the edge of vegetation\*, and then moving westward to the vicinity of the flooded area below the cliff line. The survey was done in February and March which may account for the absence of herbaceous plants and lack of clarity in identification of woody plants. Numerous attempts were made to confirm *Pinus rigida*. There were also many downed unidentifiable trees. In 2015 Karyn Molines conducted a 10-meter square habitat plot in the near vicinity. Data from that survey are not included in this report.

*\*Stake may no longer exist, may have been pulled as an object of hazard.*

K9 Species (Herbaceous)	1990	2016	2016 alt.
<i>Michella repens</i>	X		
<i>Viola sp.</i>	X		

<b>K9 Species (Trees, Shrubs, &amp; Vines)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Carya sp.</i>		X	
<i>Diospyrus virginiana</i>	X	X	
<i>Euonymus americana</i>	X		
<i>Fagus grandifolia</i>	X	X	
<i>Fraxinus pennsylvanica</i>	X		
<i>Ilex opaca</i>		X	
<i>Juniperus virginiana</i>	X	X	
<i>Lindera benzoin</i>	X	?	
<i>Liquidambar styraciflua</i>	X	X	
<i>Lonicera japonica</i>		X	
<i>Morella cerifera</i> (formerly <i>Myrica cerifera</i> )	X	X	
<i>Nyssa sylvatica</i>	X	X	
<i>Pinus rigida</i>	X		
<i>Pinus taeda</i>	X	X	
<i>Quercus falcata</i>	X	?	
<i>Toxicodendron radicans</i> (formerly <i>Rhus radicans</i> )		X	
<i>Smilax sp.</i>		X	



A/K9  
Latitude: 38 26.834N  
Longitude -76 27.403W



1990 - 2016 Grid Site  
Views from Grid Point (2/7/2016)



View North



View West

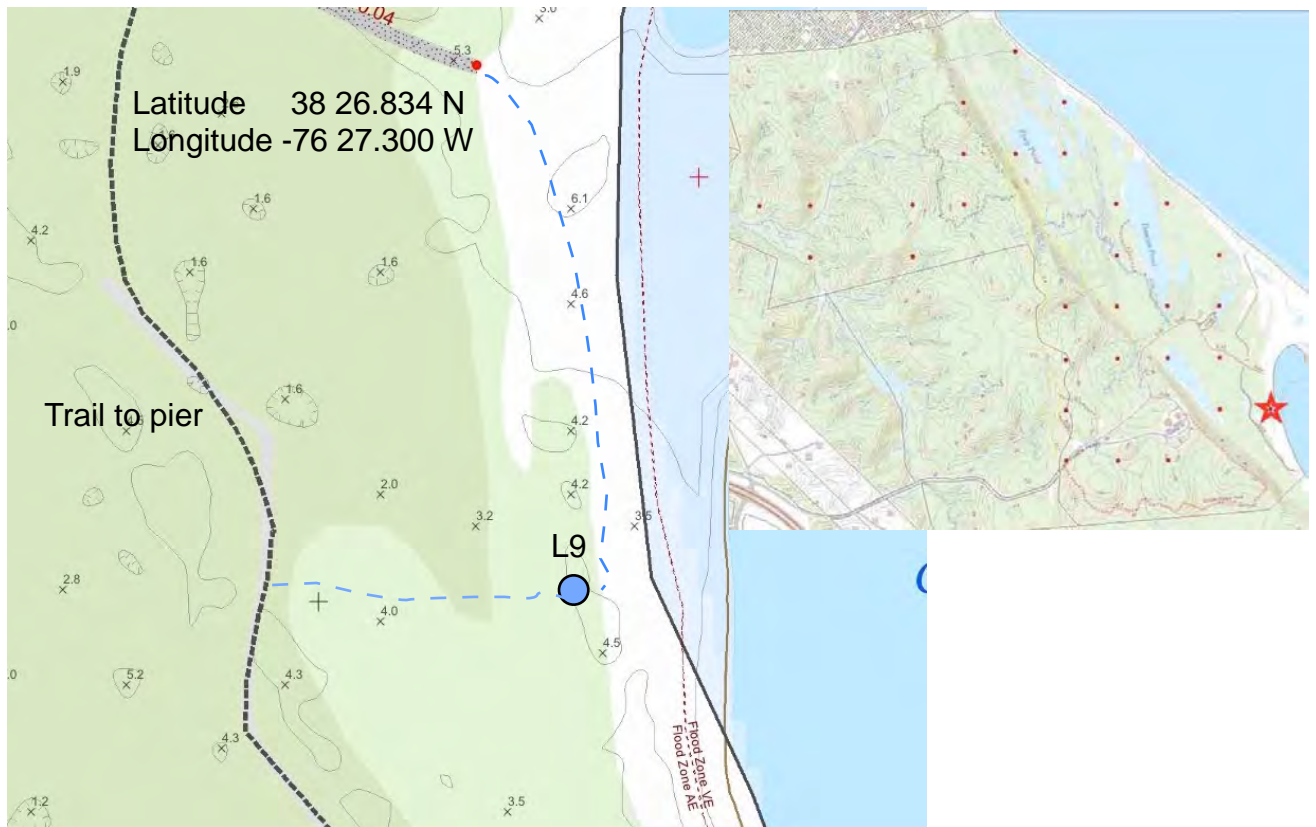


View East

View South



A/L9 (1990-2016 Site)



**Site Description (Dates Located 3/8/2015 - 2/7/2016):**

The site can be accessed by following the trail to the pier and then moving eastward to the last dune before the beach. It can also be accessed by following the trail to the beach and going southward to the end of an old wooden fence. The site is located on the first dune inside the vegetation line. Given that there were neither woody, nor herbaceous plants found in 1990 this site may well have been on the sandy coast. In 2015 Karyn Molines conducted a 10-meter square habitat plot at this site. An old metal post is located 120 feet south along the same dune, and possibly could relate to the 1990 survey.

L9 Species (Herbaceous)	1990	2016	2016 alt.
No herbaceous	X	X	

L9 Species (Trees, Shrubs, & Vines)	1990	2016	2016 alt.
No woody plants	X		
<i>Morella cerifera</i> (formerly <i>Myrica cerifera</i> )		X	
<i>Pinus sp.</i>		X	

A/L9  
Latitude: 38 26.834N  
Longitude -76 27.300W



1990 - 2016 Grid Site  
Views from Grid Point (2/7/2016)



View North



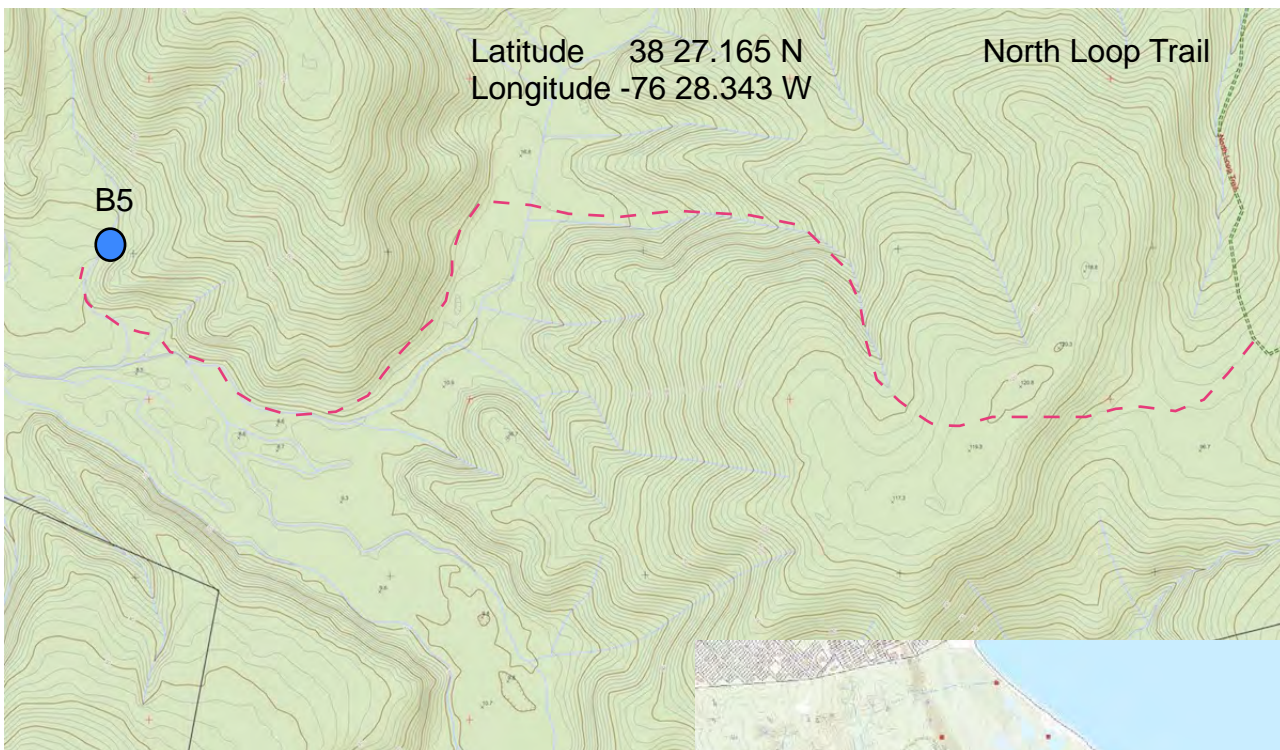
View West



View East

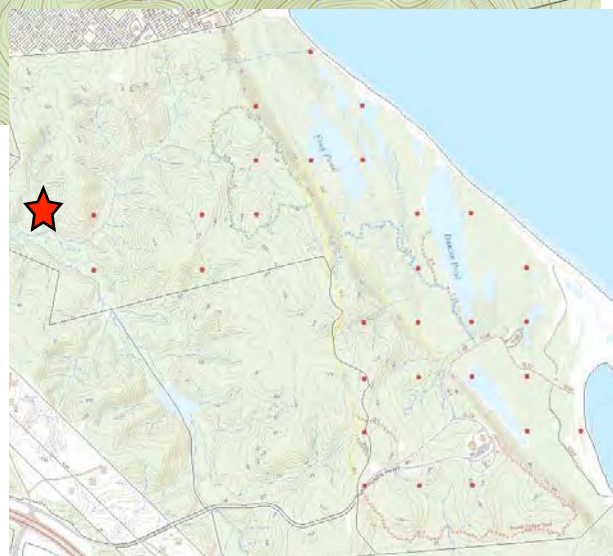
View South





**Site Description (Date Located 3/24/2016):**

B5 is the most distant of any sites from trail access. It is located 4700 feet west of North Loop Trail. There are many intervening downed trees throughout the area, particularly along ridge crests which become difficult to cross. An easier, but longer, route was found by proceeding westward from North Loop Trail to the second ravine, which dips to the north. It then bends to the west and leads onto the floodplain. The stream is fordable at this point, and the floodplain provides access to B5, C5, and C6. Follow the west side of the stream southward around a bend heading west. From this point on rubber boots are necessary. B5 can be reached overland, but only by going through thick groves of *Kalmia latifolia*. Turning north at the next drainage valley to the west leads to the stake located on the lower slope of the shoulder, and surrounded by *Kalmia latifolia*. A general review of the near vicinity indicated a poor correlation with the plants found in the 1990 plant survey. The floodplain area to the west and south seem much more likely spots for the 1990 survey. It should be noted that 1993 base maps indicate an extensive beaver pond existed throughout that area, which would have affected the vegetation at that time.



<b>B5 Species (Herbaceous)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Aster sp.</i>	X		
<i>Certophyllum demersum</i>	X		
<i>Equisetum sp.</i>	X		
<i>Galium sp.</i>	X		
<i>Impatiens carpensis</i>	X		
<i>Persicaria maculosa</i> (formerly <i>Polygonum persicaria</i> )	X		
<i>Persicaria virginiana</i> (formerly <i>Tovara virginiana</i> )	X		
<i>Podophyllum peltatum</i>	X		
<i>Ranunculus sp.</i>	X		
<i>Saururus cernuus</i>	X		
<i>Symplocarpus foetidus</i>	X	X	
<i>Viola sp.</i>	X		

<b>B5 Species (Trees, Shrubs, &amp; Vines)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Acer rubrum</i>	X	X	
<i>Asimina triloba</i>	X	X	
<i>Carpinus caroliniana</i>	X	X	
<i>Cornus florida</i>	X		
<i>Fraxinus pennsylvanica</i>	X	X	
<i>Ilex opaca</i>	X	X	
<i>Kalmia latifolia</i>		X	
<i>Lindera benzoin</i>	X		
<i>Liquidambar styraciflua</i>	X		
<i>Liriodendron tulipifera</i>	X	?	
<i>Prunus virginiana</i>	X		
<i>Ulmus americana</i>	X		

B/B5  
Latitude: 38 27.165  
Longitude -76 28.343W



1990 - 2016 Grid Site  
Views from Grid Point (3/24/2016)



View North



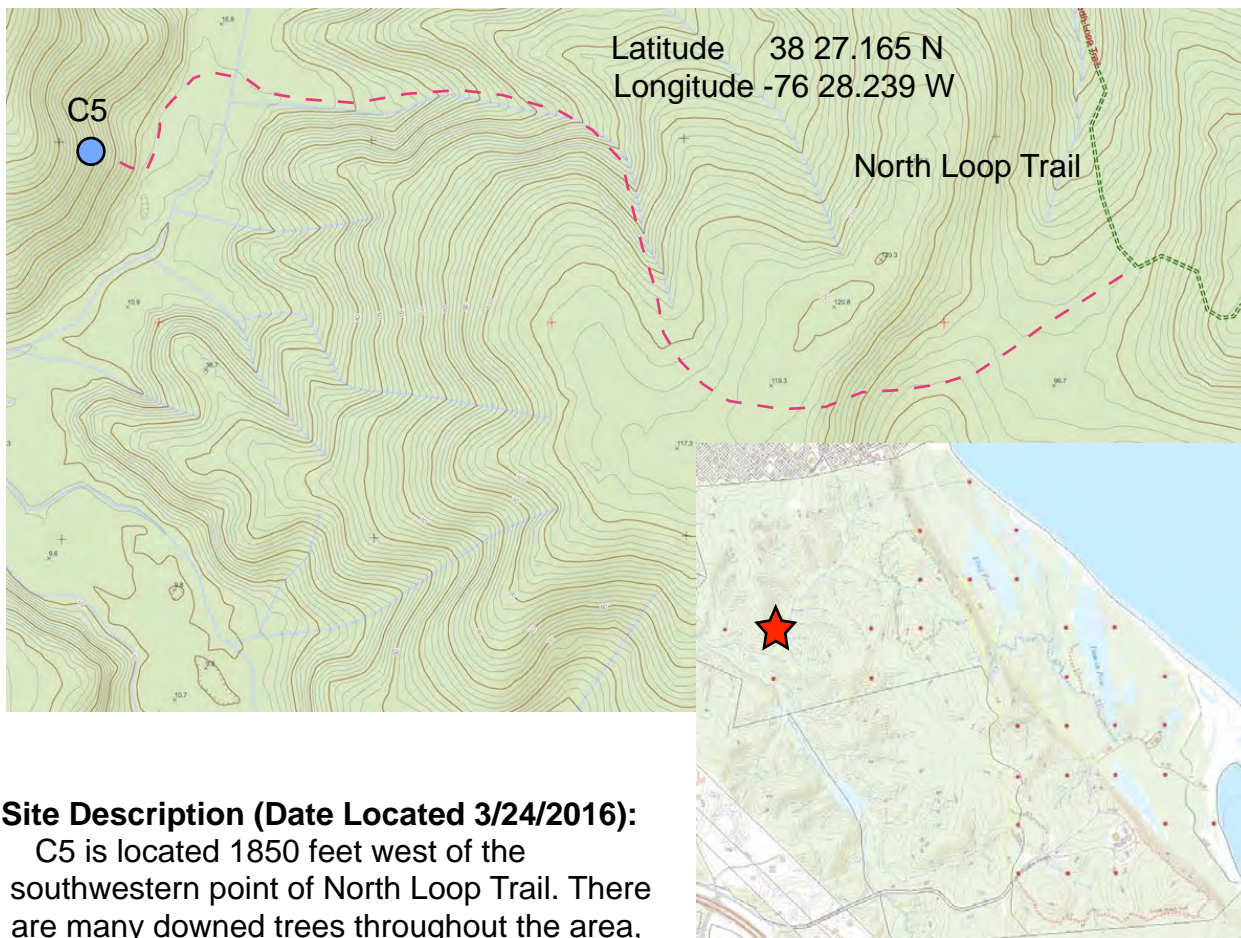
View West



View East



View South



**Site Description (Date Located 3/24/2016):**

C5 is located 1850 feet west of the southwestern point of North Loop Trail. There are many downed trees throughout the area, particularly along ridge crests which become difficult to cross. An easier, but longer, route was found by proceeding westward from North Loop Trail to the second ravine, which dips to the north. It then bends to the west and leads onto the floodplain. The stream is fordable at this point, and the floodplain provides access to B5, C5, and C6. Follow the west side of the stream southward to a point just south of a small floodplain embayment on the west. The stake is located halfway up the slope. There are several downed trees in the immediate vicinity of the site. A general review of the near vicinity indicated a poor correlation with the plants found in the 1990 plant survey. Based on the plants reported, more probable areas for the 1990 survey are on the floodplain to the east or in the small embayment just north of the stake. Because survey was done in March herbaceous plants were not found.

<b>C5 Species (Herbaceous)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Arisaema atrorubens</i> (2017 classified with <i>Arisaema triphyllum</i> )	X		
<i>Arisaema triphyllum</i>	X		
<i>Aster sp</i>	X		
<i>Desmodium nudiflorum</i>	X		
<i>Fragaria virginiana</i>	X		
<i>Galearis spectabilis</i> (formerly <i>Orchis spectabilis</i> )	X		
<i>Galium circaezans</i>	X		
<i>Podophyllum peltatum</i>	X		
<i>Ranunculus arbortivus</i>	X		
<i>Viola sp</i>	X		

<b>C5 Species (Trees, Shrubs, &amp; Vines)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Acer rubum</i>	X		
<i>Asimina triloba</i>	X		
<i>Carpinus caroliniana</i>	X	X	
<i>Carya glabra</i>	X		
<i>Euonymus americanus</i>		X	
<i>Fagus grandifolia</i>	X	X	
<i>Ilex opaca</i>	X	X	
<i>Kalmia latifolia</i>		X	
<i>Linderea benzoin</i>	X		
<i>Liquidambar styraciflua</i>	X	X	
<i>Liriodendron tulipifera</i>	X	X	
<i>Nyssa sylvatica</i>	X	?	
<i>Quercus montana</i> (formerly <i>Quercus prinus</i> )	X	?	
<i>Viburnum acerfolium</i>	X		



B/C5  
Latitude: 38 27.165N  
Longitude -76 28.239W



1990 - 2016 Grid Site  
Views from Grid Point (3/24/2016)



View North



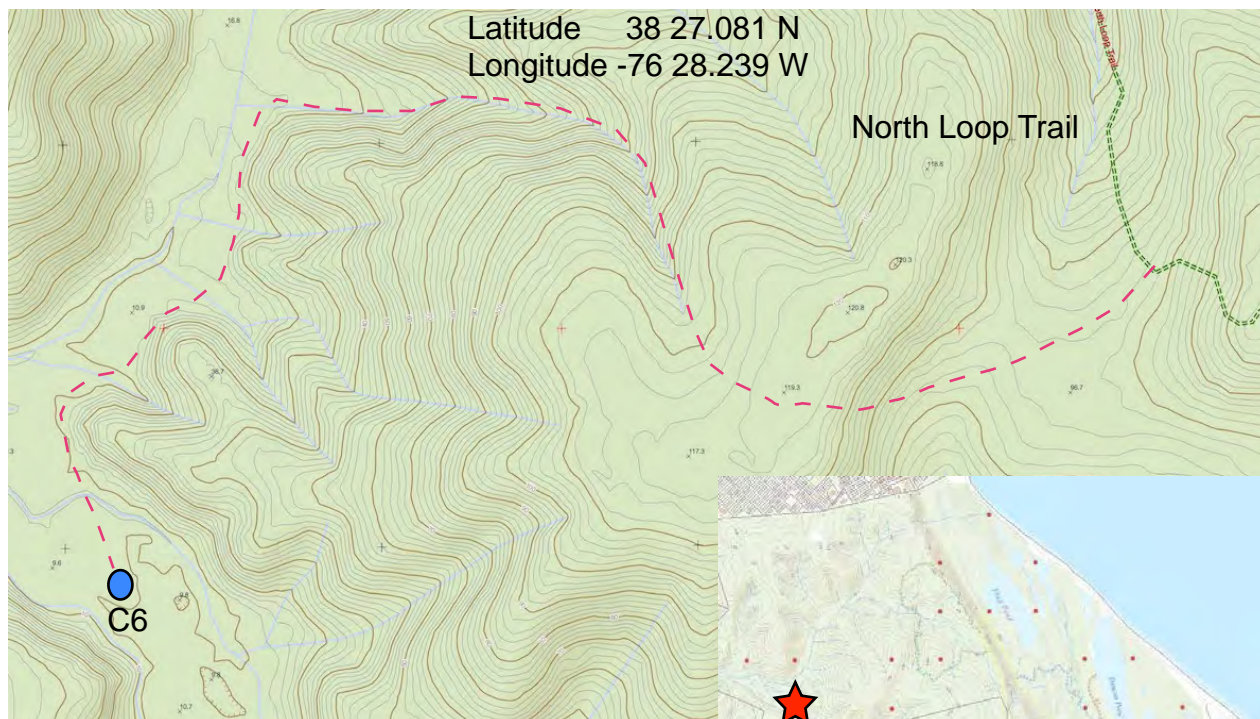
View West



View East

View South





**Site Description (Date Located 3/24/2016):**

C6 is located in the middle of the stream floodplain about 1300 feet south-southwest of North Loop Trail. There are many downed trees throughout the area, particularly along ridge crests which become difficult to cross. An easier, but longer, route was found by proceeding westward from North Loop Trail to the second ravine, which dips to the north. It then bends to the west and leads onto the floodplain. The floodplain provides access to B5, C5, and C6. To reach C6, rubber boots are advisable, but the site can be reached by hugging the east side of the floodplain southward before crossing the stream on a downed tree. An alternative access can be made from North Loop Trail by, instead of following the ravine to the north, continuing southwesterly and descending the slope to the floodplain. A general review of the near vicinity indicated a reasonable correlation with the plants found in the 1990 plant survey, but not the immediate site. Because the survey was done in March herbaceous plants are limited.

<b>C6 Species (Herbaceous)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Arisaema sp.</i>	X		
<i>Aster sp.</i>	X		
<i>Caltha palustris</i>	X		
<i>Cryptotaenia canadensis</i>	X		
<i>Impatiens capensis</i>	X		
<i>Ranunculus sp.</i>	X		
<i>Ranunculus arbortivus</i>	X		
<i>Ranunculus septentrionalis</i>	X		
<i>Saururus cernuus</i>	X		
<i>Symplocarpus foetidus</i>	X	X	
<i>Persicaria virginiana</i> (formerly <i>Tovara virginiana</i> )	X		
<i>Viola sp</i>	X	X	

<b>C6 Species (Trees, Shrubs, &amp; Vines)</b>	<b>1990</b>	<b>201</b>	<b>2016 alt.</b>
<i>Acer rubrum</i>	X	X	
<i>Asimina triloba</i>	X		
<i>Carpinus caroliniana</i>	X		
<i>Diospyros virginiana</i>		X	
<i>Fagus grandifolia</i>	X		
<i>Fraxinus pennsylvanica</i>	X	X	
<i>Lindera benzoin</i>	X		
<i>Liquidambar styraciflua</i>	X		
<i>Nyssa sylvatica</i>	X		
<i>Platanus occidentalis</i>		X	
<i>Toxicodendron radicans</i> (formerly <i>Rhus radicans</i> )	X	X	
<i>Smilax rotundifolia</i>	X		

B/C6  
Latitude: 38 27.081N  
Longitude -76 28.239W



1990 - 2016 Grid Site  
Views from Grid Point (3/24/2016)



View North



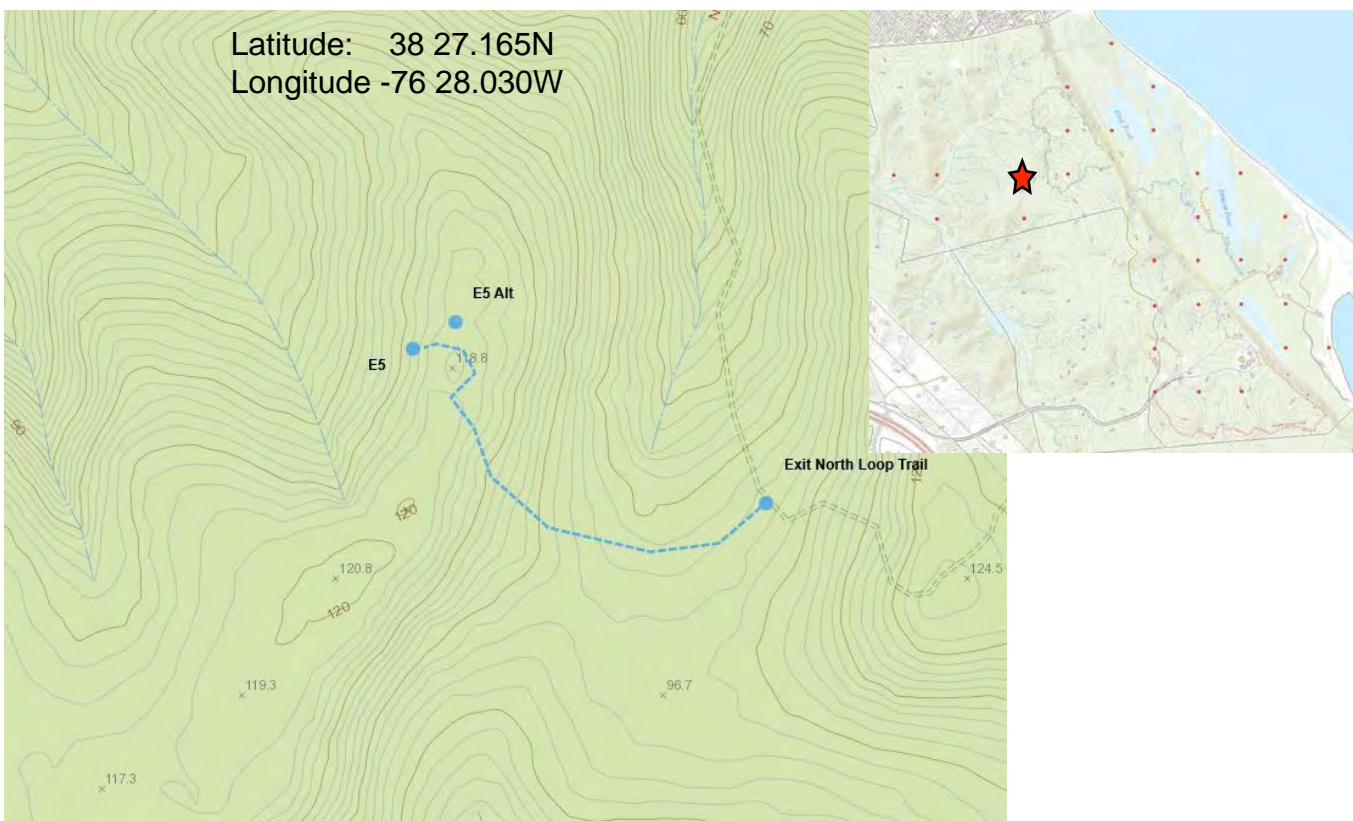
View West



View East



View South



**Site Description (Date Located 3/30/2016):**

Site is located approximately 250 feet west of North Loop Trail, just west of the ridge crest among large downed trees. Route requires climbing over some downed trees to get there and the adjoining ridge crest is characterized by many downed trees. A general review of the near vicinity indicated a poor correlation with the plants found in the 1990 survey. A nearby alternative location 53 feet to the north on the ridge crest at N38° 27.173' W76° 28.027' had many downed pine trees and appears more likely to be the site of the 1990 plant survey.

The table shows woody plants of the uplands found in 1990 and 2016. The only herbaceous plant listed for 1990 was *Mitchella repens* which is abundant in the uplands of Flag Ponds; other herbaceous plants found in 2016 include *Carex* sp., *Polystichum acrostichoides* and *Taraxacum officinale*. The presence of *Quercus falcata* was only confirmed by leaves on the ground. *Pinus virginiana* was only seen as dead logs in the alternate location. Perhaps the most significant change was the presence of the invasive *Rubus phoenicolasius*.

E5 Species (Herbaceous)	1990	2016	2016 alt.
<i>Carex sp.</i>		X	
<i>Mitchella repens</i>	X	X	
<i>Polystichum acrostichoides</i>		X	
<i>Taraxacum officinale</i>		X	

E5 Species (Trees, Shrubs, & Vines)	1990	2016	2016 alt.
<i>Acer rubrum</i>	X	X	
<i>Amelanchier sp.</i>	X	?	
<i>Asimina triloba</i>		X	
<i>Carpinus caroliniana</i>	X	X	
<i>Cornus florida</i>	X		
<i>Fagus grandifolia</i>	X	X	
<i>Ilex opaca</i>	X	X	
<i>Kalmia latifolia</i> (dead)		X	
<i>Liquidambar styraciflua</i>	X	X	
<i>Liriodendron tulipifera</i>	X	X	
<i>Nyssa sylvatica</i>	X		
<i>Pinus taeda</i> (sapling)		X	X
<i>Pinus virginiana</i>	X	dead	logs
<i>Prunus virginiana</i>	X		
<i>Quercus falcata</i>	X	?	
<i>Rubus phoenicolasius</i>		X	
<i>Viburnum acerfolium</i>	X		

B/E5  
Latitude: 38 27.165N  
Longitude -76 28.030W



1990 - 2016 Grid Site  
Views from Grid Point (3/30/2016)



View North



View West

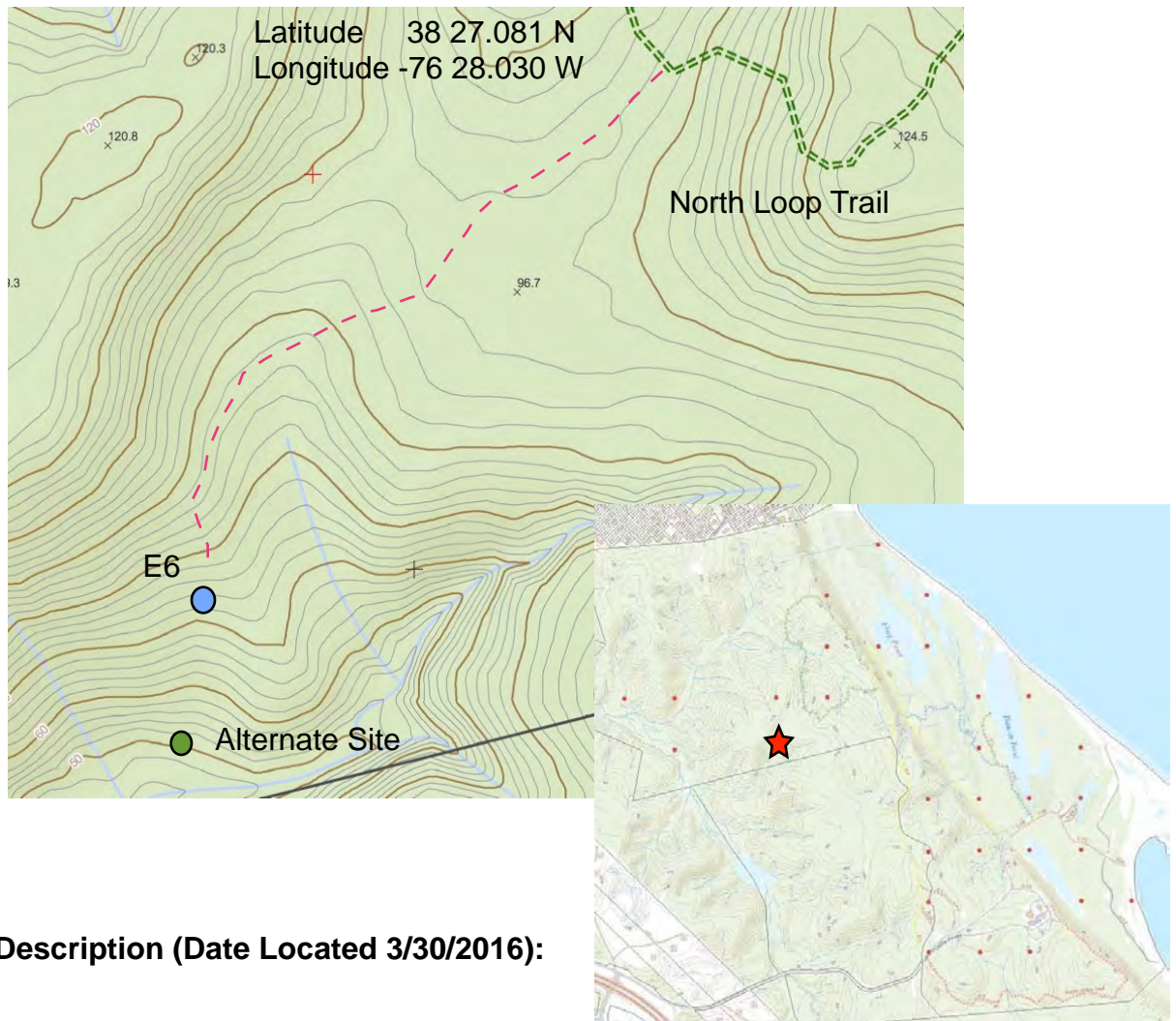


View East



View South

B/E6 (1990-2016 Site)



**Site Description (Date Located 3/30/2016):**

Site is located 480 feet southwest of North Loop Trail. Route requires climbing over or going around some downed trees to get there. The stake is found in a small gently dipping drainage hollow on the lower slope. A general review of the near vicinity indicated a poor correlation with the 1990 plant survey. However, a nearby alternative location 90 feet to the south at N38° 27.066' W76° 28.030' appears more likely to be the site of the 1990 plant survey. This site needs to be reviewed as there is uncertainty as to which plants in the 2016 survey were in the original and/or the alternate site.



<b>E6 Species (Herbaceous)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Allium sp.</i>	X		X
<i>Arisaema sp.</i>	X		
<i>Aster sp.</i>	X		
<i>Desmodium nudiflorum</i>	X		
<i>Podophyllum peltatum</i>	X		
<i>Polystichum acrostichoides</i>	X		X
<i>Viola conspersa</i>	X		X
<i>Mitchella repens</i>			X
<i>Oxalis sp.</i>			X
<i>Obolaria virginica</i>			X

<b>E6 Species (Trees, Shrubs, &amp; Vines)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Acer rubrum</i>	X		X
<i>Asimina triloba</i>	X		X
<i>Carpinus caroliniana</i>	X		X
<i>Cornus florida</i>	X		X
<i>Euonymus americanus</i>			X
<i>Fagus grandifolia</i>	X		X
<i>Ilex opaca</i>	X	X	X
<i>Liquidambar styraciflua</i>	X		
<i>Liriodendron tulipifera</i>	X		X
<i>Prunus virginiana</i>	X		X
<i>Quercus rubra</i>	X		X
<i>Ulmus rubra</i>			X
<i>Viburnum acerfolium</i>	X		

B/E6  
Latitude: 38 27.081N  
Longitude -76 28.030W



1990 - 2016 Grid Site  
Views from Grid Point (3/30/2016)



View North



View West



View East

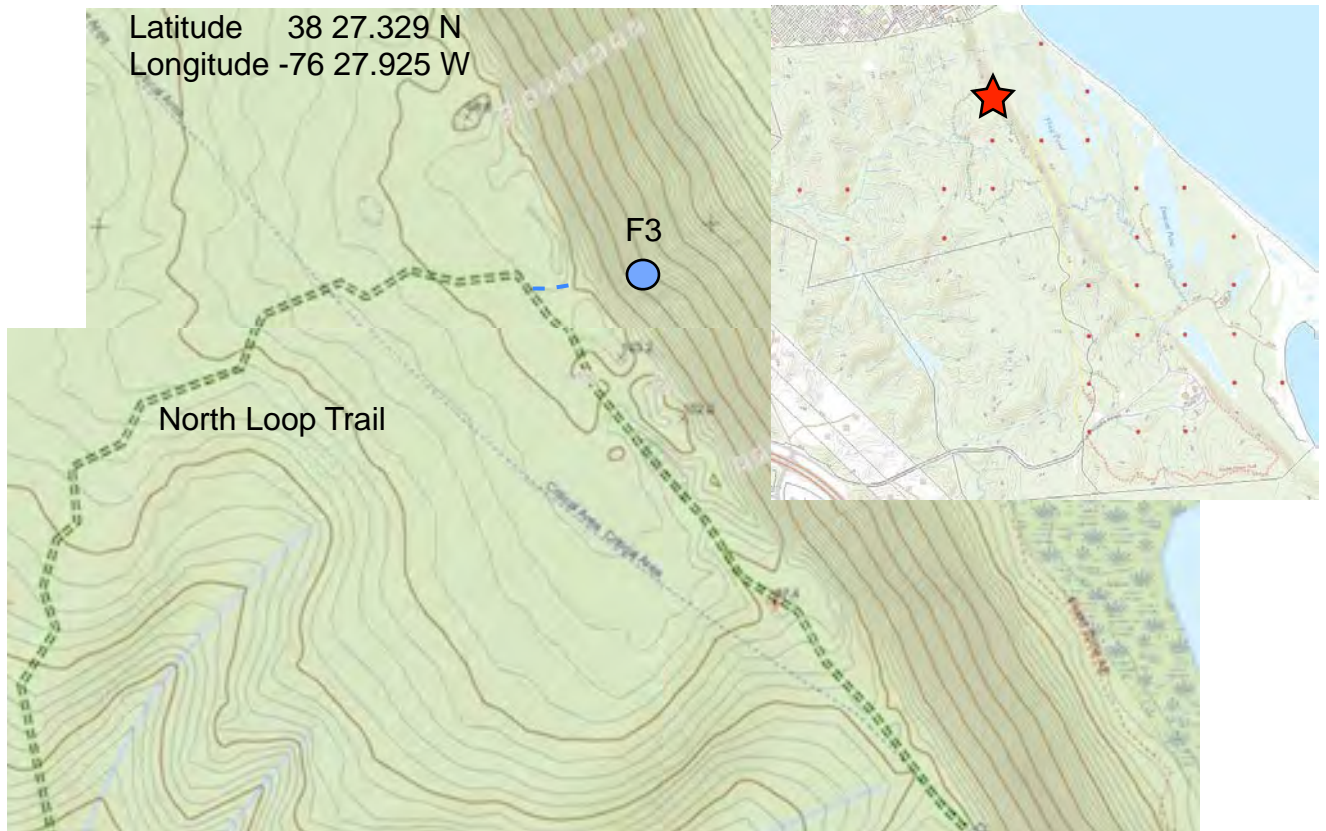
View South



View of alternate site S of E6



## B/F3 (1990-2016 Site)



### Site Description (Date Located 3/01/2016):

Site is located at northeastern corner of North Loop Trail, and is not accessible except by a steep climb partway down the cliff. It is located in a steep, rather narrow drainage ravine going downhill to the bottomland. A stake is located at the edge of the cliff 30 feet west of the site. A general review of the near vicinity using binoculars indicated a reasonable correlation with the 1990 plant survey. Because the survey was done in early March the herbaceous plants may not be accounted for in the 2016 survey.

<b>F3 Species (Herbaceous)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Arisaema sp.</i>	X		
<i>Aster sp.</i>	X		
<i>Cardamine diphylla</i> or <i>Cardamine concatenata</i> (formerly <i>Dentaria diphylla</i> ) See plant list	X		
<i>Gallium sp.</i>	X		
<i>Podophyllum peltatum</i>	X		
<i>Polystichum acrostichoides</i>	X	X	
<i>Ranunculus abortivus</i>	X		
<i>Viola rotundifolia</i>	X		

<b>F3 Species (Trees, Shrubs, &amp; Vines)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Asimina triloba</i>	X		
<i>Carpinus caroliniana</i>	X		
<i>Cornus florida</i>	X	X	
<i>Fagus grandifolia</i>	X	X	
<i>Fraxinus pennsylvanica</i>	X		
<i>Ilex opaca</i>			
<i>Liquidambar styraciflua</i>	X	X	
<i>Liriodendron tulipifera</i>	X		
<i>Prunus virginiana</i>	X		
<i>Quercus rubra</i>	X	X	

B/F3  
Latitude: 38 27.329N  
Longitude -76 27.925W



1990 - 2016 Grid Site  
Views from cliff edge 30 feet west  
of site (3/1/2016)



View North



View West

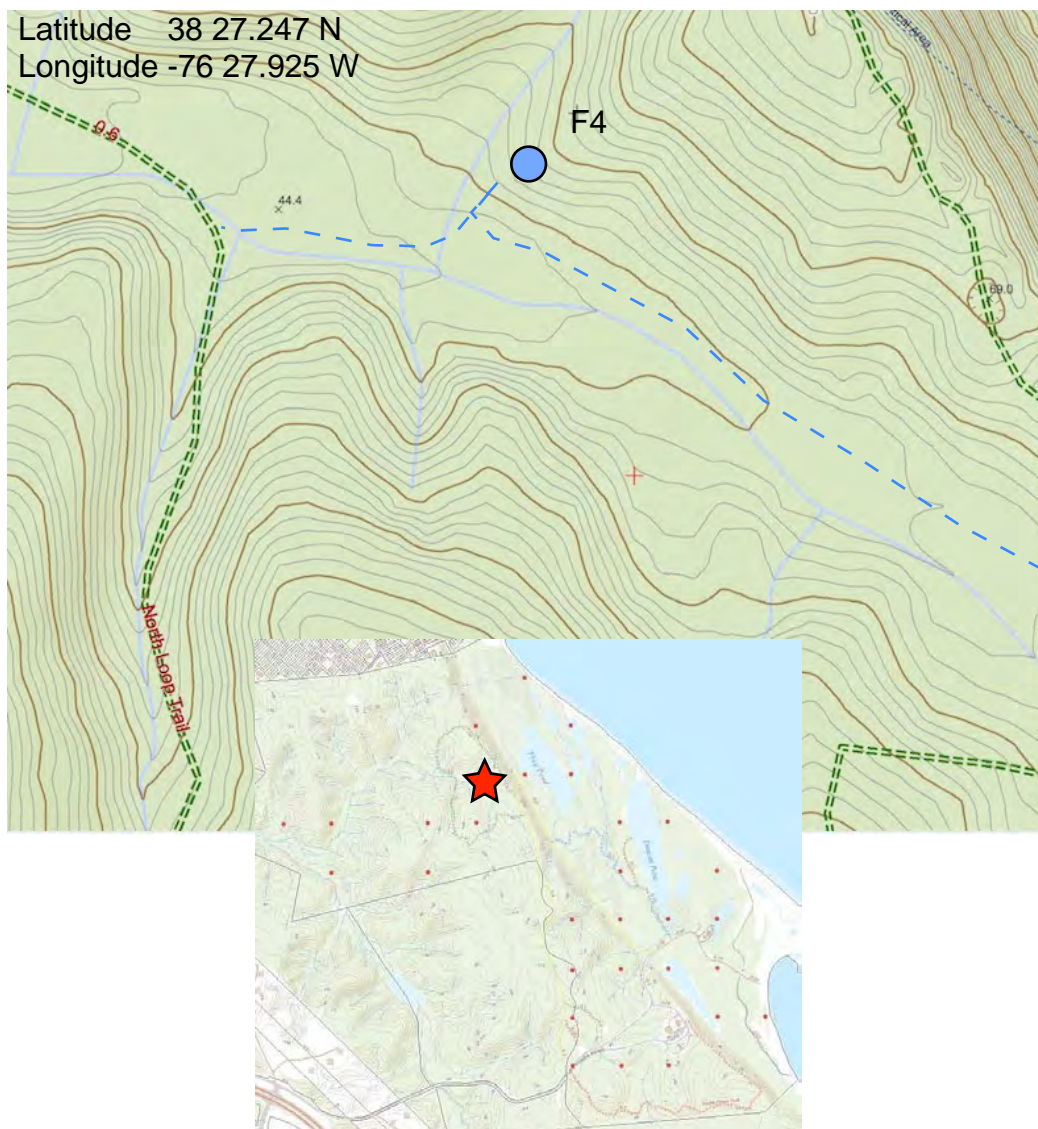


View East



View South

## B/F4 (1990-2016 Site)



### Site Description (Date Located 3/01/2016):

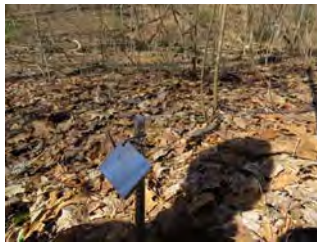
Site is located in the central area of North Loop Trail, with access either from the southeast or from the west. From the southeastern start of North Loop Trail, follow the drainage pattern downhill to the bottomland where it joins with a drainage coming down from the northeast. The stake is located on the lower slope of the northeastern shoulder between these drainages. If coming from the west, follow the drainage to the same area. This route, however, is heavy with sapling paw-paws. There are many downed trees in the vicinity of the site. A general review of the near vicinity indicated a reasonable correlation with the 1990 plant survey, but a more probable alternative location lies to the north. There may be an absence of herbaceous plants due to the fact that the 2016 survey was conducted in early March. The 1990 survey lists *Athyrium platyneuron*. They may have meant *Asplenium platyneuron* (Ebony spleenwort). Similarly, Hench refers to *Dentaria diphylla*, which is now *Cardamine diphylla*, and to which he gives the common name, Broad leaved Toothwort. However, this is a more northern plant. Hench may have meant *Dentaria laciniata*, which is now *Cardamine concatenata*, the Cutleaf Toothwort, a common spring plant at Flag Ponds.

<b>F4 Species (Herbaceous)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Arisaema sp</i>	X		
<i>Aster sp.</i>	X		
<i>Athyrium platyneuron</i> * <i>Asplenium platyneuron</i>	X		
<i>Cardamine diphylla</i> or <i>Cardamine concatenata</i> (formerly <i>Dentaria diphylla</i> ) See plant list	X		
<i>Gallium sp.</i>	X		
<i>Mitchella repens</i>	X		
<i>Oxalis sp.</i>	X		
<i>Polystichum acrostichoides</i>		X	

<b>F4 Species (Trees, Shrubs, &amp; Vines)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Acer rubrum</i>	X	X	
<i>Asimina triloba</i>	X	X	
<i>Carpinus caroliniana</i>	X	X	
<i>Carya glabra</i>	X	X	
<i>Fagus grandifolia</i>	X	X	
<i>Ilex opaca</i>		X	
<i>Liquidambar styraciflua</i>	X		
<i>Liriodendron tulipifera</i>	X	X	
<i>Lonicera japonica</i>		X	
<i>Prunus virginiana</i>	X		
<i>Quercus falcata</i>	X	X	
<i>Quercus rubra</i>	X	X	
<i>Viburnum acerfolium</i>	X		



B/F4  
Latitude: 38 27.247N  
Longitude -76 27.925W



1990 - 2016 Grid Site  
Views from Grid Point (3/1/2016)



View North



View West

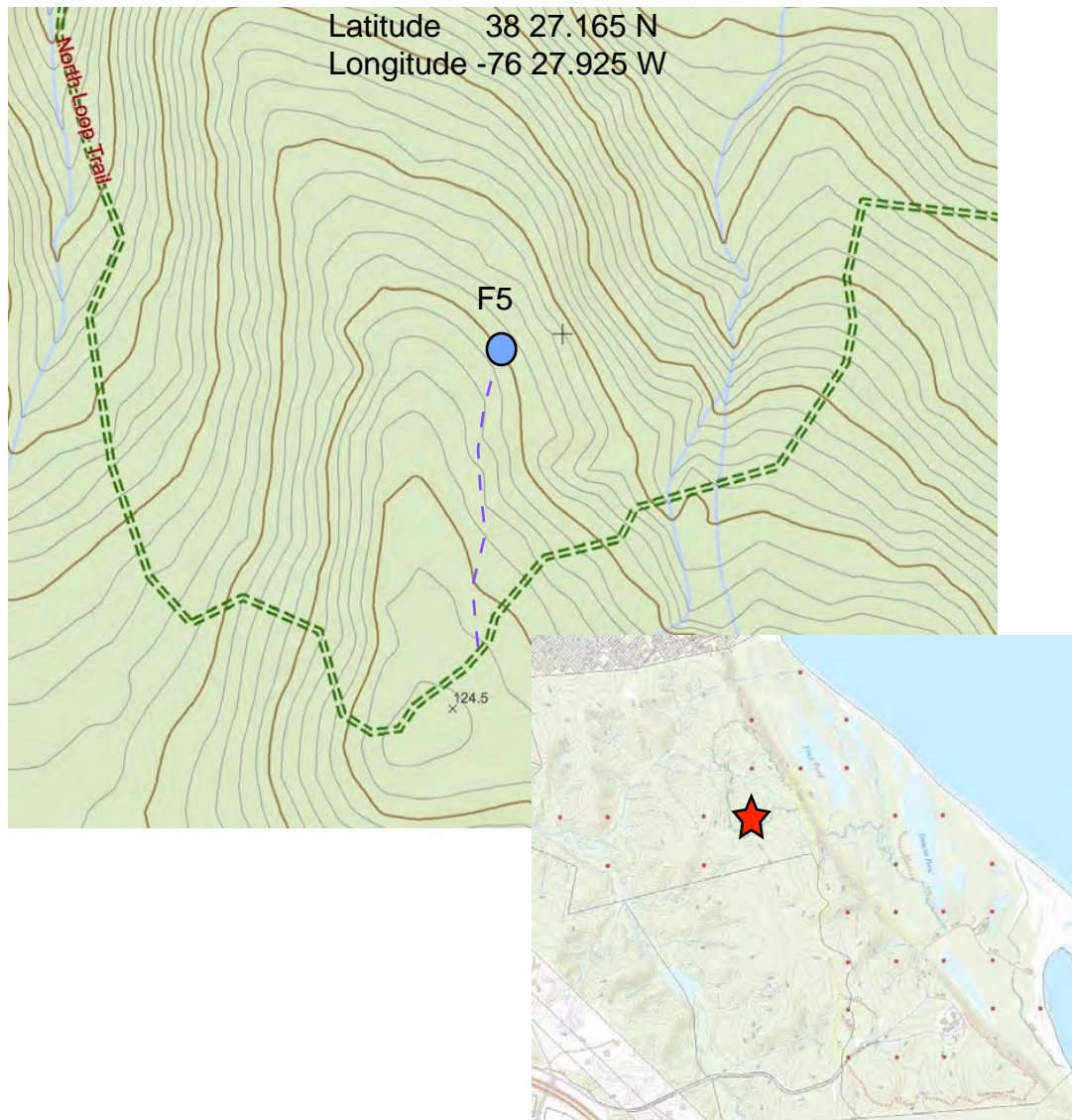


View East



View South

## B/F5 (1990-2016 Site)



### **Site Description (Date Located 3/01/2016):**

Site is located in the southern part of North Loop Trail, with easiest access from the south. From east of the southern bend of North Loop Trail, follow a northerly path to the site. The stake is located on the upper slope surrounded by downed trees. There are many downed trees in the vicinity of the site. A general review of the near vicinity indicated a reasonable correlation with the 1990 plant survey.

F5 Species (Herbaceous)	1990	2016	2016 alt.
<i>Michella repens</i>	X	X near	
<i>Polystichum acrostichoides</i>		X	
<i>Tipularia discolor</i>		X	

F5 Species (Trees, Shrubs, & Vines)	1990	2016	2016 alt.
<i>Acer rubrum</i>	X	X	
<i>Asimina triloba</i>	X	X	
<i>Carya glabra</i>	X	?	
<i>Cornus florida</i>	X		
<i>Fagus grandifolia</i>	X	X	
<i>Ilex opaca</i>	X	X	
<i>Liquidambar styraciflua</i>	X		
<i>Liriodendron tulipifera</i>	X	near	
<i>Pinus virginiana</i>	X	near	
<i>Prunus virginiana</i>	X		
<i>Quercus alba</i>	X	X	
<i>Quercus falcata</i>	X	?	
<i>Quercus montana</i> (formerly <i>Quercus prinus</i> )	X	?	
<i>Quercus rubra</i>	X	X	
<i>Sassafras albidum</i>	X		
<i>Smilax rotundifolia</i>	X	X	

B/F5  
Latitude: 38 27.165N  
Longitude -76 27.925W



1990 - 2016 Grid Site  
Views from Grid Point (3/1/2016)



View North



View West

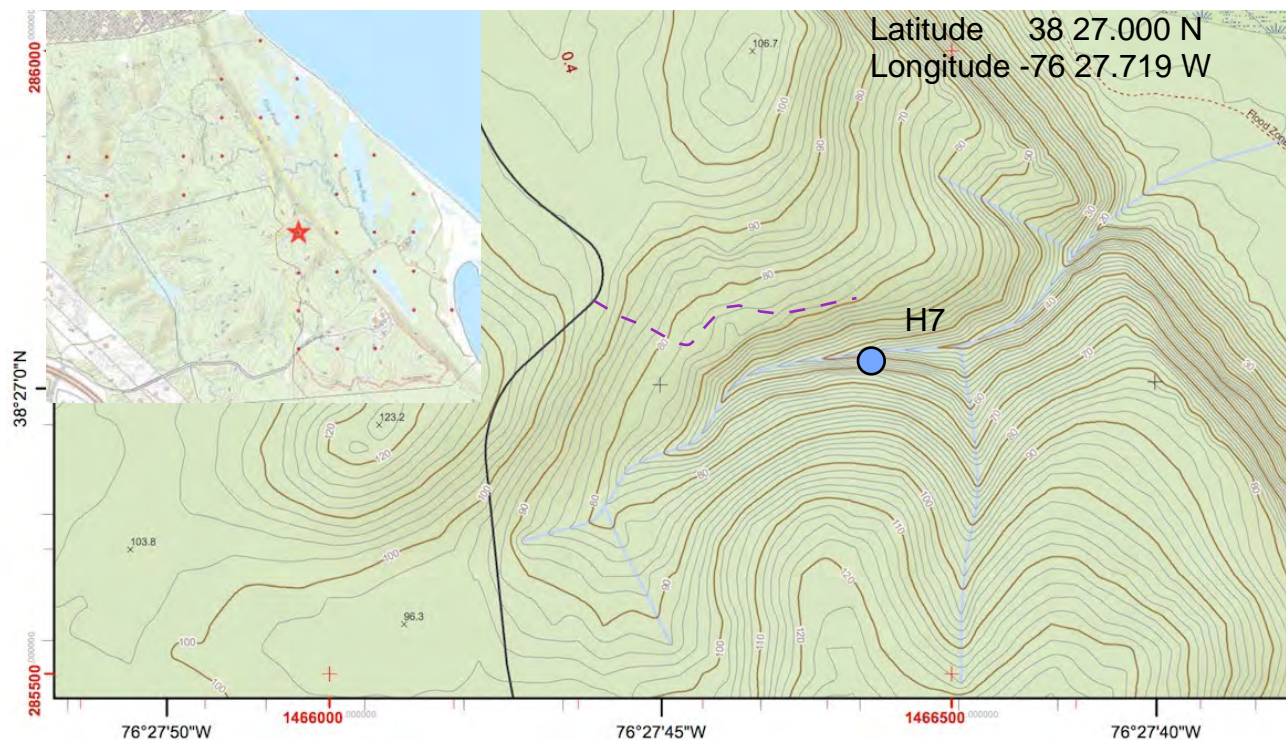


View East



View South

## B/H7 (1990-2016 Site)



### Site Description (Dates Located 3/21/2015, 2/20/2016):

Site is located near the bottom of a steep ravine draining to the east, and is extremely difficult to access from North Loop Trail. Easiest access is along the upper north slope of the ravine to where a stake has been placed at the upper slope break. The site lies to the south at the bottom of the ravine. Access from the south is along a deer trail that follows the upper slope of the ravine eastward. By keeping to the lower branch of the deer trail, the nearest approach to the site lies in a mountain laurel thicket just past a large rock on the trail. A general review of the near vicinity indicated a reasonable correlation with the 1990 plant survey. Lack of herbaceous plants may be because the 2016 survey was conducted in March. A 10 Meter Plot Survey was done by Karyn Molines and volunteers on 7-22-2015 and at an alternative site. That data are not included here.

H7 Species (Herbaceous)	1990	2016	2016 alt.
<i>Carex sp</i>	X		
<i>Galium circaezans</i>	X		
<i>Polystichum acrostichoides</i>	X	X	

H7 Species (Trees, Shrubs, & Vines)	1990	2016	2016 alt.
<i>Acer rubrum</i>	X	X	
<i>Asimina tribloba</i>	X		
<i>Carpinus caroliniana</i>	X	X	
<i>Carya glabra</i>	X		
<i>Cornus florida</i>	X	X	
<i>Fagus grandifolia</i>	X	X	
<i>Ilex opaca</i>	X		
<i>Kalmia latifolia</i>	X		
<i>Liquidambar styraciflua</i>	X		
<i>Liriodendron tulipifera</i>	X	X	
<i>Pinus taeda</i>	X	X	
<i>Prunus virginiana</i>	X		
<i>Quercus alba</i>	X	?	
<i>Quercus montana</i> (formerly <i>Quercus prinus</i> )	X	?	
<i>Sassafrass albidum</i>	X		
<i>Viburnum prunifolium</i>	X		

B/H7  
Latitude: 38 27.000N  
Longitude -76 27.719W



1990 - 2016 Grid Site  
Views from Grid Point (2/20/2016)



View North



View West

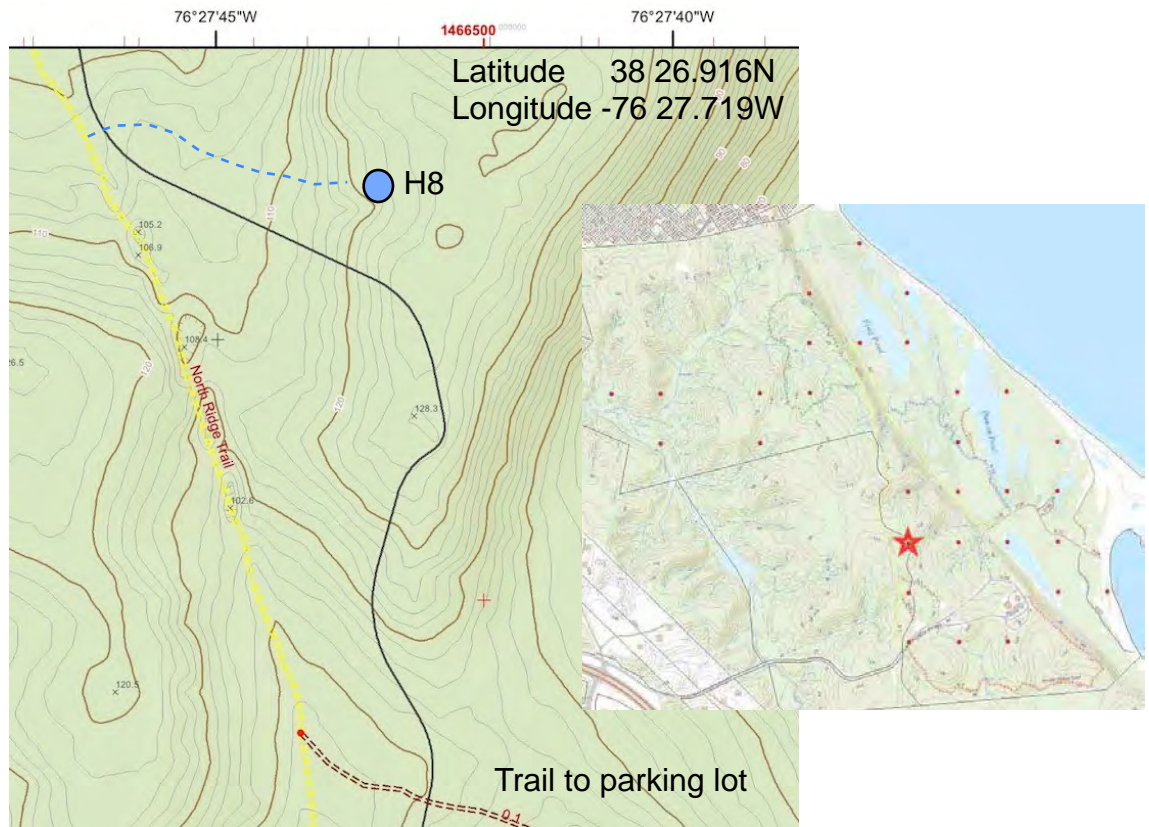


View East



View South

## B/H8 (1990-2016 Site)



### Site Description (Date Located 2/20/2016):

Site is located about 172 feet east of North Ridge Trail. Due to large downed trees in the area, access is best obtained by leaving the trail at the crest and then angling back to the SE. A general review of the near vicinity indicated a poor correlation with the 1990 plant survey. However a nearby alternative location about 100 feet to the northeast on the ridge crest appears more likely to be the actual site of the 1990 plant survey. On July 22, 2015 Karyn Molines conducted a 10-meter square habitat plot survey at this location and at the alternative site (38 26.924/ -76 27.7030)\*. Data from both surveys are not included in this account.

\*38.44873042N/ 76.46171713W originally surveyed



H8 Species (Herbaceous)	1990	2016	2016 alt.
<i>Viola sp.</i>	X		

H8 Species (Trees, Shrubs, & Vines)	1990	2016	2016 alt.
<i>Acer rubrum</i>	X		
<i>Amelanchier sp.</i>	X		
<i>Carya glabra</i>	X		
<i>Cornus florida</i>	X		
<i>Ilex opaca</i>	X	X	
<i>Liquidambar styraciflua</i>	X		
<i>Liriodendron tulipifera</i>	X		
<i>Parthenocissus quinquefolia</i>	X		
<i>Pinus taeda</i>		X	
<i>Pinus virginiana</i>		X down	
<i>Prunus virginiana</i>	X		
<i>Quercus falcata</i>	X		
<i>Toxicodendron radicans (formerly Rhus radicans)</i>	X		
<i>Sassafrass albidum</i>	X		
<i>Smilax rotundifolia</i>	X		
<i>Viburnum acerfolia</i>	X		

B/H8  
Latitude: 38 26.916N  
Longitude -76 27.719W



1990 - 2016 Grid Site  
Views from Grid Point (2/20/2016)



View North



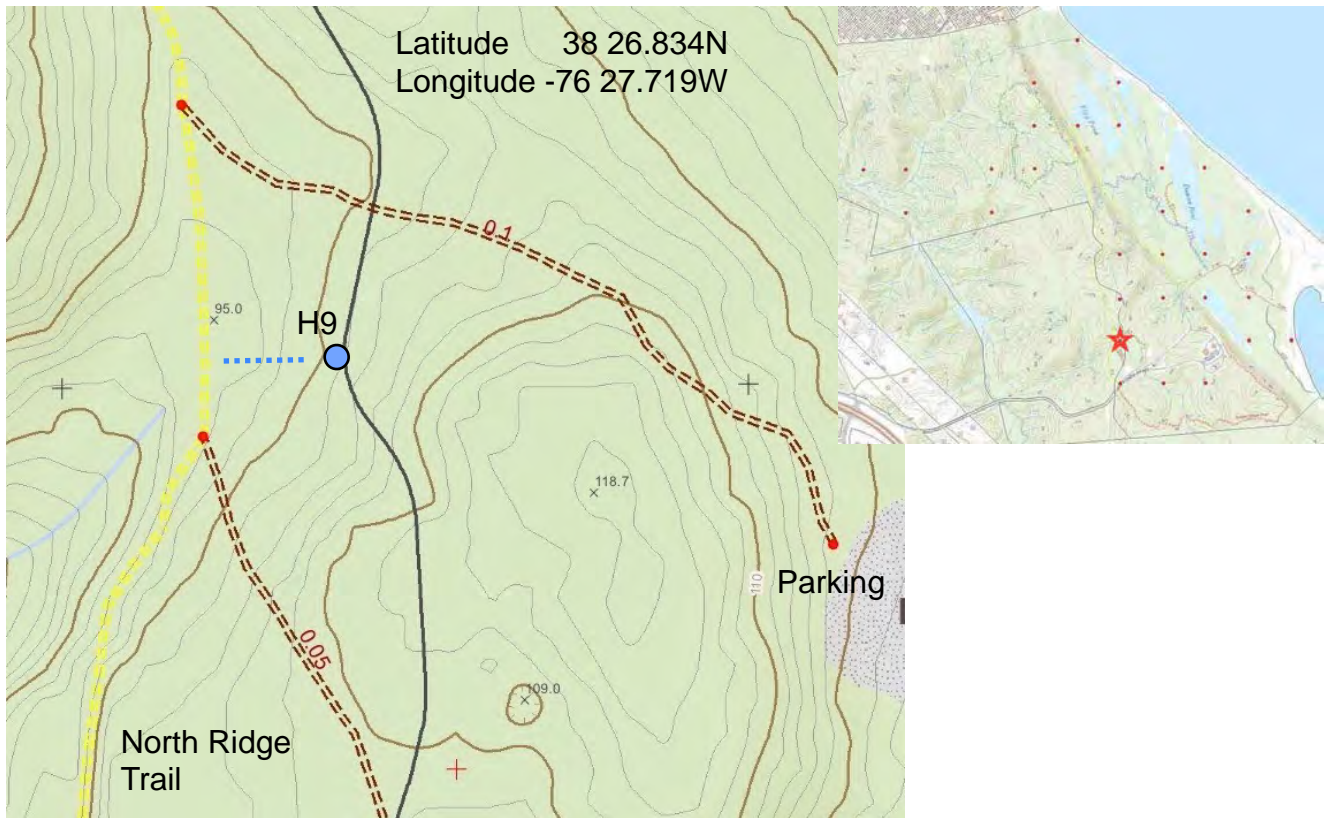
View West



View East

View South





**Site Description (Date Located 2/20/2016):**

Site is located about 50 feet east of North Ridge Trail in a holly grove, measured from a spot about 120 feet south of the junction with trail to parking lot. A general review of the near vicinity indicated a poor correlation with the 1990 plant survey. Additional study of maps and coordinates by Karyn Molines led to the conclusion that the site is probably at Latitude 38.4472N Longitude 76.4620W (38 26.832N/ 76 27.720W). This new site has yet to be surveyed.

H9 Species (Herbaceous)	1990	2016	2016 alt.
<i>Lycopodium obscurum</i>	X		
<i>Ranunculus sp.</i>	X		

H9 Species (Trees, Shrubs, & Vines)	1990	2016	2016 alt.
<i>Acer rubrum</i>	X	X	
<i>Carpinus caroliniana</i>	X		
<i>Carya sp.</i>	X		
<i>Cornus florida</i>	X		
<i>Euonymus americana</i>	X	X	
<i>Ilex opaca</i>	X	X	
<i>Liquidambar styraciflua</i>	X		
<i>Liriodendron tulipifera</i>	X		
<i>Ostrya virginiana</i>	X		
<i>Pinus taeda</i>	X		
<i>Pinus virginiana</i>	X		
<i>Prunus virginiana</i>	X		
<i>Quercus sp.</i>	X		
<i>Robinia pseudo-acacia</i>	X		
<i>Sassafras albidum</i>	X		
<i>Smilax rotundifolia</i>	X		
<i>Vaccinium corumbosum</i>	X		

B/H9  
Latitude: 38 26.834N  
Longitude -76 27.719W



1990 - 2016 Grid Site  
Views from Grid Point (2/20/2016)



View North



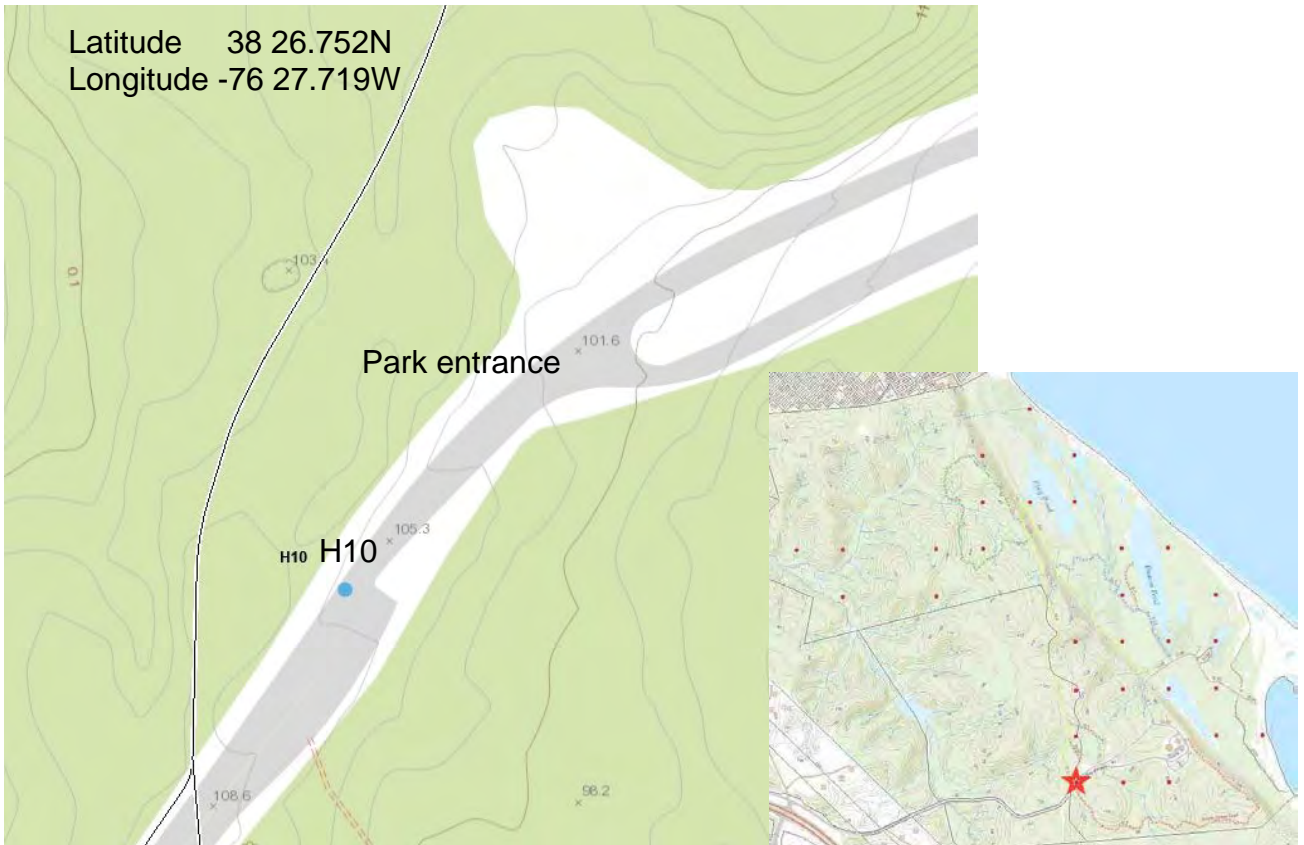
View West



View East



View South



**Site Description (Date Located 2/20/2016):**

Site is located on entrance road to Park, just west of entrance. Though the computed site is located in the roadway, a stake was placed on the north side of the road at the No Parking sign. This seems an unlikely location for a habitat survey, but corresponds with the 1990 500-foot grid. A general plant review of the near vicinity indicated no correlation with the 1990 survey. A cursory study was done by volunteers in the area south east of the computed site March 9, 2017. That habitat content is listed in the alternate site column. A 10 meter square survey was done March 26, 2015 by Karyn Molines in an area southeast of the computed site. Additional study of maps and coordinates by Karyn led to the conclusion that the site is probably at Latitude 38.4459N/ Longitude 76.4620W (38.26.754N/ 76.27.720W).

<b>H10 Species (Herbaceous)</b>	<b>1990</b>	<b>2016</b>	<b>2017 alt.</b>
<i>Caltha palustris</i>	X		
<i>Euonymus americana</i>			X
<i>Eupatorium sp.</i>	X		

<b>H10 Species (Trees, Shrubs, &amp; Vines)</b>	<b>1990</b>	<b>2016</b>	<b>2017 alt.</b>
<i>Acer rubrum</i>	X		
<i>Asimina triloba</i>	X		?
<i>Cornus florida</i>	X		
<i>Diospyros virginiana</i>	X		X
<i>Ilex opaca</i>	X		X
<i>Juniperus virginiana</i>		X	X
<i>Liquidambar styraciflua</i>	X		X
<i>Liriodendron tulipifera</i>	X		
<i>Lonicera japonica</i>			X
<i>Pinus taeda</i>	X		X
<i>Pinus virginiana</i>	X	X	X
<i>Prunus virginiana</i>	X		
<i>Quercus montana</i> (formerly <i>Quercus prinus</i> )			X
<i>Rosa multiflora</i>			X
<i>Rubus phoenicolasius</i>			X
<i>Smilax rotundifolia</i>	X		X
<i>Toxicodendron radicans</i> (formerly <i>Rhus radicans</i> )			X
<i>Vitis sp.</i>			X

B/H10  
Latitude: 38 26.752N  
Longitude -76 27.719W



1990 - 2016 Grid Site  
Views from Grid Point (2/20/2016)



View North



View West



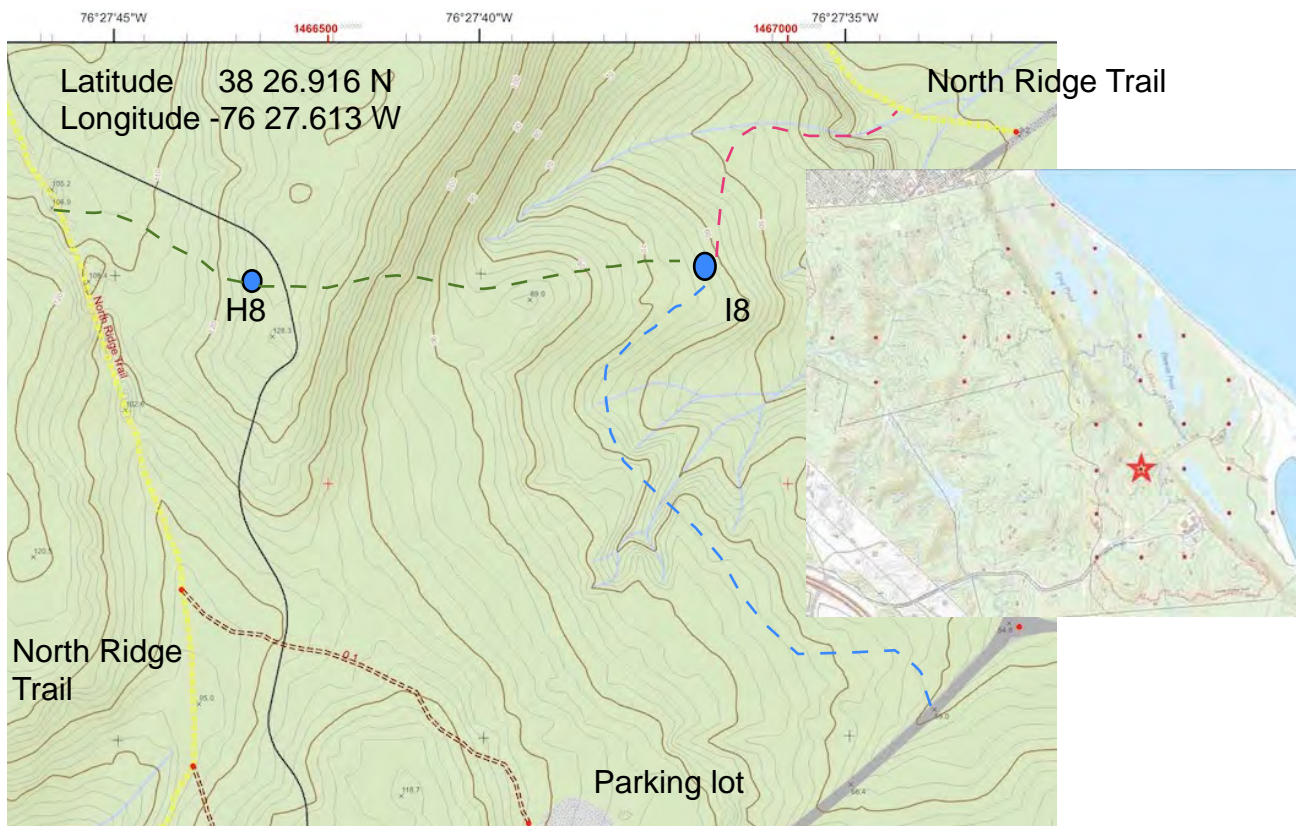
View East

View South





## B/I8 (1990-2016 Site)



### Site Description (Dates Located 8/21/2015 - 2/20/2016):

The shortest route to the site (red) starts on lower North Ridge Trail, but requires climbing up the cliff through a steep ravine. Easier, but longer, access (green) is obtained by hiking eastward from upper North Ridge Trail. Entry from Flag Ponds Parkway (blue) is also possible, but requires maneuvering around or crossing ravines and areas abundant with Japanese wineberry. Large downed trees are encountered in the area. Poor match on plants as found on the two surveys from 1990 and 2015/16.

I 8 Species (Herbaceous)	1990	2016	2016 alt.
<i>Arisaema sp.</i>	X		
<i>Cardamine dyphylla</i> or <i>Cardamine concatenata</i> (formerly <i>Dentaria diphylla</i> ) See Plant list	X		
<i>Gallium sp.</i>	X		
<i>Gallium circaezans</i>	X		
<i>Podophyllum peltatum</i>	X		
Unknown fern		X	

I 8 Species (Trees, Shrubs, & Vines)	1990	2016	2016 alt.
<i>Asimina triloba</i>	X	X	
<i>Cornus florida</i>	X		
<i>Fagus grandifolia</i>		X	
<i>Ilex opaca</i>	X	X	
<i>Lindera benzoin</i>	X		
<i>Liquidambar styraciflua</i>	X		
<i>Liriodendron tulipifera</i>	X		
<i>Nyssa sylvatica</i>		X	
<i>Parthenocissus quinquefolia</i>	X		
<i>Pinus taeda</i>	X	X	
<i>Prunus virginiana</i>	X		
<i>Rubus phoenicolasius</i>		X	
<i>Smilax rotundifolia</i>	X	X	

B/18  
Latitude: 38 26.916N  
Longitude -76 27.613W



1990 - 2016 Grid Site  
Views from Grid Point (2/20/2016)



View North



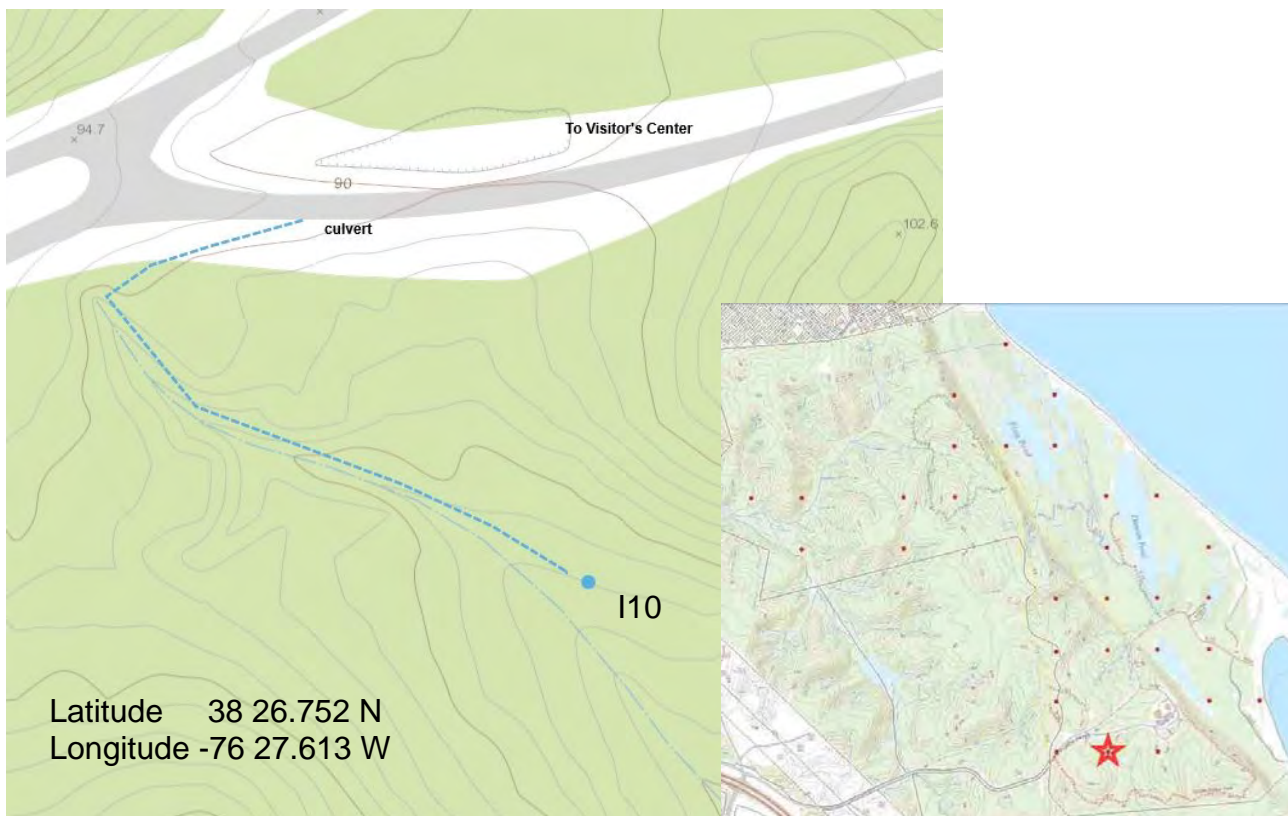
View West



View East



View South



**Site Description (Date Located 2/20/2016):**

Site is located south of entrance road to Visitor's Center. From south end of culvert under road, follow drainage west to stream and follow stream to site on lower slope east of stream. A general plant review of the near vicinity indicated a poor correlation with the 1990 survey, but good correlation with the 1990 Drainage Map. On March 26, 2015 Karyn Molines and volunteers conducted a 10-meter square habitat plot in the vicinity of this site. Data from that survey are not reported here. Herbaceous plants may not be included in 2016 survey as it was conducted in February.

I 10 Species (Herbaceous)	1990	2016	2016 alt.
<i>Allium sp.</i>	X		
<i>Aster sp.</i>	X		
<i>Fragaria virginiana</i>	X		
<i>Gallium circaeans</i>	X		
<i>Viola sp.</i>	X		
<i>Viola labridorica</i> (formerly <i>V.conspersa</i> )	X		

I 10 Species (Trees, Shrubs, & Vines)	1990	2016	2016 alt.
<i>Carpinus caroliniana</i>	X		
<i>Cornus florida</i>	X		
<i>Ilex opaca</i>	X	X	
<i>Lindera benzoin</i>	X		
<i>Liquidambar styraciflua</i>	X		
<i>Liriodendron tulipifera</i>	X	X	
<i>Prunus virginiana</i>	X		

B/110  
Latitude: 38 26.752N  
Longitude -76 27.613W



1990 - 2016 Grid Site  
Views from Grid Point (2/20/2016)



View North



View West

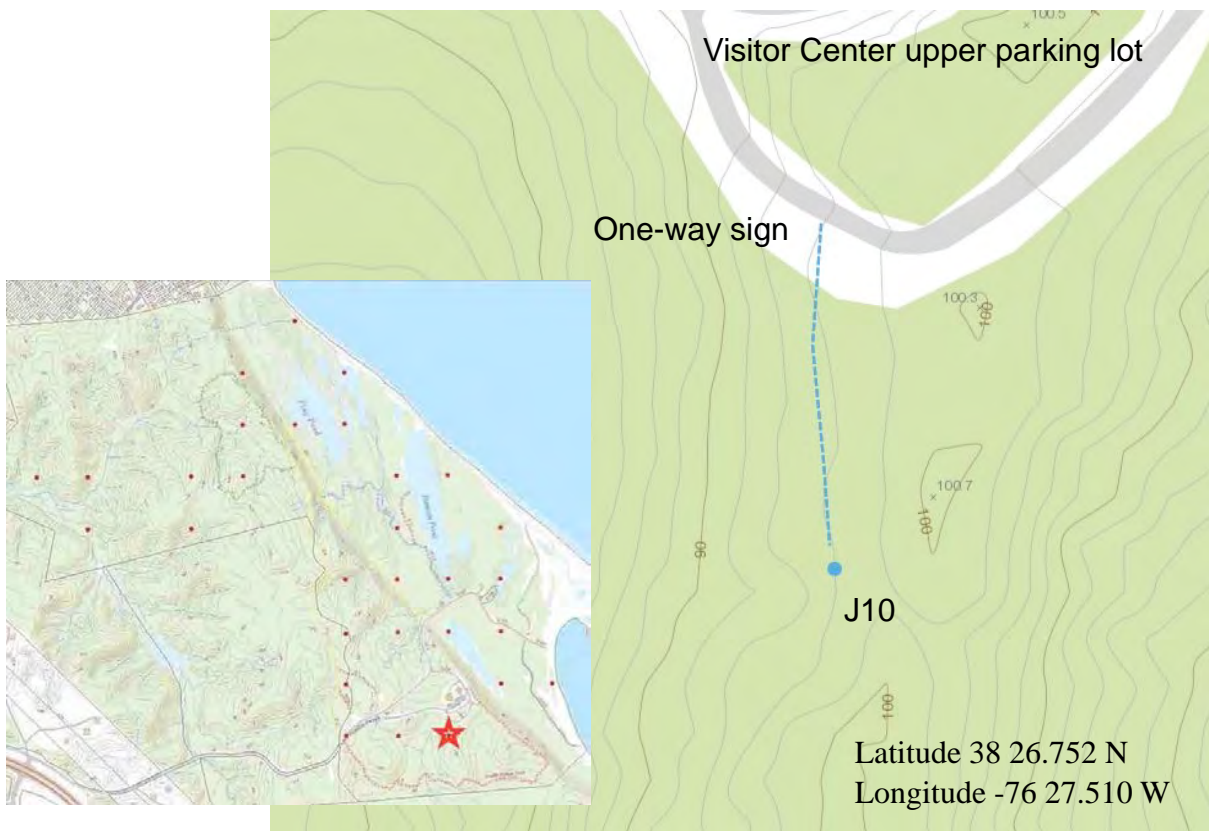


View East



View South

B/J10 (1990-2016 Site)



**Site Description (Date Located 3/6/2016):**

Site is located 134 feet south of SW corner of upper parking lot at Visitor's Center, at upper end of small drainage going west. Several downed trees are in the vicinity. A general plant review of the near vicinity indicated a reasonable, but not conclusive, correlation with the 1990 survey, but good correlation with the 1990 Drainage Map. In 2015 Karyn Molines conducted a 10-meter square habitat plot in the vicinity of this site. The data are not included in this report.

J10 Species (Herbaceous)	1990	2016	2016 alt.
<i>Aster sp.</i>	X		
<i>Symphyotrichum urophyllum</i> (formerly <i>Aster sagittifolius</i> )	X		
<i>Mitchella repens</i>	X	X	
<i>Polystichum acrostichoides</i>	X	X	
<i>Tipularia discolor</i>		X	
<i>Viola sp.</i>	X		
<i>Viola labradorica</i> (formerly <i>V. conspersa</i> )	X		

<b>J10 Species (Trees, Shrubs, &amp; Vines)</b>	<b>1990</b>	<b>2016</b>	<b>2016 alt.</b>
<i>Acer rubrum</i>	X	X	
<i>Carpinus caroliniana</i>	X		
<i>Carya glabra</i>	X		
<i>Cornus florida</i>	X		
<i>Ilex opaca</i>	X	X	
<i>Juniperus virginiana</i>		X	
<i>Liquidambar styraciflua</i>	X		
<i>Liriodendron tulipifera</i>	X	X	
<i>Prunus virginiana</i>	X		
<i>Quercus rubra</i>	X	X	
<i>Rubus phoenicolasius</i>		X	
<i>Smilax sp.</i>		X	

B/J10  
Latitude: 38 26.752N  
Longitude -76 27.510W



1990 - 2016 Grid Site  
Views from Grid Point (3/6/2016)



View North



View West



View East



View South



## IV. Environmental Changes From 1990 to 2016

Broadly speaking, both the 2016 survey and historical records show significant environmental changes at Flag Ponds over the 1990-2016 interval. These include both climate and man related interventions.

Weather related environmental changes occur as a result of high winds, lightning, and coastal storms, surges, and tidal flooding. The National Weather Service Severe Weather Database for this period includes :

1. Tornados – 7 (For the general region, not specifically for Flag Ponds)
2. Tropical Storms – 3
3. Storm Surge/Coastal Flooding/Tidal Flooding – 12
4. Ice Storm – 2
5. High winds/thunderstorms – 84
6. Winter storms/blizzards – 26.

These might be broadly grouped as: 1. Coastal changes, 2. Pond changes, 3. Plant changes, and 4. Animal changes.

Coastal changes: The water/land interface along the shores of Chesapeake Bay has always been a dynamic process of sediment deposition and coastal erosion. This is aptly illustrated at Flag Ponds. Sedimentation distribution as mapped by the Maryland Geological Survey in the Chesapeake Bay Earth Science Study found pure sand (typical of a high energy environment) as the predominant sediment off the coast of Calvert County.

Meteorological tides (the interaction of weather and tides) produce complex offshore currents predominantly from the north, mainly due to outflow from the Susquehanna River and the narrowing of the upper region of Chesapeake Bay. When combined with the configuration of the coastline at Flag Ponds, the long-term tendency has been erosion of the northern shoreline and deposition along the southern portion (Figure 1.). This is enhanced by the human development north of Flag Ponds with the resulting installation of rip-rap, etc. to control shoreline erosion.

During periods of severe weather events, significant changes are observed over short time intervals. This is illustrated in more detail in the aerial photos for 1993 (Figure 2.), 2005 (Figure 3.), 2009 (Figure 4.), and 2013 (Figure 5.). Using both the northeast corner of Flag Ponds and the loop drive of Flag Ponds Parkway as reference points, the erosion of the northeast coast and the expansion and southern extension of the sandy hook are clearly discernible.

The 1990 Site G2 on the northeastern point of the survey was located 325 feet inland from the beach within the tree line, as indicated by a 1990 map and the presence of red maple. By 2016, the 1990 site was approximately 47 feet out in the Bay. Moreover, the preliminary survey of G2 in March 2015 shows a large dead tree down that was completely washed away by April 2016.

Pond changes: The entire coastal lowland area of Flag Ponds is subject to severe flooding due to tidal surge and storm surge. Debris washed in from the Bay is common even as far inland as the base of the cliffs. The sequence of aerial photographs clearly show the changes in individual ponds as well as the creation and disappearance of smaller ponds. As one example, the site at J8 was accessible in 1990, but has become flooded by 2016, with the resultant loss of trees and a complete change in vegetation habitat. Likewise, Site G4 is now located 90 feet off the shore of Richardson's Pond. However, in 1990 H3 was 50 feet northwest of a small pond. This site remains the same in 2016.

Plant changes: Significant vegetation changes have occurred throughout the Park related both to natural environmental changes and to human impact. Erosion along the northerly coast has caused the loss of many trees, to the extent that the beach area is blocked by downed trees.

In the upland areas, the 26-year interval has resulted in normal forest succession affecting both hardwoods and pine trees. In addition many areas have been severely affected by high wind damage causing significant stretches of downed trees, particularly along ridge lines.

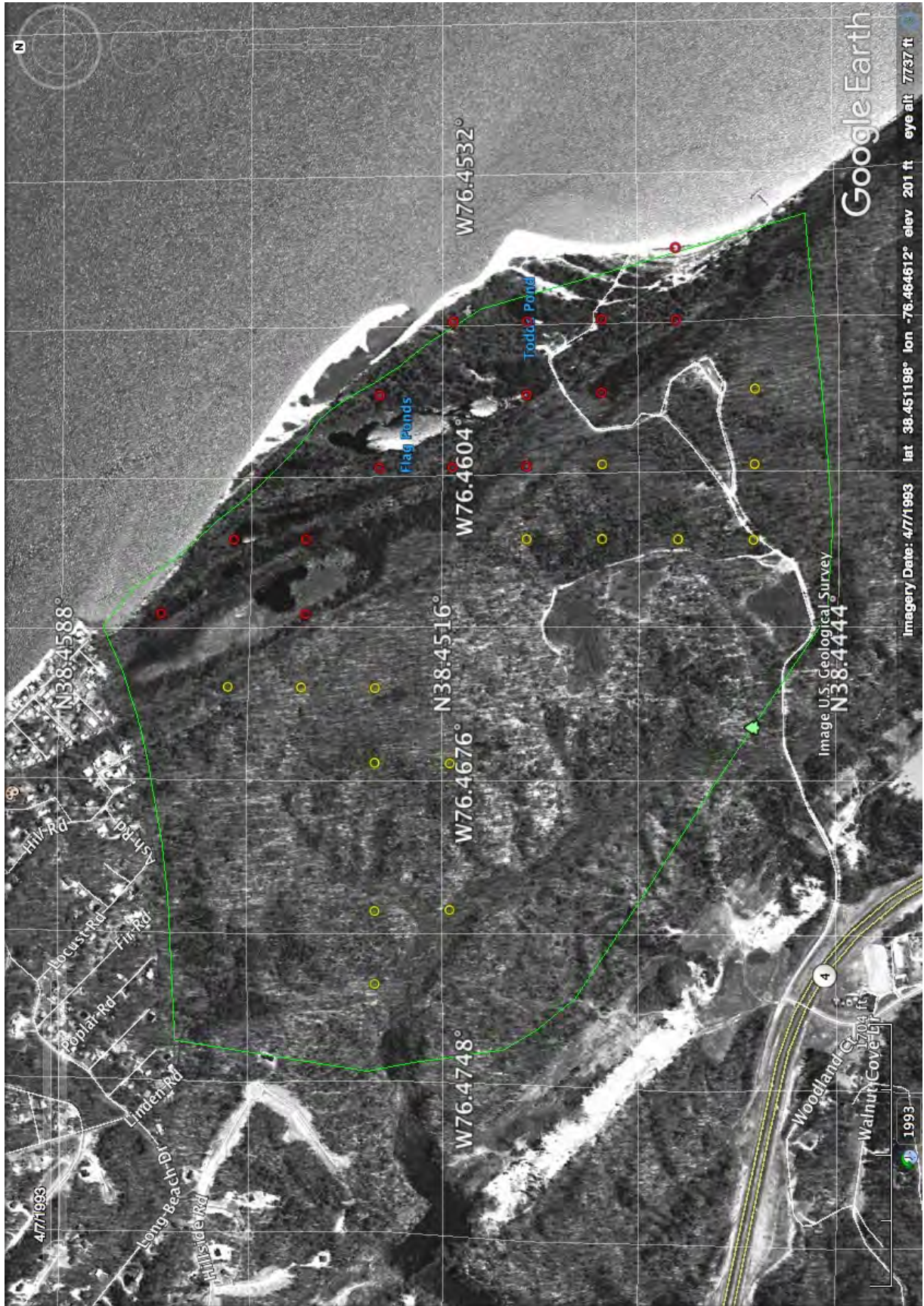
Man's impact in some cases has been deliberate, such as in the northwest portion of the park where a large beaver pond existed in 1990. With the decision

to relocate the beaver population, the pond was lost, with only wetlands continuing along the stream valley.

In addition, public access and use have greatly increased, and have undoubtedly contributed to the introduction and increase of many invasive plants, to the detriment of native plants. The widespread occurrence of downed trees has provided open space for sun-seeking invasive plants. Japanese wineberry is presently observed throughout the Park, but was not reported in 1990. Phragmites was observed in 1990, but is now so dense in the lowland wetlands that some 1990 sites are not possible to reach. Site H4 in 1990 was located between 2 ponds, but by 2016 had become totally inaccessible due to dense Phragmites growth.

Animal changes: As mentioned earlier, beavers are no longer present due to relocation. The beaver pond has retreated, with both tree and herbaceous plants being affected. The deer population, and the resulting impact on habitat thru browsing, has also greatly increased, but comparative numbers are not available.





Upland sites in yellow; Lowland sites in red

Fig. 2 - 1993



Upland sites in yellow; Lowland sites in red

Fig. 3 - 2005



Upland sites in yellow; Lowland sites in red

Fig. 4 - 2009



Upland sites in yellow; Lowland sites in red

Fig. 5 - 2013

## V. Site Specific Habitat Changes 1990-2016

A more site-specific picture of habitat change can be derived from a comparison of Vegetation Types and Water Regimes as developed by Hench in 1990 for the entire Flag Ponds Nature Area (Appendix C). Given the poor correlation with the 1990 Permanent Plots, an obvious consideration is that the 2016 sites were not conducted in the same location as the 1990 Plots. No geographic coordinates were provided for the 1990 Plots. As part of the 2016 study, an effort was made to determine the accuracy of correlation between the 1990 and 2015 grids.

The 1990 survey included a map for the entire Park designating the distribution of eleven generic Vegetation/Habitat Types combined with 7 generic Water Regimes (Appendix C.). For instance Type 1 designates Deciduous Forest and covers more than half of the Park. Other Types combined with the Water Regime are more detailed, such as 4S (Scrub Swamp in Tidally Influenced Temporarily Flooded Freshwater System). For easier reference the 1990 categorization is outlined below:

<b>VEGETATION/HABITAT TYPE</b>	<b>WATER REGIME</b>
1. Deciduous Forest	A. Temporarily Flooded
2. Open Water	C. Seasonally Flooded
3. Emergent Marsh	E. Seasonally Flooded and Saturated
4. Scrub Swamp	P. Irregularly Flooded
5. Coniferous Forested Swamp	R. Tidally Influenced Seasonally Flooded Freshwater System
6. Coniferous - Deciduous Forest Swamp	S. Tidally Influenced Temporarily Flooded Freshwater System
7. Deciduous Forested Swamp	U. Tidally Influenced Permanently Flooded Freshwater System
8. Unconsolidated Sandy Beach	
9. Grass - Forb	
10. Scrub - Shrub	
11. Coniferous Deciduous Forest	

Correlation with the 1990 Permanent Plots was derived by overlaying the Plot map with the Habitat map. The following Table compares the 1990 and 2016 Sites for both the coastal areas and upland areas:



<b>SITE</b>	<b>1990 Classification</b>	<b>2016 Classification</b>	<b>Plant Correlation 1990/2016</b>	<b>Factors Affecting Habitat Changes</b>
A/G2	3S	2 (in Bay)	None	Coastal erosion
A/G4	7R	2	None	Pond encroachment
A/H3	3R	8	Poor	Coastal erosion; Invasives
A/H4	7R	7R	Inaccessible	Invasives
A/I5	6R	7R	None	Downed trees
A/I6	7R	7R	Unknown	Downed trees
A/I7	7R	7R	Poor	Downed trees
A/J5	6R	7R	None	Invasives, Downed trees
A/J7	7R	2	None	Pond encroachment
A/J8	7E	7	None	Pond encroachment; Downed trees
A/K6	4R	7R	None	None observed
A/K7	2U	2U	None	Pond encroachment, Invasives
A/K8	11	11	Poor	Downed trees
A/K9	11	11	Reasonable	Downed trees
A/L9	8P	11	None	Coastal deposition; Plant succession
B/B5	7A	1A	Poor	Loss of beaver pond w/ plant succession.
B/C5	1	1	Poor	Downed trees
B/C6	7C	7C	Reasonable	Loss of beaver pond; Downed trees
B/E5	1	1	Poor	Downed trees
B/E6	1	1	None	Downed trees
B/F3	1	1	Reasonable	None observed
B/F4	1	1	Reasonable	Downed trees
B/F5	1	1	Reasonable	Downed trees
B/H7	1	1	Reasonable	Downed trees
B/H8	1	1	Poor	Downed trees
B/H9	1	1	Poor	Downed trees
B/H10	1 (roadside)	1 (roadside)	None	Possible road development
B/I8	1	1	Poor	Downed trees
B/I10	1	1	Poor	Downed trees
B/J10	1	1	Reasonable	Downed trees

It should be noted in studying the site locations mapped in Appendix D that the upland area is considerably larger than the lowland area. In 1990 Flag Ponds consisted of 343 acres with approximately 206 acres (60%) being upland and 137 acres (40%) being lowland. However, the above Table shows the upland area with only 2 Habitat Types and 2 Water Regimes. In contrast the lowland area includes 8 Habitat Types and 5 Water Regimes.

In addition to the habitat changes outlined above, other causes may contribute to the disparity of plant correlation between the 1990 and 2016 surveys. These include natural succession over a period of 25 years, misidentification of plants, and 1990 field surveys not being actually conducted at the designated Permanent Plots. Natural succession is ongoing as new plants emerge and forests mature, but in and of itself is not sufficient to affect the large numbers of sites studied. Perhaps the absence of *Pinus rigida* (Pitch Pine) at K8 and K9 is the result of succession, but it more probably was misidentification as this would have been an uncommon location for *Pinus rigida*. The plants listed for several 1990 Plots had better correlations at some Alternate Sites as discussed previously in the Site Descriptions. The Alternate Sites had no consistent offset and did not comply with the systematic 500-foot grid. This indicates that the 1990 field surveys did not necessarily conform with the intended Permanent Plot sites.

## VI. Summary

As was made clear in the site-by-site comparisons, correlation with the 1990 data proved to be a very challenging task. To begin with, volunteers were unable to find either tree tags or pole markers at any of the “permanent” sites. Nor was any positive indication of the 1990 surveys found in the areas surrounding the established sites. This is possible for the following reasons: Flag Ponds has experienced heavy storms resulting in many downed trees, both in uplands and lowlands; metal tags on trees are quickly overgrown or destroyed in 3-5 years; and heavy erosion/deposition along the coast has created drastic coastal changes every year, both in the coastline and in the lowland ponds.

The second challenge is that given the lack of global positioning equipment, the 1990 field surveys may not have been conducted precisely at the intended grid sites. The third challenge is that the 1990 surveyors did not give even a general description of the sites. They simply listed species. One does not know if, for example, they found a dozen red maples or only one small one, a field of mountain laurel or a single plant. One does not know if there were downed trees, streams, or trails. Hence, it is virtually impossible to confirm the 1990 field survey location, but there is strong evidence that they differ to some degree from the intended 1990 Permanent Plot locations.

One can say, with reasonable confidence, that the sites of the 1990 field surveys are generally in the same locale as the intended grid site, probably within less than one to two hundred feet. Still, this disparity is difficult to understand. The Methodology described in the Hench Report is very precise, as are the 1990 maps, i.e., the 1990 Habitat map shows detail distinguishing between narrow vegetation-covered sand dunes as distinct from open sandy areas.

As a result, we have only been able to document some general conclusions about the changes that have occurred at Flag Ponds based on these two surveys. In the process, much has been learned to provide better documentation for future long-term studies. This is particularly important with the recognition of the accelerating effects of global warming and the anticipation of rising sea levels, warming temperatures, and more frequent and violent storm events.

It is hoped that volunteers will be able to use the information assembled in this study to do more detailed surveys in the future. Possible studies include:

1. With the confirmation that the 1990 maps were based on the NAD 27 Plane Grid, it is now possible to convert any grid point or location from the NAD 27 to current NAD 83 geographic coordinates. A field study could compare the sites surveyed for this report using the NAD 83 coordinates of the 2016 study with the 2018 corrected NAD 27 conversions. (See Appendix B).
2. Use the data and descriptions of the A and B sites to establish a data base for monitoring coastal change as a result of climate change.
3. Use the data and descriptions of the A sites to establish a data base for monitoring the long term changes as a result of the living shoreline construction.
4. Given the enlargement of Flag Ponds by 90 acres and the lack of 1990 coverage of approximately 30% of the upland area in the northwestern section of Flag Ponds, over 150 acres of Flag Ponds remains completely undocumented.

Basic exploration of vegetation and habitat distribution for this area is a high priority.

5. Establish NS/EW transect studies to compare the validity of the 1990/ 2016 studies with the general environments of Flag Ponds.
6. Conduct an in-depth study of the abundance of plants found in 2016 that were not found in 1990.
7. Conduct a search for plants found in 1990 that were not found in 2016. This study might also expand to reintroducing these plants to Flag Ponds.
8. Intensive monthly study of plants and changes in selected sites for a year or more.
9. Studies of the presence and or expansion of invasive species that existed in 2016, but not in 1990, could be beneficial in establishing rate of invasion as well as conditions that promote the spread of invasive species.
10. Continue/complete the Habitat Surveys begun in 2014 using the protocol found in Appendix A.
11. Conduct Habitat Surveys in sites established by NAD 27 coordinates to compare with 2014-16 surveys using the protocol found in Appendix A.
12. Supplement and consolidate information from the above suggestions to establish comprehensive baselines for future data collection for long-term studies to evaluate global warming changes. Specifically,
  - a.) Install a digital weather station at Flag Ponds to monitor long-term temperature changes and specific major storm occurrences. Section IV. Environmental Changes references the impact of severe weather, but the uncertainty in establishing which ones impacted Flag Ponds;
  - b.) Install some sort of long-term water level monitoring for both sea level and pond levels;
  - c.) Consolidate a comprehensive database for all species at Flag Ponds to include information on first occurrence and last observation, as well as first annual appearance of migratory species and the first flowering of angiosperms.

Flag Ponds Nature Park is a unique site along the Western Shore of Chesapeake Bay. It is located at a point of dynamic coastal changes while encompassing a large area of fairly undeveloped terrain. As such it presents a special opportunity for the documentation and study of long-term changes. We have learned that the study of long-term changes requires accurate and comprehensive documentation of baseline data. What has been presented in this report is only a start.

## **VII. Appendix**

### **A. Protocol and Data for 10 Meter Square Plot Studies of Sites at Flag Ponds Surveyed 2015 and 2016**

There were ten plot studies using the protocol of 10 meter squares conducted in 2015/2016 at the areas assumed to be the sites established by the Hench Survey in 1990. As pointed out in the Introduction to this Report, the exact locations of the sites surveyed in 1990 can no longer be determined. However, the general locales of the sites have been determined. These ten 10 meter square site surveys have been done in the 2016 established sites with calculated Longitude and Latitude coordinates. Some, however, are Alternate sites that are near the Lat/Long coordinates, but seem to better fit the habitat descriptions. These 10 meter square surveys were done in the spring by volunteers under the direction of Karyn Molines. There was also one survey done at an alternate site.

A-1 : Data forms used in the 10 meter surveys

A-2: Summary of Ten Meter Square Survey of A Plots (Coastal)

A-3: Summary of Ten Meter Square Survey of B Plots (Upland)

# Appendix VII. A.1 Methodology: Forms

Calvert County Natural Resources

## FLAG PONDS NATURE PARK HABITAT SURVEY FORM

Date \_\_\_\_\_ Plot # \_\_\_\_\_ Quad / Grid \_\_\_\_\_  
 Plot dimensions \_\_\_\_ by \_\_\_\_ m sample area \_\_\_\_\_ sq. m  
 Surveyors \_\_\_\_\_

GPS Datum:  NAD83  UTM WGS84 Est. accuracy \_\_\_\_\_ m / ft # sats fixed: \_\_\_\_\_  
 Coordinates in DMS (ddmmss.nnn) Coordinates in UTM Aspect: none | N | E | S | W | All  
 Lat: \_\_\_\_\_ X: \_\_\_\_\_ E Cover Pattern (1-12) \_\_\_\_\_  
 Long: \_\_\_\_\_ Y: \_\_\_\_\_ N  
 Type-to-enter text: \_\_\_\_\_

<p><b>Terrestrial</b> (not a wetland)</p> <p><b>Aquatic Systems</b></p> <p><b>Tidal</b>          A – Irregularly exposed          B – Regularly flooded          C – Irregularly flooded          D – Wind tidally flooded</p> <p><b>Non-Tidal</b>          A – Permanently flooded          B – Semipermanently flooded          C – Seasonally flooded          D – Intermittently flooded          E – Temporarily flooded          F – Saturated</p> <p><b>Salinity</b>          A – Saltwater (&gt;30 ppt)          B – Brackish (5-30 ppt)          C – Oligohaline (0.5-5 ppt)          D – Freshwater (&lt;0.5 ppt)</p> <p><b>Inundation</b>          A – never          B – infrequently          C – regularly (&lt;6 mos)          D – regularly (&gt;6 mos)          E – always submerged by shallow water (&lt;30cm)          F – always submerged by deep water (&gt;30cm)</p>	<p><b>Disturbances/Threats:</b></p> <p><input type="checkbox"/> deer browse  <input type="checkbox"/> clearing / logging  <input type="checkbox"/> erosion  <input type="checkbox"/> gypsy moth  <input type="checkbox"/> fire  <input type="checkbox"/> ditching  <input type="checkbox"/> other:</p> <p><b>Non-native plants:</b> (%cover)  <i>Leave blank if 0 in category</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Surface Substrate</th> <th style="text-align: left;">% cover</th> </tr> </thead> <tbody> <tr><td>Honeysuckle</td><td></td></tr> <tr><td>Stiltgrass</td><td></td></tr> <tr><td>Beefsteak plant</td><td></td></tr> <tr><td>Phragmites</td><td></td></tr> <tr><td>Ailanthus</td><td></td></tr> <tr><td>Other</td><td></td></tr> <tr><td>Other</td><td></td></tr> <tr><td><b>TOTAL</b></td><td><b>100%</b></td></tr> </tbody> </table> <p><b>Disturbance Comments</b></p>	Surface Substrate	% cover	Honeysuckle		Stiltgrass		Beefsteak plant		Phragmites		Ailanthus		Other		Other		<b>TOTAL</b>	<b>100%</b>	<p><b>Slope</b>          A - 0-3% (Level)          B - 3-8% (gentle/undulating)          C - 8-16% (sloping/rolling)          D - 16-30% (moderate/hilly)          E - 30-65% (steep)          F - 65-17% (very steep)          G - &gt;75% (extremely steep)</p> <p><b>Slope Shape</b>  <b>Vertical Horizontal</b>          C - concave C - concave          X - convex X - convex          S - straight S - straight          H - hummock ( _ %) and hollow ( _ %) microtopo.</p> <p><b>Surface Substrate</b> (% cover)  <i>Excludes live vegetation</i>  <i>Leave blank if 0 in category</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Surface Substrate</th> <th style="text-align: left;">% cover</th> </tr> </thead> <tbody> <tr><td>Stones (&gt;10 cm)</td><td></td></tr> <tr><td>Gravel (.2-10cm)</td><td></td></tr> <tr><td>Leaves</td><td></td></tr> <tr><td>Decaying wood</td><td></td></tr> <tr><td><input type="checkbox"/> Twigs</td><td></td></tr> <tr><td><input type="checkbox"/> Branches</td><td></td></tr> <tr><td><input type="checkbox"/> Old logs</td><td></td></tr> <tr><td><input type="checkbox"/> Recent treefall</td><td></td></tr> <tr><td>Water</td><td></td></tr> <tr><td>Soil or sand</td><td></td></tr> <tr><td>Other</td><td></td></tr> <tr><td><b>TOTAL</b> (does not need to equal 100%)</td><td></td></tr> </tbody> </table>	Surface Substrate	% cover	Stones (>10 cm)		Gravel (.2-10cm)		Leaves		Decaying wood		<input type="checkbox"/> Twigs		<input type="checkbox"/> Branches		<input type="checkbox"/> Old logs		<input type="checkbox"/> Recent treefall		Water		Soil or sand		Other		<b>TOTAL</b> (does not need to equal 100%)		<p><b>Dominant Forest Understory</b>          1 - sparse shrub layer          2 - medium shrub layer          3 - dense shrub layer          4 - herbaceous only          5 - leaf litter/debris only</p> <p><b>Topographical Position</b>          A – crest          B – upper slope          C – middle slope          D – lower slope          E – toe          F – plain /level          G – basin/depression</p> <p><b>Successional Stage</b>          L – late          M – mid          E – Early</p> <p><b>Relative Stand Size</b>          A – Matrix (&gt;100x plot size)          B – Large (10-100 x plot size)          C – Small (3-10x plot size)          D – Very small (1-3x plot size)          U – Unknown</p> <p><b>Miscellaneous</b>  <input type="checkbox"/> Bryophyte  <input type="checkbox"/> Lichens  <input type="checkbox"/> Snags (#) _____</p>
Surface Substrate	% cover																																														
Honeysuckle																																															
Stiltgrass																																															
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Soil or sand																																															
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**Appendix VII-A-2. Coastal Sites**  
**Summary of Ten Meter Square Survey at Site A/I-7 Alternate**  
**August 21, 2015**

The area was Terrestrial, with a 3% slope (level) and a Topographical Position of plain/ level. The Dominant Understory was a sparse shrub layer. Other features included one snag outside the 10 meter plot, as well as large fallen trees and a Paw paw (*Asimina triloba*) grove within the plot. Invasive plants included *Microstegium vimineum* (Japanese stilt grass,) *Rubus phoenicolasius* (Wineberry), and *Lonicera japonica* (Japanese honeysuckle).

Coordinates: Reference A/I-7 Summary: Lat: 38 27.0N Long:-76 27.613W

**Woody Stem  $\geq$  2.5 cm DBH in Plot**

Species	2.5-5 cm 1-2"	5-10 2-4"	10-15 4-6"	15-20 6-8"	20-25 8-10"	25-30 10-12"	30-35 12-14"	35-40 14-16"	40+ 16+
<i>Asimina triloba</i>	3	10							
<i>Liquidamber styraciflua</i> in plot						1			
<i>Liquidamber styraciflua</i> out of plot					1				

**Plants found on Plot**

Herbaceous species	Woody species, vines, and shrubs
<i>Boehmeria cylindrica</i>	<i>Asimina triloba</i>
<i>Carex</i> sp.	<i>Campsis radicans</i>
<i>Leerzia</i> sp.	<i>Liquidambar styraciflua</i>
<i>Microstegium vimineum</i>	<i>Lonicera japonica</i>
<i>Phragmites australis</i>	<i>Nyssa sylvatica</i>
<i>Pilea pumila</i>	<i>Rubus phoenicolasius</i>
<i>Polystichum acrostichoides</i>	

## Summary of Ten Meter Square Survey at Site A/J-7 April 23, 2015

The area was Terrestrial, with a 3% slope (level) and a Topographical Position of plain/ level. It is Non-Tidal and Permanently flooded, with Salinity rated Oligohaline (0.5-5 with ppt), always submerged by deep water (>30cm) Invasive plants included *Microstegium vimineum* (Japanese stilt grass), *Lonicera japonica* (Japanese honeysuckle) and *Phragmites australis* (Common reed).

Coordinates: Reference A/J-7 Summary: Lat: 38.270N Long:-76 27.510

### Woody Stem $\geq$ 2.5 cm DBH in Plot

Species	2.5-5 cm 1-2"	5-10 2-4"	10-15 4-6"	15-20 6-8"	20-25 8-10"	25-30 10-12"	30-35 12-14"	35-40 14-16"	40+ 16+
<i>Acer sp.</i>									
<i>Asimina triloba</i>	5	2							
<i>Fraxinus sp</i>						1			
<i>Acer sp.</i>						1			

### Plants found on Plot

Herbaceous species	Woody species, vines, and shrubs
<i>Arisaema triphyllum</i>	<i>Acer rubrum</i>
<i>Microstegium vimineum</i>	<i>Acer sp.</i>
<i>Phragmites australis</i>	<i>Asimina triloba</i>
<i>Podophyllum peltatum</i>	<i>Fraxinus pennsylvanica</i>
	<i>Ilex opaca</i>
	<i>Juniperus virginiana</i>
	<i>Lonicera japonica</i>
	<i>Myrica cerifera</i>
	<i>Parthenocissus quinquefolia</i>
	<i>Rubus sp.</i>
	<i>Smilax rotundifolia</i>
	<i>Vitis sp.</i>

## Summary of Ten Meter Square Survey at Site A/K-8 April 23, 2015

The area was Terrestrial, with a 3% slope (level) and a Topographical Position of plain/ level and toe. Dominant Understory is leaf litter/ debris only. No invasive species were noted.

Coordinates: Reference A.K-8 Summary: Lat: 38 26.916N Long: -76 27.403

### Woody Stem $\geq$ 2.5 cm DBH in Plot

Species	2.5-5 cm 1-2"	5-10 2-4"	10-15 4-6"	15-20 6-8"	20-25 8-10"	25-30 10-12"	30-35 12-14"	35-40 14-16"	40+ 16+
<i>Liquidambar styraciflua</i>		2							
<i>Pinus virginiana</i>				1					
<i>Pinus taeda</i>			1	1				1	
<i>Quercus sp</i> (Red oak category)	3	1							

### Plants found on Plot

Herbaceous species	Woody species, vines, and shrubs
<i>Chimaphila maculata</i>	<i>Cercis canadensis</i>
	<i>Cornus florida</i>
	<i>Liquidambar styraciflua</i>
	<i>Myrica cerifera</i>
	<i>Pinus taeda</i>
	<i>Pinus virginiana</i>
	<i>Quercus rubrum</i>

## Summary of Ten Meter Square Survey at Site A/K-9 April 23, 2015

The area was Terrestrial, with a 3% slope (level) and a Topographical Position of plain/ level and toe. Dominant Understory is sparse shrub layer. Deer browse was noted as a disturbance. No invasive species were noted. There was a 19" diameter dead pine tree crossing the center of the 10 meter square.

Coordinates: Reference A/K-9 Summary: Lat: 38 26.834N Long: -76 27.403W

### Woody Stem $\geq$ 2.5 cm DBH in Plot

Species	2.5-5 cm 1-2"	5-10 2-4"	10-15 4-6"	15-20 6-8"	20-25 8-10"	25-30 10-12"	30-35 12-14"	35-40 14-16"	40+ 16+
<i>Asimina triloba</i>	4								
<i>Liquidambar styraciflua</i>	3	3	1	1					
<i>Liriodendron tulipifera</i>		1							
<i>Pinus taeda</i>						1		1	1(18")
<i>Pinus virginiana</i>				1					
<i>Ulmus sp.</i>				1					

### Plants found on Plot

Herbaceous species	Woody species, vines, and shrubs
<i>Arisaema sp.</i>	<i>Asimina triloba</i>
<i>Tipularia discolor</i>	<i>Carpinus carolinia</i>
	<i>Ilex opaca</i>
	<i>Juniperus virginiana</i>
	<i>Liquidambar styraciflua</i>
	<i>Liriodendron tulipifera</i>
	<i>Lonicera japonica</i>
	<i>Myrica cerifera</i>
	<i>Pinus taeda</i>
	<i>Pinus virginiana</i>
	<i>Rubus phoenicolasius</i>
	<i>Smilax rotundifolia</i>
	<i>Ulmus rubra</i>

**Appendix VII-A-3. Upland Sites  
Summary of Ten Meter Square Survey at Site B/H-7  
July 22, 2015**

The area was Terrestrial, with a 30 to 65% slope (steep) and a Topographical Position of middle slope. The Dominant Understory was a sparse shrub layer. Late successional stage. Lichens were noted, as was deer browse. There was a Paw paw (*Asimina triloba*) grove within the plot. No invasive plants were noted.

Coordinates: Lat: 38 27.0N Long: -76 27.719W

**Woody Stem  $\geq$  2.5 cm DBH in Plot**

Species	2.5-5 cm 1-2"	5-10 2-4"	10-15 4-6"	15-20 6-8"	20-25 8-10"	25-30 10-12"	30-35 12-14"	35-40 14-16"	40+ 16+
<i>Asimina triloba</i>	1								
<i>Fagus grandifolia</i>		1							
<i>Kalmia latifolia</i>	2	2							
<i>Liquidamber styraciflua</i> out of plot			1						
<i>Liriodendron tulipifera</i>									1 (30")
<i>Quercus montana (pinus)</i>									11 (21")
<i>Sassafras albidum</i>	3								

**Plants found on Plot**

Herbaceous species	Woody species, vines, and shrubs
<i>Athyrium filix-femina</i> -1	<i>Asimina triloba</i> -25 shrub size
<i>Chimaphila maculata</i> -1	<i>Carpinus caroliniana</i> 1 shrub size
<i>Polystichum acrostichoides</i>	<i>Fagus grandifolia</i> shrub size
	<i>Quercus prinus</i> 2 sapling
	Unknown sapling

## Summary of Ten Meter Square Survey at Site B/H-7 Alternate July 22, 2015

The area was Terrestrial, with a 16 to 30% slope (moderately hilly) and a Topographical Position of Crest- Upper slope (almost to the crest). Disturbances of deer browse was noted. Eleven snags were noted.

Coordinates: Lat: 38 26.985N Long: -76 27.709W Elevation: 134'

### Woody Stem $\geq$ 2.5 cm DBH in Plot

Species	2.5-5 cm 1-2"	5-10 2-4"	10-15 4-6"	15-20 6-8"	20-25 8-10"	25-30 10-12"	30-35 12-14"	35-40 14-16"	40+ 16+
<i>Ilex opaca</i>		3	2						
<i>Kalmia latifolia</i>	6	4							
<i>Liquidambar styraciflua</i>		1	1						1 (16") out of plot
<i>Nyssa sylvatica</i>		1							
<i>Pinus taeda</i>							1	1	
<i>Quercus alba</i>									1 (35") out of plot
<i>Quercus montana</i>			1					1 out of plot	1 (25") 1 (18") both out of plot
<i>Sassafras albidum</i>			1						

### Plants found on Plot

Herbaceous species	Woody species, vines, and shrubs
<i>No herbaceous noted</i>	<i>Asimina triloba</i> -scattered small trees
	<i>Vaccinium corymbosum</i>

## Summary of Ten Meter Square Survey at Site B/H-8 July 22, 2015

The area was Terrestrial, with a 3 to 8% slope (gentle/ undulating) and a Topographical Position of crest. The Dominant Understory was sparse shrub layer. Mid successional stage. Disturbance of deer browse was noted. *Lonicera japonica* (Japanese honeysuckle) an invasive plant was noted. Two snags were noted.

Coordinates: Lat: 38 26.916N; Long: -76 27.719W (taken from 2/20/2016 survey)

### Woody Stem $\geq$ 2.5 cm DBH in Plot

Species	2.5-5 cm 1-2"	5-10 2-4"	10-15 4-6"	15-20 6-8"	20-25 8-10"	25-30 10-12"	30-35 12-14"	35-40 14-16"	40+ 16+
<i>Carpinus caroliniana</i>		1							
<i>Ilex opaca</i>	2	3							
<i>Fagus grandifolia</i>	1								
<i>Liquidambar styraciflua</i>				1	1				
<i>Liriodendron tulipifera</i>				1					
<i>Pinus taeda</i>									1 (32")
<i>Pinus virginiana</i>									1 (20") down
<i>Quercus alba</i>		1							
<i>Sassafras albidum</i>				1					

### Plants found on Plot

Herbaceous species	Woody species, vines, and shrubs
No herbaceous noted	<i>Asimina triloba</i> - about 8 shrub size
	<i>Parthenocissus quinquefolia</i> —small
	<i>Prunus serotina</i> (very small)
	<i>Vaccinium</i> sp.

## Summary of Ten Meter Square Survey at Site B/H-8 Alternate July 22, 2015

The area was Terrestrial, with a 0 to 3% slope (level) and a Topographical Position of crest. The Dominant Understory was leaf litter/ debris only. Mid to late successional stage. Disturbance of deer browse was noted. No Non-native plants were noted. Zero snags were noted. A very large oak outside the plot may be a "witness tree" and it may fit the 1990 plot description better.

Coordinates: Lat: 38 26.924N; Long: -76 27.703W

### Woody Stem $\geq$ 2.5 cm DBH in Plot

Species	2.5-5 cm 1-2"	5-10 2-4"	10-15 4-6"	15-20 6-8"	20-25 8-10"	25-30 10-12"	30-35 12-14"	35-40 14-16"	40+ 16+
<i>Acer rubrum</i>		1		1					
<i>Cornus florida</i>		1 outside of plot	1 outside of plot						
<i>Ilex opaca</i>	3	1	1 on plot line						
<i>Fagus grandifolia</i>						1			
<i>Liquidamber styraciflua</i>				1 outside of plot					
<i>Liriodendron tulipifera</i>								1 outside of plot	1 (20")
<i>Quercus falcata</i> (circumference of 15' 1")									
<i>Sassafras albidum</i>			1 outside of plot						

### Plants found on Plot

Herbaceous species	Woody species, vines, and shrubs
<i>Mitchella repens</i>	<i>Asimina triloba</i> - 18
	<i>Ilex opaca</i> -1
	<i>Smilax rotundifolia</i>
	<i>Toxicodendron (Rhus) radicans</i>



## Summary of Ten Meter Square Survey at Site B/H-9 July 22, 2015

The area was Terrestrial, with a 8-16% slope (sloping/rolling) and a Topographical Position of middle slope. The Dominant Understory was sparse shrub and dense shrub layer. Mid successional stage. Disturbance of deer browse and a fallen tree were noted. Invasive plants *Lonicera japonica* (Japanese honeysuckle) and *Rubus phoenicolasius* (Wineberry) were noted. Zero snags were noted.

Coordinates: Lat: 38 26.834N Long: -76 27.719W (Taken from 2/20/2016 survey)

### Woody Stem $\geq$ 2.5 cm DBH in Plot

Species	2.5-5 cm 1-2"	5-10 2-4"	10-15 4-6"	15-20 6-8"	20-25 8-10"	25-30 10-12"	30-35 12-14"	35-40 14-16"	40+ 16+
<i>Acer rubrum</i>			1	1 outside of plot					1
<i>Ilex opaca</i>		3 ( one is fallen and one is multi trunk	1	1					
<i>Liquidambar styraciflua</i>									1 (17")
<i>Liriodendron tulipifera</i>								1 fallen	
<i>Pinus taeda</i>									1 (20") outside of plot

**Plants found on Plot**

<b>Herbaceous species</b>	<b>Woody species, vines, and shrubs</b>
<i>Arisaema triphyllum</i>	<i>Asimina triloba</i> - 25 sapling and seedlings
<i>Carex swanii</i>	<i>Carpinus caroliniana</i> -6 saplings
<i>Mitchella repens</i>	<i>Euonymus americanus</i>
<i>Sanicula sp.</i>	<i>Ilex opaca</i> - seedlings
	<i>Liriodendron tulipifera</i> - seedlings
	<i>Lonicera japonica</i>
	<i>Parthenocissus quinquefolia</i> -
	<i>Pinus taeda</i> — saplings
	<i>Robinia pseudo-acacia</i>
	<i>Rubus phoenicolasius</i> 1 outside of plot
	<i>Smilax glauca</i>
	<i>Toxicodendron radicans</i>
	<i>Vaccinium sp.</i>
	<i>Vitis sp.</i>

## Summary of Ten Meter Square Survey at Site B/H-10 March 26, 2015

The area was Terrestrial, with a 3 to 8% slope (gentle/undulating) and a Topographical Position of toe. The Dominant Understory was sparse shrub layer. Disturbance by deer browse was noted. Invasive plant species noted were *Rubus phoenicolasius* (Wineberry), *Microstegium vimineum* (Stilt grass) and *Lonicera japonica* (Japanese honeysuckle). No snags were noted.

Coordinates: Reference B/H-10 Summary: Lat: 38 26.752N Long: -76 27.719W

### Woody Stem $\geq$ 2.5 cm DBH in Plot

Species	2.5-5 cm 1-2"	5-10 2-4"	10-15 4-6"	15-20 6-8"	20-25 8-10"	25-30 10-12"	30-35 12-14"	35-40 14-16"	40+ 16+
<i>Acer rubrum</i>		1		1					1 (18") 1 (21") outside the plot
<i>Betel sp.</i>		1							
<i>Ilex opaca</i>		1							
<i>Liriodendron tulipifera</i>									
<i>Pinus virginiana</i>								1 fallen	

### Plants found on Plot

Herbaceous species	Woody species, vines, and shrubs
<i>Microstegium vimineum</i>	<i>Asimina triloba</i>
<i>Mitchella repens</i>	<i>Euonymus americanus</i>
<i>Polystichum acrostichoides</i>	<i>Ilex opaca</i>
<i>Tipularia discolor</i>	<i>Lonicera japonica</i>
	<i>Liquidambar styraciflua</i>
	<i>Rubus phoenicolasius</i>
	<i>Smilax sp.</i>

## Summary of Ten Meter Square Survey at Site B/J-10 March 26, 2015

The area was Terrestrial, with a 3 to 8% slope (gentle/undulating) and a Topographical Position of crest. Mid successional stage. The Dominant Understory was sparse shrub layer. Disturbance by fallen trees was noted. Invasive plant species noted was *Rubus phoenicolasius* (Wineberry). Two snags were noted as well as Bryophytes and Lichens.

Coordinates: Reference B/ J-10 Summary: Lat: 38 26.752N Long: -76 27.510W

### Woody Stem $\geq$ 2.5 cm DBH in Plot

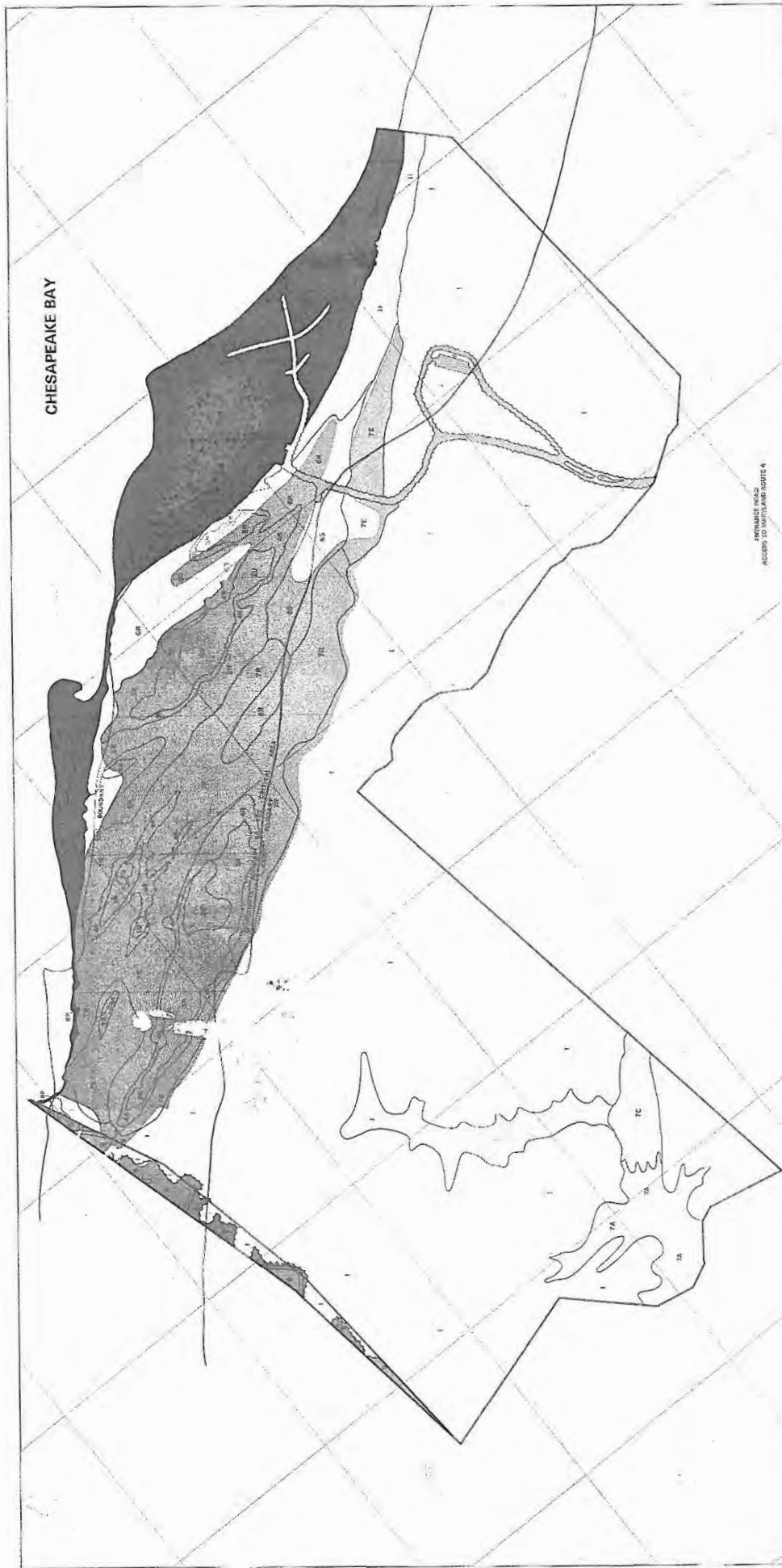
Species	2.5-5 cm 1-2"	5-10 2-4"	10-15 4-6"	15-20 6-8"	20-25 8-10"	25-30 10-12"	30-35 12-14"	35-40 14-16"	40+ 16+
<i>Acer rubrum</i> size not specified, out of plot									
<i>Liquidambar styraciflua</i>			1						
<i>Liriodendron tulipifera</i>									1 (24") fallen
<i>Quercus rubra</i>				1					

### Plants found on Plot

Herbaceous species	Woody species, vines, and shrubs
<i>Carex</i> sp	<i>Fagus grandifolia</i> —out of plot
<i>Dichanthelium clandestinum</i>	<i>Ilex opaca</i>
<i>Mitchella repens</i>	<i>Liquidambar styraciflua</i>
<i>Polystichum acrostichoides</i>	<i>Pinus virginiana</i> - out of plot
<i>Tipularia discolor</i>	<i>Rubus phoenicolasius</i>
Unknown grass	

## Appendix B: Comparison of Converted 1990 NAD 83 Grid to 2015 Computed Grid

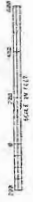
Plot ID	1990 NAD27 Plane Grid (Northing ft. Easting ft.)	1990 Plane Grid Converted to NAD83 Geographic Coordinates (Deg)	2015 Computed NAD83 Geographic Coordinates (Deg)	Lat Diff. in ft. 1990-2015	Lon Diff. in ft. 1990- 2015	Total Diff. in ft. 1990-2015
B5	N 226000 E 951000	N 38.452839593 W 76.472406762	N 38.452745 W 76.472376	34.4	8.8	35.5
C5	N 226000 E 951500	N 38.452831642 W 76.470660827	N 38.452745 W 76.470656	31.5 ft.	4.3ft.	31.8 ft.
C6	N 225500 E 951500	N 38.451458706 W 76.470670952	N 38.451356 W 76.470656	37.4 ft.	4.3 ft.	37.6 ft.
E5	N 226000 E 952500	N 38.452815658 W 76.467168958	N 38.452745 W 76.467164	25.7	1.4	25.8
E6	N 225500 E 952500	N 38.451442723 W 76.467179148	N 38.451356 W 76.467164	31.6	4.3 ft.	31.9
F3	N 227000 E 953000	N 38.45553947 W 76.465402572	N 38.455484 W 76.465408	25.5	1.6	25.5
F4	N 226500 E 953000	N 38.45418056238 W 76.465412798	N 38.454113 W 76.465408	24.6	1.4	24.6
F5	N 226000 E 953000	N 38.452807625 W 76.465423023	N 38.452745 W 76.465408	22.8	4.3 ft.	23.2
G2	N 227500 E 953500	N 38.456918373 W 76.463646312	N 38.456844 W 76.463637	21.3	2.7	21.5
G4	N 226500 E 953500	N 38.454172503 W 76.46366683	N 38.454113 W 76.463637	21.7	8.5	23.3
H3	N 227000 E 954000	N 38.455530095 W 76.46187904	N 38.455484 W 76.461978	16.8	2.8	17
H4	N 226500 E 954000	N 38.454164418 W 76.46187904	N 38.454113 W 76.461978	18.8	1.6	18.9
H7	N 225000 E 954000	N 38.45004544 W 76.461951655	N 38.45 W 76.461978	16.5	0.8	16.5
H8	N 224500 E 954000	N 38.44867268 W 76.461962028	N 38.448598 W 76.461978	27.2	4.6	27.6
H9	N 224000 E 954000	N 38.447299743 W 76.461972318	N 38.447225 W 76.461978	27.2	1.6	27.2
H10	N 223500 E 954000	N 38.445926808 W 76.461982608	N 38.445862 W 76.461978	23.6	1.3	23.6
I5	N 226000 E 954500	N 38.452783373 W 76.460185222	N 38.452745 W 76.460222	14	10.5	17.5
I6	N 225500 E 954500	N 38.45141044 W 76.460195548	N 38.451356 W 76.460222	19.8	7.6	21.2
I7	N 225000 E 954500	N 38.450037505 W 76.460205872	N 38.45 W 76.460222	13.7	4.6	14.4
I8	N 224500 E 954500	N 38.44866457 W 76.460216195	N 38.448598 W 76.460222	19.1	1.7	19.2
I10	N 223500 E 954500	N 38.445918698 W 76.46023684	N 38.445862 W 76.460222	20.6	4.4	21.1
J5	N 226000 E 955000	N 38.452775238 W 76.45843929	N 38.452745 W 76.458501	11	17.7	20.8
J7	N 225000 E 955000	N 38.450029368 W 76.458460005	N 38.45 W 76.458501	10.7	11.7	15.9
J8	N 224500 E 954000	N 38.448656433 W 76.458470362	N 38.448598 W 76.458501	16.7	8.8	18.9
J10	N 223500 E 955000	N 38.445910562 W 76.458491077	N 38.445862 W 76.458501	17.7	2.8	17.9
K6	N 225500 E 955500	N 38.45139414 W 76.456703748	N 38.451356 W 76.456724	13.9	5.8	15
K7	N 225000 E 955500	N 38.450021205 W 76.456714138	N 38.45 W 76.456724	7.8	2.8	8.3
K8	N 224500 E 955500	N 38.44864482 W 76.456724531	N 38.448598 W 76.456724	14.4	0.2	14.4
K9	N 224000 E 955500	N 38.4472753 W 76.45673492	N 38.447225 W 76.456724	14.4	3.1	14.7
L9	N 224000 E 956000	N 38.4472714 W 76.454989122	N 38.447225 W 76.455007	13.3	5.1	14.2



CHESAPEAKE BAY

BYWAY RD  
ACCESS TO ROUTE 4

**FLAG PONDS NATURAL AREA**  
**CALVERT COUNTY, MARYLAND**  
 CALVERT COUNTY DEPARTMENT OF PLANNING AND ZONING



SOIL	VEGETATION	HABITAT TYPE	WATER REGIME
1. Chertstone	1. Oak	1. Open Field	1. Open Field
2. Chertstone	2. Oak	2. Open Field	2. Open Field
3. Chertstone	3. Oak	3. Open Field	3. Open Field
4. Chertstone	4. Oak	4. Open Field	4. Open Field
5. Chertstone	5. Oak	5. Open Field	5. Open Field
6. Chertstone	6. Oak	6. Open Field	6. Open Field
7. Chertstone	7. Oak	7. Open Field	7. Open Field
8. Chertstone	8. Oak	8. Open Field	8. Open Field
9. Chertstone	9. Oak	9. Open Field	9. Open Field
10. Chertstone	10. Oak	10. Open Field	10. Open Field
11. Chertstone	11. Oak	11. Open Field	11. Open Field
12. Chertstone	12. Oak	12. Open Field	12. Open Field
13. Chertstone	13. Oak	13. Open Field	13. Open Field
14. Chertstone	14. Oak	14. Open Field	14. Open Field
15. Chertstone	15. Oak	15. Open Field	15. Open Field
16. Chertstone	16. Oak	16. Open Field	16. Open Field
17. Chertstone	17. Oak	17. Open Field	17. Open Field
18. Chertstone	18. Oak	18. Open Field	18. Open Field
19. Chertstone	19. Oak	19. Open Field	19. Open Field
20. Chertstone	20. Oak	20. Open Field	20. Open Field
21. Chertstone	21. Oak	21. Open Field	21. Open Field
22. Chertstone	22. Oak	22. Open Field	22. Open Field
23. Chertstone	23. Oak	23. Open Field	23. Open Field
24. Chertstone	24. Oak	24. Open Field	24. Open Field
25. Chertstone	25. Oak	25. Open Field	25. Open Field
26. Chertstone	26. Oak	26. Open Field	26. Open Field
27. Chertstone	27. Oak	27. Open Field	27. Open Field
28. Chertstone	28. Oak	28. Open Field	28. Open Field
29. Chertstone	29. Oak	29. Open Field	29. Open Field
30. Chertstone	30. Oak	30. Open Field	30. Open Field
31. Chertstone	31. Oak	31. Open Field	31. Open Field
32. Chertstone	32. Oak	32. Open Field	32. Open Field
33. Chertstone	33. Oak	33. Open Field	33. Open Field
34. Chertstone	34. Oak	34. Open Field	34. Open Field
35. Chertstone	35. Oak	35. Open Field	35. Open Field
36. Chertstone	36. Oak	36. Open Field	36. Open Field
37. Chertstone	37. Oak	37. Open Field	37. Open Field
38. Chertstone	38. Oak	38. Open Field	38. Open Field
39. Chertstone	39. Oak	39. Open Field	39. Open Field
40. Chertstone	40. Oak	40. Open Field	40. Open Field
41. Chertstone	41. Oak	41. Open Field	41. Open Field
42. Chertstone	42. Oak	42. Open Field	42. Open Field
43. Chertstone	43. Oak	43. Open Field	43. Open Field
44. Chertstone	44. Oak	44. Open Field	44. Open Field
45. Chertstone	45. Oak	45. Open Field	45. Open Field
46. Chertstone	46. Oak	46. Open Field	46. Open Field
47. Chertstone	47. Oak	47. Open Field	47. Open Field
48. Chertstone	48. Oak	48. Open Field	48. Open Field
49. Chertstone	49. Oak	49. Open Field	49. Open Field
50. Chertstone	50. Oak	50. Open Field	50. Open Field

Appendix C. 1990 Vegetation Habitat Type and Water Regime

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Appendix D. 1990 Plot Locations at Flag Ponds Nature Park