Remnant Natural Areas in Parks, Waterways, and Undeveloped Sites in the City of Alexandria, Virginia: Seminary Hill Area

Prepared by:
Rod Simmons
Natural Resources Division
Department of Recreation, Parks, and Cultural Activities
City of Alexandria, Virginia
2900-A Business Center Drive
Alexandria, VA 22314

Natural Resources Technical Report 13-1
June 2013

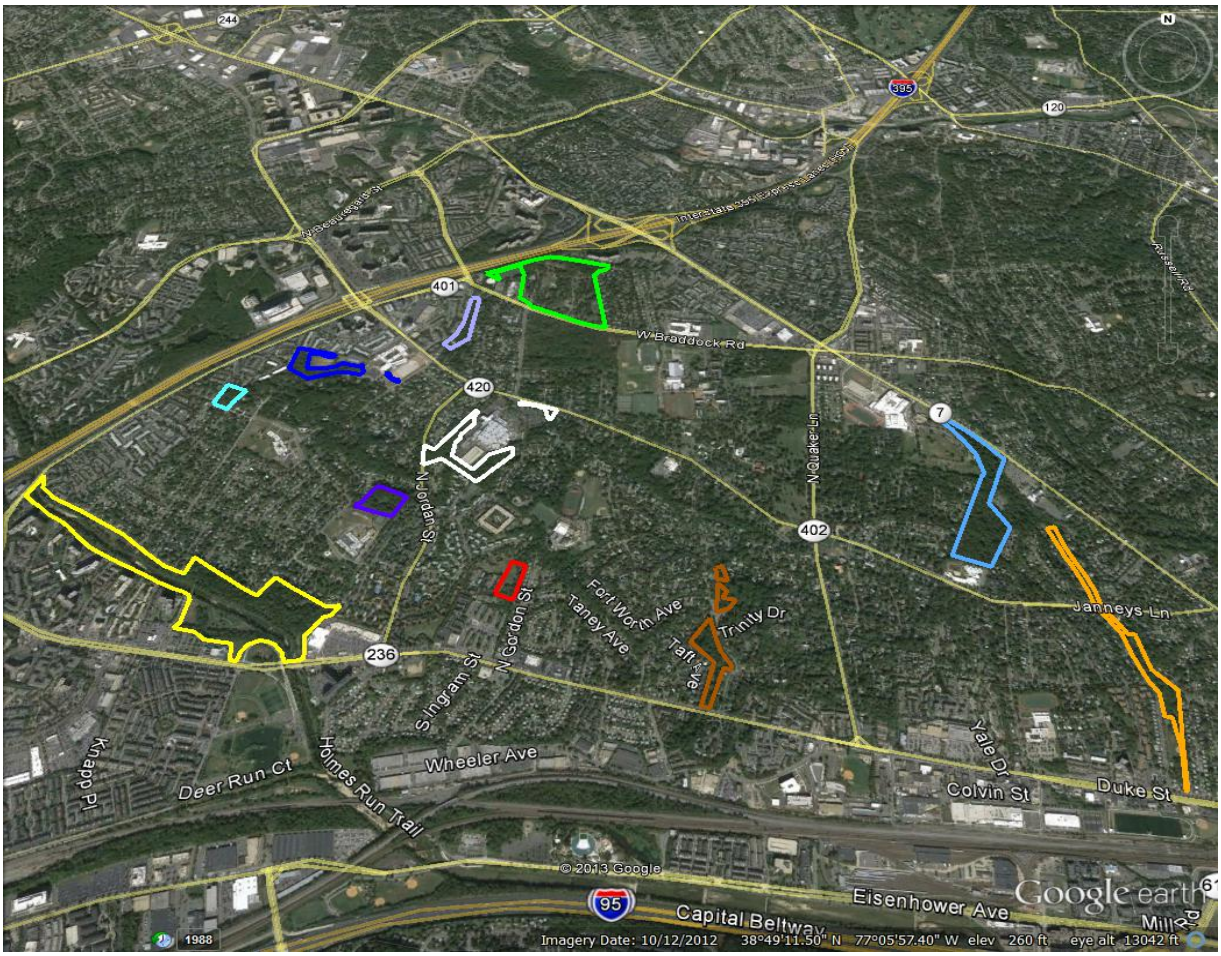

Fig. 1. Remaining natural areas and parks (outlined in color) of the Seminary Hill area in the City of Alexandria, Virginia that are regularly stewarded by City natural resource management staff: Brookvalley Park, All Veterans Park, and Holmes Run Park (yellow), 5325 Polk Avenue (turquoise), Francis C. Hammond School (dark blue), Seminary Forest (lavender), Fort Ward Park (green), Patrick Henry Woods (purple), Inova Alexandria Hospital Scenic Easement (white), Taney Avenue Park (red), Fort Williams Park (brown), Chinquapin Park and Forest Park (light blue), and Taylor Run Park and Angel Park (orange). (Sites too small or obscure to map are not included in this figure.)

Overview:

The Seminary Hill area occupies the highest ground in Alexandria, at more or less the center of the City, and encompasses lands north of Duke Street (Rt. 236); south of King Street (Rt. 7); east of Shirley Highway (395); and west of Union Station and the railroad tracks along Callahan Drive (Fig. 1).

Seminary Road follows the flat gravel terrace from Bailey's Crossroads eastward along the high ridge to the Virginia Theological Seminary, and for most of this distance is the drainage divide between Holmes Run and Four Mile Run. This area is characterized by high terraces and escarpments, steep, dissected ravines, upland wetlands, numerous springs and tributary headwaters, and stream valleys.

The western boundaries of this area were formed in three separate annexations in the early to mid-20th century: Hooff's Run to Taylor Run in 1915; lands north of Duke Street between Taylor Run and Quaker

Lane from Arlington County in 1930; and Quaker Lane westward to the current City limits from Fairfax County in 1952 (Alexandria Public Library). Large expanses of this area remained heavily forested and sparsely populated from the early days of settlement to the mid-20th century (Wrenn 1972). Many old trees and remnants of this once-widespread, upland forest are still preserved today throughout many neighborhoods, as well as the largest remaining expanses of open, grassy areas in the City.

Except for a small section of exposed saprolite (soft, decomposed rock) of Indian Run Formation bedrock along the stream bed of Holmes Run at Brookvalley Park, the underlying geology of the Seminary Hill area is composed of six, locally distinct and overlapping members of ancient river deposits of the Potomac Formation, including from bottom to top: Cameron Valley sand, Lincolnia silty clay, Winkler sand, Chinquapin Hollow fine sandy clay, Arell clay, and Shooters Hill gravel (Fleming 2008). This "great mass of the Potomac Formation accounts for the large amount of topographic relief that characterizes the City" (Fleming 2008) and is the main water-bearing formation of the region (Johnston 1964).

Lester Frank Ward (1841-1913), primarily known as an early American sociologist, was also a prolific collector of local flora during his years in Washington, D.C. as a geologist and paleontologist with the U.S. Geological Survey from 1882 to 1905. In "The Potomac Formation" (1894), Ward published accounts of his surveys documenting the geology and paleoflora of the formation, including the "vast quantities" of Cameron Valley sand ("Rappahannock Series") that extended westward in the deltaic hills and valley on the north side of Cameron Run (lower Holmes Run). Also noted was a freshwater mollusk fossil (*Unio* sp.) he collected from the exposed Potomac Formation at "Chinkapin Hollow" (Taylor Run ravine at Chinquapin Park).

Further findings of fossilized "logs, cones, and other plant debris" in a matrix of "gray clay, with irregularly distributed pockets of silt and medium to coarse sand grains" of Potomac Formation soils were documented in 1973 during excavation of a road bank along Shirley Highway between Seminary Road and Richenbacher Avenue (Hueber 1982).

Overlying and "capping" the Potomac Formation units in this area are four distinct terraces, including from highest to lowest: Seminary terrace (surface elevation between 265 and 280 feet), Dowden terrace (surface elevation mostly between 240 and 250 feet), Chinquapin Village terrace (surface elevation between 180 and 200 feet), and Beverley Hills terrace with an average elevation of 145 to 150 feet (Fleming 2008). All four of Alexandria's upland Civil War fortifications were strategically located at the edges of the highest ground of these terraces: Fort Ward, Fort Worth, Fort Williams, and Fort Ellsworth (National Park Service 2010).

See *Plate 4: Potomac Formation Expanded Explanation* and *Plate 5: Surficial Geology and Landforms Expanded Explanation* (Fleming 2008) at http://alexandriava.gov/22560 for more on the geology of this area.

For further information on the flora and natural communities of this area, as well as natural resource management in the City, see http://alexandriava.gov/22560 and http://alexandriava.gov/48838.

Natural areas that are actively stewarded by the Department of Recreation, Parks, and Cultural Activities (RPCA), Natural Resources Division, are listed below, including other significant sites.

Fig. 2. Exposed flumes of saprolite (left foreground) of the Indian Run Formation at Brookvalley Park represent the easternmost extent of exposed bedrock in Alexandria. Extensive, sand and gravel point bars (right) form in the modern Holmes Run channel, supporting uncommon to rare, seasonally-vegetated communities. Photo by R.H. Simmons.

Brookvalley Park, All Veterans Park, and Holmes Run Park:

This large, 62.67 acre suite of contiguous parks (property class 731) spans the broad floodplain and bottomlands along both sides of Holmes Run from N. Van Dorn Street southeastward to Duke Street. It is composed of seven contiguous parcels: the 22.03 acre Brookvalley Park parcel at 5599 Holmes Run Parkway, which extends along both sides of Holmes Run from N. Van Dorn Street to the Charles Beatley Bridge ("pedestrian bridge"); the 8.74 acre parcel at 301 N. Pickett Street; the 1.15 acre parcel at 299 N. Pickett Street (open field); the 3.14 acre parcel at 311 N. Pickett Street; the 3.61 acre parcel at 4725 Duke Street; the 8.5 acre parcel at 4801 Duke Street; and the 15.5 acre parcel at 201 N. Latham Street. The RPCA Park Planning Division database lists Brookvalley and All Veterans parks as 64.34 acres. (Holmes Run Park formerly occupied the area on the north side of Holmes Run, more or less east of the pedestrian bridge to Duke Street, but is now included within All Veterans Park.)

Together these parks contain numerous stands of old-age, remnant bottomland trees, including Green Ash (*Fraxinus pennsylvanica*), River Birch (*Betula nigra*), Northern Red Oak (*Quercus rubra*), Willow Oak (*Quercus phellos*), Bitternut Hickory (*Carya cordiformis*), and Sweetgum (*Liquidambar styraciflua*).

Some of the largest and oldest River Birch in the region occur at Brookvalley Park on both sides of Holmes Run. The City champion Willow Oak – one of Alexandria's "Bicentennial Trees" – grows mid-slope above the stream bank on the north side of Holmes Run downstream of the Charles Beatley Bridge.

Unfortunately, much of the stream banks and forest floor are overrun throughout with a variety of pervasive, difficult to eradicate non-native invasive plants and Poison Ivy (*Toxicodendron radicans*), all of which are indicative of major soil disturbance in the past.

Nonetheless, the only known population in Alexandria of naturally-occurring Maryland Goldenaster (*Chrysopsis mariana*) occurs on a sandy slope just west of the Bicentennial Willow Oak, with Virginia Pine (*Pinus virginiana*) and other native flora of fields and woodland edges.

Regionally uncommon to rare flora that grow on open stream banks along Holmes Run throughout these parks include Riverbank Wild Rye (*Elymus riparius*), Biennial Beeblossom (*Oenothera gaura*), Northern Obedient Plant (*Physostegia virginiana* ssp. *virginiana*), and New England Aster (*Symphyotrichum novae-angliae*).

Along the shallow waters of Holmes Run, mainly at Brookvalley Park, are found good examples of sand and gravel depositional bar communities (Fig. 2). This natural community type is classified as Piedmont / Central Appalachian Sand Bar / River Shore (Low Herbs Type): *Eragrostis hypnoides* - *Lindernia dubia* - *Ludwigia palustris* - *Cyperus squarrosus* Herbaceous Vegetation (USNVC: CEGL006483), with few good remaining examples remaining in the City.

Natural resource management at these parks is varied and consists of routine control of non-native invasive plants, litter and debris removal from the stream and wooded areas, ecological restoration plantings, and floristic inventories.

5325 Polk Avenue:

This 2.38 acre, designated natural area park (property class 731) occupies a steep, forested hillside and narrow ridge overlooking Shirley Highway (395) and the Eisenhower Valley and is floristically diverse for its size. Its recent acquisition preserves an important remnant of mature forest canopy in the City, as well as native plant diversity, essential wildlife habitat, and water resources.

Most of this section of Alexandria was heavily forested and largely unpopulated throughout much of the settlement of the region until the mid-20th century when Shirley Highway was constructed and housing developments were built (Wrenn 1972). This park was still mostly forested in the 1940s when a sawmill operated at the site (pers. comm., Laura Durham). A single home was later constructed mid-slope at the center of the property, though it burned down in 2012 with few remaining traces. The sole access to the interior of the park is an old gravel road that once led to the house from Polk Avenue.

Today, the site remains almost completely canopied by mature forest, with at least half the property in largely undisturbed condition. However, extensive carpets of English Ivy (*Hedera* sp.), Periwinkle (*Vinca minor*), and other troublesome non-native invasive plants, as well as native Poison Ivy

Fig. 3. Old-age American Beech (*Fagus grandifolia*) (right foreground) and White Oak (*Quercus alba*) (left background) at the 5325 Polk Avenue site. Photo by R.H. Simmons.

(*Toxicodendron radicans*) and Round-leaved Greenbrier (*Smilax rotundifolia*), cover much of the hillside on the southwest side of the park above Polk Avenue.

The dominant vegetation of the site is Central Appalachian / Inner Piedmont Low-Elevation Chestnut Oak Forest: *Quercus montana* - (*Quercus coccinea, Quercus rubra*) */ Kalmia latifolia / Vaccinium pallidum* Forest (USNVC: CEGL006299). White Oak (*Quercus alba*), Chestnut Oak (*Quercus montana*), Scarlet Oak (*Quercus coccinea*), including the City champion, Black Oak (*Quercus velutina*), and Southern Red Oak (*Quercus falcata*) comprise the canopy, along with scattered, mature Virginia Pine (*Pinus virginiana*). Intermixed in the tall shrub and understory layers are old colonies of Mountain Laurel (*Kalmia latifolia*), Sassafras (*Sassafras albidum*), and the largest population in Alexandria of Chinquapin (*Castanea pumila*). Extensive colonies of Pinxterbloom Azalea (*Rhododendron periclymenoides*), Deerberry (*Vaccinium stamineum*), Lowbush Blueberry (*Vaccinium pallidum*), and Black Huckleberry (*Gaylussacia baccata*) dominate the low shrub layer.

Old-age and City co-champion White Oak (*Quercus alba*) and American Beech (*Fagus grandifolia*) grow along the lower slopes of the hillside (Fig. 3), along with a notable Sweet Pignut (*Carya ovalis*) above the park entrance and a City co-champion Bartram Oak (*Quercus* x *heterophylla*) along the gravel road near the bend where it winds upslope.

Fig. 4. Purple Sneezeweed (*Helenium flexuosum*) blooming at the Hammond School Meadow. Photo by R.H. Simmons.

Also along the gravelly bank that follows the road edge are many native, woodland wildflowers, such as Mountain Bluets (*Houstonia purpurea* var. *purpurea*), Rattlesnake Weed (*Hieracium venosum*), Solomon's Seal (*Polygonatum biflorum* var. *biflorum*), Slender Goldendrod (*Solidago erecta*), Silverrod (*Solidago bicolor*), Bosc's Rosette Grass (*Dichanthelium boscii*), and others, including one of two locations in Alexandria for Hairy Bedstraw (*Galium pilosum*).

Natural resource management at this site consists of regular control of non-native invasive plants, litter removal, and vegetation inventories.

Francis C. Hammond School:

This 25.01 acre site at 4646 Seminary Road (property class 740; Ed. Public Schools) comprises app. 5 acres of semi-natural open space, including the 10,865 sq. ft. native meadow at the southeast corner of the school (Fig. 4).

The predominance of mature Virginia Pine (*Pinus virginiana*) in the canopy, absence of native understory and herbaceous layer diversity, and abundance of Poison Ivy (*Toxicodendron radicans*) and Round-leaved Greenbrier (*Smilax rotundifolia*) throughout the woodland to the west and southwest of the school and along N. Pegram Street reflect heavy soil disturbance in the past. Moreover, the gravelly, excavation-like depression that comprises the lower soccer field and little league backdrops appears to be an old sand and gravel mine (pers. comm., Tony Fleming). Nonetheless, this natural turf area and

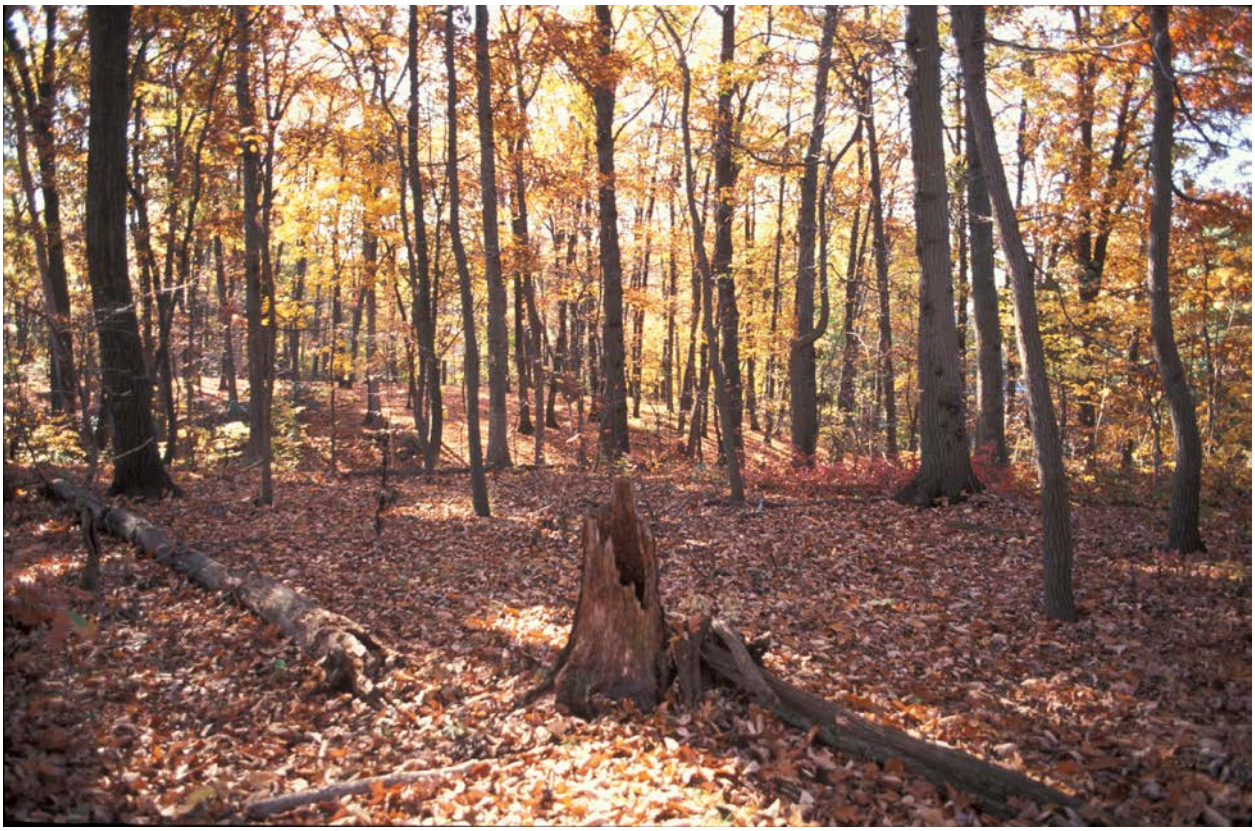

Fig. 5. Undisturbed interior of Seminary Forest. Photo by R.H. Simmons.

surrounding woodland are important for groundwater infiltration and recharge and help to provide base-flow to Holmes Run, as well as providing significant wildlife habitat.

The diverse meadow occupying a steep, gravelly slope between the tennis courts and the recently constructed artificial turf athletic field (upper field) is one of several managed meadows in the City. This area is designated a "Native Plant Conservation Zone" and is delineated with appropriate signage. Warm-season native grasses such as Purple Love Grass (*Eragrostis spectabilis*), varieties of Rosette Grass (*Dichanthelium acuminatum*), Purpletop (*Tridens flavus*), Poverty Grasses (*Aristida* spp.), and Little Bluestem (*Schizachyrium scoparium* var. *scoparium*) naturally occur at this site with a variety of native wildflowers.

Several species found at this site, including Purple Sneezeweed (*Helenium flexuosum*), Green Milkweed (*Asclepias viridiflora*), and Southern Slender Ladies-tresses Orchid (*Spiranthes lacera* var. *gracilis*), are regionally uncommon to rare and are the only known occurrences in the City of Alexandria.

Natural resource management at this site consists of non-native invasive plant control, meadow management, litter removal, and floristic inventories.

Seminary Forest:

This 4.67 acre natural area park (property class 731) at 2200 Ivor Lane occupies a narrow, forested ridge spanning most of the distance between Seminary Road and W. Braddock Road (Fig. 5).

Similar to most of the high elevation uplands in the City, the vegetation is predominately composed of Central Appalachian / Inner Piedmont Low-Elevation Chestnut Oak Forest: *Quercus montana* - (*Quercus coccinea, Quercus rubra*) / *Kalmia latifolia / Vaccinium pallidum* Forest (USNVC: CEGL006299). Moreover, this site is especially important as the headwaters of the southeast tributary of Lucky Run, which emanates in a large ravine behind the Fire Station at 4609 Seminary Road (No. 206). The mature forest canopy throughout the park is also important as a wildlife connector.

Uncommon to rare species in Alexandria that occur here include Starry Campion (*Silene stellata*), Pineweed (*Hypericum gentianoides*), Trailing Arbutus (*Epigaea repens*), Chinquapin (*Castanea pumila*), Downy Yellow False Foxglove (*Aureolaria virginica*), Smooth Serviceberry (*Amelanchier laevis*), and Cockspur Hawthorne (*Crataegus crus-galli*). The gravelly, north-facing slope along the ridge is one of two locations in Alexandria for Small's Ragwort (*Packera anonyma*).

Most of the interior of the park is remarkably undisturbed, although a major infestation of Porcelainberry (*Ampelopsis brevipedunculata*) unfortunately now covers much of the open ravine behind the fire station and threatens the site.

Natural resource management at this site consists of non-native invasive plant control, litter removal, and floristic inventories.

Fort Ward Park and Historic Site:

This large, 43.46 acre park at 4301 W. Braddock Road is regionally known for its preserved, restored, and reconstructed earthworks that once comprised Fort Ward, one of the historic Civil War Defenses of Washington. The park is composed of three contiguous parcels: the main 36.52 acre parcel at 4301 W. Braddock Road that includes the fortifications (property class 731); the 5 acre parcel at 4421 W. Braddock Road (property class 731); and the 1.94 acre parcel at 4301B W. Braddock Road (property class 732; City Rec/Cul/Centers).

Like Episcopal High School and the Virginia Theological Seminary, much of Fort Ward Park is situated on the highest terrace in Alexandria (Fleming 2008). Fort Ward Park, at the northwest edge of the terrace, overlooks an ancient meander scarp of the ancestral Potomac River to the northeast along King Street (Rt. 7) and across successively lower terraces eastward (Wentworth 1930).

National Park Service (2010) literature on the Civil War Defenses of Washington captures well the importance of early efforts to preserve such high ground surrounding the nation's capital: "Forested heights and inviting parklands – a rare backdrop to most urban settings – wrap a mantle of contrast around Washington, D.C. Even more uncommon are the exceptional natural elements and remnants of history located among the hills encircling the city…One of the nation's earliest urban planning efforts [1902 McMillan Commission Report] now provides open space for public enjoyment and important habitat for native plants and animals."

In addition to the earthen fortifications (Fig. 6), this semi-open, mixed use park includes wooded areas; numerous scattered groves; champion and notable trees; open meadows and glades; lawn areas; an intermittent stream; late 19th century and early 20th century African American historical sites; a Civil War museum; an amphitheater; picnic areas; a playground; an artificial turf athletic field; a dog exercise area; extensive ornamental plantings; and a 0.6 mile loop road around the park.

Fig. 6. View uphill to the Northwest Bastion of Fort Ward. Photo by R.H. Simmons.

Because the soils of the upland fort sites and environs are too acidic and infertile for farming, many native forest trees that were cut down for visibility during the Civil War have subsequently re-sprouted and those in the seed bank have slowly emerged following the maturation of Virginia Pine (*Pinus virginiana*) and natural succession.

A state co-champion Blackjack Oak (*Quercus marilandica*) grows above an open grassy swale to the east of the museum parking area, as well as a similar-sized, City co-champion Blackjack Oak at the north edge of the parking area. A short distance to the west is the state champion Black Haw (*Viburnum prunifolium*). The City champion Downy Serviceberry (*Amelanchier arborea*) grows near the entrance to the Northwest Bastion. (A second co-champion Downy Serviceberry nearby was recently cut down, probably because the tree had died.) The City champion Virginia Pine (*Pinus virginiana*) grows on the slope below the Northeast Bastion. Below the Northwest Bastion just west of the picnic area is a City co-champion Pignut (*Carya glabra*). A multi-trunked, City co-champion Black Gum (*Nyssa sylvatica*) grows just to the east of the Rifle Trench above the playground.

Locally uncommon to rare species that occur at the park are Hairy Thoroughwort (*Eupatorium pubescens*), Pineweed (*Hypericum gentianoides*), Hairy Bushclover (*Lespedeza hirta* var. *hirta*), and Frosted Hawthorne (*Crataegus pruinosa*). Along a dry, gravelly woodland edge on the west side of the tennis courts is the sole station in the City for Sand Blackberry (*Rubus cuneifolius*). A seasonally-wet, gravelly depression behind the tennis courts is one of two locations in Alexandria for Slender Fimbry (*Fimbristylis autumnalis*). The eastern flank of the Rifle Trench to the northeast is one of two locations in

the City for Rudkin Oak (*Quercus* x *rudkinii*), a natural hybrid between Blackjack Oak and Willow Oak (*Quercus phellos*).

The large expanses of meadow, natural turf, and woodland glades are important resources for groundwater infiltration and recharge, as well as protection of waterways and water resources in the City.

Dry, gravelly, open areas throughout the park provide unique habitat for crustose lichens and a variety of native, warm-season grasses, such as varieties of Rosette Grass (*Dichanthelium acuminatum*), Poverty Oatgrass (*Danthonia spicata*), Poverty Grass (*Sporobolus vaginiflorus*), and others, as well as diminutive wildflowers like Pinweed (*Lechea* spp.) and St. Andrew's Cross (*Hypericum hypericoides*).

A small woodland remnant at the northeast corner of the park (included in the 4301B W. Braddock Road parcel) is fairly diverse and important wildlife habitat.

Some of the largest Green Ash (*Fraxinus pennsylvanica*) in the City grow on the poorly drained, hardpan clay soils of the terrace at the southeast corner of the park near W. Braddock Road.

Natural resource management at the park consists of non-native invasive plant control, meadow management, and floristic inventories.

Patrick Henry Woods:

This remote, natural area park (property class 731) at 801 N. Latham Street occupies a high, gravelly hilltop behind Patrick Henry School (Fig. 7).

The park's 3.5 acre section of old-age forest is one of the best remaining examples of Central Appalachian / Inner Piedmont Low-Elevation Chestnut Oak Forest: *Quercus montana* - (*Quercus coccinea, Quercus rubra*) / *Kalmia latifolia / Vaccinium pallidum* Forest (USNVC: CEGL006299) in Alexandria and contains several uncommon to rare species in the City, including Pink Lady's Slipper (*Cypripedium acaule*) and Chinquapin (*Castanea pumila*). Two City co-champion Blackjack Oak (*Quercus marilandica*) trees grow along the southwest edge of the forest.

Extensive amounts of sand and gravel appear to have been mined from the southwest slope of the hill in the past, perhaps resulting in the large infestation today of Kudzu (*Pueraria montana* var. *lobata*).

Below this site on a dry, gravelly bank along the east side of the school are two City co-champion Dwarf Hackberry (*Celtis tenuifolia*) trees and the sole location in Alexandria for Heller's Rosette Grass (*Dichanthelium oligosanthes* var. *oligosanthes*).

Natural resource management at this site consists of non-native invasive plant control and floristic inventories.

INOVA Alexandria Hospital Scenic Easement (Hospital Woods West, South, and East):

This nearly 10 acre, forested natural area at 4320 Seminary Road borders INOVA Alexandria Hospital (property class 790; Hospitals) on the northwest and south and is a designated "Scenic Open Space Easement". (A 5.91 acre Scenic Open Space Easement parcel borders the hospital on the east.)

Fig. 7. Old-age Oak-Heath Forest with large Chestnut Oak (*Quercus montana*) atop a gravelly hill and terrace at Patrick Henry Woods. Photo by R.H. Simmons.

The dominant vegetation type of the dry to mesic, gravelly terrace, slopes, and ravine on the northwest side of the hospital (Hospital Woods West in the Alexandria Flora Checklist) is Central Appalachian / Inner Piedmont Low-Elevation Chestnut Oak Forest: *Quercus montana* - (*Quercus coccinea, Quercus rubra*) / *Kalmia latifolia / Vaccinium pallidum* Forest (USNVC: CEGL006299).

This high-quality, largely undisturbed forest community contains numerous old-age oaks (Fig. 8), as well as several uncommon to rare species in the City, including Pink Lady's Slipper (*Cypripedium acaule*), Ashe's Rosette Grass (*Dichanthelium commutatum* var. *ashei*), Spring Forget-me-not (*Myosotis verna*), Trailing Arbutus (*Epigaea repens*), and Chinquapin (*Castanea pumila*). This area is also the sole location in Alexandria for Rough-seeded Sedge (*Carex rugosperma*) and one of two locations in the City for Variable Rosette Grass (*Dichanthelium commutatum* var. *commutatum*).

The section of the forested easement on the south side of the hospital (Hospital Woods South in the Alexandria Flora Checklist) occupies an ancient colluvial slope bench of weathered montmorillonite clay above a large ravine and intermittent stream. Despite extensive infestations of English Ivy (*Hedera* sp.), Wintercreeper (*Euonymus fortunei*), Periwinkle (*Vinca minor*), and Poison Ivy (*Toxicodendron radicans*) throughout this area, it is one of the best remaining examples of Piedmont Acidic Oak - Hickory Forest: *Quercus alba - Quercus rubra - Carya alba / Cornus florida / Vaccinium stamineum / Desmodium nudiflorum* Forest (USNVC: CEGL008475) in Alexandria.

Fig. 8. Old-age Oak-Heath Forest with large Chestnut Oak (*Quercus montana*) at the northwestern edge of the INOVA Alexandria Hospital Scenic Easement. Photo by R.H. Simmons.

Typical examples of this community are often much more species rich than Oak-Heath Forest, with a diversity of upland oaks and hickories (*Carya* spp.) in the canopy, a fairly diverse understory, and a host of grasses, sedges, and wildflowers in the herb layer (forest floor). It typically occurs as a gradient between Oak-Heath Forest and Mesic Mixed Hardwood Forest, usually on dry to mesic, acidic, southwest facing slopes with high solar exposure.

White Oak (*Quercus alba*), Northern Red Oak (*Quercus rubra*), Pignut Hickory (*Carya glabra*), Mockernut Hickory (*Carya alba*), and Sweet Pignut (*Carya ovalis*) are the dominant canopy and subcanopy species here. Numerous large, old White Oak are scattered throughout, as well as a City co-champion Mockernut Hickory. The understory and shrub layers are diverse, with Fringe Tree (*Chionanthus virginicus*) dominant and Flowering Dogwood (*Cornus florida*), Redbud (*Cercis canadensis*), and Black-haw (*Viburnum prunifolium*) occurring to a lesser extent.

Regionally and locally rare flora associated with this community type here include Two-flowered Melic Grass (*Melica mutica*), Virginia Snakeroot (*Endodeca serpentaria*), White-topped Aster (*Doellingeria infirma*), Elm-leaved Goldenrod (*Solidago ulmifolia*), and Low Pasture Rose (*Rosa carolina*).

This site is also the sole location in Alexandria for Shiny Wedgescale (*Sphenopholis nitida*) and one of two locations in the City for Yellow Pimpernel (*Taenidia integerrima*) and Woodland Sunflower (*Helianthus divaricatus*).

Fig. 9. Taney Avenue Park. Photo by R.H. Simmons.

On the INOVA Alexandria Hospital grounds on the east side of N. Howard Street at 4250 Seminary Road is a 5.91 acre Scenic Open Space Easement parcel (Hospital Woods East in the Alexandria Flora Checklist). Nearly an acre of this area at the northeast edge of the property is a fairly high quality woodland remnant.

Locally rare species that occur here include Whorled Tickseed (*Coreopsis verticillata*). This site is also one of two locations in Alexandria for Flax-leaved Aster (*Sericocarpus linifolius*). In addition, a City co-champion Blackjack Oak (*Quercus marilandica*) grows on the south side of Seminary Road just east of the intersection of N. Howard Street and Seminary Road.

Natural resource management within the Scenic Open Space Easement parcels consists of routine control of non-native invasive plants, litter and debris removal, ecological restoration plantings (along the southeast-facing edge near the picnic area), and floristic inventories.

Taney Avenue Park:

This small, 2.59 acre park (property class 731) at 4149 Taney Avenue is important for its relatively large expanse of natural turf (Fig. 9). Such areas are increasingly rare in the City and are vital features for

Fig. 10. Long-stalk Coreopsis (*Coreopsis lanceolata*) at Fort Williams Park. Photo by R.H. Simmons.

groundwater infiltration and recharge, as well as maintaining water quality and protecting waterways.

Natural resource management at this site includes non-native invasive plant control and infrequent vegetation surveys.

Fort Williams Park:

This narrow, 8.3 acre, forested park (property class 731) includes most of the open section of Strawberry Run above Duke Street (Rt. 236). The park is comprised of five contiguous parcels: the 0.123 acre parcel at 511 Fort Williams Parkway; the 0.49 acre parcel at 509 Fort Williams Parkway; the 0.60 acre parcel at 501 Fort Williams Parkway; the 5.48 acre parcel at 501A Fort Williams Parkway; and the 1.60 acre parcel that includes the lowest section of the park adjacent to Duke Street (parcel information is not available for this section). Fort Williams Parkway divides the small upper parcels and adjoining 2.78 acre Battery Heights Conservation Easement at 3500 Dearborn Place (property class 980; Vacant Land Com. Area) from the lower parcels.

The steep, narrow, gravelly ridge that comprises the upper parcels on the east side of Fort Williams Parkway contains some of the largest and oldest Northern Red Oak (*Quercus rubra*) in the City, as well as one of the largest of three populations of Trumpet Honeysuckle (*Lonicera sempervirens*) in

Alexandria. The eastern slope of the ridge is an old stream bank that traces the once open section of Strawberry Run that closely follows it.

The two lower parcels on the west side of Fort Williams Parkway contain most of the open upstream limits of Strawberry Run and a diversity of mature and old-age canopy trees, including the City co-champion Red Maple (*Acer rubrum*).

In early 2010, the Department of Transportation and Environmental Services (T&ES), Office of Environmental Quality (OEQ), and contractors began an extensive stream bank restoration project along the open banks of Strawberry Run at the lowest section of the park as a way of improving and maintaining water quality in the lower stream valley and Cameron Run. The restoration efforts were very successful, including the seeded, native restoration plantings, largely because mature forest and vegetation were not significantly cleared and the existing topography was not greatly altered. (See http://alexandriava.gov/uploadedFiles/tes/oeq/info/StrawberryRunStreamRestorationWebpage.pdf for more on this project.)

Following the restoration work and seeding, an interesting find that was not included in any of the seed mixes turned up at the park. Long-stalk Coreopsis (*Coreopsis lanceolata*) was discovered in May of 2011 growing in the open areas along the stream banks of Strawberry Run (Fig. 10). It was previously unknown in the City, with the closest documented station a collection by W.L. McAtee on June 3, 1917 from "Pike Branch, below Alexandria" - a perennial stream in Fairfax County that flows northeast along Telegraph Road from Lee District Park to Cameron Run.

Unfortunately, much of the stream banks and forest floor throughout the park are overrun with a variety of pervasive, difficult to eradicate non-native invasive plants like English Ivy (*Hedera* sp.), Wintercreeper (*Euonymus fortunei*), Common Bamboo (*Bambusa vulgaris*), Golden Bamboo (*Phyllostachys aurea*), Arrow Bamboo (*Pseudosasa japonica*), and many others, as well as a nearly continuous cover of shrubby Poison Ivy (*Toxicodendron radicans*).

Natural resource management at this site consists of regular control of non-native invasive plants, litter and debris removal from the stream and wooded areas, and floristic inventories.

Chinquapin Park and Forest Park:

Chinquapin Park and adjoining Forest Park together comprise one of the largest parks and natural areas in the City of Alexandria. Chinquapin Park (property class 731), located at 3210 King Street, occupies 23.56 acres and borders T.C. Williams High School on the north and northwest, King Street (Rt. 7) on the northeast, First Baptist Church property on the east, and Forest Park and residences on the south and southwest. A significant portion of Chinquapin Park is comprised of mowed turf, Chinquapin Park Recreation Center, athletic facilities, and community garden plots. Its natural and semi-natural features consist of a large, open grassy terrace and large shade trees within the Chinquapin Drive circle that was formerly the site of the WW2 era Chinquapin Village; woodland edges and areas of maintained turf; Chinquapin Organic Gardens; and a long, linear, forested seepage stream valley that follows upper Taylor Run and King Street.

Fig. 11. Groves of old-age Tulip Tree (*Liriodendron tulipifera*) and fern glades at the edge of the large Acidic Seepage Swamp at Chinquapin Park. Photo by R.H. Simmons.

Forest Park is composed of two contiguous parcels: the 4.91 acre parcel at 3100 King Street (property class 731) and the 15.9 acre parcel at 1099 Francis Hammond Parkway (property class 731). Together, they occupy 20.81 acres and border Chinquapin Park and First Baptist Church property on the north and northeast, residences on the west and east, and Douglas MacArthur Elementary School on the south. The entire site is forested and divided roughly in half by the west branch of Taylor Run. A small, intermittent seepage stream follows the southwestern edge of the park to its confluence with the west branch of Taylor Run at the eastern edge of the park.

Much of the forest of the stream valley section of Chinquapin Park is perhaps best classified as Coastal Plain / Piedmont Small Stream Forest: *Liquidambar styraciflua - Liriodendron tulipifera / Lindera benzoin / Arisaema triphyllum* Forest (USNVC: CEGL004418).

This community type is often characterized by extensive glades of New York Fern (*Parathelypteris noveboracensis*) and Southern Lady Fern (*Athyrium asplenioides*) to a lesser extent, Jack-in-the-Pulpit (*Arisaema triphyllum*), and other herbaceous plants; a sparse understory and shrub layer, with Spicebush (*Lindera benzoin*) as the dominant shrub; and a canopy of Tulip Tree (*Liriodendron tulipifera*), Sweetgum (*Liquidambar styraciflua*), Red Maple (*Acer rubrum*), and scattered upland oaks (Harrison 2004, Simmons 2011b, Fleming et al. 2012).

At the southeastern end of the Chinquapin Park trail is a large Acidic Seepage Swamp. This natural community is regionally significant and is the only known example of its type remaining in the City of Alexandria. Such forested wetlands are classified as Coastal Plain / Outer Piedmont Acidic Seepage Swamp: *Acer rubrum - Nyssa sylvatica - Magnolia virginiana* / *Viburnum nudum* / *Osmundastrum cinnamomeum - Woodwardia areolata* Forest (USNVC: CEGL006238) and are now rare throughout their global range as a result of urbanization and hydrologic disturbances (Fleming et al. 2012).

As typically occurs, old-age Tulip Trees grow at the edge of the swamp in moist, sandy-loamy soil (Fig. 11). Old and large Red Maple comprise the fairly open canopy in wetter areas, with an ancient Pin Oak (*Quercus palustris*) growing at the center of the swamp in wet, clayey soil. The mostly open understory and shrub layers consist of a variety of species, including Red Maple, Black Gum (*Nyssa sylvatica*), Smooth Arrow-wood (*Viburnum dentatum* var. *lucidum*), Winterberry (*Ilex verticillata*), Common Alder (*Alnus serrulata*), Elderberry (*Sambucus canadensis*), Fringe Tree (*Chionanthus virginicus*), Round-leaved Greenbrier (*Smilax rotundifolia*), Fox Grape (*Vitis labrusca*), and others.

Amidst a variety of herbaceous plants, Skunk Cabbage (*Symplocarpus foetidus*) dominates the herb layer in spring, with Orange Jewelweed (*Impatiens capensis*) and other plants prominent in summer.

In addition to being a rare natural community, the Chinquapin Park swamp harbors many plant species that are highly rare in the City, including Cinnamon Fern (*Osmundastrum cinnamomeum*), Royal Fern (*Osmunda spectabilis*), Evergreen Wood Fern (*Dryopteris intermedia*), Downy Arrowhead (*Sagittaria latifolia* var. *pubescens*), Bog Sedge (*Carex atlantica*), Upright Sedge (*Carex stricta*), Wild Yam (*Dioscorea villosa*), Turk's Cap Lily (*Lilium superbum*), Smooth Carrionflower (*Smilax herbacea*), Cowbane (*Oxypolis rigidior*), White Turtlehead (*Chelone glabra*), Eastern Serviceberry (*Amelanchier canadensis*), and Primrose-leaved Violet (*Viola primulifolia*).

This site is also one of two locations in Alexandria for Spinulose Wood Fern (*Dryopteris carthusiana*), Triploid Hybrid Wood Fern (*Dryopteris* x *triploidea*), and Netted Chain Fern (*Woodwardia areolata*).

At Forest Park, the most significant natural feature is a fairly large section of successional pine-oak-heath forest that occupies the summit and mid-to-upper slopes of the southeastern extent of the Chinquapin Village terrace (Fig. 12). A mostly flat to gently sloping, poorly-drained terrain and heavy, clayey-silt soils characterize this terrace (Fleming 2008).

The vegetation of this area is classified as Low-Elevation Mixed Oak / Heath Forest: *Quercus alba - Quercus* (*coccinea, velutina, montana*) */ Gaylussacia baccata* Forest (USNVC: CEGL008521), a fairly common forest type throughout the greater region characterized by extensive colonies of Lowbush Blueberry (*Vaccinium pallidum*), Black Huckleberry (*Gaylussacia baccata*), and other low-lying, deciduous shrubs of the Heath family (Ericaceae) (Fleming et al. 2012). This type usually forms a mosaic over uplands of the region with the evergreen form of Oak-Heath Forest dominated by Mountain Laurel (*Kalmia latifolia*).

Regionally and locally rare species that occur mainly in this section of Forest Park include Hay-scented Fern (*Dennstaedtia punctilobula*), Branched Rosette Grass (*Dichanthelium dichotomum* var. *ramulosum*), Round-fruited Rosette Grass (*Dichanthelium sphaerocarpon*), Pink Lady's Slipper (*Cypripedium acaule*),

Fig. 12. Oak-Heath Forest at the mid-to-upper slopes and summit of the Chinquapin terrace in the northeastern section of Forest Park, where the park's rare species occur.

Rough Boneset (*Eupatorium pilosum*), Grass-leaved Blazing Star (*Liatris pilosa*), Pineweed (*Hypericum gentianoides*), Staggerbush (*Lyonia mariana*), Highbush Blueberry (*Vaccinium corymbosum*), and Subfalcate Oak (*Quercus* x *subfalcata*), a natural hybrid between Southern Red Oak (*Quercus falcata*) and Willow Oak (*Quercus phellos*). In addition, this site preserves the largest and most sustainable population of Pink Lady's Slipper in the City.

Forest Park is also the sole location in Alexandria for Fan Clubmoss (*Diphasiastrum digitatum*) and Curtiss' Milkwort (*Polygala curtissii*).

Natural resource management at both parks consists of major, ongoing non-native invasive plant control efforts by volunteers and City staff, litter and debris removal from the stream and wooded areas, trail maintenance, and floristic inventories.

For further information on these parks, see *Conservation Assessment and Natural Resource Management Plan for Chinquapin Park and Forest Park, City of Alexandria, Virginia* (Simmons 2011) at http://alexandriava.gov/48838.

Taylor Run Park and Angel Park:

This contiguous suite of three narrow, stream valley parks (property class 731) borders Taylor Run largely between E. Taylor Run Parkway and W. Taylor Run Parkway.

The 3.34 acre Taylor Run Park parcel extends from First Baptist Church property south to Janney's Lane. (Parcel information is not available for this site.)

Except for the occasional Sycamore (*Platanus occidentalis*) and Tulip Tree (*Liriodendron tulipifera*), the stream banks along the entire length of the park are highly degraded and vegetated almost exclusively with thickets of Tree of Heaven (*Ailanthus altissima*), White Mulberry (*Morus alba*), English Ivy (*Hedera* sp.), and many other noxious, non-native invasive plants. Numerous ornamental outplantings throughout this area by neighboring residents over the years also add to the degradation of the park.

Angel Park is composed of two adjoining parcels that extend from Janney's Lane south to Duke Street (Rt. 236): the 9.3 acre parcel at 201 W. Taylor Run Parkway and the 1.1 acre parcel at 501 W. Taylor Run Parkway that comprises a forested slope along the east side of E. Taylor Run Parkway.

Although the stream banks and surrounding soils are also highly disturbed here, a diversity of native trees occur along both sides of Taylor Run at Angel Park, including Sycamore, Tulip Tree, Black Gum (*Nyssa sylvatica*), American Elm (*Ulmus americana*), Red Maple (*Acer rubrum*), Silver Maple (*Acer saccharinum*), Pin Oak (*Quercus palustris*), River Birch (*Betula nigra*), Green Ash (*Fraxinus pennsylvanica*), and others.

Scattered infrequently along the east side of Taylor Run are large, old upland oaks, including Southern Red Oak (*Quercus falcata*), Black Oak (*Quercus velutina*), Post Oak (*Quercus stellata*), and a City co-champion White Oak (*Quercus alba*).

The largest Sycamore trees in the City grow along the edge of the stream and ball field at the lower end of Angel Park, as well as a City co-champion River Birch.

A bowl-shaped depression below a stand of old Tulip Trees on the slope on the east side of E. Taylor Run Parkway, in addition to Sallow Sedge (*Carex lurida*), Common Cattail (*Typha latifolia*), and other wetland plants, marks the location of a strong-flowing spring.

The ground layer throughout is highly disturbed and completely overrun with a myriad of non-native invasive plants and Poison Ivy (*Toxicodendron radicans*), including one of the largest Kudzu (*Pueraria montana* var. *lobata*) infestations in the City.

Natural resource management at these parks consists of routine control of non-native invasive plants, litter and debris removal from the stream and wooded areas, and floristic inventories.

Fig. 13. Westward view of Shuter's Hill (Shooters Hill), c. 1920, from the bottom of the hill at King St. (Rt. 7) before the George Washington Masonic Memorial was constructed. Photo courtesy Alexandria Library, Special Collections.

801 Janney's Lane:

This small, 0.214 acre park (property class 731) is comprised of a wooded thicket along the west branch of Taylor Run at the corner of Francis Hammond Parkway and Janney's Lane.

Despite heavy infestations of non-native invasive plants, the native flora of this park is fairly diverse. A strong-flowing spring emerging from an old concrete spring house on the lower slope at the back of 1603 Walleston Court forms a permanently saturated, mucky seepage braid that flows through the park and joins the west branch of Taylor Run near Janney's Lane. The spring is bordered by a large, old White Oak (*Quercus alba*) and Tulip Tree (*Liriodendron tulipifera*). Below the spring along the southwest side of the stream is an old-age Scarlet Oak (*Quercus coccinea*).

The canopy of the forested wetlands along the seepage braid is mainly comprised of Red Maple (*Acer rubrum*), with Green Ash (*Fraxinus pennsylvanica*) to a lesser extent. Spicebush (*Lindera benzoin*) and Smooth Arrow-wood (*Viburnum dentatum* var. *lucidum*) are the dominant shrubs, intermixed with Elderberry (*Sambucus canadensis*) and Fox Grape (*Vitis labrusca*). The herb layer includes Wild Yam (*Dioscorea villosa*), Sensitive Fern (*Onoclea sensibilis*), Southern Lady Fern (*Athyrium asplenioides*), Skunk Cabbage (*Symplocarpus foetidus*), Fowl Mannagrass (*Glyceria striata* var. *striata*), Bugleweed (*Lycopus virginicus*), and others. Large, old Ironwood (*Carpinus caroliniana*) trees border the woodland seep and stream.

Natural resource management at this site consists of infrequent vegetation surveys.

Upland Park:

This small, 0.22 acre park (property class 731) at 701 Upland Place is important as a remnant of the original topography of the land at the north edge of the gravel terrace at Shuter's Hill (Shooter's Hill) and historic Fort Ellsworth.

The park is a designated "Native Plant Conservation Zone" and functions as a natural rain garden featuring native, warm season grasses, such as Poverty Oat Grass (*Danthonia spicata*). Pineweed (*Hypericum gentianoides*) is an uncommon to rare wildflower in Alexandria that occurs here.

Natural resource management consists of routine control of non-native invasive plants, meadow management, ecological restoration plantings, and floristic inventories.

President Gerald R. Ford Park:

This small, 1.12 acre park (property class 731) at the corner of N. Quaker Lane and Janney's Lane is composed of two adjoining parcels: the 25,625 sq. ft. parcel at 1426 Janney's Lane and the 22,987 sq. ft. parcel at 1422 Janney's Lane.

The vegetation of the park is mostly open lawn and ornamental plantings, with an old Chestnut Oak (*Quercus montana*) along N. Quaker Lane at the southwest edge of the park the sole remaining natural feature.

Telegraph and Duke Meadow:

This 3.1 acre successional meadow consists of two adjoining parcels along the northeast interchange of Telegraph Road and Duke Street (Rt. 236). The site is a designated "Native Plant Conservation Zone" and is an important area for wildlife. (Parcel information is not available for this site.)

The entire meadow overlies a massive lens of impermeable Arell clay (Fleming 2008), giving rise to seasonally-wet soils and a small, intermittent tributary of Taylor Run. Storm water that is discharged into the meadow from a small culvert at the northeast of the interchange is dissipated and purified as it flows downslope across acres of thick herbaceous vegetation.

A variety of successional and wet meadow plants characterize the vegetation of the site, including Pin Oak (*Quercus palustris*), Eastern Red Cedar (*Juniperus virginiana*), Tapertip Rush (*Juncus acuminatus*), and one of the largest expanses of Broomsedge (*Andropogon virginicus*) remaining in Alexandria. This site is also the only known station in the City for Midland Sedge (*Carex mesochorea*), which is also a new record for Fairfax County in the Digital Atlas of the Flora of Virginia since Alexandria is included with Fairfax County in the Atlas for mapping purposes (Virginia Botanical Associates 2013).

Natural resource management at this site consists of large-scale control of non-native invasive plants, especially Callery Pear (*Pyrus calleryana*) and Siberian Elm (*Ulmus pumila*), ecological restoration plantings, and floristic inventories.

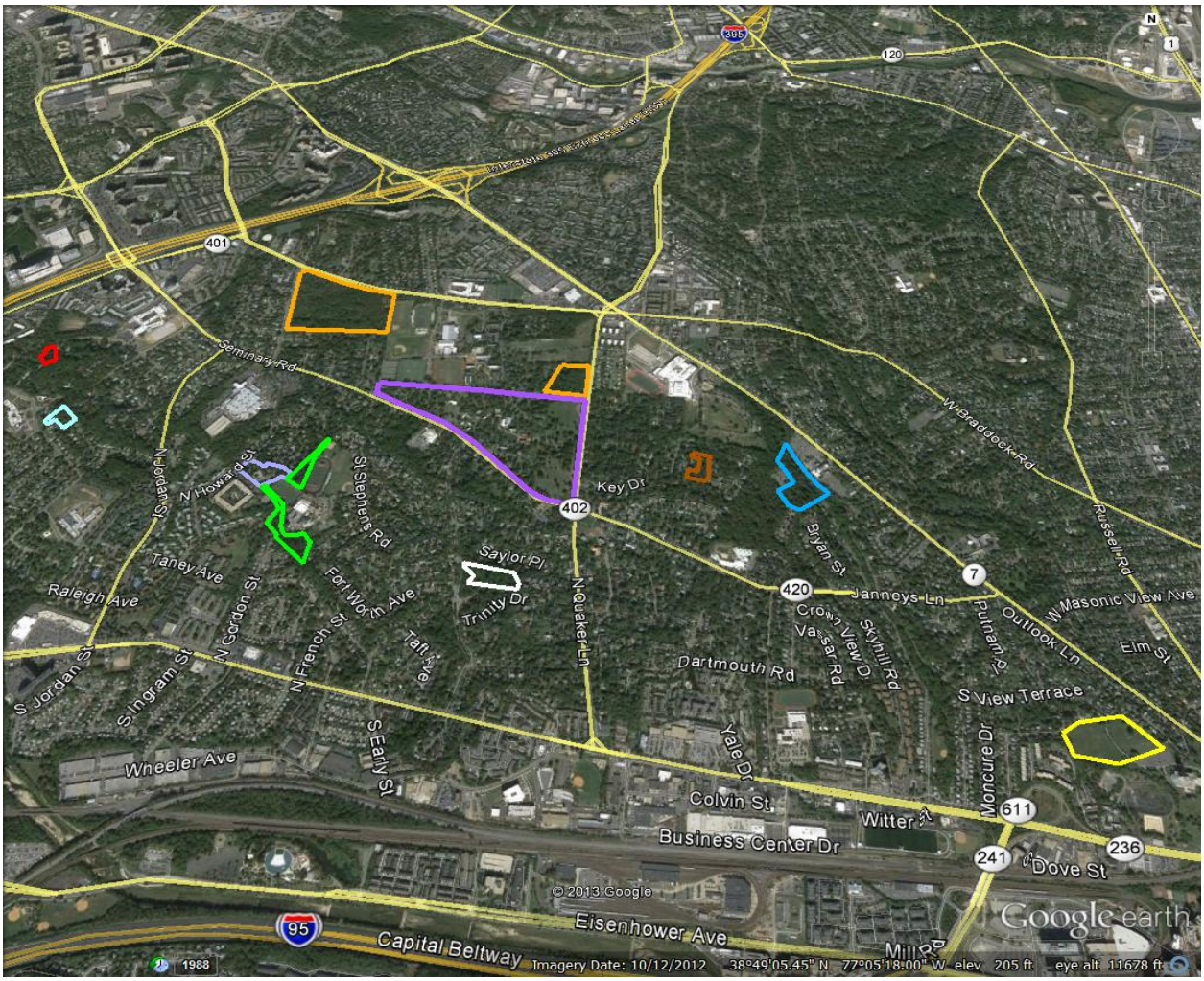

Fig. 14. Important remaining forested areas, undeveloped sites, and natural features (outlined in color) of the Seminary Hill Area that are not actively stewarded by City natural resource management staff: Beatley Bog (red), Buzzard Gap (light blue), St. Andrew's United Methodist Church (lavender), St. Stephen's and St. Agnes School Woods (green), Episcopal High School Woods (orange), Virginia Theological Seminary (purple), Battery Heights Conservation Easement (white), 1201 Key Drive (brown), First Baptist Church Woods (blue), and Shuter's Hill (yellow).

Additional Remnant Forest Areas, Undeveloped Sites, and Natural Features of the Seminary Hill Area

The following sites are privately owned and are not regularly stewarded by natural resource management staff but nonetheless include some of the largest and most important natural areas in the City. Many of these sites are in some form of protective easement. Over the years, RPCA Natural Resources Division staff have worked with the various landowners of these sites in an advisory capacity regarding non-native invasive plant control, best management practices, and land stewardship.

The following areas represent significant concentrations of natural features, forest canopy, including notable and old-age trees, and water resources. All of these places together are critical in maintaining forest connectivity and sustainability in this section of Alexandria and vicinity.

Fig. 15. Virginia Meadow Beauty (*Rhexia virginica*) at the Beatley Bog. Photo by R.H. Simmons.

Beatley Bog:

This several acre site is comprised of three private residences along N. Pegram Street. The 1.01 acre property at 1377 N. Pegram Street contains a small, semi-open, ponded area and the majority of the bog community. The adjoining property to the northeast at 1401 N. Pegram Street contains a small, open portion of the headwaters of the bog. Adjoining both properties to the southeast at 4875 Maury Lane is a nearly two acre parcel that is significant for its large expanse of old-age Oak-Heath Forest dominated by Chestnut Oak (*Quercus montana*) and Mountain Laurel (*Kalmia latifolia*). All three properties were once part of a 5 acre parcel owned by the Beatley family, with the 1401 N. Pegram Street and 4875 Maury Lane parcels still in their ownership (pers. comm., Chris Beatley).

A large, strong-flowing complex of springs draining portions of the Dowden terrace uplands (Fleming 2008) on both sides of N. Pegram Street converge downslope at the 1377 N. Pegram Street property, giving rise to Alexandria's last surviving example of a semi-open Magnolia Bog community. The outflow of the springs and bog form a perennial, unnamed tributary of Holmes Run.

The process that begins with rainwater infiltration into the terraces, including the formation of seeps and springs as groundwater comes in contact with impervious clays of the Potomac Formation, occasionally gives rise to Fall Line Magnolia Bog communities: *Nyssa sylvatica* - *Magnolia virginiana* - (*Pinus rigida*)

/ Rhododendron viscosum - Toxicodendron vernix / Smilax pseudochina Woodland (USNVC: CEGL006219).

These upland seepage wetlands are uniquely associated with Potomac Formation soils and acidic Oak-Heath Forest communities along the fall line, with their global range extending mainly from the Laurel area of Maryland south to the Fredericksburg area of Virginia. They once formed a nearly continuous mosaic along the toe slopes of dissected, sandy-gravelly uplands of this region, but are now globally-rare as a result of habitat disturbance and fragmentation.

Remarkable components of small, sunny openings within the larger, wooded bog complex are relic populations of ancient northward and westward migrations of coastal plain flora, which have persisted for millennia in these small communities well inland near the fall line (Simmons and Strong 2002). From similar, now historic sites in Alexandria, G.S. Miller, Jr. in 1902 collected Virginia Bunchflower (*Veratrum virginicum*), Red Milkweed (*Asclepias rubra*), and Downy Lobelia (*Lobelia puberula*) from a "small swamp 3 miles west of Alexandria"; J.H. Painter in 1905 collected Nodding Ladies' Tresses (*Spiranthes cernua*) "in swamp" at Hunting Creek; Paul C. Standley in 1918 collected Nodding Ladies' Tresses (*Spiranthes cernua*) from a "bog near St. Elmo" and Nellie C. Knappen c. 1922 reported White Fringed Orchid (*Platanthera blephariglottis*) from a "spring near Alexandria" (both locations are probably historic Hume Spring in the lower Four Mile Run Valley); and W.L. McAtee (1930) collected Swamp Sunflower (*Helianthus angustifolius*) "in the bog adjoining cemetery in Alexandria".

The boggy, ponded area at 1377 N. Pegram Street is naturally the heart of the bog complex and was shallowly deepened and expanded by the property owner in the early 1950s to impound and manage some of the groundwater flow (pers. comm., Chris Beatley). Doing so allowed numerous species of light-demanding bog flora to thrive along the sandy banks of the ponded area, as well as Alexandria's largest and possibly sole remaining population of Sphagnum Moss (*Sphagnum* sp.).

Regionally uncommon to rare species of open bogs found at this site that were previously unknown from Alexandria include Virginia Meadow Beauty (*Rhexia virginica*), (Fig. 15), and Slender Beaksedge (*Rynchospora gracilenta*). Also, Ridged Yellow Flax (*Linum striatum*) was rediscovered for the City here, having last been reported by S.F. Blake in 1924.

In addition to the City co-champion Sweetbay Magnolia (*Magnolia virginiana*), this site contains a characteristic suite of bog flora, including Cinnamon Fern (*Osmundastrum cinnamomeum*), Royal Fern (*Osmunda spectabilis*), Skunk Cabbage (*Symplocarpus foetidus*), Greenish-white Sedge (*Carex albolutescens*), Bog Sedge (*Carex atlantica*), White Edge Sedge (*Carex debilis*), Wild Yam (*Dioscorea villosa*), Slender Wood Oats (*Chasmanthium laxum*), Winterberry (*Ilex verticillata*), Common Alder (*Alnus serrulata*), Dangleberry (*Gaylussacia frondosa*), Fetterbush (*Eubotyrus racemosus*), Maleberry (*Lyonia ligustrina*), Swamp Azalea (*Rhododendron viscosum*), Highbush Blueberry (*Vaccinium* spp.), Fringe Tree (*Chionanthus virginicus*), Eastern Serviceberry (*Amelanchier canadensis*), Red Chokeberry (*Aronia arbutifolia*), and Primrose-leaved Violet (*Viola primulifolia*).

The portion of the bog at 1401 N. Pegram Street includes the largest population in the City of Rough Boneset (*Eupatorium pilsoum*), a characteristic plant of open bogs that is rare in Alexandria.

Surrounding the bog is the largest of two known populations in the City of Hyssop Skullcap (*Scutellaria integrifolia*), as well as the locally rare Hirsute Sedge (*Carex complanata*).

In addition to including one of the largest stands of Mountain Laurel in Alexandria, especially east of Shirley Highway (395), the 4875 Maury Lane parcel contains a small remnant of the undisturbed Dowden terrace. These flat, upland areas comprise woodland glades and include numerous native wildflowers and grasses, including the largest of two populations in Alexandria of Hairy Bedstraw (*Galium pilosum*) and Wild Basil (*Clinopodium vulgare*), as well as locally uncommon American Pennyroyal (*Hedeoma pulegioides*) and Cream Avens (*Geum virginianum*).

Buzzard Gap:

This site once comprised a southwest-facing, forested, colluvial gravel slope between the southern extent of N. Pickett Street at Maury Lane and Polk Avenue, and included a single home at the top of the slope. In addition to being a remote, completely forested natural area, the site once contained some of the oldest and largest oaks in the City, as well as locally uncommon to rare flora. Following construction of four new homes at Finley Lane beginning in 2004, most of what remains of the forest community occupies the lower slopes within the Alexandria Free Methodist Church parcels at 4901 and 4915 Polk Avenue and the abandoned easement of the N. Pickett Street connector.

Approximately half of the three acre site, including the acre or so of the N. Pickett Street connector, remains forested. The upper portion comprises a mature canopy of mainly Chestnut Oak (*Quercus montana*), White Oak (*Quercus alba*), and Southern Red Oak (*Quercus falcata*). The mesic to seasonally-wet lower slope and bottomland contains very large and notable Tulip Tree (*Liriodendron tulipifera*) and Sweetgum (*Liquidambar styraciflua*), including a multi-trunked, City co-champion Sweetgum.

St. Andrew's United Methodist Church:

This 3.75 acre site (property class 760; Churches/Religious) is composed of two adjoining parcels along the southwest edge of the Seminary terrace (Fleming 2008): the 0.69 acre parcel at 1021 N. Gaillard Street and the 3.06 acre parcel at 845 N. Howard Street.

Approximately one acre of the site is remnant Oak-Heath Forest with an overstory of mature Chestnut Oak (*Quercus montana*) and White Oak (*Quercus alba*). The steep, south and west-facing, gravelly slopes occupy nearly an acre and include locally rare elements of the Acidic Oak-Hickory Forest community, such as Bosc's Rosette Grass (*Dichanthelium boscii*), Ashe's Rosette Grass (*Dichanthelium commutatum* var. *ashei*), Virginia Snakeroot (*Endodeca serpentaria*), Flowering Spurge (*Euphorbia corollata*), Yellow Wild Indigo (*Baptisia tinctoria*), Butterfly Pea (*Clitoria mariana* var. *mariana*), Hairy Bush Clover (*Lespedeza hirta* var. *hirta*), and Downy Yellow False Foxglove (*Aureolaria virginica*). A small remnant of Oak-Heath Forest on the terrace on the north side of the church supports the locally rare Pink Lady's Slipper (*Cypripedium acaule*).

This site is also the sole location in Alexandria for Late Purple Aster (*Symphyotrichum patens* var. *patens*) and one of two locations in the City for Wild Dittany (*Cunila origanoides*).

Fig. 16. Giant, "ice-rafted" quartzite boulder on ridge in lower section of St. Stephen's and St. Agnes School Woods. Photo by R.H. Simmons.

St. Stephen's and St. Agnes School Woods (Upper School Campus):

This 29.40 acre site (property class 780; Private Ed. Insts.) is situated on the southwest edge of the Seminary terrace overlooking the Holmes Run valley and the Franconia ridge. Most of the property is developed, with app. 4 acres of remnant forest bordering the school on the north, west, and south below the terrace.

In draining surface runoff from the high, flat Seminary terrace over very long periods of time, a large ravine formed on the southeast side of N. Gaillard Street below Orleans Place. Springs that also formed long ago at the head of the ravine generate a small, intermittent stream.

The ravine follows the entire west side of the school property and converges with another sizable ravine at the south edge of the site. Nearly pure stands of old-age Chestnut Oak (*Quercus montana*) comprise the vegetation of the steep, gravelly slopes of the upper, north section of the ravine. Occasional, small colonies of Mountain Laurel (*Kalmia latifolia*), Pinxterbloom Azalea (*Rhododendron periclymenoides*), Lowbush Blueberry (*Vaccinium pallidum*), and Deerberry (*Vaccinium stamineum*) amidst a nearly continuous carpet of English Ivy (*Hedera* sp.) represent most of what remains of the natural vegetation of the shrub and ground layers. Except for a canopy of Tulip Tree (*Liriodendron tulipifera*), the lower

section of the ravine above the lower athletic field is highly disturbed and largely overrun with a variety of non-native invasive plants.

The least disturbed, highest quality forest remnant of the property occurs along an acidic, gravelly colluvial slope and low ridge adjacent to the Foxchase Apartments at the eastern extent of Raleigh Avenue (Fig. 16). The vegetation here is comprised of a mature canopy of mainly Chestnut Oak, White Oak (*Quercus alba*), Black Oak (*Quercus velutina*), and Southern Red Oak (*Quercus falcata*). Intermixed in the shrub and herb layers are colonies of deciduous ericads (shrubs in the Heath family) and other native species, including Eastern Bracken Fern (*Pteridium aquilinum* ssp. *latiusculum*), Ashe's Rosette Grass (*Dichanthelium commutatum* var. *ashei*), Creeping Bush Clover (*Lespedeza repens*), and one of the largest populations of Rattlesnake Weed (*Hieracium venosum*) in the City.

The broad debris fan below the terrace between N. Gordon Street and the eastern ravine is also completely forested and mostly includes large, old-age Chestnut Oak (*Quercus montana*), White Oak (*Quercus alba*), and Southern Red Oak (*Quercus falcata*). Most of the forest floor of this area is covered in Virginia Creeper (*Parthenocissus quinquefolia*), a valuable native vine. Unfortunately, English Ivy, Multiflora Rose (*Rosa multiflora*), Wintercreeper (*Euonymus fortunei*), and other pervasive weeds are prominent throughout the woods near the end of N. Gordon Street.

Despite the abundance of non-native invasive plants throughout much of these areas, the dense vegetation performs the role of natural leaf litter in preventing erosion of the steep slopes and friable soils.

Episcopal High School Woods:

This site is comprised of two large, forested tracts at opposite ends of the Episcopal High School grounds (property class 780; Private Ed. Insts.).

The 32.4 acre successional forest at 4200 W. Braddock Road opposite Fort Ward Park (Episcopal High School Woods West in the Alexandria Flora Checklist) extends from the southeast corner of W. Braddock Road and N. Howard Street east to N. Frazier Street and is one of the largest wooded parcels remaining in Alexandria.

This area was completely cleared at the time of the Civil War when Fort Ward was established and was likely used from that time until the early 20th century as scrubby pastureland. In the 1930s, the entire site was extensively planted in Loblolly Pine (*Pinus taeda*), which have now grown to a large size (pers. comm., Jerry Dieruf). Intermixed with the pines are a diversity of maturing oaks and successional flora, as well as Red Maple (*Acer rubrum*), Green Ash (*Fraxinus pennsylvanica*), and other species that prefer the poorly drained, hardpan clay soils that characterize portions of the Seminary terrace.

Seasonally-wet, open grassy areas and thickets of the several acre area along N. Howard Street support a variety of plants typical of the coastal plain, including one of Alexandria's largest remaining populations of Pineweed (*Hypericum gentianoides*). This site is also the sole location in Alexandria for Rough Goldenrod (*Solidago rugosa* var. *aspera*), and the largest of two locations in the City for Roundleaf Thoroughwort (*Eupatorium rotundifolium*).

The app. 8 acre wooded section bordering the Virginia Theological Seminary from the northwest corner of Trotter Road and N. Quaker Lane to the residences along Goodwin Lane supports one of the finest

remaining examples of Low-Elevation Mixed Oak / Heath Forest: *Quercus alba* - *Quercus* (*coccinea, velutina, montana*) / *Gaylussacia baccata* Forest (USNVC: CEGL008521) in the City.

Locally uncommon to rare species that occur here include Yellow-eyed Grass (*Hypoxis hirsuta*), Whorled Tickseed (*Coreopsis verticillata*), Toothed White-topped Aster (*Sericocarpus asteroides*), Pineweed (*Hypericum gentianoides*), Staggerbush (*Lyonia mariana*), Yellow Wild Indigo (*Baptisia tinctoria*), and Whorled Yellow Loosestrife (*Lysimachia quadrifolia*). Meadow Garlic (*Allium canadense* var. *canadense*), Smooth Carrionflower (*Smilax herbacea*), and large colonies of Sessile-leaved Bellwort (*Uvularia sessilifolia*) grow in mesic woodland along the headwaters of Taylor Run at the north edge of the forest. Growing in semi-open glades throughout the site is the largest of three populations of Trumpet Honeysuckle (*Lonicera sempervirens*) in Alexandria (front cover photo).

This site is also one of two locations in Alexandria for Hyssop Skullcap (*Scutellaria integrifolia*) and Three-lobed Violet (*Viola palmata*).

Relatively large forested tracts such as these are essential to preserving native forest canopy in the City, as well as native plant and wildlife diversity. They are also important in protecting water resources by maintaining groundwater infiltration and generating base flow of seeps and springs that in turn form headwater tributaries, such as the headwaters of Taylor Run which begin near the east entrance to the school off N. Quaker Lane.

Virginia Theological Seminary:

This 57.74 acre site (property class 780; Private Ed. Insts.) at 3737 Seminary Road is situated on the easternmost highest ground of the Seminary terrace overlooking Washington, D.C., Old Town Alexandria, the Potomac River, and Maryland.

The expansive, open grassy areas and groves of old trees that characterize this property have remained little changed from 1823 when the Protestant Episcopal Theological Seminary (later also the "Fairfax Seminary") was established (Fig. 16). Today, this property is widely regarded as perhaps the most scenic in Alexandria, with its sweeping vistas, numerous old-age trees, and great expanses of lawn.

In addition to preserving numerous stands of old-age White Oak (*Quercus alba*), Post Oak (*Quercus stellata*), and other upland oaks, this site hosts a diversity of native trees, including the City champion Eastern Red Cedar (*Juniperus virginiana*) and the City co-champion Willdenow Oak (*Quercus* x *willdenowiana*), a natural hybrid between Southern Red Oak (*Quercus falcata*) and Black Oak (*Quercus velutina*).

This site is also the sole location in Alexandria for Hairy Forked Nailwort (*Paronychia fastigiata*), which grows above the dry, gravelly bank along Seminary Road, and Sweet Crabapple (*Malus coronaria*) which is found sparingly in thickets along N. Frazier Street.

The Seminary highlands are also one of the most important sites in the City for groundwater infiltration and recharge, owing to the large expanses of mostly pervious surface and the many headwater tributaries it generates.

Fig. 16. Historic photograph by Mathew Brady, c. 1860-1865, of the Virginia Theological Seminary and high terrace westward up the Fort Ward escarpment from N. Quaker Lane and the Chinquapin Village terrace below (Fleming 2008). Photo courtesy U.S. National Archives.

Battery Heights Conservation Easement:

This 2.78 acre parcel (property class 980; Vacant Land Com. Area) at 3500 Dearborn Place is important for its steep, forested slopes, old-age trees, and water resources.

The vegetation of this site is similar to adjacent upper Fort Williams Park, with old-age Northern Red Oak (*Quercus rubra*) and White Oak (*Quercus alba*) mainly comprising the canopy of the northwest-facing, gravelly slope above Strawberry Run and a relatively sparse understory and shrub layer of mainly Flowering Dogwood (*Cornus florida*), Ironwood (*Carpinus caroliniana*), and Black-haw (*Viburnum prunifolium*). Virginia Creeper (*Parthenocissus quinquefolia*) is abundant in the ground layer.

A large, strong-flowing spring emanates from the northeast upper slope of the property near the edge of the Seminary terrace and underlying Arell clay (Fleming 2008). The spring forms a series of successive, bowl-like depressions bordered by large, old Tulip Tree (*Liriodendron tulipifera*) and Spicebush (*Lindera benzoin*).

Over long periods of time, the outflow of the spring formed a ravine that converges with Strawberry Run below. The vegetation along the ravine is predominately composed of Tulip Tree, White Oak, American Beech (*Fagus grandifolia*), and Mayapple (*Podophyllum peltatum*), and is a good example of Northern Coastal Plain / Piedmont Mesic Mixed Hardwood Forest: *Fagus grandifolia - Quercus (alba, rubra) - Liriodendron tulipifera /* (*Ilex opaca* var. *opaca*) */ Polystichum acrostichoides* Forest (USNVC: CEGL006075).

Spicebush (*Lindera benzoin*) is dominant throughout the site and comprises one of the largest single stands in the City.

Unfortunately, much of the forest floor throughout the site is extensively overrun with English Ivy (*Hedera* sp.), Periwinkle (*Vinca minor*), and a variety of non-native invasive plants, as well as a nearly continuous cover of Poison Ivy (*Toxicodendrom radicans*).

1201 Key Drive:

This 2.24 acre private residence is significant for the nearly acre-sized, linear seepage swamp that extends most of the length of the property along Key Drive above Francis Hammond Parkway. At the south edge of the property, the outflow of the swamp is piped underground to the west branch of Taylor Run.

Large, old Red Maple (*Acer rubrum*), including the City co-champion, mostly comprise the canopy of the swamp, with Sweetgum (*Liquidambar styraciflua*) to a lesser extent. American Holly (*Ilex opaca*) is locally abundant in the understory, along with extensive colonies of New York Fern (*Parathelypteris noveboracensis*) and Southern Lady Fern (*Athyrium asplenioides*) in the herb layer.

Locally uncommon to rare species of woodland seeps that occur here include Short-fringed Sedge (*Carex crinita* var. *brevicrinis*), White Edge Sedge (*Carex debilis*), Wild Yam (*Dioscorea villosa*), Turk's Cap Lily (*Lilium superbum*), Indian Cucumber Root (*Medeola virginiana*), Sessile-leaved Bellwort (*Uvularia sessilifolia*), Smooth Carrionflower (*Smilax herbacea*), Swamp-haw (*Viburnum nudum*), Winterberry (*Ilex verticillata*), Common Alder (*Alnus serrulata*), Black Highbush Blueberry (*Vaccinium fuscatum*), and Fox Grape (*Vitis labrusca*). Eastern Bracken Fern (*Pteridium aquilinum* ssp. *latiusculum*) grows along the wooded slope above the seepage wetlands.

Round-fruited Rosette Grass (*Dichanthelium sphaerocarpon*) is another locally rare plant that grows along Key Drive, amidst a large colony of Wild Potato Vine (*Ipomoea pandurata*) and other species of woodland edges.

First Baptist Church Woods:

This nearly seven acre, mostly wooded site includes the 6.19 acre parcel at 2998 King Street and a small portion of the ten acre parcel at 2932 King Street (property class 760; Churches/Religious). Most of this land is situated on the south side of Taylor Run and comprises the eastern extent of the deep "Chinkapin Hollow" ravine of Taylor Run (Ward 1895), as well as locally rare flora and important water resources.

The property adjoins Chinquapin and Forest parks, with the eastern extent of the main Chinquapin Park trail continuing along Taylor Run and the main upper Forest Park trail following the terrace along the upper parking lot and woods edge.

Below the main trail along Taylor Run at the toe slope of the steep ravine is a small, acidic woodland seep with locally rare to uncommon flora, including Evergreen Wood Fern (*Dryopteris intermedia*), Cinnamon Fern (*Osmundastrum cinnamomeum*), Royal Fern (*Osmunda spectabilis*), Wild Yam (*Dioscorea villosa*), and Winterberry (*Ilex verticillata*). This is also the only known station in Alexandria for Tall Flat-topped White Aster (*Doellingeria umbellata*), a plant of seepage wetlands that is rare in the coastal plain south of Delaware (Weakley 2011).

Along the north-facing stream banks of Taylor Run in exposed, permanently damp soils of Chinquapin Hollow fine sandy clay (Fleming 2008) are sizable colonies of Spinulose Wood Fern (*Dryopteris carthusiana*), Evergreen Wood Fern (*Dryopteris intermedia*), and the natural hybrid between the two – Triploid Hybrid Wood Fern (*Dryopteris* x *triploidea*). Along with Chinquapin Park, this site is also one of two locations in the City for Spinulose Wood Fern (*Dryopteris carthusiana*) and Triploid Hybrid Wood Fern (*Dryopteris* x *triploidea*).

A nearly continuous series of seeps and springs extend along the base of the steep, north-facing ravine bank to the boundaries of the property. Unfortunately, much of this area is covered in English Ivy (*Hedera* sp.) and other troublesome, non-native invasive plants, although sizable stands of Southern Lady Fern (*Athyrium asplenioides*) and Spicebush (*Lindera benzoin*) persist.

On a steep, north-facing slope of Arell clay at the eastern extent of the Taylor Run ravine just west of Taylor Run Park is perhaps the largest remaining population in Alexandria of Wild Sarsaparilla (*Aralia nudicaulis*). To the south of this area upslope on the Chinquapin Village terrace (Fleming 2008) are a few, scattered plants of the locally rare Toothed White-topped Aster (*Sericocarpus asteroides*).

Shuter's Hill:

Nearly 11 acres of meadowy grass define the landscape atop Shuter's Hill (Shooter's Hill) on the grounds of the George Washington Masonic Memorial (property class 770; Charitable) above Old Town.

This site preserves the natural topography of the hilltop that was once the location of Fort Ellsworth, the easternmost of Alexandria's upland Civil War fortifications, as well as various earlier historical sites.

In addition to conserving quality open space, scenic vistas, and natural features, this site is especially important for its great capacity for groundwater infiltration and recharge and its value in protecting Alexandria's water resources and waterways.

ACKNOWLEDGMENTS

Appreciation is extended to the following individuals, organizations, and City staff for their contributions and support: City of Alexandria Dept. Recreation, Parks, and Cultural Activities (RPCA), especially James Spengler, Dinesh Tiwari, Bob Taylor, Mark Kelly, John Noelle, Jerry Dieruf, John Walsh, Laura Durham, Dana Wedeles, Beth Carton, Scott Graham, John Burke, Jane Yeingst, James Nichols, Oscar Mendoza, Fatmata Tibbs, Sergio Rodriguez, and Jack Browand; Garry Meus of the City of Alexandria Dept. of Planning and Zoning; Brett King of the City of Alexandria Dept. of Planning and Zoning, GIS Division; Claudia Hamblin-Katnik of the City of Alexandria Dept. of Transportation and Environmental Services, Office of Environmental Quality; Fort Ward Museum and Historic Site staff; Tony Fleming; Mark Strong and the D.C. Herbarium of the U.S. National Herbarium (US), Smithsonian Institution; Tony Reznicek of the Herbarium of the University of Michigan (MICH) for checking the identification of *Carex* specimens; Dianne Simmons; Friends of the City of Alexandria Herbarium; Greg Zell, Vince Verweij, Alonso Abugattas, Cliff Fairweather, Rachael Tolman, Sarah Archer, E. David Garcia, and Lou Aronica for assistance measuring and scoring notable and champion trees; Sharon Annear, Lynn Bostain, Colleen Broderick and Thomas Knight, Kathy Burns, Jim Clark, Diane Costello, Owen Curtis, Dave and Joyce Dexter, Joe Fischer, Oliver and Carol Flint, Carolyn and John Griglione, Karla Jamir, Nancy Jennings, Dave Levy, Jay Madden, Brian Marquis, Bonnie Petry, Rev. John Smucker, BJ Sullivan, Paula and Jack Sullivan, Elizabeth Wright, and Mary Zoeter; Christine Candio and Larry Ramsdell with INOVA Alexandria Hospital; and Chris Beatley, Ken Elder, George Kundahl, Michelle Thamer, and all the property owners who kindly granted permission to conduct vegetation surveys on their lands.

REFERENCES

Alexandria Public Library. Special Collections, Vertical File: Boundaries.

American Sociological Association. 2013. www.asanet.org/

City of Alexandria Archaeology Museum. http://www.alexandriava.gov/historic/archaeology

City of Alexandria GIS & Maps. http://www.alexandriava.gov/7704

City of Alexandria Park Information. http://www.alexandriava.gov/12342

Fleming, A.H. 2008. Geologic atlas of the City of Alexandria, Virginia and vicinity. City of Alexandria Department Recreation, Parks, and Cultural Activities, Alexandria, VA. http://alexandriava.gov/22560

Fleming, G.P., K.D. Patterson, K.Taverna, and P.P. Coulling. 2012. The natural communities of Virginia: classification of ecological community groups. Second approximation. Version 2.5. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, VA. http://www.dcr.virginia.gov/natural_heritage/ncintro.shtml

Google Earth. 2013.

Harrison, J.W. 2004. Classification of vegetation communities of Maryland: First iteration. NatureServe and Maryland Natural Heritage Program, Wildlife and Heritage Service, Maryland Department of Natural Resources. Annapolis, MD. http://www.dnr.state.md.us/wildlife/Plants_Wildlife/nhpnatcomm.asp

Hueber, F.M. 1982. Megaspores and a palynomorph from the lower Potomac group in Virginia.

Smithsonian Contributions to Paleobiology, Number 49. Washington, D.C.
Johnston, P.M. 1964. Geology and ground-water resources of Washington, D.C., and vicinity. U.S. Geological Survey Water Supply Paper 1776.
McAtee, W.L. 1930. Seventh supplement to the flora of the District of Columbia and vicinity. Proc. Biol. Soc. Wash. 43: 21-54.
National Park Service. 2010. Civil war defenses of Washington: Maryland, Virginia, Washington, D.C. www.**civilwar**traveler.com/.../CWDW-Interpretive-Brochure-2010.pd...
Simmons, R.H. 2009. Annotated checklist of the native vascular flora of the City of Alexandria, Virginia. City of Alexandria Department Recreation, Parks, and Cultural Activities, Alexandria, VA. http://alexandriava.gov/22560
____. 2011. Conservation assessment and natural resource management plan for Chinquapin Park and Forest Park, City of Alexandria, Virginia. City of Alexandria Department Recreation, Parks, and Cultural Activities, Alexandria, VA. http://alexandriava.gov/48838
____. 2011b. Annals of the City of Alexandria herbarium: small stream forests of the fall line and coastal plain. City of Alexandria Dept. Recreation, Parks, and Cultural Activities, Alexandria, Virginia.
____, and M.T. Strong. 2002. Fall-line Magnolia bogs of the mid-Atlantic region. Audubon Naturalist News, October 2002.
U.S. Geological Survey. 1965. Topographic Map of the Alexandria Quadrangle, Virginia; District of Columbia; Maryland: U.S. Geological Survey Topographic Quadrangle Map, 7.5 Minute Series. Scale 1:24,000.
Virginia Botanical Associates. 2013. Digital Atlas of the Virginia Flora (http://www.vaplantatlas.org). c/o Virginia Botanical Associates, Blacksburg, Virginia.
Ward, L.F. 1895. The Potomac formation. USGS Annual Report for 1893-94.
Weakley, A.S. 2011. Flora of the southeast and mid-Atlantic states. Herbarium of the University of North Carolina, Chapel Hill, North Carolina. http://www.herbarium.unc.edu/FloraArchives/WeakleyFlora_2011-May-nav.pdf
Weakley, A.S., J.C. Ludwig, and J.F. Townsend. 2012. Flora of Virginia. Bland Crowder, ed. Foundation of the Flora of Virginia Project Inc., Richmond. Fort Worth: Botanical Research Institute of Texas Press.
Wentworth, C.K. 1930. Sand and gravel resources of the coastal plain of Virginia. Virginia Geological Society Bulletin 32. Richmond, Virginia.
Wrenn, T.P. 1972. Falls Church: history of a Virginia village. Historical Commission of the City of Falls Church, Falls Church, Virginia.