# Conservation Assessment and Natural Resource Management Plan for Chinquapin Park and Forest Park, City of Alexandria, Virginia

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## INTRODUCTION

This Natural Resource Management Plan is one of several by the City of Alexandria Dept. of Recreation, Parks, and Cultural Activites (RPCA) to provide natural resource management guidelines and goals for select City parks that contain significant natural features. Such land-use plans are essential in helping to ensure protection and future sustainability of natural resources, especially for parks in urban areas that face a myriad of environmental stresses and heavy recreational use.

Natural resource inventories and assessments are the foundation in determining the quality and type of natural amenities, conservation priorities, and appropriate management practices. Conservation assessments and resource inventories also provide important baseline information to aid master planning projects and open space acquisition.

The section of Virginia that includes the City of Alexandria and Arlington and Fairfax counties contains a broad diversity of habitats and is perhaps the most floristically diverse region of the state (Simmons 2009). Vegetation and plant communities are the dominant natural resources on parkland (FCPA 2004, MNCPPC 2009, RPCA 2011), along with geologic features, wetlands, and water resources. Certain areas of conservation significance, such as those with rare species or significant natural communities, require especially careful management. Despite extensive urbanization, a number of such sites still occur throughout Alexandria in parks and open space areas.

Vegetation surveys and conservation assessments were conducted at Chinquapin Park and adjoining Forest Park from 2002 through the summer of 2011. Significant natural communities and other conservation priorities were also noted, including uncommon to rare species; old-age and notable trees; significant geologic features; water and wetland resources; and quality wildlife habitats. In addition to natural resource surveys, an assessment of invasive exotic plant species and other environmental threats were included.

## STUDY AREA

Chinquapin Park and Forest Park together comprise one of the largest parks and natural areas in the City of Alexandria (Fig. 1). Chinquapin Park occupies 23.56 acres and borders T.C. Williams High School on the north and northwest, King St. (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 stately 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 the headwaters of Taylor Run and King St.

Forest Park occupies 20.81 acres and borders 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. It is entirely forested and is 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.


Fig. 1. Chinquapin Park (outlined in orange) and Forest Park (outlined in yellow).

*Geology*

The survey site lies within the coastal plain section of the City of Alexandria, east of the edge of the fall line (zone). The fall line is a zone of transition between the coastal plain and piedmont provinces, where the hard, crystalline bedrock of the piedmont descends under soft coastal sediments, giving rise to numerous falls and rapids in streams and rivers.

Most of Alexandria is within the coastal plain physiographic province and is underlain by vast deposits of sand, gravel, silt, and clay of the Lower Cretaceous Potomac Group (Potomac Formation). These deposits overlie crystalline bedrock and are highly variable throughout the formation, ranging from small to massive, heterogeneous lenses to interbedded layers. The thickness of the unit overall varies from thin layers in places along the fall line to several thousand feet off the eastern shore (Mixon et al. 2000), with an average thickness of 500 feet (Obermeir 1984).

Tertiary terraces of mostly Pliocene age cap the highest elevations in Alexandria, grading successively younger in a descending stair-step fashion from the oldest terrace at the highest

elevations. Gravel terraces are composed of interbedded lenses of gravel, sand, silt, and clay deposited over broad plains as river channel alluvium and overbank deposits by ancient river systems during glacial episodes, which give them a characteristic flatness except where dissected by streams (Obermeier 1984, Fleming 2008). They vary in depth from 3 to 60 feet, with an average thickness of about 20 feet (Obermeier 1984).

Terrace gravel deposits hold large amounts of rainwater in the porous sand and gravel soils, forming perched aquifers, and are important resources for groundwater infiltration. Hillside seeps and springs often occur on slopes where a perched aquifer intersects the ground surface above an impervious layer of clay. Slabs of "bog iron" or iron conglomerate sandstone are typically present in these areas indicating that this geohydrologic process has been occurring for millenia.

Over long periods of time, gravel terraces and the underlying Potomac Formation throughout the City have become deeply dissected, especially near large streams and rivers, creating an extensive, dendritic drainage system and a landscape of steep slopes, numerous seeps and streams, and large, deep valleys. Consequently, most of the mid to upper ravine slopes in Alexandria are characterized by a gravelly layer of colluvium of varying depths (Fleming 2008). Quaternary sand and gravel deposits and alluvium outcrop at lower elevations along streams and incised lowland valleys.

Geologist Tony Fleming (2008) identified four distinct upland terraces in Alexandria that overlie six distinct units (lithofacies) of the Potomac Formation. Of these, one upland terrace and two Potomac Formation units are prominent at Chinquapin Park and Forest Park. The Chinquapin Village terrace, with a surface elevation of 180-200 feet, is composed of gravel capped by abundant clayey silt and silt loam soils and extends across the uplands of Chinquapin Park. Relic swamp hydrology and vegetation is prominent on this terrace, especially from the western edge of the park to the lower slopes of the Episcopal Seminary. The fine sandy clay of the Chinquapin Hollow member of the Potomac Formation is exposed along the banks of Taylor Run throughout Chinquapin Park.

The Chinquapin Village terrace occupies most of the northeast half of Forest Park. Much of the southwest half of the park, mainly the stream valleys formed by the west branch of Taylor Run and its seepage braid, is represented by the massive, heavy Arell clay unit of the Potomac Formation. The upland, southwestern ridge of the park that separates the stream and seepage braid is composed of gravelly-loamy, high-level colluvium.

## METHODS

Field surveys began in spring of 2002 and continued through the summer of 2011. Plant identifications were made using the floras of Weakley (2011), Brown and Brown (1972, 1984), and Fernald (1950). Vegetation community type names follow Fleming et al. (2011), Harrison (2004), Lea (2004), and the National Vegetation Classification (USNVC). Natural communities, streams, wetlands, and rare species were mapped and delineated with GPS. Digital photographs of selected flora, forest communities, and geologic features were also taken.

## RESULTS AND DISCUSSION

The natural section of Chinquapin Park comprises a narrow forested tract of a ravine that extends along the headwaters of Taylor Run between the slope of the Chinquapin terrace and King St. A park entrance sign at the edge of the woodland and mowed turf behind the Chinquapin Park Recreation Center marks the head of the main trail, which closely follows the south side of Taylor

Run through the park. Taylor Run becomes an open stream where the culvert ends at the park entrance, although the stream originates as braided seepage flow from the base of the Seminary terrace (Fleming 2008) near the intersection of Braddock Road and Quaker Lane and flows underground to the park.

As a result of extensive urbanization of the watershed, channelized stormwater flow has downcut Taylor Run in many places and sections of the stream have been rip-rapped in attempts to stabilize the stream banks. In addition, a sewerline easement runs along the trail and stream through much of the park. Concrete slabs and culverts, metal, and other debris are scattered along the slope bordering Chinquapin Terrace, presumably pushed into the ravine when Chinquapin Village was razed. Much of the steep slope on the north side of Taylor Run bordering King St. is largely overrun with invasive exotic plants and is valuable mainly as a wooded buffer and low-grade wildlife habitat.

Relatively undisturbed, quality forest begins approximately 1,000 feet down the trail from the park entrance near the second bridge at a small drainage ditch, where a series of woodland seeps and vernal pools occur. Much of the forest of the stream valley section of Chinquapin Park is perhaps most appropriately classified as Coastal Plain / Piedmont Small Stream Forest: *Liquidambar styraciflua - Liriodendron tulipifera / Lindera benzoin / Arisaema triphyllum* Forest (USNVC: = CEGL004418) (Fig. 2).

Fig. 2. Large New York Fern (*Thelypteris noveboracensis*) glade in Coastal Plain / Piedmont Small Stream Forest above Acidic Seepage Swamp at Chinquapin Park, City of Alexandria, Virginia. Photo by R.H. Simmons.

This community type is often characterized by extensive glades of New York Fern (*Thelypteris noveboracensis*), with 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*), and Red Maple (*Acer rubrum*), occasionally intermixed with oaks (Harrison 2004, Fleming et al. 2011, Simmons 2011b). Today, good examples of this once-widespread forest type are increasingly hard to find in the greater Washington, D.C. area.

While this forest community type once likely covered the entire Chinquapin Park stream valley, the only remaining intact example occurs surrounding the large Acidic Seepage Swamp near the eastern edge of the park (Fig. 3). The oldest and largest trees in the park occur here as well, with several old-age specimens of Tulip Tree, Red Maple, and Southern Red Oak (*Quercus falcata*) reaching notable size. In addition, several large, old Black Cherry (*Prunus serotina*) trees grow at the western edge of the swamp, indicating past clearing of the slope west of the swamp.

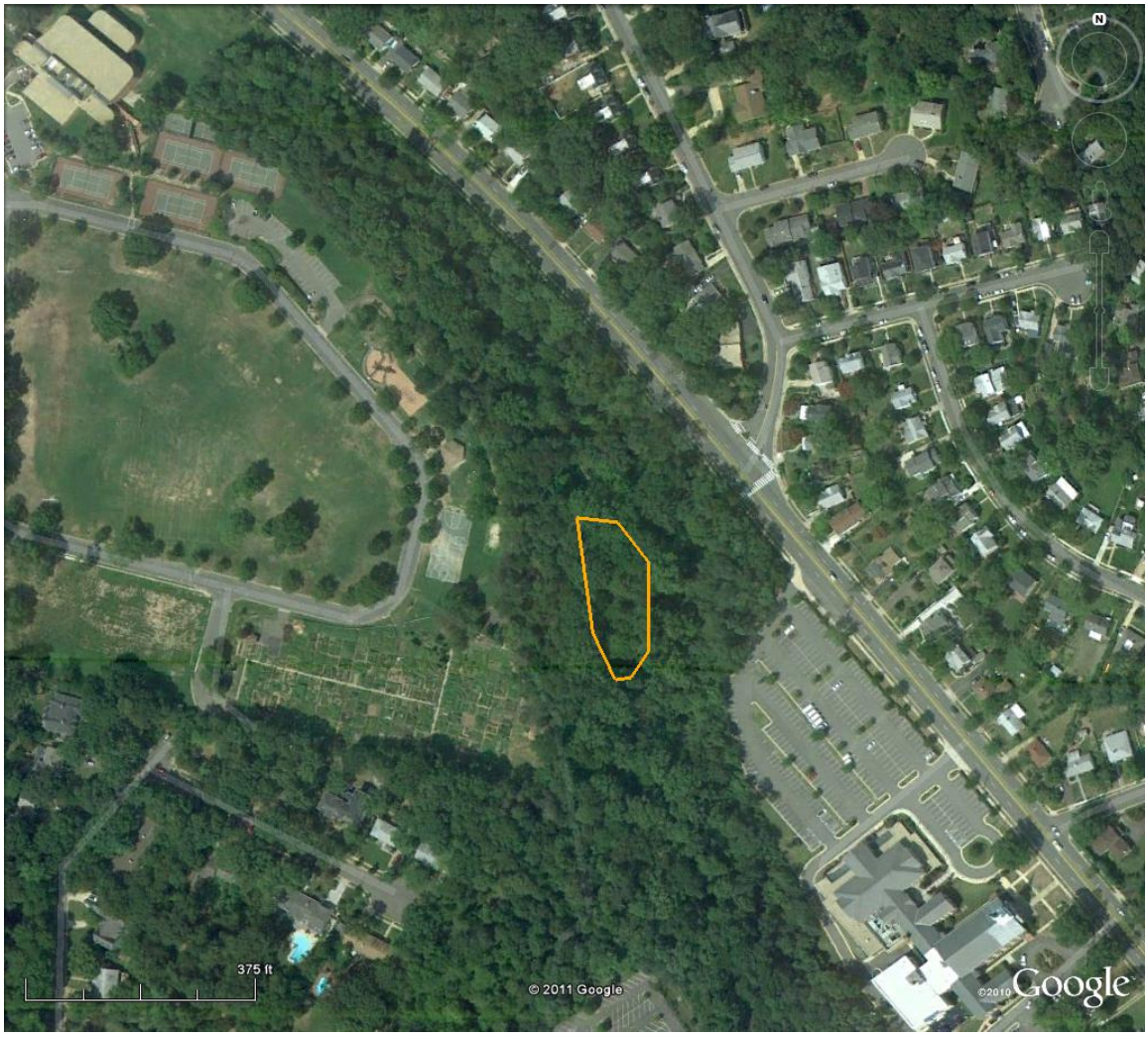


Fig. 3. Large Acidic Seepage Swamp near the eastern edge of Chinquapin Park, where the park's most important natural resources are located.

The Acidic Seepage Swamp (Fig. 4) is regionally significant and is the only known example of its type remaining in the City of Alexandria. These 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. 2011). In addition to being a rare natural community, the Chinquapin Park swamp harbors many plant species that are highly rare in the City, including several that do not occur elsewhere in Alexandria (Simmons 2009; Table 1).

The swamp was formed over millennia along the toe-slope of the north-facing ravine from springs and seepage flow emanating from the Chinquapin terrace, thus creating a shallow, permanently-saturated depression that at one time was situated just slightly above Taylor Run. Today, Taylor Run is moderately downcut at varying levels below the swamp, ranging from several feet or more.

Fig. 4. Chinquapin Park Acidic Seepage Swamp. Photo by R.H. Simmons.

A diverse assemblage of plants, many of which are characteristic of seepage bogs, grow throughout the swamp at Chinquapin Park. As typically occurs, old-age Tulip Trees grow at the rim of the swamp in moist, sandy-loamy soil. Old and widely-spaced Red Maple dominate 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*), and others.

Large colonies of Cinnamon Fern (*Osmundastrum cinnamomeum*), are intermixed with Royal Fern (*Osmunda spectabilis*), Netted Chain Fern (*Woodwardia areolata*), Southern Lady Fern, Upright Sedge (*Carex stricta*) and other carices, Fowl Mannagrass (*Glyceria striata*), White Grass (*Leersia virginica*), Jack-in-the-Pulpit, Turk's Cap Lily (*Lilium superbum*), Cowbane (*Oxypolis rigidior*), White Turtlehead (*Chelone glabra*), Wild Yam (*Dioscorea villosa*), and many other herbs. Skunk Cabbage (*Symplocarpus foetidus*) dominates the herb layer in spring, with Orange Jewelweed (*Impatiens capensis*) predominate in late summer. *Sphagnum* and a diversity of mosses are also represented.

Three characteristic plants of seepage wetlands of the coastal plain that occur at several other sites in the western section of the City – Sweetbay Magnolia (*Magnolia virginiana*), Poison Sumac (*Toxicodendron vernix*), and Swamp-haw (*Viburnum nudum*) – are notably absent from the woodland seeps and swamp at Chinquapin Park, despite the presence of many other plants typical of such communities. Tall Flat-topped White Aster (*Doellingeria umbellata*), which was recently discovered in a small woodland seep along the Chinquapin Park main trail just outside the eastern park boundary on First Baptist Church property, is a plant of seepage wetlands that is rare in the coastal plain south of Delaware (Weakley 2011) and is also a new record for the City of Alexandria. The occurrence of this plant in Alexandria and at the closest known station at Huntley Meadows Park in Fairfax County suggests a once-widespread mosaic of coastal plain seepage flora and habitats throughout the greater Washington, D.C. area, including floristic variations.

Numerous mature and maturing Spinulose Wood Fern (*Dryopteris carthusiana*), Evergreen Wood Fern (*Dryopteris intermedia*), and the natural hybrid between the above parents – Triploid Hybrid Wood Fern (*Dryopteris* x *triploidea*), were also recently discovered growing at the northwest edge of the Chinquapin Park swamp along the toe-slope and swamp margin (Fig. 5). All were identified in the field in the spring of 2011 by fern specialist Carl Taylor. A single Spinulose Wood Fern was also discovered at the toe-slope above the small woodland seep along the Chinquapin Park spur trail just outside the eastern park boundary on First Baptist Church property.

Spinulose Wood Fern and Triploid Hybrid Wood Fern are new records for the City of Alexandria, with Chinquapin Park being the only known station in the City. The Chinquapin Park station is only the second known occurrence of Evergeen Wood Fern in the City (Simmons 2011a). All three ferns, as well as Tall Flat-topped White Aster, are highly-rare in Alexandria and their occurrence together denotes the antiquity and uniqueness of the site.

The Chinquapin Park swamp and similar wetlands are also important for a variety of wildlife, such as uncommon to rare odonates (dragonflies and damselflies) that require forested seeps and swamps for breeding (Fleming et al. 2011, Kevin Munroe, pers. comm.).

Invasive exotic plants are largely absent from this community, though minor amounts of Ground Ivy (*Glechoma hederacea*) and other weeds occur along the trail edge and are actively controlled.

Tree throws within forested seepage wetlands are natural and do not indicate unhealthy conditions or disease, but rather the typical manner tree growth is limited owing to a combination of shallow root growth in saturated soils and susceptibility to wind shearing in the canopy.

Fig. 5. Botanist and fern specialist Carl Taylor examining a colony of Spinulose Wood Fern, Evergreen Wood Fern, and Triploid Hybrid Wood Fern – relics of an ancient landscape that persist today near the Chinquapin Park Acidic Seepage Swamp. Photo by R.H. Simmons.

Presumably, Chinquapin Park is named for the Chinquapin (*Castanea pumila*), a native shrub in the Beech family (Fagaceae) related to American Chestnut (*Castanea dentata*), American Beech (*Fagus grandifolia*), and oaks (*Quercus* spp.). However, Chinquapin has not been noted at either Chinquapin Park or Forest Park, despite extensive vegetation surveys over the years. Nonetheless, the park's ravine along Taylor Run (and possibly outside the park's boundary to the southeast) was apparently referred to as "Chinkapin Hollow" in the late 1890s by Lester Ward (1895), who collected fossils of extinct plants, as well as a mussel shell (*Unio* sp.), from the exposed Potomac Formation along the stream. It is certainly possible that Chinquapin once grew on the forested upper slopes and terrace of the park. Today, Chinquapin is rare in Alexandria and is known from ten sites in the western section of the City, with no documented occurrences east of Alexandria Hospital.

Continuing eastward past the swamp, the main trail forks at the eastern edge of the swamp alongside an ancient Southern Red Oak, where a set of landscape timber steps lead up the slope to the old asphalt road bordering the garden plots. The main trail meanders approximately 150 feet from this point to another fork. Here, a lower trail continues closely along the south bank of Taylor Run through First Baptist Church property while the main park trail continues southeastwardly upslope to where Forest Park begins.

Most of Forest Park is upland forest, in contrast to the wetlands and Small Stream Forest of the Taylor Run ravine that comprise the natural section of Chinquapin Park.

The most significant natural feature of Forest Park 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 terrace (Fig. 6). A mostly flat to gently sloping, poorly-drained terrain and heavy, clayey-silt soils characterize this terrace (Fleming 2008).

The vegetation of this site 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. 2011). 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*).

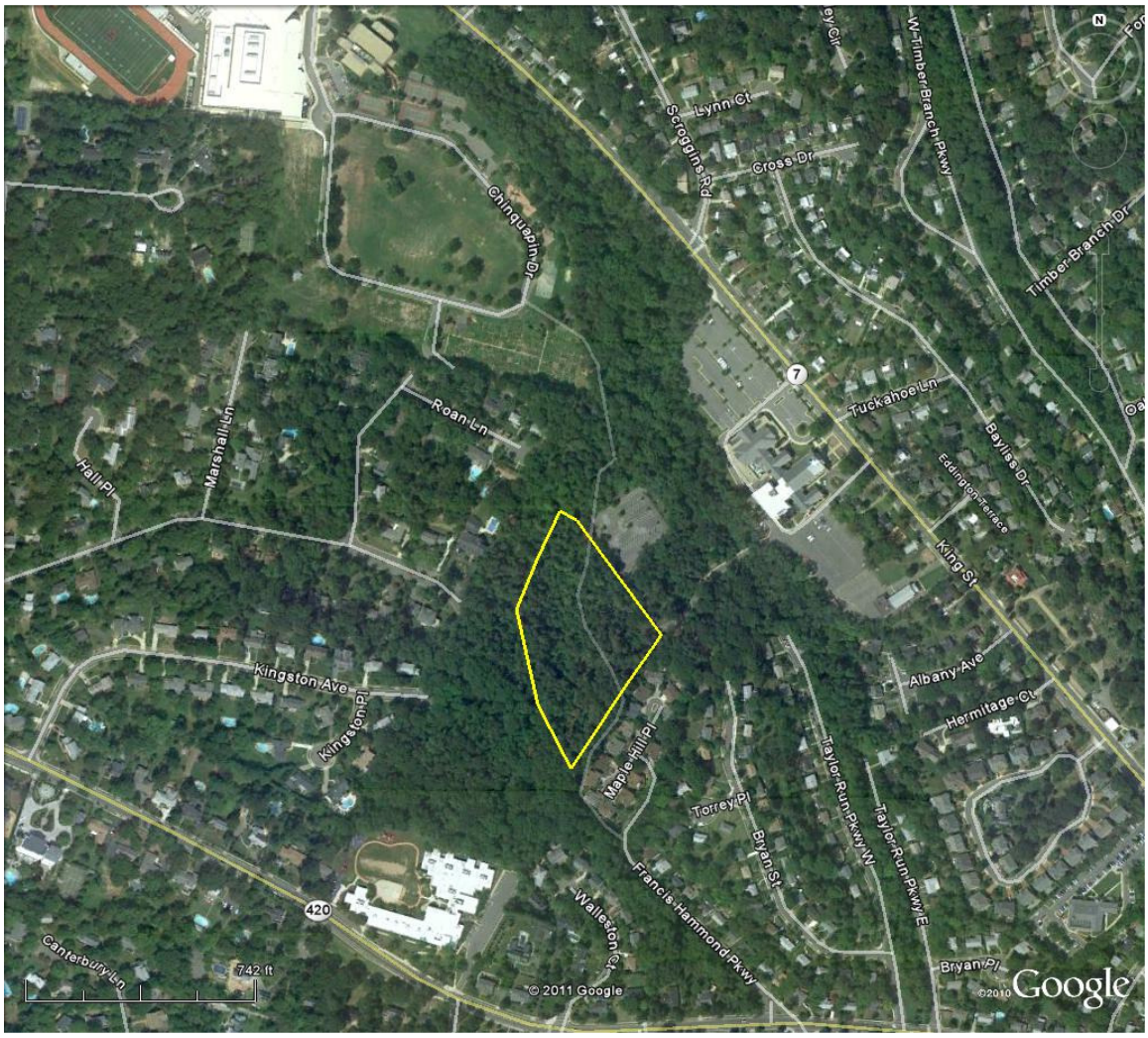


Fig. 6. Oak-Heath Forest at the mid-to-upper slopes and summit of the Chinquapin terrace in the northeastern section of Forest Park, where the park's rare species occur.

The floristic composition of this forest is somewhat more diverse than typical Oak-Heath Forests, probably a result of the poorly-drained, silty-clay soils that underlie the terrace. The abundant 80-100 year old Virginia Pine (*Pinus virginiana*) trees intermixed with maturing and mature hardwoods indicate a landscape that was cleared in the past and is now in a state where the upland hardwoods have largely become re-established. This is the process of forest succession in the mid-Atlantic region, where woodland openings and clearings are naturally re-vegetated with Virginia Pine and various native grasses and other plants and ultimately revert back to upland forest. Moreover, mature pine blow-downs increase biodiversity by creating sunny openings and shallow depressions in the forest floor where species dormant in the seed bank can grow. Thus, the numerous and ongoing pine blow-downs are natural and important components of the forest community. The forest floor and acidic soils of the terrace do not appear to have been altered much or farmed, thereby allowing most of the pre-existing native vegetation to resprout. Invasive exotic plants are largely absent from this site.

Southern Red Oak is the dominant canopy species of the terrace, perhaps owing to the poorly-drained, silty-clayey soils, and is intermixed to a lesser extent with Post Oak (*Quercus stellata*) and White Oak (*Quercus alba*). (Southern Red Oak is especially prevalent on Arell clay soils in the City, with Post Oak also prominent at high elevations.) Black Gum and Red Maple are the dominant understory trees, along with Sassafras (*Sassafras albidum*) and a variety of oaks, including Willow Oak (*Quercus phellos*) and the natural hybrid between Southern Red and Willow oaks - *Quercus* x *subfalcata*. The shrub layer is predominately composed of low-lying colonies of Lowbush Blueberry, Black Huckleberry, Deerberry (*Vaccinium stamineum*), Highbush Blueberry (*Vaccinium corymbosum*), Black Blueberry (*Vaccinium fuscatum*), and Staggerbush (*Lyonia mariana*). Mountain Laurel does not occur here or elsewhere at Forest Park.

A series of small, fairly open glades characterize the forest floor. Herbaceous species are diverse and include various Rosette Grasses (*Dichanthelium* spp.), sedges (*Carex* spp.), Partridgeberry (*Mitchella repens*) (a subshrub), Pink Lady's Slipper (*Cypripedium acaule*), wildflowers of the Aster family (Asteraceae) like Inland Roundleaf Thoroughwort (*Eupatorium pubescens*) and Grass-leaved Blazing Star (*Liatris graminifolia*), and others. The areas in and around the seasonally-wet depressions harbor emerging wildflowers, including Curtiss' Milkwort (*Polygala curtissii*), Pineweed (*Hypericum gentianoides*), Hay-scented Fern (*Dennstaedtia punctilobula*), and Rough Boneset (*Eupatorium pilosum*).

Especially considering the recent losses of similar terraces on former Winkler lands in the western end of the City, natural sites predominately composed of coastal plain vegetation are now scarce in Alexandria, with the Forest Park terrace one of the best remaining examples. Many species found here are highly rare in the City, including several that do not occur elsewhere in Alexandria (Table 2). In addition, this site preserves the largest and most sustainable population of the highly rare Pink Lady's Slipper in the City.

The main trail from Chinquapin Park that follows the western edge of Forest Park, with a spur that forms a loop trail around the Oak-Heath terrace, continues downslope past the terrace where it crosses the west branch of Taylor Run and continues upslope into the southern (lower) half of the park. A similar trail follows the eastern edge of the park across the stream and westward up the ridge that divides the west branch of Taylor Run and its seepage braid (Fig. 7).

The pre-settlement forest community along the lower slopes and banks of the west branch of Taylor Run was probably once Small Stream Forest, much like along Taylor Run at Chinquapin


Fig. 7. The west branch of Taylor Run (in dark blue) and seepage braid (in light blue).

Park. The west branch is also downcut in many places, resulting from channelized stormwater run-off from residential neighborhoods within its headwaters to the west. Old-age White Oak, Sweetgum, and Southern Red Oak trees comprise the forest canopy along the stream banks, with a variety of oaks, hickories (*Carya* spp.), Green Ash (*Fraxinus pennsylvanica*), Ironwood (*Carpinus caroliniana*), Dogwood (*Cornus florida*), and others in the understory.

Southern Red Oak, some old and large, and late-succession Virginia Pine are the dominant canopy species of the mid-slope and uplands of the park, intermixed with a variety of oaks, Sassafras, Red Maple, and other species. Old and large Red Maple trees grow along the seepage braid. Several old Black Oak (*Quercus velutina*) trees grow at the summit of the ridge that separates the seepage braid and the west branch of Taylor Run.

Much of the forest floor and shrub layer throughout the southern half of the park, including the stream banks, are overrun with invasive exotic species, such as English Ivy (*Hedera helix*), Wintercreeper (*Euonymus fortunei*), Periwinkle (*Vinca minor*), Japanese Honeysuckle (*Lonicera japonica*), Burning Bush (*Euonymus alatus*), Tea Viburnum (*Viburnum setigerum*), and others. Small, incipient populations of Japanese Stilt Grass (*Microstegium vimineum*) and Long-bristled

Smartweed (*Persicaria longiseta*) occur in places along the trails throughout the park. In addition, Poison Ivy (*Toxicodendron radicans*) and Virginia Creeper (*Parthenocissus quinquefolia*) – both valuable native plants – are nearly continuous throughout. When these species are uniformly abundant over the ground layer, it is usually indicative of extensive clearing and soil disturbance in the past. Nevertheless, many native species are intermixed with these plants, with a high recruitment of oak seedlings despite the density of vegetation and heavy cover of English Ivy.

Overall, the forest communities throughout both parks include an abundance of significant natural resources, as well as habitats that are now rare in urbanized areas, such as successional oak-pine communities (MNCPPC 2009, Zell 2011). They also provide critical habitat and refuge for a variety of wildlife that are uncommon to rare in the City, such as Eastern Box Turtle (*Terrapene carolina*), Eastern Ratsnake (*Pantherophis alleghaniensis*), Common Five-lined Skink (*Plestiodon fasciatus*), American Woodcock (*Scolopax minor*) (observed in a woodland seep along Timber Branch nearby at Ivy Hill Cemetery), and many others.

The three streams and associated springs and wetlands at Chinquapin and Forest parks also provide valuable wildlife habitat for uncommon to rare aquatic wildlife in Alexandria, including Blacknose Dace (*Rhinichthys atratulus*), Eastern Red-backed Salamander (*Plethodon cinereus*), aquatic macroinvertebrates such as Crayfish (*Cambarus* spp.), dragonflies, and damselflies, and others.

Fig. 8. Lower trail through woodland along the south bank of the west branch of Taylor Run at Forest Park. Photo by R.H. Simmons.

*Conservation Priorities*

Three natural communities of conservation significance for the City of Alexandria were identified: Acidic Seepage Swamp, Coastal Plain / Piedmont Small Stream Forest, and successional Low-Elevation Mixed Oak / Heath Forest. In addition, the woodland seep and Wild Sarsaparilla colony along Taylor Run on First Baptist Church property are also high conservation priorities.

No federal or state Rare, Threatened, and Endangered (R,T,&E) species were found in either park. However, twenty-eight species at Chinquapin and Forest parks and three species on adjacent First Baptist Church land that are highly rare in the City of Alexandria were documented and are high conservation priorities (Simmons 2009; Tables 1, 2, and 3).

Table 1. Plants of Chinquapin Park that are highly rare in the City of Alexandria, including their status in the City. All occur in and around the Acidic Seepage Swamp.

Eastern Serviceberry (*Amelanchier canadensis*); A2
Bog Sedge (*Carex atlantica* ssp. *atlantica*); A1
Upright Sedge (*Carex stricta*); A1
White Turtlehead (*Chelone glabra*); A2
Wild Yam (*Dioscorea villosa*); A1
Spinulose Wood Fern (*Dryopteris carthusiana*); A1; sole occurrence in City
Evergreen Wood Fern (*Dryopteris intermedia*); A1
Triploid Hybrid Wood Fern (*Dryopteris* x *triploidea*); A1; sole occurrence in City
Turk's Cap Lily (*Lilium superbum*); A1
Royal Fern (*Osmunda spectabilis*); A1
Cinnamon Fern (*Osmundastrum cinnamomeum*); A2
Cowbane (*Oxypolis rigidior*); A1
Downy Arrowhead (*Sagittaria latifolia* var. *pubescens*); A1
Smooth Carrionflower (*Smilax herbacea*); A2
Primrose-leaved Violet (*Viola primulifolia*); A1
Netted Chain Fern (*Woodwardia areolata*); A1

Table 2. Plants of Forest Park that are highly rare in the City of Alexandria, including their status in the City. All occur in and around the Oak-Heath Forest, except *Quercus* x *subfalcata* which occurs on both sides of the west branch of Taylor Run in the park.

Pink Lady's Slipper (*Cypripedium acaule*); A1
Hay-scented Fern (*Dennstaedtia punctilobula*); A2
Branched Rosette Grass (*Dichanthelium dichotomum* var. *ramulosum*); A2
Leafy Rosette Grass (*Dichanthelium sphaerocarpon* var. *isophyllum*); A1
Fan Clubmoss (*Diphasiastrum digitatum*); A1; sole occurrence in City
Rough Boneset (*Eupatorium pilosum*); A1
Pineweed (*Hypericum gentianoides*); A1
Grass-leaved Blazing Star (*Liatris graminifolia*); A1
Staggerbush (*Lyonia mariana*); A1
Curtiss' Milkwort (*Polygala curtissii*); A1; sole occurrence in City
*Quercus* x *subfalcata*; A1
Highbush Blueberry (*Vaccinium corymbosum*); A1

Table 3. Plants of First Baptist Church property that are highly rare in the City of Alexandria, including their status in the City. All except Toothed White-topped Aster occur along the south bank of Taylor Run east of Chinquapin Park and north of Forest Park.

Wild Sarsaparilla (*Aralia nudicaulis*); A1; largest population remaining in City
Wild Yam (*Dioscorea villosa*); A1
Spinulose Wood Fern (*Dryopteris carthusiana*); A1; sole occurrence in City
Royal Fern (*Osmunda spectabilis*); A1
Cinnamon Fern (*Osmundastrum cinnamomeum*); A2
Tall Flat-topped White Aster (*Doellingeria umbellata*); A1; sole occurrence in City
Toothed White-topped Aster (*Sericocarpus asteroides*); A1

**Key (in part):** Unofficial designation of City of Alexandria status based on occurrences within the City (Simmons 2009).
**A1**: Extremely rare and critically imperiled with 5 or fewer occurrences or very few remaining individuals in Alexandria; or because of some factor(s) making it especially vulnerable to extirpation in Alexandria.
**A2**: Very rare and imperiled with 6 to 20 occurrences or few remaining individuals in Alexandria; or because of some factor(s) making it vulnerable to extirpation in Alexandria.

Fig. 9. Staggerbush (*Lyonia mariana*) at Forest Park, one of the few remaining locations for this plant in Alexandria. Photo by R.H. Simmons.

*Best Management Practices and Recommendations*

Paramount to the future sustainability of the City's irreplaceable natural resources and biodiversity is the preservation of remaining tracts of indigenous forest communities in their natural state, including natural landforms, wetlands and waterways, native flora, geologic features, and wildlife. An absolute minimum of site disturbance and encroachment, especially to soils and vegetation, is critical in preventing irreparable damage to parkland and should be the overarching concern in determining all activities planned for a site.

During natural resource assessments at both parks, extensive infestations of invasive exotic plants were noted. These highly degraded areas and the subsequent spread of invasive species indicate areas of past soil disturbance and clearing. This is especially the case when activities creating disturbance are located near a source of invasive species producing seed material. Moreover, seed material from a source near or far can be transported into relatively pristine or undisturbed natural areas, such as interior forest, where it can persist dormant in the seed bank indefinitely until a disturbance mechanism, natural or otherwise, allows it to emerge (Honu et al. 2009).

The largest threats to both parks are invasive exotic plants; potential disturbance resulting from trail maintenance and bridge construction; disturbance from periodic sewerline maintenance; the potential for major damage resulting from stream bank stabilization and watershed improvement projects along Taylor Run and west branch Taylor Run; channelized sheetflow runoff into the parks from adjacent impervious surfaces; and illegal dumping of yard waste from neighboring residents.

The following resource management guidelines and actions are recommended:

- To effectively oversee stewardship of the City's natural resources on parkland, it is essential that RPCA natural resource management staff, and the Natural Resource Specialist in particular, be involved throughout the process of reviewing proposed park improvements, including watershed improvement projects, trails, utility corridors, park facilities, etc.

  Moreover, it is recommended that natural resource management staff be the lead in reviewing and coordinating proposed activities involving passive recreation use parks and natural areas, such as volunteer invasive exotic plant control efforts, tree and brush removal, trail maintenance, interpretive signage and trail brochures, Eagle Scout projects, research study proposals, wildlife collecting permits, etc.

  This actively involves networking with an interrelated group of City staff, including City Naturalist and Ford Nature Center staff, City Horticulturist, Urban Forestry/Arborist Office, Park Managers, Park Planning, Office of Environmental Quality, and Planning and Zoning/GIS.

- All of Forest Park and the Taylor Run ravine of Chinquapin Park are designated passive use parks and natural areas. In addition, it is recommended that the Acidic Seepage Swamp, Coastal Plain / Piedmont Small Stream Forest, and successional Low-Elevation Mixed Oak / Heath Forest be given a standardized designation reflecting their natural resource significance, such as "Natural Resource Conservation Area" (Zell 2010), "Biodiversity Area" (MNCPPC 2009), "Native Plant Conservation Plot" (Mark Kelly, pers. comm.), etc.

- The unpaved, upland terrace above the Taylor Run ravine at Chinquapin Park is important for groundwater infiltration and recharge and is critical in maintaining the springs and seepage flow to the woodland seeps and swamp along the toe-slope of the ravine. Therefore, preserving the existing turf, trees, and garden plot areas of the terrace and not adding impervious and artificial surfaces is important (Zell 2004).

- Work with Alexandria City Public Schools (ACPS), Northern Virginia Conservation Trust (NVCT), and the Open Space Coordinator to transfer 8.52 acres of open field, trees, and woodland edge, currently an unused section of T.C. Williams High School, to RPCA to be added to Chinquapin Park and designated a conservation easement. The RPCA online directory of parks currently includes this area as part of Chinquapin Park, but Planning and Zoning and GIS list it as ACPS property.

- Work with the Open Space Coordinator, NVCT, and First Baptist Church towards acquiring a conservation easement on church property along the south side of Taylor Run that includes the woodland seep and Wild Sarsaparilla colony.

- Prioritize efforts underway by the City Horticulturist to mitigate stormwater sheetflow runoff from the old asphalt road below the northeast corner of the garden plots. Stormwater runoff in the past has exceeded the capacity of the small drains along the curb and scoured sections of the slope and main trail at the southeast corner of the park. Through restorative measures, stormwater will be intercepted and contained in an area where it can infiltrate into the ground. When mitigation efforts are completed, scoured sections of the hillside and trail will be carefully restored.

- Maximize opportunities for groundwater infiltration in appropriate areas outside park boundaries to reduce damage to stream corridors and parkland from channelized stormwater runoff directed into parkland. Because of the potential for major, irreparable damage to stream valleys and native vegetation, stream bank stabilization and mitigation projects are not recommended for either park.

- Coordinate with Planning and Zoning, GIS, and RPCA to delineate and include the west branch of Taylor Run and seepage braid at Forest Park on City maps. Also designate these streams and bordering lands as Resource Protection Areas (RPAs). Neither of these streams currently appears on City maps.

- The existing trails throughout both parks are well-developed and more than adequately provide easy and safe access through the parks. In order to protect sensitive habitats and prevent forest fragmentation, it is strongly recommended that no new trails be added to either park, including boardwalk access into wetlands. Trails should be regularly monitored for any obstructions, unsafe conditions, unofficial trail offshoots, damage, litter, etc. RPCA signage denoting rules and regulations for park usage in natural areas appears to be sufficient.

- To preserve the natural condition of parks, only rock material naturally present in the parks should be used. For this reason, imported quarried bedrock, such as “bluestone” (quarried diabase), granite, shale, marble, etc., should not be used as a surface substrate for trails (i.e., crushed bluestone, bluestone gravel) or along streams (granite boulders). These materials not only look out of place and constitute a form of pollution in parkland, but certain rock can effectively alter soil chemistry, leading to the demise of some native species and the spread of invasive exotic plants along trails and corridors.

- Woodchips are the recommended trail amendment if necessary, although most upland trails do not require surface amendments. Shredded leaf compost should never be imported into parks and natural areas or used as a trail amendment because it is usually loaded with weed seeds and ground up bits of trash and other debris. Paving trails in natural areas with asphalt or other material is not recommended because of the damage to vegetation, tree roots, and soils, as well as creating favorable conditions for the growth of invasive exotic species.

- Operating motorized vehicles along any of the trails, except for rare emergency situations, is not recommended. This is highly damaging to fragile soils, vegetation, and wildlife, and creates an active disturbance mechanism for the spread of invasive exotic species. Widening trails for motorized access is also not recommended.

- To protect against soil compaction and disturbance, work projects and activities involving large groups should not be conducted in sensitive areas when the ground is saturated.

- Continue to refine and improve the existing invasive exotic plant removal program at Chinquapin Park, as largely carried out by volunteers and partner organizations under the supervision of RPCA. Extend this program to Forest Park. In addition to the management practices outlined in this report, annually re-assess the effectiveness of removal efforts and prioritize target species and work sites.

- It is the policy of RPCA staff to use an absolute minimum of herbicides, and instead employ the principles of Integrated Pest Management (IPM). Indiscriminate or blanket spraying of herbicides is not recommended for any reason as a management practice. Because of the presence of rare species, sensitive vegetation, wildlife, and water resources throughout both parks, only trained and certified natural resource management staff are to apply herbicides to areas of the parks, when needed.

  In addition, past soil disturbance in many City parks has given rise to rampant growth of Poison Ivy (*Toxicodendron radicans*), a valuable native plant, but one which occasionally needs to be thinned or controlled when growing near walkways, trails, etc. Such control efforts involve careful applications of herbicide so as not to damage native plants and wildlife and are to be overseen and performed by natural resource management and horticultural staff.

- Because soil disturbance often causes an increase of invasive exotic species, damage to native vegetation, slope and stream bank de-stabilization, erosion, and other environmental problems, digging woody plants from wooded and riparian sites is generally not recommended. Instead, it is advised to saw down and remove the brush and apply herbicide to the fresh cut. Careful hand-pulling is the preferred method for removing herbaceous weeds and English Ivy and other vines (Young et al. 2011).

- To preserve existing biodiversity, it is important to differentiate between natural sites and artificial or cultural landscapes and to allow existing seed banks of native plants to grow and sites to naturally re-vegetate (Simmons and Zell 2010). Therefore, generally adding plantings to parks (i.e., riparian buffer plantings) or planting bare ground after invasive exotic species are removed is not recommended, even if native species are used and the site is on a slope near a stream. However, at select sites that are devoid of existing native vegetation, planting with appropriate early succession and common native plants is recommended.

- Native plants are those that occur locally and naturally, without direct or indirect human intervention. On the rare occasion when seeding or planting is required, only appropriate native species should be used. Any planting or seeding proposals for natural sections of parks are to be reviewed and determined by RPCA natural resource management staff. Species considered should match those species native to similar habitats in Alexandria. See the checklist of flora native to Alexandria at: http://alexandriava.gov/22560.

- Reintroducing plants that were historically known from the City or are rare or in serious decline is an important land management practice by RPCA natural resource management staff that helps maintain biological diversity throughout the City. This involves responsibly collecting seed or rescued material from local natural sources (primarily in Fairfax and Arlington counties) and planting in appropriately-matched habitats in Alexandria. Plant reintroduction should never be considered a viable substitute for protecting or properly managing existing rare plant populations (DNR 1999).

- Update and correct information displayed on several of the high-quality interpretive signs at both parks that were produced by Office of Historic Alexandria and RPCA in cooperation with the Virginia Dept. of Conservation and Recreation.

- Unprecedented numbers of White-tailed Deer (*Odocoileus virginianus*), whose population increases directly correspond with human actions, are causing severe disturbance to herbaceous and understory vegetation throughout forest communities of the eastern U.S. (Knight et al. 2009, MNCPPC 2009, Brewer 2010). Moreover, an overpopulation of deer often results in new infestations of invasive exotic plants, especially Japanese Stiltgrass and Garlic Mustard (*Alliaria petiolata*), into hitherto undisturbed forest, as well as increasing the spread and abundance of invasives. Resident deer have recently been observed in Chinquapin Park and evidence of repeated deer browsing has been observed on several rare wildflower species in the park. It is recommended that methods of resolving conflicts with nuisance wildlife, such as deer, be approved and coordinated by the City Naturalist.

- Inventory, measure, and score all of the old-age and notable trees throughout both parks and include on the list of notable trees of the City of Alexandria.

- Continue to monitor and document significant natural resources in both parks, including rare species and wildlife. Also, monitor and control environmental threats to the parks, such as illegal dumping, invasive exotic species, improper park use, etc.

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APPENDIX

List of GPS coordinates of significant natural resources at Chinquapin Park, Forest Park, and First Baptist Church property bordering the parks.

Chinquapin Park Acidic Seepage Swamp:

N 38.82045, W 77.08025 (eastern edge of swamp along trail); N 38.82116666, W 77.08055 (northwestern edge of swamp at *Dryopteris* spp. colony); N 38.82096666, W 77.08013333 (at widest point of swamp along main trail, app. 12' south of Taylor Run); N 38.82065, W 77.08046666 (western end of swamp along toe-slope)

Wood Fern (*Dryopteris* spp.) locations:

N 38.82116666, W 77.08055; N 38.8213333, W 77.0805; N 38.82126666, W 77.08016666; N 38.82126666, W 77.080483333; N 38.819616666, W 77.08

Forest Park Oak-Heath Forest:

N 38.81783333, W 77.0799333 (northeast edge of Oak-Heath Forest); N 38.8173333, W 77.08038333 (eastern end of main east-west trail through Oak-Heath Forest); N 38.8166, W 77.0809833 (southeast edge of Oak-Heath Forest); N 38.81718333, W 77.081383333 (south central along trail); N 38.81806666, W 77.08161666 (western end of east-west trail at *Cypripedium acaule* interpretive sign); N 38.81853333, W 77.08136666 (west central along trail); N 38.818883333, W77.0809166 (northwest corner of Oak-Heath Forest at concrete boundary post)

West branch of Taylor Run:

N 38.8175, W 77.0826 (western edge of Forest Park at bridge); N 38.81738333, W 77.08175 (eastward along stream at ancient White Oak along stream bank); N 38.816983333, W 77.081583333 (southeastward along stream at sharp oxbow); N 38.81663333, W 77.08156666 (eastward along stream at sand bar); N 38.81631666, W 77.08116666 (eastward along stream at convergence of stream and seepage braid)

Forest Park seepage braid:

N 38.816583333, W 77.0831 (head of seepage braid at western edge of park); N 38.816316666, W 77.08265 (eastward along seepage braid); N 38.816216666, W 77.08223333 (eastward along seepage braid); N 38.81606666, W 77.08178333 (bridge over seepage braid); N 38.81631666, W 77.08116666 (convergence of seepage braid and west branch of Taylor Run)

Woodland seep on First Baptist Church property:

N 38.81965, W 77.0798

Wild Sarsaparilla colony:

N 38.818, W 77.0786 (east-central, at mid-slope); N 38.81816666, W 77.07893333 (western end of colony on upper slope)