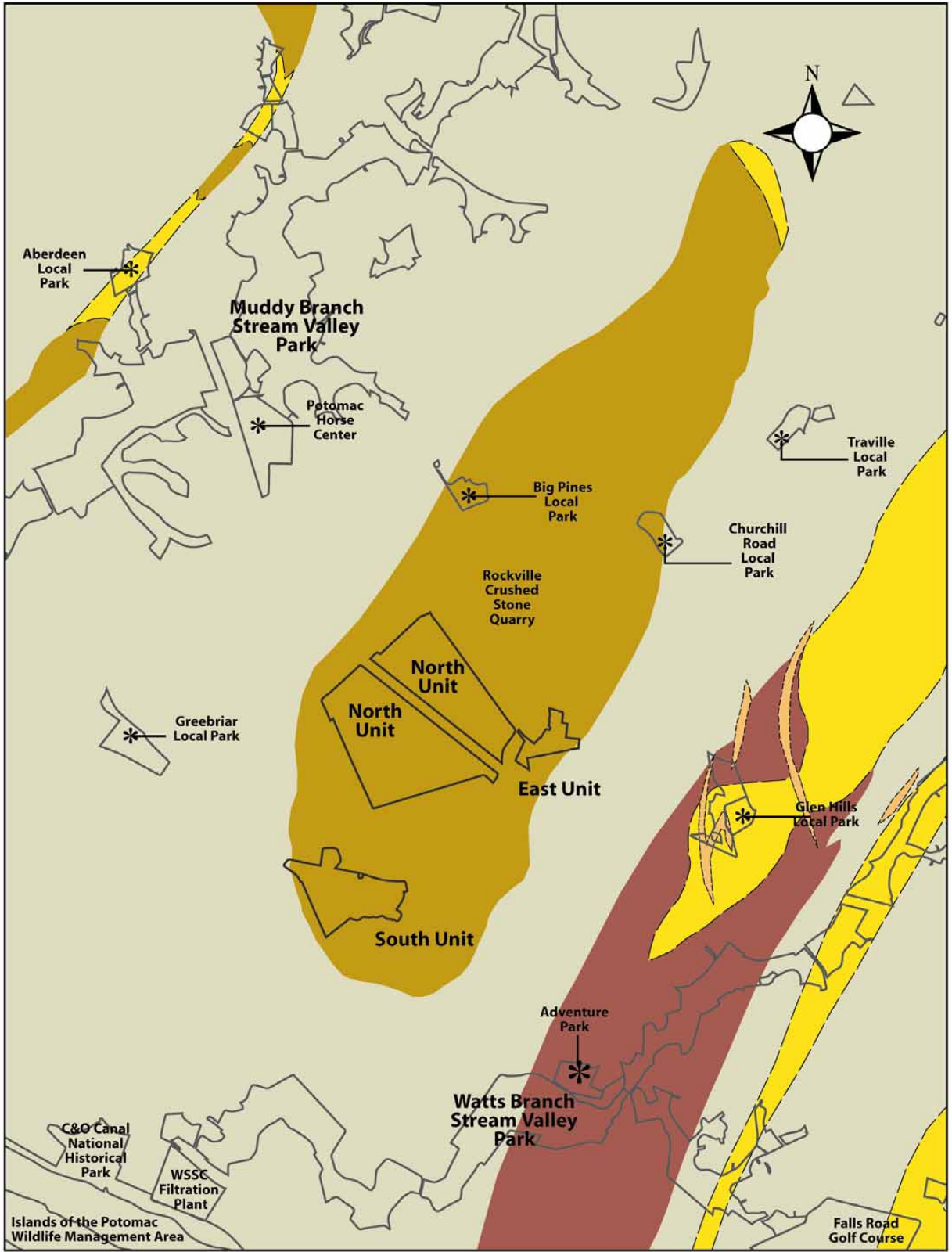


Attachment III **Geology Map**



- Quartz Bodies
- Mafic
- Gneiss
- Schist
- Ultramafic (Serpentinite)

Attachment IV Supporting Information for Public Access Proposal

Serpentine Oaks Conservation Park Supporting Info for Public Access Proposal and Excerpts from Draft Management Plan

Overview of Serpentine Oaks Conservation Park

The Serpentine Oaks Conservation Park has been acquired by M-NCPPC through a combination of purchase and dedication through the development review process. Legacy Open Space (LOS) program funding was responsible for purchase of the North Unit. LOS focuses on preserving Montgomery County's best natural areas, historical resources, and urban open spaces. From the inception of the LOS Program, the Serpentine Oaks has represented the highest priority for acquisition due to the sensitive and rare nature of the resource. Purchase started in 2001 and will be complete in July of 2006.

The Serpentine Oaks Conservation Park is a 341 acre complex located in southwestern Montgomery County, Maryland, within the Potomac subregion planning area and the Piedmont geologic province. The Serpentine Oaks is the only remaining significant undeveloped area of serpentinite-derived soils remaining in the County. The property has been known by numerous names including Travilah Barrens, Piney Barrens, Big Pine and Serpentine Barrens. The Management Plan team decided that Serpentine Oaks was the most appropriate name, for a variety of factors.

The park is located south of Travilah Road and west of Piney Meetinghouse Road, between the communities of Big Pine and Palantine Oaks. The park consists of three units, a larger Northern section, a southern section and an 18 acre area dedicated to M-NCPPC on the east side of Piney Meetinghouse Road. The Northern Serpentine Section is approximately 258 acres and the South Serpentine Section is approximately 65 acres. All sections contain a variety of exceptional natural resources, though the North Serpentine Oaks unit is most significant due to its size, resource composition and limited encroachment by residential development. The North Serpentine Oaks borders the Rockville Crushed Stone Quarry; the South Serpentine Area is located on the southern edge of the serpentinite outcrop adjacent to Glen Road.

The Serpentine Oaks area is underlain by serpentine bedrock. An uncommon light green natural bedrock, serpentine is believed to have been thrust up from the earth's core during plate shifting activity some 450 million years ago. Found only in a few places around the globe, serpentine soils are very low in essential nutrients and high in nickel and chromium metals that are toxic to most plants and animals. In North America, serpentine soils occur in a discontinuous band along the eastern border of the Appalachian Mountains from Newfoundland and Quebec, Canada through New England to Alabama. Nearly 90% of the acreage in eastern North America is within Pennsylvania and Maryland.

Serpentine soils are derived from metamorphosed ultramafic rocks. Serpentine rocks are ferro-magnesium silicates high in magnesium and iron and low in aluminum, calcium and silica. The name "serpentine" is attributed to the soil's

resemblance to a mottled greenish-brown snake dwelling on similar soils in northern Italy. The greenish soil color comes from fragments of the underlying bedrock containing magnesium silicate. Toxic to plants, as much as one-third of the bedrock may be made of magnesium. High levels of magnesium in the soil block a plant's ability to take in soil nutrients, especially calcium. Because they are shallow and low in organic material and clay, serpentine soils have limited water holding and nutrient capacity. Serpentine soils often have pockets of additional heavy metals toxic to plants, including chromium, cobalt, and nickel. Also, these soils are normally acidic near the surface, but less so in deeper layers. As wind and water erode the soil, non-acidic layers are exposed, creating varied habitat for plants. Serpentine outcrops are often associated with mining of chromite, talc, green marble and asbestos. The park is located immediately adjacent to the Rockville Crushed Stone Quarry where this bedrock has been mined (See aerial image attachment).

Serpentine communities are considered one of the State's rarest natural resources, and one of the rarest and most unusual sets of natural communities in the eastern North America temperate forest region. Only about 2500 acres remain in Maryland, or five percent of the pre European settlement amount of 50,000 acres. This geology is responsible for driving "hotspots" of uncommon endemic plant species. Prior to settlement, circa 1750, Serpentine Barrens areas in Maryland covered large areas in the upper parts of Baltimore, Harford and Carroll Counties. The most notable Serpentine Oaks areas in Maryland include Pilot (The Nature Conservancy), Cherry Hill, and Soldiers Delight. Soldiers Delight is the largest remaining serpentine area in the eastern United States. English settlers seeing these virtually treeless expanses referred to them as "Barrens." For thousands of years, Native Americans used fire management to keep the grasslands relatively free of woody vegetation for purposes of hunting. European settlement generally eliminated large-scale frequent fires, allowing grassland areas to transition to woodlands. Most barrens in Maryland and SE Pennsylvania have "naturally" afforested in the last 50-75 years.

Montgomery County's Serpentine Oaks appears to have remained forested since at least 1940 based on review of aerial photography and study of dendrology ring counts, indicating a varied ecological condition from the a classic Barrens. Once cleared, "Barrens" in part due to the lack of nutrients in the soil and the presence of minerals at levels toxic to plant growth, tend not to experience normal forest regeneration. Serpentinite soils typically stunt plant growth producing a somewhat miniaturized forest effect.

Figure1. A 45 year old stunted oak tree stump



Hydrologically, Serpentine Oaks Conservation Park is located within the Greenbrier Branch watershed. The portion of the watershed that encompasses the park has been designated a Water Use Category I-P by the Maryland Department of the Environment. Use I-P waters are suitable for use as a public water supply. The *Countywide Stream Protection Strategy* (Montgomery County Department of Environmental Protection, 1998) identifies the Greenbrier Branch tributary of the Watts Branch as having good habitat but fair stream conditions overall. A wetlands functional analysis was conducted for the Potomac subregion by Commission staff according to a protocol development collaboratively with the Maryland Department of the Environment in 1997. The presence of alluvial soils over parts of the South Serpentine Oaks indicates that possibly the Potomac River at one time may have flowed over this area. Cobbles of an ancestral Potomac River or mainstem tributary are apparent on the property.

The Montgomery County Soil Survey shows that all of the lower Greenbrier Branch properties consist of Chrome/Conowingo, Chrome silt loam or Travilah silt loam soils. The soil survey describes these soils as having severe restrictions to the placement and use of septic fields and dwellings with basements due to high water table and shallow depth to bedrock. Many locations on the Serpentine Oaks exhibit exposed bedrock on the surface.

Past and recent experience with land disturbance on this outcrop have shown extensive blasting, grading, and filling is needed for, what in other places, would be normal site preparation for development. Onsite afforestation/reforestation is generally infeasible. Land surface over serpentinite soil is typically stony, infertile and sparsely vegetated.

Because of soil driven stresses, Serpentine Oaks are rare ecosystems that provide habitat for a number of rare, endemic plant species. Over twenty species of rare, threatened, endangered, and watchlist (RTEW) plants occur in the Serpentine Oaks Conservation Park based on vegetation studies conducted by Natural Resources Management staff, Maryland DNR, the Maryland Native Plant Society, and independent consultants. These species are classified based on their abundance in Maryland. Several groups of species are either endemic or generally restricted to these serpentine areas.

A large majority of the Serpentine Oaks Conservation Park acreage is covered by maturing, second growth forest with good structure, well developed shrub levels, and relatively few non-native invasive species. The oak (*Quercus*) genus is significant on the Serpentine Oaks with abundant representation and dominance in both the overstory and the understory. Common oak species include white, red, black, post, blackjack, chestnut, swamp white, scarlet, southern red, shingle, and willow oak. The total forested acreage is approximately 339 acres. The park's forested acreage represents one of the largest remaining contiguous forest tracts in the Potomac subregion.

The large contiguous forest that comprises the majority of the acreage at Serpentine Oaks Conservation Park provides critical habitat for forest interior dwelling species, particularly birds. These species require large unbroken tracts of forest to successfully breed. Large contiguous forest habitat is scarce in Montgomery County. Development continually fragments woodlands into smaller isolated tracts. Limited wildlife inventories of the Serpentine Oaks have been conducted since the park was acquired. Natural Resources Management staff completed a field inspection of the park, and compiled a species list. Most of the species have been detected through sightings, tracks, and calls. A complete listing of the park's observed wildlife is available. Additional species will likely be recorded for this park as future surveys are conducted. Birds are an excellent indicator species for evaluating habitat quality and making inferences about habitat suitability for other animal species. Over 60 species of birds were detected in the park. The list includes a significant number of forest interior dwelling species such as Louisiana waterthrush, scarlet tanager, ovenbird, pileated woodpecker, and barred owl, indicating a high quality forest.

In addition to birds, the park is home to a wide diversity of terrestrial wildlife species including at least 14 species of mammals, 6 reptiles, and 11 amphibians. Mammals include common species such as red fox, white-tailed deer and gray squirrel, as well as less common species such as eastern coyote. Many signs of a high deer population were observed in the park including reduced forest understory density and regeneration and negative impacts to the health of several RTEW species. Reptiles include most of the common species of the County as well as the less common eastern hognose snake and five lined skink. Wetlands and vernal pools provide breeding habitat for the spotted salamanders, marbled salamanders, wood frogs, spring peepers and other amphibians. The State rare buckmoth also occurs within the forest interior.



Figure 2. Serpentine Rock Outcrop

There are no existing improved structures or known foundation structures associated with the North unit. Aerial photography dating to and subsequent to 1938 indicates an historically undeveloped site. The South Unit contains one unoccupied home and associated outbuildings, cleared areas, and abandoned farm pond and the remnants of an unimproved road network.

Four primary management plan issues are:

- Control of non native invasives species. *Microstegium* is abundant in the park and has spread into a number of patches in the forest. Japanese barberry and Japanese honeysuckle also threaten the native plants in the park.
- All Terrain Vehicle usage. The park has been a site for all-terrain vehicle (ATV) activity in the past, and continues to be so even under M-NCPPC ownership. ATVs access the park via the PEPCO Utility easements.
- Dumping of Trash and landscaping debris. Dumping of trash and woody debris has occurred on the property over many years prior to the park's acquisition. Several old minor trash dumps were observed scattered throughout the park particularly in wooded areas near utility easements. Overall debris is significantly less common in the North Unit as compared with the South Unit.
- Control of peoples choice trails. There are roughly 4 miles of existing peoples choice natural surface trails within SOCP. The trails have received infrequent use primarily by previous property owners from neighboring properties. Some of these trails are poorly eroded, impact rare plant species, or of concern due to proximity to the adjacent quarry. Reroutes and closure and revegetation of problem areas are planned.
-

Staff Trail Plan

The specific natural surface trail alignments for the park are described in detail in the following paragraphs.

The Management Plan calls for the construction of natural surface trails open to hikers only. To protect the rare and sensitive ecosystem of the Serpentine Oaks Conservation Park, the Advisory Group strongly favored limiting public access into the interior of the park to hiking only. The State of Maryland Department of Natural Resources established this policy for management of Soldiers Delight, Maryland's most expansive remaining natural serpentine area. Prior to state acquisition of the land, there were equestrian trails, but these were closed to equestrians, cyclist, and orienteers in 1990 in an effort to protect the sensitive ecosystem of the park (See Soldiers Delight Inset).

The Commission is committed to geographic equity for trail user groups. The existing availability of trails for biking and horses in the Potomac region is significant. The relatively small size, disconnected nature of the Serpentine Oaks and rarity and fragility of this resource were all heavily considered in the Management Team's decision. Historic

regional connectivity is not lost or impaired by excluding equestrians and cyclist from the interior of the Serpentine Oaks. The proposed trail access plans preserve the existing horse easements to maintain regional connections. The key issue was whether interior access of the forest was appropriate for a Conservation Park.

Trails at Serpentine Oaks Conservation Park will be field located to avoid sensitive areas including hydrologic features and concentrations of rare, threatened, endangered and uncommon plant species. Trails will allow for interpretation of the unique assemblage of natural resources.

Visitation to the park is expected to peak during Spring and Fall based on supporting park trends. As this park is generally isolated within a rapidly expanding suburban area, visitation is expected to increase.

Potential interest in the adjacent Quarry (Aggregate Industries) providing donations and support also exist. Aggregate Industries stated interest in providing signage/placards linking the Serpentine Oak Conservation Park with geology and economics associated with their aggregate extraction, in addition to donating gravel materials mined from the quarry for proposed parking areas. Donation large representative serpentine rocks as an exhibit feature has also been proposed.

North Serpentine Unit (258 acres)

The agreed upon trail concept is to have a 2-3 mile loop interior trail (Blackjack Oak Trail) and a 1 mile self-guided interpretive trail loop (Post Oak Trail). The interior trail will require two crossings of the existing PEPCO easement and an agreement from PEPCO. The short loop goes through Parcels 4A and 4B with a small parking area in the southeast corner of Parcel 4B to facilitate both trails.

The parking lot site was chosen because it provides adequate line of sight on Piney Meetinghouse Road and because that is the most narrow extension of the park and should have the least impact on the forest. A development footprint for this proposed parking area is expected to involve 5000 square feet and accommodate up to 20 automobiles. Clearing of approximately 6000 square feet of forest is expected.

The short or Post Oak Trail traverses hilly terrain providing views of a scenic chestnut oak stand with a predominantly ericaceous understory in Parcel 4A and post oak dominated glades in Parcel 4B that is representative of prototypical serpentine stunted oak forest. The short trail displays scenic landscapes and unique features of the area while leaving the majority of the forest undisturbed. The most expansive view of the Serpentine Oaks is provided where the Post Oak Trail intersects the PEPCO ROW. A forested vista stretches to the west in excess of a mile. This trail also includes the highest elevation of the Serpentine Oaks at approximately 435 feet above mean sea level and involves an approximately 65 foot elevation change over a distance of 1000 feet.

The long or Blackjack Oak Trail crosses approximately $\frac{3}{4}$ the length of the park on the north side, staying a safe distance from the Quarry and avoiding areas of dense RTE plant concentrations. The trail involves two crossings of the Greenbrier Branch. The small drainage area and low flow of Greenbrier branch in the North Unit will necessitate only

one minor bridge crossing. One additional powerline crossing is involved. The trail is an extension of the Post Oak Trail and has its terminus at the same parking area. The long trail provides access to a large portion of the park while maintaining large, undisturbed areas within the Serpentine Oaks. It is illustrative of the variety of habitats in the park, traversing Chestnut Oak Forest, Greenbrier thickets, Post Oak Glades, and mature Oak/Hickory Forest. The Blackjack Oak Trail avoids the most environmentally sensitive areas including salamander breeding habitat, high quality seeps, a vernal pool, and a State significant concentration of *Dirca palustris* (Leatherwood) and several other State rare listed plant species.

In addition, a 10 foot recorded equestrian trail easement along the southeast side of the North Serpentine Unit is platted along the property line, involving nine recorded and built single family lots. The existing trail for this easement does not honor the easement area, but in fact encroaches inside park boundaries. The management plan proposes allowing the equestrian trail to be maintained on park property, with minor improvements and rerouting as this would be a useful concession for equestrian access/connectivity but would not allow for interior encroachment of the forest. Further the management plan proposes to extend this horse trail 800 feet to the proposed parking lot along Piney MeetingHouse Road. It is believed this proposal benefits the equestrian community and negates potential conflicts with adjacent residents, without adversely affecting the Serpentine Oaks environment. Locating the horse trail on parkland allows for maintenance. The trail currently turns off of park land onto private land before it reaches Piney Meetinghouse Road. Signage indicating equestrian accessible and restricted trail sections will be necessary.

Several areas of existing trail are recommended for closure, including a 3500' stretch of trail that parallels the adjacent quarry at what is considered an unsafe distance. This trail is also in the direct path of a significant population of State rare Skullcaps. Other proposed trail closures are for the purpose of expanding interior connectivity and buffering for sensitive resources. Where appropriate, existing trails are being incorporated into the design of the proposed new trail network.

Trail connection between the South Serpentine and North Serpentine units is not recommended. An existing equestrian easement traverses narrowly forested residential backyards and crosses existing Palantine Drive (a tertiary subdivision road) to link the North and South Units. The area is aesthetically inappropriate for purposes of park usership and would be minimally used. It does not appear to be necessary or worthwhile to try to provide a trail connection between the two areas.

South Serpentine Unit (65 acres)

Consensus among the SBCP Advisory Group is that the South Serpentine provides a condensed version of the larger serpentine site (i.e. quicker access to riparian habitat, RTES, representative forest, rock outcrops) and is better suited for a shorter interpretive trail and for elementary aged school group interpretation. The overall quality of the South Serpentine Oaks is inferior when compared with the North Unit. Areas of clearing and prior usage are common. Invasive and exotic plant species are considerably more entrenched in the South Unit. These factors allows for a greater intensity for proposed usage without concern for significantly degrading a pristine area.

A single trail, the Serpentine Trail, is proposed for the South Unit and involves either a ½ or 1 mile loop. Approximately 50 percent of the proposed trail involves the use of existing unimproved pathway. This trail is intended for interpretation and represents a good example of a serpentinite influenced forest. Post and blackjack oaks are common as is the pervasive feeling of a generally stunted forest. The trail involves two crossing of an existing gas line easement. The trail parallels an intermittent stream for approximately 1000 feet and affords good view of exposed bedrock. This trail also incorporates an existing in-line farm pond that has transitioned into a cattail rich wetland area good for birding and similar nature observation.

Grades associated with the Serpentine Trail are gentle to slightly moderate allowing for Americans with Disabilities Act (ADA) compliance. The proposed trail will involve two crossing of Greenbrier Branch, necessitating bridge structures. A bridge crossing will be needed downstream of the farm pond or along the existing pond berm. On natural surface trails, six foot wide fiberglass bridges are usually installed, but hiker only bridges can be designed smaller, with a more rustic appearance.

Two extensions of an existing equestrian easement is proposed for the South Unit. One traverses an existing impaired area along a road bed west of the homestead area extending north through impacted forest and old field to link up with Greenbriar Road. The other proposed extension is along Glen Road, just within the forest interior allowing linkage from Greenbriar Road to a recently recorded easement on the Estates of Greenbrier. This connection will involve minor clearing and a ford of the Greenbrier Branch.

A trail connection is needed parallel to Glen Road from the new Park entrance to the existing recorded trail easement on the frontage of Greenbrier Estates (new subdivision under construction). The trail should be within the Park boundary following the alignment of Glen Road and be buffered by adequate treeline between the road and the trail for the protection and safety of equestrian users and possibly pedestrians using the path.

Providing this trail would ensure equestrians access to two existing trail routes- there is a bridle easement directly across Glen Road from the proposed South Unit Park entrance, and crossing Glen Road from the new Greenbrier Subdivision accesses the Great Elm bridle easement to Watts Branch Stream Valley Park.

The existing cleared area adjacent to Glen Road on the South Serpentine Unit, represents the proposed parking area for the South Unit. As part of the approved site plan for the adjacent Estates of Greenbriar Development, a condition of approval entails the developer remove the existing structures.

The Management Plan recommends that a multiple use open-air pavilion be established on the South Unit for interpretive use. The scale of clearing and development required to build a pavilion and accompanying parking lot was considered for the North unit, but deemed inappropriate because it would encroach on a high quality post oak forest community.

East Serpentine Unit (18 acres)

The east unit is entirely on the east side of Piney MeetingHouse Road. This acreage was dedicated to M-NCPPC as part of the approval of Site Plan 8-04020 (Potomac Preserve). The majority of this section is within environmental buffer, including 100-year floodplain. Entirely forested, no formal development is proposed. Access from Piney Meetinghouse Road to Tanager Lane is recommended via an existing natural surface trail. This trail provides access for surrounding developments to the east to access the North Unit. Bollards at the end of Tanager Lane are recommended to help limit the potential for dumping or illegal access. This area will be monitored for potential future use.



Figure 4. Fringe Tree in flower at Serpentine Oaks Conservation Park

Serpentine Case Study

Soldier’s Delight Environmental Area in Baltimore County is the largest remaining serpentine area in the eastern United States (700-800 ha) and is very applicable planning case for the Serpentine Oaks in Montgomery County- especially regarding management issues. Soldiers Delight is nearly 2,000 acres, half of which is underlain by serpentine bedrock. Historically, the area was predominantly a grassland and oak savannah community. In the last eighty years, the area has been invaded by Virginia pine along with red cedar and greenbrier. Natural Heritage ecologists theorize that this succession has occurred because of the absence of disturbance from fire and grazing. In the early 1990’s the park began a restoration program of mechanically removing pines and burning defined areas to recreate conditions for the growth of grasses. Results of the burns to date have been very promising.

Baltimore Gas and Electric maintains a powerline through Soldier’s Delight similar to the PEPCO line through the Serpentine Oaks. BG&E has worked with the park to put up signage and mow the powerline easement to promote the growth of a serpentine grassland community.

Public use of Soldier’s Delight is limited to hiking only. Prior to state acquisition of the land, there were equestrian trails, but these were closed in an effort to protect the sensitive ecosystem of the park. Use by equestrians, bicyclist and orienteers has been restricted since 1990 due to concerns over the impacts to the fragile environment. The park receives in excess of 70,000 visitors per year.