

# **INTRODUCTION**

This report presents an ecological assessment of the Horsepen Run Preserve owned and maintained by the Countryside Proprietary, with recommendations for management of its natural and anthropogenic features. This report is broken into three primary parts.

Part I provides a summary of the general ecological features of the site –site physiography (topography and geology), plant communities, and wildlife communities, and a discussion of some general ecological concerns – the primary ecological threats facing the site and the conservation priorities moving forward.

Part II provides a summary of current conditions and management recommendations for each of seven primary Habitat Management Units that were established for the site. These Habitat Management Units include the Central Corridor, the Northwestern Pioneer Forest, the Northeastern Pioneer Forest, the Horsepen Run Riparian Corridor, the Potomac River Riparian Corridor, the Southwestern Mature Forest, and the Eastern Mature Forest.

Part III lists and describes various restoration and maintenance tasks that can be completed to improve the ecological integrity of the site.

## **PART I – GENERAL SITE FEATURES AND PROCESSES**

### **SITE PHYSIOGRAPHY**

The site is located in the Piedmont physiographic province of Virginia and covers approximately 375 acres. A 2011 Loudoun County aerial photograph of the site is provided in Appendix A as a base map.

The site is roughly rectangular in shape with its long axis parallel to the Potomac River, which forms the northern boundary of the site. The Potomac River summer water surface elevation is near 180 feet along this reach, with a relatively narrow floodplain present at approximately 190 feet bordered by a short rise up to an upper terrace. The relatively flat upper terrace at 200-210 feet comprises the bulk of the site, which is bisected by Horsepen Run which eventually joins the Potomac River on-site. The highest elevation on site is a man-made knoll of 214 feet adjacent to Algonkian Parkway.

The Generalized Geologic Map of Virginia shows this site to be entirely within the Triassic Basin. The Geology and Mineral Resources of Loudoun County, Virginia map shows more detail, mapping the site within the TRsh mapping unit, signifying the site as Upper Triassic shale and siltstone, interbedded. This unit is described as “Shale, light greenish gray, light to dark gray, carbonaceous, and reddish brown in cyclic sequences,

laminated, silty to sandy, fossiliferous. Siltstone, typically reddish brown to gray, sandy, micaceous, with minor fine grained sandstone beds.”

A soil map is provided in Appendix B that shows the various soil types present on site, along with a key to the symbols used on the map. Eight mapped soil series exist on the site, described below with their landscape position and description from the Interpretive Guide To The Use Of Soils Maps, Loudoun County, Virginia.

Rowland silt loam (map symbol 05A) is the predominant soil along the Horsepen Run stream valley. Rowland silt loam soils are “very deep, moderately well to somewhat poorly drained reddish brown and mottled reddish brown and gray silty and clayey soils with seasonal water tables on level terrace positions in flood plains; soils developed in alluvium, derived from Triassic shale and siltstone.”

Bowmansville silt loam (map symbol 06A) is found on the south central portion of the site and is a designated hydric soil (wetland soil). Bowmansville silt loam soils are “very deep, poorly drained dominantly gray silty and clayey soils with seasonal water tables on concave terrace positions in the flood plain; soils derived from Triassic shale and siltstone.”

Huntington silt loam (map symbol 07A) is found in a narrow band directly adjacent to the Potomac River. Huntington silt loam soils are “very deep, well drained brown silty soils on convex terrace positions in the flood plain; developed in alluvium of mica bearing soils derived from mixed acid and basic rock.”

Lindside silt loam (map symbol 08A) is found in a narrow band immediately to the south of the narrow band of Huntington silt loam along the Potomac River. Lindside silt loam soils are “very deep, moderately well drained brown and mottled brown and gray silty soils with seasonal water tables on level terrace positions in the flood plain; developed in mica bearing soils derived from mixed acid and basic rock.”

Hibler silt loam (map symbol 93B) is found on the upland areas of the western portion of the site. Hibler silt loam soils are “very deep moderately well drained yellowish red loamy and silty soils with gray in the lower part and seasonal high water tables on convex river terrace positions; developed from alluvium of soils derived from sedimentary rock.”

Allegheny silt loam (map symbol 94B) is found in several locations on the site in upland areas. Allegheny silt loam soils are “very deep well drained brown to yellowish red loamy and silty soils with short duration perched water tables on convex river terrace positions; developed from alluvium of soils derived from sedimentary rock.”

Clapham silt loam (map symbol 98B) is predominantly found on the southern portion of the site. Clapham silt loam soils are “very deep moderately well to somewhat poorly drained yellowish brown or mottled brown/gray and red clayey soils with fragipans and perched water tables on nearly level river terraces; developed from old alluvium of soils derived from sedimentary rock.”

Kinkora-Delanco complex soils are found in the wettest wetland areas on the site, often covered by mature forest. This mapping unit is a designated hydric soil. Kinkora-Delanco complex soils are “very deep poorly drained mottled gray clayey (Kinkora) and moderately well drained yellowish brown loamy (Delanco) soils with a seasonal high water table on concave to level terrace positions over siltstone.”

## **AQUATIC RESOURCES**

The physical and biological attributes of the streams located on-site are discussed below, along with adjacent wetlands. The primary aquatic features and designated stream reaches are shown on the Stream reach Map provided in Appendix C. The extent of federal and state jurisdiction over these resources has not been determined as of this date. The boundaries provided herein are preliminary based on recent fieldwork and available mapped information. Any work proposed in any river, stream, or wetland must be authorized in advance by the appropriate regulatory authorities, in this case the U.S. Army Corps of Engineers and the Virginia Department of Environmental Quality.

### **Potomac River**

The Potomac River forms the northern boundary of the site. The Maryland -Virginia state line boundary was established at the low water mark on the Virginia side of the Potomac, which puts the state line boundary just off the steep streambanks facing the Potomac River. Van Deventer Island lies between the Horsepen Run preserve site and Maryland mainland. The Potomac River is a very large interstate river of national significance.

### **Horsepen Run**

Horsepen Run is the primary aquatic feature contained within the site, with its lower reaches flowing from the southeast corner of the site through the center of the site until its confluence with the Potomac River. This is a moderate sized stream of moderate slope and sinuosity with a varied substrate of fines to cobble riffles. Riffle-pool sequences are well defined and habitat quality is general good.

### **Horsepen Run Tributaries**

Two small tributaries to Horsepen Run enter the site near the parking lot on Algonkian Parkway, coalesce near the first culvert crossing of the gravel access road, and flow in a northeasterly direction until the confluence of the combined tributary, mapped as the Southern Tributary, with Horsepen Run. These are perennial tributaries of moderate slope and sinuosity with predominantly gravel substrates.

### **Intermittent and Ephemeral Streams**

Several small intermittent streams exist throughout the site. Intermittent streams are those which carry baseflow for only a portion of the year, general in late winter through spring. Ephemeral streams only carry flow during and immediately after rainfall or snow melt events. Most of the smaller on-site channels appear to be more intermittent than ephemeral, largely due to the low slopes on most of the site which discourage the formation of gullies and ephemeral channels. The intermittent streams on this site are generally of short length, small size, low entrenchment and sinuosity, and have a substrate of fines and gravels.

## **Wetlands**

The aquatic resources discussed above are primarily open water (pond) and riverine (non-tidal stream) habitats. Wetlands are landward extensions of these types of habitats characterized by wetland hydrology (flooding, ponding, or saturation), hydric soils, and hydrophytic vegetation.

Wetlands are identified and delineated by the U.S. Army Corps of Engineers Wetlands Delineation Manual (USACOE, 1987) for most regulatory purposes. The Corps of Engineers (COE) and MDE are the primary regulators of wetland-related activities in Virginia under the authority of section 404 of the federal Clean Water Act. Virginia also has a related state wetlands program under the Virginia Department of Environmental Quality (DEQ).

The National Wetlands Inventory (NWI) maps compiled by the U.S. Fish and Wildlife Service were consulted online for any mapped occurrences of wetlands on the site. A variety of wetlands are shown on the NWI maps on this site that conform well with site conditions.

The general flat conditions of this site and its past drainage history (evident from obvious surface ditches) make detailed mapping of wetlands nearly impossible without a full wetland delineation. The largest wetland areas have been identified schematically on the Ecological features Map, but these limits are schematic only and should not be used for determining the limits of regulatory jurisdiction. Small wetland depressions and ditches exist throughout the site that may not be shown on the maps.

## **PLANT COMMUNITIES**

Detailed plant community mapping or analysis was not conducted during fieldwork for this preliminary assessment. A reconnaissance of the entire site was conducted, with observations made as to the general location and extent of major plant community types on-site. The dominant plant species of each community were noted, although there are certainly variations within each identified community.

The larger habitat management units described later in this report are usually dominated by one or possibly two of these plant communities, with smaller inclusions of other plant community types.

### **Maintained Lawn**

Several areas of maintained lawn exist on the site, primarily surrounding the main parking lot on Algonkian Parkway, and a narrow strip and occasional wider open areas along the gravel access trail from the parking lot to the Potomac River. These areas are dominated by tall fescue (*Festuca arundinacea*) with other grasses and typical broadleaf lawn species such as plantains (*Plantago* spp.) and clovers (*Trifolium* spp.). These areas are the most maintained plant habitats on site, being mowed on a regular basis to keep vegetation height short.

### **Upland Meadows**

Small patches of unmowed meadow habitat exist throughout the site where herbaceous vegetation dominates. Often these patches are adjacent to the maintained lawn areas and are dominated by the same suite of predominantly exotic species. Several areas of meadow dominated by native species also exist, primarily broomsedge (*Andropogon virginicus*), oatgrass (*Danthonia* sp.) and various broadleaved species, including goldenrods (*Solidago* spp.), asters (*Aster* spp.) and mountain mints (*Pycnanthemum* spp.). Transitional habitats between upland meadows and emergent wetlands also exist in narrow bands, with various hydrophytic grasses, sedges (*Carex* spp.) and rushes (*Juncus* spp.) gaining dominance.

### **Emergent Wetlands**

Several small to moderately sized emergent wetlands exist throughout the site dominated by herbaceous hydrophytic species. Dominant species include various species of sedge (including *Carex lurida*, *C. vulpinoidea*, *C. scoparia*, *C. lupulina*), various species of rushes (*Juncus effusus*, *J. tenuis*, *J. canadensis*), various species of bulrushes (*Scirpus cyperinus*, *S. atrovirens*, *S. polyphyllus*). Other common species include spikerushes (*Eleocharis* spp.), various wetland grasses, and various broadleaved hydrophytes such as smartweeds (*Polygonum* spp.) and tickseed sunflowers (*Bidens* spp.).

### **Old Field Savannahs**

The site has large areas of former open field that are reverting to forest through natural successional processes. Several of these areas are in an early stage of forest succession where scattered individual and clusters of trees are interspersed with meadow habitats. The encroaching woody vegetation includes native tree species such as black locust (*Robinia pseudo-acacia*) and pin oak (*Quercus palustris*) as well as exotic invasive shrubs such as autumn olive (*Eleagnus umbellata*), multiflora rose (*Rosa multiflora*), and bush honeysuckles (*Lonicera* spp.), along with native brambles (*Rubus* spp.).

### **Pioneer Forest/Scrub Fields**

Several discrete old fields exist on the site, on both sides of Horsepen Run. All of these fields were cleared for past agricultural activities and have undergone significant early stage forest succession. While they may be somewhat separated, they all share similar topographic, hydrologic and successional stage characteristics, with concurrent habitat values and management challenges. Invading tree species include pin oak, black locust, sycamore (*Platanus occidentalis*) and boxelder (*Acer negundo*), with autumn olive and multiflora rose as common shrubs. Poison ivy (*Toxicodendron radicans*) and Japanese honeysuckle (*Lonicera japonica*) are common woody vines, with a variety of herbaceous species present, with herbaceous density dependent on shrub thicket density.

### **Red Maple Wetlands**

There are two moderately sized drainageways in the center of the Pioneer Forest /Scrub Fields that are densely dominated by young red maples (*Acer rubrum*). Shrubs are nearly non-existent, with occasional small multiflora rose present, and woody vines are also uncommon. The herbaceous layer is generally dense and somewhat diverse, dominated by various sedge species.

### **Maturing Forest**

Along the edges of the site and edges of the more mature forest stands are several small patches of maturing forest with relatively dense tree stocking rates and smaller sized trees. Pin oaks, sycamores, red maples, and boxelders are the most dominant tree species in the wet and moist areas, with black locust most dominant in drier areas. Shrubs, woody vines, and herbaceous species are generally not very diverse and their prevalence varies greatly by specific area.

### **Riparian Forest**

Riparian forest is present along the Potomac River frontage and Horsepen Run. The riparian forest along the Potomac is generally more mature and homogenous, whereas the Horsepen Run riparian forest is more varied in age and condition. Floodplain forests are punctuated periodically by openings caused by the disturbances common to streamside floodplain habitats. Floodwaters and blow-downs due to shallow rooting depths due to groundwater are typical of floodplain riparian habitats. Various oaks (*Quercus* spp.), maples (*Acer* spp.), and hickories (*Carya* spp.) are the dominant overstory species, with sycamores and black walnuts (*Juglans nigra*) also present. Understory trees are typically comprised of smaller individual s of the canopy species with occasional large patches of paw-paw (*Asimina triloba*). Shrubs include the exotic invasives on-site listed earlier and spicebush (*Lindera benzoin*) in some locations. Woody vines can be common, especially in canopy gaps, and include the species listed previously as well as grape vines (*Vitis* spp.). The herbaceous layer is generally very dense and dominated by wild ryes (*Elymus* spp.), wingstem (*Verbesina alterniflora*), stinging nettle (*Urtica dioica*), manna grasses (*Glyceria* spp.) and the exotic invasive stilt grass (*Microstegium vimineum*).

## **Mature Wetland Forest**

Mature Wetland Forest is present in two large areas of the site, on the western and eastern borders. This forest is characterized by strong oak dominance, with pin oak, swamp white oak (*Quercus bicolor*), and willow oak (*Quercus phellos*) most dominant. White oak (*Quercus alba*), although not considered a hydrophytic species, is common along the outer edges and on small hummocks. Black gum (*Nyssa sylvatica*) is a common understory tree, common greenbrier (*Smilax rotundifolia*) is the dominant woody vine, and highbush blueberry (*Vaccinium corymbosum*) and winterberry (*Ilex verticillata*) are the dominant shrubs. The herbaceous layer is dominated by sedges with exotic invasive stilt grass in open edge areas. Overall exotic invasive species are very minimal in these mature forest areas, limited by the wetness of the soil and competition from a mature and robust native plant community.

## **Mature Upland Forest**

Mature Upland Forest is not as common as Mature Wetland Forest on this site, mostly present on the eastern border and along the edges and in larger non-wetland hummocks on the western border. White Oak (*Quercus alba*) is the dominant species, with red oak (*Quercus rubra*) and black oak (*Quercus velutina*) also present along with hickories (*Carya* spp.) and black gum. Understory species include serviceberry (*Amelanchier* sp.) and black haw (*Viburnum prunifolium*). Common greenbrier, Virginia Creeper (*Parthenocissus quinquefolia*) and grape vines (*Vitis* spp.) are the common woody vines, with partridgeberry (*Mitchella repens*) also present. Sedges dominate the herbaceous layer with exotic invasive stilt grass present in some areas. Overall exotic invasive plant species are minimal in these mature forest areas, limited by the deep leaf litter layer and the mature and robust native plant community.

## **WILDLIFE COMMUNITIES**

A detailed wildlife inventory or survey was beyond the scope of this study. However, the habitat types provided by the site can offer some generalizations as to wildlife usage of the site. The primary wildlife needs of food, water, and cover are provided for on this site for a wide variety of species, along with areas suitable for breeding and raising of offspring. Brief discussions of the major vertebrate wildlife types are provided below.

### **Amphibians and Reptiles**

Amphibians and reptiles, collectively referred to as herptiles, occupy a wide variety of habitats. Due to the variety of habitats present on-site, a wide variety of herptiles may be expected to occur, although they will be normally limited to the edges of the agricultural fields, ditches, and the natural areas on-site.

Amphibians, including salamanders, frogs, and toads, all require water for breeding and many species are highly water-dependent as adults. Therefore, the greatest amphibian

diversity and densities should be expected to occur in and around the streams, ponds, and wetland habitats on the site.

Reptiles, including turtles, snakes, and lizards, utilize more diverse habitats and are generally not as water-dependent as amphibians, although many species are semi-aquatic. The limited but diverse range of natural habitats on-site should support a wide variety of terrestrial and semi-aquatic reptiles.

Herptile sightings were limited during this assessment, but no intensive surveys were conducted and the season of the survey was early. Confirmed sightings included Snapping Turtle (*Chelydra serpentina*), Painted Turtle (*Chrysemys picta*), Box turtle (*Terrapene carolina*), Northern Water Snake (*Nerodia sipedon*), and Black Rat Snake (*Elaphe obsoleta*).

## **Birds**

Birds utilize an extremely wide range of habitats, and species assemblages can vary greatly over time, due to migratory behavior and their inherent mobility. The variety of habitats on this site provide food, cover, and breeding habitat suitable for a number of generalist bird species. The adjacent Potomac River provides a significant habitat feature to draw various waterfowl and wading bird species. Open grassland habitats are disappearing as the site matures into forest, so grassland and edge species should decline over time.

## **Mammals**

On-site habitat is suitable for a number of mammal species common to the area. Common mammals such as white-tailed deer (*Odocoileus virginianus*), red foxes (*Vulpes vulpes*), groundhogs (*Marmota monax*), cottontail rabbits (*Sylvilagus floridanus*), and eastern gray squirrels (*Sciurus carolinensis*) were all observed on site. Although small mammals such as various species of small rodents, shrews, and moles are likely to be present throughout the site, none were captured to allow for specific identification. Various species of bats are likely to occur on-site, although their occurrence may be temporary and change with the occurrence of insect prey and also with the season.

## **ECOLOGICAL THREATS**

There are a number of ecological threats that are limiting the ecological potential of the Horsepen Run Preserve. Some of these threats are external to the site and some are internal. The threats discussed below are some of the most obvious but is not an exhaustive listing. Universal threats such as climate change are not discussed, but may have noticeable effects on the flora and fauna of the site over time.



## **Land Use and Development Patterns**

Loudoun County is under tremendous development pressures as a result of its close proximity to the growing Washington, DC metropolitan area. Luckily this site is protected as a natural area and surrounding areas have been generally developed to their maximum potential. The eastern edge is protected as Algonkian Regional Park.

The greatest impacts to the site from surrounding development patterns are associated with stormwater runoff. Large scale watershed changes in the vast Potomac River basin could have impacts on Potomac River water quality and flooding. More likely to be noticeable would be development and land use changes in the Horsepen Run watershed, which could negatively impact water quality and increase stormwater flows into Horsepen Run. Hopefully current stormwater management regulations will mitigate any impacts from any local development.

## **Deer Overpopulation**

Although deer are native to the area and are valuable elements of the outdoor experience, their overpopulation in this area is well documented. This overpopulation has led to wholesale changes in the structure of plant communities and the future path of succession in local forests. There is ample field evidence that the local deer population is exceeding the carrying capacity of the Horsepen Run Preserve, and the effects on native plant diversity and community structure are especially apparent in the mature forests on-site.

## **Feral Cats and Dogs**

Feral cats and dogs are essentially exotic animal pests that can have significant effects on local wildlife populations, as well as pose health risks for domestic pets and humans. Feral cats and dogs were not observed on-site, but may also be problematic if they exist in the area.

## **Exotic Invasive Plant Species**

Exotic invasive plant species are a significant threat to the native biodiversity and ecological integrity of the site. Next to outright habitat destruction, exotic invasive species are the most prevalent impact to native biodiversity and habitat quality. Although many of these plant species are capable of invading undisturbed natural habitats, they are usually symptomatic of large and small scale disturbances. The long-term agricultural management of this site has resulted in the establishment of many exotic invasive species, and ongoing disturbance patterns, including anthropogenic disturbances and deer activity, continue to contribute to their success on-site.

## **Disease and Decline**

Although no apparent large scale disease or decline issues were noted during the course of this assessment, there always remains the possibility that future problems will develop

in one or more habitats or life forms present on-site. Past plant disease epidemics such as the chestnut blight of the early twentieth century resulted in wholesale plant community changes. Potential future threats to the site include various plant diseases such as *Phytophthora* fungal infections and dogwood anthracnose, insect infestations such as gypsy moth and ash borers, and wildlife diseases such as chronic wasting disease in whitetailed deer. Oak decline is another phenomenon that is attributable to a variety of environmental and biological factors that may be related to overall ecological conditions.

### **Over-utilization**

Although the Countryside Proprietary is currently operating with a minimal impact on the site, it is always possible that future expansion could overwhelm the carrying capacity of the land and negatively impact natural systems. The current concentration of recreational activity on the gravel access road has limited overall impacts to an appropriate feature that can handle the exerted pressures. Some of the side trails that weave throughout the site do exhibit signs of over-use and poor placement. A comprehensive trail maintenance system should be put into place with proper training for trail maintenance volunteers

## **CONSERVATION PRIORITIES**

This section will summarize the current state of knowledge in regard to existing conservation priorities on this site. These are existing features on or adjacent to the site with high conservation value and regulatory implications. Included in this discussion are rare, threatened, and endangered (RTE) species and communities, aquatic and wetland resources, forest conservation, and old fields and open space. Proposed management and restoration options to improve the ecological value of the site are discussed in the following section.

This site is generally utilized on a moderate level for passive recreation. While use levels are not very intensive, there are some impacts related to this use. This site is not an off limits preserve, and accommodations must be made for reasonable access and use. Care must be taken to ensure that the resultant impacts are as minimal as possible.

### **RTE Species and Communities**

The Virginia Department of Conservation & Recreation (DCR) website was consulted which has maps available online showing locations of monitored species. No locations were observed in the vicinity of the site on the maps showing the locations of listed plants, animals, and natural communities.

Although it is unlikely that any RTE resources will be found on the site, the potential for their occurrence should not be discounted entirely. Many species are listed due to under-reporting, especially if they are small or difficult to identify. Future detailed studies to inventory all species occurring on the site may result in unexpected discoveries that may have heritage value. Any future discoveries of RTE species should be reported to DCR immediately and protected from any future disturbance.

## **Waters and Wetlands**

There are several waters and wetlands on the site that deserve targeted conservation efforts. These resources are regulated by federal and state regulations and cannot be disturbed without appropriate permits and authorization from the Corps of Engineers and Virginia DEQ. The location of these resources in the floodplain of the Potomac River floodplain adds to their ecological value as part of a larger system.

The disturbance regime associated with each of the waters and wetlands present on this site are quite varied. The types of disturbance also vary from direct impacts such as channelization to indirect impacts such as changes in watershed hydrology due to historic landscape changes that initiate stream incision and lateral erosion.

The waters and wetlands on the site are unique habitats for the site and local wildlife, and also provide important watershed benefits to downstream waters and landscapes. While the Potomac River is quite stable along this reach, Horsepen Run and its tributaries have areas of local instability that could benefit from natural stream restoration practices. While this is not an immediate need, opportunities exist for future stream restoration projects. However, additional assessment and design work will be required along with appropriate regulatory authorizations before any such work could proceed. Grants and technical assistance may be available from governments and non-profit environmental groups for such work.

## **Forest Conservation and Forest Interior Dwelling Species**

Although the state of Virginia does not have a forest conservation law such as the neighboring state of Maryland, the conservation of the existing forest on-site should be a major conservation priority. Forest provides unique habitats for plant and wildlife species and also provides significant air and water quality functions in the landscape. The existing forests and developing forest lands provide a variety of valuable ecological functions that deserve protection. Large contiguous tracts of forest also provide valuable breeding areas for Forest Interior Dwelling Birds species, which require large forest tracts for successful nesting and brood rearing. In combination with the adjacent Algonkian Regional Park, this site can become a valuable FIDS habitat.

## **Meadow Habitat Conservation and Restoration**

While reforestation has been a strong trend in ecological restoration in recent years, not as much attention has been paid to conserving native meadow habitats. Grassland birds are experiencing even greater declines than Forest Interior Dwelling Species birds. While this site has significant patches of mature and maturing forest, with more developing in the pioneer forest patches, meadow habitat has nearly disappeared from this site. The preservation of strategically placed existing meadow patches and the restoration of new native grass and wildflower meadows will greatly increase site habitat diversity and plant and animal species diversity.

The mostly open meadow field between the gravel access road and the adjacent school athletic fields is a very nice example of a dry depauperate soil meadow, with a very interesting and attractive suite of species present. This field is deserving of dedicated management to preserve its unique plant community.

### **Exotic Invasive Species Control**

Exotic invasive plant species are probably the most pressing ecological threat on this site. The large numbers of species and the large number of large plants make this a daunting task, however, and one which would require significant investment in time and money.

It is recommended that habitat management stewards be recruited from the Countryside community to organize any such efforts along the lines of popular Weed Warrior programs in other locales. While the thought of eliminating all exotic species from this site is daunting and surely impractical, tackling smaller areas to gain experience and confidence can encourage volunteers to tackle larger and larger areas in time. Between targeted control efforts and natural processes, such as developing forest shading out exotic invasive shrubs such as autumn olive, significant gains can be made in controlling exotic invasive plant species on this site.

### **Trail System Development**

Trails can have both positive and negative ecological effects. Poorly placed and maintained trails can impact sensitive habitats and adversely affect the water quality of receiving waters. Properly placed and maintained trails can provide easy access for monitoring and restoration activities as well as providing recreational benefits. I have enclosed a trail map developed by Countryside residents that shows the current trail system.

The trail system currently existing on this site consists of the primary central access corridor – the gravel access road from Algonkian Parkway parking lot to the Potomac River picnic area, a straight gravel access road along a sewer line near the southeastern boundary, and a series of smaller single file pedestrian/bicycle trails that have been organically developed by site users, perhaps beginning as deer trails.

Many of the trails are less than ideally located, running thorough wetland areas where nearby uplands would suffice, running straight up slopes where angled approaches would be better, and running over exposed roots where other pathways would be less damaging to tree roots. There has also been concern over unauthorized trail creation, some of which created less than ideal trail routings.

If future restoration work is to proceed at a more intensive pace, then an improved trail system suitable for wheeled vehicles should be considered. Most large scale ecological restoration work utilizes traditional construction equipment, although usually smaller varieties with lower footprints to limit soil compaction. A well designed and properly

constructed perimeter off-road vehicle accessible trail system would provide easier access with minimal impact to most of the habitat management units on-site.

At some point a thorough assessment of the pedestrian trail system should be completed, especially if mountain bikers increase their usage, as appears to be the case recently. Many of the existing trails are compatible with current levels of use, but others should be revised and/or improved and the worst should be abandoned and restored and replaced by new trail segments.

## **PART II – HABITAT MANAGEMENT UNIT DESCRIPTIONS**

There are a variety of ways that this large site could be divided into separate habitat units. The scheme presented below was considered to be an appropriate level of detail for this project, with a special emphasis on the highly utilized central corridor surrounding the gravel access road. The designated habitats are mapped on the Habitat Management Zone Map provided in Appendix C.

### **POTOMAC RIVER**

The Potomac River itself is well beyond the scope of management by an HOA with ownership of a small portion of river frontage. The State of Maryland controls the main body of the Potomac River, with a recent Supreme Court case (*Virginia v. Maryland*, 124 S.Ct. 598) reaffirming the boundary between Maryland and Virginia at the low water mark on the Virginia side. Maryland's Van Deventer Island lies in the Potomac River between the site and the Maryland mainland.

Large flood events associated with the Potomac River have tremendous potential to do damage to this site but there is little that can be done to prevent this. The scale of the watershed in relation to the relatively small Horsepen Run Preserve is significant and there are no practical solutions to large scale flooding issues on this site.

The Potomac River floodplain is the most vulnerable area on-site, although large scale Potomac River flooding can and does also back up floodwaters into Horsepen Run, causing more significant flooding problems upstream along the Horsepen Run riparian corridor.

The river banks of the Potomac River are in very good condition along the Horsepen Run Preserve northern boundary. River bank slopes are not severe and soils are generally cohesive and not easily eroded. River bank vegetation is varied, with large riparian trees supplemented by smaller trees, shrubs, woody vines, and a generally dense herbaceous layer on the river bank slopes. Occasional large woody debris jams are present along the water's edge but are generally not problematic and provide valuable fish and wildlife

habitat, especially for basking turtles, a variety of which are common along this stretch of the Potomac River.

No management or restoration activities are deemed necessary at this time. Occasional monitoring of the river bank is recommended to catch problems before they become severe. Localized riverbank instability from tree falls or extensive debris jams are the most likely causes for concern, but should not be significant threats with the intact floodplain forest present to provide buffering and regenerative potential.

## **HORSEPEN RUN**

Horsepen Run is the primary internal aquatic feature on this site. Compared to the Potomac River, Horsepen Run is a much smaller stream with an urbanizing watershed and concurrent streambank instability problems that could benefit from stream restoration efforts.

Much of the instability that is visible in various reaches of Horsepen Run on the site is due to what is often referred to as “Urban Stream Syndrome”. All streams reach an equilibrium over time between their channel dimensions and the quantities of water and sediment that they convey. As watersheds develop and forests are replaced with cleared land and most significantly impervious surfaces, storm flows increase significantly. This usually results in receiving streams “blowing out” as their channel dimensions developed over time with a forested watershed with less stormwater must expand to convey the new much greater and flashier storm flows.

Little can be done in regard to watershed issues on this site – the bulk of the subject site is in forest and other natural cover and the impervious surfaces are concentrated in the upper watershed areas beyond this site. Targeted stormwater management improvements at some point in the future on a larger scale could provide long term benefits, but such funding is not likely in the short term.

Over time, stream channels affected by urbanizing watersheds reach a new equilibrium with their new hydrologic parameters. The resultant channels are usually much deeper and wider than the previous channel forms, and the process of channel evolution can be a messy and unsightly process, with eroding streambeds and streambanks.

Horsepen Run and its tributaries that flow through the Horsepen Run Preserve exhibit both stable and unstable reaches. A more detailed stream assessment would be required to develop specific recommendations, but several generalities can be stated at this point, followed by a reach by reach discussion.

Generally the extent of stream incision, or erosion of the substrate appears to have reached its current limit. The on-site streams appear to be in the widening phase of stream adjustment whereby the channel widens as streambanks are eroded with the streambed staying relatively stable due to bedrock or other more erosion resistant

substrates being exposed. Some reaches remain relatively un-eroded in regard to the streambed due to bedrock and larger rock substrates and are exhibiting varying degrees of channel widening. Some streambanks have been eroded but have developed a stable bank angle and are rapidly stabilizing with vegetation, suggesting that stream widening is nearing its maximum and a new stream channel dimension is being stabilized in place.

Horsepen Run does experience high levels of large woody debris and trash that have caused significant damaging debris dams in several locations. While these debris dams often provide valuable fish and wildlife habitat, those observed are causing more damage than good. These debris dams should be removed, woody debris carried out of the immediate floodplain and placed in nearby forest, and manmade trash disposed of properly.

The tributaries to Horsepen Run are in generally good condition in their upper reaches, with relatively low streambank heights and gravel substrates. The best example of a stable reach in this system is the eastern fork of the primary tributary where the stream flows through a wetland forest. The tributary in that reach has very stable low banks allowing for floodwaters to spill into the adjacent floodplain wetlands, which is ideal. The lower reaches of the combined tributary are increasingly incised as the tributary cut down to reach the lowering base level of Horsepen Run. This reach is less stable but is becoming more stable as the channel evolution process nears its end point.

Horsepen Run proper is roughly divided into two halves above and below the confluence of the primary tributary. Each half of Horsepen Run is comprised of roughly three channel reaches with distinct features that of course vary somewhat through each reach length. Each reach will be discussed separately with recommendations made for restoration potential.

The upper reach of the upper half begins at the southeastern edge of the property where Horsepen Run enters the site, and ends at the end of the meander below the sewer line crossing. This is a low-moderate gradient stream reach with a moderate-high sinuosity pattern and a substrate dominated by fines and gravels. The streambanks are generally moderate in height and well vegetated, with some bare areas eroded along the tighter outer meanders, and debris dams are common.

This reach is relatively stable and well adjusted. Although debris dam removal may be recommended in other reaches, in this reach the debris dams are not causing significant problems with their backwater flooding during flood events, and the retention of entrained debris and floodwaters may mitigate these concerns in downstream reaches. Of course a breach of large debris dams in this reach could send debris and floodwater downstream in a surge. The best course of action would be to monitor these debris dams and remove them if they become too large or too unstable. The crossing of the sewer line is well armored and stable.

The middle reach of the upper half is a straightened channelized reach that flows parallel to the sewer line and its gravel access road. This reach is very straight with moderate slope and moderate-high streambanks and a gravel substrate. This reach is largely open

with minimal shade and supports large patches of elodea, a submerged aquatic plant. While riparian woody vegetation is limited, which is desired because of the stabilizing effects of deep woody root systems, this reach is surprisingly stable. The channelization process left the streambanks with a moderate bank angle that allowed herbaceous vegetation to colonize and stabilize the banks. With no meanders, the typical outer meander velocity vectors that cause outer streambank erosion are not present.

Full stream restoration of Horsepen Run would probably re-establish a typical meander pattern in this reach. However, the reach is generally stable and functioning as well as can be expected. Reinforcement of woody vegetation along this reach would help with long term stability and provide shade which would moderate in-stream temperatures and increase dissolved oxygen levels.

The lower reach of the upper half begins at the lower end of the straight channelized reach and ends at the juncture of the primary tributary. This is the most unstable stream reach on the site. Storm flows from the straight channelized reach enter this lower upper half reach at a higher velocity since there is no velocity dissipation in the channelized reach without meanders or obvious streambed undulations in that reach. The lower reach of the upper half retains a moderate slope and increases streambank heights so that floodwaters are not able to leave the channel except in the largest floods. The sinuosity pattern is minimal with well-defined riffle and pool features. Streambanks are generally unstable and lacking in woody vegetation with herbaceous vegetation varying depending on bank angle and stability.

Stream restoration opportunities are ample in this reach, but the high streambank heights will require significant efforts involving machinery to employ effective streambank stabilization techniques for these instability issues. Laying back the streambanks to a more stable angle could be effective but would require significant excavation and placement and stabilization of excavated soil. Boulder revetments and other in-stream structures could be suitable as well but would also require significant work and funds. If funds are not easily obtained to do such work, some additional stability could be obtained by enhancing streamside woody vegetation. Although this stream reach is the most in need of restoration efforts, it is not easily visible and the streambank instability problems are not threatening important features of the site.

The upper reach of the lower half begins at the juncture of the primary tributary and extends downstream along the gravel access road to the point where the stream veers eastward away from the gravel access road. The stream becomes wider and deeper with the confluence of the tributary. This reach exhibits a moderate slope with moderate streambank heights. Floodplain access is much improved over the upstream reach with the lower streambank heights. The substrate is much more varied, with fines and gravels in well-defined pools and small cobbles and gravels in riffles. Debris dams are somewhat common in this reach with some channel braiding where larger debris dams have lodged. This is expected based on the high streambanks and relatively straight non-sinuuous channel forms upstream with limited streamside woody vegetation – woody debris carried in floodwaters would tend to be carried through those upper stream reaches and



lodge in the more sinuous upper reach of the lower half where lower streambank heights and large riparian trees provide more opportunities for debris lodging.

Opportunities for streambank stabilization and other stream restoration and enhancements are also prevalent in this reach. Although bank heights are reduced, complications are introduced with the lower streambanks being well stocked with large riparian trees. Care would need to be taken to install any restoration features while minimizing impacts to streamside trees. The most pressing need in this reach is frequent clearing of debris dams. This reach of the stream floods often, causing erosion and access problems with the adjacent gravel access road. Attempting to wide or deepen this reach to carry floodwaters through is not advisable and would be a huge undertaking. The best solution is to simply ensure that floodwaters flow through this reach as unimpeded as possible, which involves keeping debris dams to a minimum and possibly trimming leaning streamside trees if they impede floodwater flow. While such activities should be allowed under channel maintenance provisions, gaining express approval from the regulatory agencies is recommended.

The middle reach of the lower half begins at the turn away from the gravel road and extends downstream to the last shallow riffle near the trail crossing of Horsepen Run. This reach is perhaps the most stable reach of Horsepen Run on-site. This reach is very unentrenched, with a moderate slope and sinuosity pattern but low streambank heights in most areas. The lack of incision is due to a substrate of erosion resistant larger cobbles with some boulder and bedrock outcrops as well. The streambanks are well stabilized with a variety of riparian vegetation. The lower section of this reach is moderately entrenched with a steep bank on the right side (looking downstream), but that reach is relatively stable and low entrenchment again below that segment at the final steep riffle.

There are a few areas of localized instability, primarily along the moderately entrenched reach, but there is no real need for any major stream restoration efforts in this reach. Some additional plantings on the steeper streambanks could have some benefit. Debris dams do not appear to be common recently, but could develop and should be removed to prevent backwater flooding into the upstream reach and onto the gravel access road.

The lower reach of the lower half extends from the lowest shallow riffle all the way to the end of Horsepen Run at its confluence with the Potomac River. This is a low gradient reach with a very open sinuous meander pattern and a substrate dominated by fines and small gravels. Most of this reach is affected by backwater effects from water levels in the Potomac River, and the streambed features basically consist of one long continuous pool with noticeable bed undulations in a typical riffle-pool sequence. Streambanks are generally stable, although a very high partially raw streambank exists on the right side where Horsepen Run cuts through the upper terrace edge where it meets the lower Potomac floodplain.

There is little opportunity for significant stream restoration in this reach, and debris dams are infrequent, although a large oak is now in the meander pool at the base of the tall streambank. Most woody debris should flush through this reach and into the Potomac,

and any debris dams that form should not back floodwaters up too far to the point where they can impact man made features. The steep partially raw slope is unstable but attempting to stabilize it would be a significant undertaking with limited opportunity for full success. Natural processes could be enhanced with additional seeding and/or plantings.

## **CENTRAL CORRIDOR**

The Central Corridor consists of a narrow corridor of varying width that surrounds a gravel access road that links the Algonkian Parkway parking lot on the south end to the picnic area at the edge of the Potomac River on the north end.

This habitat management unit was designed to include the most highly utilized portions of the site. These areas include the parking lot, maintenance depot, basketball court and surrounding maintained lawn areas adjacent to Algonkian Parkway, the long gravel access road and adjacent mowed areas and the forested picnic area at the Potomac River edge. These areas have been and will continue to be the most highly utilized areas of the site by Countryside residents. The Central Corridor was expanded near the end of the adjacent Algonkian Elementary School to include an old field undergoing forest succession that is most meadow like and easily restored to an open state if desired.

The Central Corridor includes the upper reaches of the Horsepen Run Tributaries. These streams are in general good conditions, although some restoration is possible on shorter localized unstable streambanks. There are two culvert crossings of the tributaries comprised of multiple culverts each. These crossings are performing as designed and do not appear to be problematic.

The gravel access road is in general good conditions throughout its length. However, there are localized erosion problems at several drainageway crossings in the central portion where intermittent streams flow towards Horsepen Run, which is very close to the gravel access road. Gravel is lost in these sections when Horsepen Run floodwaters sweep onto the road. Rip rap edging has been added in these location which may help somewhat, but raising the road surface with larger culverts underneath is probably the best long term solution.

The park-like setting of the Potomac River picnic area is very aesthetically pleasing and with moderate usage should not pose a threat to the trees and the river. The greatest threat to this area is Potomac River flooding, which is outside the scope of influence of Horsepen Run Preserve management. Post-flooding clean up and restoration of the road and picnic tables is the only feasible response.

The Central Corridor includes two small patches of forest in the narrow peninsula of the Horsepen Run Preserve site that extends to Algonkian Parkway from the larger body of the site. Both forest patches are moderately aged deciduous forest patches, with maturing riparian forest to the west and maturing wetland forest to the east. Exotic invasive

species are heavy along both edges and are pervasive in the western patch. The wetland forest is relatively open in the center and generally free of exotic invasives.

These forest patches provide an excellent opportunity for initial exotic invasive species removal efforts. Their relatively small size and discrete boundaries provide an area that is small enough to achieve complete or near complete exotic invasive control with reasonable effort. These forest patches also act as a gateway into the larger preserve and can provide a very visible example of restoration efforts to be later expanded elsewhere on-site. The removal of exotic invasives on the east side especially will open up desirable views into the interesting wet forest interior and the Horsepen Run tributary, which is in exceptionally good condition in that reach.

The large field included in the Central Corridor at the end of the Algonkian Elementary School field extension is the best example of native meadow habitat on the site, but one which is rapidly being lost to old field succession. Red cedars, brambles, and pin oaks are the primary native successional species, along with large numbers of autumn olive, an exotic invasive. An interesting variety of native grasses and wildflowers exist in the remaining open areas, with several emergent wetlands also present.

The Horsepen Run Preserve has extensive areas of forest of all levels of maturity. Meadow habitat is minimal and provides much desired habitat diversity. The location of this field next to the already maintained Central Corridor and its high level of native meadow species makes it the logical choice for the primary meadow habitat on-site. While native meadow vegetation persists, it is rapidly becoming shaded out by the encroaching trees and shrubs. It is recommended that the trees and shrubs be cut down as soon as possible in this field. There are several options for such clearing – the trees and shrubs could be shredded in place with a shredder, or they could be cut down individually and either removed, shredded through a chipper, or placed into brush piles. If desired, a screen of red cedars could be left along the boundary of the school athletic fields. After clearing the native meadow species should re-establish themselves, but some monitoring should be implemented to gauge revegetation progress and look for exotic invasives. After tree and shrub removal a semi-annual (one every 2-3 years) mowing program should be implemented to provide long-term arrest of the old field forest successional processes.

The gravel access road should be maintained with a mowed border to prevent encroachment of vegetation into the main travel pathway. However, the wider maintained lawn areas would be excellent areas for meadow restoration. These areas would soon revert to forest if unmowed, and with the high levels of exotic invasive plant species along the edges, it is highly likely that any unmaintained areas would quickly be dominated by exotic invasive species.

Conversion of these odd areas to more diverse native meadows would involve several herbicide treatments to kill existing vegetation and control of the re-emerging weedy seedbank, followed by seeding and maintenance mowings in the first year of establishment to control annual weeds while slower growing perennial native grasses and

wildflowers establish themselves. Long term maintenance would consist of annual spring mowings and vigilance for exotic plant species invasion.

## **NORTHWEST PIONEER FOREST**

The Northwest Pioneer Forest is an old field that has been rapidly reverting to forest through natural forest successional processes. While small patches of meadow vegetation remain scattered throughout, most of this former field is now dominated by scrub-shrub or young forest vegetation. The exotic invasive shrub autumn olive is especially prevalent and forms thick patches that are nearly impenetrable. Red cedars are also very common and also form dense thickets. Trees are establishing to varying degrees throughout the former field, with black locust, pin oak, and sycamore most common.

A low area dominated by red maple wetland forest is located on the north-central portion of this area. This is a natural low point in this former field and drainage ditches were constructed to pull water to this area from the surrounding field areas. A deeply incised intermittent stream channel/ditch drains this area to the Potomac River floodplain below to the north. The red maple forest is relatively young and densely stocked, with little woody plant diversity and a moderately dense herbaceous layer dominated by sedges.

Several smaller wetland depressions exist within the larger scrub-shrub/pioneer forest matrix. These depressions are dominated by emergent herbaceous vegetation, with red maples invading along the edges. These wetlands will evolve into red maple wetland forests similar to the one described above in time.

This habitat management unit is one in the throes of ecological transition. There are transitions occurring between hydrologic conditions from upland to wetland, and transitions in seral stage from open field to forest. Such transitions can often be problematic, especially when exotic invasive species are prevalent, as they are in this instance.

The size and extent of the autumn olive and other exotic invasive species problems are probably beyond the scope of control at this time. The level of effort involved to remove this size and quantity of exotic shrubs would be substantial. As trees become more established and throw more shade, the autumn olive will begin to fade away. The best chance for making some progress against exotic invasives would be along the boundary with the Central Corridor where control efforts would be easier to stage and the benefits would be more apparent. This would be especially useful if meadow restoration efforts were to be implemented along the Central Corridor to limit the opportunity for exotic invasive seed introductions. While the dense thickets are nearly impenetrable for humans, they are very useful for wildlife habitat, and while autumn olive is a problematic exotic invasive, it does provide some benefits in terms of cover and food through its berries.

The wetland habitats provide the greatest plant diversity, especially the open wetland depressions. To maximize site biodiversity these depressions should be maintained in their current open state. Red maples and other invading trees should be cut back to limit encroachment. Although exotic invasives are not problematic at this time, monitoring should be implemented to ensure that remains so.

Red maples can be detrimental to wetlands by limiting biodiversity and consuming high levels of water from wetland habitats. Should another project be desired, thinning of red maples in the red maple wetland forest would be a beneficial restoration project. The herbaceous layer of this wetland area is dominated by a moderately dense cover of a wide variety of sedges. Increasing shade and competition from the dense red maples will eventually reduce this desirable sedge cover significantly, and its preservation would be desirable.

## **NORTHEAST PIONEER FOREST**

The Northeast Pioneer Forest is very similar to the Northwestern Pioneer Forest, but is separated by a relatively wide segment of the Horsepen Run Riparian Corridor. This is another former agricultural field that has been reverting to scrub-shrub and pioneer forest habitat. Likewise, a central red maple wetland forest exists in the center of this area.

This area is somewhat different from the Northwestern Pioneer Forest in that its northern portion has evolved past the scrub-shrub stage to full-fledged pioneer forest. Box elder and sycamore have established a nearly continuous low canopy of high density small trees with autumn olive relegated to a declining understory. Several wetland depressions exist in this portion of this area, the eastern depression nearly entirely covered by young forest, and the western depression still supporting a diverse emergent wetland community.

The southern portion is similar to the Northwestern Pioneer Forest with a mixture of small deciduous trees interspersed with autumn olive and red cedar. The southern portion of this half is a savannah-type habitat with thickets interspersed with meadow patches.

The central red maple wetland forest is very similar to the red maple wetland forest in the Northwestern Pioneer Forest area, with densely stocked young red maples over a diverse and moderately dense herbaceous cover dominated by various sedges. This wetland area drains to Horsepen Run through a long straight ditch, with other ditches leading to this area that once drained the adjacent agricultural fields.

Management recommendations for this habitat management unit are similar to those provided for the Northwestern Pioneer Forest. Large scale exotic removal is probably not realistic, but targeted control efforts adjacent to higher quality habitats are encouraged. The sole remaining open wetland depression should be cleared of trees and shrubs along its edge to maintain its diverse shade intolerant plant community. The red maples forest

could also benefit from the thinning of red maples to maintain its diverse sedge community.

Natural reforestation successional processes have largely controlled the autumn olive in the northern portion of this area, providing an example of how sites can heal themselves. Encouraging tree growth in other areas dominated by autumn olive can achieve similar results, although patience is required. The southern savannah portion of this area has potential for preserving open meadow habitats in open areas, although this would require substantial control of adjacent woody vegetation to be successful long-term. If meadow habitat is not desired in this area then forest succession should be encouraged.

### **HORSEPEN RUN RIPARIAN CORRIDOR**

The Horsepen Run Riparian Corridor is the most diverse habitat management unit created, but has Horsepen Run as an important unifying element. This corridor includes the areas surrounding both Horsepen Run and the lower portion of its primary tributary on site. The Horsepen Run Riparian Corridor encompasses a relatively broad band along the southeastern edge of the site, then follows Horsepen Run south towards its confluence with the Potomac River through the central portion of the site, immediately to the east of the Central Corridor.

Forest dominates this habitat management unit, with common open areas along Horsepen Run. Forest types range from small areas of mature forest at the southeast corner to maturing forest along the southern property boundary to mature riparian forest in the lower reaches of the Horsepen Run floodplain. Exotic invasive species generally vary with the maturity of the forest, with pioneer and maturing forests most impacted by exotic invasives. Floodplain forests tend to be subject to greater disturbances and increased wildlife usage and are more heavily impacted by exotic invasives than similarly aged upland forest, and this is evident here.

The open areas along Horsepen Run are dominated by various grasses, wingstem, and brambles. The most troublesome species observed in these areas is Asiatic tearthumb, which is a problematic herbaceous vine that recently invaded Virginia. If there is one incipient exotic invasive problem on this site worthy of attention it is this species. As an annual it can be controlled over time if it is kept from producing seeds. Herbicide treatments can be difficult due to its very waxy leaf surfaces, so hand pulling in its early stages is often the best control method. While these open areas do provide some habitat variety, they are contributing to localized streambank instability due to a lack of deep rooted woody plants along these reaches of Horsepen Run. Encouraging reforestation of these areas is probably the best option.

The primary man-made feature in this corridor is a sewer line with access road that roughly parallels the southern site boundary. Sewer odors are prevalent but no evidence of recent sewer overflows was evident. The sewer line access road was constructed of large sorted stone which has largely been depressed into the substrate and overwhelmed

by vegetation and soil and water flows. Large pockets of standing water and soft mud on the surface limit its usefulness as a recreational corridor. The re-establishment of this trail through the addition of another layer of stone and/or finer gravels along with the installation of culverts could restore this to a regularly passable recreational corridor. This access road could also provide access for future restoration efforts as well as make access for sewer line maintenance more efficient and less damaging.

Two large old ponds exist between the sewer line access road and the southern property boundary. While these were once shallow open water ponds, they are now largely filled up with sediments and hydrophytic vegetation, with only a few small very shallow open water depressions remaining. The full restoration of these ponds to open water would require substantial levels of effort and funds, and require a suitable dredge spoil area to receive excavated sediments. While this may be impractical, smaller excavations to provide some open water would be beneficial, with sidecasting of sediments a possibility. It may be possible to partner with Loudoun Water to explore the restoration possibilities involving the access road and the ponds.

The Horsepen Run Riparian Corridor is second only to the Central Corridor in terms of recreational use by Countryside residents. Many of the smaller trails run through this area, in addition to the sewer line access road. One of the biggest impediments to full access to the eastern half of the Horsepen Run Preserve is Horsepen Run itself, which can be difficult to cross, especially during higher spring flows and after storms. Countryside has been exploring bridge possibilities and this is recommended. Any such bridge should be wide and strong enough to accommodate smaller wheeled vehicles such as four wheelers and small loaders and excavators for future work projects if needed.

## **POTOMAC RIVER RIPARIAN FOREST**

The Potomac River Riparian Forest consists of a band of mature riparian forest extending along the Potomac River. While this habitat management unit has been divided into western and eastern portions, there is little difference between the two. The Central Corridor and Horsepen Run Riparian Corridor habitat management units were extended all the way to the Potomac River even though their lower portions fall within the Potomac River floodplain. This compartmentalization could have been justifiably reversed to keep the Potomac River Riparian Forest intact, but an emphasis on the human high-usage component of the Central Corridor was deemed important for the understanding of residents. With the extension of the Central Corridor to the Potomac River, it was logical to extend the Horsepen Run Riparian Corridor to the Potomac River as well. Keep in mind that the lower portion of those two habitat management units are equally part of the Potomac River Riparian Forest habitat management unit, which actually exerts more influence on these other units.

There are four linear sub-communities that parallel the Potomac River within this wider corridor. A narrow band of steep riverbank exists immediately adjacent to the Potomac River. The widest sub-community is a relatively wide floodplain terrace that supports a

typical Potomac River floodplain forest. A typical large floodplain slough exists where a linear depression is formed at the base of the adjacent terrace slopes, with the southernmost sub-community being a forested steep slope leading up to the upper terrace.

The steep riverbank is very stable and nearly completely vegetated due to its relatively shallow slope. The floodplain forest is dominated by very large trees with common canopy gaps and smaller trees, typical of large river floodplain forests. Exotic invasive species are minimal due to the maturity of the forest and a diverse and vigorous native plant community.

A floodplain slough is a typical feature in larger river floodplains. As rivers overtop their banks during floods, sediments are often deposited as the water drops its sediment load upon entering the floodplain, where water depths and velocities are slower than in the river itself. This forms a natural levee where the floodplain elevation is higher at the river bank than it is further inland on the floodplain. The lowest elevation on most large river floodplains is near the outer edge where adjacent slopes often meet the floodplain. Overland flow from adjacent slopes and shallow groundwater often accumulate in these linear depressions, forming wetland known as floodplain sloughs. A series of floodplain sloughs exist on this site, separated by narrow upland intrusions and/or occasional drainageways leading to the river itself. The floodplain sloughs along this reach of the Potomac are not extraordinary but are valuable wetland habitats that support a variety of wetland plants and wildlife.

The slope forest leading up to the pioneer forests are rather mature and dominated by oaks with dense patches of paw paw in the understory. Exotic invasives have established in some areas but are not problematic overall.

While the upper areas of this site were manipulated extensively in the past for agricultural uses, the Potomac River Riparian Forest was left largely unmolested. There was certainly some forest harvesting and other isolated disturbances (such as the abandoned car on the western half of the floodplain) but this habitat management unit is largely self-sustaining due to the significant influence of the Potomac River and its floodplain ecosystem. Exotic invasive species are present but not in extreme quantities and human induced impacts are minimal. Monitoring should be ongoing and focused on exotic invasive species and riverbank conditions.

## **SOUTHWESTERN FOREST**

The Southwestern Forest is an excellent example of a mature deciduous wetland forest. While surely not bona fide old growth forest, this forest is developing mature forest characteristics, with well-spaced dominant large trees, excellent structural diversity with clearly defined subcanopy layers, self-healing canopy gaps, and a substantial duff layer and fallen timber on the ground. Exotic invasive species are very minimal and generally limited to the edges where sunlight penetration is heaviest.



This forest covers a large depression with significant wetlands coverage. However, not all of this area is jurisdictional wetland, with common upland hummocks of varying size scattered throughout its interior and a gradual rise up to non-wetland edges around its perimeter. While these upland inclusions and edges are not truly wetlands, they are moist and mesic in nature. The wettest wetlands are found in the center as expected and appear to remain saturated to the surface for most if not all of the year.

The biggest threat to this nicely self-contained forest ecosystem is very heavy deer browsing pressure. This forest has impressive extensive patches of winterberry, a deciduous shrubby holly, but they are almost entirely browsed to near ground level. Although deer control efforts may be difficult to implement in this suburban location, reducing the deer population would be the best management strategy possible to assist this habitat management unit. Although full deer fencing is probably impractical, establishing small fenced test plots would be very useful for demonstration and limited conservation purposes. If deer browse could be kept at bay until the shrubs reach a height over six feet a significant increase in wildlife habitat value for all species could be realized.

## **EASTERN FOREST**

The Eastern Forest is a mosaic of wetland and mesic upland mature forest located along the eastern edge of the site adjacent to Algonkian Regional Park. This is an oak dominated forest exhibiting many signs of developing old growth characteristics, similar to the Southwestern Forest - well-spaced dominant large trees, excellent structural diversity with clearly defined subcanopy layers, self-healing canopy gaps, and a substantial duff layer and fallen timber on the ground. Exotic invasive species are very minimal and generally limited to the edges where sunlight penetration is heaviest.

The most mature forest with the oldest dominant trees exists in a broad band along the eastern boundary. This forest patch extends westward between Horsepen Run and a well-defined northern edge with the forest being less mature with a denser understory in that portion.

This forest is also threatened by extensive deer browsing pressure, but does not appear to be impacted as significantly as the Southwestern Forest. Small deer exclosures are one potential management tool, along with spot removal of the relatively infrequent exotic invasives.

## **PART III – RECOMMENDED RESTORATION PROJECTS AND MAINTENANCE TASKS**

The proposed restoration and management tasks discussed below are far from exhaustive, but provide a variety of projects to begin a more comprehensive management program for this valuable site.

### **GRAVEL ACCESS ROAD**

The gravel access road that leads from the parking lot to the picnic area at the Potomac River is an important thoroughfare through the center of the site. This trail is actively utilized for recreational purposes and maintenance and is important to keep in good repair for those uses and to allow for emergency vehicle access if needed.

The gravel roadbed itself is in generally good condition, and the low slope of most of the roadway is central to its good condition and minimal erosion. The biggest problems occur at the stream crossings where large storm events can cause flooding and erosion.

The larger tributary crossings can flood by overwhelming the capacity of the culverts, which would usually not occur, but can easily occur should one or more culverts become clogged with flood debris. These culverts should be regularly checked for blockages and kept open.

A more difficult problem occurs at the smaller culverts draining to Horsepen Run where the larger stream flows parallel to the gravel access road. Flooding in these areas is not usually due to water flowing through the small channels flowing through the culverts, but it is a result of the floodwaters of Horsepen Run backing up into these areas. The best preventative measure to reduce this flooding is to keep that reach of Horsepen Run as free flowing as possible. Debris dams should be cleared on a regular basis to provide adequate floodwater conveyance. A more long term solution would be to raise the level of the gravel access road, but that would be a large and expensive undertaking.

### **HORSEPEN RUN BRIDGE**

Plans are underway to construct a small bridge over Horsepen Run to allow for easier access the eastern portion of the site. The site has been selected and is in a good location on a relatively straight reach of stream with generally stable banks. The bridge should be constructed at sufficient height to pass most floodwaters and resist snagging the common woody debris flowing through this system.

As with this entire reach of Horsepen Run that flows parallel to the gravel access road, the bridge span should be kept free of debris dams and inspected frequently. Larger flood flows could cause localized erosion and instability at the ends of any bridge structure, especially if debris lodges underneath the bridge.

## **TRAIL SYSTEM DEVELOPMENT**

Although trails can increase intrusions, act as avenues for predators and exotic invasives, and result in localized erosion and sedimentation, they also have valuable functions in allowing access and increasing environmental awareness. Trails also provide critical access for other restoration projects.

A system of trails has developed organically through the years through the actions of official and unofficial trail building efforts. While these trails have various levels of usage, they also have varying levels of condition and impacts to ecological features.

A complete inventory and assessment of trails was beyond the scope of this assessment, but a more thorough trail planning effort would be a valuable project in the near future. The construction of the Horsepen Run bridge will increase access to the eastern portion of the site. More formal trails exist on the adjacent Algonkian Regional Park property, and these trails could be linked to in a more formal manner.

The existing trails would benefit from more regular maintenance. Eroded areas are common, often resulting in exposed tree roots that are obvious trip hazards, as well as being an unhealthy situation for the trees with exposed roots. Scattered single exposed roots could be cut out, but larger expanses of exposed roots should be covered with soil, or be abandoned with nearby re-routing. Steep slope approaches should also be angled and utilize switchbacks when needed. When longer trail slopes cannot be avoided, water bars using landformed soil or logs should be installed to reduce the slope length and break up flow patterns.

A wider more engineered perimeter trail or narrow natural surface roadway along the perimeter of the site should be considered on a longer term schedule. Access of course would need to be controlled, but having a more accessible perimeter roadway would allow for much better access for restoration projects and policing of the site, as well as providing a more usable recreational trail circuit for Horespen Run Preserve users.

## **PICNIC AREA AND SHORELINE ACCESS**

The picnic area at the end of the gravel access road on the Potomac River is a very attractive setting that could be utilized more extensively. This area is subject to flooding during very large flood events, so permanent structures are not feasible. However, improvements could be made to the existing picnic tables and small shelter to accommodate larger groups or other community events.

The current wood chip ground cover is less than ideal, and decomposes very quickly in a floodplain setting. A gravel base installation would result in some initial impact but would be less erosive over time, and would still allow for infiltration and protection of tree roots. Any grading should be limited to reduce tree root damage to the greatest extent possible.

The current access to the waters edge of the Potomac River is less than ideal and is not easily accessible to small boaters (canoes and kayaks). The Potomac River along this reach is an ideal small watercraft recreational river and access could be improved for these users. Minimal grading could establish a more useable take-in/take-out point, but would require regulatory review before proceeding.

## **SEWER LINE ROADWAY RECONSTRUCTION**

The eastern length of the sewer line that traverses the Horsepen Run Preserve is in generally poor condition. The sewer line itself exists in a cleared right of way with a large stone access road surface over the sewer line. Sewer odors are commonly detected by those passing along this corridor, and apparent surface discharges were observed on one occasion during this assessment. There may be some need to raise the manholes to prevent overflows and/or flooding.

The roadway itself is in very poor repair. Past heavy machinery traffic has resulted in the rock base being splayed to the sides of the trail with deep ruts in the tire tracks. Culverts were installed in the past, but are generally too few and too far spaced to provide adequate drainage of upslope wetlands across the sewer line roadway. Wetland conditions have developed along most of the length of this section, with semi-permanent flooding in several sections.

This sewer line roadway is in an easement across the property of Countryside Proprietary, and as such Loudoun Water is responsible to maintain this easement in a manner that is Not damaging to the Horespen Run Preserve. In its present condition this sewer line roadway is in poor condition, inhibiting site drainage, and experiencing active erosion. The utility of this linear feature as a recreational and maintenance roadway for Countryside is significantly impaired by its poor condition.

Additional culverts should be installed to allow for better drainage of natural wetland flows across the sewer line roadway. Additional stone base is needed to fill the existing ruts and raise the roadway bed above the saturated surface. Smaller gravel should then be installed over top of the large stone sub-base to allow for easier passage on foot or bike.

## **STREAM RESTORATION**

As stated earlier in this report, the Potomac River is generally stable along this reach, with little to be done in terms of stream restoration. The smaller ephemeral and intermittent streams are also in relatively good condition. Horespen Run and its primary tributaries are generally in good condition but have some unstable reaches that could benefit from the application of natural stream channel restoration techniques.

Stream restoration requires careful assessment before proceeding to large scale restoration work. Some reaches of Horsepen Run could benefit from substantial stream restoration, but this would be a significant undertaking requiring a significant investment.

As a community non-profit organization, Countryside Proprietary may be eligible for grants that could offset most or all of this cost.

The stream reaches in need of restoration are generally large enough with serious problems that are beyond simple planting or handwork methods. Such work would require surveys and other assessment measures, detailed plans, and work requiring heavy equipment, boulders and logs in addition to plantings. This will require several years of work to go through the design and permitting phase should this avenue be pursued. Detailed stream restoration planning was beyond the scope of this assessment, but the general areas in need of attention have been identified in previous sections of this report.

On a smaller scale, efforts should be made to limit further damage. While large woody debris such as logs and branches can be valuable aquatic habitat features, they can accumulate into problematic debris dams, especially in high energy and somewhat incised stream systems such as Horsepen Run. Since the gravel access road that is adjacent to the central reach of Horsepen Run on-site floods often with damage to the gravel access road, debris dams should be cleared periodically to ensure unimpeded floodwater flows. Trees that fall across the stream in this reach should also be cleared to discourage snagging and debris dam buildup. Streamside trees that being to fall can be cut at the base to remove the straining top weight but leave the stabilizing root system in the streambank.

In select areas of minimal to moderate instability, supplemental seeding and plantings may add some stability. Appropriate native seed mixes and riparian plant species should be utilized.

## **WETLAND RESTORATION**

There are a wide variety of wetlands on this large site. The higher quality forested wetlands exist in mature forest stands and have no real restoration needs. Some of these wetlands have older drainage ditches that could possibly be plugged with soil fill periodically to increase localized hydrology, but such drainage blocking could have unintended consequences downstream as receiving areas become drier. Due to the age of these ditches and the plant communities that have evolved around them, it is probably best to leave these ditches as is.

Wetlands in younger forests are somewhat similar, with old drainage ditches important to several, especially the red maple forest patches within the larger Pioneer Forest habitat zones. The drainage ditches are supporting wetland conditions within the ditches themselves, which are facilitating the development of adjacent wetlands along their length. These ditches should also remain as is. There are several areas within these younger forest patches where minimal excavation could create additional vernal pool habitats that would increase hydrologic diversity and increase amphibian breeding opportunities.

The red maple forests have areas of dense herbaceous cover, predominantly of various sedges, that add important cover and food for wildlife. Red maple is known to be an aggressive colonizer of herbaceous wetlands, and the densities of red maple in many areas are obviously negatively impacting the diverse herbaceous flora beneath on the ground level. Red maple is also known to consume large quantities of water, and dense stands can lead to reductions in surface and soil water. Thinning the red maple stands in these areas will retain the forested wetland community but preserve the highest possible level of herbaceous diversity, leading to greater wildlife habitat value.

There are several small open wetlands within the Pioneer Forest patches that are quickly being lost to woody plant invasion, both from trees and exotic invasive shrubs. These areas contain high levels of herbaceous plant diversity and are unique features on this large mostly forested site. The invading trees and shrubs should be cut out of these open wetlands and cut back from the edges to retain the unique open wetlands that have developed in these locations.

## **EXOTIC INVASIVE PLANT SPECIES CONTROL**

There are very few areas on this large site that are not impacted to any degree by exotic invasive plant species. The mature forest areas are the least impacted, with wooded wetland areas usually least vulnerable to exotic invasion. By far the most impacted areas are the pioneer forest areas, which is typical in this region and many others, with old agricultural fields being very susceptible to exotic invasive plant species establishment.

On a site as large as the Horsepen Run Preserve it would be extremely challenging to expect to achieve adequate control of all species throughout the entire site. With a limited budget and manpower, a more targeted approach is more realistic, and a triage-type approach is warranted.

The mature forest areas are in generally good condition, largely because of their mature established plant community, insulating forest duff layer (decaying organic matter and more recent leaf fall), and wetland conditions (few wetland tolerant exotics in this region), and should be able to fend for themselves in the near future.

The large pioneer forest zones are very heavily dominated with some very aggressive exotic invasives such as autumn olive, multiflora rose, and Japanese honeysuckle. Attempting to achieve significant control of exotics throughout these large areas would be a massive undertaking requiring large machinery and significant manpower and funds. Follow up[ treatments would be even more extensive due to the well-developed seedbank from years of exotic seed production. At this point it is probably best to leave these areas to develop on their own. Native trees are establishing in these areas and over time their shade will eliminate most of the exotic shrubs that are currently dominant in many areas. The best management strategy in the short term with limited resources would be to free all trees from exotic competition by cutting away draping and/or strangling woody vines and large shrubs that may be very close and competitive with individual trees.

The areas of most concern should be the forest edges adjacent to the more mature forests and the exotic edges close to the existing and any proposed native meadow areas. These areas have the most potential to sow seed into high quality native dominated areas and should be the highest priority for exotic invasive plant species control efforts. Even if full control cannot be completed, cutting back of larger reproductive individuals should be a high priority in these areas to limit seed production. Once exotic free areas are establishing, the exotic free boundaries should be gradually pushed outward as resources allow.

## **MEADOW RESTORATION**

There are two primary types of meadow restoration opportunities available on this site. The first and most important is restoring and maintaining the existing meadow field between the gravel access road and the school athletic fields. Secondly, there are ample opportunities for creating new native meadow habitats in areas currently dominated by tall fescue and other exotic invasive species.

A remarkable small meadow currently exists on poor quality soils left from past grading operations. Poor soils often support diverse assemblages of uncommon native grasses and wildflowers, whereas old fields on more fertile soils can often become dominated by exotic invasives. The meadow in question supports a diverse assemblage of mostly native species, along with interesting patches of reindeer lichens on bare soil patches. The biggest threat to this meadow is the rapid encroachment of red cedars, deciduous trees, exotic invasive shrubs such as autumn olive and multiflora rose, and native invasive blackberry shrubs. Additionally, exotic invasive sericea lespedeza is invading this area along with exotic invasive arthraxon grass in wetter areas.

The large Horsepen Run Preserve site is dominated by forest habitat of varying ages, with all unmowed open areas experiencing varying levels of woody shrub and tree invasion. This existing meadow field is a high quality example of a depauperate soil meadow community and should be preserved in its meadow successional stage if at all possible. The trees and larger shrubs should be cut down and have their stumps treated with appropriate herbicides to prevent re-sprouting at any time of year. The field should then be mowed in the dormant season to cut back the remaining smaller trees and shrubs, followed by spot herbicide treatments to target the woody plants and exotic invasive species. This area should then be mowed once every year or two in the dormant season, preferably early spring to provide winter habitat.

There are a number of mowed areas along the Central Corridor that serve no discernable purpose that could be transformed into more attractive and ecologically valuable native grass and wildflower meadows. These areas are generally dominated by tall fescue and typical lawn weed species which would need to be controlled prior to seeding. Several herbicide treatments are generally recommended to not only kill the existing vegetation, but to also flush the ready to germinate weed seedbank and kill those plants as well so that they do not outcompete the seeded species from relatively expensive native seeds. The site preparation process should occur over a full growing season to get the best control, with seeding occurring in the following spring. Monthly mowings at a relatively

high cut height are then usually needed in the first growing season after seeding to keep remnant weeds in check and to ensure sunlight penetration to slow to mature native grasses and wildflowers.

## **DEER CONTROL**

Whittailed deer are native to Virginia, but their populations have increased exponentially in recent decades to the point where deer overpopulation has resulted in significant impacts to native plant communities. Over-browsing by deer can devastate native plant communities and significantly affect forest regeneration, and deer often do not prefer to browse on some of the most problematic exotic invasive plant species. Deer also contribute to the recent explosion of Lyme Disease carrying deer ticks which has resulted in increased human cases of Lyme Disease.

However, deer are difficult to control without resorting to lethal means, which may make suburban residents uncomfortable. Even thorough site control may provide fleeting since deer often move into depleted population zones from adjacent high density habitats, which are present to the east and west. While it may prove to be controversial, managed deer hunts should be considered to reduce the deer herd to a level more compatible with the supporting plant communities.

In the absence of deer control efforts, deer exclosures may be considered to illustrate the damaging effects of deer overpopulation. This is simply utilizing tall fences to exclude deer from certain areas. Doing this on the scale of the entire site is obviously not feasible.

## **NATIVE PLANT ARBORETUM**

A variety of habitats exist near the parking lot that provide an excellent opportunity to create a native plant arboretum with interpretive signage to increase resident and visitor knowledge of native plants. Species included for display can be those that are common throughout the larger Horespen Run Preserve area, as well as native plants that are appropriate for landscaping. While some of these species may already exist in this area, others may need to be transplanted from elsewhere on the site, or perhaps plants from nursery stock.

A variety of sign types are available, and sign types may vary depending on the type of plant being identified. Signage suitable for tacking onto trees could be distributed on larger trees along the gravel access road and other trails to increase educational opportunities. For shrubs and herbaceous species, tagging masses would be more appropriate than tagging individual plants since they may not be as long lived or as easily visible in all seasons as trees.

An interpretive map with additional information could be made available at a kiosk, with handouts also provided if desired. This is surely a project which would be an attractive grant opportunity for various funding organizations.