

INVENTORY AND CLASSIFICATION OF WETLANDS AT SHILOH NATIONAL MILITARY PARK, SHILOH, TENNESSEE

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INVENTORY AND CLASSIFICATION OF WETLANDS AT SHILOH NATIONAL MILITARY PARK, SHILOH, TENNESSEE

A Report Submitted to the National Park Service

By

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EXECUTIVE SUMMARY

During 2005, an inventory was conducted to collect baseline information on wetlands at Shiloh National Military Park (SHIL). A preliminary investigation based on National Wetland Inventory (NWI) maps indicated that only ten to fifteen wetlands were present at SHIL. This comprehensive inventory was conducted by systematically searching transects throughout the entire park and identifying each jurisdictional wetland.

Methods used to identify wetlands followed the definition and procedures outlined in the 1987 U. S. Army Corps of Engineers, Wetland Delineation Manual (WDM). At each wetland located, data were collected that characterized hydrology, soils, and dominant plant species, location, wetland type, and estimated size. The functions and potential values of the wetland also were recorded. Potential functions included surface water storage, groundwater discharge to streams, carbon/nutrient export, provision of wildlife habitat, and support of wetland plants. Potential values included cultural importance, research and scientific value, and economic value. Additionally, observations regarding the presence of exotic plant species and alterations or degradations to the wetland and the potential for restoration were recorded. Upon completion of the field investigation, eighty-one wetlands had been located and characterized. These wetlands totaled an estimated 376.63 acres.

Based on the Hydrogeomorphic (HGM) classification system, fifty-five were slope wetlands, twenty were depressions, four of the sites were riverine wetlands, and two were considered flats wetlands.

Based on the Cowardin classification system, seventy-three of the wetlands were palustrine, forested wetlands dominated by deciduous trees (PFO1). Of these, fifty-one were seasonally flooded (PFO1C), eighteen were temporarily flooded (PFO1A), and four were

seasonally flooded/saturated (PFO1E). Non-forested wetlands included one wetland having persistent vegetation that was seasonally flooded and in some portions semi-permanently flooded (PSS1E/F) and seven palustrine emergent wetlands having persistent vegetation (PEM1). Two of these were temporarily flooded (PEM1A), three were seasonally flooded (PEM1C), and two were seasonally flooded/saturated.

One wetland of particular interest is the bottomland hardwood complex associated with Owl Creek. It is approximately 315 acres in size and likely supports a great variety of species and habitat types. Including this area, the average size of wetlands in the park is 4.65 acres. Excluding this area, the average wetland size is approximately 0.76 acres.

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INTRODUCTION and BACKGROUND

Wetlands are defined as "Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." (U. S. Army Corps of Engineers 1987). Wetlands are characterized by the presence of "hydric" soils and are dominated by "hydrophytes" that have adaptations that enable them to persist where "upland" plants cannot. A prolonged hydrologic regime (i.e., one in which the site is flooded, ponded, or saturated for approximately two or more consecutive weeks during the growing season) is the primary factor that controls the establishment and maintenance of wetland characteristics.

This water logging is responsible for the fundamental difference between wetland and non-wetland areas. Specifically, the upper portion of the soil profile in wetlands becomes anoxic because microorganisms consume the available oxygen that is not replenished because of the slow rate of diffusion from the atmosphere into and through a saturated medium. This anoxic environment supports unique microbial populations that have the ability to use elements other than oxygen as terminal electron acceptors in their metabolic processes. These anaerobic microbes are responsible for mediating the biochemical reactions in wetlands (e.g., denitrification) that typically do not take place in environments in which oxygen is present. From a practical perspective, these reactions also result in changes in soil color (generally from brown to gray) due to the conversion of oxidized ferric iron to reduced ferrous iron. The presence of this distinctive color can be used in combination with an examination of the plant community and indicators of hydrology to identify wetlands and delineate the extent of their boundaries. Examination of these three factors (hydrology, soils, and vegetation) has become

accepted as the basis for the process of wetland delineation as outlined in the Wetland Delineation Manual (WDM) (U. S. Army Corps of Engineers 1987).

Wetlands include a variety of landforms including marshes, swamps, bogs, fens, vernal pools, pocosins, potholes, playas, wet meadows and others that are described in varying detail in Mitch and Gosselink (2000). These diverse types occur in different landscape positions and may have quite different hydrologic regimes. For example, wetlands commonly are found in lower landscape positions such as lake fringes and river bottoms, but also may occur on hillsides or even on topographic highs such as watershed divides. Similarly, wetlands vary from those in which surface flooding or ponding occurs regularly to those in which surface water is seldom present. Examples of those in the former category include inland and coastal marshes, and river bottom swamps that are commonly referred to as bottomland hardwoods. These types account for the majority of wetlands in the Southeast. In the latter category are wetlands such as wet meadows and seeps or "springs" where groundwater discharges to the surface. Groundwater discharge wetlands have highly variable hydroperiods with some containing water throughout the year while others are wet only following periods of significant rainfall.

WETLAND CLASSIFICATION SYSTEMS/FUNCTIONS

Because of the many inherent differences among wetland types, several classification systems have been developed over the years to place wetlands into meaningful groups for inventory, management, and other purposes. Two of the most useful are the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979) and *A Hydrogeomorphic Classification for Wetlands* (HGM) (Brinson 1993). The former, normally referred to as the Cowardin system, was developed as the basis for the National Wetland

Inventory (NWI) conducted by the U. S. Fish and Wildlife Service. It assigns wetlands to 1 of 5 systems and then to a varying number of subsystems and classes based on hydrologic regime, water chemistry, plant community, and other characteristics. The notation or codes for these various attributes are recorded on the NWI maps so users have information not only regarding the presence of wetlands, but what the characteristics of those wetlands are. The Cowardin system has proved very useful for the NWI, but sometimes does not take into account even major differences in landscape position, the source of hydrology for the wetland, or its hydrodynamics; all factors that influence the functions wetlands perform. Thus, its use in classifying wetlands into groups that function similarly is limited. As a result, the HGM classification system that is based on those three factors (landscape setting, source of hydrology, and hydrodynamics) was developed for that specific purpose. In the HGM classification system, wetlands are assigned to 1 of 7 classes: riverine, depression, slope, tidal fringe, lacustrine fringe, mineral soil flats, and organic soils flats. Further subdivisions into subclasses are based on hydrology source and hydrodynamics. A desirable feature of the HGM classification system is that inferences regarding function can be made from the classification system alone. For example, wetlands in the depression class usually will store surface water whereas those in the slope class typically will not. Export of carbon and nutrients typically will occur in riverine wetlands, but typically will not occur in either of the flats classes. Thus, simply by assigning a wetland to the appropriate HGM class or subclass, much is known about the wetland's role in the landscape.

In addition to those functions mentioned above, wetlands also may cycle nutrients, trap sediments and pollutants, and in some cases, recharge groundwater and provide base flow to streams and rivers. Almost all wetlands provide habitat for a wide variety of flora and fauna and are critical in maintaining local and regional biodiversity. Sather and Smith (1984), Marble

(1990), Mitsch and Gosselink (2000) and various HGM documents and guidebooks (e.g., Smith et al. 1995, Ainslie et al. 1999, Smith and Klimas 2002, Wilder and Roberts 2003) all provide excellent summaries of functions that wetlands perform and the values derived from them. During the past decade, consideration of wetland functions has become a routine part of the wetland regulatory process, and it is now common for functions to serve as the basis for decision making regarding issuance of permits and development of mitigation alternatives.

The HGM approach also has been used as the basis for the development of assessment "models" that identify functions performed by a specific wetland class and subclass and can be used to determine the degree to which those functions are performed. The output usually is on a 0 - 1.0 scale in which a score of 1.0 indicates the wetland performs the function to the highest degree, while a score of 0 indicates that the function is not performed at all. Such rigorous assessments may be needed to calculate potential impacts due to a proposed project or to assist in the development of mitigation alternatives. Less detailed assessments where potential wetland function is ranked as high, medium, or low often are appropriate for inventory and baseline determination projects. The HGM approach has been recognized as one of the most useful tools for assessing wetland function by the major federal agencies with regulatory authority or oversight over wetlands; these include the U. S. Fish and Wildlife Service (FWS), U. S. Environmental Protection Agency (EPA), U. S. Army Corps of Engineers (COE), and the U. S. Natural Resources Conservation Service (NRCS).

RATIONALE FOR STUDY

In spite of the many functions that wetlands perform and the often-significant value derived from those functions, approximately 53% of the wetlands originally present in the lower

48 states have been lost since European settlement as a direct result of human activities (Dahl 1990); and in many states, those losses are continuing (Hefner et al. 1994). Dahl (2000) reported that from 1986 to 1997, the wetland types in which the greatest losses occurred were freshwater forested wetlands and freshwater marshes. Estimated losses in each category were 1.2 million acres.

While wetland loss continues today, our understanding of their importance has changed considerably since the mid-1800s through the 1900s when landowners were encouraged to drain, ditch, and fill wetlands (Mitsch and Gosselink 2000). State and Federal regulations have since been instituted to reduce wetland loss, and many entities at all levels of government have adopted programs to aid in wetland conservation and stewardship. The U. S. National Park Service, (NPS) which manages millions of acres in the United States, has begun an initiative to determine the extent and quality of natural resources (including wetlands) under its jurisdiction, including those at SHIL.

With a general goal of improving the stewardship of wetlands at SHIL, it was determined that information needed included the location and types of wetlands present and a rapid assessment of wetland functions performed by them. Such knowledge is necessary to facilitate the evaluation of future potential impacts to wetlands. Further, if unavoidable impacts do occur, this information would be useful in the determination of appropriate compensation as required by the U. S. Army Corps of Engineers under Section 404 of the Clean Water Act (CWA), State requirements under Section 401 of the CWA, and requirements by the NPS for compliance with Directors Order #77-1.

OBJECTIVES

The primary objectives of this inventory and assessment included: (1) identify and delineate all wetlands subject to jurisdiction under Sections 404 and 401 of the CWA, and all wetlands subject to National Park Service procedures for implementing Director's order #77-1, (2) produce a database that includes the location and description of all wetlands present including their Cowardin and HGM classifications, and (3) assess the biotic and abiotic functions and values of these wetlands.

METHODS

Prior to conducting the field investigation at SHIL, data that might provide information regarding wetlands there were examined. The principal data were the NWI maps for the area. In spite of their usefulness for inventory studies, NWI maps have limitations. For example, the NWI is more accurate in open landscapes in which wetland "signatures" such as open water can be seen and identified from remotely sensed imagery. Wetlands in which saturation as opposed to ponding or flooding is the primary source of hydrology often will not be detected by the NWI. Wetland size also is a factor that determines the likelihood of wetlands being identified by the NWI surveys. There is no absolute minimum size necessary for a wetland to be included on an NWI database, but commonly, wetlands smaller than one acre will be missed.

Following this "office" investigation, the area within the boundaries of SHIL (Figure 1) was systematically searched on foot to identify areas that potentially might meet the criteria to be considered a wetland according to the WDM (U. S. Army Corps of Engineers 1987). Detailed topographic maps that included the network of roads and trails within SHIL along

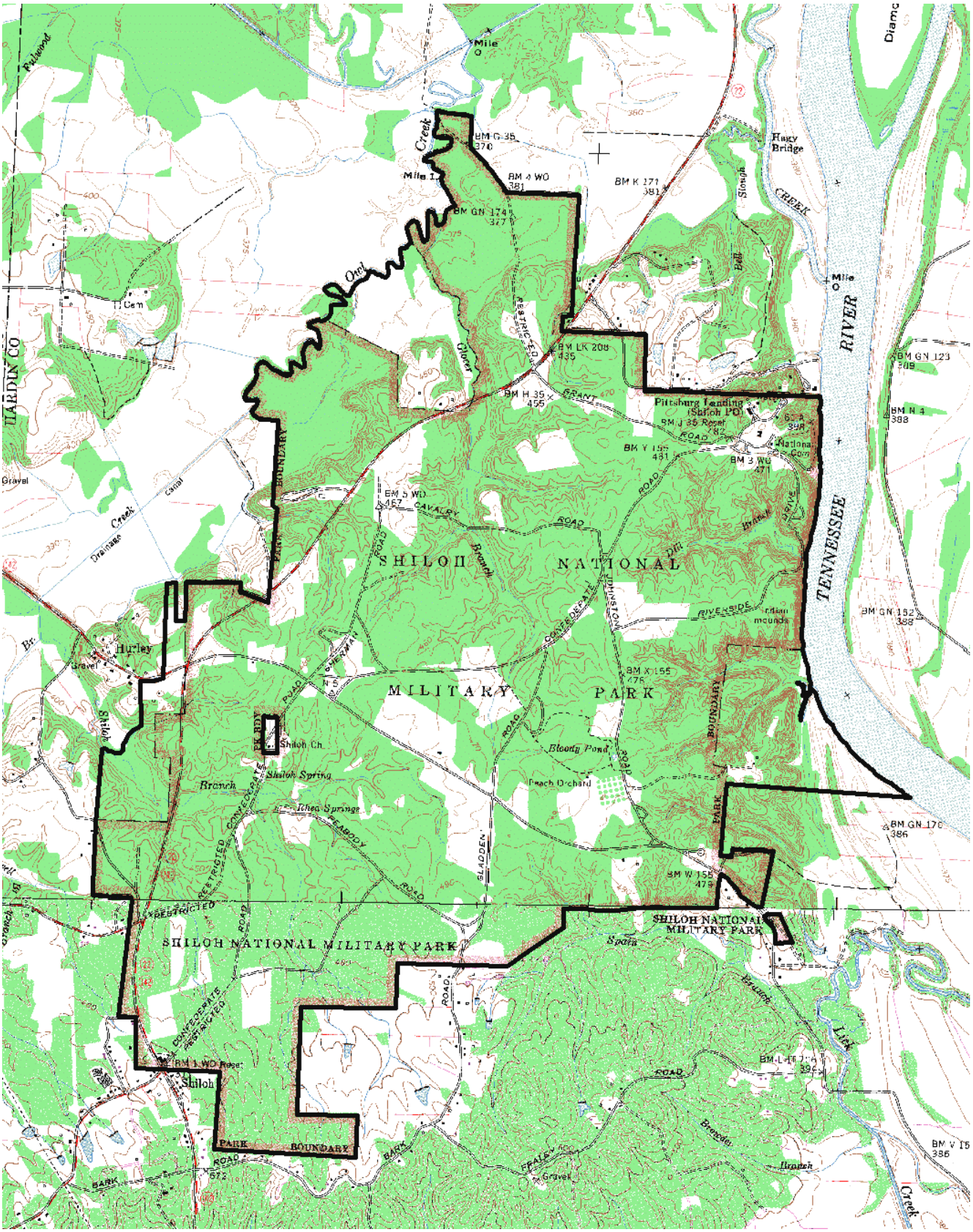


Figure 1. Location of Shiloh National Military Park.

with a Global Positioning System (GPS) receiver were used as navigation aids in the field. The primary indicators of potential wetlands were the presence of surface water, an obvious change in vegetation cover, and the presence of plant species known to occur primarily in wetlands.

Whenever potential wetland areas were located, procedures prescribed by the WDM (U. S. Army Corps of Engineers 1987) were employed to: (1) determine if the area was a wetland, and if so, (2) delineate the boundary of the wetland. This process involved documenting the dominant plant species and carefully examining potential indicators of soils and hydrology. The dominant plant species in all strata (i.e., tree, shrub, ground, and woody vine) were identified to species if possible using Radford et al. (1968) and Godfrey and Wooten (1979) and their indicator status (obligate, facultative wetland, etc.) was determined from Reed (1988) (Table 1). If more than 50% of the dominant species were facultative, facultative wetland, or obligate, then the site was considered dominated by hydrophytic vegetation. Soils were exposed either by digging a series of pits with a sharpshooter shovel, or extracting samples with a soil probe to a depth of approximately 18 inches. Color of the soil matrix (the primary color) and of the mottles (splotches of color within the matrix, if present) was described using standard Munsell color notation. Other indicators of "hydric" soil also were noted (USDA, NRCS 2002, and U. S. Army Corps of Engineers 1987). The primary one used in this study was the presence of low matrix chromas (i.e., those < 2). This indicator develops as a result of prolonged reduction; thus it can be inferred that the site is flooded, ponded, or saturated for long periods during the growing season. A determination of whether the site had a hydroperiod prolonged enough to be considered "wetland hydrology" was made based on field indicators described in the WDM (U. S. Army Corps of Engineers 1987).

Table 1. Wetland indicator definitions according to Reed (1988) used to determine the indicator status of plant species recorded in wetlands at Shiloh National Military Park.

Category	Abbreviation	Definition
Obligate Wetland	OBL	Occur almost always (estimated probability >99%) in wetlands under natural conditions
Facultative Wetland	FACW	Usually occur in wetlands (estimated probability 67-99%), but occasionally found in non-wetlands
Facultative	FAC	Equally likely to occur in wetlands or non-wetlands (estimated probability 33-66%)
Facultative Upland	FACU	Usually occur in non-wetlands (estimated probability 67-99%), but occasionally found in wetlands
Upland	UPL	Occur almost always (estimated probability >99%) in non-wetlands under natural conditions

The primary one used in this study was soil saturation within 12 inches of the surface. Oxidized rhizospheres that indicate prolonged saturation were found at some sites. Additional information regarding each of the indicators/parameters of wetland hydrology can be found in the WDM (U. S. Army Corps of Engineers 1987).

Once an area was determined to be a wetland, its boundaries were delineated based on the presence or absence of each of the three parameters (soils, hydrology, and vegetation). A flag or other marker was placed in the ground to indicate the point at which one or more of the parameters ceased to be present, thus denoting the edge of the wetland. Wetland size was estimated by approximating a geometric figure (square, rectangle, circle, etc.) and using a rangefinder to determine distances needed for the appropriate calculations.

Universal Transverse Mercator (UTM) coordinates for each wetland were determined using a handheld GPS receiver. Coordinates were stored in the receiver and recorded on field data sheets. After each field sampling period, the UTM coordinates were transferred to a Geographic Information System (GIS) and graphically represented using ArcView© software.

By continuously updating the GIS database (and maps), areas of SHIL that still needed to be searched could be identified.

Each wetland was assigned to the most detailed Cowardin and HGM class possible. The Cowardin classification uses an alphanumeric code to denote characteristics of the wetland. The first character is an upper case letter that represents the *system*. All the wetlands at SHIL were classified within the palustrine system. The palustrine system includes most interior freshwater wetlands not associated with large open water bodies and is denoted on NWI maps by the letter P. Next is a set of two upper case letters that represent the *class*. For the wetlands at SHIL, the potential classes included: EM - emergent wetland (dominated by non-woody vegetation), SS - scrub/shrub (dominated by woody vegetation < 3 inches in diameter and < 20 feet tall), and FO - forested (dominated by woody vegetation 3 inches or greater in diameter and at least 20 feet tall). The next character is a number representing the *subclass*. These modifiers provide more detail regarding the plant community and they vary with the class. For example, in emergent wetlands at SHIL, the most common modifier used was "1" – plant species that commonly remain standing until the next growing season. The other modifier in this subclass is "2" - non-persistent (plant species that do not remain standing until the next growing season). In scrub/shrub wetlands at SHIL, the modifier used was "1" – broad-leaf deciduous plants that lose their leaves in winter. Other examples of this modifier include needle-leaved deciduous, and broad-leaved evergreen. The next character is an upper case letter that represents the water regime (i.e., the hydroperiod). Examples of modifiers may include: A - temporarily flooded (typically floods for < 2 weeks during the growing season), and C - seasonally flooded (typically floods for two or more weeks during the growing season). As an example, a wetland assigned a code of PSS1A is a freshwater wetland not associated with a lake or open water body that is

dominated by deciduous, scrub-shrub vegetation and is inundated for less than two weeks during the growing season. A complete explanation of these notations can be found in Cowardin et al. (1979).

In the HGM system, the classes that potentially could occur at SHIL were riverine, depression, slope, mineral soil flat, and lacustrine fringe. Further designations are not as structured as in Cowardin and vary among classes. Examples of factors that potentially could be used to assign wetlands to the more-detailed subclass level include: stream gradient (high or low) for riverine wetlands, landscape form (open or closed contours) for depressions, and primary source of hydrology (ground or surface water) for depressions. Vegetation usually is not considered formally when determining class or subclass within the HGM classification system.

The initial list of potential functions/values (biotic, hydrologic, research/scientific, cultural, and economic) was reviewed to determine their applicability to the wetland types most likely to occur at SHIL. Further, a review of HGM guidebooks, the scientific literature, and previous inventory and assessment work completed in the region was conducted to identify the physical, chemical, and biological characteristics of the wetlands responsible for the performance of the function(s). Based on this preliminary work, eight specific functions/values believed to be the most relevant at SHIL were selected for evaluation. These included: surface water storage, groundwater discharge to streams, carbon/nutrient export, provide wildlife habitat, support wetland plants, cultural value, research/scientific value, and economic value. These functions/values along with a section in which ratings could be recorded were included on the field data form.

The functions/values of each wetland identified at SHIL were evaluated by visually examining the characteristics of wetlands likely to be related directly to one or more

functions/values. The following references provided background regarding these characteristics and recommendations on how they can be estimated: Mueller-Dombois and Ellenberg (1974) and Hays et al. (1981) for plant and habitat-related parameters; Brady and Weil (1999) for soil and soil-related parameters; and Ponce (1989) for hydrologic parameters. Examples of characteristics presumed to be related to the capacity of the wetlands to perform one or more functions include: species composition of the vegetation in the overstory, midstory, and understory layers, diameter at breast height (DBH) of the overstory and midstory trees, density of saplings and shrubs, size and density of logs and snags, percent cover of understory vegetation, and percent cover of litter. Non-vegetation characteristics included hydrology source (i.e., flooding, ponding, or saturation), timing and duration of inundation or saturation, depth to the seasonal high water table, landscape position (i.e., HGM classification, proximity to stream or river, etc.), and soil characteristics (i.e., color, depth to redoximorphic features, texture, presence or confining layers, etc.). Nominal ratings of high, medium, or low were used for three functions; high and low only for two functions; and yes or no for the three "values." The following sections provide a description of each function/value and an overview of the characteristics and conditions used to derive the ratings. More detail regarding the logic used to assign ratings to various wetland functions can be found in Ainslie et al. (1999), Smith and Klimas (2002), and Wilder and Roberts (2003). Wetland size is an obvious factor related to all functions or values. In many instances larger wetlands provide increased function and value over that produced by smaller wetlands. Size however is not considered directly in the HGM process. If desired, users can incorporate size into the comparison when two or more wetlands are being assessed.

Surface Water Storage

This function addresses the capacity of the wetland to store surface water during periods of high rainfall and runoff**.** It is performed by wetlands in both the depression and riverine classes. Many benefits related to flood attenuation and the reduction of flood damage occur as a result of wetlands performing this function. For example, storage of surface water in wetlands can reduce the velocity of the flood-wave and as a result, decrease peak discharge downstream. Similarly, this reduction in velocity can have a dramatic effect in reducing damage from erosive forces.

Wetlands at SHIL were assigned a rating of either high or low for this function based solely on HGM classification. Depressions occur in both upland and floodplain locations and vary greatly in size. Regardless of their location or size, depressions store water so they were assigned a rating of high for this function. Riverine wetlands (i.e., those on floodplains) adjacent to mid-and low-gradient streams or rivers also store water, so those in this landscape position also scored high. Other types of wetlands do not store surface water and were assigned a rating of low for this function.

Groundwater Discharge to Streams

This function addresses the capacity of the wetland to retain and convey subsurface water to an adjacent stream or river; it is performed most commonly by wetlands in the HGM riverine and slope classes. Subsurface water stored in or moving through the wetland will be released more slowly than would surface flow. This slow release is important in maintaining water levels in the channel during periods of low rainfall, that in turn is important in developing and maintaining habitat structure and biotic diversity in stream or river systems.

Wetlands at SHIL were assigned a rating of high or low for this function based on HGM classification and landscape position. Only riverine and slope wetlands adjacent to a stream or river have the opportunity to facilitate the slow release of water to maintain baseflow, those that met this condition received a score of high. Conversely, wetlands not adjacent to a stream or river were assigned a score of "low" or "not applicable" for this function.

Carbon/Nutrient Export

This function addresses the capacity of the wetland to export dissolved and particulate organic carbon and other nutrients present in the wetland to downgradient systems by leaching and flushing litter via overland flow. Wetlands in the riverine and slope HGM classes perform this function most commonly. Many benefits accrue from the performance of this function. Material exported to downstream systems is vital for supporting aquatic food webs and numerous biogeochemical processes. Dissolved organic carbon is a significant source of energy for the microorganisms that form the base of detrital food webs, while particulate carbon is used to support invertebrate shredders.

Wetlands at SHIL were assigned a rating of high, medium, or low for this function based on HGM classification, landscape position and condition of the plant community. First, only riverine and slope wetlands adjacent to a stream or river have the opportunity to export significant amounts of carbon, so this condition had to be met before a score could be assigned. Wetlands in other HGM classes that were not adjacent to a stream or river were assigned a score of low for this function. Second, only wetlands with a well-developed plant community have the potential to produce substantial amounts of organic carbon and other nutrients. Assuming wetlands at SHIL were forested historically, only wetlands in which all vegetation strata (understory, midstory, and overstory) were present received a high score for this function.

Wetlands with two strata received a score of medium, while those with only one stratum received a score of low. These conditions were determined onsite, but can be approximated by the Cowardin classification. In most cases palustrine forested (PFO) wetlands are comprised of three strata, palustrine scrub/shrub (PSS) wetlands of two strata, and palustrine emergent (PEM) wetlands of only one stratum

Provide Wildlife Habitat

This function addresses the capacity of the wetland to provide habitat for wildlife either periodically or year around. This function is somewhat unique in that wetlands in all HGM classes support various species of wildlife. The focus of this assessment was on amphibians, a group of organisms that is dependent on wetlands for completing their life cycle in that generally they must lay their eggs in water or moist soil. Amphibians have experienced worldwide population declines, thus they are ideal for serving as the emphasis of this function.

Wetlands were assigned a rating of high, medium, or low for this function based on their hydrologic regime. Only wetlands with prolonged hydroperiods have standing water for two or more weeks during the growing season and have the potential to provide breeding habitat for amphibians, so only these wetlands could receive a high score for this function. Such wetlands often are referred to as vernal pools and typically belong to the HGM depression class; although, wetlands in other classes may contain depressions within their boundaries. Wetlands in which only short-term ponding occurred were assigned a score of medium. These mostly could be characterized as micro-depressions. Wetlands in which only soil saturation occurred were assigned a score of low for this function.

Support Wetland Plants

This function addresses the capacity of the wetland to support a plant community comprised primarily of species associated with wetland ecosystems. In this study, the emphasis was placed on species found only or primarily in wetlands (i.e., the obligate and facultative wetland groups described by Reed (1988)). In addition to the inherent value of the plants themselves, the plant community in most instances is one of the major factors upon which the animal community depends. Further, the plant community is the ultimate source of primary production and as such essentially drives many of the other functions such as on-site cycling of nutrients and production of material for export to other systems.

Wetlands were assigned a score for this function based on the uniqueness of the plant community present. Wetlands that were dominated by unique species, particularly those in the obligate category or those wetlands containing a rare, threatened, or endangered plant species were assigned a score of high. Wetlands that were dominated by species in the facultative wetland category were assigned a score of medium. Wetlands dominated by species in the facultative or drier category were assigned a score of low.

Cultural Values

Cultural values include a broad array of concepts ranging from aesthetics to archeological significance. The values differ somewhat from those derived from the above functions, but are extremely important at a facility such as SHIL where consideration for the experiences of the visiting public are a high priority.

Wetlands at SHIL were assigned either a “yes” or “no” (i.e., either having or not having value) for this category. Factors that were considered were uniqueness, size (the larger the better), evidence of historical use by humans, proximity to trails and roads (important

consideration for environmental education), etc. It could be argued that all wetlands have cultural significance in the form of aesthetics and potential for environmental education; but, unless a wetland "stood out" for one or more of the above reasons, it was given a rating of "no." As an example, wetlands that were less than average size, had no apparent evidence of past human activity and were not readily accessible by the public, were not considered to have cultural significance. Reasons for rating wetlands as having cultural significance were noted on the field forms. Nothing was noted for wetlands judged to lack cultural significance.

Research/Scientific Value

Research/scientific values include a broad array of concepts ranging from supporting unique species that warrant investigation to serving as "reference" sites to promote a better understanding of ecosystems and how they may be degraded, restored, or managed. As with cultural considerations, these values differ somewhat from those derived from the above ecological functions.

Wetlands at SHIL were assigned either a "yes" or "no" (i.e., either having or not having value) for this category. Factors that were considered included uniqueness, size, degree of disturbance, and presence of species of high interest. It could be argued that all wetlands have research/scientific value; but, unless a wetland "stood out" for one or more of the above reasons, it was given a rating of "no." Reasons for rating wetlands as having research/scientific value were noted on the field forms. Nothing was noted for wetlands judged to have no research/scientific potential.

Economic Values

Economic values may be derived from resources produced by or within the wetland or may be due to some function that the wetland performs. Examples of the former include timber

or fisheries production. Examples of the latter include the value of the wetland for reducing flooding downstream because of water storage capacity. Some wetlands are unique or otherwise of sufficient interest to serve as an attraction for park visitors.

Wetlands at SHIL were assigned either a "yes" or "no" (i.e., either having or not having value) for this category. The two factors that were considered were the ability of the wetland to serve as an attraction to visitors and the value of the wetland for reducing flood damage. Given that SHIL is a NPS facility, values associated with timber and commercial exploitation of wildlife and other natural resources were not considered. Reasons for rating wetlands as having economic value were noted on the field forms. Nothing was noted for wetlands judged to have no economic value.

RESULTS

The NWI maps indicated approximately fifteen wetlands were present at SHIL; however, field investigation documented the presence of eighty-one wetlands (Figure 2). The limitations of the NWI information mentioned previously simply had not permitted the additional wetlands to be identified, likely because of small size and the absence or short duration of standing water. The eighty-one wetlands totaled 376.63 acres, with the average wetland size being approximately 4.65 acres.

The reason for the large average wetland size at SHIL is the bottomland hardwood complex associated with Owl Creek at the northern end of the park. It is approximately 315 acres in size and likely supports a great variety of species and habitat types. Excluding this area, the average size of wetlands at SHIL is approximately 0.77 acres. This average acreage figure more accurately characterizes the size of the majority of wetlands at SHIL.

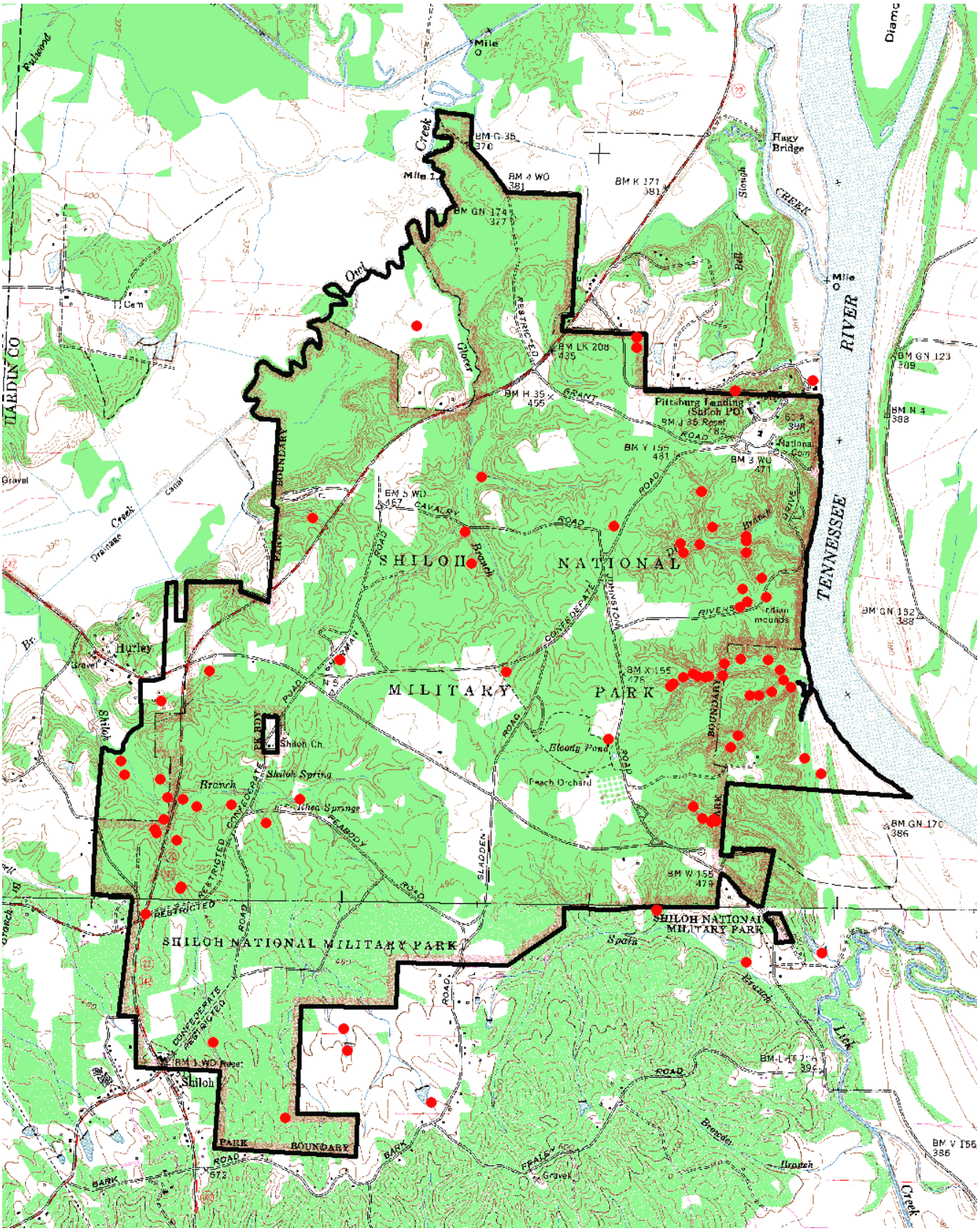


Figure 2. Location of wetlands at Shiloh National Military Park

Common species in the majority of wetlands at SHIL included sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), willow oak (*Quercus phellos*), and Japan grass (*Microstegium viminium*).

Based on the Hydrogeomorphic (HGM) classification system, fifty-five were slope wetlands, twenty were depression wetlands, four of the sites were riverine wetlands, and two were considered flats wetlands. Based on the Cowardin classification system, seventy-three of the wetlands were palustrine, forested wetlands dominated by deciduous trees (PFO1). Of these, fifty-one were seasonally flooded (PFO1C), eighteen were temporarily flooded (PFO1A), and four were seasonally flooded/saturated (PFO1E). Non-forested wetlands included one wetland having persistent vegetation that was seasonally flooded and in some portions semi-permanently flooded (PSS1E/F) and seven palustrine emergent wetlands having persistent vegetation (PEM1). Two of these were temporarily flooded (PEM1A), three were seasonally flooded (PEM1C), and two were seasonally flooded/saturated (PEM1E). .

Owl Creek

Historically, bottomland hardwood forests such as the one associated with Owl Creek covered thousands of acres in western Tennessee. Such areas provided numerous functions and values including improvement of water quality, flood attenuation through surface water storage, and wildlife habitat. Unfortunately, the majority of these ecosystems have been converted for agricultural practices. This 315-acre bottomland hardwood forest (Figure 3) also has experienced landscape-level clearing and draining, and likely was contiguous with hundreds or even thousands of acres of bottomland hardwood forest in years past. Conversion to agriculture, especially to the north of SHIL, has degraded the site somewhat, but the area associated with the southern side of Owl Creek remains in relatively good condition. The site continues to receive

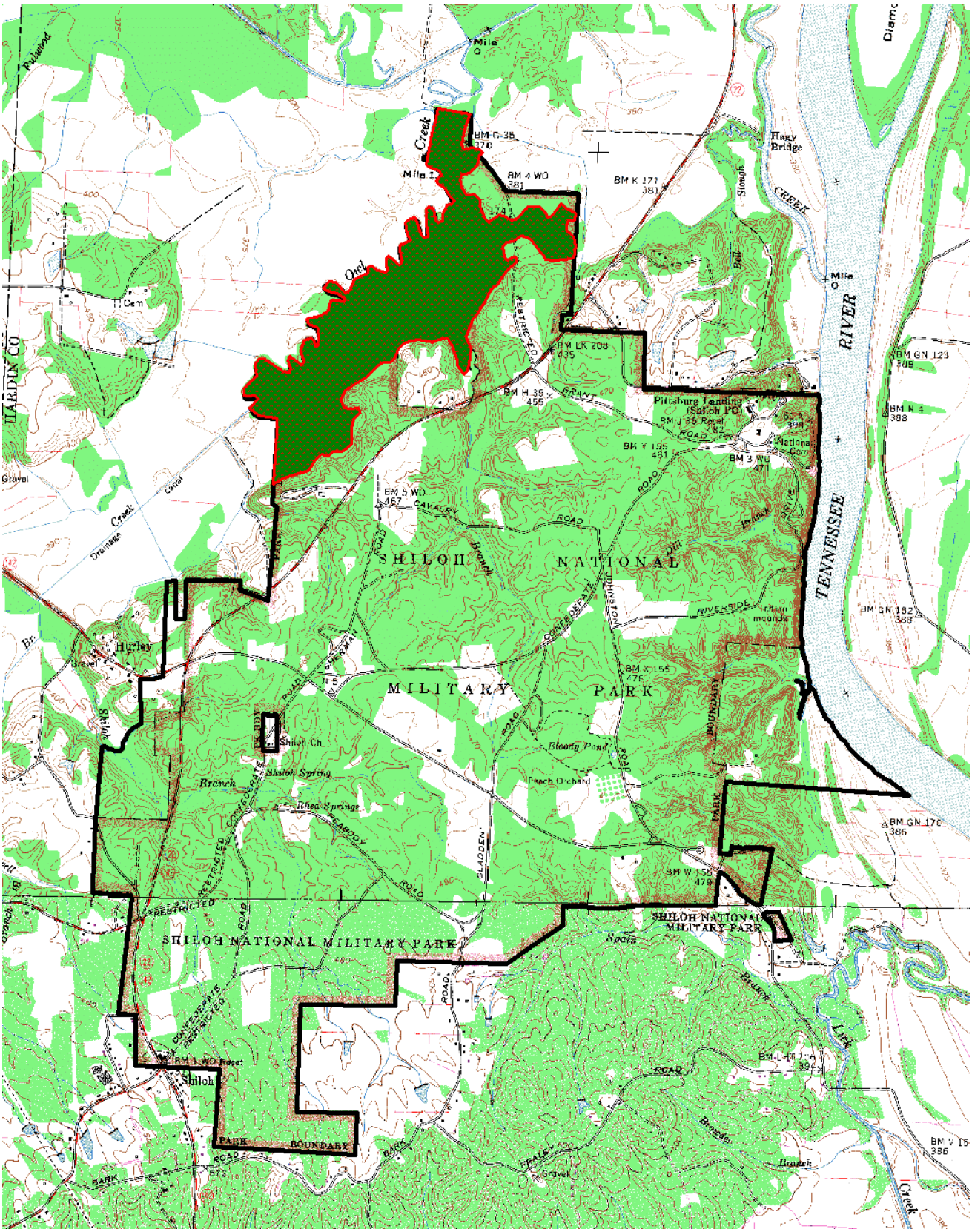


Figure 3. Location of the bottomland hardwood forest complex adjacent to Owl Creek at Shiloh National Military Park.

overbank flooding from Owl Creek, and there are numerous areas at the wetland/upland boundary where ground water is significant enough to provide wetland hydrology, thus the hydrology of the site is relatively in tact (Figures 4 and 5). Microtopography has not been altered significantly across the majority of the area. These numerous depressions provide additional water storage, amphibian breeding habitat, and a variety of vegetation types adapted to a range of inundation and saturation tolerances. This includes areas dominated by mature hardwoods (Figure 6) that are only moderately tolerant of flooding to tree, shrub and herbaceous vegetation that is tolerant of inundation or saturation for most of the year (Figures 7 and 8).



Figure 4. Flooding within the bottomland hardwoods adjacent to Owl Creek.



Figure 5. Sediment remaining on ground layer vegetation adjacent to Owl Creek.



Figure 6. Mature hardwoods that are moderately tolerant of flooding comprise a large percentage of the Owl Creek area.

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Figure7. Shrub and herbaceous vegetation that tolerate prolonged flooding or ponding generally were dominant in areas with beaver activity.



Figure 8. Trees such as these *Taxodium distichum* and *Nyssa sylvatica* var. *biflora* dominated the lowest elevations of the Owl Creek area.

CONCLUSIONS/RECOMMENDATIONS

Small wetlands such as the majority found at SHIL have received little attention by researchers and managers thus, these wetlands likely should be investigated further. We commonly observed wetlands holding water or saturated throughout the growing season that were being used as breeding habitat by amphibians. Because of the nature of our survey, there was not time to document use by other vertebrate groups. Because wetlands at SHIL exist as unique patches within a mostly upland landscape, their value as water sources for other groups of wildlife should be investigated, especially during prolonged dry periods. This could be accomplished by live-trapping, track counts, or use of remotely operated cameras.

This inventory documented several previously unknown wetlands, thus the findings will facilitate searches by botanists, herpetologists, and scientists in other disciplines during future

research activities. Research regarding such species would be useful in determining the role these wetlands play in maintaining local and regional populations. Further, genetic makeup of these populations would be of interest to scientists as part of recent endeavors to understand metapopulation dynamics.

Additionally, several could serve as sites for scientific studies given that they have not been as severely impacted as most wetlands on private lands. Specifically, the large bottomland hardwood complex associated with Owl Creek is in relatively good condition and likely would useful as a study area for a variety of wetland research topics. The state of Tennessee and the Environmental Protection Agency are currently involved in developing assessment models for various wetland types in Tennessee and across the Southeast. Areas such as Owl Creek and the numerous other wetlands identified at SHIL likely would add significantly to these research efforts.

ACKNOWLEDGEMENTS

We wish to thank Jerald Moore for developing the GIS database, and Stacy Allen and other SHIL staff for providing us with valuable assistance in locating potential wetlands, and providing access to all portions of SHIL. We also wish to thank Teresa Liebfreid with the Cumberland Piedmont Network, and the Water Center at Tennessee Tech University for providing support and administering the project.

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APPENDIX A

Wetland photographs and selected data



Site ID – SHIL 1

Area (ac) – 315.0

UTM – E 377457

N 3891285

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Carpinus caroliniana, Osmunda cinnamomea, Microstegium vimineum*



Site ID – SHIL 2

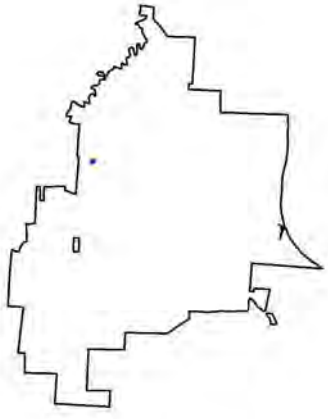
Area (ac) – 0.06

UTM – E 376818

N 3890106

Cowardin Class – PFO1A

HGM Class – Slope



Dominant Species: *Smilax rotundifolia, Acer rubrum, Liriodendron tulipifera*

Site ID – SHIL 3

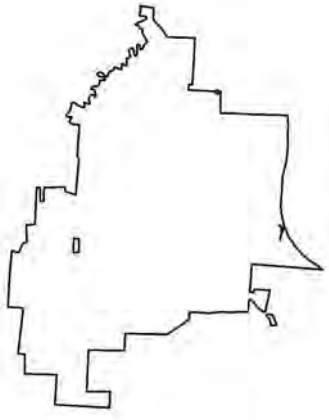
Area (ac) – 0.02

UTM – E 378804

N 3891213

Cowardin Class – PFO1A

HGM Class – Depression



Dominant Species: *Ulmus americana, Vitis sp.*

Site ID – SHIL 4

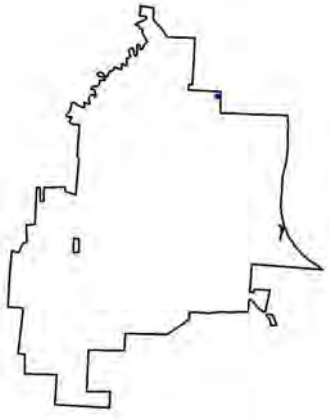
Area (ac) – 0.03

UTM – E 378802

N 3891150

Cowardin Class – PFO1A

HGM Class – Flat



Dominant Species: *Chasmanthium laxum, Nyssa sylvatica, Smilax obtusifolia*



Site ID – SHIL 5

Area (ac) – 0.14

UTM – E 379409

N 3890886

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Microstegium vimineum, Ulmus rubra, Smilax rotundifolia, Saururus cernuus*

Site ID – SHIL 6

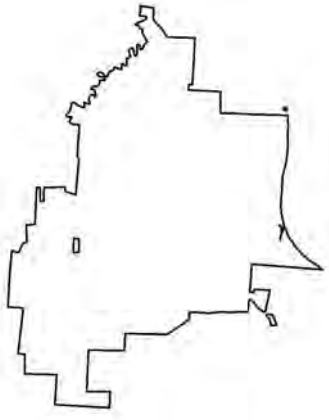
Area (ac) – 0.54

UTM – E 379884

N 3890950

Cowardin Class – PFO1C

HGM Class – Depression



Dominant Species: *Liquidambar styraciflua, Ulmus americana, Toxicodendron radicans*



Site ID – SHIL 7

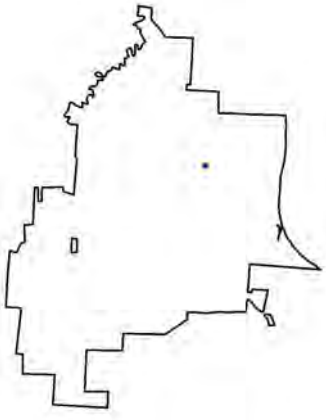
Area (ac) – 0.10

UTM – E 378660

N 3890056

Cowardin Class – PFO1A

HGM Class – Flat



Dominant Species: *Chasmanthium laxum, Carya cordiformis, Celtis laevigata*



Site ID – SHIL 8

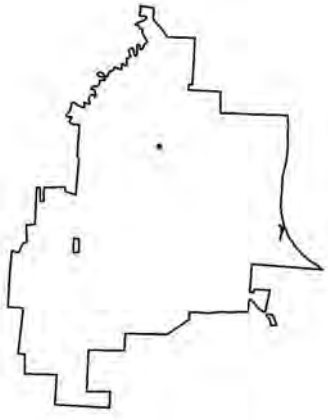
Area (ac) – 32.73

UTM – E 377852

N 3890355

Cowardin Class – PFO1A

HGM Class – Slope



Dominant Species: ***Microstegium vimineum, Liriodendron tulipifera, Lindera benzoin, Liquidambar styraciflua***



Site ID – SHIL 9

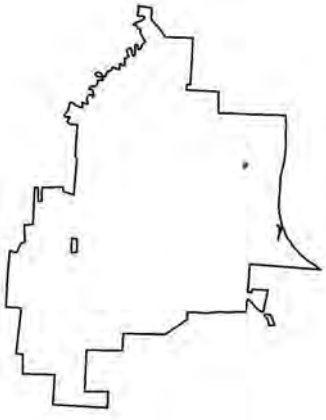
Area (ac) – 0.31

UTM – E 379266

N 3890049

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: ***Saururus cernuus, Microstegium vimineum, Onoclea sensibilis, Acer rubrum, Fraxinus pennsylvanica***



Site ID – SHIL 10

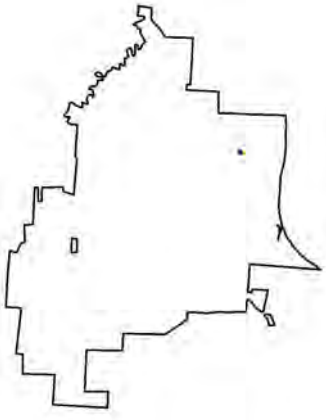
Area (ac) – 0.06

UTM – E 379201

N 3890267

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: ***Polystichum acrostichoides, Liquidambar styraciflua, Chasmanthium laxum, Microstegium vimineum***



Site ID – SHIL 11

Area (ac) – 0.02

UTM – E 379475

N 3889966

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: ***Onoclea sensibilis, Lonicera japonica, Fraxinus pennsylvanica, Carpinus caroliniana***



Site ID – SHIL 12

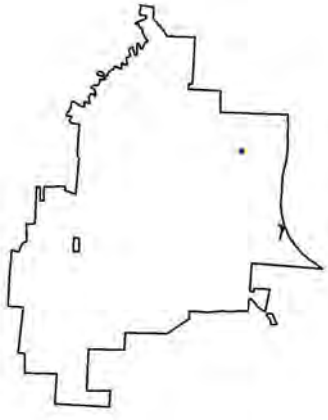
Area (ac) – 0.06

UTM – E 379201

N 3890267

Cowardin Class – PFO1A

HGM Class – Slope



Dominant Species: ***Polystichum acrostichoides, Liquidambar styraciflua, Chasmanthium laxum, Microstegium vimineum***

Site ID – SHIL 13

Area (ac) – 5.20

UTM – E 379475

N 3889966

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Onoclea sensibilis, Fraxinus pennsylvanica, Carpinus caroliniana, Saururus cernuus*

Site ID – SHIL 14

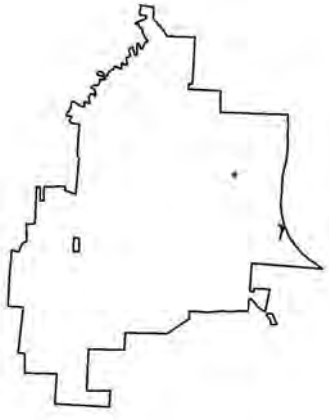
Area (ac) – 0.11

UTM – E 379090

N 3889891

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: ***Vaccinium sp., Smilax sp., Liquidambar styraciflua, Osmunda cinnamomea***



Site ID – SHIL 15

Area (ac) – 2.30

UTM – E 379223

N 3889928

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: ***Saururus cernuus, Onoclea sensibilis, Carpinus caroliniana, Microstegium vimineum***

Site ID – SHIL 16

Area (ac) – 0.15

UTM – E 379475

N 3889994

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Microstegium vimineum, Saururus cernuus, Carpinus caroliniana, Carex sp.*



Site ID – SHIL 17

Area (ac) – 0.04

UTM – E 379476

N 3889891

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: ***Onoclea sensibilis, Saururus cernuus, Fraxinus pennsylvanica, Carpinus caroliniana***



Site ID – SHIL 18

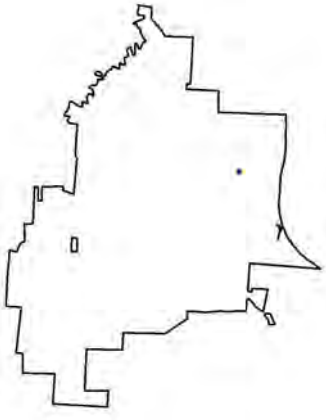
Area (ac) – 0.01

UTM – E 379191

N 3889939

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Saururus cernuus, Microstegium vimineum, Acer rubrum, Liquidambar styraciflua*

Site ID – SHIL 19

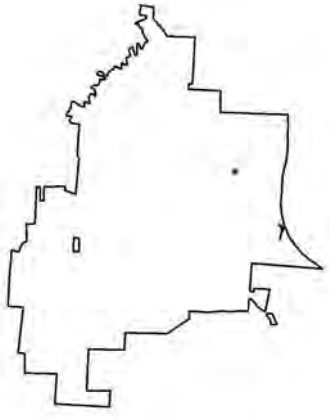
Area (ac) – 0.01

UTM – E 379073

N 3889945

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: ***Thelypteris noveboracensis, Saururus cernuus, Liquidambar styraciflua***



Site ID – SHIL 20

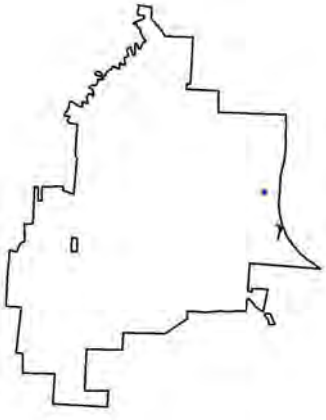
Area (ac) – 0.01

UTM – E 379596

N 3889615

Cowardin Class – PEM1Cx

HGM Class – Depression



Dominant Species: *Campsis radicans, Bohmeria cylindrica*

Site ID – SHIL 21

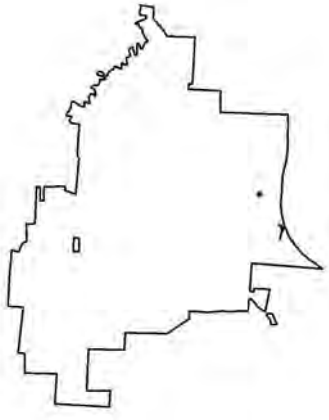
Area (ac) – 0.71

UTM – E 379483

N 3889594

Cowardin Class – PEM1Ex

HGM Class – Depression



Dominant Species: *Leersia oryzoides, Cephalanthus occidentalis, Lemna sp., Sphagnum sp.*



Site ID – SHIL 22

Area (ac) – 0.04

UTM – E 379571

N 3889733

Cowardin Class – PFO1C

HGM Class – Depression



Dominant Species: *Liquidambar styraciflua*



Site ID – SHIL 23

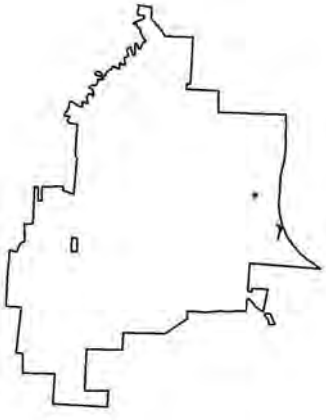
Area (ac) – 0.29

UTM – E 379437

N 3889563

Cowardin Class – PFO1Cx

HGM Class – Depression



Dominant Species: ***Ulmus americana, Liquidambar styraciflua, Quercus phellos, Smilax sp.***



Site ID – SHIL 24

Area (ac) – 0.47

UTM – E 379450

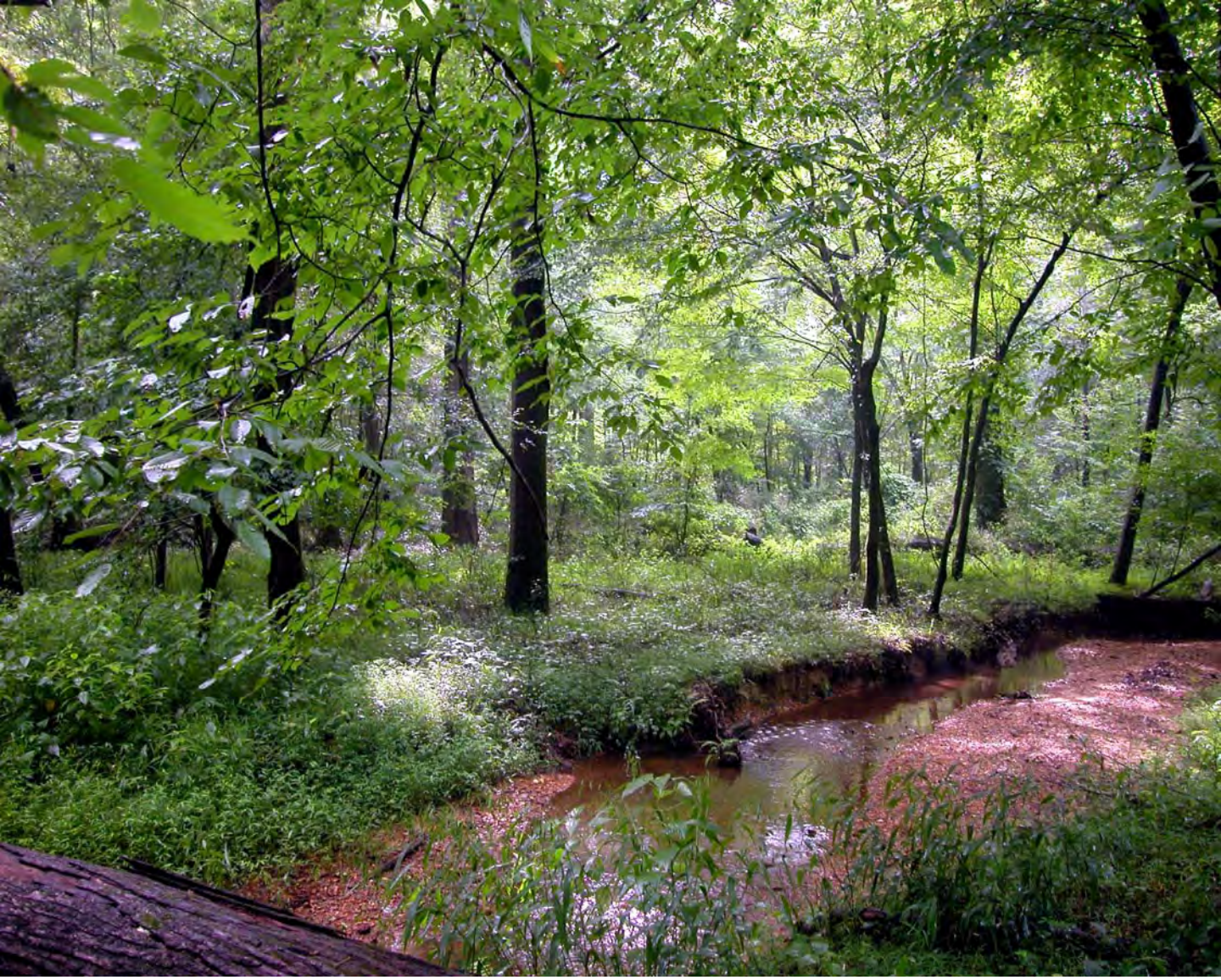
N 3889667

Cowardin Class – PFO1Ex

HGM Class – Depression



Dominant Species: *Smilax sp.*, *Liquidambar styraciflua, Acer rubrum*



Site ID – SHIL 25

Area (ac) – 0.25

UTM – E 379340

N 3889214

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Osmunda cinnamomea, Saururus cernuus, Acer rubrum, Microstegium vimineum*

Site ID – SHIL 26

Area (ac) – 0.09

UTM – E 379748

N 3889070

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Smilax sp., Ulmus americana, Fraxinus pennsylvanica*

Site ID – SHIL 27

Area (ac) – 0.03

UTM – E 379702

N 3889111

Cowardin Class – PFO1A

HGM Class – Slope



Dominant Species: *Fraxinus pennsylvanica, Carpinus caroliniana*



Site ID – SHIL 28

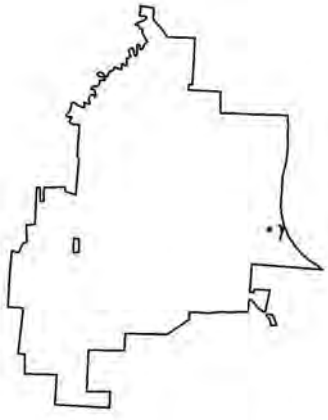
Area (ac) – 0.63

UTM – E 379631

N 3889042

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Microstegium vimineum, Sarurus cernuus, Acer rubrum, Onoclea sensibilis*

Site ID – SHIL 29

Area (ac) – 0.06

UTM – E 379551

N 3889015

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: ***Arundinaria gigantea, Carpinus caroliniana, Fraxinus pennsylvanica***

Site ID – SHIL 30

Area (ac) – 1.03

UTM – E 379495

N 3889018

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: ***Liquidambar styraciflua, Ulmus americana, Osmunda regalis, Osmunda cinnamomea***



Site ID – SHIL 31

Area (ac) – 0.02

UTM – E 379424

N 3888771

Cowardin Class – PFO1C

HGM Class – Slope/Seep



Dominant Species: *Osmunda cinnamomea, Osmunda regalis, Acer rubrum, Onoclea sensibilis*

Site ID – SHIL 32

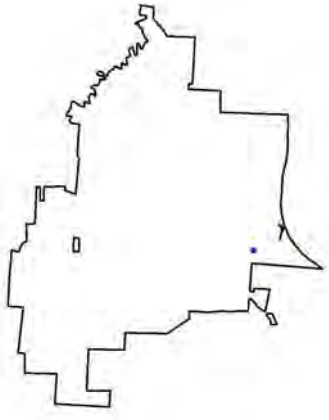
Area (ac) – 0.65

UTM – E 379379

N 3888700

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Liquidambar styraciflua, Acer rubrum, Fraxinus pennsylvanica*

Site ID – SHIL 33

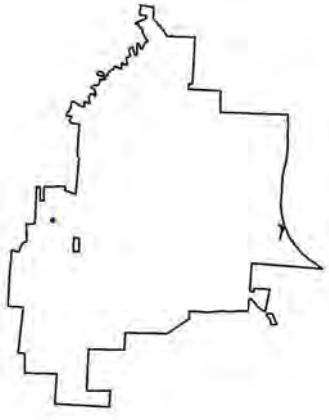
Area (ac) – 0.01

UTM – E 376789

N 3889171

Cowardin Class – PFO1C

HGM Class – Depression



Dominant Species: *Liquidambar styraciflua, Ulmus americana*

Site ID – SHIL 34

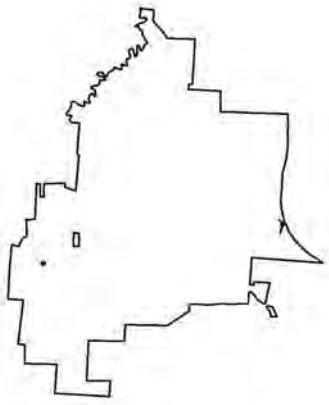
Area (ac) – 2.51

UTM – E 376026

N 3888379

Cowardin Class – PEM1C

HGM Class – Slope



Dominant Species: *Impatiens capensis, Scirpus cyperinus, Osmunda cinnamomea*



Site ID – SHIL 35

Area (ac) – 0.21

UTM – E 375884

N 3888502

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Onoclea sensibilis, Fraxinus pennsylvanica, Microstegium vimineum, Carpinus caroliniana*



Site ID – SHIL 36

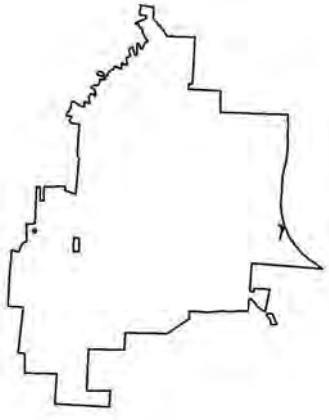
Area (ac) – 0.12

UTM – E 375892

N 3888981

Cowardin Class – PFO1Cx

HGM Class – Depression



Dominant Species: *Liquidambar styraciflua, Nyssa sylvatica, Acer rubrum, Campsis radicans*



Site ID – SHIL 37

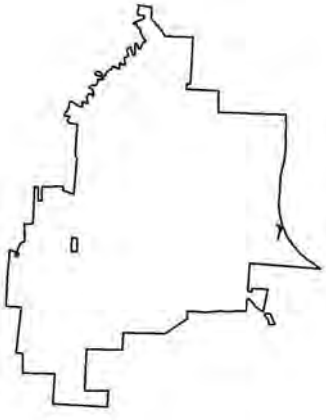
Area (ac) – 0.07

UTM – E 375643

N 3888613

Cowardin Class – PFO1E

HGM Class – Depression



Dominant Species: *Carpinus caroliniana, Betula nigra, Arundinaria gigantea*



Site ID – SHIL 38

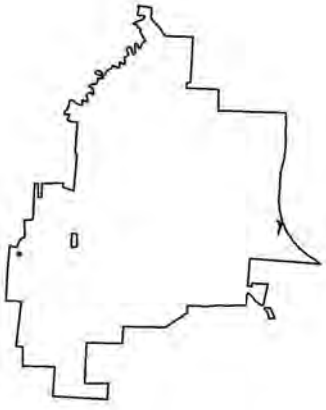
Area (ac) – 1.42

UTM – E 375667

N 3888532

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: ***Saururus cernuus, Acer rubrum, Carpinus caroliniana, Microstegium vimineum***



Site ID – SHIL 39

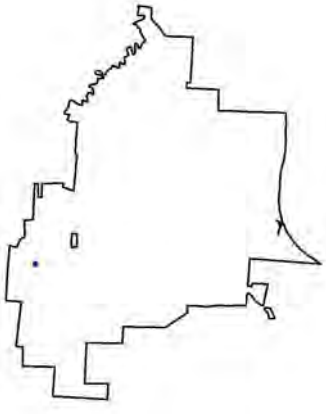
Area (ac) – 0.02

UTM – E 375930

N 3888387

Cowardin Class – PFO1C

HGM Class – Depression



Dominant Species: *Acer rubrum, Carpinus caroliniana, Fraxinus pennsylvanica*



Site ID – SHIL 40

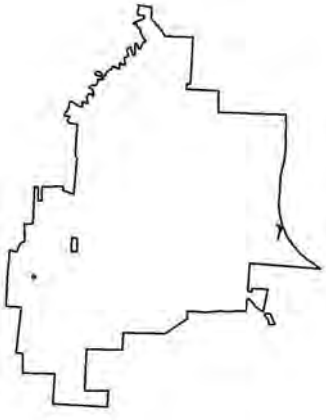
Area (ac) – 0.20

UTM – E 375906

N 3888254

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Athyrium filix-femina, Acer rubrum, Fagus grandifolia, Quercus shummardii*



Site ID – SHIL 41

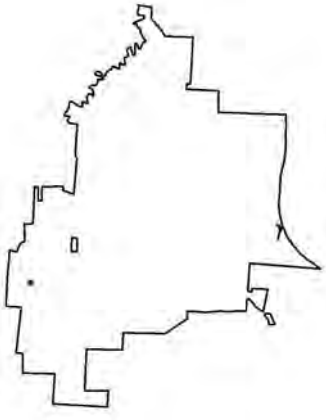
Area (ac) – 0.01

UTM – E 375860

N 3888171

Cowardin Class – PFO1A

HGM Class – Slope



Dominant Species: *Athyrium filix-femina, Fagus grandifolia, Smilax sp., Osmunda cinnamomea*

Site ID – SHIL 42

Area (ac) – 0.02

UTM – E 375848

N 3888196

Cowardin Class – R3UB

HGM Class – Riverine



Dominant Species: *Onoclea sensibilis, Osmunda cinnamomea, Liquidambar styraciflua*

Site ID – SHIL 43

Area (ac) – 0.01

UTM – E 375794

N 3887674

Cowardin Class – PFO1C

HGM Class – Depression



Dominant Species: *Liquidambar styraciflua, Lonicera japonica, Chasmanthium laxum*

Site ID – SHIL 44

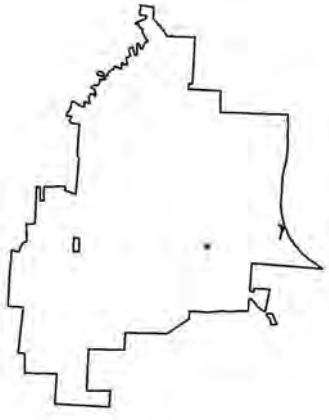
Area (ac) – 0.18

UTM – E 378629

N 3888749

Cowardin Class – PEM1C

HGM Class – Depression



Dominant Species: ***Diodia virginiana, Panicum virgatum, Lespedeza cuneata***

Site ID – SHIL 45

Area (ac) – 1.33

UTM – E 377787

N 3889826

Cowardin Class – PFO1E

HGM Class – Slope/Seep



Dominant Species: *Liquidambar styraciflua, Saururus cernuus, Osmunda cinnamomea*

Site ID – SHIL 46

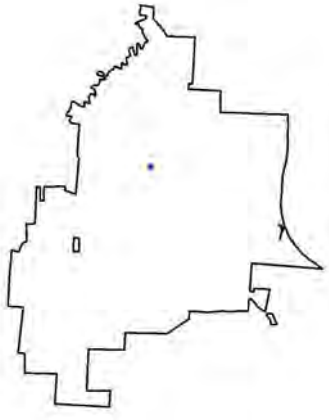
Area (ac) – 0.07

UTM – E 377747

N 3890019

Cowardin Class – PFO1A

HGM Class – Depression



Dominant Species: *Microstegium vinimeum, Acer rubrum, Liquidambar styraciflua*



Site ID – SHIL 47

Area (ac) – 1.35

UTM – E 376986

N 3889233

Cowardin Class – PEM1E

HGM Class – Depression



Dominant Species: *Carex sp., Leersia oryzoides, Eleocharis sp.*



Site ID – SHIL 48

Area (ac) – 0.04

UTM – E 378002

N 3889162

Cowardin Class – PFO1A

HGM Class – Slope



Dominant Species: *Saururus cernuus, Commelina virginica, Acer rubrum, Microstegium vinimeum*



Site ID – SHIL 49

Area (ac) – 0.04

UTM – E 378928

N 3887693

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Onoclea sensibilis, Smilax sp., Liquidambar styraciflua*



Site ID – SHIL 50

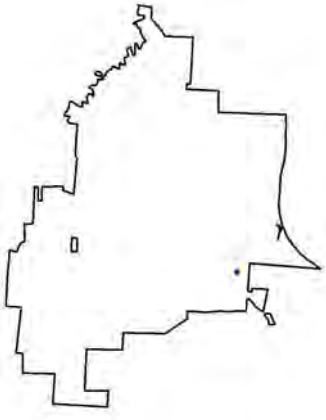
Area (ac) – 0.07

UTM – E 379152

N 3888332

Cowardin Class – PFO1E

HGM Class – Slope



Dominant Species: *Saururus cernuus, Acer rubrum, Polystichum acrostichoides*



Site ID – SHIL 51

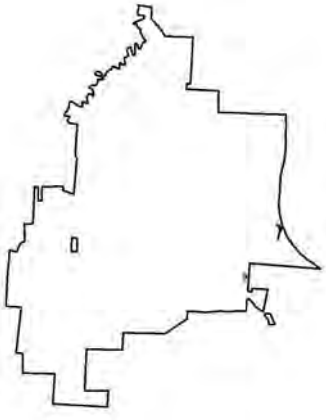
Area (ac) – 0.01

UTM – E 379276

N 3888254

Cowardin Class – PEM1Ax

HGM Class – Depression



Dominant Species: *Polystichum acrostichoides, Onoclea sensibilis, Smilax sp.*

Site ID – SHIL 52

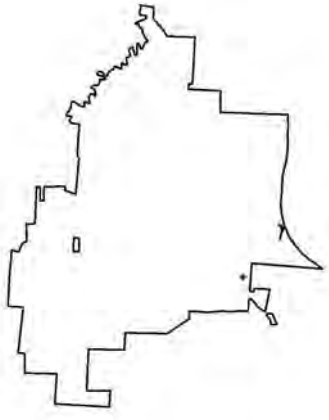
Area (ac) – 0.01

UTM – E 379208

N 3888263

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Acer rubrum, Smilax rotundifolia, Fraxinus pennsylvanica*

Site ID – SHIL 53

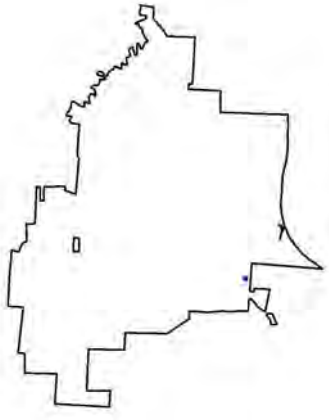
Area (ac) – 0.02

UTM – E 379260

N 3888239

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Osmunda cinnamomea, Liquidambar styraciflua*

Site ID – SHIL 54

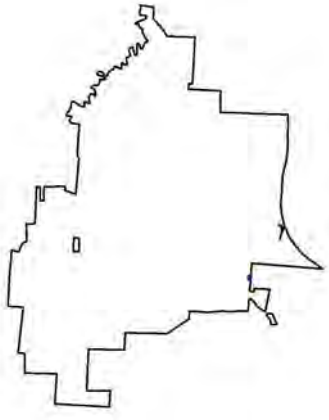
Area (ac) – 0.12

UTM – E 379291

N 3888243

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Saururus cernuus, Microstegium vinimeum, Acer rubrum, Liquidambar styraciflua*



Site ID – SHIL 55

Area (ac) – 0.02

UTM – E 379011

N 3889075

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Microstegium vinimeum, Platanus occidentalis*

Site ID – SHIL 56

Area (ac) – 0.02

UTM – E 379028

N 3889090

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: ***Liriodendron tulipifera, Onoclea sensibilis, Osmunda cinnamomea, Microstegium vinimeum***



Site ID – SHIL 57

Area (ac) – 0.01

UTM – E 379090

N 3889129

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: ***Microstegium vinimeum, Onoclea sensibilis, Asimina triloba, Fagus grandifolia***



Site ID – SHIL 58

Area (ac) – 0.11

UTM – E 379148

N 3889142

Cowardin Class – PFO1A

HGM Class – Slope



Dominant Species: *Osmunda cinnamomea, Athyrium filix-femina, Liquidambar styraciflua, Acer rubrum*

Site ID – SHIL 59

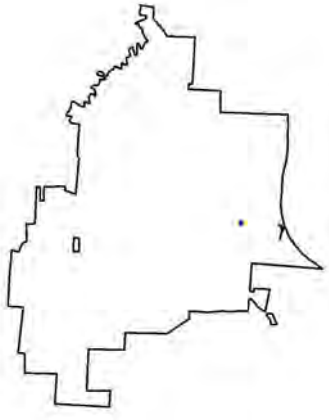
Area (ac) – 0.05

UTM – E 379176

N 3889134

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Osmunda cinnamomea, Onoclea sensibilis, Acer rubrum*

Site ID – SHIL 60

Area (ac) – 0.02

UTM – E 379225

N 3889127

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Saururus cernuus, Liquidambar styraciflua*

Site ID – SHIL 61

Area (ac) – 0.33

UTM – E 379244

N 3889132

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: ***Saururus cernuus, Microstegium vinimeum, Chasmanthium laxum, Acer rubrum***

Site ID – SHIL 62

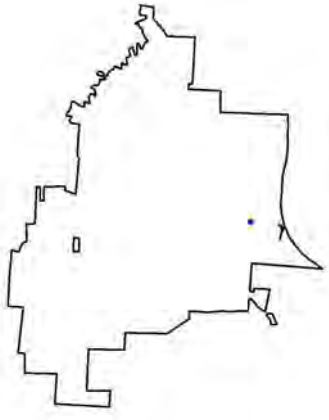
Area (ac) – 0.06

UTM – E 379331

N 3889141

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Saururus cernuus, Liquidambar styraciflua, Ulmus americana, Microstegium vinimeum*

Site ID – SHIL 63

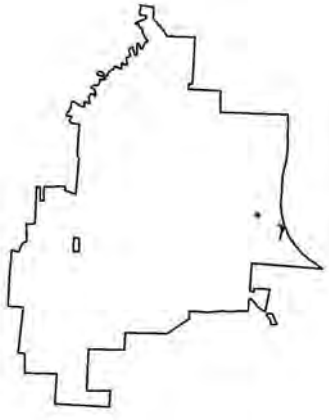
Area (ac) – 0.04

UTM – E 379442

N 3889241

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Microstegium vinimeum, Platanus occidentalis, Acer rubrum, Chasmanthium laxum*



Site ID – SHIL 64

Area (ac) – 0.12

UTM – E 379607

N 3889238

Cowardin Class – PEM1C

HGM Class – Slope



Dominant Species: *Saururus cernuus, Microstegium vinimeum, Ulmus americana*

Site ID – SHIL 65

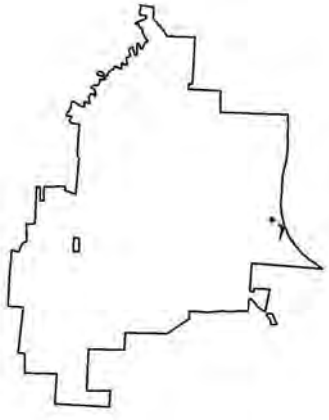
Area (ac) – 0.02

UTM – E 379680

N 3889172

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Boehmeria cylindrica, Acer rubrum, Onoclea sensibilis, Carpinus caroliniana*



Site ID – SHIL 66

Area (ac) – 0.07

UTM – E 376005

N 3887828

Cowardin Class – PFO1A

HGM Class – Slope



Dominant Species: *Onoclea sensibilis, Liquidambar styraciflua*



Site ID – SHIL 67

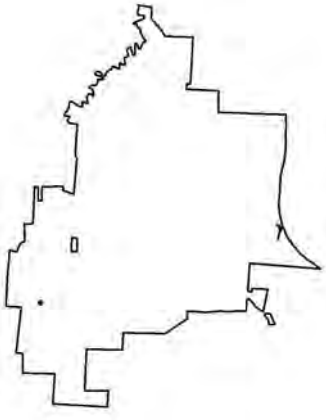
Area (ac) – 0.13

UTM – E 376012

N 3887842

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: ***Osmunda cinnamomea, Saururus cernuus, Microstegium vimineum, Liquidambar styraciflua***

Site ID – SHIL 68

Area (ac) – 0.08

UTM – E 375982

N 3888125

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: ***Liriodendron tulipifera, Liquidambar styraciflua, Microstegium vimineum, Carex crinita***



Site ID – SHIL 69

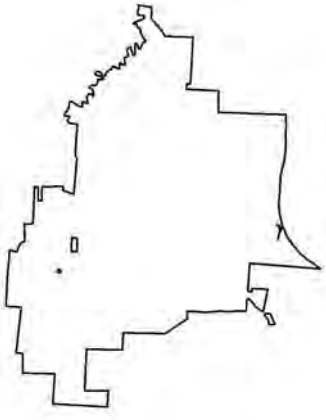
Area (ac) – 0.15

UTM – E 376321

N 3888346

Cowardin Class – PFO1A

HGM Class – Slope



Dominant Species: ***Microstegium vimineum, Osmunda cinnamomea, Athyerium filix-femina, Acer rubrum***

Site ID – SHIL 70

Area (ac) – 0.02

UTM – E 376709

N 3888331

Cowardin Class – PEM1C

HGM Class – Slope



Dominant Species: *Rumex crispus*, *Sagittaria sp.*

Site ID – SHIL 71

Area (ac) – 0.04

UTM – E 376535

N 3888230

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Onoclea sensibilis, Athyerium filix-femina, Smilax sp., Liquidambar styraciflua*

Site ID – SHIL 72

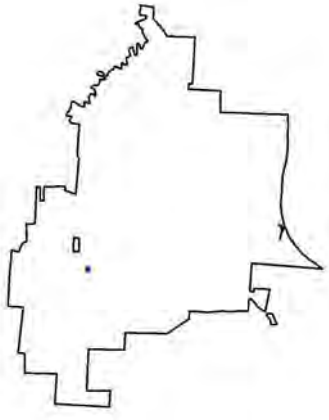
Area (ac) – 0.13

UTM – E 376741

N 3888380

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Liriodendron tulipifera, Acer rubrum, Microstegium vimineum, Osmunda cinnamomea*



Site ID – SHIL 73

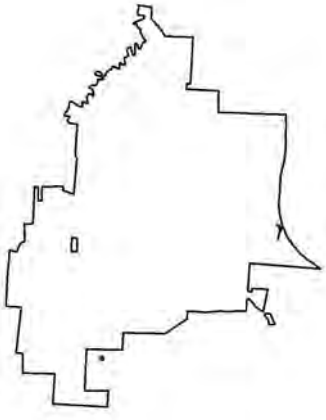
Area (ac) – 0.03

UTM – E 377010

N 3886964

Cowardin Class – PFO1C

HGM Class – Depression



Dominant Species: *Acer rubrum, Liquidambar styraciflua*

Site ID – SHIL 74

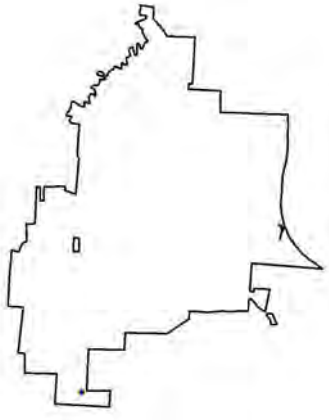
Area (ac) – 0.03

UTM – E 376649

N 3886420

Cowardin Class – PFO1C

HGM Class – Slope



Dominant Species: *Microstegium vimineum, Smilax sp., Vitis sp., Quercus alba*



Site ID – SHIL 75

Area (ac) – 0.19

UTM – E 376206

N 3886885

Cowardin Class – PFO1A

HGM Class – Slope



Dominant Species: *Microstegium vimineum, Vitis sp., Acer rubrum*

Site ID – SHIL 76

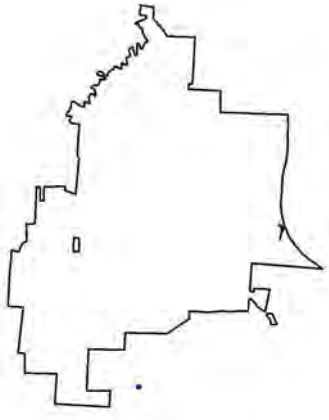
Area (ac) – 0.04

UTM – E 377546

N 3886575

Cowardin Class – PFO1C

HGM Class – Depression



Dominant Species: *Liquidambar styraciflua, Juncus effusus*



Site ID – SHIL 77

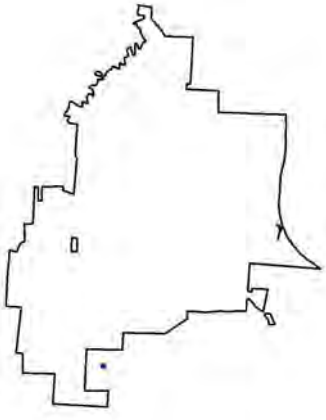
Area (ac) – 0.10

UTM – E 377035

N 3886833

Cowardin Class – PEM1C

HGM Class – Depression



Dominant Species: *Agrostis stolonifera, Eleocharis sp.*

Site ID – SHIL 78

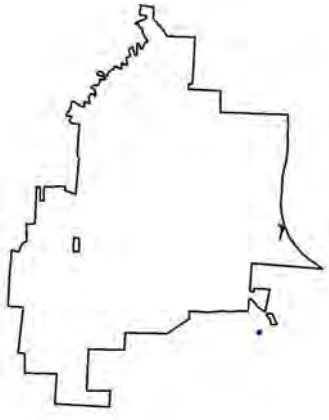
Area (ac) – 0.10

UTM – E 379476

N 3887378

Cowardin Class – PFO1A

HGM Class – Riverine



Dominant Species: *Liquidambar styraciflua, Liriodendron tulipifera, Impatiens capensis, Athyerium filix-femina*



Site ID – SHIL 79

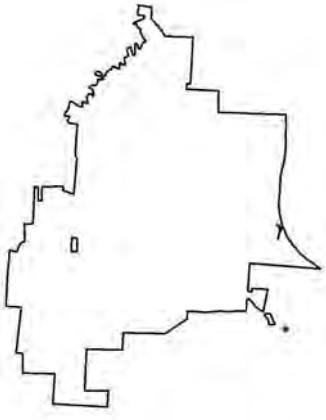
Area (ac) – 0.25

UTM – E 379939

N 3887429

Cowardin Class – PEM1C

HGM Class – Depression



Dominant Species: ***Agrostis stolonifera, Boehmeria cylindrica, Polygonum sp., Salix nigra***



Site ID – SHIL 80

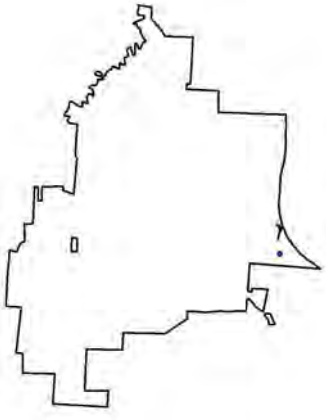
Area (ac) – 0.53

UTM – E 379834

N 3888632

Cowardin Class – PFO1C

HGM Class – Riverine



Dominant Species: *Fraxinus pennylvanica, Acer saccharinum, Diodea virginica, Leersia oryzoides*



Site ID – SHIL 81

Area (ac) – 5.19

UTM – E 379934

N 3888533

Cowardin Class – PSS1F

HGM Class – Riverine



Dominant Species: *Cephalanthus occidentalis, Hibiscus moscharbs, Scirpus cyperinus, Salix nigra*

APPENDIX B

Database Table

SITE_ID	UTM_E	UTM_N	ACREAGE	HGM_CLASS	COWARD_CLA	SUR_WAT_ST	GROUND_DIS	CARBON_NUT	PROV_WILD	SUPP_WET	CULT_VAL	RES_SCI	ECON_VAL	EXOT_PRES
SHIL1	377457	3891285	315.00	Riverine	PFO1C	N/A	High	High	High	Medium	No	Yes-Larger than average size,herpetological research	Yes-Flood attenuation	Yes-Japan grass,Japanese honeysuckle
SHIL2	376818	3890106	0.06	Slope	PFO1A	N/A	High	High	Medium	Low	No	No	No	Yes- Japan grass
SHIL3	378804	3891213	0.02	Depression	PFO1A	High	N/A	N/A	Medium	Low	No	No	No	Yes-Japan grass
SHIL4	378802	3891150	0.03	Flat	PFO1A	Low	N/A	Low	Low	Low	No	No	No	No
SHIL5	379409	3890886	0.14	Slope	PFO1C	N/A	High	High	Medium	Medium	No	Yes-Herpetological research	No	Yes-Privet, Japan grass
SHIL6	379884	3890950	0.540	Depression	PFO1C	High	N/A	Low	High	Low	No	Yes-Larger than average size, Herpetological research	No	Yes-Japan grass
SHIL7	378660	3890056	0.100	Flat	PFO1A	N/A	N/A	N/A	Low	Low	No	No	No	Yes-Japan grass
SHIL8	377852	3890355	32.730	Slope	PFO1A	Low	High	High	Medium	Low	No	Yes-Larger than average size	No	Yes-Japan grass
SHIL9	379266	3890049	0.310	Slope	PFO1C	N/A	High	High	High	High	Yes - Adjacent to trail	Yes-Larger than average size,Herpetological research	No	Yes-Japan grass
SHIL10	379201	3890267	0.060	Slope	PFO1C	N/A	High	High	High	Low	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL11	379475	3889966	0.020	Slope	PFO1C	Low	High	High	High	Medium	No	Yes-Larger than average size	No	Yes-Japanese Honeysuckle
SHIL12	379201	3890267	0.060	Slope	PFO1A	N/A	High	High	Medium	Low	No	No	No	Yes-Japan Grass
SHIL13	379475	3889966	5.200	Slope	PFO1C	Low	High	High	High	Medium	No	Yes-Larger than average size	No	Yes-Japanese Honeysuckle
SHIL14	379090	3889891	0.110	Slope	PFO1C	Low	High	High	High	Medium	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL15	379223	3889928	2.300	Slope	PFO1C	Low	High	High	High	High	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL16	379475	3889994	0.150	Slope	PFO1C	Low	Medium	Medium	Medium	High	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL17	379476	3889891	0.040	Slope	PFO1C	N/A	High	High	Medium	High	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL18	379191	3889939	0.010	Slope	PFO1C	N/A	High	High	High	High	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL19	379073	3889945	0.010	Slope	PFO1C	Low	High	High	Medium	High	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL20	379596	3889615	0.010	Depression	PEM1Cx	High	N/A	N/A	High	Medium	Yes-Adjacent to trail	Yes-Herpetological research	No	Yes-Japan grass
SHIL21	379483	3889594	0.710	Depression	PEM1Ex	High	N/A	Low	High	High	Yes-Archeological, Adjacent to road	Yes-Archeological, Herpetological research	No	Yes-Japan grass
SHIL22	379571	3889733	0.040	Depression	PFO1C	High	N/A	Low	High	Low	Yes-Archeological	Yes-Archeological, Herpetological research	No	No
SHIL23	379437	3889563	0.290	Depression	PFO1Cx	High	N/A	N/A	High	Medium	Yes-Interpretation, Archeology	Yes-Archeology, Herpetological research	No	Yes-Japan grass
SHIL24	379450	3889667	0.470	Depression	PFO1Ex	High	N/A	N/A	High	High	Yes-Archeological	Yes-Archeological, Herpetological research	No	No
SHIL25	379340	3889214	0.250	Slope	PFO1C	Low	Medium	Medium	High	High	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL26	379748	3889070	0.090	Slope	PFO1C	Low	High	High	High	Medium	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL27	379702	3889111	0.030	Slope	PFO1A	N/A	High	High	High	Medium	No	No	No	Yes-Japan grass
SHIL28	379631	3889042	0.630	Slope	PFO1C	Low	High	High	High	High	No	Yes-Herpetological research,Larger than average size	No	Yes-Japan grass
SHIL29	379551	3889015	0.060	Slope	PFO1C	Low	Low	Low	Medium	Medium	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL30	379495	3889018	1.030	Slope	PFO1C	N/A	High	High	Medium	High	No	Yes-Larger than average size, Herpetological research	No	No
SHIL31	379424	3888771	0.020	Slope	PFO1C	N/A	High	High	Medium	High	No	No	No	No
SHIL32	379379	3888700	0.650	Slope	PFO1C	N/A	High	High	High	High	No	No	No	No
SHIL33	376189	3889171	0.010	Depression	PFO1C	High	Low	Low	High	Medium	Yes-Adjacent to road, Interpretation	Yes-Herpetological research	No	No
SHIL34	376026	3888379	2.510	Slope	PEM1C	High	Medium	Medium	High	Medium	No	Yes-Adjacent to the road/Interpretation-Larger than average	Yes-Large depression in floodplain of the creek-cumulative flood attenuation	No

SITE_ID	UTM_E	UTM_N	ACREAGE	HGM_CLASS	COWARD_CLA	SUR_WAT_ST	GROUND_DIS	CARBON_NUT	PROV_WILD	SUPP_WET	CULT_VAL	RES_SCI	ECON_VAL	EXOT_PRES
SHIL35	375884	3888502	0.210	Slope	PFO1C	N/A	Low	Low	Medium	Low	No	Yes-Herpetological research/Larger than average	No	Yes-Japan grass
SHIL36	375892	3888981	0.120	Depression	PFO1Cx	High	N/A	N/A	High	Low	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL37	375643	3888613	0.070	Depression	PFO1E	High	Low	Low	High	Low	No	No	Yes-Depression in a floodplain-cumulative flood attenuation	Yes-Japan grass
SHIL38	375667	3888532	1.420	Slope	PFO1C	Low	Low	Medium	High	Medium	No	Yes-Herpetological research/Larger than average size	No	Yes-Johnson grass
SHIL39	375930	3888387	0.020	Depression	PFO1C	High	Low	Low	High	Low	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL40	375906	3888254	0.200	Slope	PFO1C	Low	High	High	High	Low	No	No	No	Yes-Japan grass
SHIL41	375860	3888171	0.010	Slope	PFO1A	Low	High	High	High	Low	No	No	No	Yes-Japan grass
SHIL42	375848	3888196	0.020	Slope	PFO1A	N/A	Medium	Medium	Medium	Medium	No	No	No	Yes-Japan grass
SHIL43	375794	3887674	0.010	Depression	PFO1C	High	N/A	N/A	High	Low	Yes-Interpretation	No	No	Yes-Japanese honeysuckle
SHIL44	378629	3888749	0.180	Depression	PEM1A	High	N/A	N/A	High	Medium	Yes-Interpretation	Yes-Herpetological research	No	Yes-Lespedeza
SHIL45	377787	3889826	1.330	Slope	PFO1C	Low	High	High	High	High	No	Yes-Larger than average size, Herpetological research	No	Yes-Japan grass
SHIL46	377747	3890019	0.070	Depression	PFO1A	High	Low	Low	Medium	Low	No	No	Yes-Flood attenuation	Yes-Japan grass
SHIL47	376986	3889233	1.350	Depression	PEM1E	High	N/A	Low	High	High	Yes-Interpretation, adjacent to road	Yes-Larger than average size, Herpetological research, Potential restoration site	No	No
SHIL48	378002	3889162	0.040	Slope	PFO1A	N/A	High	High	Medium	Medium	No	No	No	Yes-Japan grass
SHIL49	378928	3887693	0.040	Slope	PFO1C	Low	High	High	High	Low	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL50	379152	3888332	0.007	Slope	PFO1E	Low	High	High	High	Medium	No	Yes-Herpetological research	No	No
SHIL51	379276	3888254	0.010	Depression	PEM1A	High	Low	Low	High	Low	No	No	No	No
SHIL52	379208	3888263	0.010	Slope	PFO1C	Low	High	High	High	Low	No	No	No	No
SHIL53	379260	3888239	0.020	Slope	PFO1C	Low	High	High	High	Medium	No	Yes-Herpetological research	No	No
SHIL54	379291	3888243	0.120	Slope	PFO1C	Low	Medium	Medium	High	Medium	Yes-Interpretation, adjacent to trail	Yes-Herpetological research	No	Yes-Japan grass
SHIL55	379011	3889075	0.020	Slope	PFO1C	N/A	High	High	High	Low	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL56	379028	3889090	0.020	Slope	PFO1C	N/A	High	High	High	Medium	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL57	379090	3889129	0.010	Slope	PFO1C	Low	Medium	Medium	High	Low	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL58	379148	3889152	0.110	Slope	PFO1A	N/A	High	High	Low	Low	No	No	No	No
SHIL59	379176	3889134	0.050	Slope	PFO1C	N/A	High	High	Medium	Medium	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL60	379225	3889127	0.020	Slope	PFO1C	N/A	High	Medium	High	High	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL61	379244	3889132	0.330	Slope	PFO1C	Low	High	High	High	High	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL62	379331	3889141	0.600	Slope	PFO1C	N/A	Medium	Medium	High	High	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL63	379442	3889241	0.040	Slope	PFO1C	Low	High	High	High	Low	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL64	379607	3889238	0.120	Slope	PEM1C	Low	High	High	High	High	No	Yes-Herpetological research	No	Yes-Japan grass

SITE_ID	UTM_E	UTM_N	ACREAGE	HGM_CLASS	COWARD_CLA	SUR_WAT_ST	GROUND_DIS	CARBON_NUT	PROV_WILD	SUPP_WET	CULT_VAL	RES_SCI	ECON_VAL	EXOT_PRES
SHIL65	379680	3889172	0.020	Slope	PFO1C	Low	High	High	High	Medium	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL66	376005	3887828	0.070	Slope	PFO1A	N/A	High	High	Low	Low	No	No	No	Yes-Asiatic dayflower
SHIL67	376012	3887842	0.130	Slope	PFO1C	Low	Medium	Medium	High	Medium	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL68	375982	3888125	0.080	Slope	PFO1C	Low	High	High	High	Low	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL69	376321	3888346	0.150	Slope	PFO1A	Low	Medium	Medium	Low	Low	No	No	No	Yes-Japan grass
SHIL70	376109	3888331	0.020	Slope	PFO1E	Low	High	High	High	High	Yes-Interpretation,adjacent to trail	Yes-Herpetological research	No	Yes-Japan grass
SHIL71	376535	3888230	0.040	Slope	PFO1C	Low	Low	Low	High	Low	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL72	376741	3888380	0.130	Slope	PFO1C	Low	High	High	High	Low	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL73	377010	3886964	0.030	Depression	PFO1C	High	N/A	Low	High	Low	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL74	376649	3886420	0.030	Slope	PFO1C	N/A	N/A	Low	Medium	Low	No	Yes-Herpetological research	No	Yes-Japan grass
SHIL75	376206	3886885	0.190	Slope	PFO1A	N/A	High	High	Low	Low	No	No	No	Yes-Japan grass
SHIL76	377546	3886515	0.040	Depression	PFO1C	High	N/A	N/A	High	Low	No	Yes-Herpetological research	No	Yes-Japanese Bindweed
SHIL77	377035	3886833	0.100	Depression	PFO1C	High	Low	Low	High	High	No	Yes-Herpetological research	No	Yes-Lespedeza
SHIL78	379476	3887378	0.100	Riverine	PFO1A	Low	Low	High	Low	Low	No	No	Yes-Flood attenuation	Yes-Japan grass,multiflora rose
SHIL79	379939	3887429	0.250	Depression	PFO1A	High	N/A	Low	Low	Medium	No	No	No	No
SHIL80	379834	3888632	0.530	Riverine	PFO1A	High	N/A	High	High	High	No	Yes-Herpetological research, larger than average size	No	No
SHIL81	379934	3888533	5.190	Riverine	PSS1F	High	N/A	High	High	High	No	Yes-Herpetological research, larger than average size	Yes-Flood attenuation	No

APPENDIX C

List of Plant Species and Indicator Status

Scientific Name	Common Name	Indicator Status
Acer negundo	Boxelder	FACW
Acer rubrum	Red Maple	FAC
Acer saccharum	Sugar Maple	FACU-
Agrostis sp.	Bentgrass	Unknown
Andropogon virginicus	Broomsedge	FAC-
Arisaema triphyllum	Jack-in-the-Pulpit	FAC
Arundinaria gigantea	Giant Cane	FACW
Asimina triloba	Paw Paw	FAC
Aster simplex	Aster	FACW
Aster sp.	Aster	Unknown
Athyrium filix-femina	Common Ladyfern	FAC
Betula nigra	River Birch	FACW
Boehmeria cylindrica	False Nettle	FACW
Campsis radicans	Trumpet Creeper	FAC
Carex crinita	Fringed Sedge	FACW+
Carex gigantean	Giant sedge	OBL
Carex intumescens	Sedge	FACW
Carex sp.	Carex	Unknown
Carex tribuloides	Sedge	FACW
Carex vulpinoidea	Fox Sedge	FACW
Carpinus caroliniana	American Hornbeam	FAC
Carya cordiformis	Bitternut Hickory	Fac
Carya ovata	Shagbark Hickory	FACU
Carya sp.	Hickory	Unknown
Celtis laevigata	Sugarberry	FACW
Cephalanthus occidentalis	Buttonbush	OBL
Cercis canadensis	Redbud	FACU
Chasmanthium latifolium	Indian Wood Oats	FAC-
Chasmanthium laxum	Slender Woodoats	FACW-
Chasmanthium sessiliflorum	Southern Slender Woodoats	FACW-
Commelina sp.	Dayflower	Unknown
Commelina virginica	Virginia Dayflower	FACW
Conoclinium coelestinum	Mistflower	FACW
Cornus sp.	Dogwood	Unknown
Cyperus sp.	Umbrella Sedge	Unknown
Cyperus strigosus	Umbrella Sedge	FACW
Dichanthelium clandestinum	Deer-tongue grass	FACW
Diodea teres	Buttonweed	FACW
Diodea virginiana	Buttonweed	FACW
Diospyros virginiana	Persimmon	FAC
Echinochloa crusgalli	Barnyard Grass	FACW
Eleocharis linearis	Spike Rush	OBL
Eleocharis sp.	Spike Rush	OBL
Eupatorium perfoliatum	Boneset	FACW

Scientific Name	Common Name	Indicator Status
Eupatorium sp.	Boneset	Unknown
Fagus grandiflora	American Beech	FACU
Festuca arundinaceae	Tall Fescue	FAC-
Fraxinus pennsylvanica	Green Ash	FACW
Hibiscus moscheutos	Swamp Mallow	OBL
Ilex decidua	Deciduous Holly	FACW
Ilex opaca	American Holly	FAC
Impatiens capensis	Spotted-Touch-Me-Not	FACW
Ipomea sp.	Morning Glory	FACW
Juncus effuses	Soft Rush	FACW
Juncus sp.	Rush	Unknown
Juniperus virginiana	Eastern Redcedar	FACU
Justicia americana	American Water Willow	OBL
Leersia oryzoides	Rice Cutgrass	FACW
Lemna sp.	Duckweed	OBL
Lespedeza cuneata	Sericea lespedeza	UPL
Ligustrum vulgare	European privet	NI
Lindera benzoin	Northern Spicebush	FACW
Liquidambar styraciflua	Sweetgum	FAC
Liriodendron tulipifera	Tulip Poplar	FAC
Lobelia sp.	Lobelia	Unknown
Lolium sp.	Ryegrass	Unknown
Lonicera japonica	Japanese Honeysuckle	FAC-
Lycopus americana	Bugleweed	FACW
Lycopus sp.	Bugleweed	Unknown
Microstegium vimineum	Japan Grass	FAC
Mimulus alatus	Monkey Flower	FACW
Nyssa biflora	Swamp Tupelo	OBL
Nyssa sylvatica	Black Gum	FAC
Onoclea sensibilis	Sensitive Fern	FAC
Osmunda cinnamomea	Cinnamon Fern	FACW
Osmunda regalis	Royal Fern	OBL
Panicum rigidulum	Panic Grass	FAC
Panicum sp.	Panic Grass	Unknown
Panicum virgatum	Switchgrass	FAC+
Paspalum sp	Unknown	Unknown
Pinus taeda	Loblolly Pine	FAC
Plantago cordata	Heartleaf plantago	OBL
Platanus occidentalis	Sycamore	FAC
Polygonum hydropiper	Smartweed	OBL
Polygonum hydropiperoides	Smartweed	FACW
Polygonum sp.	Smartweed	Unknown

Scientific Name	Common Name	Indicator Status
Polygonum virginianum	Jumpseed	FAC
Polystichium acrostichoides	Christmas Fern	FAC
Proserpinaca sp.	Mermaid Weed	OBL
Quercus alba	White Oak	FACU
Quercus lyrata	Overcup Oak	OBL
Quercus nigra	Water Oak	FAC
Quercus phellos	Willow Oak	FACW
Quercus shumardii	Shumard Oak	FACW
Ranunculus sp.	Unknown	Unknown
Rhododendron sp.	Rhododendron	FAC
Rubus sp.	Blackberry	Unknown
Rumex crispus	Curly Dock	FAC
Sagittaria sp.	Arrow Arum	OBL
Salix nigra	Black Willow	OBL
Saururus cernuus	Lizard's Tail	OBL
Scirpus sp.	Bulrush	Unknown
Scirpis cyperinus	Woolgrass	FACW
Scirpus atrovirens	Green Bulrush	FACW
Scirpus cyperinus	Woolgrass	FACW
Scirpus validus	Bulrush	FACW
Sericea lespedeza	Lespedeza	UPL
Smilax bona-nox	Greenbriar	FAC
Smilax obtusifolia	Greenbriar	FAC
Smilax rotundifolia	Greenbriar	FAC
Smilax sp.	Greenbriar	FAC
Solanum carolinense	Horsenettle	FACU
Sphagnum sp.	Sphagnum	Unknown
Thelypteris noveboracensis	New York Fern	FAC+
Toxicodendron radicans	Poison Ivy	FAC
Typha latifolia	Cattail	OBL
Ulmus Americana	American Elm	FACW
Ulmus rubra	Slippery Elm	FAC
Urtica dioica	Stinging Nettle	FAC+
Vaccinium sp.	Blueberry	Unknown
Vitis sp.	Grape	FAC

APPENDIX D

Data Forms