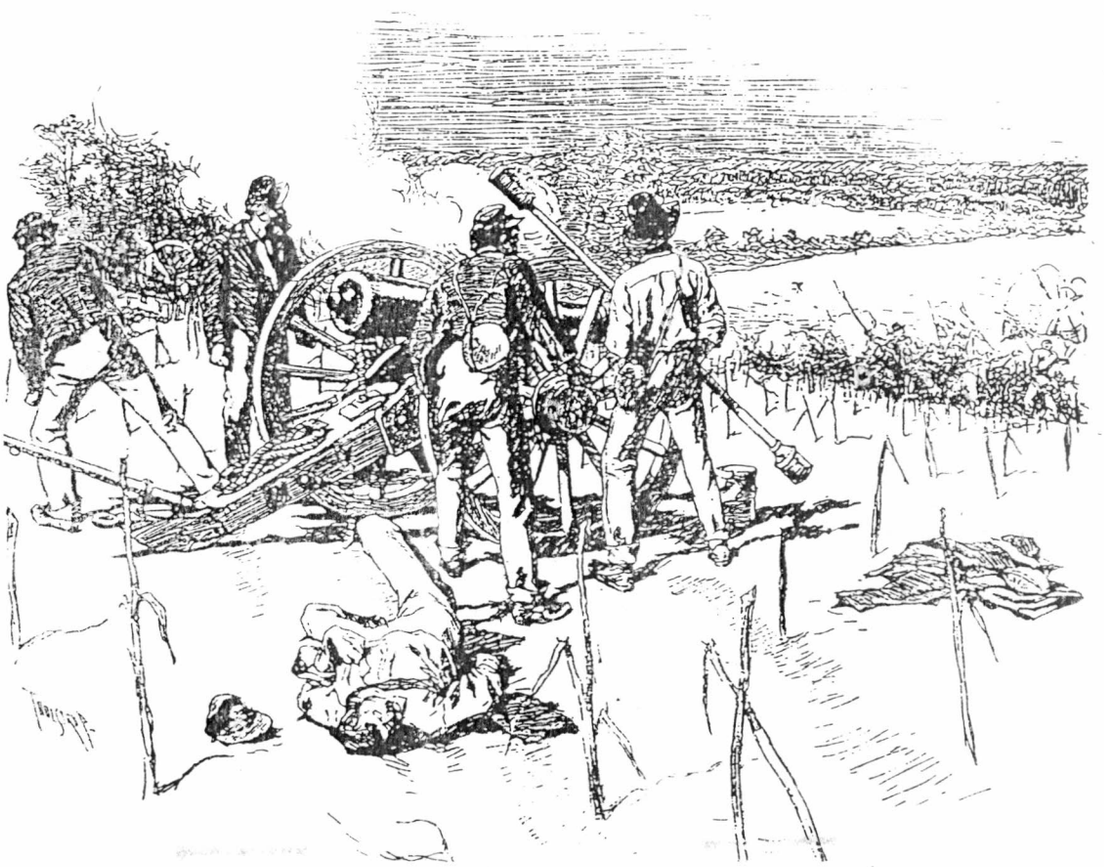
FOREST STEWARDSHIP PLAN

FOR

GLENDALE AND MALVERN HILL,

The Association for the Preservation

of Civil War Sites



North American Resource Management, Inc.
P. O. Box 6777
Charlottesville, VA 22906

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Acknowledgement

Glendale and Malvern Hill Civil War Battlefields lie in Henrico County five miles southeast of Richmond. The management group, The Association for the Preservation of Civil War Sites, Inc., (APCWS) express long term goals to include the establishment of landscape management policies that allow for good stewardship of the land and which preserve existing cultural, historic, and natural resources. Other objectives include appropriate forest stand management techniques, managing timber for income, protecting rare and/or unique natural areas, maintaining a scenic forest and conserving soil and water resources. To achieve these goals, the consulting firm of North American Resource Management, Inc. was asked to prepare a Forest Stewardship Plan. This report presents the result of the inventory and plan proposals developed as the Landscape Management Plan, prepared for APCWS by West Main Design Collaborative and North American Resource Management, Inc. in June, 1995. The information in this report was taken during recent on-site visits to the property. It is designed to be flexible - to be modified and improved as the owners' desires are refined and supplementary inventory data are made available.

This report was prepared by David A. Tice, Vickie H. Tice, R. Clement Riddle and forestry and wildlife staff of North American Resource Management, Inc.

North American Resource Management gratefully acknowledges the firm of West Main Design Collaborative for maps and portions of the Historical and Cultural Significance section.

David A. Tice, President
North American Resource Management, Inc.

Introduction

Location

The Glendale and Malvern Hill battlefields are located in Henrico County, Virginia, five miles southeast of the City of Richmond limits, twelve miles from downtown Richmond. Henrico County crosses three of the physiographic provinces of Virginia: the Piedmont, Fall Zone, and Atlantic coast Plain. Malvern Hill and Glendale are both located within the Coastal Plain province which is primarily underlain by sedimentary rocks such as sandstone and shale. The James River forms the southeastern boundary of Henrico County; at its nearest point, the river lies within two miles of Malvern Hill Battlefield.

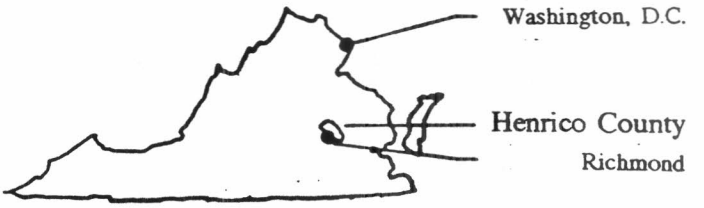
Topography

Slope conditions within the project area are characteristic of alluvial terraces in the Atlantic Coastal Plain Province. Steep slopes (greater than 25%) occur predominately along water bodies such as the James River; at Malvern Hill and Glendale, steep slopes are found along Western Run and along Malvern Hill's western escarpment.

In the northern section of the project area adjacent to Willis Methodist Church and Western Run Farms subdivision, the land is relatively level and reaches a high point of 140 feet above sea level. One observed topographic modification in this area is the mound of soil adjacent to the western, unused, Western Run Farms subdivision cul-de-sac. Western Run and McDowell Creek form the western edge of the project area here; the landform that edges both Western Run and McDowell Creek is more steeply sloped, and forms narrow ravines. Further to the south within the project area McDowell Creek joins Western Run. A broad, woody, marshy area occupies a level area beyond the confluence of these two creeks. Within the marshy area is a remnant earthen mill dam and two borrow pits from which the earth for the dam appears to have been taken. East of the marshy area are two upland terraces. West of the marshy area is a large, relatively level wooded area bisected by Carter's Mill Road. Two sand borrow pits were observed within the woodland occupying the area west of Carter's Mill Road; both appear to have been abandoned. A steeply sloped ridgeline, the Malvern Hill escarpment, forms the western edge of this upland terrace, dividing it from agricultural fields, and beyond, the area known as "The Slash." Within "The Slash," the land is low and level, with wet soils. The elevation at its lowest point in this area is forty-seven feet above sea level. A perennially wet pond and associated wetlands are located in the southwestern corner of the project site.

Glendale and Malvern Hill Civil War Battlefields Landscape Management Plan

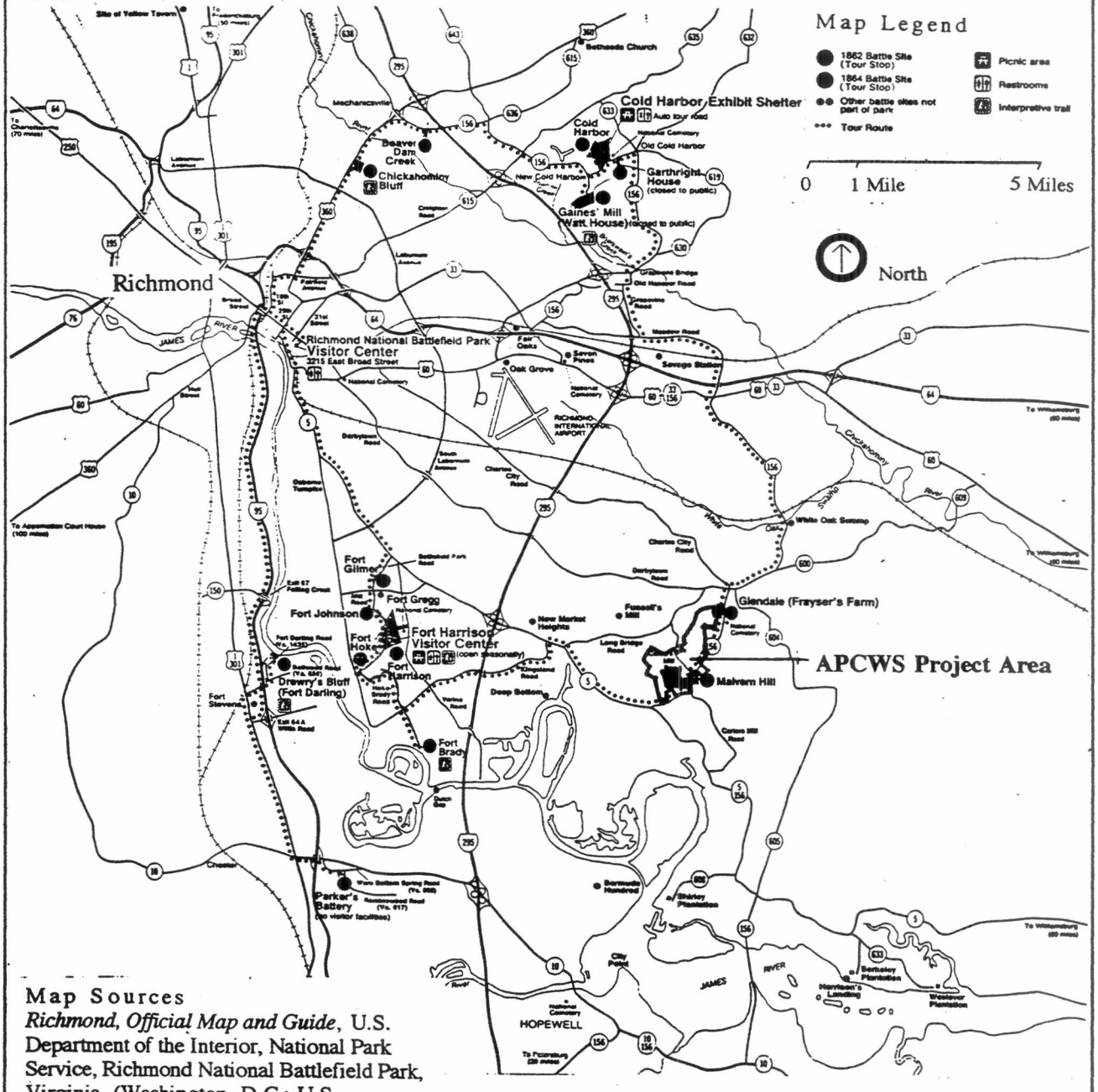
Context and Location Maps



Commonwealth of Virginia

Not to Scale

Context Map



Map Sources

Richmond, Official Map and Guide, U.S. Department of the Interior, National Park Service, Richmond National Battlefield Park, Virginia. (Washington, D.C.: U.S. Government Printing Office, 1992).

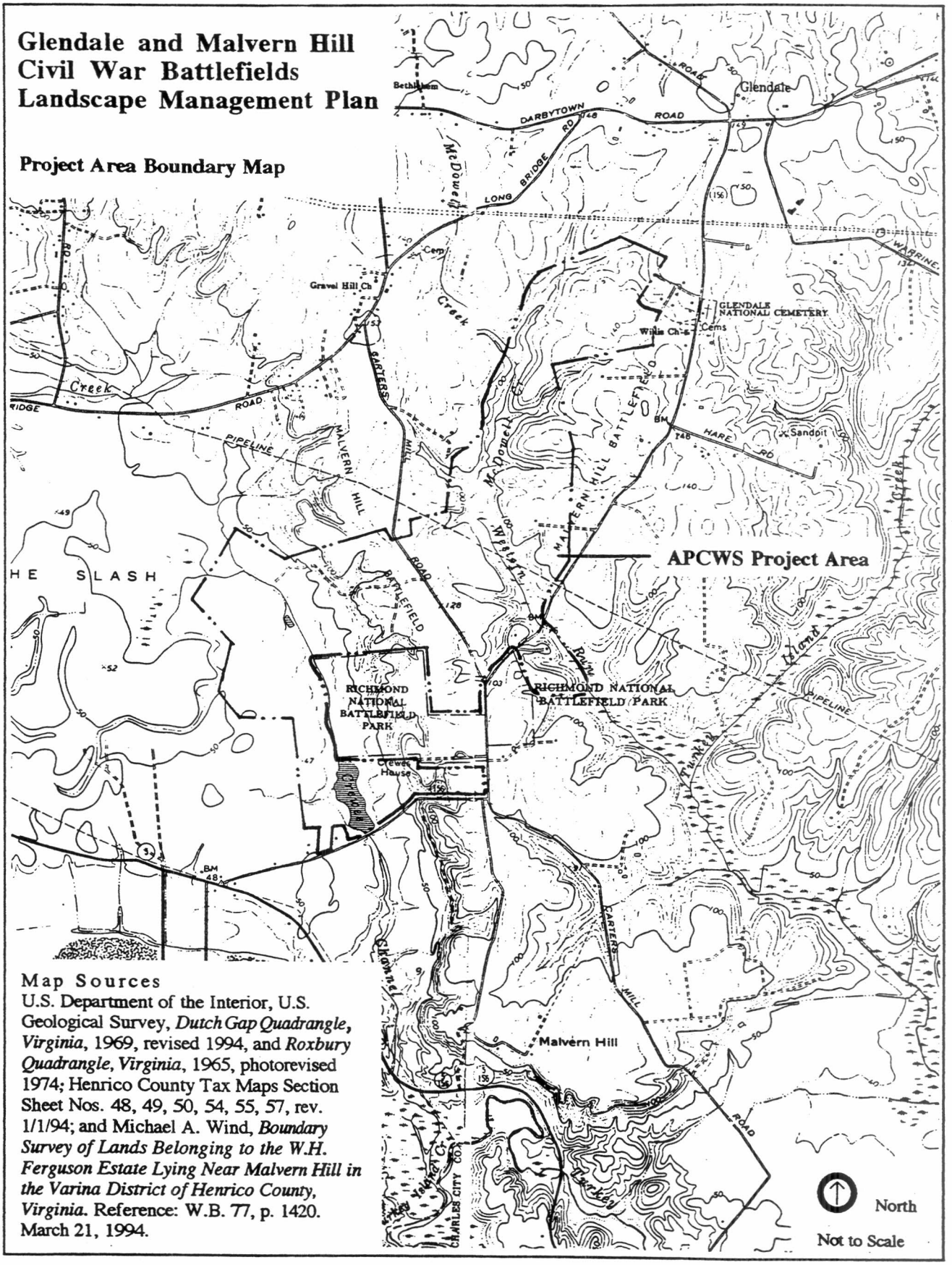
Location Map

Map prepared by WMDC, 1995

Figure A.

Glendale and Malvern Hill Civil War Battlefields Landscape Management Plan

Project Area Boundary Map



Map Sources

U.S. Department of the Interior, U.S. Geological Survey, *Dutch Gap Quadrangle, Virginia*, 1969, revised 1994, and *Roxbury Quadrangle, Virginia*, 1965, photorevised 1974; Henrico County Tax Maps Section Sheet Nos. 48, 49, 50, 54, 55, 57, rev. 1/1/94; and Michael A. Wind, *Boundary Survey of Lands Belonging to the W.H. Ferguson Estate Lying Near Malvern Hill in the Varina District of Henrico County, Virginia.* Reference: W.B. 77, p. 1420. March 21, 1994.

Map prepared by WMDC, 1995

Figure B.

Historical and Cultural Significance

Glendale and Malvern Hill are situated in an area of significant historical note. A brief review of its features follows.

Pre-European Settlement to the Civil War

The landscape facing the newly arrived English settlers had never been subject to a legal property regime, and appeared to be free of all recognized property claims. Although politically unrecognized by the settlers, a fairly well-organized confederacy of native tribes known as Powhatan--also the name of its ruler at that time--inhabited Tidewater Virginia. There were at least six tribes within a fifty-mile radius of the headwaters of the James River, just below the present day city of Richmond: Arrohattoc, Appomattoc, Mattaponi, Pamunkey, Powhatan, and Youghtanund. The confederacy had three distinct settlements which functioned as residences for the ruler Powhatan, one of which was located below the falls and described by Captain John smith as being sited on high ground overlooking the river, with twelve lodges surrounded by cornfields. The other two villages, Orapakes at the head of the Chickahominy River, and Werowocomoco, closer to the Jamestown Fort, were connected by a well-worn series of trading paths, which either were identical to, or lay parallel with a later colonial trade route between Richmond and Williamsburg known as Market or River Road (present day Route 5). Illustrations published by Captain John Smith and later historians recorded the native agrarian landscape as characterized by a hierarchy of palisaded villages, outlying lodges, fields, and woodlands.

The English settlers intended to establish settlements and industrial sites along what they claimed for England as the James River, fortify them, and begin a rudimentary process of town planning. In 1611, "Henrico Town" was established by Sir Thomas Dale on present day Farrar's Island as a seven-acre blockaded site, mirroring Jamestown's attempt to promote colonization in the form of a fortified company town with little outlying occupation. After the arrival of a representative government by means of a House of Burgesses in 1619, a more expansive policy was pursued with respect to settlement: in addition to nearly 11,000 acres of land set aside of a University and College at Henrico Town, the system of headrights was established.

Specifically, the headrights act instituted a policy of granting 50 acres per new colonist to the individual who arranged for their transportation from England, this acreage deemed as the minimal amount for subsistence in the new land. What this system accomplished, in reality, was to allow for a burgeoning trade in land speculation and large-scale importation of labor. Immense land patents were granted for the patrons of ships full of English, Irish, and Scottish immigrants, some of whom became indentured servants on the tracts of land that had been exchanged for their arrival in Virginia. Richard Cocke received a patent for 2,000 acres in 1639 for land "upon the head of Turkey Island Cr. called by the name of mamburne

failing to capture Richmond with a naval force, McClellan directed the Army of the Potomac to enter overland from the east. The first skirmish on June 26, 1962 near Mechanicsville convinced McClellan to retreat south, also ordering his naval force to relocate to Harrison's Landing on the James River. During the next few days, General Lee and General McClellan's army met several times. The final engagements of the Seven Days' Battles, occurred on successive days at Glendale and Malvern Hill. The campaign resulted in horrific casualties on both sides, however General Lee was able to prevent the North in its first attempt to capture Richmond.

The Battle of Glendale/Frayser's Farm

The engagement known as Glendale or "Frayser's Farm" was perhaps the best opportunity throughout the bloody battles of the Seven Days for the Confederate army tot rap Federal forces into surrender. Since McClellan's "change of base" strategy entailed funneling the entire Army of the Potomac through the vicinity known as the "Crossroads" in order to get to the James River, Lee's strategy focused on positioning his troops to sever Federal forces in half as they narrowly marched down Willis Church Road to Malvern Hill. The "Crossroads," another name for this part of eastern Henrico county, described the crucial intersection of a network of roads along which the Federal troops, cattle and supply trains moved in retreat; it also referred to the community of farms such as Whitlock, Nelson ("Frayser"), Riddell's blacksmith shop and farm, and Willis Methodist Church. The control of the roads was pivotal: Long Bridge, Charles City, Darbytown, and most important, Willis Church (labeled "Quaker Road" on maps dating from 1853, as well as most Civil War maps). In particular, the strategically critical Willis Church Road was the most vulnerable for the Federals since it was the quickest, direct route to the river, and had to be defended at all costs.

Lee organized his command so as to position Gen. T. J. "Stonewall" Jackson's men (four divisions numbering about 25,000 soldiers) to hold McClellan's rear guard at the other vulnerable point to the north, White Oak Swamp crossing, thereby separating the Federal forces. The remaining six Confederate divisions, some 44,000 men, were to converge at the Crossroads in order to overwhelm the remaining Federals en route to the river via Willis Church Road. Generals A. P. Hill and James Longstreet (as well as General "Prince" John Magruder) approached the intersection from the north and west via Darbytown and Long Bridge roads; the ineffectual General Huger - whose men and batteries were supposed to plan an opening role in the engagement - slowly moved his forces toward the site on Charles City Road. At some point, Lee made the decision to attack the Federal forces already at Malvern Hill with the artillery and men of Gen. Theophilus H. Holmes, who approached the area along the southerly River Road. The plan was, in essence, a triangular trap.

McClellan had nearly two-thirds of his Army of the Potomac at White Oak Swamp and Glendale, totalling 62,500

took advantage of the situation by ordering Col. Henry Hunt to position a daunting defense of artillery covering an entire sweep of the field in front of them from east to west. Specifically, the Federal line ran on a west-east axis extending from the cliff behind the Crewes/Mettert house across Willis Church Road to the West house and farm buildings. Most of the Porter's Fifth Corps was involved, as well as Gen. Couch's Fourth Corps division. McClellan, concerned about a perceived weakness on the right flank just below the ravines of Western Run, stationed the rest of the Army of the Potomac on this flank, which consisted of the remaining forces of Heintzelman (Third Corps), Sumner (Second Corps), and Franklin (Sixth Corps). Thus, Federal forces occupied the farms of Crewes/Mettert, West, James Binford, and B. F. Dew in the form of an invested "U," with the open area facing due south toward the James River.

After the opportunity to sever the Federal army was lost at Glendale/Frayser's Farm, Lee's sense of urgency was at its peak. The pursuit of McClellan clearly had no more than a day left before Federal forces reached safety at Harrison's Landing on the James River. Although it seemed that the Confederates were "on a hot trail," General D. H. Hill had gathered information affirming the prominence of the Federal defense and the topographic difficulty of a frontal assault moving up an open field under what would surely be incredible artillery fire. Hill's objections were overruled; supported by his other generals, Lee was determined to smash the Federal line with an overwhelming assault. His plan was to deploy Confederate forces in such a way as to overwhelm the narrow (1,200 yard wide) - but densely packed - line of men and artillery, and break the defense before reinforcements could be called in. Following crossfire from two separate artillery positions designed to soften the Federal line, a Confederate infantry assault was to begin by one of Huger's commanders, Gen. Lewis Armistead, to be followed by the rest of Huger's forces, and those of Jackson and Magruder.

A combination of poor communication between the Confederate generals, critical delays in troop movements, and the overwhelming topographic disadvantage of attacking from low, wooded, and swampy ground up and across open fields turned Malvern Hill into a disastrous battle for Lee's Army of Northern Virginia. After Confederate batteries - which never went into full service that afternoon - were silenced by the more powerful Federal artillery, it was apparent that the frontal assault would proceed against the worst odds. Magruder, supposed to be marching down Willis Church Road behind Jackson, again found himself on the wrong "Quaker Road," and arrived hours late to his position; only two brigades of Huger awaited him on the field for the opening of the assault. Jackson's division contributed virtually nothing to be battle of that day. General Lewis Armistead, ostensibly under Huger's command, had already charged the field to chase back Berdan's Federal sharpshooters; in doing so, however, they reached the ravine just north of the Crewes/Mettert house and were unable to advance or withdraw due to the artillery fire.

agricultural drainage ditches north and southwest of the Crewes/Mettert house.

Further investigation is needed to ascertain whether the site across Willis Church Road from the Parsonage ever contained an outbuilding referred to in some historic maps as "C.W. Smith's blacksmith shop." At least one historic record - which served as the basis for historic period maps - indicated that General Lee used the shop for a temporary headquarters during the Battle of Malvern Hill.

Soils

Soils identified within the project area are based on the Henrico County Soil Survey and fall into one of three soil associations: Kempsville-Atlee-Duplin; Ochrepts and Udults-Norfolk-Caroline; and Angie-Pamunkey-Lenoir. The Kempsville-Atlee-Duplin Association consists of deep, well drained and moderately well-drained upland soils with a dominant sandy clay loam or clay subsoil. Ochrepts and Udults-Norfolk-Caroline Association soils are deep, moderately well-drained to excessively drained uplands soils consisting primarily of sandy clay loam or clay below the surface layer with some gravelly areas. Angie-Pamunkey-Lenoir Association soils are deep, moderately well drained, well drained or somewhat poorly drained soils on stream terraces with silt clay loam or clay subsoil. These soils generally run across the project area from east to west in linear bands, with Kempsville-Atlee-Dupelin soils found to the north, Ochrepts and Udults-Norfolk-Caroline Association soils in the central portion of the project area, and Angie-Pamunkey-Lenoir Association soils to the south. Many of the soils in the project area are not suited to septic tank absorption fields, dwellings with basements, or roads and streets due to such factors as low to moderate permeability, the presence of a fragipan, high water table, clayey subsoil, flooding, or shrink swell tendencies. Many of the soils are, however, well suited to agricultural crops or woodland production, especially pines, due to strong acidity and low fertility.

Soil Descriptions

Ag - Angie:

The Angie series consists of deep, moderately well drained, nearly level to moderately steep soils that have a thick, dominantly clayey subsoil. These soils formed in loamy and clayey alluvium on terraces of rivers and streams.

At - Atlee:

The Atlee series consists of deep, moderately well drained, nearly level soils that have a week fragipan at a depth of 22 to 30 inches. These soils formed in Coastal Plain sediments.

Ca - Caroline:

The Caroline series consists of deep, well-drained, gently sloping to sloping soils that have a thick, well-drained, gently sloping to sloping soils that have a thick, dominantly clayey subsoil. These soils formed in loamy and clayey Coastal Plain sediments.

Cg - Chastain:

The Chastain series consists of deep, poorly drained, nearly level soils that have a clayey subsoil. These soils formed in clayey and loamy alluvium on the flood plains.

brown, and brown to yellowish red. The underlying layers range from sand and fine sand to clay, and some are gravelly to extremely gravelly. The underlying layers are gray to red, and they are mottled in many areas of the finer textured soils. Springs and seepage areas are common, especially along the lower parts of the steeper slopes. The soil material is moderately well drained to excessively drained.

Ro - Roanoke:

The Roanoke series consists of deep, poorly drained, nearly level soils that have a dominantly clayey subsoil. These soils formed in alluvium, mostly on terraces.

Ru - Ruston:

The Ruston series consists of deep, well-drained, nearly level to sloping soils that have a thick loamy subsoil. These soils formed in Coastal Plains sediments.

Ss - Sassafras:

The Sassafras series consists of deep, well-drained, nearly level to gently sloping soils that have a loamy subsoil. These soils formed in Coastal Plain sediments.

St - State:

The State series consists of deep, well-drained, nearly level to sloping soils that have a loamy subsoil. These soils formed in alluvium on high river terraces.

Tu - Turbeville:

The Turbeville series consists of deep, well-drained, nearly level to sloping soils that have a thick, dominantly clayey subsoil. These soils formed in alluvial materials that are above and some distance from present stream channels.

Soil Characteristics, Malvern Hill Battlefield

SOIL TYPE		Woodland Suitability Group	Site Index				Seasonal High Water Table
			Northern Red Oak	White Oak	Yellow Poplar	Loblolly Pine	
			(feet)	(feet)	(feet)	(feet)	(depth - feet)
Ag	Angie Loam	3o	65-75	65-75		70-80	1.5-2.5
At	Atlee very fine sandy loam	3o	65-75	65-75		70-80	1.5-2.5
Ca	Caroline very fine sandy loam	3o	65-75	65-75		70-80	>5
Cb	Caroline clay loam	4c	55-65	55-65		65-75	>5
Cg	Chastain silt loam	3w				75-85	0-1
Cm	Chewacla/Riverview	1w	85+	85+	95+	95+	1.5-2.5
Du	Duplin very fine sandy loam	3o	65-75	65-75		70-80	1.5-2.5
Ke	Kempsville fine sandy loam	3o	65-75	65-75		75	>5
Kn	Kinston/Mantachie	2w	70-80			85-95	0-1
Le	Lenoir silt loam	3w	65-75	65-75		75-85	1-1.5
Ly	Lynchburg fine sandy loam	2w	70-80	70-80		85-75	1-1.5
Mc	Mantachie/Chastain	3w				75-85	1-1.5
No	Norfolk fine sandy loam	3o	65-75	65-75		70-80	>5
OUD	Ochrepts/Udults, sloping	2o	75-85	75-85	85-95	85-95	
OUF	Ochrepts/Udults, steep	2r	75-85	75-85		85-95	
Ro	Roanoke silt loam	1w	85+		95+		0-1
Ru	Ruston fine sandy loam	2o	75-85	75-85	85-95	85-95	>5
Ss	Sassafras fine sandy loam	3o	65-75	65-75		70-80	>5
St	State fine sandy loam	3o	65-75	65-75		70-80	>5
Tu	Turbeville fine sandy loam	3o	65-75	65-75		70-80	>5

Woodland Suitability Group:

1st digit = relative potential productivity for indicator tree species
(1=very high; 2=high; 3=moderately high; 4=moderate)

2nd part = important soil property associated with a moderate or severe limitation
(o=few limitations; c=clay in upper part of soil; w=water in or on soil; r=steep slopes)

Site Index = average height that dominant trees of this species can attain at age of 50 years

Hydrology

There are three perennially-flowing streams located within the project area: Western Run, McDowell Creek, and Crewes Channel (also known as Turkey Run). These streams drain into Turkey Island Creek, which flows south into the James River. The banks of both McDowell Creek and Western Run are steeply sloped; the creeks are forty to sixty feet below the elevations of the upland terraces of Malvern Hill and the farmland near Western Farm Subdivision. A forested wetland occupies the low, level area below the confluence of Western Run and McDowell Creek. An emergent wetland and pond are located west of Crewes/Mettert house along State Route 156. The western portion of the project area abuts "The Slash," a large wetland and forest located on an alluvial terrace associated with the James River. There is also a man-made farm pond located adjacent to the upper agricultural fields in the northwestern corner of the project area. Ditches constructed many years ago to drain agricultural fields have altered hydrologic conditions; in particular, wetlands have been drained along Crewes Channel.

Groundwater in the coastal plain province generally is found in water table aquifers that average thirty feet in depth. Artesian aquifers often lie below the water table aquifers. Because these aquifers are slowly recharged by groundwater, which is susceptible to pollution from many sources such as septic leach fields, development, and agricultural, proposals for land use and development in coastal plain areas need to take into consideration groundwater and aquifer hydrology.

Wildlife

Natural Heritage

Natural Heritage resources are defined as the habitats of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic foundations. A review of these resources was conducted, with the Department of Conservation and Recreation's Division of Natural Heritage, to determine the potential occurrence of animals and plant species listed as endangered or threatened by current state and federal legislation. Neither our field examinations nor our investigations of the Virginia Natural Heritage Program database revealed any known rare or endangered species on the property. Bald eagles, however, nest in the proximity of the property and occasionally forage in the area.

Historical Note

Due largely to land cover changes and hunting, the faunal component of the natural system has been altered dramatically by 1862. Deer, turkey, beaver, and waterfowl populations were very low, if not extirpated. Information related to bald eagle populations in 1862 is rare, but based on the extent of forest cover along the river systems, it is likely that eagles were not abundant. Forest interior breeding species, including many warblers, were also uncommon due to the low extent of forest cover and the common practice of allowing domestic animals to graze woodlands. Non-game species of early successional habitats were likely abundant. River and stream systems are ecologically significant as corridors of migration for large numbers of both plant and animal species.

General Wildlife Management Guidelines

Certain wildlife enhancement projects fit well with the objectives of APCWS. In addition to providing habitat for a variety of animal species, the project area may provide an important migratory-bird flyway link to nearby identified habitats such as "The Slash" and nearby Presquile National Wildlife Refuge. Therefore, protection and enhancement of existing habitat and creation of additional habitat should be undertaken for the project area. Recommendations related to this goal include:

- convert fescue to native grasses

- Patches of fescue are present in various areas of the project area, notably in the non-crop areas of the agricultural fields and croplands, the Colonial Pipeline easement corridor, along roadways, and in the yards of houses. Fescue is both historically incorrect for the 1862 period and does not support wildlife. Wildlife avoids fescue in preference to just about any other plant species.

There are a number of appropriate native

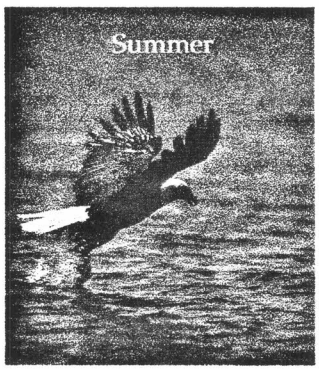
insects. However, there are few fruits and insects in winter so most winter visitors depend on seed-bearing plants. Likewise, summer visitors tend to be those species that have evolved to feed primarily on insects which thrive in a diversity of plant types.

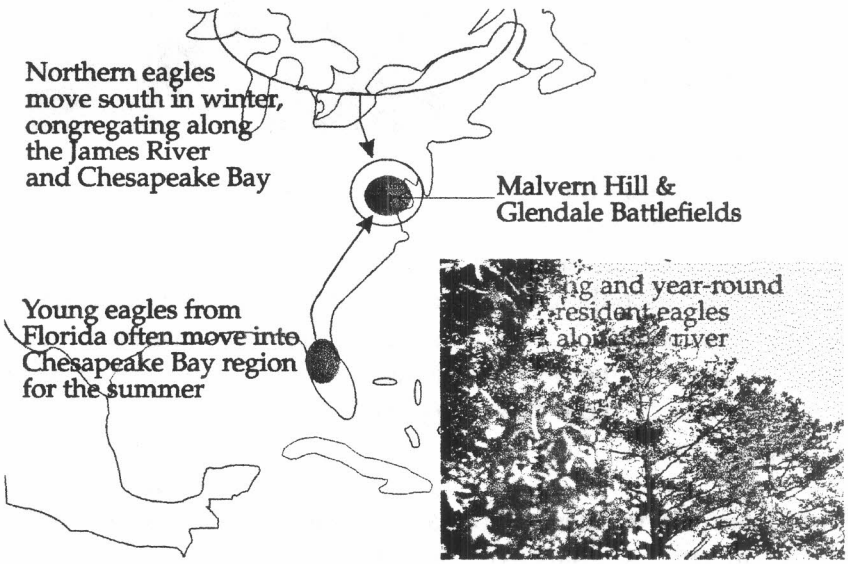
By providing mixed habitats that support all food types over the course of a year, it is possible to support all bird species that might occur in that area. If all types of management can not be undertaken, an assessment should be made regarding which groups of birds is in the most need of proper management, and habitats suited to their needs can be provided.

exotic plants should be removed

BALD EAGLE BIOREGIONAL DYNAMICS







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NORTH AMERICAN RESOURCE MANAGEMENT, INC.
P.O. Box 6777, Charlottesville, VA 22906 (804) 975-1390 Fax:(804) 975-1391



Nest site characteristics

Eagle nesting sites are most commonly located within 1km of water along sparsely developed shorelines. Nest site characteristics:

- species - most (>60%) nests are in loblolly pine. Other nest tree species include shortleaf pine, Virginia pine, white oak, chestnut oak, northern red oak, swamp white oak, southern red oak, willow oak, yellow-poplar, beech, hickory, sycamore and sweetgum. None of these species, except loblolly pine, account for more than 10% of the nesting.

- tree size - nest trees typically are large super-canopy trees. Mean nest tree heights in Virginia and Maryland are 30m and 23m, respectively, versus average tree height of the surrounding stands of 17m.

  Mean nest tree diameters in Virginia and Maryland are 57cm and 62cm, respectively, versus 39cm for the average tree in surrounding stands.

Roosting site characteristics

Roost trees also stand out among the surrounding forest. In the northern Chesapeake Bay, a study revealed mean diameter of roost trees (74cm) nearly double that of the average tree (39cm).

Roosts are virtually always in forest blocks of at least 100 acres, typically in areas of little or no development and adjacent to good foraging habitat.

Species most often used for roosting include oaks, beech, yellow-poplar, and loblolly pine. Species does not seem to be as important a factor for roosting sites as tree size, habitat, location and branch configuration.



Perching site characteristics

Hunting is usually conducted from a perch. Widely distributed perch trees are important to eagles, as most fish captures occur within a short distance from the perch.

Perch trees also tend to be significantly larger than the average shoreline tree - 53cm in diameter versus 34cm in a northern Chesapeake study.

Habitat Improvement Practices

Every animal must live somewhere, but all animals cannot live everywhere. Each species of animal needs a particular environment in which to live and landowners must be aware of those things in that environment that wildlife need to survive and reproduce. Landowners and resource managers should be cautious when considering alterations to wildlife habitat; when you alter the habitat of one species, you enhance or affect the habitat of another. From a long term perspective, management practices do not destroy ecosystems; they only temporarily modify them and change the assemblage of species comprising the ecosystem.

As with humans, wild animals have specific requirements that their habitat must provide, including food and water for nourishment, cover from weather and predators, space to gather food in and attract mates, and safe corridors between habitats. Factors that affect wildlife basically fall into two categories: 1) "welfare factors," those factors that contribute to the well-being of an animal, and 2) "decimating factors," those factors that contribute to the demise of an animal. This section is concerned mainly with welfare factors (i.e., food, cover, water, space, and corridors).

Create new habitat

Brush piles - All animal need dense cover throughout the year for various reasons such as concealment and protection from predators, protection from severe weather, resting, or loafing cover. In areas where dense tangles of brush and vines are absent or limited, artificial brush piles can be constructed to provide much needed cover for ground nesting birds, rabbits, songbirds, and other small animals.

Brush piles should be constructed along forest edges and in openings, field corners, or along the margins of streams and marshes. Brush piles should be situated near grassy areas or cultivated lands so that food and nesting habitat can easily be found near the protective cover of brush piles. In open areas where cover is lacking, three to four brush piles per acre should be constructed. Along woodland borders, one brush pile sited every 200 to 300 feet will provide adequate cover as well as travel lanes to other areas..

Brush piles should be built in conjunction with land clearing or forest thinning operations. The materials used for brush pile construction will depend upon what is locally available. Rot resistant trees, such as oats and locust, make durable bases for the brush piles as do waste lumber or timbers. The base of the brush pile should be formed by placing alternate layers of logs at right angles to one another. The logs used should be at least six inches in diameter and spaced six to ten inches apart in each layer. To increase the durability of the brush pile, the base layers may be stacked on top of stones or around large stumps. It is important to remember that

usable location), 3) what is needed physiologically by the consumer, and 4) the habits of the species, including skills in locating food items. The animal's adaptations to a type of food in turn affect the physiology and habits of the animal. Depending on their food habits, wildlife are classified as carnivorous (eat meat), herbivorous (eat only plants), or omnivorous (eat a variety of plant and animal food items). Thus, having a variety of wildlife species will require a variety of food types to meet the food needs of the desired species.

For carnivorous, predatory animals, food availability means prey availability. Predators generally do not experience problems with diet quality because most animal matter is nutritionally complete and easy to digest. Even though carnivores expend a large amount of energy in searching for, chasing, capturing, and killing their food, this expenditure of energy is offset by the high nutrient content of animal matter.

Herbivores can become stressed from either lack of food (quantity) or by a shortage of nutritious foods (quality). Therefore herbivores do not feed randomly in the environment. They exhibit food preferences which can be summarized as:

1) preferred foods - utilized first and for as long as they remain available; generally are nutritious;

2) staple foods - will maintain body weight and are highly nutritious; 3) emergency foods - will not maintain body weight and vitality over prolonged periods of time; and,

3) "stuffer" foods - consumed for bulk only, no nutritional value.

Food quality and palatability may vary substantially depending upon:

1) presence or absence of toxins which are avoided by experience;

2) seasonal changes in chemical and physical composition;

3) geographical variations of forage species; and,

4) intraspecific differences between plants.

Both availability and quality of food are important factors in wildlife nutrition. Animals can become malnourished (lack of food quality) if the wrong foods are present or starved (lack of quantity) if food is unavailable due to covering by sleet or snow, characteristics of the plants (food is too high in a bush or tree), topographic features such as cliffs or rivers, and artificial features such as highways. Supplemental feeding of wildlife often is not economically feasible nor biologically desirable. Management efforts should concentrate on providing appropriate natural foods in sufficient quantities where they can be utilized.

crowded conditions. Space requirements (as a function of habitat quality and quantity) essentially determine the carrying capacity, i.e. number of animals the site will support, of the site for wildlife.

Carrying capacity may be increased by enhancing the quantity and quality of the wildlife habitat components.

Spatial Heterogeneity The spatial relationship of welfare factors and their relative abundance largely determines which wildlife species can survive in a given area and in what numbers. Within any area, food, water, or cover may be unused because they are too far from the customary travel lanes of animals in the area. Ecotones, more commonly called **edges**, are important to wildlife because the boundary between two adjoining habitats contains components of each type and can thus satisfy the needs of a greater diversity of wildlife species than any one habitat type alone can. Some wildlife species live only within the edge, others live both in the edge and the adjoining habitat (e.g., bobwhite quail, cottontail rabbit, white-tailed deer), while others live exclusively within the interior of a particular habitat type (e.g., forest interior species).

Maximizing edge and increasing horizontal diversity usually will increase the number of species present. However, not all species benefit from an increase in edge. Species dependent upon large, unbroken tracts of habitat (e.g., some species of migratory birds) may decline as habitats are bisected or segmented into smaller discrete units in an effort to produce more edge. Therefore, landowners must clearly state their management objectives and be made aware of the consequences of their actions.

There are two types of edge, inherent edge and induced edge. Inherent edge occurs as a result of natural features of a site, such as soil, water, and topography. These edges are long-lasting, relatively stable features of the landscape. They can be changed rapidly by some catastrophic occurrence or slowly by processes such as erosion. Induced edges exist where two different successional stages abut, and may be created by fire, wind, logging, planting and seeding, and other disturbances. Induced edges are typically short-lived phenomena, lasting only a few years or decades before blending into the landscape. There is, obviously, enormous scope for creating induced edge, but potential consequences on wildlife must be considered prior to creating edge.

Keep in mind: an increase in edge may not be beneficial to all wildlife. For example, forest interior species do not benefit from more edge. Predation and parasitism, particularly of songbirds, typically are greater in edge. Therefore, edge sometimes has been called an **ecological trap.** Further, an improvement in the welfare factors provided by an increase in edge may stimulate population growth of selected species, such as deer. Should population growth exceed the capability of the habitat to satisfy food demands, a substantial reduction in health and natural regeneration of shrubs, trees, and other herbaceous cover may result.

Leave Areas of Older Trees When harvesting timber from any appreciable acreage, leave some areas with good mast-producing trees. This will ensure a dependable food source for many wildlife species while forest regeneration is occurring.

Maintenance of Cavity Trees Snags and/or "wolf trees" with cavities should be left standing during and after any timber harvest. These trees provide nesting, foraging, and winter cover for a variety of wildlife species. Standing snags do not hurt forest regeneration, and they provide an important habitat component of the future young timber stand.

If you must remove some snags or wolf trees, leave the largest sound trees with existing cavities. When possible, six to eight large well-spaced cavity trees per acre should be left standing in any timber harvest.

Woody Debris Management During a timber harvest, hollow logs, tree tops, and limbs remain after the removal of the merchantable timber. A patchy distribution of limbs and tree tops in piles or short rows provides habitat for a variety of wildlife species. Logging debris can be "windrowed" and left along the outer edges of the cut. Do not leave debris in or near stream or drainage area. On slopes, orient the logs along the contours and place them near stumps if possible. This reduces runoff and siltation problems and provides drumming logs for ruffed grouse.

Log Landings/Skid Trails Log landings and skid trails should be seeded with a mixture of legumes or grasses-legumes to provide brood habitat and feeding areas for wildlife. These permanent, grass-legume woodland openings can be maintained by controlled burns, selective herbicide application, bush-hogging, or manual removal of woody material once every five years.

Maintaining Soft Mast Species like dogwood, wild grape vines, black cherry, greenbriars, and sassafras should not be removed during a timber harvest or during site preparation. Soft mast-producing trees, shrubs, and vines are very important food sources for many forest wildlife species. Maintaining plenty of good soft mast producers within any timber stand is essential for ruffed grouse and a variety of other wildlife species.

Stream, Creek, and Drainage Management Riparian zones are lands adjacent to streams, rivers, lakes, and wetlands. They are highly productive ecosystems because they receive nutrients, water, and energy from the adjacent uplands. They are important habitats for wildlife because the vegetation is unique and diverse. Riparian zones tend to be linear and provide travel corridors between other habitat types. Riparian zones are vitally important for fish because the overhanging vegetation provides cover, and the shade prevents extreme temperature fluctuations harmful to aquatic organisms. Special riparian areas that contain older trees, wetlands, threatened or endangered species, or unique scenic values should be considered for management on a case-by-case basis.

and wood duck populations can be increased locally by the erection of artificial nest boxes in woodlots where natural cavities are scarce. Cavity trees suitable for wildlife should exist at a rate of no less than 6 to 8 per acre. If you survey your woodlot and find less than this number, you can supplement natural cavities with artificial nest boxes. A squirrel box may have screech owls, kestrels, deer mice, flying squirrels, gray squirrels, or fox squirrels using the box within a few years time. Because many predatory animals are attracted to these sites, it is wise to place a predator guard under the nest box.

Habitat Management Practices for Agricultural Areas

A major problem facing "small game" is the lack of suitable reproductive and winter cover. The use of heavy, sod-producing grasses, such as KY 31 tall fescue, has almost eliminated this type of cover. Good management for small game makes use of techniques that disturb the soil on a frequent basis (every three to five years). Several methods to create soil disturbances beneficial to small game are described below.

Fallow fielding and Crop Rotation One way to create small game cover is to incorporate a crop-rotation practice which will let recently cropped lands lie idle for a period of time. A crop-rotation pattern, such as corn, winter wheat, soybeans, hairy vetch (two years) back to corn, will produce good results. Another good crop-rotation pattern might be corn, winter wheat, and a legume 9 two-years). You might also consider a rotation of corn or milo followed by three years of fallow field back to the row crop. Whatever crops you plan, including a year or two of fallow fielding or legume cover in the rotation will benefit many wildlife species.

Strip Discing or Plowing In less intensive agricultural situations (like an old field pasture or abandoned area), soil disturbance must be created specifically for small game. Strip discing or plowing, where the ground is simply plowed or disced and left alone, is often done for this purpose. Strip discing/plowing should be done in long linear strips 30 to 50 feet wide by as long as possible next to or paralleling brushy or woody escape cover. The disturbed area should be left fallow for three years following the discing. Usually after three years the vegetation will become too thick for small game to use. Weedy species such as foxtail, ragweed, partridge pea, Korean lespedeza, and others will volunteer in these fields. These are heavy seed-producing plants which provide a high energy food source for wildlife.

Any of the above soil-disturbance or fallow-fielding techniques can be enhanced further by overseeding a legume such as Korean lespedeza or ladino clover. This should be done the winter following the creation of the food plot or field. Legumes attract large numbers of insects which are essential food items for young birds during their first two or three weeks of life.

Mowing Hayland Many game bird nests, young birds, and deer fawns are lost each

fencerow/travel lane habitat. This type of habitat can be created through mowing practices or by planting soft mast-producing shrubs. This type of habitat can also be created next to forest lands to increase the amount of edge present. Hedgerow habitat should be 30 to 45 feet wide to provide travel corridors and resting areas for small game. Narrow fencerows (15 feet wide) have little protective value when they divide clean agricultural fields.

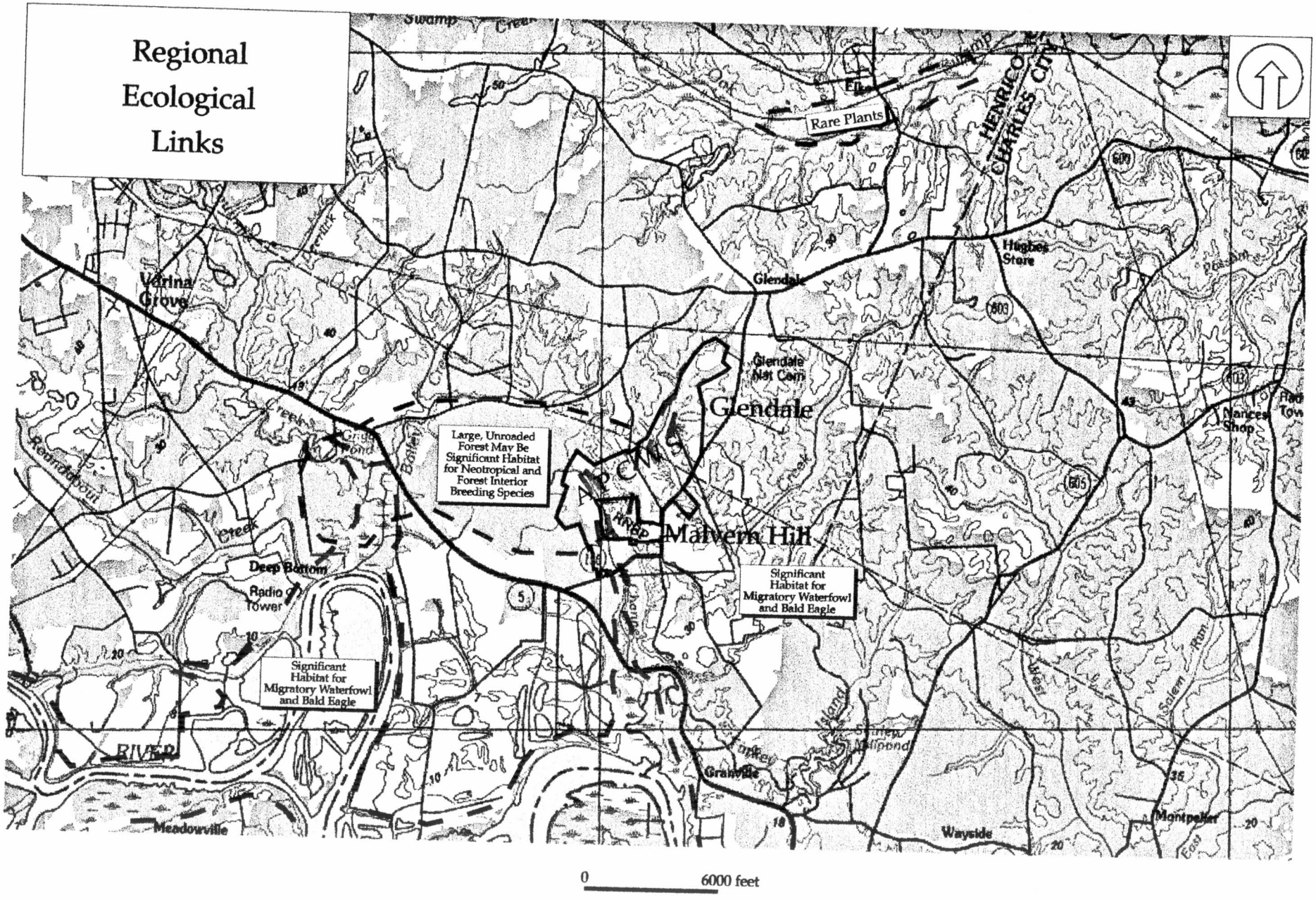
Hedgerow habitat can be created by not mowing or tilling the area adjacent to fences on a yearly basis. Briars and tree seedlings will naturally establish themselves along this border. Once these areas have become established, they can be placed in a rotational mowing or burning pattern so they are controlled and do not become too large for the equipment available for the mowing. Existing hedgerows can be thinned by cutting the large trees for firewood to encourage dense shrub growth. In any particular field, one-quarter of the fence line might be treated in any one year. This type of habitat can be created without a fence at all, or it may be created by moving a mower's width away from an actual fence to allow for easier fence maintenance.

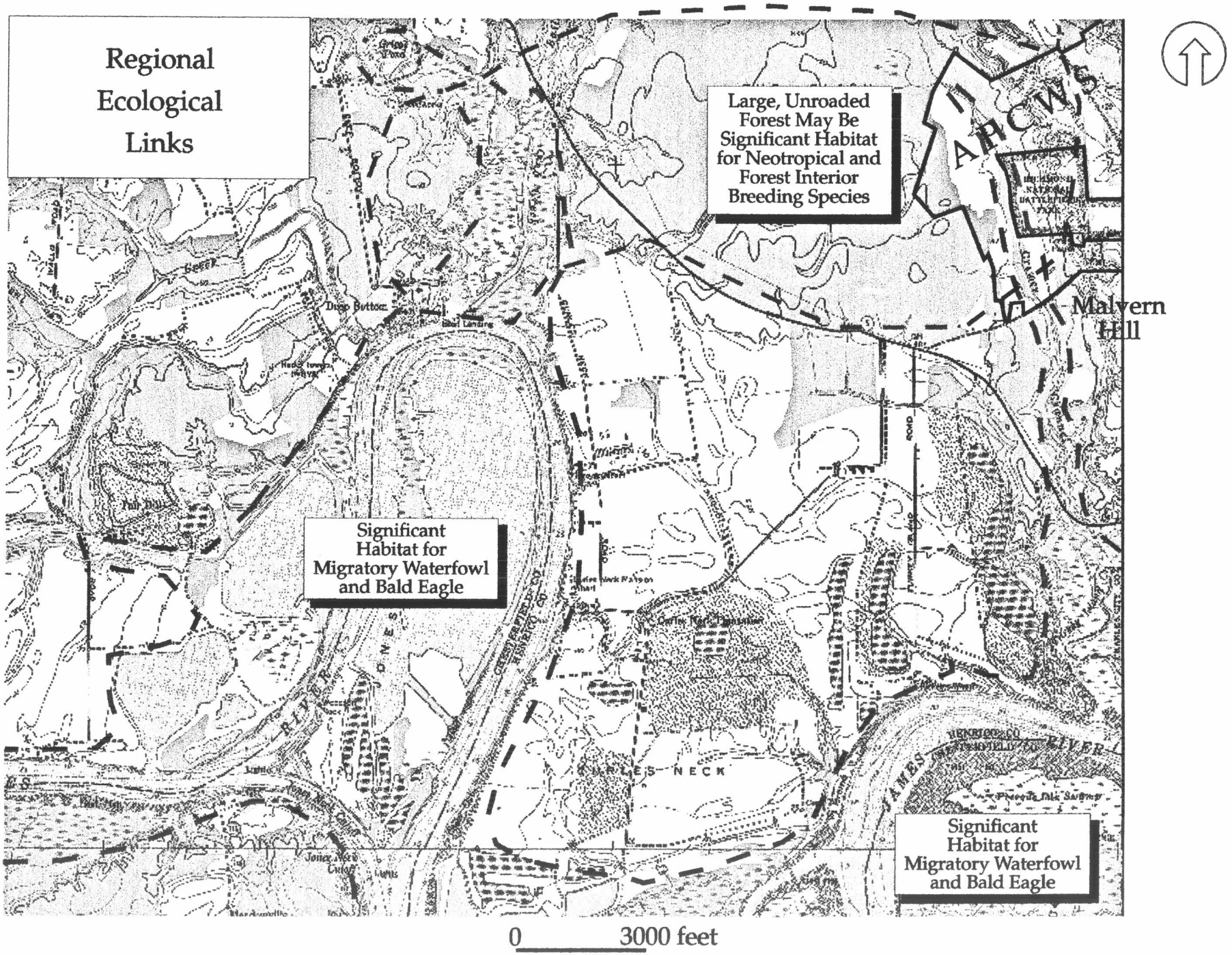
If shrubs and trees are to be planted in a fencerow, clumpy growth species like sumac, wild plum, bi-color lespedeza, gray and silky dogwoods, crab apples, hawthorns, chokecherry, white ash, and sassafras should be used. They should be plated in dense clumps. These shrubby clumps will provide good winter food and escape cover.

Development of Roadside and Ditch Habitat Roadsides and ditch banks can become important travel corridors for many wildlife species. Roadsides and ditches should not be mowed every year if possible. Mowing should be done on a three- to five-year rotation. These areas can also be planted to native grasses and wildflowers or shrubs which increase their value to wildlife.

Development of Odd Areas On most farms there are unused corners in fields or gullies that can be developed and maintained in brushy or woody cover. Gullies, steep hillsides, and rock outcroppings should be allowed to naturally regenerate into brushy areas. These areas may also be allowed to regenerate into forest. Natural succession can be advanced by planting dogwoods, hawthorns, sumac, crab apples, wild plums, or chokecherry shrubs.

Fall Plowing: Why Not? A common problem for many farm wildlife species is the lack of adequate later winter food and cover. Fall plowing has become commonplace in Virginia and contributes to the problem of inadequate winter food and cover. By plowing under crop residues in the fall, the landowner creates an essentially barren piece of land. There is a tremendous amount of seed available to wildlife in harvested fields. This seed comes from the harvested grain and native plants. With mechanized harvesting as much as 5 to 10 percent of the crop may be left in the field. Any waste grains that would be available for wildlife are lost as they are incorporated into the soil. The crop residues that may have provided some


Regional
Ecological
Links
Rare Plants
Large, Unroaded Forest May Be Significant Habitat for Neotropical and Forest Interior Breeding Species
Significant Habitat for Migratory Waterfowl and Bald Eagle
Significant Habitat for Migratory Waterfowl and Bald Eagle
Glendale
Malvern Hill
Varina Grove
Deep Bottom
Meadowville
Granville
Wayside
Montpelier
Hughes Store
Nances Shop
0
6000 feet


Regional
Ecological
Links
Large, Unroaded
Forest May Be
Significant Habitat
for Neotropical and
Forest Interior
Breeding Species
Malvern
Hill
Significant
Habitat for
Migratory Waterfowl
and Bald Eagle
Significant
Habitat for
Migratory Waterfowl
and Bald Eagle
0
3000 feet

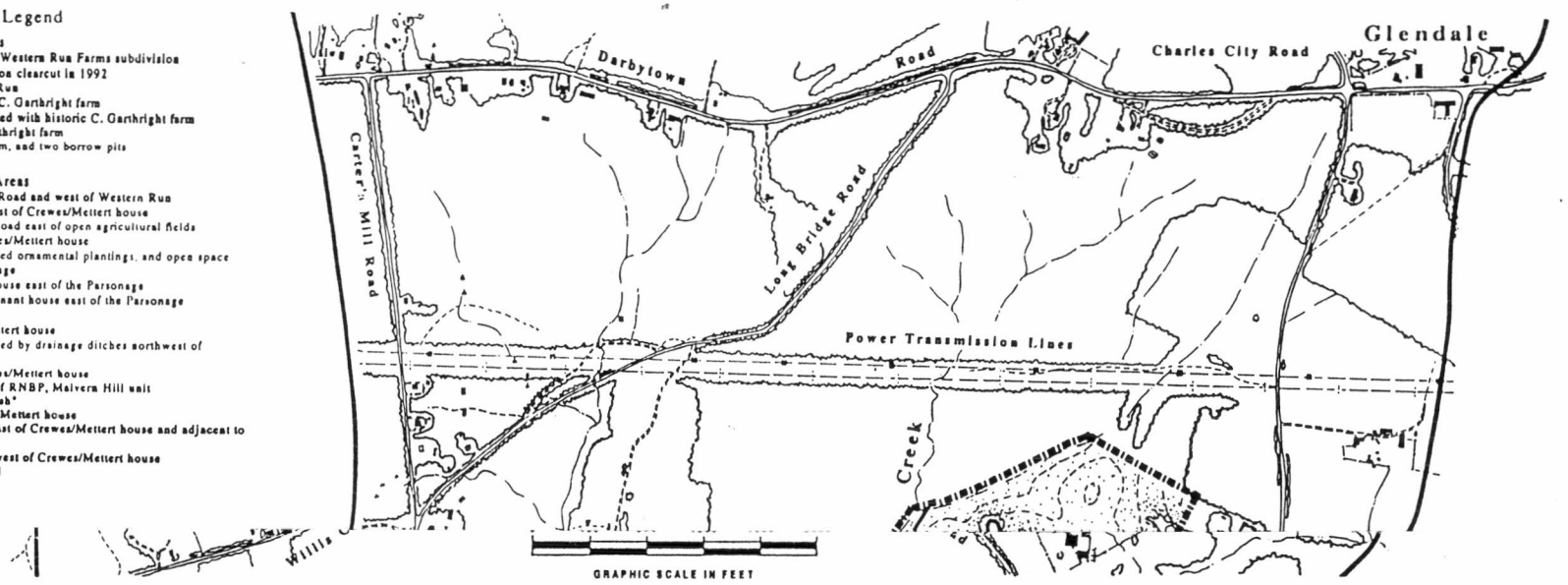
Landscape Character Areas Legend

Glendale Battlefield Character Areas

- G1-Os - Open agricultural fields west of Western Run Farms subdivision
- G2-Wf - Recently replanted pine plantation clearcut in 1992
- G3-Wh - McDowell Creek and Western Run
- G4-Wf - Woodland surrounding historic C. Garthright farm
- G5-Os - Open agricultural fields associated with historic C. Garthright farm
- G6-Oc - Tenant house on historic C. Garthright farm
- G7-Wc - T. French grist mill site, mill dam, and two borrow pits

Malvern Hill Battlefield Character Areas

- M1-Wf - Woodland east of Carter's Mill Road and west of Western Run
- M2-Os - Open agricultural fields northeast of Crewes/Mettert house
- M3-Wf - Woodland along Carter's Mill Road east of open agricultural fields
- M4-Oc - Tenant house northeast of Crewes/Mettert house
- M5-Oc - Ruins of the Parsonage, associated ornamental plantings, and open space
- M6-Oc - Tenant house east of the Parsonage
- M7-Wf - Woodland abutting the tenant house east of the Parsonage
- M8-Os - Open fallow land abutting the tenant house east of the Parsonage
- M9-Wh - Western Run
- M10-Wf - Woodland north of Crewes/Mettert house
- M11-Os - Open agricultural fields separated by drainage ditches northwest of Crewes/Mettert house
- M12-Os - Open fallow land west of Crewes/Mettert house
- M13-Os - Open agricultural fields south of RNBP, Malvern Hill unit
- M14-Wf - Woodland adjacent to "The Slash"
- M15-Wf - Woodland southeast of Crewes/Mettert house
- M16-Os - Open agricultural fields southeast of Crewes/Mettert house and adjacent to State Route 156
- M17-Ok - Pond and associated wetlands west of Crewes/Mettert house
- M18-Wh - Crewes Channel and farm pond



Base Map Sources

- U. S. G. S. Quadrangles, Scale: 1"=2000'; Dutch Gap, Virginia, 1969, Revised 1994 and Roxbury, Virginia, 1965, Photo-inspected 1984.
- Topographic Survey of Henrico County, Virginia by ADR Associates, Inc., Planimetric Sheets, Scale: 1"=400', Date of Photography: February 27, 1975.
- Henrico County, Virginia Tax Maps, Scale: 1"=400', Revised 1/1/94.
- Boundary Survey of Lands Belonging to the W. H. Ferguson Estate Lying Near Malvern Hill in the Varina District of Henrico County, Virginia, Ref: W. B. 77 p. 1420, Michael A. Wind, Certified Land Surveyor, Scale: 1"=300', March 21, 1994.
- Field Investigations; West Main Design Collaborative, January 1995; North American Resource Management, December 1994

Base Map Legend

- APCWS Property Boundary
- Battlefield Core Area Boundary (NPS Info.)
- Contour Interval 10 Feet
- Buildings
- Roads
- Unimproved Roads
- Trails
- Tree Cover
- Watercourses
- Lakes, Ponds
- Swamps, Wet Areas
- Fence Lines

Glendale and Malvern Hill Civil War Battlefields

County of Henrico, Virginia

Landscape Management Plan

Landscape Character Areas

June 1995

This map is intended to be used for planning purposes only.

Prepared For

The Association for the Preservation of Civil War Sites, Inc.

Fredericksburg
Virginia

Prepared By

West Main Design Collaborative

Charlottesville
Virginia

Landscape Architecture
Planning
Urban Design
Historic Preservation

In association with

North American Resource Management

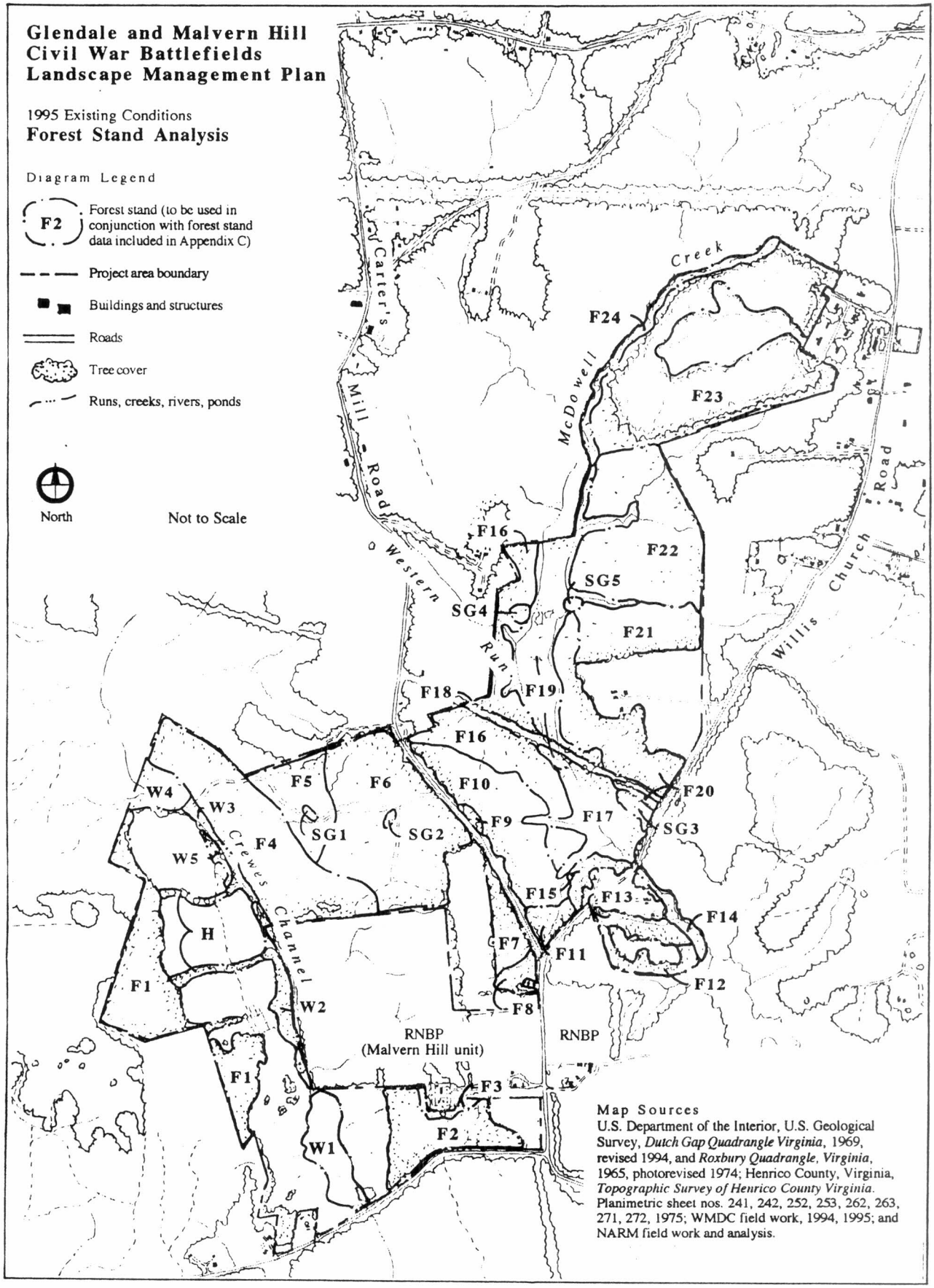
Environmental Planning
Forestry

Charlottesville
Virginia

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United States
Department of the Interior
National Park Service
American Battlefield
Protection Program

Figure TT.


Glendale and Malvern Hill
Civil War Battlefields
Landscape Management Plan
1995 Existing Conditions
Forest Stand Analysis
Diagram Legend
F2
Forest stand (to be used in conjunction with forest stand data included in Appendix C)
Project area boundary
Buildings and structures
Roads
Tree cover
Runs, creeks, rivers, ponds
North
Not to Scale
Carter's Creek
Mill Road
McDowell
Western Run
Willis Church Road
F24
F23
F16
F22
SG5
SG4
F21
F18
F19
F16
F5
F6
F10
F20
W4
W3
F9
F17
SG3
SG1
SG2
F4
W5
Crewes Channel
F15
F13
F14
H
F7
F11
F1
F12
W2
F8
RNBP
(Malvern Hill unit)
RNBP
F1
F3
F2
W1
Map Sources
U.S. Department of the Interior, U.S. Geological Survey, Dutch Gap Quadrangle Virginia, 1969, revised 1994, and Roxbury Quadrangle, Virginia, 1965, photorevised 1974; Henrico County, Virginia, Topographic Survey of Henrico County Virginia. Planimetric sheet nos. 241, 242, 252, 253, 262, 263, 271, 272, 1975; WMDC field work, 1994, 1995; and NARM field work and analysis.

Area F1

Acres:	28
Vegetation Type:	loblolly pine
Principal Species:	loblolly pine
Tree Canopy Cover:	90+%
Tree Size Class:	saplings
Age:	11
Stocking/Density:	500 trees/acre
Soil:	mostly Lenoir silt loam (3w)[1] where poorly drained; Angie loam (3o) elsewhere
Hydrology:	significant areas of wetland hydrology; generally flat area
Habitat Considerations:	Hawks use edge of woods; interior too dense to be of high value for many species. Good woodcock habitat, but will decline in future years as pines mature. Area adjoins very large block of forest called "The Slash" which may provide significant habitat for neotropical forest interior species.
1862 Conditions:	agriculture
Other Remarks:	Previous forest was clearcut in 1982. The remaining debris was bulldozed into piles in 1983. Loblolly pine seedlings were planted in 1984.

[1]Woodland Suitability Group:
1st digit=relative potential productivity for indicator tree species
(1=very high; 2=high; 3=moderately high; 4=moderate)
2nd part= important soil property associated with a moderate or severe soil limitation
(o=few limitations; w=water in or on soil; r=steep slopes)

Area F2

Acres:	22
Vegetation Type:	loblolly pine
Principal Species:	loblolly pine
Tree Canopy Cover:	90+%
Tree Size Class:	saplings
Age:	11
Stocking/Density:	450 trees/acre
Understory Species:	--
Soil:	Mostly Ochrepts/Udults (2r) on the slopes, Lenoir silt loam (3w) and Angie loam (3o) on the flat bottomland; some areas of steep slope
Hydrology:	Mostly moderately-drained slopes with narrow areas of slow drainage
Habitat Considerations:	Low quality for most species due to density; lower portion, however, provides good woodcock habitat
1862 Conditions:	Agriculture and orchard (near house)
Other Remarks:	Previous forest originated in 1924; was clearcut following Southern Pine Beetle infestation in 1982. This stand was planted with no site preparation in 1983 and replanted, due to low seedling survival, in 1984. Hardwoods were sprayed in 1984 to reduce competition with the pine seedlings.
Recommendations:	Restore the orchard near the house. Clearing the stand to restore 1862 conditions is an option when the forest becomes marketable (about 2000-2001). but would expose steep slopes. If the stand is not cleared, thin the pines as described for area F1.

Area F4

Acres:	52
Vegetation Type:	loblolly pine
Principal Species:	loblolly pine
Tree Canopy Cover:	90+%
Tree Size Class:	saplings
Age:	11
Stocking/Density:	600 trees/acre
Understory Species:	--
Understory Canopy Cover:	--
Soil:	Mostly Lenoir silt loam (3w) and Roanoke silt loam (1w)
Hydrology:	Flat bottomland, some areas of poor drainage
Habitat Considerations:	Low quality for most species due to density; lower portion, however, provides good woodcock habitat
1862 Conditions:	At least the southern half of the area was open land
Other Remarks:	Portions of the area, at its southern end, remained open land through the 1970's. The forest was clearcut in 1983, drumchopped and burned in 1983, and planted in 1984.
Recommendations:	Restore the southern half of the area to open farmland when the current forest reaches merchantable size (2000-2001). Thin the remainder of the area as described for area F1.

Area F6

Acres:	63
Vegetation Type:	loblolly pine
Principal Species:	loblolly pine
Tree Canopy Cover:	90+%
Tree Size Class:	saplings
Age:	11
Stocking/Density:	500 trees/acre
Understory Species:	--
Understory Canopy Cover:	--
Soil:	Mostly Caroline very fine sandy loam (3o), with Ochrepts/Udults (2r) on the slopes
Hydrology:	upland
Habitat Considerations:	Low quality due to density of forest
1862 Conditions:	Southern half was open farmland
Other Remarks:	Previous forest was clearcut in 1982 and planted with no site preparation in 1983. The hardwoods were sprayed to reduce competition with the pine seedlings in 1984.
Recommendations:	Restore the open farmland when the current stand becomes marketable (about 2000-2001). Retain forest in the drainage areas and side slopes. At that time, thin the rest of the forest as described in area F1.

Area F8

Acres:	5
Vegetation Type:	yellow poplar-oak-hickory
Principal Species:	red oak, yellow poplar, sweet gum, white oak
Tree Canopy Cover:	90%
Tree Size Class:	12-20 inches dbh
Age:	75
Stocking/Density:	Basal area 95 square feet per acre
Understory Species:	Dogwood, sweet gum, red maple
Understory Canopy Cover:	30%
Soil:	Mostly Caroline very fine sandy loam (3o)
Hydrology:	Upland
Habitat Considerations:	--
1862 Conditions:	Open land
Other Remarks:	Forest was retained as a visual buffer for the house when area F7 was clearcut in 1982
Recommendations:	Retain the forest for future growth.

Area F10

Acres:	60
Vegetation Type:	loblolly pine-hardwood
Principal Species:	loblolly pine, white oak, beech, red oak, yellow poplar, hickory, sweet gum
Tree Canopy Cover:	85-90%
Tree Size Class:	saplings to 6 inches dbh (scattered larger trees)
Age:	Mostly 16-18, with scattered 72 year old loblolly pines and 90 year old hardwoods
Stocking/Density:	Fully stocked: average basal area 80 square feet per acre
Understory Species:	holly, beech, red maple
Understory Canopy Cover:	20-30%
Soil:	State fine sandy loam (3o), Kempsville very fine sandy loam (3o) and Caroline very fine sandy loam (3o) on uplands, Ochrepts/Udults (2r) on steep drainages
Hydrology:	Mostly upland
Habitat Considerations:	Low quality due to density of forest
1862 Conditions:	Was mixed forest of pines and hardwoods
Other Remarks:	Forest had been heavily cut in 1978. Evidence of previous major harvest in 1937. May also have had timber harvests or major disturbances about 1922 and 1904.
Recommendations:	Retain forest. Thin the stand 1998-2000, in a manner similar to that described for area F1.

Area F12

Acres:	8
Vegetation Type:	loblolly pine-hardwoods
Principal Species:	loblolly pine, sweet gum, yellow poplar, red oak
Tree Canopy Cover:	90+%
Tree Size Class:	saplings
Age:	10
Stocking/Density:	800+ trees/acre
Understory Species:	--
Understory Canopy Cover:	--
Soil:	Mostly State fine sandy loam (3o)
Hydrology:	upland
Habitat Considerations:	Low quality for most species due to density; high suitability for woodcock.
1862 Conditions:	
Other Remarks:	Adjoins road trace and NPS land. Previous forest was clearcut in 1983-1984; debris piled in 1984; loblolly pines planted in 1985.
Recommendations:	Retain as forest. Thin in 2001-2003 as described in area F1

Area F14

Acres:	3
Vegetation Type:	bottomland hardwoods
Principal Species:	yellow polar, sweet gum, sycamore, red maple, birch
Tree Canopy Cover:	varies, 50-90%
Tree Size Class:	generally 14-20 inches dbh
Age:	70
Stocking/Density:	varies, 60-150 square feet per acre
Understory Species:	grass and forbs
Understory Canopy Cover:	< 10%
Soil:	Kinston/Mantachie (2w)
Hydrology:	Floodplain and wetlands along Western Run
Habitat Considerations:	High number of snags (basal area 30); very productive site
1862 Conditions:	--
Other Remarks:	junk in stream
Recommendations:	Retain forest. Clean junk from stream.

Area F16

Acres:	55
Vegetation Type:	oak-hickory
Principal Species:	white oak, red oak, beech, yellow poplar, black walnut, hickory
Tree Canopy Cover:	70%
Tree Size Class:	10-16 inches dbh
Age:	uneven-aged, but mostly 50-60 years
Stocking/Density:	basal area averages 70 square feet per acre
Understory Species:	holly, beech, hickory, red maple, black gum, sweet gum, dogwood
Understory Canopy Cover:	30%
Soil:	Mostly Sassafras fine sandy loam (3o), with Ochrepts/Udults (2r) on the steeper slopes
Hydrology:	Side slopes above Western Run
Habitat Considerations:	Herbaceous layer very light; small snags present, but few large snags or dens
1862 Conditions:	Forested slopes
Other Remarks:	Scattered large (and old trees), including an 11.5 inches dbh holly (unusually large for this species). Stand was heavily cut at various times and intensities, including 1978, 1937, 1922, and 1904. Junk pile near power line.
Recommendations:	Retain forest, remove junk.

Area F18

Acres:	4
Vegetation Type:	forbland
Principal Species:	grass, forbs
Tree Canopy Cover:	0
Stocking/Density:	100% groundcover
Soil:	Mostly Ochrepts/Udults (2o with 2r on the steeper slopes) and Kinston/Mantachie (2w)
Hydrology:	Some wetland, mostly side slopes
Habitat Considerations:	Powerline right-of-way provides herbaceous corridor through forest and wetland.
1862 Conditions:	Forest and brush
Recommendations:	Install nest boxes, particularly near wetland areas

Area F20

Acres:	42
Vegetation Type:	oak-hickory
Principal Species:	white oak, red oak, beech, yellow poplar, black walnut, hickory
Tree Canopy Cover:	70%
Tree Size Class:	10-16 inches dbh
Age:	uneven-aged, mostly 50-60 years
Stocking/Density:	basal area averages 70 square feet per acre
Understory Species:	Holly, beech, hickory, red maple, black gum, sweet gum, dogwood
Understory Canopy Cover:	30%
Soil:	Mostly Sassafras fine sandy loam (3o) and Ochrepts/Udults (2r)
Hydrology:	Side slopes above Western run
Habitat Considerations:	Herbaceous layer very light; small snags present, but few large snags or dens
1862 Conditions:	--
Recommendations:	Retain forest.

Area F22

Acres:	60
Vegetation Type:	yellow poplar-oak-hickory
Principal Species:	yellow poplar, sweetgum, white oak, scarlet oak, loblolly pine, hickory
Tree Canopy Cover:	60-70%
Tree Size Class:	8-16 inches dbh
Age:	uneven aged: mostly 40-50 years and 65-70 years old; few trees 15-16 years old
Stocking/Density:	80 square feet per acre
Understory Species:	Holly, beech, dogwood, yellow poplar, ironwood
Understory Canopy Cover:	varies-40-100%; averages 65%
Soil:	State fine sandy loam (3o) and Caroline very fine sandy loam (3o) on upper, level areas, Ochrepts/Udults (2o) on side slopes
Hydrology:	Upland, with three narrow bands of wetland along tributaries of Western Run
Habitat Considerations:	Herbaceous layer very light; small snags present, but few large snags or dens
1862 Conditions:	Forested
Other Remarks:	Some evidence of selective timber harvest 15-16 years ago.
Recommendations:	Retain as forest

Area F24

Acres:	6
Vegetation Type:	bottomland hardwood
Principal Species:	sweetgum, yellow poplar, red maple, black gum
Tree Canopy Cover:	60%
Tree Size Class:	10-16 inches dbh
Age:	70
Stocking/Density:	narrow band of trees along stream
Understory Species:	sweetgum, beech, iron wood, birch, red maple
Understory Canopy Cover:	50-60%
Soil:	Kinston/Mantachie (2w), Kempsville fine sandy loam (3o)
Hydrology:	Wetland along stream
Habitat Considerations:	Important habitat along stream. Hawks use trees for perching along edge of clearcut.
1862 Conditions:	
Other Remarks:	Small patch of old cypress and gum (probably present in 1862) on adjoining property.
Recommendations:	Retain trees. Consider protection of old forest on adjoining property.

Area SG3, SG4, SG5

Acres:	5
Vegetation Type:	yellow poplar
Principal Species:	yellow poplar, sweetgum, red oak
Tree Canopy Cover:	70%
Tree Size Class:	10-16 inches dbh
Age:	50
Stocking/Density:	Basal area 60 square feet per acre
Soil:	Sand and gravel pits
Hydrology:	Upland
1862 Conditions:	These earthworks may have been present at time of the battle. SG4 and SG5 are associated with the old mill dam and were probably open in 1862.
Recommendations:	Restore SG4 and SG5 to open condition. Remove trees and establish native grasses.

Area W2

Acres:	6
Vegetation Type:	forested wetland
Principal Species:	sweetgum, yellow poplar, red oak
Tree Canopy Cover:	varies, 10 - 80%
Tree Size Class:	10-16 inches dbh
Age:	70
Stocking/Density:	varies
Understory Species:	ironwood, sweetgum, red maple, black gum
Understory Canopy Cover:	varies
Soil:	Roanoke silt loam (1w)
Hydrology:	Wetland
Habitat Considerations:	Large number of snags and dens; important wetland habitat.
1862 Conditions:	Open farmland
Other Remarks:	Adjoins NPS land - mature forest that was open farmland in 1862.
Recommendations:	Retain.

Area W4

Acres:	5
Vegetation Type:	loblolly pine
Principal Species:	loblolly pine, red oak, sweetgum, yellow poplar, red maple
Tree Canopy Cover:	80 - 90%
Tree Size Class:	Most saplings, some larger trees near field.
Age:	11, 70
Stocking/Density:	500 trees/acre
Soil:	Roanoke silt loam (1w)
Hydrology:	Wetland site, previously drained to convert to agricultural use.
Habitat Considerations:	Significant wetland site; beaver activity.
1862 Conditions:	
Other Remarks:	Channelized stream and ditches; large red oak (age uncertain)
Recommendations:	Restore wetlands by filling ditches.

Area H

Acres:	5
Vegetation Type:	hedgerows and trees clumps within agricultural fields
Principal Species:	red oak, sweetgum, swamp chestnut oak, yellow poplar, red maple
Age:	40 - 70
Soil:	Lenoir silt loam (3w)
Hydrology:	Mostly along drainages; narrow wetland bands
Habitat Considerations:	Important habitat corridors and edges along fields; high use by hawks and other birds.
1862 Conditions:	Open farmland; one large tree (66" DBH swamp chestnut oak appears to date before battle).
Recommendations:	Retain fencerows and specimen tree.

General Management Guidelines

The following guidelines relate to a philosophy of cultural landscape treatment based on a comprehensive view of the project area as a whole. The following guidelines review and complement the Landscape Management Plan, (June 1995, West Main Design Collaborative). The recommendations provided in both reports should be used by the manager in developing future sivilcultural and landscape treatments.

Preserve existing landforms, wetlands, stream corridors, natural drainage patterns, and hydrology to the greatest extent possible. Preserve vegetative cover in wetland areas and within a 100-foot wide zone to either side of identified wetlands and surface water corridors (perennial streams and water bodies). Retain trees, especially old forest of bald cypress and black gum (probably present in 1862). Install nest boxes, especially near wetland areas, and wood duck boxes in open water areas such as ponds.

Preserve, including protection, maintenance and stabilization, all known and potential archeological resources. Avoid land-use activities, whether historic or contemporary, that threaten or impair known or potential archeological resources. Monitor and regulate use of landscape to minimize immediate and long-term damage to cultural resources.

Consider equally both natural and cultural features of the project area in treatment and land use decisions.

Control unauthorized access onto APWCS property in all areas.

Improve the overall landscape by removing all known debris and trash piles from the property.

Agricultural Fields and Cropland Management

Encourage best management practices, integrated pest management, soil and erosion control measures, and the planting of stream-side buffer strips, in all lease agreements with tenant farmers to minimize water pollution and degradation of natural systems.

Plant crops, if feasible, that have similar heights, colors, textures, and planting patterns as the crop cover that was present in the agricultural fields of Glendale and Malvern Hill Civil War battlefields in 1862 (wheat, corn, and oats). If crop farming is not feasible, establish hay fields or native-grass fields. Discourage crops, such as nursery plants or vine crops, that do not approximate the general character of the historic crops. Continue/undertake contemporary farming practices. Avoid farming operation on slopes greater than 15% in areas of erodible soils adjacent to drainage corridors.

Manage timber operations in management zones where woodland areas are recommended to be restore to agricultural fields. Protect environmental resources, reduce clearing costs, and maximize income from the marketable timber employing the steps included in the three categories below:

Pre-harvest planning: Delineate the actual boundary of the conversion area using an interdisciplinary team, including at least one historian, archeologist, historical landscape architect, forester, soil scientist, and wildlife biologist. The team should collectively delineate the locations and alignments of all timber haul roads, loading areas, stream-side management zones, and other related conditions of the harvest. The forester should then inventory the timber to be harvested and recommend the provisions to be included in the timber sale contract.

Timber Harvest Administration: The forester's responsibilities should include regular inspections of the timbering operation to monitor compliance with the terms of the contract and applicable laws. The archeologist, soil scientist, and/or other professionals may also participate in these inspections.

Site restoration: Installation of Best Management Practices (BMP) to protect resources should be an on-going provision of the timbering contract. At completion of the harvest, final BMP installation and maintenance should be performed by the timber buyer, subject to the approval of the forester. At that time, the contract for site preparation of the agricultural fields can be negotiated. Appropriate BMP's and erosion control measures should be included in that contract.

Retain, where appropriate, existing woodlands, allow successional areas to mature, or establish new buffers along the majority of the project area boundary. Buffers should consist of mixed species woodlands with understory plants. Buffers should be a minimum of 100 feet in width. Promote varied plant composition. Existing native woodland species should be considered for screen and buffer plantings. Buffers should be sufficient to accommodate future visitor access facilities such as parking areas to avoid visual intrusions in historic areas. Maintain a woodland screening buffer between open agricultural fields and adjacent properties not currently owned or under option by APCWS of the National Park Service.

Employ Best Management Practices in the administration of existing wooded areas to harvest timber. Do not undertake forestry or clearing/grading operations within areas identified as potential archeological resources, including, but not limited to road traces, until further archeological and cultural landscape analyses and investigations have been completed.

Water Resource Management

Retain and maintain all existing wetlands. Preserve wetland ecology for its role in flood control, sediment and erosion control, water supply, nutrient retention, and pollution control.

Preserve or establish a minimum 100 foot vegetative buffer zone along all edges of stream corridors and wetlands, and on erodible soils with slopes greater than 15 percent that abut wetlands, water courses, and water bodies. Wooded buffer zones along the project area's streams can be classified as riparian forests, which differ from upland forest in their hydrology, plant community, soils, and topography. These features determine the potential abundance of animal populations. In agricultural areas where extensive forests are not present, riparian forests provide critical habitat and may be the only edge cover available.

Monitor water resources for invasive alien plant species. Remove invasive alien species identified during water resource monitoring activities using ecologically sound removal techniques.

Adjacent Lands and Visual Quality

Monitor and participate in regional and local planning activities in order to protect adjacent resources and the setting of the APCWS project area.

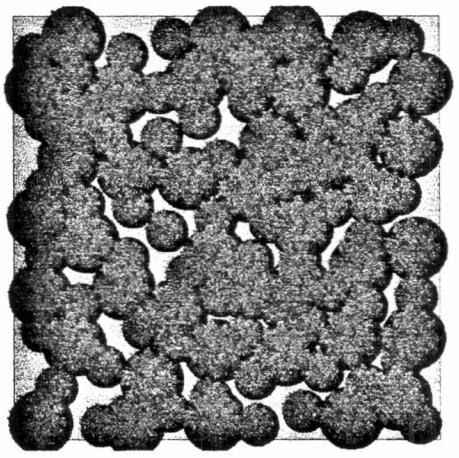
Develop and maintain working relationships with adjacent property owners. Work with local citizens to develop a program of monitoring unauthorized access and destruction of resources.

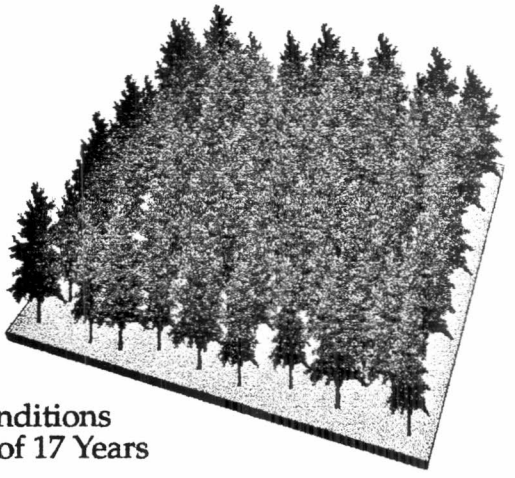
Educate adjacent property owners regarding resources located on their lands. Work with these owners to develop programs for the protection of resources on their lands.

Develop visual buffers along property lines abutting developed lands, lands that likely will be developed, or woodland areas, that, when cleared for timber or agricultural, afford views of developed areas. Forestry and clearing of woodlands on abutting properties may be the activities that could most likely threaten the visual quality of the APCWS project area. Maintain existing views into adjacent open area that are compatible with the historic scene or are views surviving from the period of significance. Monitoring of adjacent planning and development activities coupled with working relationships with adjacent land owners will yield information that may require the establishment of additional buffers due to proposed development.

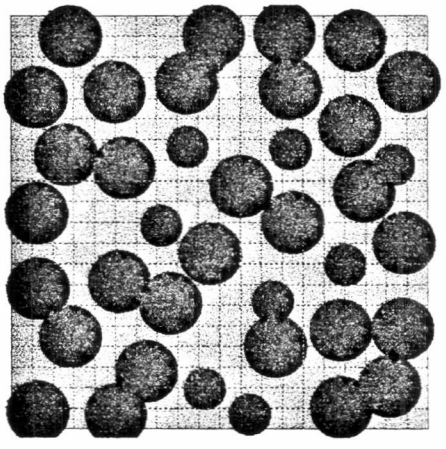
Minimize development impacts adjacent to and near the project area by working with developers during the planning process by suggesting increased setbacks, and the least intrusive siting and character of improvement and structures. Special consideration should be given to preserving and protecting the visual quality and rural character of primary vehicular access routes to the battlefields.

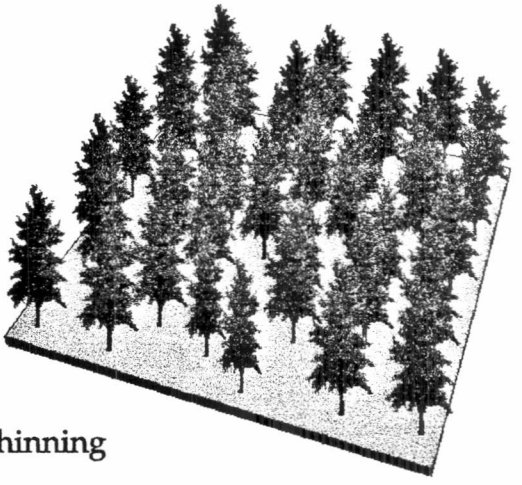
Thinning of Pine Stands at Malvern Hill and Glendale



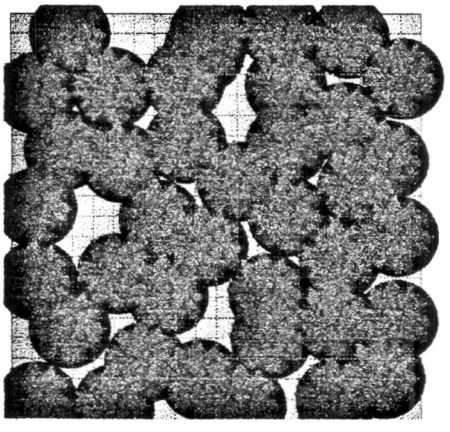


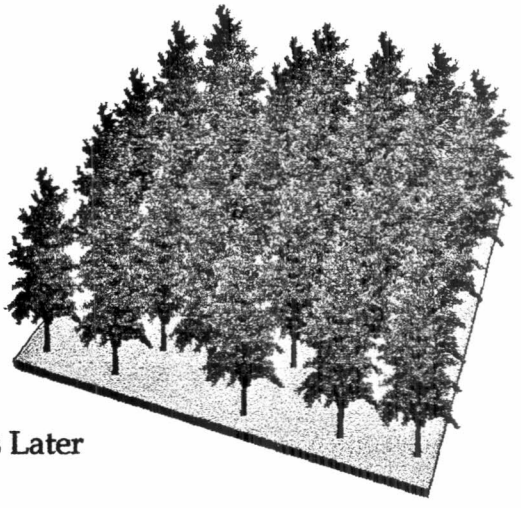
Typical Conditions
at Stand Age of 17 Years





After Thinning





Ten Years Later

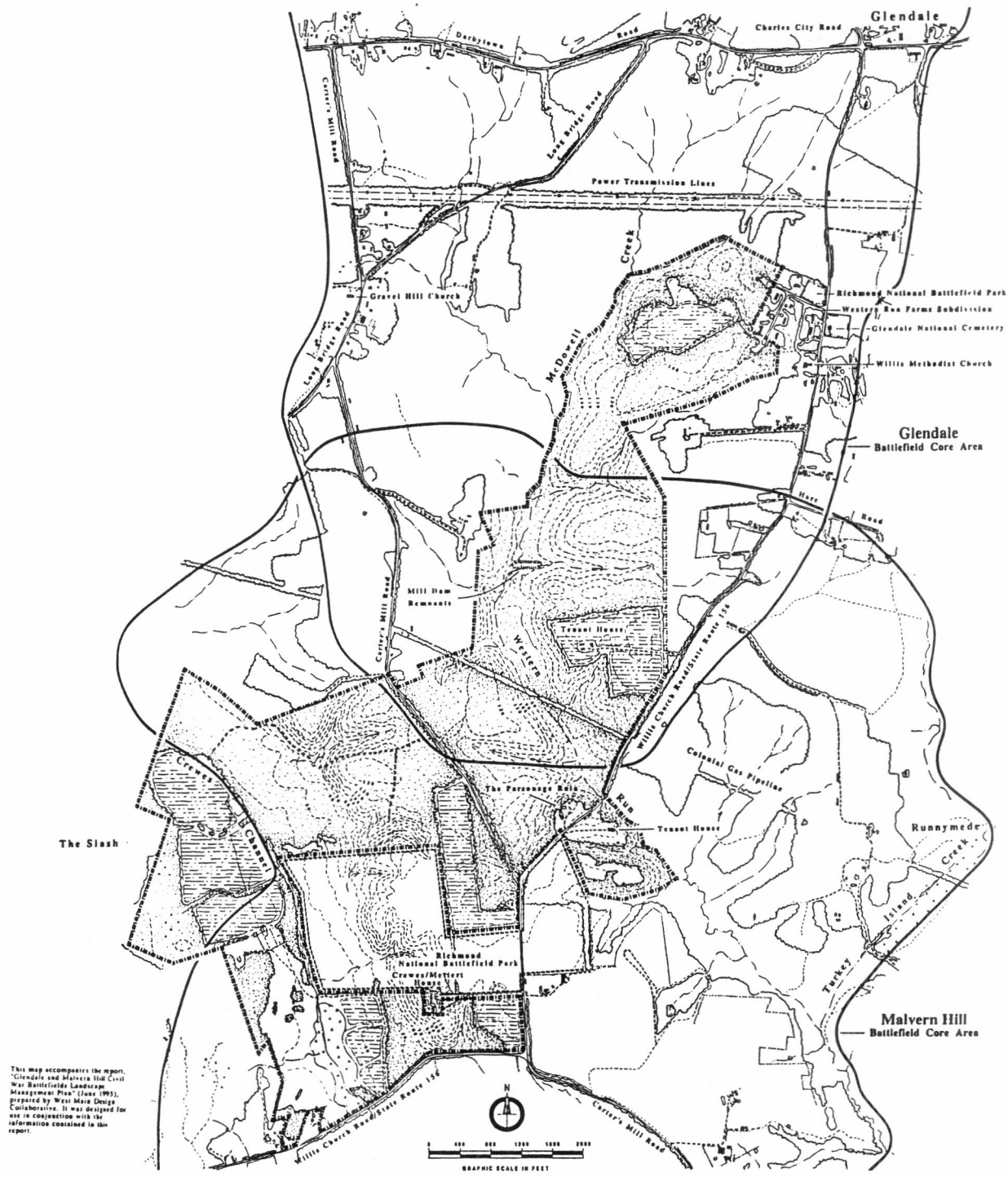
Each sketch represents
an average acre of
APCWS' pine plantations

NORTH AMERICAN
RESOURCE MANAGEMENT, INC.
P.O. Box 6777, Charlottesville, VA 22906 (804) 975-1390 Fax:(804) 975-1391

Five Year Plan

Glendale and Malvern Hill

Recommendation	Stand No.	1996	1997	1998	1999	2000
Monitor for Southern Pine Beetle	F1-7, F10, F12-13, F21, F23	✓	✓	✓	✓	✓
Thin Pine Stands	F1, F4, F5, F6, F7, F12 F10,			✓		✓
Restore to 1862 Conditions a. Orchard	F2, F3,					✓
b. Farmland	F4,F5, F6 F7, F21,					✓
c. Open land	SG3,SG4, SG5	✓	✓			
Install Nest Boxes	F3, F8, F9, F18, F23, W1, W5	✓	✓	✓	✓	✓
Clean Area	F14,F15, F16	✓				
Monitor for Erosion	F19	✓	✓	✓	✓	✓
Re-seed area	SG1, SG2, SG3, SG4, SG5,	✓	✓			
Re-establish wetlands	W4		✓	✓		
Update your Forest Stewardship Plan	All					✓



This map accompanies the report, "Glendale and Malvern Hill Civil War Battlefields Landscape Management Plan" (June 1995), prepared by West Main Design Collaborative. It was designed for use in conjunction with the information contained in this report.

Base Map Sources

- U. S. G. S. Quadrangles, Scale: 1"=2000': Dutch Gap, Virginia, 1969, Revised, 1994 and Roxbury, Virginia, 1965, Photo-inspected 1984.
- Topographic Survey of Henrico County, Virginia by ADR Associates, Inc., Planimetric Sheets, Scale: 1"=400', Date of Photography: February 27, 1975.
- Henrico County, Virginia, Tax Maps, Scale: 1"=400', Revised 1/1994.
- Boundary Survey of Lands Belonging to the W. H. Ferguson Estate Lying Near Malvern Hill in the Varina District of Henrico County, Virginia, Ref. W. B. 77 p. 1420, Michael A. Wind, Certified Land Surveyor, Scale: 1"=300', March 21, 1994.
- Field investigations; West Main Design Collaborative, January 1995; North American Resource Management, December 1994

Base Map Legend

- APCWS Property Boundary
- Battlefield Core Area Boundary (NPS Info.)
- Contour Interval 10 Feet
- Buildings
- Roads
- Unimproved Roads
- Trails
- Tree Cover
- Watercourses
- Lakes, Ponds
- Swamps, Wet Areas
- Fence Lines
- Cultivated Fields
- Open Areas, Fallow Fields

Glendale and Malvern Hill Civil War Battlefields

County of Henrico, Virginia

Landscape Management Plan

1995 Existing Conditions

June 1995

This map is intended to be used for planning purposes only.

Prepared For

The Association for the Preservation of Civil War Sites, Inc.

Fredericksburg Virginia

Prepared By

West Main Design Collaborative

Charlottesville Virginia

Landscape Architecture Planning Urban Design Historic Preservation

In association with

North American Resource Management

Environmental Planning Forestry

Charlottesville Virginia

This project is funded through a grant from:

United States Department of the Interior

National Park Service

American Battlefield Protection Program

Figure MM.

Glendale and Malvern Hill Civil War Battlefields Landscape Management Plan

1995 Existing Conditions
Views and Viewsheds

Diagram Legend

1 Interior Views to Woodland Edges with Limited Views to Malvern Hill and Adjacent Fields

2 Interior Views to Woodland Edges with Limited Views to Malvern Hill and Adjacent Properties and Fields

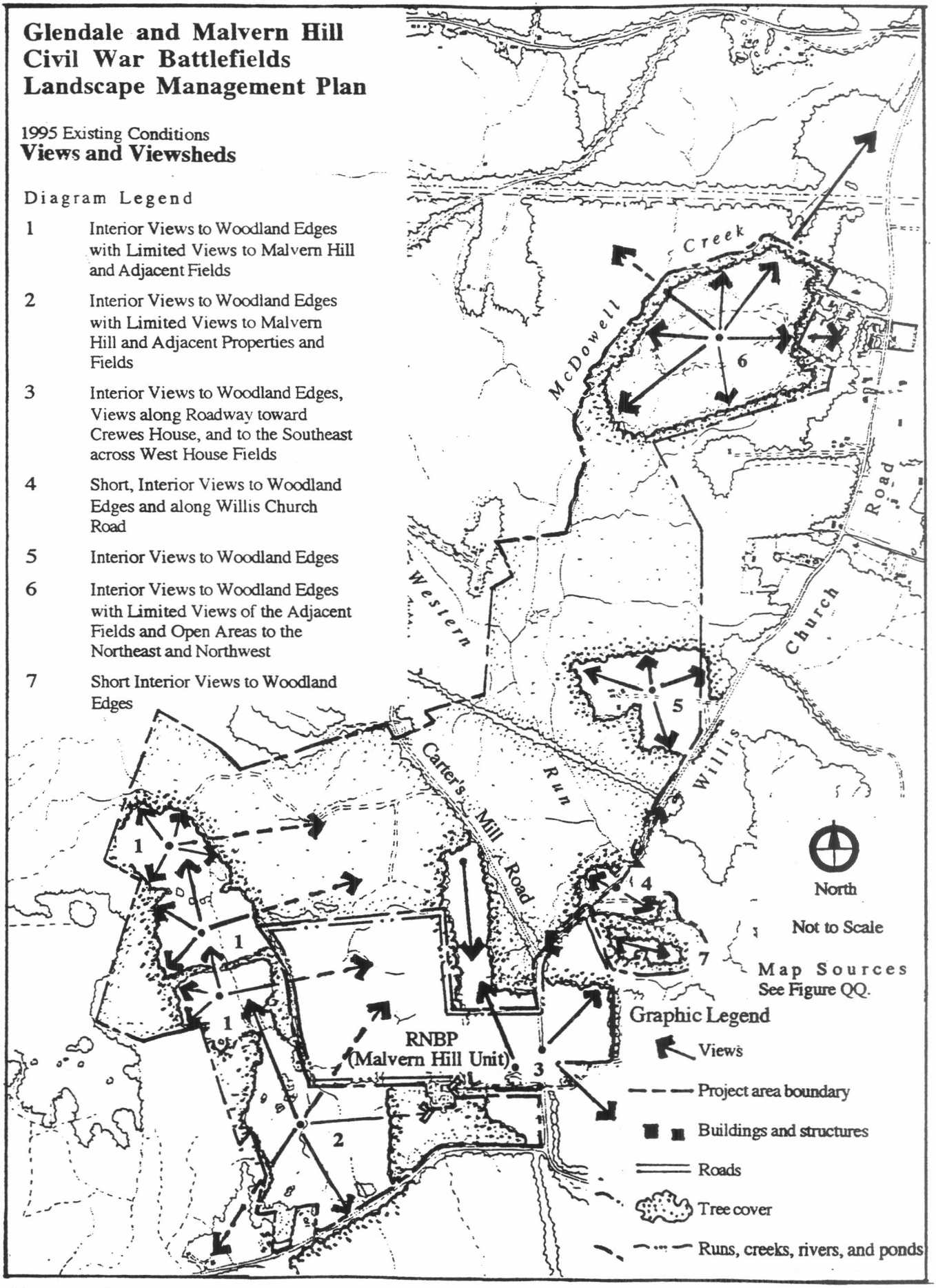
3 Interior Views to Woodland Edges, Views along Roadway toward Crewes House, and to the Southeast across West House Fields

4 Short, Interior Views to Woodland Edges and along Willis Church Road

5 Interior Views to Woodland Edges

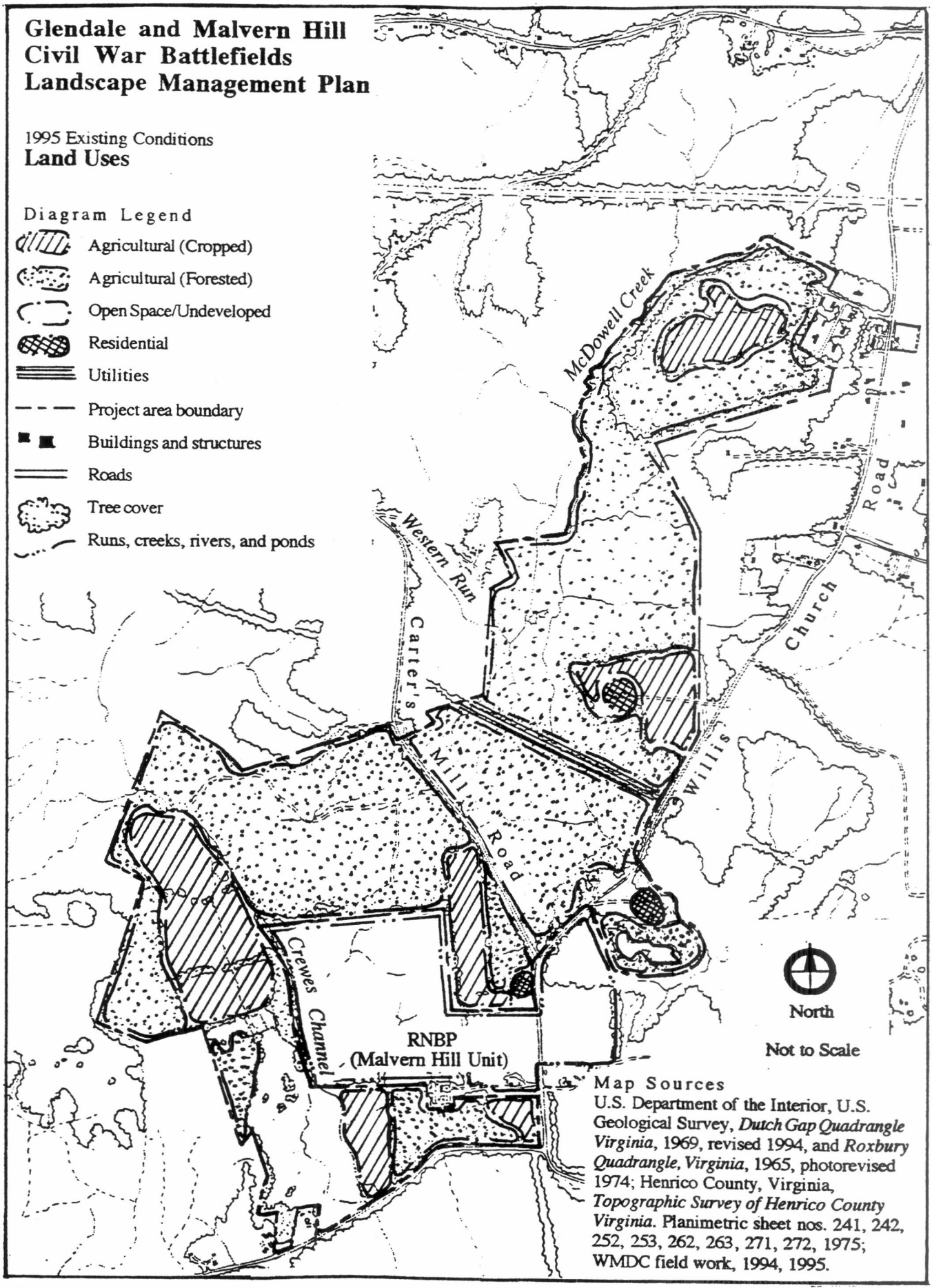
6 Interior Views to Woodland Edges with Limited Views of the Adjacent Fields and Open Areas to the Northeast and Northwest

7 Short Interior Views to Woodland Edges



Map prepared by WMDC, 1995

Figure PP.



Map prepared by WMDC, 1995

Figure QQ.