FINAL
Environmental Assessment

White-tailed Deer Management

National Conservation and Training Center
U.S. Fish and Wildlife Service
Shepherdstown, West Virginia

August 2003

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National Conservation and Training Center
Route 1, Box 166
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I. PURPOSE AND NEED FOR THE PROPOSED ACTION

The U.S. Fish and Wildlife Service proposes to regulate the growth of the white-tailed deer population on the National Conservation Training Center (NCTC) through implementation of a deer management plan. Hunting and other management techniques may be involved. Management techniques will also be integrated into a course on deer hunt management, offered by NCTC. The training course will be geared toward management of a deer population on a relatively small (less than 1000 acre) property, surrounded by development. The proposed action strives to protect and maintain the unique biota, species diversity and communities dependant upon the NCTC grassland, woodland and wetland habitats by managing the deer herd within the carrying capacity of the NCTC. This environmental assessment examines potential strategies and programs to manage the deer herd on the NCTC within a relative index of approximately 55-75 deer. This index is actually the exact counts observed on quarterly spotlight deer counts. It is estimated that this index translates to an approximation of 82 to 112 deer regularly utilizing the property. If it is found that habitat damage is occurring, even within this index, then the index may be lowered.

II. INTRODUCTION

The 538-acre National Conservation Training Center is located approximately 3 miles north of Shepherdstown, West Virginia along the Potomac River, which forms its northern boundary. Terrapin Neck Road forms the eastern boundary of the property, with Shepherd Grade Road forming the southwest border. (See map).

The primary purpose of the National Conservation Training Center is to enhance conservation of fish, wildlife and their habitats through leadership in: conservation education for the public; training for the conservation and resource management community; and fostering alliances among diverse interests.

III. NEED FOR THE PROPOSED ACTION

Suburban expansion into regions of undeveloped and forested habitats has steadily reduced available habitat for wildlife, pushing normally secretive species such as black bear and white-tailed deer, onto increasingly smaller fragments and into residential communities. Regionally, the deer population in the eastern panhandle of West Virginia is at a high level, and reports of deer foraging in neighborhoods, deer-related property and crop damage, and

highway collisions with deer in the eastern panhandle of West Virginia have risen sharply over the last two decades. It may be argued that the deer problem is not one of overabundance but of undesirable interaction between deer and humans. However, the fact that optimum habitats in the eastern panhandle of West Virginia are shrinking in the face of development cannot be denied, and this taxes the remaining habitats more heavily. One management concern is that ungulate populations generally overshoot the ultimate carrying capacity of the habitat before an equilibrium is reached (McCullough 1982). White-tailed deer are more prone to habitat alteration during this process than many other species due to their high reproductive potential (McCullough 1982; McCullough 1997), with substantial impact on the vegetation. Deer foraging habits and preferences can change plant composition and structure over time (Russell and Fowler 1999, Augustine 1998a, Brown and Parker 1997, Van Deelen et al. 1996, Porter 1991a) and such alterations have subsequent impacts on other wildlife, such as songbird species richness and abundance (DeCalesta 1994). This impact is magnified when other factors, such as mild weather, alternative food sources, and reduced annual mortality allow populations to quickly increase in numbers.

The intensity of grazing on woody browse in forest fragments is inversely proportionate to the availability of field forbs (Augustine 1998a). Pastures and old fields are vulnerable to overgrazing when deer densities are high because they contain more abundant and higher quality forage, especially in spring and summer (Johnson et al.1995). Cumulative effects of grazing over successive years may result in reduced plant reproduction and growth (Augustine 1998b) and height (Anderson 1994), which places sensitive plants at risk of extirpation (Augustine 1998b). A protected area with a high abundance of quality forage such as on the National Conservation Training Center sets the stage for potential population irruption and degradation of its grassland vegetation.

In addition to a general decrease in habitat quality, impacts of high deer densities include a decline in overall deer population health as evidenced by decreased body weights, increased occurrence of deformities and recessive albino traits, increased levels of internal and external parasitism, decreased body fat deposits, and disease transmission (Cypher and Cypher 1988, Demarais et al. 2000, Fischer et al. 1995).

If allowed to progress unchecked by natural predators or management, deer reproductive potential can be very high. For example, just one mating pair can grow to 1,000 in 10 years, including natural mortality (Yarrow and Yarrow 1999). Although a weak correlation exists between density and fertility rates (i.e., reproduction declines at high densities), substantial

reproduction still occurs when densities exceed 50 deer/km2 (or 50 deer/247 acres) (Swihart, et al 1998). This is because of higher number of adult does in the population, and even though they have lower reproduction, collectively they produce a large number of offspring each year. The level of deer on NCTC is about equal to that level at this point (approx. 100 deer for 532 acres) and with casual observation one sees many fawns in the spring, including several sets of twins. The goal of the NCTC, therefore, is to manage the deer herd not only to protect habitat but also to protect the overall health of the herd.

IV. DEER POPULATION LEVELS AT THE NATIONAL CONSERVATION TRAINING CENTER

Night time spotlight deer counts have been done by NCTC personnel at least annually since 1998. Two surveys were done in 1998. The number of deer observed and the actual acres of the NCTC property observed are as follows:

	1998	1998	1999	2000	2001	2002
DEER COUNTED	65	66	54	42	69	62
SURVEY ACRES	247	287	215	245	250	244
DEER/ACRE	.263	.230	.251	.171	.276	.254

Note that the average number of acres surveyed is almost 50% of the total acreage of the property, however the acres surveyed does contain the best habitat for the deer so an easy population estimate cannot be obtained just by multiplying the number of deer by 2. We estimate that we are seeing perhaps 2/3 of the deer regularly utilizing the property. Therefore using the above numbers, we estimate the number of deer on the property to range from approximately 65 to just over 100. The low number in the 2000 survey may have been affected by the time of year that the survey was done (June vs. January or February for the other surveys). Spotting the deer through the increased summer vegetation may have affected the numbers seen. It should also be noted, that even though the numbers seen in the surveys are fairly steady, the amount of best deer foraging habitat has been dropping. There are approximately 35 acres of formerly cultivated crop land that have been allowed to go fallow over the past several years and another 26 acres returned to native grasslands.

Few estimates of habitat carrying capacity for deer exist, and vary naturally, with habitat type. Carrying capacity is enhanced by the additional forage provided by old fields, from 20 deer/km2 (1 deer per 12.35 acres) for those sites that lack old fields, to perhaps 60 deer/km2 (1 deer per 4.1

acres) for those that possess 50% old fields (deCalesta and Stout 1997). These estimates, however, represent a single-species emphasis and do not integrate the needs of other ecosystem components. Recommended indices reported in the literature that consider levels at which habitats will rebound from deer grazing pressure when determining carrying capacity range from 1 deer per 10 acres (Halls et al. 1984), 1 deer per 12 acres (Harder 1980) , to 1 deer per 25 acres (Virginia Department of Game and Inland Fisheries 1999). As is apparent, the minimum index of deer density on the NCTC property is higher than the recommended indices reported in the literature. Deer counts, shown above, show a density from a low of one deer to 12.7 acres to a high of one deer to 7.7 acres. This is using the exact numbers from the surveys, which would assume a count of 100% of the deer on the property (not likely). If, as is assumed above, 1/3 of the deer on the property are missed on these spotlight counts then the density would be from a low of one deer to 8.2 acres to a high of one deer to 5.2 acres.

V. ALTERNATIVES

Options Considered but Eliminated from Further Consideration

There were several options that were analyzed and considered during the environmental assessment process but were eliminated as non-viable management options. These include immunocontraception, steroidal implants, oral delivery of contraceptives, GNRH vaccine, sterilization, live trapping and relocation, and habitat management. Please refer to Appendix A for their description and discussion.

Description of the Alternatives

The Service examined the feasibility and impacts of the proposed action and two alternatives, including the no-action alternative, and these represent a reasonable range as required by the National Environmental Policy Act of 1969. They reflect management approaches based on existing wildlife populations, existing state and federal regulations, the purpose and objectives of the NCTC , endangered species considerations, Service policies and guidance, and safety considerations.

Alternative 1: No Action

The Service would manage the National Conservation Training Center without the use of deer hunting, professional removal, or other deer suppression programs.

Alternative 2: - Provide a Controlled Hunt for the General Public

This alternative provides for an annual hunt based on the deer population estimates acquired through spotlight surveys, previous hunting success on the property (for example, the number of does and bucks harvested), and success or effectiveness of previous hunting techniques (for example, shotgun versus bow). Several approaches will be available to the NCTC Director, whereby the Director can choose the most appropriate management strategy to meet the population and habitat goals of the NCTC. In addition, the NCTC Director may seek assistance from organizations outside the agency to assist in the management of the hunts, so as to meet management goals and objectives based on budgets or time constraints. As the NCTC is situated in a semi-residential area, safety will be given the highest priority in the conduct of the hunt. During the actual hunt days, the NCTC may be closed to all but hunt participants and essential personnel. Hunting will be restricted to designated areas and access to closed areas will be controlled. Such precautions as establishing buffer zones around restricted or sensitive areas, requiring trees stands in certain areas, or setting minimum distance requirements for discharging near buildings and recreation areas may be taken to ensure safety. All Federal and State hunting regulations and laws will apply. All participants will be required to obtain a permit. Permit conditions may include attendance at an orientation session on the hunt rules and regulations. All hunters will be required to have completed a state sponsored hunter safety course.

Alternative 3: Professional Removal or Sharpshooting

A professional removal program can be developed that complies with all State and Federal regulations, provides public safety, and poses no conflicts with other NCTC uses. The NCTC Director can consider various methods for conducting the sharpshooting alternative, particularly with respect to frequency and timing, since deer are capable of responding with avoidance behaviors that diminish marksmen's efforts.

VI. AFFECTED ENVIRONMENT

This section describes the existing natural and socioeconomic resources of the NCTC area.

Climate and Air Quality

Jefferson County has a humid, continental type of climate which is marked by seasonal temperature changes. Annual precipitation is approximately 40

inches, with a mean annual temperature of 55 degrees Fahrenheit. Rainfall is relatively uniform throughout the year. Annual precipitation in Jefferson County is the highest of the eastern panhandle counties of West Virginia, although it is still slightly below the state average of 43 inches per year. Summer temperatures average about 73 degrees Fahrenheit, and winter temperatures average about 25 degrees Fahrenheit. Temperature differences are minor between the valley floor and the top of the Blue Ridge Mountains (USDA 1973). Air quality is generally very good in this region and has continued to improve on a statewide basis since 1964. This improvement is a result of substantial emission reductions by major industrial sources in order to comply with the West Virginia Air Pollution Control Commission (WVAPCC) regulations. No violations of National Ambient Air Quality Standards (NAAQS) in the Shepherdstown area have been recorded or are known to have occurred. West Virginia is divided into 10 Air Quality Control Regions (AQCRs). NCTC is part of Region 10. An air quality monitoring site located in Martinsburg, West Virginia, monitors ambient air quality for this region. Only suspended particulate matter is currently monitored at the Martinsburg site; however, historical records of sulfur dioxide are available. The closest particulate sampling site is located west of the project site at the Morgantown Airport.

Geology and Topography

Jefferson County consists of two separate geologic provinces: the Blue Ridge Province and the Great Limestone Valley Province. The majority of the NCTC area is located in the Great Limestone Valley Province of Jefferson County. The Great Limestone Valley is moderately rolling and is underlain by limestone and a small amount of acid shale. Elevations in the Great Limestone Valley vary from 450 to 600 feet above sea level. The rolling terrain is oriented in a northeast/southwest axis which reflects the underlying trend of the folded limestone formations (USDA 1973). Karst features, such as sinkholes and caverns, are prevalent in the Great Limestone Valley and are often found in association with springs, stream channels, and drainageways.

The topography, surface drainage, surficial soil characteristics, and hydrogeologic characteristics of the region are, to a large extent, determined by the character of the underlying bedrock. The strike of the bedrock in this region is approximately N 15 E (WCC 1992). Slopes on the site are generally moderate, but steep terrain is found on the site where the Potomac River has cut into the underlying bedrock. The bedrock formation that underlies the site is the Cambrian Age Conococheague Formation (limestone, siliceous limestone, shaley limestone). The natural overburden soils primarily consist of soils derived from in-place weathering of the underlying bedrock. The Conococheague Formation, a carbonate rock type, contains surficial residual soils of reddish clay to

clayey sand, gravel, and cobbles (WCC 1992). The limestone and dolomite of the Conococheague Formation are susceptible to solution activity, which results in the solutioning of carbonate bedrock thereby creating caves and sinkholes (WCC 1992). A groundwater hydrology map of Jefferson County (WVGES 1981) identifies the northeastern section of the project site as a cavernous area, and, therefore, this section is likely to correspond to areas of unstable bedrock conditions. Other areas, particularly near runs, drainage courses, and along the Potomac River, are also likely to be underlain by karst features.
The U.S. Department of Agriculture Soil Conservation Service developed a map of known sinkholes in Jefferson County. Woodward-Clyde Consultants (WCC) mapped the sinkholes and solution features that occur on the project site and adjacent properties and field verified some of these locations (WCC 1992). Small scale solution features were visible on many of the outcrops. Signs of solution activity on the outcrops include small cavities, channels, and rounded rock faces. Several caves and cavities are listed as occurring within the study area (WCC 1992). The entrance to one cavity (1 to 2 feet in diameter) was found northeast of the barn on the Hendrix Farm. Other cavities were observed by WCC in the region known as the Dam No. 4 Cave area, located on the Maryland side of the Potomac River approximately 500 feet north of the site (WCC 1992). Four sinkholes were also found during WCC's field reconnaissance. WCC reported that the sinkholes appear to be at various stages of development. A small subterranean opening was observed by Greenhorne & O'Mara in the southeastern portion of the site during a field reconnaissance in October of 1992.

Soils

Three soil associations exist on the NCTC property: the Hagerstown Frederick-Huntington local alluvium association, the Duffield-Frankstown association, and the Braddock-Landes-Ashton association. Within these associations, there are six soil series present on the site. The soil characteristics of these series are listed below.

O Duffield Series: This series consists of deep, well-drained soils formed in material weathered from limestone that contained some silty shale. These soils are fertile with moderate permeability and a high available moisture capacity. Duffield silt loam, 2 to 6 percent slopes is classified as a prime farmland in Jefferson County (USDA 1973).

O Hagerstown and Frederick Series: Both of these series are deep, well-drained soils that formed in material weathered in limestone. The Frederick series contains some quartz grains and angular chert. Fertility and available moisture capacity are high. Permeability is moderate. Hagerstown silt loam, 2 to 6 percent slopes, is classified as a prime farmland soil in Jefferson County (USDA1973).

O Huntington Series: This series consists of deep, nearly level, well-drained soils on the floodplain of streams and along intermittent drainage ways. These soils formed in recent alluvium washed from limestone uplands and are subject to flooding. These soils are fertile and have a moderate permeability. Available moisture capacity is high. Huntington silt loam and Huntington silt loam, local alluvium of this series are classified as prime farmland soils in Jefferson County (USDA 1973).

O Ashton Series: These soils consist of deep, nearly level, well-drained soils that formed in the alluvium washed from limestone uplands. These soils are fertile and have a moderate permeability. Available moisture capacity is high. Ashton loam of this series is classified as a prime farmland soil in Jefferson County (USDA 1973).

O Braddock Series: This series consists of deep, well-drained, gravelly soils. These soils formed from acid sandstone and shale deposits washed down from uplands. Available moisture capacity is moderate or high, natural fertility is moderately low, and permeability is low (USDA 1973).

Surface Water

The NCTC site drains to the Potomac River. Little site-specific information on surface hydrology (volume, quality, base flow) is available. In the Limestone Valley of Jefferson County, much of the precipitation enters solution channels in the limestone and readily becomes part of the water table aquifer. As a result, first and second order streams have limited baseflow.

The northern boundary of the NCTC site is the Potomac River. This river is regulated by Maryland and is classified by the Maryland Department of Natural Resources, Water Resources Administration as a Class I waterway (a surface water used for water contact recreation, habitat for fish, other aquatic life, and wildlife). The north and western portions of the site drain directly to the Potomac River primarily through three perennial tributaries that flow in a northerly direction. The western-most stream is fed by an on site spring. A farm pond, located adjacent to the farm house on Shepherdstown Road, is also fed by a spring. The northeastern portion of the site drains northward to the Potomac River through three deeply cut ravines which carry intermittent streams. The southeastern portion of the site drains to the east towards the Potomac River. Surface water from this area drains off-site across Terrapin Neck Road and is conveyed to the river through small tributaries.

Groundwater

In general, groundwater flows in Jefferson County extend toward the Shenandoah and Potomac Rivers, located to the south and north of the study area, respectively. The depth to groundwater in the area ranges from 25 to 100 feet. The water table elevation on the site ranges from 325 to 300 feet. The depth to groundwater ranges from 0 (Potomac River) to about 75 feet. The matrix of the Conococheague Formation limestone underlying the NCTC site is dense and impermeable. However, the rock is cut by fractures which can store and transmit groundwater. Groundwater levels in limestone terrains can be highly variable and can fluctuate rapidly in response to events such as heavy precipitation. They also vary seasonally, with lows generally occurring in the late fall and highs in the spring. Groundwater at the NCTC site is contained in at least two water bearing zones on the site. The large spring that feeds the farm pond is evidence of the shallow water bearing zone. The spring is reported to discharge at about 20 gallons per minute (gpm) (G&O 1992). The shallow water bearing zone has been tapped for water supply through dug wells in the local area. The deeper water bearing zone is tapped by a deep well on the farm property. This well is reported to be 267 feet deep and has a water level at about 100 feet, which roughly corresponds to the level of the Potomac River (WCC 1992).

Wetlands and Floodplains

The wetlands on the NCTC site consist of a small pond and perennial and intermittent streams within incised channels that carry runoff from the adjacent uplands as well as discharge from springs to the Potomac River. In addition there are four retainment ponds that were constructed when the buildings were constructed. The wetlands were classified according to the Cowardin System as described in Classification of Wetlands and Deepwater Habitats of the United States (1979). This is a hierarchial system that provides a uniformity of concepts and terms that define wetlands according to hydrologic, geomorphologic, chemical and biological factors. The three streams on the western portion of the project site are classified riverine, upper perennial with an unconsolidated bottom of cobble/gravel and mud (R3UB1/3). The pond is classified palustrine open water with an unknown bottom (POW). The three streams on the eastern portion of the project site are classified riverine, intermittent with cobble/gravel and mud streambeds (R4SB3/5).

Floodplains on the site occur along the Potomac River. These floodplain boundaries are based on Federal Emergency Management Agency maps.

Vegetation and Wildlife Habitat

Four general vegetative communities occur on the NCTC site: meadows, agricultural fields, mature deciduous forest, and immature deciduous forest. Appendix B contains lists of plants and animals observed at NCTC, with species listed by both common and scientific names.

The meadow community consists of grassed fields with shrubs and scattered trees and comprises approximately 95 acres. This vegetative community is located primarily in the western and central portions of the site. Tree species include eastern red-cedar, American sycamore, black locust, hackberry and box-elder. Shrub species include multiflora rose and eastern red-cedar. The groundcover species consist of orchard grass, meadow fescue, yellow foxtail, barnyard grass, purpletop, Chinese mustard, dandelion, Queen Anne's lace, several species of goldenrod, milkweed, daisy fleabane, and wingstem as well as a great variety of mostly non-native weedy annuals. This plant community offers a variety of habitat for upland species. The open, grassy fields provide food and cover for small mammals and upland herptiles, and the scattered trees and shrubs provide food and cover for songbirds and small mammals. Animals likely to be found in this type of habitat include mice, shrews, fox, groundhogs and white tailed deer. Bird species observed include turkey vulture, bobwhite quail, pileated and red bellied woodpecker, barn swallow, and brown thrasher. Numerous species of small songbirds were observed, including blue-gray gnatcatcher, eastern bluebird, chipping sparrow, and goldfinch.

The agricultural fields on the property comprise about 80 acres and are located in the southern and central portions of the site. About 47 acres are allowed to be alternately tilled and planted with small grain crops such as wheat and oats, though most of this is currently utilized for hay and includes a significant percentage of alfalfa. About 21 acres are planted in native warm-season grasses including big bluestem, little bluestem, side-oats gramma, Indian grass, and switchgrass which will be utilized as hay once it is well-established. Another 12 acres, a cultural resource known as the old racetrack, will remain as a hayfield composed primarily of fescue, orchard grass, and purpletop. Hedgerows of hackberry, black cherry, ailanthus and black locust line the edges of the fields. In the fallow fields, species typical of disturbed areas are common and include dandelion, curly dock, clover, and Chinese mustard. Animals are attracted to this plant community either because of the food offered by planted areas, or by the dense cover present in the fallow fields. White-tailed deer commonly use these fields, as do many other birds and mammals.

The mature hardwood forest comprises approximately 195 acres and is

located in the western southeastern and northeaster portions of the site, and correlates well with the areas under tree cover in a 1938 aerial photo. There is nearly complete canopy closure in this vegetative community and the dominant overstory species are tulip-poplar, red oak, black oak, bitternut hickory, black walnut, green ash, beech, and sugar maple. The forest has been selectively cut in the last 20 years and has had some impacts from cattle grazing; some portions have canopy openings that allow dense concentrations of bramble species such as multiflora rose, wineberry, and Japanese honeysuckle to dominate the understory, particulary near the forest edges. The mid-canopy is commonly dense and consists of sugar maple and hackberry saplings. The shrub layer in the shadier portions contains spicebush and pawpaw that has become more dense since the removal of cattle grazing in the mid-1990s. The groundcover layer is lush in the portions along the river, and more sparse on the adjacent slopes. Groundcover species near the river include a much higher percentage of native plants including such spring wildflowers as wild ginger, trillium, enchanter's nightshade, mayapple, and Virginia bluebells. This plant community offers an extremely diverse habitat for wildlife, and supports a variety of mammals, herptiles, and birds. White-tailed deer, eastern gray squirrel, eastern cottontail, striped skunk, and raccoon have been identified, as well as eastern box turtle, wood turtle, northern dusky salamander, and American toad. Several smaller species of mammal such as mice and shrews also occur in this plant community. Bird species include pileated and red-bellied woodpecker, Carolina chickadee, tufted titmouse, yellow billed cuckoo, and red-eyed vireo.

The immature hardwood forest is located in the northeastern and southeastern portions of the site and consists of 74 acres. Because this forest was logged in the last 20 years, the canopy closure is incomplete, which has resulted in a dense understory and considerable vine growth in the canopies of the overstory trees. Dominant overstory species are yellow poplar and box-elder. The understory is dense and consists of multiflora rose and various species of blackberry. Vine species prevalent throughout the plant community include poison-ivy, grape, and greenbrier. Groundcover species include beefsteak plant, Indian strawberry, and bedstraw.
Some of the same species which utilize the mature hardwood forest will also use this plant community, except for those species which require the closed canopy and large trees typical of a mature forest, such as the pileated woodpecker. This plant community is also used by some of the same species found in the pasture community, such as white-tailed deer and eastern gray squirrel.

Threatened and Endangered Species

The Natural Heritage Program of the Division of Natural Resources has

published guidelines for conserving significant natural features in Jefferson County and this document lists rare, threatened, and endangered species known to occur in the county, many of which are species of concern in the state. However, because West Virginia has no official state regulations protecting sensitive species, the only species afforded. protection in the state are those which are federally listed as threatened or endangered under the Endangered Species Act.

Correspondence from the USFWS indicated that, except for transient individuals, no threatened or endangered species are known to occur within the NCTC property. The Natural Heritage Program of the Division of Natural Resources has records of 3 species of plants occurring at NCTC considered rare, including 2 species of rockcress (genus Arabis) and the white troutlily.

Significant Natural Features

The NCTC site contains significant natural features as defined by the West Virginia Natural Heritage Program (WVNHP). The significant natural features on the site include caves, the floodplain of the Potomac River, and mesic limestone forests. The cave habitat that occurs on the site includes sinkholes and a small subterranean opening. This habitat is important because it can provide habitat for three cave invertebrates of special concern in Jefferson County including the Shenandoah Valley cave amphipod (Stygobromus gracilipes), the Shenandoah Valley cave isopod (Caecidotea pricei) and Blake"s millipede (Conotyla blakei) (WVNHP 1988).

The floodplain of the Potomac River, a portion of which is included on the project site, is also considered a significant natural feature because it can provide food and habitat for a number of species of special concern in Jefferson County including the red-bellied turtle (Pseudemys rubriventris), the wood turtle (Clemmys insculpta), the snowy campion (Silene nivea), native cane (Arundinarea gigantea), and the prothonotary warbler (Protonotaria citrea) (WVNHP 1988).

Mesic limestone forests occur on the project site and are also considered to be a significant natural habitat because less than 10 percent of the original mesic limestone forest remains in Jefferson County. Mesic limestone forests are rich woodlands located on limestone soils. These forests are characterized by multiple strata, a mixture of hardwood species in the canopy, and a dense herbaceous layer. The Natural Heritage Program considers the total forested acreage and the patchiness of small woodlots in Jefferson County to be below that required to prevent a severe decline in the native species found associated with mesic limestone forests. These forests

are one of the most diverse and productive forests in the state and are characterized by multiple strata, a mixture of hardwood trees in the canopy, and a lush vernal herbaceous layer. Two orchids that are considered rare in West Virginia can occur in this forest type. These orchids are Wister's coralroot (Corallorhizan wisteriana) and oval ladies' tresses (Spiranthes ovalis) (WVNHP 1988).

Socioeconomic Environment

Land Use and Zoning

The predominant land use within the county is agricultural. Jefferson County has fertile soils, adequate water supplies, excellent markets, and the necessary infrastructure to support the agricultural industry (USDA 1973). The 538-acre NCTC site is located north of Shepherdstown and is surrounded by farmland, forestland, and large lot single-family residential properties. The Potomac River forms the northern boundary of the site. The site is zoned as a rural-agricultural district. A rural-agricultural district is designated to provide low density, single-family residential development in conjunction with continued farming activities. Permitted uses include single family dwellings, farms, churches, schools, hatcheries, and several types of public facilities.

Regional Economy

According to the Comprehensive Plan for Jefferson County (Jefferson County Planning Commission 1986), the primary industries in the county since World War II have been agriculture and manufacturing. The amount of agricultural land remained fairly constant between 1969 and 1982. Employment in the manufacturing and retail trade sectors increased between 1980 and 1985 from 16.6 percent to 32.3 percent for manufacturing, and from 12.8 percent to 22.7 percent for retail trade.

There are six sources for taxes in Jefferson County including property taxes, corporate net income taxes, business franchise taxes, retail sales, individual income taxes, and gasoline taxes. The tax rates are provided below (Jefferson County Development Authority 1990):

Property Taxes
Corporate Net Income 9.75 %
Business Franchise Tax 5.75% of net equity of
partnership or corporation
Retail Sales 6%
Individual Income Minimum - 3.02 % Maximum 6.51 %
Gasoline 0.0485 cents per gallon

According to the 1997 Census of Retail Trade, Jefferson County generated $197,678,000 in retail sales (USDOC 1999). The county accounts for 1.3 percent of the total retail sales within the state of West Virginia. The largest amount of revenues generated are from food stores ($35,778,000), eating and drinking establishments ($19,205,000), automotive dealers ($18,244,000), and miscellaneous retail stores ($11,647,000).

Population and Employment

In 2001, Jefferson County had an estimated population of 43,545. This was up 3.2% from the 2000 census count of 42,190. In comparing the 2000 counts to 1990 counts, the population in Jefferson County increased by 17.4%, compared to only 0.8% for the entire state of West Virginia. The population of West Virginia actually declined by 0.4% in 2001. In 1990, a total population of 35,926 compared to 30,302 in 1980 similarly reflects an 18.6 percent increase for the county. Jefferson County residents between the ages of 25 to 44 make up the largest portion of the total population at 31.6 percent, with the median age being 32.7. The number of people under 18 years of age comprises 25.6 percent of the population, and 11.4 percent of the population is more than 65 years of age. The state of West Virginia is declining in population because, due to a poor economy, people are moving out of the state. However, the population of Jefferson County has increased over the past two decades, primarily due to the influence of migration from the Washington and Baltimore metropolitan areas, located approximately 60 and 70 miles, respectively, from the county. Jefferson County is a growing bedroom community with a positive economic future based on a strong light industrial sector. The county anticipates growth to continue due to lower real estate costs, space, privacy, amenities of single-family housing, and the movement of jobs to suburban areas.

Emergency Medical Services

Emergency medical services are provided through three of the five fire departments. These include two ambulances at Shepherdstown Fire Company, one ambulance at Friendship Fire Company, and two ambulances at the Independent Fire Company. These five ambulances not only provide medical assistance at the scene of an accident, but they also transport persons to and from hospitals, nursing homes, and residences. The county has 15 paramedics; nine are volunteers at the Shepherdstown Fire Company and six are volunteers at the Independent Fire Company.
City Hospital and the Veterans Administration Center, both in Martinsburg, Berkeley County; Winchester Memorial Hospital in Winchester, Virginia; Washington County Hospital in Hagerstown, Maryland; and the county's only hospital, Jefferson Memorial Hospital are serviced by County ambulances.

The closest hospitals to NCTC are the City Hospital and the Veterans Administration Center in Martinsburg, a distance of approximately 10 miles. Although the number of ambulances and trained personnel appear to be adequate to meet the county's needs, local planners recognize that if the current growth pattern continues, a substantial burden will be placed on the ambulance services provided by the Shepherdstown and Friendship Fire Companies. Medical services are not provided at the NCTC. However, professional medical offices of physicians, dentists, pharmacies and other medical services are situated throughout the urban and rural areas of the county.

Education

The Jefferson County Public School system consists of nine elementary schools, three junior high schools, and one high school. There are also two private schools and Shepherd College located within the county. At present, the elementary, junior high schools and high school have available capacity.

Recreational Resources

The surrounding area of the NCTC offers many recreational amenities, historical attractions, and outdoor activities.

Cultural Environment

The nature of the Terrapin Neck project site's history, and its land usage over time, shaped the types of cultural resources found on the site. Its geography, marked by several streams and steep cliffs overlooking the Potomac River, suggests the existence of evidence of pre-historic habitation. During the Historic Period, the Terrapin Neck area has been used for agricultural purposes, and thus a number of agriculture-related archeological and architectural features are present on the project site. Files of known archeological sites and of historic standing structures, as well as published and unpublished sources on the archeology and history of the area were reviewed. The search of the archeological files revealed two known prehistoric sites outside of the NCTC site. During a 1987 survey (C.A. Hulse 1991), a model for areas with a high potential for archeological resources in Jefferson County was developed; the Terrapin Neck peninsula was identified as a high-potential area for pre-historic resources. Later surveys and studies identified several prehistoric and historic archeological sites on the NCTC site (Hulse 1991, Hopkins and Crosley 1992, Hopkins and Sparenberg 1993, Hopkins, et. al 1994, Hulse 1996). The site at the location of the boat ramp was excavated and studied by John Milner and Associates before construction on the boat ramp began.

Considerably less published information exists on the historic architecture of

the area. There are no buildings on the NCTC site or its immediate vicinity currently listed on the West Virginia State Historic Preservation Office (WV SHPO) inventory of Jefferson County historic sites. The Jefferson County Historical Society published an architectural history of Jefferson County in 1990 which provided valuable information about the architecture of the Terrapin Neck area, and served to place the architectural resources of the area in their historic context.

Prehistoric occupation of the area began as early as 10,000 years ago with the Paleo-Indian Period. Archeological sites have been encountered throughout the region dating from the Archaic Period through the Woodland Period, and the arrival of the first Europeans.

European settlement of the area began in the late 1720s and early 1730s. German settlers from Pennsylvania, together with several family groups from the Monocacy river settlements in Maryland, crossed the Potomac River at a ford one mile down-river from Shepherdstown. Settlers were attracted to the rich soils in the area, as well as the water resources, and began cultivating tobacco and cereal-based crops, and raising a variety of farm animals.

In the 1750s, the land of which the NCTC is a part was owned by Colonel Van Swearingen (d. 1788). The Swearingen family has two cemeteries on the property, one with late 18th century graves, and one with graves dated from 1822 to 1842 when they owned only the western portion of present-day NCTC now referred to as River View Farm. Col. Van Swearingen built the fieldstone house now referred to as the Springwood property in 1759 during the French and Indian War. The Springwood portion of the property was purchased in several sections between1798 and 1809 by Captain Abraham Shepherd, son of Thomas Shepherd. The later wing of the house, as well as two of the outbuildings, were built by his son Henry Shepherd. The Shepherd family, prominent in the political, economic, and social history of the area, is also associated with another historic resource, Wild Goose, an ante-bellum farmstead, located just outside the NCTC boundaries and across Shepherd Grade Road from the Springwood Farm. Members of the Shepherd family were also responsible for the construction of a race track, the remains of which can still be seen on the NCTC site, and an early macadamized road that once ran between their two farms. The Hendrix Farm (Springwood), passed out of the Shepherd family's hands around 1910, and the various portions of the original Swearingen lands were united between 1941 and 1943.

A survey of historic resources was conducted on the 500-acre NCTC site, as

well as its immediate environs, by Greenhorne & O'Mara in April and May of 1992. This survey was completed to fulfill the USFWS's responsibilities under Sections 106 and 110 of the National Historic Preservation Act of 1966, as well as other applicable regulations. At the conclusion of the background research and field work, a letter report summarizing G&O's findings was submitted to the USFWS for their review. One historic resource, the Hendrix Farm (Springwood), was found within the boundaries of the NCTC. Another historic resource, Wild Goose, was found in the immediate vicinity of the site; and the NCTC complex is within the viewshed of this resource. In addition, the C&O Canal National Historical Park
runs along the north side of the Potomac River, just across the river from the northern boundary of the NCTC. The NCTC complex is also within the viewshed of this resource. The C&O Canal National Historical Park is presently listed on the National Register of Historic Places. Both the Hendrix Farm and Wild Goose may be individually eligible for the National Register of Historic Places, and a Determination of Eligibility may need to be requested for both properties.

Hendrix Farm (Springwood)
The Hendrix residence (also known as Springwood, Maple Shade, or the Lower Farm at Shepherd's Grade) was the 500-acre farmstead containing the main house and associated service and outbuildings. The earliest part of the main two-story fieldstone residence may have been built as early as the mid-18th century by Colonel Van Swearingen and was added to after 1822 by Henry Shepherd. Two stone outbuildings, a springhouse and a dairy, were built in 1819. Also on the property are several late 19th and early 20th century barns, a caretaker's residence, and the Swearingen family cemetery. All buildings are in apparently excellent condition.
The Hendrix residence may be significant under National Register Criteria C, as a well-preserved farmstead encompassing several different periods of architecture. It also has several historical associations with persons prominent in the history of Jefferson County. Between 1800
and the early 20th century, the farm was owned by the Shepherd family, many of whom have played a pivotal role in the political, social, and economic history of the Terrapin Neck and Shepherdstown areas.

Wild Goose
Wild Goose is located opposite the southwestern comer of the NCTC site, and is clearly visible both from Shepherd Grade Road (Route 5/7) and from the more elevated heights of the NCTC site. The main residence, an imposing two-story brick, house built circa 1842 by Henry Shepherd, is complemented by numerous associated historic outbuildings, including a carriage house and several barns. All buildings are in apparently good condition.
The Wild Goose residence may be significant under National Register Criteria C, as a well-preserved ante-bellum farmstead encompassing several

different periods of architecture. It too is significant for its association with the Shepherd family, particularly the noted 19th-century Shakespearean actor, Rezin D. Shepherd.

C&O Canal National Historical Park

The C&O Canal National Historical Park, containing the bed, locks, towpath, and associated structures of the C&O Canal, extends from Georgetown, in Washington, D.C., to Cumberland, Maryland. Begun in 1824, the canal was operational along its entire length by 1850, and ceased service in 1924. One of the best preserved early canals in the U.S., the C&O Canal is a significant feature in the history of western Maryland and the West Virginia panhandle. The stretch of the canal opposite the project site still retains the original bed and towpath, and there is an original lock approximately one mile to the east. The C&O Canal National Historical Park is listed on the National Register of Historic Places.

Other Significant Sites

Greenhome and O'Mara conducted an archeological reconnaissance survey on the NCTC site. The level of disturbance was determined, archeological sites were identified, and an archeological sensitivity map was developed. The reconnaissance survey provided a test for predictive models formulated for both prehistoric and historic sites. Three historic archeological sites (46JF93, 46JF94, and 46JF95) were previously recorded for the project site (Hulse 1991). The archeological reconnaissance survey of the property located a total of nine sites (two prehistoric sites and seven historic sites):

1) A complex of historic foundations was found on a small ridge, 75 feet north of Terrapin Neck Road and about 1,500 feet south of the Potomac River. The foundations included: two barns, one of which is still standing; a privy, partially standing; and four stone foundations. The stone foundations were sealed with mortar. Corrugated tin roofing was found in association with the structures. Modern concrete was used as a foundation for two of the buildings. Concrete was also used as a floor for another structure. The land around the standing barn was scattered with artifacts. These included yellow ware, transfer print whiteware, ironstone, and milk glass. All of the artifacts appear to date to the late 19th to early 20th century. This site is in the same general location as the C. Crowe house located on the 1852 Map of Jefferson County (Brown 1852). In 1883, the structures and land are shown to be occupied by John M. Snyder (Stephans 1967d).

The house at this site was torn down in 1969; it was then part of an 80-acre farmstead pieced together starting in 1888 by a George Turner, who owned it until 1909 when it was bought by William Foutz. It was owned by a series of families during and after the depression until it was added to the adjacent Springwood property by the Hendrix family in 1943.

2) On top of a ridge and 500 feet south of the Potomac River, one foundation, a depression and a possible artificial terrace were recorded. The foundation was L-shaped and made of cut fieldstone. This possibly domestic structure appears to have had a cellar. Hand made bricks were visible throughout the site. A depression was located north of the stone foundation and may represent an associated structure; however, no foundation was visible. A possible artificial terrace was located east of the stone foundation. Five artifacts were collected from this site: one gray stoneware sherd, one whiteware sherd, one lead glazed coarse red earthenware sherd, one olive green bottle glass fragment, and one window glass fragment. A road and fence line which runs south from the area towards Terrapin Neck Road may be associated with this site. The 1809 Map of Berkeley and Jefferson Counties does not show a structure in this location (Varle 1809), though many houses known to exist at the time in the area also did not appear on this map. This site is shown as the Joseph Entler house on the S. Howell Brown Map of Jefferson County dated 1852. In 1883, the house was still credited to the Entler family (Stephans 1967d).

3) A small brick chimney and stone foundation were located on the hillside below the second terrace above the Potomac River, about 250 feet south and 30 feet above the Potomac. Foundations for the attached structure were present but had collapsed and moved down the slope.
This is the remains of a recreational cabin built in 1937 by Ernest and Leone Stutzman, who sold the property several years later. The chimney may represent remains of a 20th century hunting cabin. A review of the historic maps did not reveal a building in this area.

4) An icehouse was located on the east side of a small hill just east of Hendrix Farm manor house. A second foundation is located three feet north of the icehouse. Also associated with the icehouse is a pond, now dry, which was probably created to supply ice for the icehouse.

5) A possible springhouse is located in a drainage in the northwestern portion of the project site. Brick was scattered the entire length of the drainage, but it was concentrated at the top of the drainage. Both machine-made and hand-made bricks were found, but no foundation was visible.

6) Soil, that was probably excavated to create the pond adjacent to the Hendrix Farm, was stored on the hill overlooking the pond. The soil may cover an area from which prehistoric material was recovered. The hill faces the house and has a southeast exposure.

7) An historic farm complex was found 1,250 feet south of the Potomac River, on a ridge which overlooks the river. Nine structures were identified.

Of these nine structures, one is a springhouse, four appear to be domestic structures, and four foundations may have been outbuildings. All of the foundations identified were characterized by thick field-stone walls. The 1809 Map of Berkeley and Jefferson counties does not show a building in this vicinity (Varle 1809). [Note: The 1809 Map of Berkeley and Jefferson counties only shows the residences of those rich enough to pay for having their homes included in the map and is a poor indicator of existing structures at the time]. The 1852 Map of Jefferson County shows James Markell occupying a structure where this site is located (Brown 1852). C.W. Mason's heirs are shown as occupying this land in 1883 (Stephans 1967d).
Also identified was the Swearingen family cemetery, which was 600 feet to the east of the foundations. The cemetery had five tombstones and one footstone, with dates of death from 1822 to1842. It was surrounded by a large stone wall. Some slave burials can be expected to be located within 100 feet of the Swearingen family plot.

8) A survey of three fields along the Potomac River floodplain recovered only one diagnostic artifact, a triangular point found on the second terrace overlooking the river. Flakes of chert and quartz and some historic artifacts were visible on the ground surface. Only a small sample of the artifacts was collected. They included the point, one possible quartz care, a rhyolite utilized flake, and a chalcedony flake. The triangular point most likely dates to the Late Woodland phase of prehistoric occupation. The Late Woodland date was derived from comparison with related types. Kevin Kilcullen, an archeologist on staff with the USFWS, reported cord-marked pottery and other lithic materials consistent with Late Woodland occupation from a preliminary walkover.

9) A race track is south of the Hendrix Farm, along Shepherd Grade Road. The track has a foundation of field-stone and dirt, with banked turns. No above ground evidence was found to suggest that a structure was associated with the track. Henry Shepherd III built the horse race track sometime during the mid to late 19th century (West Virginia Writer's Project 1941:279).

A literature review and reconnaissance of the NCTC site contributed to the determination that the level of ground disturbance was not significant. The level of disturbance of archeological remains is minimal. The disturbance appears to be mainly due to the agricultural usage of the property.
Research to date has shown that prehistoric sites can be expected around springs and along small streams leading to the river. On the wide floodplain of the Potomac River, major Woodland villages can be expected to occur. Smaller agricultural hamlets as well as earlier Archaic camps tend to occur inland along springs and small streams (Hulse 1987). Studies in Maryland and

Virginia (Hopkins and Dinnel 1989, Rust 1986) support and modify the Hulse model by adding hilltops to areas of high potential. Background research showed evidence for the occurrence of historic settlements near springs. Fieldwork and the NCTC supported this research. Out of seven sites, three were associated with springs (1,5,7) and contained architectural material. The field work conducted by Greenhorne and O'Mara points to historic settlement on ridgetops and along historic roads. All six of the sites containing foundations or architectural material (1, 2, 4, 3, 6, and 7) were found on the tops of ridges or along historic roads. A portion of the NCTC site that is reserved as a lifetime estate was excluded from investigation but is consistent with this model.

Infrastructure

Traffic and Transportation

Regional access to the NCTC site is provided from Baltimore and Washington via interstate highways, four-lane divided and controlled access highways, and state primary routes. Local access to the NCTC site is provided by rural roadways that are not designed to carry large volumes of traffic. Roadways adjacent to the site are winding and very narrow, no more than 16 to 20 feet wide, with no shoulders. In addition, some of these roadways are unpaved. These roadways were built to provide individual property owners with access to the regional network.

Water-Supply

Wells in the Conococheague Formation yield from zero to nearly 400 gpm. There are many wells that produce 20 gpm and a few are reported as "dry' holes. The wells of greatest capacity are industrial and commercial wells in the Hagerstown area (G&O 1992). Few water wells exist in the area immediately surrounding the NCTC site, due to its rural nature. Most of the wells in the region have yields of 5 gpm or less and are 100 to 400 feet deep. Two wells are reported to have yields of 50 gpm and 40 gpm with depths of 270 feet and 300 feet, located approximately 3/4 mile and one and one-half miles west and southwest of the Hendrix farm, respectively. There is also a well next to the farmhouse. This well is approximately 280 feet in depth and yields 2 to 5 gpm, significantly less than the nearby spring which yields approximately 20 gpm (G&O 1992).

VII. ENVIRONMENTAL CONSEQUENCES

Alternative 1: No Action

Disadvantages of no action alternative include negative long-term effects from a large population of white-tailed deer such as potential for disease epidemic, increase in

automobile accident rates, and browsing pressure on vegetation, which will affect abundance and distribution of species. The latter would have continued effects on composition of forest canopy even well after a population decline, should one occur. Grassland cover would quickly regenerate (Porter 1991), however, species composition may be permanently altered. A no-action approach carries the risk of allowing the population to exceed carrying capacity and may result in significant declines in deer health and in severe habitat degradation (Demarais et al. 2000, Cypher and Cypher 1988). Damage to local agriculture and horticulture would be expected to increase and the possibility of a reservoir for Lyme disease increases with an increased population. The rapid rate at which deer populations are capable of expanding was already emphasized above. The no-action alternative would be favorable to that segment of the public which opposes hunting programs in general, however, allowing overpopulation to occur is negligent management of the NCTC's other resources. The West Virginia Department of Natural Resources has recommended that NCTC conduct deer management to be consistent with their statewide deer management program.

Alternative 2: - Controlled Hunting

Based on a nationwide survey of all states in the United States published in 1992, deer were effectively controlled with hunting and habitat manipulation in many areas where they were overpopulated. The remaining overpopulated herds were either not hunted, had an inadequate doe harvest, or inadequate harvest. In a 10-year study in northwestern Pennsylvania examining the impacts of varying densities of deer on deer health and habitat, starvation mortality resulted when densities reached higher than 25 deer/km2. Also, species richness and abundance of shrubs and herbaceous vegetation was shown to decline when deer densities reach between 4-8 deer/km2 (deCalesta and Stout 1997). No prevention or control of epizootic hemoraghic disease exists to date except by keeping populations below the carrying capacity. It is anticipated, therefore, that deer quality, deer health, and habitat would be enhanced by reduced numbers competing for resources. It is not likely that hunting will reduce the population to such low levels as to place it at risk because, despite fencing around the property, the population is relatively open. No adverse impacts to vegetation from trampling from hunters is likely, as most species will have senesced or become dormant. Neither are soils and water quality expected to experience any negative effects under this alternative. The deer hunt would occur outside of the breeding period of most species, thereby avoiding any potential disturbance. No adverse effects on migratory birds, inter-jurisdictional fishes, and endangered species are anticipated as a result of establishing a hunt program. Although bald eagles forage along its shores, the species does not currently nest at the NCTC. Habitat use by birds, small mammals, and

reptiles may experience some disturbance, but it is expected that this will be temporary and normal use will resume shortly after the hunt closes.
Reducing the deer population will benefit the surrounding human community by reducing grazing on residential landscape vegetation and by reducing deer/automobile interactions and reducing the potential for Lyme disease transmission. At high densities, deer may act as a host reservoir for Lyme disease bearing ticks (Jones et al. 1998). The NCTC may be closed to other uses during hunt days, but hunt days will be scheduled on days that there would normally not be students present on campus. A controlled hunt would allow the NCTC to manage the deer population while providing the local public with a quality wildlife-dependent recreational opportunity. A major benefit to a controlled hunt would be the integration of the hunt into a training course on deer management. This would not only contribute to the NCTC training mission, but would provide a method of disseminating proper techniques of deer management to others.

Alternative 3: Professional Removal/Sharpshooting

Professional removal with marksmen can be very efficient and cost effective (Cypher and Cypher 1988) if performed by experts that are well equipped, trained, familiar with deer behavior and the terrain, and familiar with use of bait stations. In general, this alternative will have the same impact as the controlled hunt but is expected to involve less personnel. No adverse impacts to habitat and wildlife, or existing public recreation are anticipated except that sharpshooting does deprive the public of hunting as one source of wildlife-dependent recreation. This alternative may be more costly than a public hunting program, particularly if outsourcing is required for equipment and personnel, but may also be more cost-beneficial in terms of the NCTC staff time and resources required for managing a public hunt. There would be limited integration into a deer management training course, thus little additional benefit to other governmental organizations or the NCTC training mission.

VIII. CONSULTATION AND COORDINATION

The environmental assessment is being forwarded to the following agencies, groups, and individuals for comments and review. It will also be made available to the general public.

A. Federal Agencies
U.S. Fish and Wildlife Service
U.S. National Park Service

B. State Agencies
Maryland Department of Natural Resources
West Virginia Department of Natural Resources
Jefferson County, West Virginia

C. Private Organizations
See Appendix C.

D. Private Landowners
See Appendix C.

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APPENDIX A

Options Eliminated from Further Consideration

1. Reproductive Intervention (birth control)

Reproductive intervention or birth control is the general category for a number of fertility control methods available, each with varying rates of success. Immunocontraception with porcine zona pellucida (PZP) vaccine injection, is probably the best known and most widely applied. Steroid implantation has been available since the 1970s. Remote prostaglandin injection (Denicola 1997), oral vaccination with a live vector (Miller et al. 1999a), and GNRH vaccines are more recent and lack long-term evaluation of effectiveness. Sterilization is a permanent option, although not widely applicable.

Effectiveness and efficiency of any of the above forms of reproductive intervention is affected by a number of factors including; method of application or delivery, need or ability to capture the animal, the number of treatments needed to ensure effectiveness, size of the population, status of the population (confined or free ranging), and longevity of treatment.

Immunocontraception

Immunocontraception (PZP injection) is most effective at preventing pregnancy when hand injected and combined with subsequent boosts. The PZP vaccination produces reversible infertility lasting 1-4 years (Miller et al. 1999b), however, it requires two injections, four weeks apart, to be effective for at least two years (McShea et al.1997). Effectiveness at reducing population number and growth rate is greatly reduced when dealing with large and open populations due to the need to treat a large percentage of the females over a large area. For a large population, contraception rates of less than 50% of does will curb growth in 30 years, but will not reduce the size. Even rates of greater than 50% require at least a 5-10 year planning horizon to see significant population declines (Seagle and Close 1996). Therefore, the cost, effort, expertise, manpower, and handling time will continue for years before achieving any results.

Another obstacle to PZP immunocontraception is the adjuvant used for the initial injection (an adjuvant is a microbial aid necessary for boosting the vaccine once inside the animal's bloodstream). Complete Froine's, the most commonly used, contains heat-killed tuberculin cells, which causes subjects to test false positive for TB. The FDA, which has jurisdiction over its commercial use, currently does not permit use of this adjuvant on other than

tightly controlled or isolated populations and in combination with ear-tagging (in order to prevent the public from consuming escaped deer).

Steroidal implants

Subcutaneous steroidal implants have been used during the past 25 years with varying rates of effectiveness in reducing deer pregnancy (and now remote delivery of this treatment is possible) but the long-term effectiveness is uncertain. In addition, the same factors that confound the PZP method at the population level apply (Connecticut Department. Of Environmental Protection, Wildlife Bureau, 1988). Because of the uncertainty of long-term health effects on deer and subsequent impacts on the food-web (including human consumption of treated deer), the FDA will not approve application on free-ranging deer at this time (DeNicola et al. 2000).

Oral Delivery of Contraceptives

Oral delivery of contraceptives has a number of concerns that make this method ill-advised and impractical: it is not species-specific (risks ingestion by non-target species), bait and supplies are wasted on non-target species, deer sometimes reject treated bait, and it is difficult to manage dosage control. Currently, the method is not working at the field or captive level. Oral vaccinations through live-vector delivery is a relatively new method, and is species-specific, but is not long-acting and so must be delivered on a frequent and regular basis (Alan Rutberg, Humane Society of the U.S., 2000).

GNRH Vaccine

Another field method currently being tested is the GNRH vaccine. This shuts down the whole reproductive hormone system of both sexes and its effects are dramatic, even on behavior and antler development. This is a new method and the affect on deer and their behavior needs further evaluation prior to application in the field (Ibid.).

Sterilization

Sterilizations must be done annually, the number of which must be calculated based on the number of fertile females in the herd. Great care must be taken to reduce the number of sterilizations in time to prevent a population crash and bottleneck (Boone and Wiegert 1994). Again, this option is not effective for open populations unless performed at a landscape level. No matter which birth control method is used, more than 50% of the females will need to remain infertile to effect a reduction in population size (Hobbs et

al. 2000, Seagle and Close 1996). All of the above described techniques are compromised at the individual and population levels due to the openness of the population. Because these operations entail multiple captures, considerable handling time, facilities for holding captured animals or conducting surgery, risk to personnel and animals, trauma losses, and constant or recurring expense means that at this stage of development they are not viable methods in the field. This situation may change in a few years as applications of these techniques are improved upon.

2. Live Trapping and Relocation

The live trapping and relocation approach entails transporting captured animals to a new location outside the impacted area. Disadvantages, however, far outweigh the advantages. Capture and handling of deer involves risk to deer and handlers. Deer are susceptible to capture myopathy, a form of muscle dysfunction that is stress-related and can result in delayed mortality. Trauma losses can amount to about 4% of capture and transfer efforts (Wildlife Information Publication, Virginia Department of Game and Inland Fisheries, 1999). The mortality potential attendant to handling is amplified by placing individuals in unfamiliar surroundings (Cypher and Cypher 1988).

Finding suitable release sites is increasingly more difficult as most locations cannot accommodate more deer and are experiencing their own population management problems. A further complication to this alternative is the recent increase in Lyme-Disease associated with deer populations.

3. Habitat Management

This approach manipulates the existing habitat to induce behavioral changes in deer and reduce human/deer conflicts. An example would be to lower the biological carrying capacity by removing forage species, and/or changing landscape elements such as water features or forest edge. This alternative has an appeal for its humane and non-lethal approach. NCTC has already converted 46 acres of croplands to either fallow fields or natural, native grasslands. While these are still good deer habitat, they are not as attractive as standing crops. As stated in the original Environmental Assessment for the NCTC, the central NCTC design theme was “maintaining the existing rural character of the area.” This included “Prime farmlands on the site will be preserved as much as possible” and maintaining “the open and undeveloped character of the site with internal, long-distance views and wooded buffers.” Obviously, this larger objective established for the NCTC landscape restricts the ability to do the types of habitat management that would significantly reduce deer populations.

Trees

COMMONNAME	GENUS	SPECIES	FAMILY	NATIVE
Boxelder	Acer	negundo	Aceraceae	native
Sugar Maple	Acer	saccharum	Aceraceae	native
Silver Maple	Acer	saccharinum	Aceraceae	native
Black Maple	Acer	nigrum	Aceraceae	native
Tree of Heaven	Ailanthus	altissima	Simaroubac	alien
Paw-Paw	Asimina	triloba	Annonaceae	native
Sweet Birch	Betula	lenta	Corylaceae	native
River Birch	Betula	nigra	Corylaceae	native
Shagbark Hickory	Carya	ovata	Juglandacea	native
Pignut Hickory	Carya	glabra	Juglandacea	native
Bitternut Hickory	Carya	cordiformis	Juglandacea	native
Hackberry	Celtis	occidentalis	Ulmaceae	native
Redbud	Cercis	anadensis	Leguminosa	native
Flowering Dogwood	Cornus	florida	Cornaceae	native
American Beech	Fagus	grandifolia	Fagaceae	native
Green Ash	Fraxinus	pennsylvani	Oleaceae	native
White Ash	Fraxinus	anadensi	Oleaceae	native
Honey Locust	Gleditsia	triacanthos	Leguminosa	native
Black Walnut	Juglans	nigra	Juglandacea	native
Red Cedar	Juniperus	virginianus	Cupressace	native
Tulip Poplar	Liriodendron	tulipifera	Magnoliacea	native
Cucumber Tree	Magnolia	acuminata	Magnoliacea	native
White Mulberry	Morus	alba	Moraceae	alien
Virginia Pine	Pinus	virginiana	Pinaceae	native
Pitch Pine	Pinus	rigida	Pinaceae	native
White Pine	Pinus	anaden	Pinaceae	native
Sycamore	Platanus	occidentalis	Platanaceae	native
Bigtooth Aspen	Populus	grandidentat	Salicaceae	native
Cottonwood	Populus	anadens	Salicaceae	native
Black Cherry	Prunus	serotina	Rosaceae	native
Sweet Cherry	Prunus	avium	Rosaceae	alien
Wild Crabapple	Pyrus	coronaria	Rosaceae	native
Scarlet Oak (?)	Quercus	coccinea	Fagaceae	native
Chinquapin Oak	Quercus	muhlenbergii	Fagaceae	native
Red Oak	Quercus	rubra	Fagaceae	native
Chestnut Oak	Quercus	prinus	Fagaceae	native
Black Oak	Quercus	velutina	Fagaceae	native
White Oak	Quercus	alba	Fagaceae	native
Black Locust	Robinia	pseudo-	Leguminosa	native
Sassafras	Sassafras	albidum	Lauraceae	native
Basswood	Tilia	anadensi	Tiliaceae	native
Slippery Elm	Ulmus	rubra	Ulmaceae	native
American Elm	Ulmus	anadensi	Ulmaceae	native

Shrubs

COMMONNAME	GENUS	SPECIES	FAMILY	NATIVE
Prickly Gooseberry	Ribes	cynosbati	Saxifragace	native
Staghorn Sumac	Rhus	typhina	Anacardiace	native
Jetbead	Rhodotypos	scandens	Rosaceae	alien
Elderberry	Sambucus	□anadensis	Caprifoliace	native
Multiflora Rose	Rosa	multiflora	Rosaceae	alien
Witch Hazel	Hamamelis	virginiana	Hamamelida	native
Wild Hydrangea	Hydrangea	arborescens	Saxifragace	native
Spicebush	Lindera	benzoin	Lauraceae	native
Bladderpod	Staphylea	trifolia	Staphyleace	native
Autumn Olive	Elaeagnus	□anadensi	Eleagnacea	alien
Blackhaw	Viburnum	prunifolium	Caprifoliace	native
Tartarian	Lonicera	tartarica	Caprifoliace	alien

Grasses

COMMONNAME	GENUS	SPECIES	FAMILY	NATIVE
Colonial Bent Grass	Agrostis	tenuis	Poaceae	native
Broomsedge	Andropogon	virginicus	Poaceae	native
Big Bluestem*	Andropogon	gerardi	Poaceae	native
Little Bluestem*	Andropogon	scoparius	Poaceae	native
Sweet Vernal Grass	Anthoxanthu	odoratum	Poaceae	alien
Small Carp Grass	Arthraxon	hispidus	Poaceae	alien
Oats	Avena	sativa	Poaceae	alien
Side-oats Grama*	Bouteloua	curtipendula	Poaceae	native
Long-awned Wood	Brachyeletru	erectrum	Poaceae	native
Brome Grass	Bromus	tectorum	Poaceae	alien
Brome Grass	Bromus	inermis	Poaceae	alien
Bermuda Grass	Cynodon	dactylon	Poaceae	alien
Orchard Grass	Dactylus	glomerata	Poaceae	alien
Smooth Crabgrass	Digitaria	ischaemum	Poaceae	alien
Crabgrass	Digitaria	sanguinalis	Poaceae	alien
Barnyard Grass	Echinochloa	crusgalli	Poaceae	alien
Goose Grass	Eleusine	indica	Poaceae	alien
Wild Rye	Elymus	villosus	Poaceae	native
Canadian Rye	Elymus	□anadensis	Poaceae	native
Virginia Wild Rye	Elymus	virginicus	Poaceae	native
Frank's Love Grass	Eragrostis	frankii	Poaceae	native
Meadow Fescue	Festuca	elatior	Poaceae	alien
Rattlesnake	Glyceria	□anadensis	Poaceae	native
Fowl Mannagrass	Glyceria	striata	Poaceae	native
Bottlebrush Grass	Elymus	hystrix	Poaceae	native
White Grass	Leersia	virginica	Poaceae	alien
Rice Cutgrass	Leerzia	orizoides	Poaceae	alien

Italian Rye Grass	Lolium	multiflorum	Poaceae	alien
Perennial Rye	Lolium	perenne	Poaceae	alien
Two-flower Melica	Melica	mutica	Poaceae	native
Japanese Stilt Grass	Microstegiu	viminium	Poaceae	alien
Wood Witch Grass	Panicum	philadephicu	Poaceae	native
Switch Grass*	Panicum	virgatum	Poaceae	native
Timothy	Phleum	pratense	Poaceae	alien
Phragmites	Phragmites	communis	Poaceae	native
Kentucky Bluegrass	Poa	pratensis	Poaceae	alien
Rye Grass	Secale	cereale	Poaceae	alien
Yellow Foxtail	Setaria	glauca	Poaceae	alien
Foxtail	Setaria	faberii	Poaceae	alien
Indian Grass*	Sorghastrum	nutans	Poaceae	native
Johnson Grass	Sorghum	halapense	Poaceae	alien
Dropseed	Sporobolus	vaginiflorus	Poaceae	native
Purpletop	Triodia	flava	Poaceae	native
Wheat	Triticum	aestivum	Poaceae	alien

- Denotes those grasses that were planted on about 26 acres in 1999 and now established.

Forbs

COMMONNAME	GENUS	SPECIES	FAMILY	NATIVE
Velvet-leaf	Abutilon	theophrasti	Malvaceae	alien
Wingstem	Actinomeris	alternifolia	Compositae	native
Tall Agrimony	Agrimonia	gryposepala	Rosaceae	native
Garlic Mustard	Alliaria	officinalis	Cruciferae	alien
Meadow Garlic	Allium	canadense	Liliaceae	native
Wild Leek	Allium	tricoccum	Liliaceae	native
Green Amaranth	Amaranthus	retroflexus	Amaranthac	alien
Giant Ragweed	Ambrosia	trifida	Compositae	native
Ragweed	Ambrosia	artemisiifolia	Compositae	native
Common Pimpernel	Anagallis	arvensis	Primulaceae	alien
Rue-anemone	Anemonella	thalictroides	Ranunculac	native
Mayweed	Anthemis	cotula	Compositae	alien
Puttyroot	Aplectrum	hyemale	Orchidaceae	native
Indian Hemp	Apocynum	cannabinum	Apocynacea	native
Wild Columbine	Aquilegia	□anadensis	Ranunculac	native
Spreading Rockcress	Arabis	patens	Cruciferae	native (rare)
Rockcress	Arabis	perstellatus	Cruciferae	native (rare)
Smooth Rock Cress	Arabis	laevigata	Cruciferae	native
Burdock	Arctium	minus	Compositae	alien
Jack-in-the-Pulpit	Arisaema	atrorubens	Araceae	native
Mugwort	Artemisia	vulgaris	Compositae	alien
Annual Wormwood	Artemisia	annua	Compositae	alien
Wild Ginger	Asarum	canadense	Aristolochiac	native

Green-flowered	Asclepias	viridiflora	Asclepiadac	native
Common Milkweed	Asclepias	syriaca	Asclepiadac	native
Butterfly Weed	Asclepias	tuberosa	Asclepiadac	native
White Wood Aster	Aster	divaricatus	Compositae	native
Bushy Aster	Aster	dumosus	Compositae	native
Calico Aster	Aster	lateriflorus	Compositae	native
Lowrie's Aster	Aster	lowrieanus	Compositae	native
Short's Aster	Aster	shortii	Compositae	native
Small White Aster	Aster	vimineus	Compositae	native
Heath Aster	Aster	pilosus	Compositae	native
Wild Indigo	Baptisia	tinctoria	Leguminosa	native
Early Winter Cress	Barbarea	verna	Cruciferae	alien
Winter Cress	Barbarea	vulgaris	Cruciferae	alien
Larger Bur Marigold	Bidens	leavis	Compositae	native
Begger Ticks	Bidens	frondosa	Compositae	native
False Nettle	Boehmeria	□anadensis	Urticaceae	native
Tall Bellflower	Campanula	□anadensi	Campanulac	native
Shepherd's Purse	Capsella	bura-	Cruciferae	alien
Hairy Bittercress	Cardamine	□anaden	Cruciferae	native
Common Thistle	Carduus	acanthoides	Compositae	alien
Musk Thistle	Carduus	nutans	Compositae	alien
Blue Cohosh	Caulophyllu	thalictroides	Berberidace	native
Yellow Star Thistle	Centaurea	solstitialis	Compositae	alien
Brown Knapweed	Centaurea	jacea	Compositae	alien
Mouse-Ear	Cerastium	vulgatum	Caryophylla	alien
Celandine	Chelidonium	majus	Papaverace	alien
Turtlehead	Chelone	glabra	Scrophularia	native
Lamb's-quarters	Chenopodiu	album	Chenopodia	alien
Skeleton-weed	Chondrilla	juncea	Compositae	alien
Ox-eye Daisy	Chrysanthe	leucanthemu	Compositae	alien
Chicory	Cichorium	intybus	Compositae	alien
Black Cohosh	Cimicifuga	racemosa	Ranunculac	native
Enchanter's	Circaea	quadrisulcat	Chenopodia	native
Bull Thistle	Cirsium	vulgare	Compositae	alien
Canada Thistle	Cirsium	arvense	Compositae	alien
Spring Beauty	Claytonia	virginica	Portulacace	native
Horse-balm	Collinsonia	□anadensis	Scrophularia	native
Asiatic Dayflower	Commelina	communis	Commelinac	alien
Poison Hemlock	Conium	maculatum	Umbelliferae	alien
Cancerroot	Conopholis	□anadensi	Orobanchac	native
Hare's-Ear Mustard	Conringia	orientalis	Cruciferae	alien
Hedge Bindweed	Convulvulus	sepium	Convulvulac	native
Lance-leaved	Coreopsis	lanceoloata	Compositae	native
Yellow Corydalis	Corydalis	flavula	Fumariacea	native
Honewort	Cryptotaenia	□anadensis	Umbelliferae	native
Tarweed	Cuphea	petiolata	Lythraceae	native
Jimsonweed	Datura	stramonium	Solanaceae	native

Queen Anne’s Lace	Daucus	carota	Umbelliferae	alien
Dwarf Larkspur	Delphinium	tricorne	Ranunculac	native
Cut-Leaved	Dentaria	laciniata	Cruciferae	native
Tick-trefoil	Desmodium	perplexum	Leguminosa	native
Tick-trefoil	Desmodium	paniculatum	Leguminosa	native
Tick-trefoil	Desmodium	glutinosum	Leguminosa	native
Hoary Tick-Trefoil	Desmodium	canascens	Leguminosa	native
Deptford Pink	Dianthus	armeria	Caryophylla	alien
Dutchman’s Breeches	Dicentra	cucullaria	Fumariacea	native
Squirrel Corn	Dicentra	□anadensis	Fumariacea	native
Indian Strawberry	Duchesnea	indica	Rosaceae	alien
Viper’s Bugloss	Echium	vulgare	Boraginacea	alien
Ellisia	Ellisia	nyctelea	Hydrophylla	native
Purple-leaved Willow	Epilobium	coloratum	Onagraceae	native
Northern Willow Herb	Epilobium	glandulosum	Onagraceae	native
Harbinger of Spring	Erigenia	bulbosa	Umbelliferae	native
Daisy Fleabane	Erigeron	annuus	Compositae	native
Horseweed	Erigeron	□anadensis	Compositae	native
Common Fleabane	Erigeron	philadelphic	Compositae	native
Trout Lily	Erythronium	americanum	Liliaceae	native
White Trout Lily	Erythronium	albidum	Liliaceae	native
Boneset	Eupatorium	perfoliatum	Compositae	native
Spotted Joe-Pye	Eupatorium	maculatum	Compositae	native
White Snakeroot	Eupatorium	rugosum	Compositae	native
Mistflower	Eupatorium	coelestinum	Compositae	native
Late Flowering	Eupatorium	serotinum	Compositae	native
Cyperus Spurge	Euphorbia	cyparissias	Euphorbiace	alien
Spotted Spurge	Euphorbia	maculata	Euphorbiace	alien
False Mermaid Weed	Floerkea	proserpinac	Limnanthace	native
Woodland Strawberry	Fragaria	vesca	Rosaceae	alien
Galinsoga	Galinsoga	ciliata	Compositae	alien
Fragrant Bedstraw	Galium	triflorum	Rubiaceae	native
Hairy Bedstraw	Galium	pilosum	Rubiaceae	native
Long-stalked	Geranium	columbinum	Geraniaceae	alien
Small-flowered	Geranium	pusillum	Geraniaceae	alien
White Avens	Geum	canadense	Rosaceae	native
Rough Avens	Geum	virginianum	Rosaceae	native
Gill-over-the-ground	Glechoma	hederacea	Labiatae	alien
Cudweed	Gnaphalium	obtusifolium	Compositae	native
Virginia Stickseed	Hackelia	virginiana	Boraginacea	native
Sneezeweed	Helenium	autumnale	Compositae	native
Thin-leaved	Helianthus	decapetalus	Compositae	native
Rough Ox-eye	Heliopsis	scabra	Compositae	native
Ox Eye Daisy	Heliopsis	helianthoide	Compositae	native
Day Lily	Hemerocalli	fulva	Liliaceae	alien
Round-lobed	Hepatica	□anadensi	Ranunculac	native
Dame’s Rocket	Hesperis	matronalis	Cruciferae	alien

Flower-of-an-Hour	Hibiscus	trionum	Malvaceae	alien
Virginia Waterleaf	Hydrophyllu	virginianum	Hydrophylla	native
Common St.	Hypericum	perforatum	Guttiferae	alien
Spotted St. Johnswort	Hypericum	punctatum	Guttiferae	native
Dwarf St. Johnswort	Hypericum	mutilum	Guttiferae	native
Jewelweed	Impatiens	capensis	Balsaminace	native
Pale Touch-Me-Not	Impatiens	pallida	Balsaminace	native
Ivy-Leaved Morning-	Ipomea	hederacea	Convulvulac	alien
Twinleaf	Jeffersonia	diphylla	Berberidace	native
Water Willow	Justicia	□anadensi	Acanthacea	native
Prickly Lettuce	Lactuca	scariola	Compositae	alien
Wood Nettle	Laportea	□anadensis	Urticaceae	native
Motherwort	Leonurus	cardiaca	Labiatae	alien
Field Cress	Lepidium	campestre	Cruciferae	alien
Bushclover	Lespedeza	intermedia	Leguminosa	native
Butter-and-eggs	Linaria	vulgaris	Scrophularia	alien
Cardinal Flower	Lobelia	cardinalis	Lobeliaceae	native
Great Lobelia	Lobelia	syphilitica	Lobeliaceae	native
Indian Tobacco	Lobelia	inflata	Lobeliaceae	native
Spiked Lobelia	Lobelia	spicata	Lobeliaceae	native
White Campion	Lychnis	alba	Caryophylla	alien
Northern Bugleweed	Lycopus	uniflora	Labiatae	native
Moneywort	Lysimachia	nummularia	Primulaceae	alien
Fringed Loosestrife	Lysimachia	ciliata	Primulaceae	native
White Sweetclover	Melilotus	alba	Leguminosa	alien
Yellow Sweetclover	Melilotus	officinalis	Leguminosa	alien
Virginia Bluebell	Mertensia	virginica	Boraginacea	native
Bishop’s Cap	Mitella	diphylla	Saxifragace	native
Wild Bergomot	Monarda	fistulosa	Labiatae	native
Indian Pipe	Monotropa	uniflora	Pyrolaceae	native
Watercress	Nasturtium	officianale	Cruciferae	alien
Catnip	Nepeta	cataria	Labiatae	alien
Common Evening	Oenothera	biennis	Onagraceae	native
Northern Evening	Oenothera	parviflora	Onagraceae	native
White Evening	Oenothera	speciosa	Onagraceae	native
Star-of-Bethlehem	Ornithogalu	umbellatum	Liliaeae	alien
Sweet Cicely	Osmorhiza	claytoni	Umbelliferae	native
Yellow Wood Sorrel	Oxalis	europaea	Oxalidaceae	native
Yellow Wood-Sorrel	Oxalis	stricta	Oxalidaceae	native
Poppy	Papaver	dubium	Papaverace	alien
Ditch Stonecrop	Penthorum	sedoides	Saxifragace	native
Beefsteak Plant	Perilla	frutescens	Labiatae	alien
Mountain Phlox	Phlox	ovata	Polemoniac	native
Blue Phlox	Phlox	divaricata	Polemoniac	native
Lopseed	Phryma	leptostachya	Phrymaceae	native
Smooth Ground	Physalis	subglabrata	Solanaceae	native
Common Ground-	Physalis	heterophylla	Solanaceae	native

Pokeweed	Phytolacca	□anadensi	Phytolaccac	native
Clearweed	Pilea	pumila	Urticaceae	native
Common Plantain	Plantago	rugellii	Plantaginac	native
Common Plantain	Plantago	major	Plantaginac	alien
English Plantain	Plantago	lanceolata	Plantaginac	alien
Mayapple	Podophyllu	peltatum	Berberidace	native
Solomon's Seal	Polygonatu	canaliculatu	Liliaceae	native
Mild Water Pepper	Polygonum	hydropiperoi	Polygonace	native
Water Smartweed	Polygonum	coccineum	Polygonace	native
Dock-leaved	Polygonum	lapathifolium	Polygonace	native
Ladies Thumb	Polygonum	persicaria	Polygonace	alien
Water Smartweed	Polygonum	punctatum	Polygonace	native
Asiatic Water Pepper	Polygonum	cespitosum	Polygonace	alien
Large-flowered	Polymnia	uvedalia	Compositae	native
Rough-fruited	Potentilla	recta	Rosaceae	alien
Rough Cinquefoil	Potentilla	norvegica	Rosaceae	native
Tall Cinquefoil	Potentilla	arguta	Rosaceae	native
Self-Heal	Prunella	vulgaris	Labiatae	native
Swamp Buttercup	Ranunculus	septentrional	Ranunculac	native
Crowfoot	Ranunculus	abortivus	Ranunculac	native
Cursed Crowfoot	Ranunculus	sceleratus	Ranunculac	native
Hooked Crowfoot	Ranunculus	recurvatus	Ranunculac	native
Black-Eyed Susan	Rudbeckia	hirta	Compositae	native
Brown-eyed Susan	Rudbeckia	fulgida	Compositae	native
Ruellia	Ruellia	strepens	Acanthacea	native
Curly Dock	Rumex	crispus	Polygonace	alien
Sheep Sorrel	Rumex	acetosella	Polygonace	alien
Bloodroot	Sanginaria	□anadensis	Papaverace	native
Long-Fruited	Sanicula	□anadensis	Umbelliferae	native
Black Snake Root	Sanicula	marylandica	Umbelliferae	native
Bouncing Bet	Saponaria	officinalis	Caryophylla	alien
Wild Basil	Satureja	vulgaris	Labiatae	alien
Lizard Tail	Saururus	cernuus	Saururaceae	native
Early Saxifrage	Saxifraga	virginiensis	Saxifragace	native
Mad-dog Skullcap	Scutellaria	lateriflora	Labiatae	native
Wild Stonecrop	Sedum	ternatum	Crassulacea	native
Squaw-weed	Senecio	obovatus	Compositae	native
Golden Ragwort	Senecio	aureus	Compositae	native
Prickly Mallow	Sida	spinosa	Malvaceae	alien
Hedge Mustard	Sisymbrium	officinale	Crusiferae	alien
Tumble Mustard	Sisymbrium	altissimum	Cruciferae	alien
Blue-eyed Grass	Sisyrinchium	angustifoliu	Iridaceae	native
False Solomon's Seal	Smilacina	racemosa	Liliaceae	native
Horse Nettle	Solanum	carolinense	Solanaceae	native
Black Nightshade	Solanum	americanum	Solanaceae	native
Wreath Goldenrod	Solidago	caesia	Compositae	native
Sweet Goldenrod	Solidago	odora	Compositae	native

Late Goldenrod	Solidago	□anadensi	Compositae	native
Early Goldenrod	Solidago	juncea	Compositae	native
Rough-stemmed	Solidago	rugosa	Compositae	native
Spiny Sow Thistle	Sonchus	asper	Compositae	alien
Venus Looking Glass	Specularia	perfoliata	Campanulac	native
Rough Hedge-Nettle	Stachys	tenuifolia	Labiatae	native
Common Chickweed	Stellaria	media	Caryophylla	alien
Star Chickweed	Stellaria	pubera	Caryophylla	native
Common Dandelion	Taraxacum	officinale	Compositae	alien
American Germander	Teucrium	canadense	Labiatae	native
Tall Meadow Rue	Thalictrum	polygamum	Ranunculac	native
Foam Flower	Tiarella	cordifolia	Saxifragace	native
Virginia Knotweed	Tovara	virginiana	Polygonace	native
Yellow Goat's Beard	Tragopogon	pratensis	Compositae	alien
Yellow Goat's Beard	Tragopogon	major	Compositae	alien
Low Hop Clover	Trifolium	campestre	Leguminosa	alien
Rabbit's Foot Clover	Trifolium	arvense	Leguminosa	alien
Red Clover	Trifolium	pratense	Leguminosa	alien
White Clover	Trifolium	repens	Leguminosa	alien
Red Trillium	Trillium	erectum	Liliaeae	native
Toad Trillium	Trillium	sessile	Liliaeae	native
Coltsfoot	Tussilago	farfara	Compositae	alien
Cattail	Typha	latifolia	Typhaceae	native
Burning Nettle	Urtica	dioica	Urticaceae	alien
Moth Mullein	Verbascum	blattaria	Scrophularia	alien
Common Mullein	Verbascum	thapsus	Scrophularia	alien
Blue Vervain	Verbena	□anaden	Verbenacea	native
White Vervain	Verbena	urticifolia	Verbenacea	native
New York Ironweed	Vernonia	noveborace	Compositae	native
Corn Speedwell	Veronica	arvensis	Scrophularia	alien
European Brooklime	Veronica	beccabunga	Scrophularia	alien
Pale Violet	Viola	striata	Violaceae	native
Round-leaved Violet	Viola	rotundifolia	Violaceae	native
Common Blue Violet	Viola	papilionacea	Violaceae	native
Cocklebur	Xanthium	strumarium	Compositae	native

Sedges and Rushes

COMMONNAME	GENUS	SPECIES	FAMILY	NATIVE
Blunt Broom Sedge	Carex	tribuloides	Cyperaceae	native
Carex	Carex	laxiculmis	Cyperaceae	native
Carex	Carex	stipata	Cyperaceae	native
Carex	Carex	intumescens	Cyperaceae	native
Carex	Carex	frankii	Cyperaceae	native
Carex	Carex	lurida	Cyperaceae	native

Many-flowered	Cyperus	lancastriensi	Cyperaceae	native
Galingale	Cyperus	strigosus	Cyperaceae	native
Nut Sedge	Cyperus	esculentus	Cyperaceae	native
Common Rush	Juncus	□anaden	Juncaceae	native
Path Rush	Juncus	tenuis	Juncaceae	native
Great Bulrush	Scirpus	validus	Cyperaceae	native
Scirpus	Scirpus	lineatus	Cyperaceae	native

Vines

COMMONNAME	GENUS	SPECIES	FAMILY	NATIVE
Trumpet Creeper	Campsis	radicans	Bignoniacea	native
Climbing Bittersweet	Celastrus	scandens	Celastracea	native
Field Bindweed	Convolvulus	arvensis	Convulvulac	alien
Japanese Hop	Humulus	japonicus	Canabinace	alien
Common Morning	Ipomea	purpurea	Convulvulac	alien
Wild Potato Vine	Ipomea	pandurata	Convulvulac	native
Japanese	Lonicera	japonica	Caprifoliace	alien
Moonseed	Menispermu	canadense	Menisperma	native
Virginia Creeper	Parthenocis	quinquefolia	Vitaceae	native
Yellow Passion	Passiflora	lutea	Passiflorace	native
Poison Ivy	Rhus	radicans	Anacardiace	native
Wineberry	Rubus	phoenicolasi	Rosaceae	alien
Black Raspberry	Rubus	occidentalis	Rosaceae	native
Flowering Raspberry	Rubus	odoratus	Rosaceae	native
One-seeded Bur	Sicyos	angulatus	Cucurbitace	native
Cat Briar	Smilax	rotundifolia	Liliaceae	native
Periwinkle	Vinca	minor	Apocynacea	alien
Summer Grape	Vitis	aestivalis	Vitaceae	native
Muscadine	Vitis	rotundifolia	Vitaceae	native
Winter Grape	Vitus	□anaden	Vitaceae	native

Ferns and Fern Allies

COMMONNAME	GENUS	SPECIES	FAMILY	NATIVE
Maidenhair	Asplenium	trichomanes	Polypodiace	native
Meadow Spikemoss	Selagenella	apoda	Sellagenella	native
Field Horsetail	Equisetum	arvense	Equisetacea	native
Rattlesnake Fern	Botrychium	virginianum	Ophioglossa	native
Purple Cliff-brake	Pellaea	atropurpurea	Polypodiace	native
Common Maidenhair	Adiantum	pedatum	Polypodiace	native
Liverwort	Marchantia	polymorpha	Marchantiac	native
Ebony Spleenwort	Asplenium	platyneuron	Polypodiace	native
Fragile Fern	Cystopteris	fragilis	Polypodiace	native
Sensitive Fern	Onoclea	sensibilis	Polypodiace	native
Southern Lady Fern	Athyrium	asplenioides	Polypodiace	native
Bulblet Bladder Fern	Cystopteris	bulbifera	Polypodiace	native
Christmas Fern	Polystichum	acrostichoid	Polypodiace	native
Spinulose Wood Fern	Dryopteris	spinulosa	Polypodiace	native
Rockcap Fern	Polypodium	virginianum	Polypodiace	native
Walking Fern	Camptosoru	rhyzophyllu	Polypodiace	native

Note: Ornamental species and other species planted during and after the construction phase of NCTC are not included in this list, with the exception of the native warm season grasses planted in 1999. Some of the plants in the vine category could also be considered

shrubs and visa versa. The list is current as of Oct. 2002. Nomenclature tends to follow Strausbaugh and Core, Flora of West Virginia, though is not consistent.

Mammals

White-tailed deer	Odocoileus virginianus
Red Fox	Vulpes fulva
Gray Fox	Urocyon cinereoargenteus
Bobcat	Lynx rufus
Black Bear	Ursus americanus (rarely travels through the area)
Coyote	Canis latrans
Long-tailed Weasel	Mustela frenata
Mink	Mustela vison
Gray Squirrel	Sciurus carolinensis
Eastern Fox Squirrel	Sciurus niger
Striped Skunk	Mephitis mephitis
Common Raccoon	Procyon lotor
Virginia Opossum	Didelphus virginiana
Groundhog	Marmota monax
Masked Shrew	Sorex cinereus
Common Water Shrew	Sorex palustris
Hairy-tailed Mole	Parascalops breweri
Eastern Mole	Scalopus aquaticus
Star-nosed Mole	Condylura cristata
Meadow Vole	Microtus pennsylvanicus
Eastern Woodrat	Neotoma floridana
Deer Mouse	Peromyscus maniculatus
White-footed Mouse	Peromyscus leucopus
House Mouse	Mus musculus
Eastern Chipmunk	Tamius striatus
Little Brown Bat	Myotis lucifigus
Big Brown Bat	Eptesicus fuscus
Red Bat	Lasiurus borealis
Hoary Bat	Lasiurus cinereus
Eastern Pipistrelle Bat	Pipestrellus subflavus
Eastern Cottontail Rabbit	Sylvilagus floridanus
American Beaver	Castor c□anadensis
River Otter	Lutra c□anadensis
Eastern Cottontail	Silvilagus floridanus

Birds

The Shenandoah Valley and the Potomac River form natural migration corridors for birds in the spring and fall, thus many of the species listed below can only be seen during these periods of migration; the species listed below have been seen at NCTC or in the immediate vicinity. Common winter residents are marked with an asterisk*.

Cormorants, Grebes and Loons

- Double-crested Cormorant
- Pied-billed Grebe
- Common Loon

Herons and Bitterns

- Great Blue Heron*
- Green Heron
- American Bittern
- Black-crowned Night Heron

Waterfowl

- Canada Goose*
- Tundra Swan
- Wood Duck*
- Green-winged Teal
- Blue-winged Teal
- Mallard*
- Black Duck
- American Wigeon
- Ring-necked Duck
- Lesser Scaup
- Common Goldeneye
- Bufflehead
- Ruddy Duck
- Hooded Merganser
- Common Merganser
- Red-breasted Merganser
- American Coot

Vultures

- Turkey Vulture*
- Black Vulture*

Hawks and Eagles

- Sharp-shinned Hawk*
- Red-tailed Hawk*
- Red-shouldered Hawk
- Bald Eagle*

- Broad-winged Hawk
- American Kestrel*
- Cooper's Hawk
- Osprey
- Peregrine Falcon

Quail and Turkeys

- Northern Bobwhite*
- Wild Turkey*

Sandpipers and Shorebirds

- Killdeer
- Solitary Sandpiper
- Baird's Sandpiper
- Least Sandpiper
- American Woodcock
- Greater Yellowlegs
- Lesser Yellowlegs

Gulls

- Ring-billed Gull

Pigeons and Doves

- Rock Dove*
- Mourning Dove*

Cuckoos and Allies

- Yellow-billed Cuckoo
- Black-billed Cuckoo

Goatsuckers

- Common Nighthawk
- Whip-Poor-Will

Owls

- Great Horned Owl*
- Barred Owl*
- Eastern Screech Owl*
- Long-eared Owl

Hummingbirds

- Ruby-throated Hummingbird

Kingfishers

- Belted Kingfisher*

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Woodpeckers

- Northern Flicker*
- Red-headed Woodpecker*
- Pileated Woodpecker*
- Red-bellied Woodpecker*
- Yellow-bellied Sapsucker*
- Hairy Woodpecker*
- Downy Woodpecker*

Flycatchers

- Eastern Kingbird
- Great Crested Flycatcher
- Eastern Phoebe
- Acadian Flycatcher
- Eastern Wood-pewee

Swallows and Swifts

- Barn Swallow
- Cliff Swallow
- Bank Swallow
- Tree Swallow
- Northern Rough-winged Swallow
- Purple Martin
- Chimney Swift

Jays, Crows and Ravens

- Blue Jay*
- American Crow*
- Fish Crow*
- Common Raven*

Chickadees and Titmice

- Carolina Chickadee*
- Black-capped Chickadee*
- Tufted Titmouse*

Nuthatches and Creepers

- White-breasted Nuthatch*
- Red-breasted Nuthatch
- Brown Creeper*

Wrens

- House Wren

- Carolina Wren*
- Winter Wren

Mimic Thrushes

- Northern Mockingbird*
- Gray Catbird
- Brown Thrasher

Shrikes

- Loggerhead Shrike

Thrushes

- American Robin*
- Wood Thrush
- Hermit Thrush
- Eastern Bluebird*

Kinglets and Gnatcatchers

- Blue-gray Gnatcatcher
- Ruby-crowned Kinglet
- Golden-crowned Kinglet

Waxwings

- Cedar Waxwing*

Starlings

- European Starling*

Vireos

- Solitary Vireo
- Red-eyed Vireo
- Philadelphia Vireo
- Warbling Vireo
- White-eyed Vireo
- Yellow-throated Vireo

Wood Warblers

- Blue-winged Warbler
- Northern Parula
- Nashville Warbler
- Yellow-rumped Warbler
- Cerulean Warbler
- Kentucky Warbler
- Black-throated Blue Warbler
- Black-throated Green Warbler
- Blackburnian Warbler

- Pine Warbler
- Prairie Warbler
- Palm Warbler

- Bay-breasted Warbler
- Blackpoll Warbler
- Worm-eating Warbler
- Mourning Warbler
- Tennessee Warbler
- Wilson's Warbler
- Yellow Warbler
- Chestnut-sided Warbler
- Magnolia Warbler
- Cape May Warbler
- Black-and-White Warbler
- American Redstart
- Prothonotary Warbler
- Ovenbird
- Northern Waterthrush
- Louisiana Waterthrush
- Common Yellowthroat
- Yellow-breasted Chat

Weaver Finches

- House Sparrow*

Blackbirds and Orioles

- Bobolink
- Eastern Meadowlark
- Red-winged Blackbird*
- Rusty Blackbird*
- Common Grackle*
- Brown-headed Cowbird*
- Orchard Oriole
- Baltimore Oriole

Tanagers

- Scarlet Tanager

Finches, Sparrows, etc.

- Northern Cardinal*
- Indigo Bunting
- House Finch*
- Dickcissel

- American Goldfinch
- Rufous-sided Towhee
- Chipping Sparrow

- Field Sparrow
- Song Sparrow*
- Lincoln's Sparrow
- Swamp Sparrow
- American Tree Sparrow
- Fox Sparrow
- Grasshopper Sparrow
- White-throated Sparrow*
- White-crowned Sparrow
- Dark-eyed Junco*
- Bobolink
- Purple Finch
- Evening Grosbeak
- Rose-breasted Grosbeak

Additional Species:

Reptiles and Amphibians

Spotted Salamander	Ambystoma maculatum	
Valley and Ridge Salamander	Plethodon hoffmani	
Northern Dusky Salamander	Desmognathus brimleyorum	
Long-tailed Salamander	Eurycea longicauda	
Red-backed Salamander	Plethodon cinereus	
American Toad	Bufo americanus	
Fowler's Toad	Bufo woodhouseii	
Upland Chorus Frog	Pseudacris triseriata feriarum	
Gray Tree Frog	Hyla versicolor	
Green Tree Frog	Hyla cinerea	disjunct population
Spring Peeper	Hyla crucifer crucifer	
Green Frog	Rana clamitans	
Pickerel Frog	Rana palustris	
Bull Frog	Rana catesbeiana	
Wood Frog	Rana sylvatica	
Snapping Turtle	Chleydra serpentina	
Eastern Box Turtle	Terrapene carolina	
Eastern Painted Turtle	Chrysemys picta picta	
Wood Turtle	Clemmys insculpta	

Black Rat Snake	Elaphe obsoleta obsoleta
Northern Water Snake	Nerodia sipedon
Northern Black Racer	Coluber constrictor
Eastern Garter Snake	Thamnophis sirtalis
Eastern Ribbon Snake	Thamnophis sauritus sauritus

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Fish

(no fish have been recorded living in any of the ponds or small creeks on the property)
The following list contains fish common to this section of the Potomac River

Smallmouth Bass	Micropterus dolomieu
Largemouth Bass	Microptera salmoides
Common Carp	Cyprinus carpio
Quillback	Carpiodes cyprinus
Bluegill	Lepomis macrochirus
Redbreast Sunfish	Lepomis auritus
Pumpkinseed	Lepomis gibbosus
Green Sunfish	Lepomis cyanellus
Long-eared Sunfish	Lepomis megalotis
Rockbass	Ambloplites rupestris
American Eel	Anguilla rostrata
Channel Catfish	Ictalurus punctatus
Yellow Bullhead	Ameiurus natalis
Margined Madtom	Noturus insignis
Walleye*	Stizostedion vitreum
Muskelunge*	Esox masquinongy
Creek Chub	Semotilus atromaculatus
Fallfish	Semotilus corporalis
River Chub	Nocomis micropogon
Greenside Darter	Etheostoma blenniodes
Rainbow Darter	Etheostoma caeruleum
Fantail Darter	Etheostoma flabellare
Tesselated Darter	Etheostoma olmstedi
Central Stoneroller	Campostoma anomalum
Spotfin Shiner	Cyprinella spiloptera
Cutlips Minnow	Exoglossum maxillingua
Common Shiner	Luxilus cornutus
Golden Shiner	Notemigonus crysoleucas
Comely Shiner	Notropis amoenus
Spottail Shiner	Notropis hudsonius
Rosyface Shiner	Notropis rubellus
Bluntnose Minnow	Pimephales notatus
Blacknose Dace	Rhinichthys atratulus
Longnose Dace	Rhinichthys cataractae
Pearl Dace	Margariscus margarita

White Sucker	Catostomus commersoni
Northern Hogsucker	Hypentelium nigricans
Golden Redhorse Sucker	Moxostoma erythrurum
Shorthead Redhorse Sucker	Moxostoma macrolepidotum

Brook Trout*	Salvelinus fontinalis
Banded Killifish	Fundulus diaphanus
Yellow Perch	Perca flavescens

* = stocked fish

Invertebrates

(Note: invertebrates and aquatic macrophytes have not been recorded in any detail as yet, but we are working on it – the list below is what we have thus far.)

Aquatic invertebates include Asiatic clam, *Corbicula fluminea* which is most common shellfish, considered an invasive exotic, old shells several inches deep on island shoreline. Native mussels include: L*ampsilis*, E*lliptio*

List of caddisflies collected by B. Bauer of BHE Environmental 5/26/99

Protoptila palina	Hydropsyche scalaris
Cheumatopsyche campyla	Hydroptila spatulata
Cheumatopsyche sordida	Oecetis inconspicua
Hydropsyche hageni	Triaenodes injustus
Hydopsyche phalerata	

Butterflies (collected 1998, specimens curated at NCTC Lab Building)

Summerbrood Hairstreak	Everes comyntas comyntas
Great Spangled Fritillary	Speyeria cybele cybele
European Skipper	Thymelicus lineola
Clouded Sulphur	Colias philodice philodice
Peck's Skipper	Polites peckius
Orange Sulphur	Colias eurytheme
Meadow Fritillary	Boloria bellona bellona
Tawny Emporer	Asterocampa clyton clyton
Grey Hairstreak	Strymon melinus humuli
Silvery Checkerspot	Chlosyne nycteis nycteis
Pearl Crescent	Phyciodes tharos
Silver Spotted Skipper	Epargyreus clarus
Tiger Swallowtail	Papilio glaucus
Monarch	Danaus plexippus

Zebra Swallowtail	Eurytides marcellus

Other known butterfly species:

Mourning Cloak	Nymphalis antiopa antiopa
Red-spotted Purple	Limenitis arthemus astyanax

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Spicebush Swallowtail	Papilio troilus troilus
Hackberry Butterfly	Asterocampa celtis celtis

(there are more than 20 additional species that could be commonly found here, so this list is not yet a representative sample of the butterflies of the area.)

Fungi

identified and collected by WV DNR, June 26-28, 2001
voucher specimens curated at Davis and Elkins College Herbarium

Auricularia auricularia	Tree-Ear (Jelly Fungi)
Bovista sp	Puffball
Chalciporus rubinellus	Purple-red Bolete
Cheimonophyllum candidissimus	White Oysterette
Collybia luxurians	(a gilled mushroom)
Conocybe lactea	White Dunce Cap
Coprinus quadrifidus	
Crepidotus applanatus	Flat Crepidotus
Crepidotus crocophyllus	
Crucibulum laeve	Bird's Nest Fungi
Daldinia concentrica	Carbon Balls, Crampballs
Exidia thuretiana	(a Jelly Fungi)
Gyroporus castaneus	Chestnut Bolete
Lepiota cristata	Malodorous Lepiota
Megacollybia platyphylla	(a gilled mushroom)
Microstoma floccosum [floccosa?]	Shaggy Scarlet Cup
Phylloporus rhodoxanthus	Gilled Bolete
Pluteus admirabilis	Yellow Pluteus
Pluteus atricapillus (P. cervinus)	Fawn Mushroom, Deer Mushroom
Polyporus mori	
Polyporus varius	
Psathyrella candolleana	Common Psathyrella
Sarcoscypha occidentalis	Stalked Scarlet Cup
Schizophyllum commune	Common Split Gill
Scleroderma areolatum	Puffball
Scutellinia scutellata	(a Saucer fungi)
Ustulina deusta	Carbon Cushion
Xerula megalospora	(a gilled mushroom)
Xerula radicata var. radicata	(a gilled mushroom)
Xylaria polymorpha	Dead Man's Fingers

Appendix C
EA Mailing List
Including private organizations and adjacent landowners

Mrs. John Dower
Route 1, Box 144
Shepherdstown, WV 25443

Mr. Jim Auxer
Mayor of Shepherdstown
P.O. Box 248
Shepherdstown, WV 25443

Mr. Ronald K. Sowers
Rt. 1 Box 142
Shepherdstown, WV 25443

Deborah & Meredith Dickinson
Rt. 1 Box 173
Shepherdstown, WV 25443

Ms. Elizabeth H. Hyman
RR 1 Box 138
Shepherdstown, WV 25443

Mr. Paul J. Raco
Director of Planning and Zoning, Jefferson County
P.O. Box 338
Charles Town, WV 25414

Mr. and Mrs. Dennis Small
P.O. Box 1612
Shepherdstown, WV 25443

Dave Dunlop, President
Shepherd College
Shepherdstown, WV 25443

Mrs. Jesse Hendrix
Route 1 Box 168
Shepherdstown, WV 25443-9716

Patrick Dockeney
Spirit of Jefferson- Advocate
P.O. Box 966
Charles Town, WV 25414

Ms. Jean Neely
League of Women Voters of Jefferson County
P.O. Box 1393
Shepherdstown, WV 25443

Donald Campbell, Superintendent
Harpers Ferry National Historical Park
P.O. Box 65
Harpers Ferry, WV 24525

Dean Hockensmith
Route 1 Box 81C
Shenandoah Junction, WV 25442

James K. Ruland
P.O. Box 790
Charlestown, WV 25414

Al Hooper
660 Tuscawilla Hills
Charlestown, WV 25414

James G. Knode
P.O. Box 5
Shepherdstown, WV 25443

Jane Tabb
Route 3 Box 268
Kearnysville, WV 25430

Leslie D. Smith, County Administrator
C/O Jefferson County Commission
P.O. Box 250
Charlestown, WV 25414

Everett Boober, Sheriff
P.O. Box 9
Chales Town, WV 25414

Douglas Faris, Acting Superintendant
C&O Canal Historical Park
P.O. Box 4
Sharpsburg, MD 21782

Mr. Hank Walter
Route1, Box 45
Shepherdstown, WV 25443

William Palmisano, Director
Leetown Science Center
USDI National Biological Survey
1700 Leetown Road
Kearnysville, WV 25430

Dr. Donald Henry
Dean, School of National Resource and Mathematics
Shepherd College
Shepherdstown, WV 25443

Shepherdstown Chronicle
P.O. Box 2088
Shepherdstown, WV 25443

Charlie Cole
Chief of Police
P.O. Box 248
Shepherdstown, WV 25443

H & M Construction, Inc.
Norman Mumaw
524 Morning Calm Lane
Harpers Ferry, WV 25425
Lots 1-8

Charles and Clair Redden
11 Leisure Way
Shepherdstown, WV 25443

Patience Wait
9 Leisure Way
Shepherdstown, WV 25443

Van Court and Demaris Wilkins
P.O. Box 1254
Shepherdstown, WV 25443

Ernest Fuss
P.O. Box 1802
Shepherdstown, WV 25443

Ernest Hendry, Jr. and Judith Hendry
Rt. 1, Box 174
Shepherdstown, WV 25443

John and Mary Lehman
P.O. Box 1224
Shepherdstown, WV 25443

James T. Stoval III and Lou Ann Stoval
P.O. Box 1760
Shepherdstown, WV 25443

Gerald and Catherine Moore
Rt. L, Box 172
Shepherdstown, WV 25443

Deborah Dickinson and Meredith Wait
Rt. L, Box 173
Shepherdstown, WV 25443

John and Linda Eaton
Rt. 1, Box 164
Shepherdstown, WV 25443

John and Theresa Causer
P.O. Box 604
Shepherdstown, WV 25443

William G. Caperton IV and Susan Caperton
Rt. 1, Box 141A
Shepherdstown, WV 25443

Randall and Paula Tremba
P.O. Box 114
Shepherdstown, WV 25443

Martin Burke and Barbara Spicher
Rt. 3, Box 327
Kearneysville, WV 25430

Thomas and Diana Cushing
143 Terrapin Neck Rd.
Shepherdstown, WV 25443

William Johnson
724 Albert St.
Martinsburg, WV 25401

Alma and Charles Bray
37880 Nicewarner Lane
Lovettsville, VA 20180

Brad Lewis
118 Shepherd Lane
Shepherdstown, WV 25443

Eric and Joy Lewis
Rt. 3, Box 305A
Shepherdstown, WV 25443

Anthony and Donna Maciorowski
Rt. 1, Box 160
Shepherdstown, WV 25443

Calvin and Lis Golumbic
14804 Flintstone Lane
Silver Spring, MD 20905

David C. Borchard
Rt. 1, Box 158
Shepherdstown, WV 25443

Steven and Jill Schatken
Rt. 1, Box 157-C
Shepherdstown, WV 25443

John and Ann Craig
P.O. Box 1708
Shepherdstown, WV 25443

John J. Duwel
1200 23rd St., NW
Washington, DC 20037

Terrapin Neck Community Association, Inc.
Rt. 1, Box 148-A
Shepherdstown, WV 25443

Phillip Bufithis
Rt. 1, Box 147
Shepherdstown, WV 25443

Windell S. Arbuckle
N. Sheffield
1610 Ervine Ave.
Longmont, CO 80501

John Eaton, Jr.
Rt. 1, Box 164
Shepherdstown, WV 25443

Michael Hammer
132 Oak Tree Rd.
Kearneysville, WV 25430

Pamela Jones et al
17 Landsdowne Rd., Buxton
Derbyshire UK SK17 6RR, UK

Judy Tyson et al
6 Jefferson Lane
Shepherdstown, WV 25443

John Hessenauer, Jr.
Rt. 1, Box 151
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Gordon J. Arbuckle
1610 Ervine Ave.
Longmont, CO 80501

Gaston Caperton
P.O. Box 1083
Shepherdstown, WV 25443

Deborah L. Munoz
10200 Malvern Ct.
Manassas, VA 20110

Jeanne M. Norris
Rt. 1, Box 150
Shepherdstown, WV 25443

Victoria J. Young
P.O. Box 130
Shepherdstown, WV 25443

William and Louise Hilton
Rt. 1, Box 157B
Shepherdstown, WV 25443

Mark S. and Martha J. Orling
2019 Swan Terrace
Alexandria, VA 22307

Linda D. Smith Miller Walters
Rt. 1, Box 149
Shepherdstown, WV 25443

Sharon Sue Smith
Rt. 1, Box 149
Shepherdstown, WV 25443

Ralph Stevens
407 Penn St.
Martinsburg, WV 25401

Potomac Farms Nursery, Inc.
P.O. Box 579
Shepherdstown, WV 25443

John D. Lowe III
Rt. 1, Box 154
Shepherdstown, WV 25443

Phillip A. Lowe
P.O. Box 1523
Shepherdstown, WV 25443

Matthew S. Lowe
P.O. Box 1512
Shepherdstown, WV 25443

Scott M. and Kelly H. Lowe
P.O. Box 1360
Shepherdstown, WV 25443

Appendix D

White-tailed Deer Management

Environmental Assessment

National Conservation Training Center

Public Comment Summary

A total of 74 copies of the EA were mailed out to private and public organizations, adjacent landowners, and other individuals inviting comments. We received 12 letters of response with various comments and concerns. These comments are summarized below.

All 12 letters were in support of either Alternative 2 or 3 with the majority favoring Alternative 2. There were a few concerns and issues that were consistent throughout the comments.

Stated Concerns:

Safety (7 comments)

Use of firearms in close proximity to homes and other buildings and vehicles
Liability issues for NCTC
Deer/car collisions
Parking for hunters during the hunt

NCTC Comments – Deer stands and shooting zones are being picked with safety in mind. There will be no shooting toward any buildings, roads, etc. in close proximity to any deer stands. The NCTC liability for the deer management program is the same as for any other program run at NCTC. Deer/car collisions in the area hopefully will be lessened as the population numbers lower. There will be specified areas for hunters to park during the hunt, they will not be allowed to park on neighboring properties.

Legality (3 comments)

Strict enforcement of all applicable laws and regulations
Patrol of surrounding properties to minimize poaching during the NCTC hunt

NCTC Comments – There will be special FWS law enforcement officers on duty during the deer hunts in addition to the regular NCTC security officers. Officers will not patrol surrounding properties, but will patrol all boundary lines and roads surrounding the NCTC property. NCTC hunters will be required to check-in and check-out to the NCTC property. NCTC hunters are required to hunt only from assigned stands so there will not be any chance of accidentally entering surrounding private property.

Ethics (4 comments)

Skill level of hunters and hunting methods (to minimize wounding)
Disposition of meat (to be consumed or donated)

NCTC Comments – Hunting will be by shotgun slug only. This provides for safety and accuracy of hunting. All hunters are also required to have taken a state certified hunter safety course before hunting in any NCTC hunt. Most hunters will take deer meat home for consumption, however, they are also welcome to participate in any "Hunters for the Hungry" type of donation program.

Other (11 comments)

Timing of NCTC hunt to coincide with state hunting season on surrounding properties
Integration of NCTC hunt into a deer management training program at NCTC
Habitat and property damage by "over-population" of white-tailed deer

NCTC Comments – NCTC hunts will follow state regulations for dates, limits, etc. unless special permission is obtained from the state to deviate from those regulations. A deer management training program is scheduled to begin in 2004, after the first year of managed hunts is completed. Hopefully, the deer management program run by NCTC will help to alleviate local habitat and property damage caused by overpopulation of the local deer population.