

I. Introduction

“Wouldn’t we be wise to bring nature and wildlife into the city where the pleasures they bring can be enjoyed on a daily basis? Man has an inherent metaphysical and spiritual need for nature and he should not retreat from it. Most urban people want open spaces and trees and a contact with nature as part of their daily lives.”

-Lorraine C. Smith

The *mission* of this Resource Management Plan is to provide a blueprint for the management of Sandy Bottom Nature Park through protecting and conserving the natural and recreational resources while ensuring an educational and enriching experience for the public.

The sound management of a nature park in an urban setting requires a carefully planned approach. The purpose of this plan is to design that approach.

The realization of this plan will depend upon effectively balancing the requirements of managing a facility with a broad spectrum of resources and satisfying the needs and desires of the public. While urban sprawl and development continue to damage and fragment the integrity of natural resources, the City of Hampton has resolved to protect a large portion of land within its borders. The City of Hampton has responded to the needs of the public, in spite of the trends toward habitat fragmentation. By creating Sandy Bottom Nature Park, the City of Hampton is enhancing the quality of life for its citizens by providing a variety of safe and healthy

lifelong opportunities in the areas of recreation, education, culture, and the environment. Implementing the Resource Management Plan for Sandy Bottom Nature Park will ultimately serve to continue these efforts.

This plan will define who we are, what we do, and what we can do to serve the public. It will set forth the primary responsibilities, policies, and procedures for conducting daily operations, educational programming, as well as wildlife and habitat management. The goals of this plan are to:

Educate the public through nature based interpretive programming and wildlife husbandry

Conserve and protect our natural resources

Bring the park and public together through collaboration, recreational experiences, and volunteering

Continue training and growth experiences for SBNP staff

Develop and maintain a safe and aesthetically pleasing facility

Evaluate this plan regularly to measure success and make the necessary amendments.

The development of this plan was made possible by the collective efforts and collaboration of the staff of Sandy Bottom Nature Park along with assistance and recommendations from other agencies. The City of Hampton's Department of Public Works has provided maps.

Historical Background

Sandy Bottom Nature Park has a relatively short history, going back only to 1994. The land that makes up the site, however, goes back millennia. Before the arrival of settlers, this area was inhabited by Native Americans. The Kecoughtan Tribe dominated this area and was part of a greater tribe known as the Powhatans. In 1610, the settlers founded what is today Hampton, Virginia. Hampton is now the oldest continuously English-speaking city in the United States.

As the country grew, the natural landscape was irreversibly converted. Old growth forests were cleared and wetlands were drained. This site was not immune. The land, over the years was used for agricultural purposes. This area also played a role in some of this country's most important wars. A Civil War battle, known as the Battle of Big Bethel, was fought just a few miles away.

After World War II the country was experiencing an economic boom. The suburbs of America were being built. The nation was also beginning to build the interstate highway system.

In the early 1950's, the Virginia Department of Transportation purchased the land that is now Sandy Bottom Nature Park and began mining for sand to build Interstate 64. This project subsequently left behind two large borrow-pits. Once construction had been completed, the land was abandoned and rainwater had filled the borrow-pits leaving what is now Sandy Bottom Lake (formerly known as Chisman Lake) and Crystal Lake. Between the years of 1965 and 1994, the land was used and abused by locals. Illegal hunting, four

wheeling, and partying were common. The area also became a local trash dump. There were sofas, shingles, and even old trucks discarded in the area. Hampton expressed its interest in turning the area into a city park. VDOT agreed to sell the land to the City of Hampton for one dollar so long as the site could be used to restore non-tidal wetlands.

The city unveiled plans to turn the land into a nature based recreation facility in 1992. Visitation estimates were a mere 20,000 a year. Plans were then modified to add more exhibits, a playground, picnic shelters, and other amenities to attract more visitors. Visitation estimates were then boosted to 70,000 a year. In 1994, the city began hiring staff. In order to achieve the dream of a wildlife and environmental education facility there were many daunting tasks to be undertaken. The first was to stop the public from damaging the land and endangering the wildlife by eliminating the four wheeling, hunting, dumping, and partying on the property. The next task was to remove tons of discarded materials. Once these things were done it was time to start building a nature park. Bridges, observation platforms, picnic shelters, and a pier were just some of the structures to be built. Construction of the parks main facilities (the Nature Center, Ranger Station, and Outdoor Restrooms) began in 1995. The park officially opened to the public on May 25, 1996. The park's visitation has increased every year and is over 500,000 visitors per year. The rangers have provided interpretive programming to many schools and public groups from all over the Hampton Roads area.

II. Education

“Do not try to satisfy your vanity by teaching a great many things. Awaken people’s curiosity. It is enough to open minds; do not overload them. Put there just a spark. If there is some good inflammable stuff, it will catch fire”

-Anatole France

The City of Hampton’s Parks and Recreation Department has consistently demonstrated the values of conservation, preservation, and education. By creating Sandy Bottom Nature Park the City of Hampton has created an opportunity to develop and foster an educational program that will be devoted to promoting the conservation and protection of our natural heritage. This includes all of the living and non-living features of ecosystems.

Public Education

Sandy Bottom Nature Park (SBNP) educates the public through nature based interpretive programming and wildlife husbandry. The achievement of this goal will require communication and partnerships within the community, with private and public organizations, and the Hampton city school system.

In order to educate the public SBNP promotes and provides nature based interpretive programming open to the public. Staff has develop and distribute public service announcements to the appropriate organizations. The public service announcements contain detailed descriptions of the type of program, location, time, and date. Other

information includes Nature Center hours of operation, telephone number, or any other location where a program may be hosted (See Appendix A).

Staff also developed and produced program publications to be distributed and posted in the park. This brochure is published monthly and clearly illustrates the day, date, time, location, title, and description of each program given in that month. The programs should be listed in chronological order for easier legibility. Also, include Nature Center hours of operation, telephone number, and location of program may be given. Placement of the monthly program brochure for guests to see or take will be place in high traffic areas. These areas are the front desk information area, kiosks at trailheads, bulletin boards, playground, bark park, city hall, and other city parks or tourist locations within the city. See Appendix A for an example of a monthly program guide.

The development of a variety of nature based interpretive programs that are suitable for all ages will be necessary to provide quality programming throughout the year. Programs should be developed to reflect temporal and seasonal changes in the environment. A “Program and Activities Guide to SBNP” should be developed as an interpretive resource for park staff members. This guide should include program titles, descriptions, objectives of each program, any pertinent information that the interpreter will need to host a successful and informative program, and other resources for further study. Information and activities from Project WET, Project WILD, Aquatic WILD, and Project Learning Tree should be referenced and incorporated where appropriate. Examples of programs, format, and descriptions to be included in

the “Program and Activities Guide to SBNP” can be found in Appendix A.

Staff members that are designated as interpreters shall be trained on program topics and how to properly conduct interpretive programs for SBNP. Interpreters will know the difference between interpretation and education and will be trained in interpretive techniques, methods, and activities. Certification in Project WET, Project WILD, Aquatic Wild, and Project Learning Tree should also be included in interpreter training. SBNP’s interpretive staff will be afforded the time and resources to become proficient in this area.

In order to provide regularly scheduled nature based interpretive programs to the public, programming should be scheduled on weekends.

Student Education

A critical aspect of Sandy Bottom Nature Park’s public education program is reaching out to students within the local school system. Though the Hampton City School system already has a science curriculum that covers aspects of the environment, SBNP offers a unique hands-on experience that can inspire love and respect for the natural world.

Sandy Bottom Nature Park will promote and provide nature based interpretive programming to school groups. It will be necessary to collaborate with teachers and administrators to determine the most effective method of promoting SBNP’s interpretive program. Monthly program publications specifically targeting schools are handed out.

Collaborating with teachers and administrators to develop programming that is appropriate, includes the Standards of Learning for Virginia Public Schools (SOLs), and also follows the schools curriculum will be the best way to create an effective student education program. From this collaboration, a variety of nature based interpretive programs and activities should be compiled to create a “Program and Activities Guide to SBNP for Schools.” The format should be similar to that of the “Guide” for public programming. The “Program and Activities Guide to SBNP for Schools” should, however, contain more activities that help students conceptualize ecological ideas and theories.

Sandy Bottom Nature Park provides a superb location for school groups to come to receive a hands-on natural experience through interpretive programming, seeing and touching live native wildlife, and being outdoors. Some of the facilities available for programs and activities include the Wildlife Education Area, the Nature Center Display Area, various trails, the Outdoor Classroom, and the Nature Center Classroom for indoor activities.

In order to develop an efficient fieldtrip scheduling system a letter of confirmation that has all of the pertinent information about the visiting school and the type of program to be given should be developed. Also, a monthly schedule outlining upcoming fieldtrips is produced and posted for the interpretive staff to reference located in the mail room and ranger station (See Appendix B for an example of the letter of confirmation).

In addition to providing a location for schools to bring students, SBNP also developed and provide

interpretive programming and activities for outreach programs at local schools and community centers. Programs for outreach should be broad in scope so as to reach and maintain the attention of students of varying age. Activities from Project WET, Project WILD, Aquatic Wild, and Project Learning Tree should be the primary focus of these programs.

The appropriate staff members will be trained on program topics and how to properly conduct both outreach programs as well as those done in the park. Interpreters will become certified in Project WET, Project WILD, Aquatic Wild, and Project Learning Tree. Interpreters will also be afforded the time and opportunity familiarize themselves with the “Program and Activities Guide for Schools.”

Special Interest Groups

Sandy Bottom Nature Park is but one of many organizations that share the values of conservation, preservation, and education. It is, therefore, in the best interests of these organizations to share their resources. SBNP will do its part by providing specialized interpretive programming for special interest groups on an as needed basis. Groups that come to SBNP to seek nature based interpretive programming might include: garden clubs, the Boy Scouts of America, the Girl Scouts of America, government agencies, and other community groups. To promote the resources, facilities, and programs available at SBNP a brochure shall be developed, distributed, or provided upon request to organizations that demonstrate similar values. SBNP will promote the use of its facilities for the purposes of

hosting meetings, training sessions, and conferences.

Sandy Bottom Nature Park will also promote public awareness and demonstrate support for special interest groups and other environmental organizations that share similar values. Organizations that promote litter prevention, recycling, clean water, and other causes will be identified. Some of these groups might include the Chesapeake Bay Foundation, The Hampton Land Conservancy, Hampton Clean City Commission, and Hoffler Creek Wildlife Foundation. Locations for special interest groups to display their literature and activity schedules are located at the front desk information area and kiosks.

Wildlife Rehabilitation Education and Awareness

Wildlife rehabilitation is the high quality care of injured, orphaned, sick, displaced, or distressed wild animals with the goal of ultimately releasing them back into their native habitat. While SBNP does not actively rehabilitate wild animals, it will promote public awareness and education of wildlife rehabilitation.

SBNP will promote public awareness of organizations and individuals that actively rehabilitate wildlife via publications, programs, and web links. Organizations to promote include: the International Wildlife Rehabilitation Council (IWRC), the National Wildlife Rehabilitators Association (NWRA), Wildlife Rehabilitators Association of Virginia

(WRAV), Wildlife Rehabilitation and Education Network (WREN), the Wildlife Center of Virginia, Virginia Department of Game and Inland Fisheries (VDGIF), and local veterinarians that donate services for injured wildlife. Literature produced by organizations that include information on the practices and benefits of wildlife rehabilitation will be displayed and provided to the public at SBNP. SBNP will also promote any wildlife rehabilitation programming that may be occurring in its facilities.

Along with promoting public awareness and education of wildlife rehabilitation, Sandy Bottom Nature Park will also promote public awareness of the legal issues regarding the keeping and handling of both healthy and injured wildlife. Federal, state, and local governments require that all persons and organizations caring for sick, injured, orphaned, or displaced wild animals have the appropriate permits. SBNP will not support, sponsor, or condone the illegal care of wild animals. Literature with legal guidelines, contacts, and initial care guidelines will be displayed for the public's use.

The staff of Sandy Bottom Nature Park will know wildlife rehabilitation permitting conditions, status, and the necessary steps that need to be taken in order to obtain all proper permits. Staff will also be familiar with the Wildlife Rehabilitator's Code of Ethics (see appendix C) and the Minimum Standards for Wildlife Rehabilitation. Knowledge and familiarity with the necessary steps and relevant documents will help SBNP's staff to better inform the public.

Federal, state, and local regulations regarding the handling, molesting, disturbing, and/or possessing

of native wildlife will be researched and provided for staff members. Any information deemed pertinent will be provided to the public in the form of brochures, fliers, and handouts.

Environmental Education Library

The development of an Environmental Education Library is an important step towards providing resources to the public and the SBNP staff. The library will contain up to date books pertaining to both the biotic and abiotic features of the environment. The books should vary in their level of complexity to accommodate children, adolescents, and adults. For the staff it will offer the resources and location to study for interpretive programs and research. For the public, the library will offer a location and resources for study, research, and wildlife identification.

Promoting the use of the Environmental Education Library will require the park to inform the public of its existence and accessibility. To promote the library staff will develop and produce fliers and brochures to be distributed and posted. Also, park guests with wildlife inquiries or plant identification questions should be directed to the library.

Access to the library will be limited. It will be necessary to determine times for the library to be open to the public and a staff member will need to be in the library when guests are using it. The necessary schedule adjustments should be made to accommodate these needs. Checking out books will be limited to park guests who are using them while in the park and will

return them before leaving the park. Checking out books to take home will be prohibited. Collateral items (driver's license or keys) should be taken to ensure the return of books.

In order to better serve the public, the staff will be trained and knowledgeable on the organization and contents of the library. It will be organized according to the Dewey Decimal System. A card catalog will initially be used to assist library users in locating books, however, computer based system of organizing, locating, and tracking books should be researched. Incorporating internet service with the resources available to both the public and staff should also be researched. Due to limited space expansion of the library will be limited. However, it should be expanded to maximize its potential as an environmental education resource.

Wildlife Education Areas

Sandy Bottom Nature Park will offer a unique educational experience to the public and students. Part of achieving this will be allowing people to see, and in some cases, touch native wildlife. To accomplish this, a Wildlife Education Area and an animal display area inside the Nature Center has been established.

The Wildlife Education Area displays only non-releasable wildlife species for the purposes of rehabilitation education and nature based interpretive programming. To achieve quality programming and education SBNP staff will be trained on the natural history of species in the exhibit area and will also be knowledgeable on the history of the individual animals.

Maintenance of the Wildlife Education Area will comply with federal, state, and local regulations. Permits will be kept up to date as needed. All regulations regarding the display of injured or healthy wildlife, living conditions, and standards of cleanliness will be recognized and complied with. Wildlife caregivers will become familiar with and refer to the "Minimum Standards for Wildlife Rehabilitation." In accordance with USDA regulations and to understand how to give the best care, records will be kept on all activities regarding the exhibit area. There will be daily records on diets, feeding, cleaning, and behavior. Records on any veterinary care will also be maintained as needed. A checklist that is consistent with the VDGIF Rehabilitation Facility Checklist should be produced. Regular inspections of all facilities used, with respect to the Wildlife Education Area, should be conducted.

To provide the best care and to keep the best interests of the animals in mind, diets and living requirements that provide the most comfortable and habitable conditions will be implemented and updated as necessary. Confering with veterinarians and local rehabbers to exchange ideas about behavioral enrichment, living conditions, and diets is recommended. A veterinary care program will be developed cooperatively with a local veterinarian. This will ensure that animals are properly vaccinated and are properly being cared for. SBNP will have all caregivers vaccinated for any infectious diseases (i.e., rabies) in order to protect them from any potential illness. Caregivers shall also strive to meet the conditions of the "Wildlife Rehabilitators Code of Ethics" (See

appendix C). SBNP staff and primary caregivers will seek training from the Wildlife Center of Virginia, and other organizations, to become proficient in rehabilitation techniques and to become familiar with basic emergency veterinary care procedures.

While this facility should comply and exceed the conditions mandated by the federal, state, and local governments; it should also be practical. This facility will be aesthetically pleasing and accessible for the public. Entrance into the exhibit area should, however, be prohibited without a staff member being present. Paths within the exhibit area will be clearly visible. The aesthetics of fencing and animal enclosures will be maintained (i.e., fresh paint). In the interests of protecting the animals as well as visitors, a barrier shall be erected between the enclosures and where visitors will observe the animals.

A detailed policy and procedure manual for the Wildlife Education Area is available to all staff. This manual contains recommended diets and resources for further research.

The Nature Center Animal Display Area will serve in a capacity that is similar to the Wildlife Education Area. Its purpose will be to display native wildlife for nature based interpretive programming. To achieve quality programming, staff will need to be knowledgeable on the natural history of those species on display.

The Nature Center Display Area will comply with all federal, state, and local regulations regarding permits, care, and living conditions. Staff will strive to exceed recommended living conditions for the benefit of exhibited animals. In accordance with this effort, daily records will be kept on feeding and cleaning. Veterinary records will be kept as

needed. Cleaning and feeding records can be found in Appendix C.

This area will be primarily used as interpretive resource and should display those animals that are conducive to effective programming. The animals exhibited in this area should be relatively easy to care for in terms of their living conditions and requirements. Many of these animals should be species that are receptive to handling. They should also be of special interest to the public. Some recommended animals are freshwater fish, turtles, and snakes.

Maintaining the aesthetics of the Nature Center Animal Display Area will be critical due to its central location in a high traffic area. It shall be kept orderly and clear of debris. Water containers will be cleaned and refilled daily and any waste or leftover food items will also be removed daily.

III. Natural Resources Conservation

“To keep every cog and wheel is the first precaution of intelligent tinkering.”

-Aldo Leopold

Natural resources are generally accepted to be those materials supplied by the environment and utilized by humans. These materials include water, soil, fuels (wood, coal, etc.), timber, and wildlife. Natural resource management clearly implies the influence and application of human manipulation to achieve specific goals. From this

definition one could argue that management denotes the domination of nature and contradicts the ethic of resource conservation.

Conservation includes maximizing benefits over a sustained period of time and in some cases it involves preservation, where natural systems are left alone. For the purposes of this plan and how it relates to Sandy Bottom Nature Park the term *Natural Resource Conservation* will be used and the ethic that it implies will be implemented.

Sandy Bottom Nature Park is a good representation of what once was common along the coastal plain of Virginia in terms of ecosystems. However, historical land use has influenced the age composition, level of biodiversity, and abundance of both flora and fauna in the area. The forest is a relatively young deciduous-pine mix dominated by Loblolly Pine, *Pinus taeda*; American Beech, *Fagus grandifolia*; various oaks, *Quercus spp.*; and Red Maple, *Acer rubrum*. SBNP has some of the last upland forest within the City of Hampton. There are also many acres of forested lowlands that are saturated for several months out of the year called wetlands.

Relics of former land use include two freshwater lakes, Sandy Bottom Lake (formerly known as Chisman Lake) and Crystal Lake. These lakes are former borrow pits left by the Virginia Department of Transportation (VDOT). Sand was mined in the 1950's from the site for the construction of Interstate 64, which borders the parks north side. Sandy Bottom Lake is fairly typical of a young freshwater lake. The other lake, Crystal Lake, is not typical at all. It had a very low pH and therefore did not support a great deal of life. Also, a very

large portion of the lake has been used for wetland mitigation. During the mitigation project the pH level was corrected. Today there are species in the lake such as largemouth bass, bluegill, and turtles. (For more information on the wetland mitigation area, see Restored Wetland Management).

There is also an ephemeral pond that is the result of a test dig by VDOT. This pond, Wood Duck Pond, has standing water for several months out of the year and is inhabited by a wide variety of animals including a state threatened species, Mabee's Salamander, *Ambystoma mabeei*.

The park is bordered on nearly all sides by a major road. The nature of these borders virtually makes SBNP an island. Many species are limited in their ability to emigrate. On the west side Newmarket Creek borders the park. Newmarket Creek is a ditched perennial stream that acts as a corridor. It is also the Hampton/Newport News border. On the other side of the creek is several hundred acres of similar habitat that could provide additional habitat for some of the parks wildlife populations.

Of Sandy Bottom Nature Park's 456-acres, approximately 75-acres on the eastern side of the park are most heavily used by people. This area of the park is where the Nature Center, Ranger Station, playground, roads, parking lots, shelters, dog park, and other recreation facilities are located. The intensity of use declines as one travels west, further into the park. There are established trails with some maintained for emergency management and heavy equipment use. The impact of other trails is minimal.

Wildlife Protection- Legal Considerations

Parks are designed primarily for the purpose of human recreation. Sandy Bottom Nature Park is no exception. However, SBNP is different from other parks in that the recreation that is promoted by the park is nature-based. Wildlife observation and nature-based interpretive programming are just some of the activities available at the park. Providing opportunities to view wildlife would enhance the recreational values for park visitors. Achieving an enhanced recreational experience for visitors will direct park planning and management within federal, state, and local natural resource regulations.

Sandy Bottom Nature Park strives to protect its wildlife and natural resources by implementing and enforcing relevant laws such as the Migratory Bird Treaty Act (16 USC 701-712), the Endangered Species Act (16 USC 1531-1544), and the Virginia Endangered Plant and Insect Species Act (VA Code 3.1-1020-1030) (To see a list of pertinent Natural Resource Laws see Appendix D).

Effective law enforcement and management will require a cooperative effort between SBNP and other agencies such as the Hampton Police Division, the Virginia Department of Game and Inland Fisheries, the Virginia Department of Environmental Quality, the Virginia Department of Conservation and Recreation, and the U.S. Fish and Wildlife Service. Inter-agency cooperation will allow for effective law enforcement, sound management, and the exchange of fresh ideas with respect to natural resources conservation.

In addition to implementing and enforcing federal, state, and local natural

resource regulations, SBNP will prohibit activities that may have the potential to or actually cause physical harm, stress, and/or death to any species. Activities that will be prohibited include: hunting, poaching, trapping, removal of animals from their natural habitat, unauthorized ATV use, use of vehicles off of designated roadways and trails, and speeding within park boundaries. Laws and park policies regarding threatened or endangered species will be strictly enforced. Violators will be prosecuted to the fullest extent of the law.

Protecting the park's wildlife and habitats will involve controlling how people access the park and where the public is allowed to go. Therefore, illegal access of the park via Newmarket Creek will be eliminated. The public's access to certain areas of the park will be restricted. Some areas, such as the Wildlife Core Areas, will be off limits to the public. Access to other areas, such as Wood Duck Pond, will be restricted during certain times of year to protect wildlife during their breeding season or some other sensitive condition. For example, during the winter months of December, January, and February access to Wood Duck Pond will be limited in order to protect Mabee's Salamanders during their breeding season. Only foot traffic should be allowed in this area of the park as well.

Research

When the City of Hampton created Sandy Bottom Nature Park it created the resources to combine passive recreational experiences with education and research. Habitat management should be driven by proven methods and

the information gathered through scientific research. Research is essential to help maintain some biotic communities in accordance with the parks objectives of creating opportunities for the public to view wildlife and experience nature-based recreation.

Research opportunities at SBNP are numerous. The park presents a location that is protected and experiences little impact. It does however have some interesting conditions and influences. For example, the park is surrounded on nearly all sides by a highway or some other major road except for the west side where it is bordered by Newmarket Creek. This essentially makes Sandy Bottom an island. This "island" is only 456-acres and it is well known that some wildlife species require more space for a home range than what the park has to offer. Due to a lack of corridors to other resources, combined with the nature of the borders of the park, there is little opportunity for dispersal. All of these factors lead one to believe that some animal populations might exceed levels that can be sustained by the resources available within the park.

Another interesting condition is created by the fact that SBNP is directly under the flight path of Langley Air Force Base's planes. The level of noise created by flyovers may have an impact on some of the parks wildlife. What species are affected? How are they affected? At what level do the animals begin to exhibit signs of being affected? Answering these questions, along with a host of others, will require collaboration with various agencies and local schools and universities.

Before the park was developed there was already interest, and some

research, concerning the parks habitats and wildlife. For example, VDGIF had already been conducting fisheries studies. Electroshocking and seining have been some of the methods used to assess Sandy Bottom Lake's level of health and biodiversity. Based on their findings they have made valuable stocking recommendations to help maintain a healthy game population. Old Dominion University has been conducting valuable research on the northernmost known population of the state endangered species Canebrake Rattlesnake (*Crotalus horridus*). In addition to these projects the John Clayton Chapter of the Native Plant Society has conducted a preliminary floristics survey and Hampton University has been conducting research on the effects of carbon dioxide on red maples (*Acer rubrum*) located next to I-64. The development of research internships with local universities would be a positive effort for SBNP, the partnering university, and the students involved. Continuing and expanding on these projects would be in the best interest of the park's efforts in the continued development of management strategies.

Ecological research on various aspects of the park communities will be conducted. Surveys and inventories of wildlife are important research techniques that should be undertaken in order to determine exactly what species of both flora and fauna exist in the park. Inventories are different from surveys in that inventories document the species that exist in a particular area while surveys demonstrate population demographics such as density, relative abundance, mortality, natality, and sex ratio biases. Surveys and inventories are crucial in evaluating the health of the

parks wildlife and the effectiveness of park management. They also provide insight into the level of biodiversity and help fill information gaps.

Surveys and inventories should be conducted for herpetofauna, mammals, birds, and fishes. Some research programs should be directed at specific species of concern like White-tailed Deer (*Odocoileus virginianus*), red and gray foxes (*Vulpes vulpes* and *Urocyon cinereoargenteus*, respectively), and raccoons (*Procyon lotor*). Other species-specific research programs shall focus on species of special concern, such as any threatened or endangered species that may inhabit the park.

Habitat Management

Habitat management involves the manipulation of the resources animals need to survive. These resources include food, water, space, and cover. To sustain wildlife populations these four components must be available in sufficient quantity and quality within that species home range. The availability of these resources may be dependent upon several factors including land use. In previously disturbed areas habitat management may include making up for a shortage of cover or food. Conversely, undisturbed or neglected areas are typically not stable and may need management. Enhancing habitat conditions coupled with retaining critical ecosystem functions should be the goal of habitat management.

There are many different approaches to habitat and wildlife management. A great deal of wildlife management is habitat management and

the approach typically reflects the desired outcome or goal. For example, on some wildlife management areas where hunting is the primary purpose, the habitat management approach will be enhancing the habitat and conditions for the targeted game species. The goal of habitat management for white-tailed deer is to increase the availability of resources, which will in turn increase the carrying capacity and harvest opportunities for hunters.

The main objective of habitat management at Sandy Bottom Nature Park is to provide wildlife viewing opportunities for the public while sustaining a complex multi-species ecosystem. In order to meet this objective the park must support a variety of habitat types in different stages of succession. A mixture of habitat types including forest, edge, open field, or wetland, will be capable of supporting a greater variety of wildlife species. Fortunately, prior land use has left the park with forests, wetlands, lakes, edges, and fields. All of these habitat types within 456-acres provides considerable variability. Greater variability and a healthy abundance will enable the park to support other goals of nature based education and research.

Annual habitat work plans will be developed by the city's Wildlife Biologist. These plans will include habitat objectives to be completed within the plan year. The progress toward achieving the habitat objectives from management strategies and prescriptions will be evaluated. Similarly, the response of wildlife to the management strategies and prescriptions will be evaluated. Information collected from these evaluations will be used to help select the most effective management strategies. Also, unmet habitat needs

and management shortfalls will be described and addressed with the necessary prescriptions. Each management strategy will include the location, timing, interval, and intensity.

Forest Management

The objective of forest management at Sandy Bottom Nature Park is to create a forest that is capable of supporting diverse plant and animal communities. Achieving this will require a deeper understanding of the forests at SBNP. Research that strengthens knowledge of forest characteristics will be necessary to guide effective forest management.

Sandy Bottom Nature Park has approximately 300 acres of second growth, hardwood-pine mixed forest that varies in age and in stages of succession. The forest is largely a mixture of upland and low wet woods. These forested wetland areas are seasonally flooded. Flooding is dependent mostly upon precipitation and plays an important role in determining the distribution of herbaceous and woody plant communities, as well as animal communities (Boyce and Haney, 1997). These forested wetland areas should be preserved.

Human activities are probably the greatest factor in determining the distribution of many forest species. Timber harvesting and disruption of wetland complexes are a couple of human activities that have occurred on the site that is now Sandy Bottom Nature Park.

These types of activities have determined the current structure of the forests. At least three different successional stages can be distinguished

in the parks forests. The first stage has few mature, mast producing trees and an abundance of younger oaks, pines, maples, and gum trees. The second stage has more large mast producing trees than the first but still has an abundance of small immature trees. There are few shrub and herbaceous plants. The third has mature, mast producing trees making up a tall canopy. Beneath the canopy are relatively few younger trees, shrubs, or herbaceous plants. American beech and oaks dominate this third stage.

Thinning

Areas that are dominated by an abundance of young trees will need thinning. All of these trees are competing for the same space, light, and nutrients, and are therefore, reducing their growth rates and ability to produce mast or forbs. Thinning will stimulate new growth by releasing selected trees from competition and allow them to grow faster, healthier, and stronger. Thinning around mast producing trees can also boost mast production.

Tree selection will be very important since some trees have more wildlife value than others. A balance of red and white oaks is recommended. Oaks that are not bearing mast during the current year should not be removed because they might produce in succeeding years. Oaks, hickory, beech, hickory, cherry, and conifers should be retained, as they are among the most important mast producing species. Thinning should not exceed more than 35 acres so as to discontinue any trend toward a homogenous forest type.

Fall and winter will be the best times to conduct thinning projects because of better visibility and more

comfortable conditions. Spring and early summer should be avoided because trees are growing rapidly and may seal wounds or flush herbicides. Thinning projects in wetland areas should be avoided in order to protect the integrity of the hydrology in those areas.

Forest Openings

In areas where there is little sub-canopy growth openings should be created to promote the growth of understory species and release overtopped young trees. Existing openings should be identified before creating any new openings. When creating new openings, areas that have been damaged from severe weather, insects, or disease should be selected first. Also, areas with an abundance of young pole size trees should be considered. Sites with large trees that have important wildlife value should be avoided when possible. Forest openings should be no less than a quarter of an acre and no larger than two acres in size. Openings should be irregularly shaped to create maximum edge. Some openings should be permanently maintained while others should be allowed to revert to forest. Permanent openings should be allowed to naturally regenerate, then should be cleared every 3-5 years to prevent the growth of woody material. As with forest thinning projects, forest opening in wetland areas should be avoided.

Brush Piles

The woody debris collected from creating forest openings and thinning projects should be used to create brush piles in various areas. Cover may be a limiting factor for some wildlife species

in the park and would benefit from additional hiding and nesting sites. Brush piles should be located close to food sources and at least 200 feet from other escape cover or brush piles (Yarrow and Yarrow, 1999). To be useful to a wide variety of wildlife species, brush piles should have a ground clearance of 6 to 12 inches, and be at least 25 to 50 feet in length, 12 to 15 feet in width, and 4 to 5 feet high. No more than 2 to 3 brush piles per acre should be necessary.

When creating brush piles, larger debris should be placed on the bottom and smaller debris on top. This will slow the rate of decay. Living brush piles, or half-cuts, can also be made where saplings or small deciduous trees are partially cut through the trunk and bent toward a common center. Some trees that make good living brush piles include willow, live oak, and post oak. Brush piles should be inspected annually to assess their wildlife value. Decayed materials should be replaced (Yarrow and Yarrow, 1999; Payne and Bryant, 1994).

Snags and Cavity Trees

Trees that are dead or dying are called snags and are a valuable part of forest habitat. A variety of wildlife species use snags for perches, nesting sites, and food sources. Snags are produced naturally by fire, flooding, lightning, disease, and insects. They may also be produced by methods known as girdling or the use of herbicides. As forests develop snags become a natural part of the landscape and should be left in place unless they pose a safety threat to park visitors.

Snags are classified as either hard or soft, depending on the state of

decay. Trees resistance to decay varies from species to species. Table 1 shows the resistance of decay of selected species. A snags usefulness to a given wildlife species may be dependent upon the state of decay. For example, cavity-nesting wildlife uses soft snags the most because they are excavated easier (Payne and Bryant, 1994). Pileated woodpeckers, however, only use hard snags.

Resistant	Non-Resistant
Red Cedar	Willows
Sassafras	Butternut
Black Cherry	Yellow Poplar
Black Walnut	Sweetgum
White Oak	Beech
Chestnut Oak	N. Red Oak
	Black Oak
	Pines

Table 1. Resistance to decay of selected species (Adapted from Yarrow and Yarrow, 1999).

Different wildlife species require a different number of snags and there is, therefore, no optimum density of snags. Snag density should vary from one area to the next. However, there should be a minimum density of 4 to 6 snags per acre. To achieve this may require girdling some trees. Leaning trees should be avoided because they would be likely to fall sooner than straight trees.

Cavity trees are those trees that have some hollow area and may be either live or dead. Cavities may develop naturally or may be caused by a fungus or injury. A large limb may break off of a hardwood and allow the process of natural decay to set in. Disease, fire, and lightning are other causes of cavities. American beech and

sycamore trees are particularly susceptible to cavity development.

Cavities cannot be created like snags. Therefore, cavity trees, whether live or dead, should be retained except where they pose a threat to the safety of park visitors. In areas where cavity trees are absent or limited nest boxes should be erected.

Edge

Edge habitats act as a transition zone between habitats and have the tendency to add diversity to an area. Edge habitats, also known as ecotones, contain a greater variety of species and more dense populations than any of the surrounding communities. This phenomenon is known as edge effect. Edges may have characteristics of the surrounding habitats or they may have characteristics of their own.

Edge habitat is limited at Sandy Bottom Nature Park because the majority of land in the park is forested and there are few fields. The parks borders create abrupt changes in environmental conditions and little space and opportunity to develop edge habitats. Both inherent and induced edge habitats exist and can be found along lake edges, field edges, Newmarket Creek, and other open areas in the human activity core area. The majority of edge habitats in these areas are poorly developed.

Increasing edge habitat will not benefit all wildlife species. Some species may live within the edge; others may live in the edge and the adjoining habitat, while others may be adapted to only a particular forest type such as a forest interior. It is also believed that edge habitats may enhance conditions for predators and therefore result in

higher levels of mortality. Many of the wildlife species found on the coastal plain of Virginia, particularly on the Lower Peninsula, have had to become adapted to living with fragmented habitats, and therefore, a significant amount of edge habitats. It will be necessary to strive for optimal amount of edge habitats in the park so diversity is increased while achieving a balance between mortality and natality.

Creating gradual transition zones between habitats or plant community types will be the most effective method of edge development. This method may require the removal of some trees to reduce the abrupt shift in environmental conditions coupled with supplemental herbaceous and shrub plantings. Shrubs and herbs will also provide cover and food for edge-adapted species. Once an edge has been developed it should be maintained every 3-5 years.

Where edge habitat already exists trees, saplings, and other woody plants will need to be maintained every 3-5 years. Edge enhancement will include herb and shrub plantings to supplement food and cover shortages. Lespedeza and black berry are beneficial plants that might be included.

Lake Management

The lakes found at Sandy Bottom Nature Park are very different in terms of their water chemistry, flora, and fauna and, will therefore, be managed quite differently. Sandy Bottom Lake will be managed for diversity, but primarily for its recreational fishing opportunities while the other, Crystal Lake, was initially be managed to enhance the current conditions.

Sandy Bottom Lake

Sandy Bottom Lake is a former borrow pit of approximately thirteen acres. It ranges in depth from approximately eight feet to fifteen feet. Lake depths and water chemistry conditions are known to fluctuate seasonally. Therefore, bathometric studies, along with basic water chemistry studies, should be done to gain a better understanding of the lakes dynamic conditions.

Biodiversity in lakes is supported by plankton and nutrients. It will be necessary to develop and maintain phytoplankton and zooplankton in the lake because they are the first building blocks in lakes. They produce oxygen, which is critical to all other life in lakes, and form the basis of the food chain. Zooplankton feed on phytoplankton, insects feed on zooplankton, and larger species feed on insects. Establishing this level of life in the lake will be critical to the success of a recreational fishing location.

Establishing and enhancing the level of plankton and nutrients in a lake can be achieved through fertilizing. Fertilized ponds can support nearly twice as many fish as unfertilized ponds (Yarrow and Yarrow, 1999). Alkalinity should be checked before fertilizing because fertilizing may not stimulate good phytoplankton growth if alkalinity is below 20ppm (Yarrow and Yarrow, 1999). Liming may be necessary to achieve the appropriate alkalinity levels.

A serious drawback of fertilizing is the potential of algae blooms and promoting the growth of aquatic weeds, which can severely reduce the amount of dissolved oxygen in the water. Before fertilizing, research to determine the need and potential effects must be

conducted to avoid any negative consequences. Assistance from experienced professionals should be requested.

Aquatic vegetation and weeds are an important part of aquatic habitats because they provide cover for small fish to hide from predators. If unchecked though, they can pose a serious problem to the maintenance of a successful recreational fishery. Aquatic weeds should be monitored so as to prevent overly abundant growth. Biological and manual methods are recommended. Biological methods include the introduction of species such as grass carp (*Ctenopharyngodon idella*). These fish are primarily herbivores and may eat up to 30 or 40 percent of their body weight in weeds daily. Manual methods can be labor-intensive and take long periods of time. Chemical methods should be avoided when possible. Introducing chemicals into a lake may have undesirable effects on species other than the target species.

The development of fish structure is another important aspect of a successful recreational fishery. Fish structure serves as a refuge for smaller fish. Fingerlings, fry, and smaller species can use the structure to hide from larger predator fish and increase survivorship. Old Christmas trees and slash from forestry operations can be anchored and serve as good structure. Structure should be placed within casting distance of the fishing pier as well as other areas of the lake.

Nesting structures such as weighted buckets for catfish, spawning beds made of frames filled with sand and gravel can increase reproduction. The buckets should be placed in water that is 5-10 feet deep while the spawning beds

should be placed in water that is 2-5 feet deep.

Crystal Lake

Like Sandy Bottom Lake, Crystal Lake is a former borrow pit. It was the site of a large wetland mitigation project. This project has reduced the lake from approximately 69 acres to 17 acres (For more information on the Wetland Mitigation Project see Restored Wetland Management on page 41). The seventeen acres unaffected by the mitigation project will be used as a recreation site for canoeing and paddle boating. It has an average depth of approximately four feet.

Crystal lake is historically known to support very little life due to poor water chemistry. The pH in the lake has at times been as low as 2.5. The low pH is due mainly to the presence of pyrite. As time has passed the pH has gradually increased. The water is very clear, indicating low levels of nutrients and plankton. Consistent research and monitoring will be necessary to determine the proper course of action in order to enhance the lakes capacity to support life.

Liming and fertilizing should be considered to bring the pH levels, nutrients, and plankton levels to within optimum ranges. Once this was achieved structure and nesting sites were placed throughout the lake. Finally, stocking the lake should be considered. Although its primary purpose would not be to support recreational fishing it should be managed for diversity and as a healthy resource for the parks wildlife.

Field Management

Sandy Bottom Nature Park has very little area available for open field management. There are several acres of field in the human activity core area. These areas will be landscaped and maintained by weekly mowing for passive recreational use and aesthetics. Along Old Crystal Trail there is an area of approximately two acres that could be managed as an open field and used as a wildflower meadow or to provide supplemental feeding for wildlife in the future.

It will be necessary to enhance the soil conditions of this area to optimize forbs and soft mast production for wildlife. Plowing, discing, and fertilizing may be necessary to enhance aeration and fertility of the soil.

This area should be planted with grasses, legumes, and wildflowers. Wildlife mixes are available and should be researched before planting. Some woody species could be planted, however, in limited numbers. Crabapple (*Malus spp.*), persimmon (*Diospyros virginiana*), and serviceberry (*Amalanchier arborea*) should be considered. A list of herbaceous and potential woody plants for field plantings can be found in Appendix E.

Creating additional meadow areas would be beneficial to the park's wildlife. There are several areas in the park that would be appropriate for this management effort. One suitable site is located west of the wetland mitigation site along the pipeline to Newmarket Creek. This area will need to be maintained to accommodate access to the pipeline. Additional clearing in this area would benefit wildlife by diversifying habitats and allowing for an

area to be managed for supplemental feeding.

Wildlife Management

Wildlife management is the application of ecological knowledge to populations of vertebrate animals and their plant and animal associates in a manner that strikes a balance between the needs of those animals and the needs of people. Ecological knowledge is applied in three basic ways: (1) preservation, when nature is allowed to take its course without human intervention; (2) direct manipulation, when animal populations are trapped, shot, poisoned, and stocked; and (3) indirect manipulation, when vegetation, water, or other key components of wildlife habitat are altered (Bolen and Robinson, 1998).



The goal of wildlife management at Sandy Bottom Nature Park is to promote the growth of healthy wildlife

populations and optimize wildlife visibility for the public. Wildlife management at SBNP will be largely made up of indirect manipulation and preservation because of the parks urban location and the potential dangers of some of the elements of direct wildlife manipulation. Shooting and poisoning are not practical options for wildlife management at Sandy Bottom Nature Park. These methods would be recommended only in the most dire conditions.

Non-native species and pests will be deterred and trapped when necessary. Domestic species, such as house cats, will be trapped and taken to the SPCA by Hampton Animal Control, unless owners can be found. Trapped or rehabilitated animals should not be released in the park. This will reduce the introduction of disease, stress, and territorial disputes.

It will be important for park personnel to promote a “don’t feed the wildlife ethic” in order to protect both wildlife and the public from nuisance species and dangerous wildlife encounters. Staff will make efforts to educate the public on the dangers of taming wildlife. Signage will be strategically placed to deter the public from feeding any wildlife. Campers will also be informed of proper food storage techniques to reduce the potential dangers of leaving food accessible to wildlife. Only acceptable methods of feeding, such as birdfeeders, will be promoted. A list of wildlife known to inhabit Sandy Bottom Nature Park can be found in Appendix F.

White-tailed Deer

White-tailed deer are a species of interest and concern because they are the largest mammals known to inhabit SBNP and are often a species of interest to the public. While many people enjoy seeing wildlife they do not necessarily enjoy having white-tailed deer on their property. In the Harris Creek section of



Hampton the deer population has exceeded the social carrying capacity and was causing damage to property and landscaping. The problem became serious enough to get the attention of the Hampton City Council. Council deemed it necessary to develop a citywide wildlife management plan to help manage the problem. As of September 1, 2006 Virginia Department of Game and Inland Fisheries band the feeding of wild deer statewide due to population. If anyone witnesses or suspects someone of feeding wild deer they are to call the Departments Wildlife Crime Line at 1-800-237-5712.

Sandy Bottom Nature Park's deer population will have to be closely monitored and managed so as to prevent overpopulation and dispersal into neighboring communities. Another serious concern about a dense deer population is the potential for an increased frequency of collisions with automobiles on the bordering highways.

White-tailed deer have no natural predators within the park boundaries, and as evidence has shown, a lack of predators and/or hunters leads to overpopulation (See Figure 1). An overly abundant population can quickly deplete resources, which in turn, leads to a rapid decline in the population. The decline could be from starvation and/or disease.

Estimating population trends will be critical. Since a true census would be difficult, other methods will be employed. Night spotlight counts, fecal pellet counts, and track counts are recommended methods of obtaining population indices (For detailed methods see Wilson et al., 1996, and Smith 1996).

White-tailed deer probably require more land for their home range than any other species in the park. In good habitat bucks typically need about 640-acres, whereas does require roughly 300-acres (Yarrow and Yarrow, 1999). Clearly, bucks need more space than SBNP has to offer. However, with good management a healthy population can be maintained.

Estimating the health of SBNP's herd can help ascertain when the population has outgrown the available resources. Looking at the physical condition of deer in the one and one-and-a-half-year-old age class is the best method to help determine the health of the herd because it does not require the

observer to handle or manipulate the animal and it is a non-stressful method for the animal.

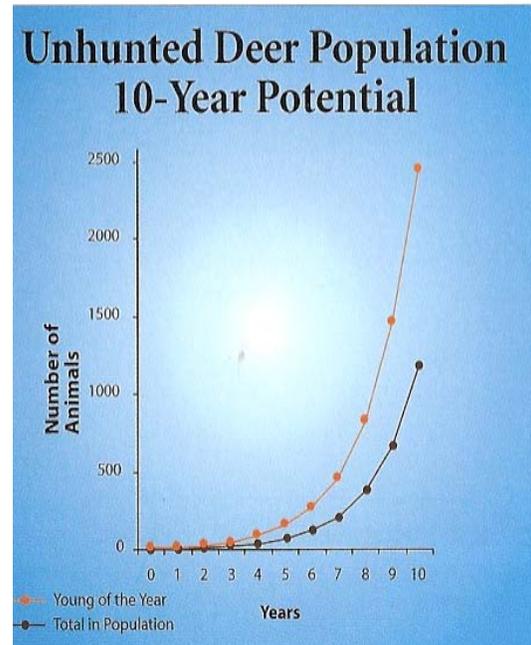


Figure 1 Beginning with a doe and a buck, this graph depicts the population growth potential in 10 years of an unhunted population, including natural mortality (Yarrow and Yarrow, 1999).

This age group represents deer that are still growing and are sensitive to changes in the quality and quantity of food available. The appropriate measures need to be taken to properly manage their population to suit the available resources.

Like most wildlife species, deer have essential requirements including food, cover, water, and space. Food and cover will prove to be the most important concerns in deer management since space is fixed and water is available. Ideal habitat types include un-thinned pine stands; dense three to four year old openings in forest stands; abandoned fields that have grown up in tall grasses, shrubs, and trees; evergreen thickets; and virtually

any area that contains thick vegetation. SBNP has areas that are representative of all of the listed habitat types. The result of having these different habitats in close proximity is many ecotones with edges. Edge effect adds diversity to habitats and is beneficial to white-tailed deer as well as many other species.

Land use history of SBNP has caused the age of the forest to vary from one area to the next. This has resulted in varying densities and mast production rates. In areas where the canopy is dense, there is little understory forage. Small area clearings would encourage new growth competition resulting in fast growing forage. These areas should be spaced at least one-quarter of a mile apart.

The development of supplemental feeding areas and the placement of salt blocks will be researched and considered. The purpose of these areas would not be to help the herd sustain higher numbers or elevate the carrying capacity, but to provide locations for the public to view wildlife; and, in some cases, to compensate for yearly or seasonal fluctuations in natural food supplies. Therefore, the size of the population will be noted before creating any supplemental food plots. If the population is thought to be approaching its carrying capacity food plots will not be developed. For more information on plants favored by deer for food plots see Appendix G.

Lyme disease is a public health concern wherever deer are located. White-tailed deer are known to be a keystone host for adult deer ticks (*Ixodes spp.*), which are the carriers of the spirochete bacterium that causes Lyme disease. As deer populations increase so does the prevalence of Lyme disease (Yarrow and Yarrow, 1999). However,

deer are not the only species of wildlife known to host the deer tick. Other species, such as the white-footed mouse and raccoon, are known to host the deer ticks.

Prevention of Lyme disease is difficult. The best method of prevention for visitors and staff include the proper use of the appropriate pesticide and proper clothing.

Red and Gray Foxes

Red and Gray foxes are a species of interest because, along with coyotes, they are perhaps the most adaptable predatory mammals to urban settings. Although they are known to inhabit SBNP, little is known about their populations. In general, foxes are known to be opportunistic omnivores, eating everything from mice, cottontails, and birds to grasses, nuts, and fruits. They are also very secretive. They are generally crepuscular with nocturnal tendencies. Activity increases during the breeding season (January – February) (Linzey, 1998). Otherwise they are seldom seen. These animals are also known to be susceptible to rabies and canine distemper.

There is some debate as to whether red foxes (*Vulpes vulpes*) are native to North America. Some sources suggest they are native while others suggest they were introduced by colonialists for the purposes of fox hunting (Linzey, 1998). In either case they have proven to be quite adaptive to the changes that humans are making to the environment. Although they have adapted well, the primary causes of death are related to man. Hunting, trapping, and being killed by automobiles are some of the most

common causes of death. The life expectancy of red foxes is only 2-4 years (Linzey, 1998).

Red foxes show a preference for open habitats and edges of forested areas. They are not usually associated with dense forests though they may utilize the cover that these areas offer. Also, red foxes may be found in openings in forests. In general, they select areas that have a diversity of habitats.

Denning sites are essential for good fox habitat. Red foxes may dig their own dens but they will typically utilize a burrow abandoned by another animal. Dens are not typically used throughout the year. They are most important while rearing young. The pups may be moved from one den to another or they may be separated and kept in different dens.



Gray foxes (*Urocyon cinereoargenteus*) are slightly smaller than their red cousins and they also have a black tipped tails as opposed to the white tipped tails of the red fox. Gray foxes seem to show a preference for a diversity of habitats like the red fox; however, they seem to use forested areas more. Gray foxes are known to climb trees and even have dens in tree hollows. Although it is not typical they will use

trees. Woodpiles, brush piles, and hollow logs are common denning sites and they are used throughout the year.

Like the red fox, the gray fox is an opportunistic omnivore, feeding on anything that it is able to catch. They also feed on plants and fruits.

Management strategies include providing sufficient edge habitat, as well as openings in forest stands. Woodpiles and brush piles should be created for both cover and potential denning sites.

SBNP's foxes will be monitored to gain information on population trends. Data on population densities, health, sex biases, and natality rates are desirable. Methods to be used are similar to those of monitoring white-tailed deer. Methods include fecal counts and track counts. Locating dens and monitoring activity around them will also be good technique of gaining information about these populations.

A serious concern for the public and the staff is the susceptibility of foxes to rabies. Foxes, according to some sources, are permanent reservoirs of rabies (Linzey, 1998). Outbreaks, however, seem to be associated with dense populations. Dense populations increase the frequency in which individuals come in contact with others.

Foxes home ranges are often larger than the area that SBNP has to offer. It is, therefore, likely that territories will overlap and increase the frequency of contact between individuals. It will be in the best interests of the park to limit growth of fox populations. Gray foxes were documented to be the primary rabies carrier in Virginia during the period of 1951-1976, and, they were the main source of human exposures for nearly the same period of time (Linzey, 1998). In 1975, raccoons comprised 88 percent

of all laboratory confirmed cases (Linzey, 1999).

Informing the public to avoid contact with foxes and keep their dogs leashed will help protect the public from potential encounters with rabid animals.

Raccoons and Rabies

The common raccoon (*Procyon lotor*) is one of the most recognizable mammals in the country. Its black mask and ringed tail make it unmistakable. It is also known to “wash” its food (hence the name “lotor,” meaning washer). Most biologists agree, though, that the raccoon is most likely feeling its food rather than washing it; since much of its preferred prey items include aquatic species such as crab, fish, and amphibians (Linzey, 1998).

Raccoons are generally considered to be semi-aquatic species because of their food habits and association with wetlands (Webster, et al., 1985). They are seldom found far from a source of water, whether it is a swamp, lake, stream, or other riparian area. It is likely that this affinity for water is why they are more common along the coastal plain than in the piedmont or mountains.

Though raccoons can swim they prefer to wade in shallow water while they search and feel for food leading to the idea that they are washing their food. Their food is not made up entirely of aquatic animals. Raccoons are omnivorous and are known to feed on wild fruits and berries as well as bird and turtle eggs. They are also known to make their way into neighborhoods and urban areas and pry into garbage cans in search of food.

Raccoons typically use hollow tree cavities and logs for dens. The dens are typically 4.5 to 12 meters above the ground and are only large enough to fit a female and her litter of kits (Linzey, 1998). Ground dens are less common, however, they can be just as important as areas to rest during the day or if tree dens are not available. The biggest threats to raccoons are humans, their dogs and automobiles.

It is thought that denning sites may be a limiting factor of stable raccoon populations. Therefore, management practices should be directed at controlling the availability of denning sites. Brush piles and wetland management are also important strategies in maintaining a stable raccoon population. Maintaining both hard and soft mast species in forested areas is also recommended.



Currently there is no need to improve conditions for raccoons. Energy will likely need to be directed towards discouraging interest in camping and picnicking areas. It is also possible that management efforts will need to be directed at limiting population growth. Raccoons trapped in other areas shall not be released into Sandy Bottom Nature Park.

Over the past fifteen years raccoons have developed a reputation for being carriers of the rabies virus. Since approximately 1990 raccoons have been the predominant rabies carrier of all wildlife species (Linzey, 1998). From 1951-1980, in Virginia, only 29 cases of rabies were recorded in raccoons. Since 1981, confirmed cases of rabies in raccoons has been no less than 56 percent, and up to 87 percent, in both wild and domestic mammals (Linzey, 1998). Additionally, the number of confirmed rabid animals in Virginia increased 42 percent from 1995 to 1996, but has shown a decrease in more recent years from 690 in 1997 to 549 cases in 1998 (Porter, 1999). While all mammals are susceptible to this disease the most commonly affected species in the U.S. are the raccoon, skunk, bat, and fox (Porter, 1999). For more information on rabies in Virginia and the Hampton Roads area see Appendix H.

The domestic dog was at one time the leading rabies vector in this country. In recent years the domestic cat has replaced the dog as the most commonly affected domestic species. Still, over 90 percent of rabies cases occur in wildlife (Porter, 1999).

These numbers do not reflect the incidence of rabies in humans. In the U.S., since 1990, there have been only 27 confirmed human deaths due to rabies. Worldwide, however, there are approximately 35,000 deaths attributed to rabies annually, with the majority occurring in Asia (Porter, 1999). When untreated, rabies is *always* fatal. Contracting the disease is, however, relatively difficult. The probability of a person contracting rabies from an animal with confirmed rabies varies from less than one percent to more than 80 percent (Porter, 1999). The difference appears

to be in exposure (animal bite, scratch, contamination of mucus membranes, or saliva). Exposure from animal bites has the highest rate of contamination.

Public education on signs, symptoms, effects of rabies, as well as the preventative measures to be taken will be critical. A cooperative effort with the City of Hampton Health Department and local veterinarians would be desirable. Implementing and enforcing a leash law within the boundaries of SBNP to reduce the incidence of domestic and wild animal encounters will be necessary.

It is essential that all staff working with mammals must obtain pre-exposure rabies vaccinations. Anyone working in the Wildlife Exhibit Area must be vaccinated. A cooperative effort with the Health Department will be necessary to obtain information, advice, vaccines, boosters, and monitoring of titers.

There are recent developments in oral vaccines for use in wildlife. Trials in Virginia and Pennsylvania have proven to be effective. Research into the possibility of obtaining and using these vaccines in various baits at SBNP should be done.

Species of Special Concern

Virginia has some of the most diverse flora and fauna found in the United States. This diversity is the result of a complex history of evolution and migration among plant and animal species which has taken place over several hundred million years on a varied land surface and under changing climatic conditions (Terwilliger, 1991). Virginia's central location along the east coast contributes to its biodiversity.

There are species that reach their northern limits of distribution in Virginia, as there are species that reach their southern limits of distribution. Also, certain natural features, such as the Chesapeake Bay and the drainage of major rivers in Virginia, contribute to both floral and faunal diversity.

European settlers once thought that the resources of the New World were infinite. The forests were vast and the wildlife was abundant. To these settlers the New World was a wilderness to be tamed and conquered. This meant converting a natural landscape into farmland to support an ever-growing population of Europeans. Not only was the American landscape forever altered by deforestation, but also, game was overharvested and predators were eliminated. So great are the accumulative modifications of the last 400 years of Virginia's history that today it is difficult to designate any part of the state a wilderness (Terwilliger, 1991).

Clearing of the forests obviously means outright loss of habitat for the species that inhabit it, but in addition, clearing usually proceeds in a patchwork fashion that first fragments the forests. For many species, habitat fragmentation means increased difficulty in finding mates, increased expenditure of time and energy in locating food, and perhaps increased vulnerability to predation—especially by humans, many of whom view wildlife as pests in the agricultural ecosystem—when passing through cleared lands. All these factors translate into population decline and the increased probability of extirpation (Terwilliger, 1991).

A major step toward legal protection of habitats and wildlife began in 1900 with the Lacey Act. The Lacey Act prohibited the interstate

transportation of “any wild animals or birds” killed in violation of state laws (Terwilliger, 1991). This law eventually led to one of the most important laws, the Migratory Bird Treaty Act (MBTA). The MBTA provides penalties for the taking, selling, transporting, and importing of migratory birds.

Step by step, federal and state legislation strengthened the management and preservation of wildlife and their habitats. The Endangered Species Act of 1973 further strengthened conservation efforts, especially for those species whose populations are considered to be in danger of becoming extinct. The Act created two categories of endangerment, endangered and threatened. Endangered species are those species in danger of extinction throughout all or a significant portion of their range. Threatened species are those which are likely to become endangered within the foreseeable future throughout all or a significant portion of their range (Terwilliger, 1991).

Virginia currently has 66 federally listed threatened and endangered species (USFWS, 2006). The Department of Conservation and Recreation, Division of Natural Heritage, lists and ranks species that are rare to Virginia's biota. Currently, Virginia supports 350 animal species and 157 plant species that are ranked globally rare by the International Natural Heritage Network (DCR, 1999).

The cities of Hampton, Newport News, and Poquoson support 9 animal species and 5 vascular plant species that are listed as special concern, threatened, or endangered by the Department of Conservation and Recreation, Division of Natural Heritage. Within the borders of Sandy Bottom Nature Park there is one state endangered species, the

Canebrake rattlesnake (*Crotalus horridus*), and one state threatened species, Mabee's salamander (*Ambystoma mabeei*).

Canebrake Rattlesnake

The Canebrake rattlesnake is a large venomous snake and the only rattlesnake in southeastern Virginia. Southeastern Virginia is the northernmost limit of the Canebrake's distribution. On the lower peninsula they have been known to occur in Hampton (SBNP), Newport News, and York County. Mature hardwoods are the preferred habitat for Canebrakes, however, they are found in mixed hardwood-pine forests, cane thickets, and swamps. They prefer areas littered with logs and a significant layer of leaves and humus. Canebrake rattlesnakes hibernate over winter in the bases of hollow trees, stumps, and in the underground tunnels resulting from stump and root decomposition, particularly those of pine trees (Terwilliger, 1991).



The biggest threat to the remaining populations of Canebrake rattlesnakes is habitat loss and fragmentation. Some individuals are killed by hunters, deer, dogs, and occasionally hawks (Terwilliger, 1991).

There are direct consequences from habitat loss and fragmentation. First, individuals are killed in the process of clearing or den sites are destroyed. Also they will be exposed to roads and people more frequently. Secondly, habitat fragmentation isolates small populations making it difficult to locate mates and making them susceptible to inbreeding.

It is believed that the remaining populations of Canebrakes could be extirpated within just a few years. Spring 2006, an individual born the previous year was sited. A cooperative effort with the research being conducted by Old Dominion University is essential in monitoring and ultimately managing the SBNP population.

Current management recommendations include creating and placing artificial hibernacula. It is believed that with development in the areas surrounding SBNP hibernacula were most likely destroyed leaving some individuals without a suitable site to over winter. Minimizing brush along heavily traveled trails so as not to attract snakes to areas where they are likely to encounter people and pets is recommended. Research into the development and placement of barrier fencing to control movement in high traffic areas of the park is desirable. Research into developing and providing artificial birthing sites is recommended. Additional management recommendations will come from research efforts.

Only those staff members who have been trained with the appropriate equipment and on the proper methods shall catch Canebrake rattlesnakes. No student or other member of the public will be allowed to catch, trap, or harass any Canebrake without the proper

permits coupled with the permission of park authorities.

Mabee's Salamander

Mabee's Salamander is stout-bodied member of the Mole Salamander family, Ambystomatidae. These salamanders are quite secretive and little is known about their ecology. They are typically terrestrial and are known to burrow underground and emerge only to breed (Behler and King, 1997). Breeding occurs during late fall to early spring in fishless, vernal ponds. Habitats associated with these ponds include hardwood bottomlands and mixed hardwood-pine bottomlands. Like other amphibians, Mabee's salamanders are very sensitive to environmental changes. Threats include habitat loss and alteration. Changes in water chemistry, drainage, and groundwater flow associated with breeding ponds adversely affect populations (Terwilliger, 1991).

Little is known about the Mabee's salamander population at SBNP. Individuals have been found in the Wood Duck Pond area of the park. In 2006, a new population was recorded off of Fallen Oak Trail. Exact location will not be provided for its protection. A survey of their population is necessary to determine their status at SBNP. Monitoring must be done to determine size, structure, and dynamics of the population so that appropriate management recommendations can be made.

Implementing a mark and recapture program that incorporates drift fences and pitfall traps is a recommended method of long term monitoring. Refer to Smith (1996), Hero (1989), and Martof (1953) for toe-clipping systems and Heyer, et al. (1994)

for detailed methods of drift fences and pitfall traps. Other methods of marking that do not injure or mutilate animals will be researched. Collaboration with CNU, ODU, and VDGIF is recommended for this project.



Public access to areas of the park that are known to support Mabee's salamanders shall be limited. Access to these areas will be limited to foot traffic. There shall be no bicycles, motorized vehicles, or horses allowed. During the breeding season access may be prohibited all together in order to ensure uninhibited movement. There shall be no major park projects or operations conducted in the areas known to have Mabee's salamanders.

Other management recommendations include providing sufficient downed logs and excluding fish from known breeding ponds. The creation of additional ephemeral ponds should also be considered. Consulting the appropriate agencies would be necessary. Also, the 52-acres of freshwater wetlands on the Crystal Lake site will be an encouraging addition as potential habitat for this species.

Bald Eagle

The Bald Eagle (*Haliaeetus leucocephalus*) is a species that is both federally and state listed as threatened.

In 1995, it was removed from the endangered list and re-ranked as threatened. Nationwide, populations are continuing to make significant comebacks. For many years reproductive rates were severely reduced due to chlorinated hydrocarbon pesticides such as DDT (Terwilliger, 1991). Now that the use of DDT and other harmful agents are banned in North America the bald eagle has been given a chance to make a come back.

The first pair documented in Hampton was in 1999. Several breeding pairs have been identified in the City of Hampton. One pair is within just a few miles of SBNP and has been spotted within the borders of the park. They have also known to feed from both of SBNP lakes. The exact location of the nest is known and is protected under state and federal law. SBNP will seek management recommendations from state and /or federal authorities as needed.

Spotted Turtle

The spotted turtle (*Clemmys guttata*) is a rare species that receives limited protection in the United States, including in Virginia. Some states offer full protection under their endangered species acts. Others, like Virginia, offer partial protection. In Virginia the spotted turtle is ranked S3 (Vulnerable-typically 21-100 occurrences). This status offers little protection. Collection and possession is legal for personal use only. There is a possession limit of five.

Spotted turtles live in mostly unpolluted, small, shallow bodies of water such as small marshes, marshy pastures, bogs, fens, woodland streams, swamps, small ponds, and vernal pools (CITES COP 11, 2000). Threats to

spotted turtles include habitat loss and fragmentation, and collection for use in the pet trade.

Preliminary inventories have shown that spotted turtles inhabit SBNP in the Wood Duck Pond area. Additional surveys need to be conducted to determine the population status and population trends at SBNP. Collecting, trapping, and harassing of spotted turtles at SBNP will be prohibited except by authorized staff and associated researchers.

As stated previously, access to Wood Duck Pond will be limited to protect this area from heavy traffic and adverse sensitive wildlife and human interaction. Grass, sedge, and rush growth within and around the pond will be encouraged along with other herbaceous growth. Efforts into nest protection will be considered. The 52-acre wetland mitigation project on Crystal Lake will be an encouraging addition to the park because of its potential habitat value for the spotted turtle.

In general, management of species of special concern within the borders of SBNP will reflect the methods and recommendations of state and/or federal officials. Cooperative efforts in research and management will be necessary.

Herpetofauna

Virginia's herpetofauna are among the most diverse in the United States and the world. While Virginia's amphibians are the most diverse, reptiles rank thirteenth, giving Virginia an overall rank of seventh (Moriarty).

A dramatic decline in amphibian populations, with some extinction, has

been occurring. Causes of amphibian decline seem to be habitat loss, disease, increased ultraviolet radiation, climate change, and pollutants (WWF, 1999). Amphibians are particularly sensitive to environmental changes because of their amphibious life cycle, absorptive surfaces (porous skin), exposure to ultraviolet light, food habits, and susceptibility to cold and drought (Stebbins and Cohen, 1995). These sensitivities make amphibians indicators of environmental health.

Preliminary inventories have indicated only eight species of frogs (*Rana spp*, *Hyla spp*, and *Pseudacris spp*), two species of toads (*Bufo spp.*), and three species of salamander (*Ambystoma spp* and *Plethodon spp*) exist at SBNP. The first sighting of squirrel treefrog (*Hyla squirella*) in Hampton was recorded at SBNP in June 2006.

It will be essential to continue monitoring amphibian populations within the borders of SBNP. Inventories as well as surveys are recommended. Research methods should include drift fences with pitfall traps.

The objective of amphibian management at SBNP will be to provide the most suitable conditions and continued protection from habitat degradation and fragmentation. Activity where amphibians are known to breed will be limited. Limiting fish populations to the appropriate lakes will ensure that there are suitable locations for breeding and reduce predation on egg masses and larvae. Low-growing herbaceous cover and shrubs around wetlands and ponds will provide protection from excess UV radiation and desiccation. Logs and cover boards should be provided at sites where there is a shortage.

Reptiles in the park are of particular interest because they are a very visible group of wildlife. The public demonstrates strong feelings toward reptiles, particularly snakes. Emotions vary from intense anxiety to excitement. Providing safe opportunities for the public to see wild reptiles will surely help create an enhanced recreational experience.

Reptile diversity at SBNP appears to be good based on observation and preliminary inventories. The species composition seems to be fairly representative species known to exist on the coastal plain. There are at least nine species of turtle, fourteen species of snake, and six species of lizard.

Management of reptiles should be directed at providing the most suitable habitats as well as providing safe opportunities for the public to see wild reptiles. During the warmer months snakes are known to travel in search of food and mates. Their search may take them several miles away from den sites. Also, snakes are known to bask in open areas. These behaviors are certain to provide encounters with people.

Snake management will prove to be paradoxical at SBNP. Although management efforts include providing opportunities for the public to see snakes, it is in the best interest of the park to not have frequent encounters with the Canebrake rattlesnake. While habitat management includes providing basking locations and brush piles it is important to keep these habitat modifications away from trails. Other management considerations should involve prey species such as small mammals. Providing cover and food items for these species will be necessary.

Snakebites are common where snakes are found. It will be necessary to advise the public not to handle, trap, or provoke any snake species. Providing information on snakebites, such as when and why people get bitten, would be beneficial.

Turtles are another commonly seen group of reptiles. During their breeding season (generally spring and summer months) females are known to travel some distance from the lakes or ponds they inhabit to nesting sites. Nests are vulnerable and experience frequent predation, particularly by raccoons.

Turtles are generally known to be a group of animals that are docile and slow. While true for some species, others, like snapping turtles (*Chelydra serpentina*) can be quite aggressive. The public will be advised to not handle or trap these animals. Occasionally turtles are caught on fishing lines. Anglers should be advised to contact an experienced staff person for assistance in freeing the animal, especially if it is a snapping turtle. All caught turtles will be immediately documented for population monitoring and released.

Turtle platforms are an easy method of attracting turtles to sites where the public can view them from a distance. A turtle platform plan can be found in Appendix I.

The various turtle populations currently appear to be healthy with a few exceptions (spotted turtle and stinkpot, *Sternotherus odoratus*). A survey of all species will be necessary to further ascertain the status of these populations. A mark and recapture program utilizing a numerical coding system for marking hard-shelled turtles is recommended (see Appendix J).

Nest protection will be considered once population densities are determined for those species of concern. Lake and fisheries management will be important factors affecting the state of turtle populations at SBNP and will be discussed later. Other management recommendations will be forthcoming once there is more information on population trends. The size and accessibility of Sandy Bottom Lake will provide a good research opportunity for schools such as CNU and ODU.

Birds

Birds are probably the most frequently seen group of animals, especially in urban areas. Their daytime feeding activities and vocal communication provide many opportunities to observe them. Birding has become a very popular and absorbing recreational activity. Thousands, if not millions of people build or buy backyard bird feeders and seed to attract backyard wildlife. In the United States alone people spent over \$600 million on field guides, birdhouses, and birdbaths in 1980, of which \$500 million was spent just for birdseed (Bolen and Robinson, 1999). Still, thousands more visit parks and refuges to observe, identify, and count birds in their natural habitat. Their value to people is incalculable.

The ecological functions of birds are critical to maintaining a stable ecosystem. Swallows and Purple Martins feast on mosquitoes. Orioles and warblers, along with a host of others, are important plant pollinators (Hickman, 1999). Many other birds aid in plant dispersal by spreading the seeds of fruits they feed on.

One of the most fascinating phenomena known in the natural world is the annual migration of millions of birds. Many species of waterfowl, raptors, and neo-tropical songbirds travel hundreds or thousands of miles south to spend the winter months in tropical or subtropical climates. Southern migratory destinations provide food, shelter, and breeding sites.

Migration is energetically costly and extremely hazardous. Nearly one-half of the birds that leave their northern range in the fall will not return in the spring. Predation and starvation are leading causes of death during migration. Another threat is destruction of tropical rainforests and fragmentation of other habitats like eastern forests of North America where the continents largest breeding concentrations of migratory birds occur (Bolen and Robinson, 1999). Bird conservation will require the protection of forests, as well as other habitats and stopover sites in summer and winter ranges. A table of habitat preferences for select birds can be found in Appendix K.

Passerines and Songbirds

The needs of many birds are easily met. Populations of most North American songbirds are secure and normally fluctuate within acceptable limits with little or no management (Bolen and Robinson, 1999). Other species, however, have some very specific requirements. As with other wildlife species, birds need food, water, and cover. Birds will assess general aspects of a habitat, such as vegetation features and the presence of lakes or wetlands. Habitat preferences for some common birds can be seen in Appendix L.

There are essentially three different populations of birds throughout the year. There are year round residents, summer visitors, and winter visitors. The year round residents are most versatile and can sustain themselves on a combination of seeds, fruits, and insects. Winter visitors depend mostly on seed bearing plants since there are few fruits and insects during this time. The summer visitors primarily feed on insects.



Many birds benefit from efforts commonly seen in backyard habitats such as bird feeders and nest boxes. SBNP will provide feeders and nesting sites in addition to what is naturally available. Many of these additional feeders and nesting sites will be placed in the human activity core area to increase wildlife visibility. Nest box plans and information for bluebirds, screech owls, wood ducks, purple martins, wrens, chickadees, and mallards can be found in Appendix L. The idea of providing birdbaths was reviewed but discouraged due to the threat of mosquitoes and mosquito borne illnesses. There are three man made fountain water ponds in the park.

Some other management methods that will be employed include maintaining native plantings in gardens

and open areas. Leaving snags in areas where they pose no threat to people and maintaining edge habitat is recommended. Snags will benefit several species of woodpeckers and nuthatches. Edge habitat will offer several beneficial elements. Edges support soft mast producing species, perching sites, and access to open areas and cover areas. SBNP will also promote understory and herbaceous growth by forest thinnings and clearings.

The development of a wildflower meadow to serve as a supplemental feeding area was planted in 3 locations in the park. Wildflowers and other beneficial plant species can be very attractive and would be suitable for edges and along some trails. Additional wildflower meadows will be determined if needed.

Waterfowl

The requirements of waterfowl are different than those of passerines and songbirds. Due to difference in habitat and food preferences management techniques will be different. Ducks are generally broken into three major groups: diving, dabbling, and perching.

Divers tend to have similar habitat and food preferences. They prefer open, deep-water habitats and feed on submerge aquatic vegetation and aquatic insects. Some divers that may be found at SBNP include ring-necked ducks (*Aythya collaris*), buffleheads (*Bucephala albeola*), and hooded mergansers (*Lophodytes cucullatus*). SBNP has limited habitat that is suitable for these species and is therefore used primarily as a stopover. Management of submerged aquatic vegetation and emergent vegetation is recommended to create the most favorable conditions.

Dabbling ducks and perching ducks are sometimes called pond and river ducks since they share similar habitats. Management for these two groups will be discussed together. Some of these ducks include mallards (*Anas platyrhynchos*), wood ducks (*Anas rubripes*), and American black ducks. Mallards are considered to be the most widely distributed species of waterfowl in the northern hemisphere and are known to use nearly any body of water. They are sometimes seen flocking with black ducks. Mallards will typically nest in upland habitats of grasses, shrub, and occasionally forest. Protecting emergent and shoreline vegetation for cover and nesting sites is suggested. In addition to protecting areas where these ducks are known to nest the park will also place artificial nesting sites that are suitable for mallards.

The wood duck (*Aix sponsa*) is arguably one of the most beautiful birds in the world. They are also considered a conservation success story. At the turn of the twentieth century wood duck numbers were so low many believed that they would become extinct. The Migratory Bird Treaty Act and regulated hunting have helped re-establish their populations. The wood duck prefers bottomland hardwood swamps and marshes, or forested riparian areas. When nesting they use hollow tree cavities and artificial nest boxes. The placement of nest boxes is placed for wood ducks since natural nesting sites are limited at SBNP. Wood duck pond likely offers the most suitable habitat for this species, hence the name. Limiting public access and promoting the growth of native wetland plants will help protect this area.

The 52-acre wetland restoration project at SBNP will add a significant

amount of valuable habitat. Wood duck and mallard nest boxes have been placed in this area.

Raptors

Raptors are a group of birds that share certain physical and behavioral characteristics. The term “raptor” is a blanket term used to refer to hawks, falcons, eagles, vultures, and owls. All are diurnal except for owls. Some raptors commonly seen at SBNP include red-tailed hawks (*Buteo jamaicensis*), cooper's hawks (*Accipiter cooperii*), and osprey (*Pandion haliaetus*).

Raptors are also known as birds of prey and feed almost exclusively on meat. They pursue and kill the animals on which they feed. Anatomy defines what a raptor is more than diet. All have talons and a curved beak for tearing meat. Vultures are an exception to the rule of both diet and anatomy. Vultures feed on carrion and lack the strongly taloned feet of other raptors and rely on their sense of smell. Their bills are hooked although not as severely. Evidence suggests that they are more closely related to storks and only coincidentally resemble raptors (Weidensaul, 2000).



Raptors have different habitat and food requirements and will therefore require a different management approach, although, some of the management recommendations for other birds will benefit raptors. For example, edge habitats will benefit raptors because they perch at the edge of a forest waiting for small mammals moving in open areas. Forest openings will benefit forest dwelling raptors like Sharp-shinned hawks (*Accipiter striatus*) by attracting smaller birds and lizards. Creating artificial nest sites have proven to benefit several species of raptors including Osprey and American kestrel. Other important management strategies for raptors, along with effective habitat management, will be effective small mammal and fisheries management. Raptor management is basically management of the food they eat.

Mammals

The mammals of Virginia are quite diverse, but most people are aware of only the largest and most visible species. Other than the gray squirrel (*Sciurus carolinensis*), mammals are a group of animals that are not often seen at SBNP mainly because many of them are nocturnal or dwell underground. Although they may not be seen they leave signs of their activities. The mammals that are seen occasionally include raccoons, opossums, deer, and bats. There are, however, several other species known to be in the park and they play a very important role in the stability of communities. Many mammals are predators and help keep prey populations at healthy levels. Others are important prey species for owls, hawks, snakes, or other mammals.

Mammals are extremely variable in their appearance, behavior, and habitat preferences. They inhabit all regions of the world and make up groups that are carnivores, herbivores, insectivores, and omnivores. Mammals demonstrate how form follows function. For example, the specialized structure of the bat forelimb to better support the wing and the palmate forefeet of the mole for efficient digging (Linzey, 1998).

Sandy Bottom Nature Park offers a variety of habitats and therefore supports a variety of mammals. Although, the park is not big enough to support many large mammals that have large home ranges. The large mammals that the park does support have already been addressed. The other mammals, mostly small, will be addressed here and include mice, moles, shrews, bats, opossums, otters, rabbits, and squirrels. It will be necessary to conduct a thorough small mammal survey. Information about what species exist in the park is scarce and little is known of the species that are known to occur there. Data gathered from the survey should be used to fill information gaps relevant to small mammal management at SBNP.

Shrews and Moles

Shrews and moles are small mammals with dense fur, small eyes, and small ears. Both are primarily insectivores and are voracious feeders. Because of their high metabolism they require up to fifty percent of their body weight in twenty-four hours. Shrews may spend some time in burrows searching for food and moles will spend most of their time underground. They may even utilize underwater openings to

accommodate their semi-aquatic habits. Shrew and moles cannot be easily classified as either nocturnal or diurnal because they may be active at any time of day with scattered short periods of rest. They are also typically active throughout all seasons.

The Northern short-tailed shrew (*Blarina brevicauda*) is a species known to exist at SBNP and is found nearly throughout Virginia. This shrew is a slate gray color. Eyes are small and ears are so small they are concealed under the fur. The primary prey of northern short-tailed shrews are snails and earthworms. They may also feed on centipedes, beetles, and other invertebrates. Shrews from the genus *Blarina* produce a poison in their saliva glands that is used to paralyze prey. The prey that is paralyzed can then be stored for future use. The poisonous saliva is apparently not dangerous to humans but a bite may be painful for several days (Whitaker, 1997). Handling of these animals, live or dead, will be discouraged except during surveying in which extreme caution will be used.

Shrews excavate underground runways, which they patrol for prey. Males mark their tunnels with secretions from glands on the hips and belly. Territorial marking prevents meetings between individuals, which often results in conflicts. Shrews are important prey species for snakes, hawks, owls, foxes and other predators.

The Eastern mole (*Scalopus aquaticus*), also known as the common mole, is the only mole that has been encountered at SBNP. It is possible that the Star-nosed mole (*Condylura cristata*) also exists at SBNP. Further surveying will be conducted.

The feet of the Eastern mole are probably the most distinguishing

characteristic. They are greatly enlarged with broad, flat claws used for digging. The fur varies from gray to brown or tan. The eyes are reduced and vision is poor. The only evidence of ears are holes concealed by fur. Moles are infrequently seen because they rarely exit their burrows. Evidence of their activities comes in the form of ridges and molehills created by burrowing. These signs are usually found in relatively dry areas but are much more evident in wetter conditions (Whitaker, 1997). Moist, sandy, or loamy soil is preferred by this mole. It may be found in meadows, gardens, cultivated fields or lawns, and both coniferous and hardwood forests (Linzey, 1998).

Earthworms make up the primary diet of the Eastern mole, although, insect larvae, insects, and occasionally vegetable matter are eaten. They capture and kill their prey by crushing it with their front feet against the sides of the tunnel. Few animals feed on moles because of their subterranean habits. However, snakes, owls, and foxes have been known to prey on moles (Linzey, 1998).

Mice and Rats

Mice and rats are in the largest and possibly the most adaptable family of mammals. There are a great variety of species and are abundant throughout the world (with the exception of Australia, Ireland, Iceland, and the Antarctic). Members of this group are mostly terrestrial with some semi-aquatic and semi-arboreal species. The majority are nocturnal and none are known to hibernate, although, several are known to experience daily torpor. The general characteristics of mice and rats will be discussed together because

there are too many species that likely exist at SBNP to discuss them independently.

Food habits are diverse but most are omnivorous. Some may feed on green plants, seeds of grasses, nuts, fruits, crustaceans, insects, spiders, earthworms, and snails (Linzey, 1998 and Whitaker, 1997).

The populations of mice and rats have shown remarkable fluctuations in size. These fluctuations are typically cyclical. The reproductive rate of mice and rats are high while life spans are short. There may be several litters throughout the year with four to six young per litter. Some species are known to mate only hours after giving birth. The population fluctuations of mice and rats can have significant effects on the populations of carnivores such as snakes, hawks, owls, and foxes.

There are a variety of mice and rats that are known to exist on the coastal plain of Virginia and could potentially inhabit SBNP. It is unclear what species actually do exist in the park because there has been no thorough or preliminary survey conducted. A few of the species that likely exist at the park are the marsh rice rat (*Oryzomys palustris*), eastern harvest mouse (*Reithrodontomys humulis*), white-footed mouse (*Peromyscus leucopus*), cotton mouse (*Peromyscus gossypinus*), Norway rat (*Rattus norvegicus*), and the house mouse (*Mus musculus*).

Squirrels

The eastern gray squirrel (*Sciurus carolinensis*) is the most frequently seen, and likely the most common, species of squirrel found at Sandy Bottom Nature Park. The gray squirrel is a common species and has

adapted very well to urban settings as long as there are mast bearing trees and nesting sites available. The preferred habitat for gray squirrels is dense hardwood and mixed coniferous-hardwood forests, especially near ravines, slopes, and river bottoms (Linzey, 1998).

Gray squirrels primarily rely on a few species of plants for their year-round staples, although, their diet may be quite varied. The acorns of oaks, nuts of beech, and the buds and fruits of others make up the bulk of the gray squirrels diet. Acorns, nuts, and fungi are the main foods in late summer, fall, and winter. In early spring buds, seeds, twigs, and flowers are fed upon. The most difficult time of year is late winter when the nut crop and stored foods may be depleted. Insects and insect larvae make up an important part of juveniles diets. Mushrooms, eggs, and young birds are also known to be eaten (Linzey, 1998). In general, the size of a population is directly related to the quantity of acorns, nuts, and other foods produced during the growing season (Webster, et al., 1985).

The gray squirrel does not store nuts and acorns in a cache where it finds them. Instead, they carry nuts to another location and bury them individually. Approximately eighty-five percent of stored nuts and acorns are recovered and eaten. The rest play a very important role in propagating trees.

Gray squirrels are an important prey species for several snakes and are the primary food source for canebrake rattlesnakes. Other animals that may feed on squirrels include hawks, owls, and foxes.

In backyards and parks squirrels are a common sight. So common, in fact, they are considered pests by some.

The most common complaint comes from birders. Squirrels are notorious for raiding birdfeeders. Squirrel proof birdfeeders are available. The regular feeding of squirrels is not recommended. The local populations appear healthy and in no need of supplemental feeding. Garbage cans should be checked and emptied regularly so as not to attract squirrels and attached secured lids is recommended. Local mast crops will suffice. It seems that there is little need for management at this time. However, populations should be monitored to prevent overpopulation. Dense populations can result in territorial fights and injuries.

The southern flying squirrel (*Glaucomys volans*) is the only flying squirrel found in southeastern Virginia. These animals are nocturnal and are rarely seen and unfamiliar to many people. These squirrels glide and do not actually fly. They have a loose fold of skin that extends from the wrists of the forelimbs to the ankles of the hind limbs. The tail acts as a rudder that helps control the path of the glide. Glides may cover twenty to thirty feet (Webster, et al., 1985).

The southern flying squirrel inhabits hardwood and mixed hardwood-pine forests. Nesting occurs in old trees with natural cavities, woodpecker holes, and artificial nest boxes. Primary food items include acorns, nuts, berries, fruit, and some insects. They are known to store nuts in nests, forks and cavities of trees, and on the ground.

Predators of southern flying squirrels include tree climbing snakes, owls, and other mammals. The biggest threat to the success of populations is the availability of suitable nesting sites. Management for flying squirrels should ensure the presence of snags and trees

with natural cavities. Nesting boxes are provided throughout the park where there is a shortage of suitable nesting sites.

Eastern Cottontail

Eastern cottontails (*Sylvilagus floridanus*) are the best-known rabbits in Virginia and the eastern United States. These rabbits are typically associated with disturbed habitats such as old fields, shrubby edges, and even lawns. An important aspect of habitat selection appears to be the availability of cover for protection against predation.



Cottontails are an important food source for predators such as foxes, several species of raptors, and even some larger snakes. Domestic cats are also known to prey on rabbits. Cottontails may have an annual mortality of up to eighty-five percent due to predation, weather, habitat destruction, diseases, and parasites (VDGIF Factsheet). In spite of this, clearing of forested areas can enhance habitat as well. Forest openings will allow sunlight to reach the forest floor and stimulate growth of understory vegetation. The cottontail population at SBNP currently appears to need little or no management at this time. This population will be monitored to help guide future management.

cottontails are able to maintain populations if suitable habitat is available.

Creating brush piles and developing edge habitat enhance rabbit habitat best. Edges with briars, herbs, and small shrubs provide cover and safe travel corridors. Thinning and selective

Virginia Opossum

The Virginia opossum (*Didelphis virginiana*) is the only marsupial found in the United States and is distributed throughout Virginia. The placenta of opossums is less specialized and provides limited support to embryos. Young are born twelve to thirteen days after copulation and make their way to the abdominal pouch, or marsupium, where they attach to a teat and complete their development. The young may stay in the pouch for up to two months. Once they leave the pouch they may stay with the mother for another three to four weeks. Weaning usually begins between eighty and one hundred days after birth. Females may have two litters in a year. Other than breeding seasons the lives of opossums are thought to be solitary. They are thought to be shy and secretive and generally feed and den alone but are tolerant of others (Linzey, 1998 and Webster, et al., 1985).

There is little evidence to suggest that opossums are territorial. Home ranges are fluid and overlap significantly. Some studies have concluded that opossums are more or

less nomadic and that home ranges are nearly linear as a result of being associated with stream courses (Linzey, 1998).

As a result of being solitary and nomadic opossums can be found in almost any habitat though they tend to show a preference for low, damp, wooded areas along streams, lakes, and swamps (Linzey, 1998). The opossum has demonstrated remarkable adaptability to human presence and is a common site in both rural and urban areas.

The opossum is omnivorous and known to feed on a wide variety of food items but showing a preference for animal matter. Beetles, crickets, and grasshoppers are commonly eaten insects. Snails, millipedes, rodents, birds, snakes, salamanders, and carrion make up other animal matter that is eaten. Plant food items include dewberries, blackberries, persimmons, wild grapes, and apples.

Great horned owls, carnivorous mammals, including dogs and cats, and man are the chief predators of opossums. They are also frequently hit by cars while they scavenge roadsides and move around.

The best management practices to be implemented for opossums include the creation of brush piles and ensuring that there are plenty of nesting sites. However, habitat improvements are not a necessity at this time since preliminary track counts and visual encounters indicate a strong population. It is likely that future management efforts will be directed at keeping opossums away from campsites and picnic areas.

On occasion, opossums are trapped in residential areas and brought to the park for release. This activity is highly discouraged. It is against the

policy of SBNP to release wildlife in the park where it is assumed that all niches and habitats are occupied. Introduction of new individuals may create violent encounters.

Bats

Bats are the only mammals with modified appendages that allow for true and sustained flight. They are represented by the order Chiroptera, which means “winged hand.” The fingers of bats are greatly elongated with extensions of skin connecting legs, tail, and wing.

In Virginia, there are sixteen known species of bat and they are all insectivorous. Most bats become active at dusk and remain active throughout the night. Contrary to popular belief, bats can see but vision is not important in nighttime navigation or hunting. Instead, bats use echolocation to locate prey.

Bats play a very important role in limiting insect populations such as mosquitoes. A bat can eat more than fifty percent of its own body weight in insects on a given night. A nursing female may eat enough insects to equal her body weight, as many as 4,500 or more, small insects. Thus, a summer colony of 1,000 bats weighing 10 grams each could consume twenty-two pounds of insects in a single night, or as many as 4,500,000 insects (Harvey, et al., 1999).

Bats are distributed throughout Virginia and typically utilize hollow trees, buildings, and caves to establish colonies. Bats will typically emerge in the evening and forage near open areas and over lakes or ponds.

During the winter months many bats will migrate south and/or hibernate. Hibernation in bats is sporadic or of

short duration. Individuals may waken periodically and become quite active for short periods. Mating in most hibernating species occurs in the fall. Many females will store the sperm until ovulation occurs in the spring. Females usually have one or two offspring per year. This low reproductive rate is compensated by longevity. Bats ranging in age up to thirty years have been recorded in the wild (Linzey, 1998).

Few animals feed on bats as a regular part of their diet. Although occasionally owls, hawks, raccoons, and snakes will take bats. The greatest threats to bats are humans. Habitat destruction, disturbance of hibernating and maternity colonies, direct killing, and the use of pesticides are leading causes of death for bats (Harvey, et al., 1999).

The outright killing of bats is usually the result of ignorance or misinformation. Bats have been given a reputation of being rabies carriers. While it is true that bats, like many other mammals, can contract and transmit rabies it is relatively uncommon. Linzey (1998) provides evidence that less than one percent of bats contract rabies and those that do die quickly. Transmission from bats to people is very uncommon. Therefore, bats should not be considered a serious threat to the public. The public should, however, be careful and never handle a wild bat.

The bats of SBNP are not well known and may include the little brown myotis (*Myotis lucifugus*), silver-haired bat (*Lasionycteris noctivagans*), eastern pipistrelle (*Pipistrellus subflavus*), big brown bat (*Eptesicus fuscus*), red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), and the evening bat (*Nycticeius humeralis*). An inventory and subsequent monitoring will be

needed to further verify their existence at SBNP.

It has been shown that bats are extremely important for controlling insect populations. It would therefore, be in the park's best interest to attract bats and sustain a healthy population. Trees that have cavities, or have the potential to develop cavities, will be retained. Bat houses that have previously been erected have been unsuccessful in attracting bats. Bat house styles need to be researched and evaluated. The park will seek advice to determine the most effective locations and methods for attracting bats to bat houses. Limiting the use of insecticides within the park borders is also recommended.

Fish

Sandy Bottom Nature Park has two freshwater lakes, Sandy Bottom Lake and Crystal Lake. Sandy Bottom Lake is twelve acres and is fairly typical of young lakes. It supports a variety of fish and will be managed to provide productive recreational fishing. Crystal Lake had few fish due to low pH and nutrient levels. During the wetland mitigation project the pH was restored to normal and now supports fish. This lake is shallow with an average of four to five feet. It will be primarily used for small boating activities and will not be managed to support recreational fishing. Water quality and nutrients will be monitored. Management goals may be adjusted if the water quality begins to reflect levels of fish populations.

Sandy Bottom Lake supports populations of largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), black crappie

(*Pomoxis nigromaculatus*), and American eel (*Anguilla rostrata*). Other fish have been introduced, however, based on preliminary observation there has been no evidence suggesting that they have become established. Some of these include grass carp (*Ctenopharyngodon idella*), brown bullhead catfish (*Ameiurus nebulosus*), white catfish (*Ameiurus catus*), channel catfish (*Ictalurus punctatus*), and chain pickerel (*Esox niger*).

The Virginia Department of Game and Inland Fisheries has demonstrated interest and support in the management of Sandy Bottom Lake and Crystal Lake. Electrofishing and seining have been methods used by VDGIF to sample the populations supported in the lake. Management reports have been made (See Appendix M). Recommendations made in the reports include stocking, monitor and control of aquatic vegetation, implementing catch limits, and encouraging the release of larger fish. SBNP will follow these recommendations so as long as they support the fisheries goals of the park.

In an effort to collect more information on the status and health of the game fish populations in Sandy Bottom Lake anglers will be encouraged to fill out surveys. The surveys will include time-spent fishing, species caught, number of fish caught, and weight and size of each fish caught (Appendix N). Record keeping will help ensure that fish populations are properly balanced and able to support recreational fishing. Fish tagging is another recommended method of cataloging fish, growth rates, and other population trends.

Largemouth bass are one of the most popular game fish in North America because of their tenacity and

willingness to put up a good fight when caught on hook and line. Anglers often experience a rush when they hook a bass. This rush is what keeps them coming back and why SBNP will work towards producing a fishing lake with a healthy abundance of large largemouth bass.

In order to achieve a healthy population of largemouth bass in the four to seven pound range it will be necessary to periodically implement catch and size limits as well as manipulate prey populations. Since bluegill are prolific breeders and provide a steady supply of fingerling and fry they make up a large portion of the largemouth diet. With the proper harvest techniques, the bass will grow rapidly and prevent blue gill from overcrowding the lake. Enough bluegill should survive to reproduce and sustain good populations (Yarrow and Yarrow, 1999).

Improper harvest techniques can generally have two negative effects on the general health and balance of populations in a fishing lake. The first is a result of over-harvesting bass. When bass are over-harvested the lake becomes overcrowded with stunted bluegill. If this happens it is difficult to restore the proper predator/prey balance.

The second effect of improper harvesting is when not enough bass are harvested and crowd out smaller bluegill. Bass may begin to suffer from a lack of prey to eat. They may become stunted or have a weakened physical condition.

To prevent either of these conditions it will be necessary to determine the status of both predator and prey populations before implementing any catch and release program or size limits. A general rule will be to remove

ten to fifteen bluegill for each bass taken.

SBNP will try to reach a variety of anglers by attempting to establish other game species in the lake. However, those populations will be limited because they will compete with largemouth bass for smaller sunfish like bluegill.

Environmental Stewardship

Park operations range in scope from daily maintenance and cleaning to large-scale construction projects. All of these activities can potentially have adverse environmental impacts if the proper precautions are not taken. As an environmental education facility the staff of SBNP should act as models of environmental stewardship. Therefore, it will be important to conduct all park activities and operations in the most environmentally friendly way possible. Park staff will research and design operation projects so as to reduce adverse environmental effects.

Proper training will be necessary to ensure that all staff are adequately informed and experienced to conduct activities and operations in an environmentally friendly fashion. Park personnel will be trained on relevant federal, state, and local laws regarding environmental issues. The appropriate staff members will be trained and certified in herbicide, pesticide, and fungicide application. In an effort to limit the use of chemicals, natural and/or other environmentally friendly methods of pest and weed control will be researched and conducted when possible. The use of hazardous materials

under any circumstances will be minimized. All hazardous materials will be disposed of as recommended by the proper authorities.

Management of the human activity core area can have a significant effect on the amount of chemicals used, whether they are fertilizers or pesticides. By promoting native plantings in flowerbeds and gardens native wildlife are benefited, the effects on the environment are mitigated, and the introduction of invasive species is reduced.

Daily operations and duties will result in the use and accumulation of trash and recyclables. These materials will be disposed of accordingly. Paper, aluminum cans, glass bottles, and plastics will be recycled as a part of the cities recycling program. Other un-recyclable materials will be collected and disposed daily. An appropriate waste disposal company will be contracted to remove waste from the park.

Restored Wetland Management

The site that is now Sandy Bottom Nature Park was once owned by the state and was turned over to the city of Hampton for one dollar, by the Virginia Department of Transportation, under the condition that part of the site could be used for wetland mitigation. Wetland mitigation is a state mandated effort to restore wetlands that have been destroyed by projects such as road construction. The wetland mitigation project at SBNP has been designated to occur on a majority of Crystal Lake.

In general, the mitigation project will add 52 acres of non-tidal wetlands back to the area by reclaiming land originally impacted years ago when sand and dirt was mined from the property for the construction of Interstate 64. Crystal Lake will be pumped out and backfilled to prescribed elevations. Topsoil will be applied and, eventually, a variety of hydrophytic vegetation, ranging from trees and shrubs to herbs and grasses, will be planted. The new wetland area will include more than 21,000 trees, shrubs, and herbaceous plants, and 2000 pounds of seed mix. There will be 9 acres of Bald Cypress/Water Tupelo forest, 40 acres of mixed bottomland hardwood forest, 2 acres of emergent wetlands that include two types of iris, cardinal flower, and lizard's tail, a two-level observation tower, 4,200 foot canoe trail, 10 foot wide perimeter trail, and a 100 foot bridge over the canoe channel.

An indefinite period of monitoring will follow the planting process to ensure that the vegetation continues to grow. Cooperation between SBNP and all of the other agencies involved will be critical to the success of this project.

The wetland mitigation project was set to begin during the summer of 1999. It had subsequently, been scheduled to be completed by the fall of 2001. However, due to unforeseen complications and unseasonable weather conditions the project has been delayed. Planting of the site was scheduled to begin in the fall of 2004. The mitigation project was completed in spring 2006.

Wetlands are complex systems with dynamic hydrology, chemistry, and biotic conditions. Wetland reconstruction is, therefore, also very complex. Proper planning and execution

of a project of this scale is crucial. Many factors and conditions must be considered and met in order to successfully recreate a functional wetland. Hydrology, water quality, erosion control, and control of invasive fauna are some these factors.

Habitat destruction is a leading cause in the loss of biological diversity. When wetlands are destroyed, ecosystem services, such as filtering pollutants, controlling floodwaters, and recharging groundwater, are lost along with a wealth of diversity. Wetlands are especially known to foster great diversity in both flora and fauna. Wetland mitigation and restoration reduce the negative effects of development and urban sprawl. When wetlands are successfully restored, they can replace the ecosystem services and provide suitable habitat for many plant and animal species.

SBNP anticipates that the restored wetland area will enhance the biodiversity within the park. Migratory waterfowl, rare odonates, neo-tropical songbirds, and others are likely to benefit from the restoration of freshwater wetlands. SBNP looks forward to the many new opportunities the wetland mitigation and restoration project will bring.

A management plan for this site will be developed and added to this document as an addendum.

The management plan for this site should include the following:

- A final description of the site
- Water-quality monitoring
- Floristic surveys
- Wildlife surveys
- Measuring precipitation
- Monitoring changes within the site

Management recommendations should be sought out from VDOT, VDGIF, and other agencies involved in this project.

IV. Public Relations

“Though the leaves are many, The root is one.”

-William Butler Yeats

The City of Hampton’s Department of Parks and Recreation has always worked towards providing enriching experiences and beautiful environments for the public to enjoy. Sandy Bottom Nature Park is one of the locations where this is truly made possible. However, without public participation, involvement, and input the park could not be an effective location for environmental education and conservation. It will, therefore, be imperative to incorporate community participation with park operations, events, and programs.

Public Interest

To achieve collaboration with the public the park must make an effort to reach a wide range of people by providing facilities for passive recreational activities for all age groups. Primitive campsites, hiking and biking trails, canoes, paddleboats, jon boats, a fishing pier, and picnic shelters are some of the accommodations that will be provided for the public. Also, a safe playground facility for children is provided.

The public must be made aware of the opportunities and facilities available to them. This will be done through public relations efforts of the staff. Park Rangers and Ranger Aides will be encouraged to engage the public and inform them of park projects, opportunities, and events. Park facilities, such as kiosks, will be utilized to help keep the public informed of interpretive programs, special events, fund raising events, and various park projects. Other media shall be utilized as well. For example, television stations, radio stations, and the internet will all be utilized to promote park activities and events.

The majority of the parks contact with the public will come in the form of environmental education programming. Each of the programming opportunities should be utilized to promote park activities and events. Fliers and pamphlets with current events and activities is made available.

Volunteer Opportunities

Volunteers will be critical to many aspects of the park. Volunteers can assist with general operations, public relations, environmental education, and special events. Coordination of volunteers will be very important in order to assure that they are effective and efficient. The incorporation of a non-profit volunteer organization is recommended.

A non-profit volunteer organization will be capable of generating and accepting funds in order to provide support to Sandy Bottom Nature Park. The volunteer organization will also be capable of providing funds

in addition to what can be procured from the city funds. Additional funding will lend further support to park staff, general park operations, projects, and special events.

Sandy Bottom Nature Park will designate a park ranger as a volunteer coordinator. The coordinator will be responsible for recruiting dedicated volunteers, volunteer training, and coordination of volunteer opportunities and events. The development of a volunteer handbook was established. The volunteer handbook contains information such as responsibilities, job descriptions, safety issues, and volunteer incentives.

SBNP will draw people from many different areas of the community because of the many programs, facilities, and activities available to the public. This will enable volunteer recruitment. Local military installations, schools and universities, ecology clubs, and special interest groups should be contacted to seek volunteers.

While it will be important for the park to attract volunteers, it will also be important to keep park staff involved in community activities and events. Staff members will be encouraged to volunteer in community activities, causes, and organizations that support the values that are consistent with those of the park.

V. Staff

“Far and away the best prize in life offers is the chance to work hard at work worth doing.”

-Theodore Roosevelt

The first park ranger in the city of Hampton was hired in 1994 in conjunction with the development of Sandy Bottom Nature Park. Since that time more rangers have been hired. Some have been dispersed to other parks in the city to assure the public of a safe and pleasant recreational experience.

Park rangers are classified by the Department of Parks and Recreation as ‘permanent full-time employees’ (PFT). These are positions needed on a continuing basis and require a regular work week of 40 hours or more. Senior park ranger aides are classified as ‘permanent part time’ (PPT). Park ranger aides are classified as ‘when actually employed’ (WAE).

Park rangers and all other employees at SBNP will be required to familiarize themselves with park policies and procedures. A policy and procedures manual is available to all staff members. Also, an employee orientation and information manual is provided to staff members with the standards they will be expected to uphold including personal appearance. This manual will be intended to promote the highest degree of professionalism among rangers and ranger aides. Park staff will also be encouraged to cultivate customer satisfaction skills, communication skills, good judgment, and high quality work performance.

Staff Development

In the eyes of the public, park rangers are many things including stewards, educators, law enforcement officers, and naturalists. As public servants and representatives of the city of Hampton, it is very important that all

rangers and ranger aides strive to meet the public's expectations. Achieving this level of well roundedness will require extensive training and valuable experience.

All staff members will be trained in all essential aspects of park operations in order to better serve the public. Duty sheets for all shifts was developed and outline policies, procedures, and daily operations responsibilities. Training on daily operations, safety, and customer service should occur upon hiring of new employees. Periodic training should be conducted to ensure that all staff members are kept up to date on any changes to regulations. Staff members should also be trained and certified in small boating safety, CPR, and first aid.

Managers and supervisors will be expected to seek out training opportunities that will benefit the park as well as other staff members. These training opportunities should be consistent with park values and goals. Knowledge and experience gained from these training opportunities will be shared to help foster the growth and development of other staff members.

Staff members with specialized training, education, or experience will provide training opportunities for other staff members. For example, the environmental educator or city wildlife biologist should provide periodic training that would help park staff become better interpreters and naturalists.

Park rangers who attend the Hampton Roads Academy of Criminal Justice will share their knowledge and experience with other personnel. This training will allow all staff members to resolve non-violent conflicts and de-escalate minor situations before they become law enforcement issues. Other

situations will be handled by law enforcement personnel only. Law enforcement personnel will maintain all state standards of training and education to maintain law enforcement status.

Park rangers will be expected to assume responsibility for different aspects of park operations. For example, a park ranger will be the environmental education coordinator while another will be the volunteer coordinator. Still all will be primarily responsible for grounds or equipment maintenance. All rangers will be expected to help park ranger aides develop a strong work ethic and high degree of professionalism. For job description and staff organizational chart see Appendix O.

Safety Training

A safety ethic will be promoted at Sandy Bottom Nature Park in an effort to prevent unsafe and hazardous conditions in the work place. Practicing and maintaining minimum safety standards in the work place is necessary because of the potential for saving lives, preventing injuries, and limiting damage to equipment.

It is the policy of the City of Hampton and the Department of Parks and Recreation to provide the safest possible working environment for its employees. This responsibility is that of managers, supervisors, and every member of the department. All department employees are expected to comply with safety procedures and practices as regulated by State Laws, City Ordinance, City Policy, and Departmental Policy.

Managers and supervisors at SBNP have the responsibility of

knowing safety procedures and promoting a positive safety attitude among peers and subordinates. Training on all equipment that is essential in maintaining park facilities as well as vehicle use will begin at the earliest opportunity by a qualified staff member. No equipment or vehicle will be used or operated by untrained employees. Employees must be observed and must prove competency to the satisfaction of a manager or supervisor.

The city of Hampton is obligated to comply with the Occupational Safety and Health Act (OSHA). This Act, and the agency that enforces it, defines minimum safety standards for the work place. Park personnel will become familiar with relevant OSHA standards through ongoing training and practical demonstrations. A copy of OSHA standards will be made available to park personnel. The park will also make Material Safety Data Sheets (MSDS) for all required materials available to park personnel.

To avoid unsafe conditions and prevent potential injuries minimum safety standards will be maintained. The proper safety equipment; such as hearing and eye protection, hard hats, chaps, or gloves, will be worn as recommended by OSHA.

All employees are required and expected to report any unsafe conditions or behavior to their supervisor.

Law Enforcement

Park rangers in the City of Hampton are required to qualify and attend the Hampton Roads Academy of Criminal Justice, unless specified otherwise. The academy trains prospective police officers from cities

and counties in the region. The academy generally lasts 16 weeks and covers all areas of law enforcement including firearms, defensive tactics, and narcotics. Park ranger aides and other staff members will not attend HRACJ but may receive limited training from sworn law enforcement officers.

Sandy Bottom Nature Park will implement a passive law enforcement philosophy. Passive law enforcement at SBNP will involve educating park visitors of park rules and regulations, as well as any other local, state, or federal laws. Citations and other law enforcement actions will be appropriately applied at the officers discretion.

Non-law enforcement personnel will only engage in educating park visitors of rules and regulations. Park rangers, with law enforcement powers, may request assistance from park personnel in dealing with law enforcement situations. Non-law enforcement personnel should never approach dangerous persons or situations. A law enforcement ranger should be contacted immediately. If a ranger is unavailable, the Hampton Police Division should be contacted.

All Hampton Police Division policies and procedures will apply to Hampton Park Rangers.

Emergency Management

Sandy Bottom Nature Park is located in an area that is prone to a variety of emergency conditions. Natural disasters and events resulting from human action have the potential of directly affecting the park. Emergencies and disasters are typically unexpected

events and are, therefore, difficult to prepare for. However, staff preparation and prevention will be critical to emergency response and recovery.

Weather Related Emergencies

Weather affects the lives of people on a daily basis. Occasionally there are weather patterns and conditions that have catastrophic effects and result in death, personal injury, property damage, and hazardous environmental conditions. Although natural disasters may not be prevented, their effects can be mitigated through disaster preparedness and response.

Steps should be taken to prepare for a variety of weather related emergencies. For example, staff should maintain all vehicles, chainsaws, firefighting equipment, and first aid equipment in a state of readiness. Generators should be fueled and ready for animals that require electricity and appliances that hold food for the animals. In addition, the latest weather forecasts should be made available to the staff via a weather radio or other media. This will allow the staff to keep the public informed of any threatening conditions or suspend outdoor activities. In the event of a city wide emergency the SBNP staff may be assigned to the Big Bethel Road area from the park to Todds Lane. They would be responsible for restoring and maintaining safe conditions, protecting the public from hazardous conditions, assisting with evacuations, and establishing cordons.

Fire

Fires are naturally occurring events that are known to be beneficial to many ecosystems. Many plants rely on fire for seed germination and nutrients are returned to the soil. However, not all fires are naturally occurring or desirable. Occasionally, fires are accidentally set by people. Sometimes they are not set by accident, but purposefully. All fires, including unauthorized campfires, naturally occurring fires, or accidental fires, will be suppressed as soon as possible.

SBNP staff will work with the Hampton Fire Department to coordinate a wildfire response. Firefighting responsibilities will ultimately be that of the professionally trained firefighters. SBNP staff will be the first to respond to fire reports. They will then be made available for assistance. Forest firefighting equipment will be maintained in a state of readiness. Flappers, rakes, shovels, portable water pumps, and other equipment will be kept in strategically placed fireboxes throughout the park. Additionally, Old Crystal Trail and Newmarket Trail must be maintained for use by heavy equipment including firefighting vehicles.

Fire prevention and safety will be promoted to the public. Campers will be provided with campfire guidelines that will be safety oriented. Campfires must be attended at all times and will not be allowed beyond 10:30 p.m. SBNP will also follow all state guidelines regarding fire bans during periods of drought.

Prescribed burns are controlled habitat management tools that are very beneficial to ecosystems. A prescribed burn at SBNP would be beneficial in that it would reduce the amount of fuel

accumulating on the forest floor, return nitrogen and other nutrients to the soil, sets back succession, and allows grasses, forbs, and other valuable wildlife foods to grow. However, with all of this in mind, it is not likely that prescribed burns would be recommended or authorized due to the parks close proximity to major roadways and subdivisions. Should such a management strategy be recommended, the Hampton Fire Department would be consulted along with Virginia Department of Forestry.

Other Emergencies

Other emergencies are those that may be the result of human action and have the potential of affecting SBNP. These include hazardous material accidents, plane crashes, motor vehicle accidents, medical emergencies, injuries, and others.

Prevention, preparedness, and response by staff will be the key element in managing any of these emergencies. Sandy Bottom Nature Park's minimum standards for emergency prevention and preparedness will include staff training in CPR/First Aid, small boating safety, compliance with OSHA standards, and the use of safety equipment. All training in these areas will be documented.

Every staff member who interacts with the public will need to be certified in CPR/First Aid. The public often engages in activities at SBNP that can result in injury. A hiker may twist an ankle, someone may be burned at a campfire, or someone may suffer a heat stroke or have a heart attack. It will be imperative that staff members be trained and ready to respond to any of these conditions. The welfare and safety of park visitors will depend upon the staff's

ability to respond and care for sick or injured individuals.

So long as SBNP rents canoes, jon boats, and paddleboats to the public there will be the risk of drowning or other water related emergency. The staff's ability to respond to these emergencies will depend upon the boating safety training they receive. Staff members should be certified by qualified instructors on small boating safety and water rescue. Training and certifications should be renewed as necessary.

Hazardous material accidents can range in severity from spilled chemical containers to overturned trucks carrying fuel. Minor accidents will be carefully responded to by staff members. The appropriate action will be taken to remove any threat of danger. In the event of a major hazardous material accident, cleanup will be the responsibility of the appropriate agency. SBNP staff will respond accordingly (i.e., evacuations, cordons).

Sandy Bottom Nature Park is in the flight path of Langley Air Force Base (LAFB) and therefore has the potential of experiencing a plane crash. Pilots may direct failing aircraft to the park to avoid heavily populated areas. Response to this type of emergency will be coordinated and directed by USAF emergency management officials. SBNP staff will make the necessary evacuations, cordons, and other needed response actions. LAFB officials should be contacted to establish a response protocol.

VI. Park Maintenance

“It is best to do things systematically, since we are only human, and disorder is our worst enemy.”

-Hesiod

Sandy Bottom Nature Park will be developed and maintained to provide a safe and aesthetically pleasing facility. Park personnel will strive to achieve and exceed the expectations of the public.

The maintenance of a clean, safe, and beautiful facility is critical to the success of the park. Inventories, park inspections, and cleaning schedules are needed to assure consistent and thorough upkeep of all of the parks facilities, equipment, and vehicles.

Equipment Inventories

As SBNP continues to grow and develop, equipment will likely accumulate via purchases or donations. Newly acquired equipment will be logged along with pertinent information such as serial numbers and given an inventory number. The status and condition of all equipment will also be included. An inventory should be conducted annually to ensure that all equipment is accounted for. Files of all equipment will be maintained and regularly updated. Files should include owners/operators manuals, maintenance schedules, and maintenance records.

A park ranger will be responsible for conducting and maintaining inventories and files for all equipment including tools and vehicles.

Park Inspections

Park inspections will be developed and conducted on a regular basis to ensure the safety of the public and park personnel. An inspection form was created and include all facilities, equipment, vehicles, grounds, signage, structures, and trails. Each of these items will be scored based on a three-point scale. A score of three will indicate that an item is in excellent condition. A score of two will indicate satisfactory condition, while a score of one will indicate poor condition. Inspections should be conducted at regularly set intervals. Appendix P shows an example of a park inspection form.

Park inspections will be used as a tool to identify and prioritize maintenance needs. A park ranger will be responsible for conducting inspections as well as any follow up maintenance needs.

Additional inspections should be should be periodically conducted to assess the parks compliance status with OSHA standards. A checklist of relevant OSHA standards will be developed.

Maintenance Schedules

SBNP staff will develop and keep maintenance schedules that will allow for effective and accurate record keeping. Each facility will have a maintenance schedule that will outline the required cleaning and maintenance procedures. In addition, cleaning charts, which will document facilities

maintenance, will need to be kept up by the appropriate staff members.

Each shift will be assigned certain responsibilities to assure the public of a clean and safe park. For example, evening shift will be responsible for collecting trash from all picnic areas as well as daily cleaning of the outdoor restrooms. Night shift will be responsible for cleaning the nature center. See Appendix Q for an example of a maintenance schedule and shift assignments.

Park vehicles and equipment that requires periodic maintenance will be maintained according to manufacturer recommendations. Maintenance schedules will be developed and kept up accordingly. Vehicle maintenance will be conducted by Fleet Management.

Grounds Maintenance

Grounds maintenance will prove to be one of the most important aspects of park maintenance because of the landscapes visibility. Creating an attractive landscape and beautifying the existing grounds where human activity is concentrated will demonstrate that the park is well maintained. Making such an impression on the public will compel them to return. Therefore, it will be important that flowerbeds, gardens, and other landscape modifications be properly planned and designed.

Landscape design plans will be developed for any landscape beautification projects and should include plant recommendations that are site appropriate. Signage for plant identification should be developed and placed in appropriate gardens and

flowerbeds. These signs can be used as an interpretive tool for native plants.

In addition to landscape design plans, landscape/grounds maintenance schedules will be developed. An annual work plan will be included to guide seasonal care for gardens, flowerbeds, and other landscaped areas. Maintenance schedules should be utilized to document that the appropriate care has been administered. It would be beneficial to develop lists of appropriate native plants for gardens and flowerbeds. Creating another list of native and non-native plants to avoid is also advisable. A park ranger will assume the responsibility of overseeing grounds maintenance. See appendix R to see an example of a landscape/grounds maintenance schedule.

VII. Plan Evaluation

“If anything is certain, it is that change is certain. The world we are planning for today will not exist in this form tomorrow.”

-Philip Crosby

Management plans are dynamic documents that are meant to be flexible and should be evaluated and updated periodically. As the park continues to grow, there will be changes that will need to be addressed in this plan. Some of these changes can be anticipated. New staff members will be hired. Others will leave. New structures will be built. Old ones will be torn down. New events and programs will be designed. Old ones will be abandoned.

The parks forests and habitats will change and new management practices will be developed. These are all predictable events. Many other events cannot be anticipated. Yet, this plan must be flexible and adaptive in order to accommodate these changes.

This plan should be updated and revised as changes occur and when conditions and objectives change. Annual review of this plan is recommended in order to achieve effectiveness and measure success. Documentation and record keeping for maintenance, program attendance, and research data will be critical to this process. Modifications to this plan, including policies and procedures, should be made based upon the results of the review.

Analysis of documentation and records will help identify policies, procedures, and practices that have proven to be successful as well as those that produce poor results. Ineffective policies, procedures, and practices should be modified or eliminated.