HURON-CLINTON METROPOLITAN AUTHORITY

DEER HERD AND ECOSYSTEM MANAGEMENT PLAN

2022–2026

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HURON-CLINTON METROPARKS

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EXECUTIVE SUMMARY

The Huron-Clinton Metropolitan Authority (HCMA; Metroparks) has a long legacy of active stewardship managing the extensive wildlife and ecosystems cherished throughout the Metropark system.

As part of this ongoing commitment, the Metroparks remains focused on preserving the native ecosystems and recreational open spaces within the park system which consists of 13 parks throughout Livingston, Macomb, Oakland, Washtenaw and Wayne counties.

Through wide-ranging efforts, the goal has always been and continues to be creating a balanced and functional environment for the native plants and animals who call the parks home. Climate change, invasive species, and the pressures of surrounding land use present an ongoing threat to the integrity of these ecosystems. The ecosystems stand a greater chance of long-term survival and have an opportunity to thrive when concerted monitoring is combined with analysis of available scientific data and a review of best practices from around the state and country.

The Metroparks oversees and manages more than 25,000 acres throughout the park system encompassing developed and undeveloped land. Its goal is to protect and restore natural diversity while balancing ecological stewardship with compatible recreational uses. This is a responsibility the Metroparks takes very seriously. It is imperative to act judiciously to preserve the robust diversity of plants and wildlife found in the parks for future generations.

White-tailed deer are important to the people of the state of Michigan. The expectations, concerns, and values associated with deer by Michigan residents are diverse and complex making successful management of this natural resource challenging. Responsibly managing populations of both animal and plant species, including ensuring healthy, thriving deer herds within the Metropark system, is most effective when best practices are understood, practiced, and evaluated to determine what is most effective for the overall welfare of the deer herds and the entire ecosystem.

In early 2021, the Metroparks committed to conducting a comprehensive review of evolving best practices and alternative methods used to effectively control deer populations. This Deer Herd and Ecosystem Management Plan is a compilation of that research, and a historical overview of how wildlife and ecosystem management has evolved. The HCMA has further committed to similar reviews every five years. These efforts are also further evidence of the HCMA's ongoing commitment to transparency.

Research and Analysis

This comprehensive review is to ensure the latest, best, and most humane practices are used to manage the robust yet vulnerable ecosystems within each Metropark. The data considers scientific deer and vegetation research, results from a Metroparks deer herd health study conducted by third-party wildlife biology experts, Michigan Department of Natural Resources deer population density thresholds, as well as aerial surveys used to identify herd sizes within the 13 parks. This work serves to ensure continued evaluation of the program and assurance that everything possible continues to be done to humanely address deer overpopulation while creating a stable home to a healthy, thriving herd and while also protecting the diverse flora and fauna.

Plants are a significant component of the foundation of all ecosystems' function. When this foundation begins to crumble, there is a cascading effect that alters other levels of the food chain and other species of wildlife including insects, birds, and mammals. In response to an observed decline in the overall health of the deer herds and loss of many species of native plants, a deer management program at the Metroparks was initiated in 1999.

To better understand why a Deer Herd and Ecosystem Management Plan for the Metroparks is crucial, it is important to understand how white-tailed deer reproduce and forage. Because deer can consume up to 12 pounds of vegetation per day, they can influence the composition of the fauna and flora communities in ecological systems, putting some species and ecological systems at risk. Scientific journals, studies, and position papers from a number of organizations and institutions have documented the effects of overabundance of white-tailed deer across North America. Impacts cited include increased instances of car-deer collisions, public health issues, property damage, and ecosystem degradation.

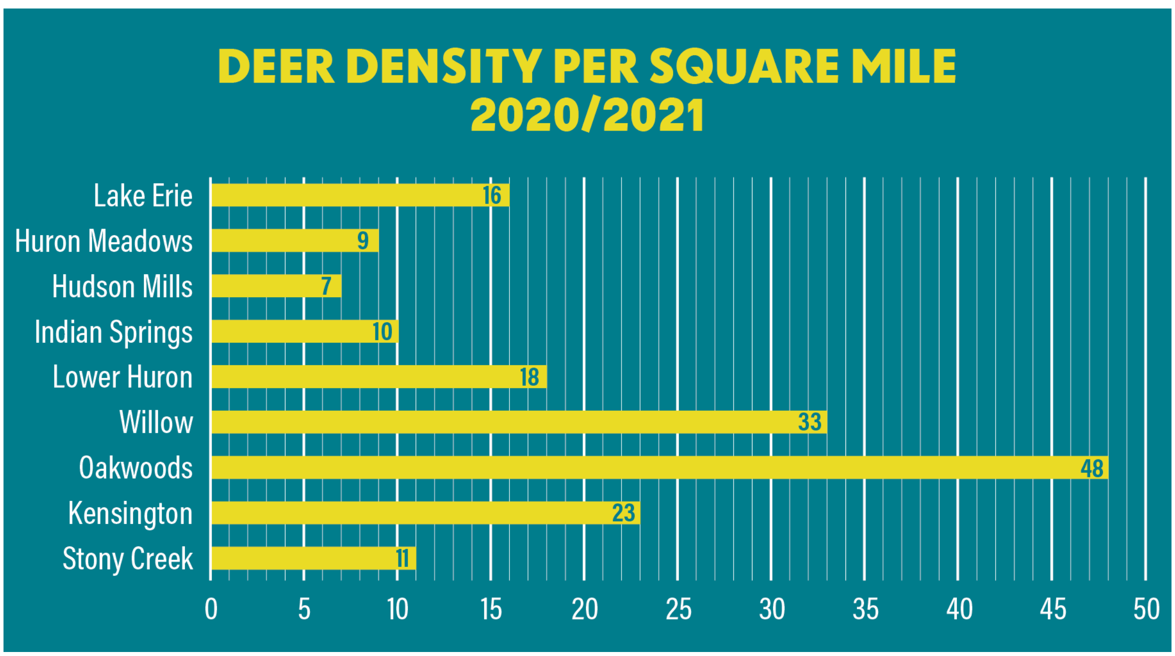
Vegetation surveys in 1998-1999 at Kensington Metropark revealed a loss of 69 species of plants, with an additional 25 species listed as uncommon. During the same year, surveys at Stony Creek Metropark revealed a loss of seven species of plants and an additional 21 species listed as uncommon. In addition, data gathered by the Michigan Department of Natural Resources (MDNR) from the Metroparks management program in 1999 indicated the Metroparks deer herd was under stress from the high population density and lack of proper nourishment.

Excessive deer populations and invasive plants are two related issues that often play on each other causing further stress to native ecosystems. In the absence of natives, invasive plants create habitat that wildlife has trouble adapting to. Metroparks hosts several volunteer days during certain parts of the year to both harvest seeds from native plants as well as limit the spread of invasive plant species. The harvested seeds are replanted in degraded areas to restore and expand healthy ecosystems in the Metroparks.

Deer Herd Management

To address the concerns of deer overabundance within the park system, the Metroparks Wildlife Management Advisory Committee was formed in 1997 to assist in the development of a deer management plan. Following their recommendations, a white-tailed deer cull was conducted at Kensington, Stony Creek and Hudson Mills Metroparks in the fall of 1999. Since then, the HCMA has initiated a long-term deer management plan that allows deer populations in the Metroparks to be managed using several forms of integrated management techniques.

Aerial survey data, collected at least every five years or in compliance with MDNR permit requirements, are incorporated into a population model to predict herd sizes and to help determine necessary population management actions. In general, a population density of between 15-20 deer per square mile is the preferred carrying capacity for habitats within the Metroparks. This aligns with a population density threshold of between 15-20 deer as recommended by the Michigan Department of Natural Resources. In the year 2021, population densities averaged 19.5 deer per square mile with the highest density at Oakwoods Metropark with 48 deer per square mile (last surveyed in 2017).



Over the past year, the Metroparks has fulfilled its commitment to review available data and research and evaluate best practices for maintaining a thriving deer herd. Research continues to support culling as the most effective, humane way to protect the health and welfare of the Metroparks deer population, as well as the ecosystem which sustains them.

HCMA understands and appreciates the wide range of passionate viewpoints this issue evokes. HCMA is committed to sharing as much information as possible to raise awareness of what HCMA is doing and why, as well as to the transparent disclosure of the process used to preserve and manage wildlife and ecosystems within the Metroparks.

Deer populations are managed at park locations in accordance with special permitting through the Michigan Department of Natural Resources using trained Metroparks Police sharpshooters and approved volunteers through controlled hunts. Safety is always of utmost importance. Unique deer, recognized as bringing added value to the Metroparks system, continue to be protected for the public interest and enjoyment, or environmental / genetic diversity, unless determined by the Metroparks and/or MDNR to be detrimental to public or environmental (including deer or other plant or animal species) health, safety, and welfare. All white-tail deer harvested are processed and meat is distributed to food banks to help feed hungry families across southeast Michigan.

To assist biologists and park managers in assessing deer herd health, program success, and future management needs, biological data is collected from all deer taken in the program and provided to the MDNR. Underscoring the importance of sound population management practices is the confirmed outbreak of Chronic Wasting Disease reported in neighboring Ingham County in 2015. All county ordinances related to the sharing of biological data from harvested deer are adhered to and the MDNR plans to conduct CWD testing on all deer taken in Oakland County in 2022.

Deer Herd and Ecosystem Successes

Overall, the Metropark deer population has shown a significant improvement in physical condition since the beginning of the management effort in winter of 1999. Changes have been most noticeable in fawns and yearlings through increases in body weights. Fawn dressed weights are suggestive of a shift from poor diet to healthy diet. Presence of fawn breeding also indicates an improvement in physical condition and perhaps physiological maturity. Total herd productivity either has remained good or increased in many instances.

Flora and fauna continue to be monitored throughout the park system by Metroparks Natural Resources Department and Interpretive Department staff trained in photo monitoring and observing changes in the ecosystems. Since the inception of the deer management program, several uncommon plant species are once again being observed in the parks, and in many instances, overall ecosystem health is improving. Moderate to good increases have been noticed in indicator species like trillium and geranium along with white cedar, cherry and oak regeneration. Unfortunately, the increase in non-native, invasive plant infestation is impeding the recovery process.

"2010 was the first time since 1993 that Michigan Lily were observed in blossom. Deer seem to have a special affinity for members of the lily family, and this plant is no exception. We have been anticipating the return of this species ever since the deer culls began in 1999." (Stony Creek Deer Photo Monitoring Report 2010)

RESEARCH

Introduction

The Huron-Clinton Metropolitan Authority (HCMA; Metroparks) Deer Herd and Ecosystem Management Plan program encompasses wide-ranging efforts to manage native ecosystems and recreational open spaces within the Metropark system. By working toward a balanced and functional environment, all native plants, and animals (including white-tailed deer) contained within these ecosystems stand a greater chance of long-term survival and have an opportunity to thrive.

Impacts on an Ecosystem

An ecosystem is a geographic area where plants, animals, and other organisms, as well as weather and landscapes, work together to form a bubble of life. An ecosystem can seem healthy at first glance but may be experiencing an invisible ecological disturbance.

DEER

There are many impacts that can stem in an ecosystem from just one disturbance. For example, white-tailed deer are opportunistic and selective browsers; consuming what is available to them in the area as well as choosing based on nutritional value. Deer impact the food chain (trophic levels) directly and indirectly, in addition to other environmental factors such as soil nutrients and resource availability for vegetation (Patton et al., 2018). When deer select an entire plant species in one area this will harm not only the individual plant species but also other organisms within the area, creating a ripple effect (Shelton et al. 2018).

If deer eat most of the acorns found in one area of the forest floor, fewer oak trees will grow. This would result in a lower density of oaks, changing the composition of plant density in that area (McShea, 2012). When there are less plants, this impacts other animals and organisms that also rely on this plant; whether they leave in search of food and homes in another area or die from competition. This will now affect that animal's prey and predators. With less food available that species is going to have to compete for food. This cycle can lead to over population or large die-offs. Other organisms are not just impacted by a high deer population, it can also be from selective browsing.

Deer are selective feeders. The effects of preferential browsing by deer can be seen in trees and herbaceous flowering plants alike. Overabundant deer populations can have devastating effects on many native tree populations including maple, oak, and dogwoods. Impacts may not be immediately apparent on large, established trees, but saplings are at the perfect height and tenderness for deer browsing. Forests are built to withstand some browsing, but as older trees mature and die forests struggle to regenerate (Aronson & Handel, 2011).

Deer also enjoy trillium; a spring wildflower which is one of the preferred foods of deer. If one or two deer eat all the trillium in one area, other organisms like ants will be impacted because they rely on this wildflower as a food source. With trillium depleted, ants need to find a new source of food. Trillium seeds are primarily dispersed when ants eat the seed. With no trillium in an area, it creates a lower density of vegetation. This can lead to other plants, possibly invasive species moving into the area. If these plants are not good options for organisms that relied on trillium there will be higher competition for other food and resources, or they will move away from the area.

NATIVE LANDSCAPES AND PLANT SPECIES

In recent decades, concern has grown for the impact of invasive species on our native landscapes. An invasive species is a non-native species that presents a risk of harm to economic, environmental, or human health (Invasive.org, Invasive species 101 - an introduction to invasive species, 2018). This harm may be because of actual toxins or illness associated with the invasive species, or it may be because they take over an area leaving little room for anything else.

In Michigan, some common invasive plant species include garlic mustard (Alliaria petiolata), Japanese barberry (Barberis thunbergii), glossy buckthorn (Frangula alnus), tree of heaven (Ailanthus altissima), Asian bittersweet (Celastrus orbiculatus), and autumn olive (Elaeagnus umbellate). This list, however, is not exhaustive and natural resource professionals are always on the lookout for new emerging species to mitigate what could become a bigger problem.

(Pictured above: Garlic mustard, Japanese barberry, Tree of heaven)

Repeated disturbances within a small area always brings with it the chance that new species, carried within the feet, fur, or scat will be introduced into that region. Additionally, once a new plant species is introduced, deer in the region will either enjoy it or avoid it. Either scenario can put new stresses on already stressed native plant populations. Furthermore, invasive plants may even change the soil chemistry in a way that is unsuitable to the native plants making a comeback difficult.

A subtler, yet immediate impact can be seen when comparing numbers and diversity of spring wildflowers over consecutive years. Often, invasive plants are avoided by the deer and other herbivores leaving them with little in the way of competition. Plants such as Japanese Barberry, garlic mustard, and Japanese stiltgrass are consistently avoided by deer, while Asian bittersweet, common privet and certain honeysuckles are sought after (Averill et al., 2016). The unfortunate consequence is that there is increased pressure on native plants as deer seek out other, tastier options. Both avoidance and attraction by deer can contribute to the proliferation of an invasive plant. In cases where the plant is avoided, growth goes unchecked and native plants are crowded out. In cases where animals are attracted to the plant, it is often the fruits of that plant that are consumed, allowing seeds to spread elsewhere such as with autumn olive and multiflora rose. Autumn olive and Asian bittersweet, for example, have berries that deer are attracted to, and tree of heaven is browsed when alternatives are sparse.

Plants have adapted many ways in which to spread their seeds to further distances than their immediate area. Rather than conscious decisions, these are adaptations that make it more likely the seeds may catch on the wind, be eaten by an animal, or hitch a ride in fur, for example. Deer are certainly a part of this phenomena and frequently carry seeds in their fur. They also can be responsible for the spread of seeds through the eating of berries, and many of the invasive species deer enjoy are for the sake of their fruits. Asian bittersweet, honeysuckle, and wild raspberries are all favorites (Averill et al., 2016). Asian bittersweet, in particular, benefits from passing through an animal's digestive tract, where digestion of the fleshy aril results in higher germination rates and enhances seedling emergence. (Greenberg et al., 2001) This process is an example of scarification, wherein a seed's protective coating is disturbed resulting in enhance germination.

SOIL

Soil plays an important role in an ecosystem as well. Soil is made up of a combination of broken-down bedrock and decomposed organic material and serves as a major determinate of habitat (Dickman and Leefers, 2003). Soil, however, is also home to bacteria and fungus that help break down the wastes of the rest of the forest. They convert what would otherwise be waste into usable nutrients, like nitrogen, that plants depend on to grow. Soil is a full living system, and as such it is also vulnerable to change when the conditions around it change.

NITROGEN CYCLE & INVASIVE PLANTS

The nitrogen cycle is a natural process that recycles essential nutrients for growing plants. When it is thrown out of balance by invasive plants or population booms, it can cause deep consequences in our environment. On this chart, normal processes are shown with green arrows and trouble spots are shown in orange. Pictures with a red border are of elements not normally found in healthy Michigan forests.

Biodiversity: Having a wide variety of plants and animals is essential to a healthy functioning forest. Natural processes keep populations in check to allow room for variety, but human activities have altered the processes and sometimes imbalances occur.

Excessive deer populations and invasive plants are two separate problems that often play on each other causing further stress to native ecosystems. Since deer are only a problem under high numbers, they are shown here in orange. See the Food Web diagram for more information.

Michigan Lily
(Lilium michiganense)

Great White Trillium
(Trillium grandiflorum)

White-tailed Deer
(Odocoileus virginianus)

An Ecosystem in Peril:
With populations imbalanced and soil chemistry altered, nutrients like nitrogen are no longer in a form optimal for plant growth. This puts both native plants and the animals that eat them in peril.

Mycorrhizae and Bacteria, cont.:
Soil organisms continue to breakdown nitrite to become nitrate (NO_3). Plants are able to use nitrate to get the nitrogen essential to growth.

Earthworms
(Lumbricus sp, Eisenia, sp., Amynthas sp.)

Unwelcome Guests: Believe it or not, earthworms are not a native part of MI's ecosystem. Their presence opens our ecosystem to invasion by other invasive organisms. While deer did not originally bring worms here, studies have shown a link between deer overabundance and earthworm invasions.

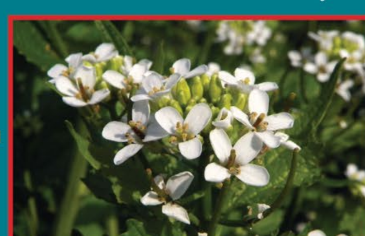
Mycorrhizae and Bacteria: Fungus in the soil called mycorrhizae and bacteria break down ammonia created during decomposition to create nitrite (NO_2), a from of nitrogen not easily used by plants.

Part of the Cycle: Death is a part of nature. Decaying plants, animals and animal waste are broken down to return nutrients to the soil. In the first steps of decomposition, nitrogen is released into the soil as ammonia (NH_3).

Bare Soil: A little bare soil is okay, but a healthy forest floor is full of decaying organic matter. If the canopy changes or worms eat fallen plants, the forest floor can become bare in areas where it is crucial to have leaf litter.

Japanese Barberry
(Berberis thunbergii)

Secondary Invasions: Sometimes soil changes caused by an invasive plant open the door to invasions by other plants. Barberry is a plant that is able to get nitrogen from the soil without the help of mycorrhizae, and thus flourishes after garlic mustard invasions have killed off these important soil microbes.



Garlic Mustard
(Alliaria petiolata)

Invasive Plants: Bare soil makes the environment more suitable for invasive plants such as garlic mustard. Garlic mustard crowds out native plants and releases chemicals that inhibit the growth of other plants and kill beneficial soil organisms. Deer favor other plants and avoid garlic mustard, giving it a competitive edge in forests.

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Studies have shown a correlation between deer overabundance and earthworm invasions. Garlic mustard is a particularly poignant reminder of this, as in addition to being allelopathic (meaning it releases chemicals to inhibit growth of other plants) it is also able to thrive in areas of much higher nitrogen in different forms than what our native northern forest ecosystems have adapted to. Interestingly, one predictor of garlic mustard seems to be the presence of invasive earth worms (Blossey, 2020). It should be noted that Michigan has not had a native earthworm since before the last glaciers retreated, so any earthworm you see here is a non-native species. The role of earthworms seems to be to clear away leaf litter to make way for garlic mustard to establish itself.

As can be seen in this nitrogen cycle and invasive plants diagram, the presence of earthworms opens the ecosystem up to invasion by other invasive organisms which exacerbates ecosystem damage. The more deer, the more deer feces, and earthworms thrive resulting in ideal growing conditions for garlic mustard. This type of monoculture and lower plant diversity equates to more damage to the ecosystem as deer eat whatever plants that are left, effectively worsening the overall cycle. Additionally, deer exclusion studies also show deer seem to be a factor in the success of earthworm populations. In study plots where deer had been excluded, earthworm populations seem to drop-off as well (Averill et al., 2018).

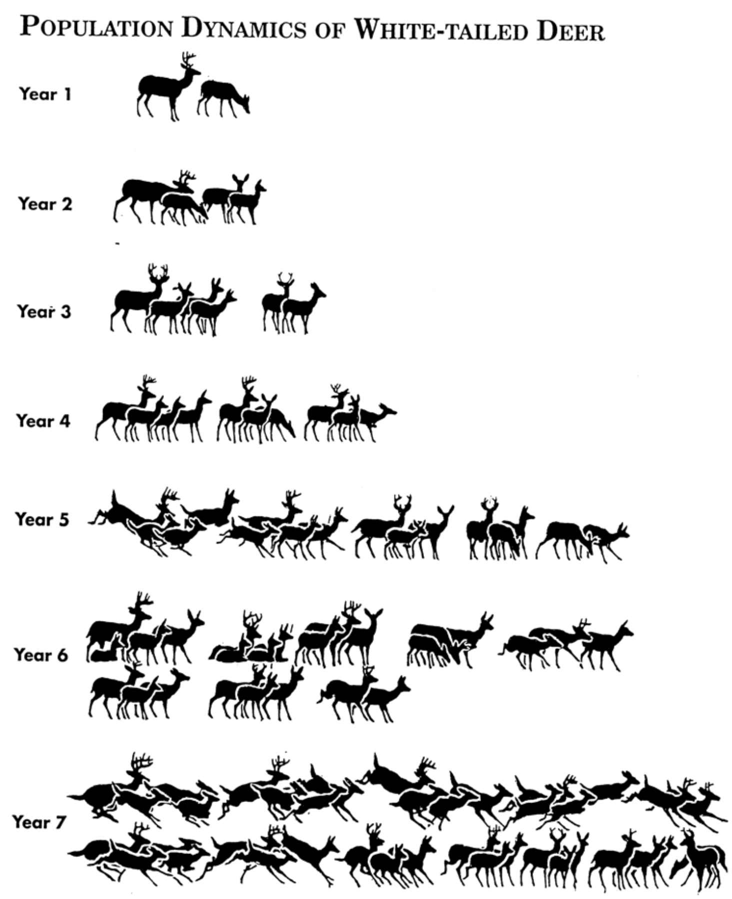
The soil changes brought on by garlic mustard and earthworms seem to also favor invasive plants, such as barberry and bittersweet (U.S. National Park Service; 2018). More studies are being done to determine the full links between deer and earthworms, but evidence seems to show that deer pellets create a better environment for earthworms to survive and deer presence tends to correlate with earthworm invasions.

Another concern with deer overpopulation, is one that is not immediately apparent – the alterations to a forest canopy. Canopy changes are undoubtedly something that will be of an even higher concern as climate change alters our landscapes. While deer prefer fresh green plants, during colder months they must shift their eating habits to woody plants. During this time, they will eat twigs and saplings. Forests can withstand some browsing since trees will put off many more seedlings and suckers than what are needed, but when too many trees have been browsed, there may not be enough to reforest an area that has been logged, experienced a storm, or that simply has a high number of aging trees (Aronson & Handel, 2011). Particularly susceptible tree species include red oak and sugar maple. In fact, up to 60 percent of red oak seedlings are browsed by deer (Blossey, Curtis, Boulanger, and Davalos, 2019). Gaps left in the forest floor coupled with sunlight let in from reduced canopy cover then leave room for invasive species to establish themselves putting further strain on already impacted native species.

There is a ripple effect from one impact or disturbance within an ecosystem. The focus remains on the overall quality of an ecosystem. This includes all the plants and animals within as well as the soil composition, as everything that lives within the ecosystem affects everything else.

BIOLOGY OF WHITE-TAILED DEER

White-tailed deer (Odocoileus virginianus) are native to Michigan and an important part of the natural Metropark wildlife community. They are one species interacting with thousands of other plants and animal species in a complex ecosystem. The complexity of this system makes it difficult to determine one species' importance over another, so it is imperative that these natural ecosystems are maintained to promote full native species diversity. Deer, however, are an opportunistic species that can, without checks and balances, become abundant enough to disrupt the equilibrium within a native community.



These illustrations show the potential population growth starting with a pair of healthy deer on good range. This model implies no deaths from disease, hunting or vehicle accidents. Given this scenario, two deer could lead to 40 deer in seven years.

NATIONAL BOWHUNTER EDUCATION FOUNDATION

The population of white-tailed deer has increased dramatically throughout southeast Michigan in the past thirty years, including within the Metropark system. Population increases can be attributed to many factors including the deer's own high reproductive rate, the absence of natural predators and the restriction of open hunting on park property. In addition, the continued urbanization of the areas around the park system, reduces habitat quality and quantity, constrains their movement patterns, and may force animals into any remaining natural areas including parks. At higher densities, deer can place a heavy burden on the natural communities by reducing species diversity of plants and wildlife as well as impairing forest regeneration. If over browse continues, plant populations can decline with some species disappearing altogether, which in turn, further disrupts nature's balance.

By the mid-1990s it became evident that damage to both the parks' natural habitats and landscaped areas by deer was reaching a critical stage and that a Deer Herd and Ecosystem Management Plan was needed to maintain the biodiversity within the Metropark system, while maintaining a healthy deer herd.

Ecosystems Within the Metroparks and Interpretive Staff Observations and Research

The quality of the natural resources has been a focus since the inception of the Metroparks in 1940. Metroparks interpretive staff have been observing, monitoring, recording, and researching natural areas within the parks since 1954 with numerous documented records available for review spanning from the 1970s to present day.

For example, in the late 1990s, park staff built exclosures in select ecosystems. An exclosure allows for the monitoring of plant life growing within for the purpose of comparing it to the flora growing in an adjacent area. An exclosure prohibits white-tailed deer from entering and eating the plants. This type of study allows interpretive staff to collect data every year on the plants growing inside and outside of exclosures. Interpretive staff look for plant indicator species such as trillium, a plant white-tailed deer selectively eat. Additional information about exclosure studies and successes can be found on page 40 – 42 of this plan.

In addition to ongoing data collection, interpretive staff recently conducted a tremendous amount of research on current science in 2021 for updating the Deer Herd and Ecosystem Management Plan. Research was approached without bias and staff were tasked with finding current up-to-date scientific research on the impacts of invasive species on ecosystems and the general biology and behavior of white-tailed deer. The research timeline was spread out over the course of several months to methodically research this specific topic. Staff approached the research applying decades of combined knowledge and background experience in wildlife management and invasive species, relying on those skills to effectively expand the range of research.

One of the many fascinating articles interpretive staff researched is on soil. Soil is part of an ecosystem and until a recent scientific study was conducted and published it was not realized how much of an impact soil has on the relationship between invasive species and white-tailed deer. All the references that interpretive staff researched are listed within this plan, and more information about the connections between flowers and plants are the subject of personal accounts as documented in Appendix 2.

HEALTHY FOOD WEB

This Healthy Food Web is a small part of the entire ecosystem. It demonstrates the many connections between plants and animals. Yellow arrows point to the plant or animal that benefits from a relationship. White arrows points back to an organism receiving a mutual benefit as well. However, too many of any of these organisms can create an imbalance in the relationships, causing other parts of the web to break down. Some organisms will be negatively affected, while others might receive a temporary positive benefit. In the same way, too few of any of these organisms also lead to imbalances. Each ecosystem depends upon a "give and a take" between all members.

Coyote
(Canis latrans)

As deer populations increase, they eat more trillium, but they also serve as a growing food source for coyotes.

Gray Fox
(Urocyon cinereoargenteus)

Red-tailed Hawk
(Buteo jamaicensis)

White-tailed Deer
(Odocoileus virginianus)

Mutualism: White-tailed deer disperse the trillium seeds and eat plants that other animals depend on. More deer create more competition in the food web.

Eastern Cottontail
(Sylvilagus floridanus)

If there are fewer trillium, rabbits may leave the area to find other food. Predators that depend on rabbits will also need to look for food elsewhere.

Northern Flicker
(Colaptes auratus)

Fewer trillium lead to fewer ants that depend upon them. Fewer ants mean Northern Flickers must look elsewhere for the ants they love to eat.

Great White Trillium
(Trillium grandiflorum)

Trillium is a favorite treat to White-tailed Deer.

Spine-waisted Ant
(Aphaenogaster Sp.)

Mutualism: Some ants depend on the fatty elaisomes (fat and protein packet) attached to trillium seeds. They carry the seeds to their colony, eat the elaisomes, then drop the seeds, dispersing trillium seeds across the land. This spreads Trillium to new areas.

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Great White Trillium Seed
(Trillium grandiflorum)

GENERAL DEER HERD MANAGEMENT BACKGROUND

(The following information has been excerpted from the publications A Review of Deer Management in Michigan – Michigan Department of Natural Resources, September 2009 and Managing White-Tailed Deer in Suburban Environments – A Technical Guide, DeNicola, VanCauteren, Curtis & Hygnstrom, 2000).

Introduction

White-tailed deer (Odocoileus virginianus) are important to the people of the state of Michigan. The expectations, concerns, and values associated with deer by Michigan residents are diverse and complex making successful management of this natural resource challenging. The Michigan Department of Natural Resources (MDNR) is responsible for the management of deer in this state and uses a scientific approach when considering the biological, social, economic, and political aspects of deer management.

The MDNR has been managing Michigan's deer herd since the late 1800s with 1895 marking the beginning of dedicated deer management in the state in response to legislation limiting market hunting. Deer populations had plummeted as records showed over 90 percent of deer taken were by commercial hunters, and less than 10 percent by sportsmen. By the 1930s populations had boomed again, and citizens were recognizing overabundance in the form of car collisions and crop damage. Today, there are about 1.7 million deer across Michigan with many regions, including suburban neighborhoods reporting overabundance. There is no question that the Michigan deer herd will generate considerable discussion and debate in the future. Such debate is essential to develop management procedures to keep our deer herd and deer range in good condition. (Michigan Department of Natural Resources).

Although wildlife management recommendations and decisions are based on the best available biological science, they are nearly always determined within a social context where stakeholder values and priorities must be addressed. The integration of social considerations into scientific examination is necessary to move wildlife management recommendations and actions forward, especially in an environment where public knowledge and inquiry regarding management of public resources is significant.

This Deer Herd and Ecosystem Management Plan is a distillation of much of the scientific information pertaining to deer, deer-related issues, and deer-management best practices, and presents the best available biological and social science relevant to these topics. The information presented in this document was obtained from published scientific literature, agency and university reports, unpublished agency data, and personal communication with deer experts. The purpose of this review is to present general information on deer and specific information relevant to deer management in Michigan.

DISTRIBUTION, TAXONOMY AND PHYSICAL DESCRIPTION

Deer are probably the best recognized and most widely distributed large mammal in North America. The white-tailed deer is found in nearly every state in the United States. Deer can be found throughout the southern provinces of Canada, in tropical forests of South America and even in the midst of urban locations in Michigan.

White-tailed deer are the largest herbivore in many forested ecosystems in the eastern United States (McShea 2012). White-tailed deer successfully live across a wide range of habitats and can be found in every Michigan county (Baker 1983). Deer are creatures of the forest edge and thrive in agricultural areas interspersed with woodlots and riparian habitat. They favor forest stands in early succession in which brush and sapling browse are within reach. Dense forest cover is used for winter shelter and protection.

White-tailed deer are ungulates, or hoofed mammals, belonging to the family Cervidae. The white-tailed deer's coat and color change semi-annually. Deer are more reddish brown with a thin coat during summer months. Deer shed their summer coat in late summer or early fall and replace it with a thick, brownish-grey winter coat. The underside of the tail, belly, chin, and throat are white year-round. The winter coat consists of both a short underfur and hollow, outside guard hairs that provide additional insulation and protection during the winter. The winter coat is shed in mid- to late-spring. Hair color is alike in both sexes. Fawns are born with white spots in the upper coat which provides excellent camouflage. They shed their spotted coats in three to four months, and it is replaced with a brownish-grey fall and winter coat.

In Michigan, adult deer typically weigh between 125 to 225 pounds live weight and stand 32 to 34 inches at the shoulder. Female deer (does) tend to be smaller than males (bucks) of the same age from the same area. Deer weights vary considerably, depending upon age, sex, diet, and the time of year the weight is checked. Deer are extremely agile and may run at speeds of up to 30 miles per hour. White-tailed deer are also good swimmers and often enter rivers and lakes to escape predators or insects.

REPRODUCTION

Deer productivity rates (fawns produced per doe) generally are highest in regions with an abundance of nutritious food. Thus, deer occupying fertile farmland regions typically have higher productivity rates than deer in heavily forested regions. Likewise, deer living in areas with low annual snow accumulation tend to be more productive than those living in regions where snow covers available food for months at a time and inhibits deer movement to food sources. In southern Michigan where winter conditions are relatively mild, a high percentage of fawns and almost all yearling and adult does breed each year.

Productivity rates also vary with age of the doe. Adult does have the highest productivity rates, and yearlings (deer that are 1 year old) have higher productivity rates than fawn does (less than one year old). In addition, the health of a doe, often a function of habitat quality, influences her reproductive capacity as females from the best range produce more fawns than those from poor range. Adult females (three years and older) usually produce twins, and triplets are not uncommon.

White-tailed deer are seasonal breeders, with breeding occurring October through December in northern parts of their range like Michigan (Green et al., 2017). Peak mating activity is in November. Female deer generally enter estrus for a 24- to 48-hour period. If not bred, does will cycle two or three times until bred. One buck may breed several does. A male deer will court the female and guard her until they mate, as well as during the remainder of her estrus, and then find another doe to mate with (Turner et al., 2016). On average white-tailed deer have a 200-day gestation, with peak of fawn drop is mid-May to mid-June. Time of birth can vary depending on the age of the doe. A deer can reproduce as early as six months of age. Young deer typically have a single birth, while mature does tend to have twins, or on occasion, triplets (Green et al., 2017). For the first couple of weeks, does leave their fawns in a hiding place for several hours at a time, returning briefly to nurse them. This strategy reduces the likelihood of predators locating the newborn fawn. Fawns begin to follow their mother on her foraging trips at about four weeks of age. White-tailed deer fawns are nursed for eight to 10 weeks before they are weaned.

Chronic Wasting Disease (CWD) should not affect reproduction. Males positive for CWD are less likely to participate in mating (Blanchong et al., 2012). In the study more CWD positive females were identified than females negative for CWD. This could potentially be explained with how CWD deer are more likely to be harvested. CWD-positive mothers were found in closer proximity to their female fawns than CWD-negative mothers (Blanchong et al., 2012).

In southern Lower Michigan, where habitat for deer is excellent and winters are relatively mild, about 30 to 50 percent of females breed as fawns and produce a fawn themselves when one-year old. In northern regions of the state, particularly in the Upper Peninsula (UP), only about

5 percent of one-year-old does produce a fawn. Pregnancy rates for does two years and older typically are very high, ranging from 80 to 95 percent. Pregnant one-year old deer usually produce a single fawn, whereas older does usually produce twins, with singles or triplets possible depending upon their age and nutritional status.

FOOD HABITS

The diet of white-tailed deer changes with the seasons. Succulent herbaceous plants, such as ferns, wild strawberry, dandelions, and goldenrod are preferred by deer during the summer months, and these “forbs” are supplemented with berries, mushrooms, new leaves from trees, and aquatic plants. Some examples of their food preferences are trillium, wild strawberry, blackberry, dogwood, maples, oaks and oak acorns, poison ivy, and grasses (University of Missouri Extension, 2012).

A wide variety of agricultural crops are also eagerly consumed by deer, including corn, soybeans, oats, barley, alfalfa, pumpkins, and potatoes. In the autumn, deer continue to make use of available agricultural crops but turn to hard mast crops that are high in energy, such as acorns and beechnuts, as well as soft mast such as apples and other fruits. During winter, deer abruptly change their diet in northern areas to stems and buds of woody plants. Favorite winter “browse” species in Michigan are white cedar, maple, birch, aspen, dogwood, and sumac, as well as many shrubs. Deer in northern Michigan typically enter a “negative energy balance” during winter and lose weight even when browse is present and abundant.

CAUSES OF MORTALITY

A deer’s life expectancy in Michigan is influenced greatly by hunting pressure and hunting regulations. Simply put, Michigan has a large number of deer hunters who are very effective at harvesting deer. In 2020, an estimated 540,000 hunters spent 8.5 million days afield and harvested about 411,000 deer. Statewide, 51 percent of hunters harvested a deer, about 26 percent took an antlerless deer (doe or fawn), and 35 percent took an antlered buck. About 18 percent of deer hunters harvested two or more deer. Poaching, or illegal taking of deer by people, is also a cause of mortality.

Vehicle-deer collisions are another major source of deer mortality in the state. According to State Farm Insurance research, Michigan ranks 4th in the nation in reported vehicle deer collisions. During 2021, there were 51,103 reported deer involved collisions with four motorists killed and 1,143 injured (Michigan Traffic Crash Facts 2021). Crashes occurred most often in Michigan’s southern, heavily populated counties. Vehicle-deer crashes occur during all months of the year, but they are especially prevalent during autumn (October-December) when roadways offer the last green forage of the season, corn fields are being harvested, the deer mating season ("rut") is in progress, and daily commute occurs around dawn and dusk, when deer are most active.

In Michigan, white-tailed deer are susceptible to a host of diseases and parasites. Many parasites and some diseases may weaken infected animals or use them as a host but generally are not fatal. Others can be deadly to individuals and may potentially affect local or even statewide populations. Supplemental feeding and high deer density are major players in the spreading of disease, a large factor in deer mortality (VerCauteren & Hygnstrom, 2011; O'Brien et al., 2002, 2006). In recent years, several significant disease outbreaks in Michigan's deer herd have stimulated public concern and driven deer management decisions as real and perceived threats are realized.

Bovine tuberculosis (bTB), caused by Mycobacterium bovis, was first diagnosed in free ranging Michigan white-tailed deer in November 1975. (Schmitt et al. 1997). Since that time, the extent and characteristics of the outbreak, as well as its ongoing management by the DNR, have been extensively described (de Lisle et al. 2002, Hickling 2002, O'Brien et al. 2002, O'Brien et al. 2006, Schmitt et al. 2002). Bovine tuberculosis is primarily of concern because of its ability to infect a wide variety of species (Oreilly 1995), including humans (Wilkins et al. 2003, Wilkins et al. 2008), and the resulting economic costs of infection for the livestock industry due to herd condemnations and closure of markets (Morris et al. 1994). After more than 13 years of surveillance and research, white-tailed deer remain the only proven reservoir of infection for cattle besides other cattle (Corner 2006).

Chronic Wasting Disease (CWD) is a Transmissible Spongiform Encephalopathy (TSE), caused by mutant cellular protein that affects four species of North American cervids (Sigurdson 2008, Williams 2005, Williams et al. 2002), including white-tailed deer. The clinical features, pathology and epidemiology of the disease have been well described in areas where the disease is endemic. Both simulation modeling (Gross and Miller 2001, Miller et al. 2000) and field research (Miller et al. 2008) suggest that once established, CWD can build to high prevalence in infected deer populations, resulting in marked decreases in survival of infected deer and likely causing substantial population declines over decades. Where the disease has become established, no management agency has thus far been able to control its spread, let alone eradicate it.

CWD transmits easily through a deer population via deer-to-deer transmission, and transmission through vegetation or soil is possible. CWD can also spread through bait piles where prions are transferred from the saliva of an infected deer onto the bait, and later consumed by a healthy deer. It is unclear how long CWD can survive in soil and plants, though studies on the prions that cause CWD, and other similar prions, have detected prions persisting in plant and soil samples several years after introduction. Studies have shown that after a deer contracts CWD it has a much lower chance of survival than a deer that does not have CWD, with the annual survival rate of CWD positive deer around 39.6 percent, compared to CWD negative deer at 80.1 percent (Edmunds et al., 2016).

Following confirmed diagnosis of Michigan's first case of CWD in a captive white-tailed deer in a Kent County facility in August 2008, the DNR's intensified surveillance was implemented per the Michigan Surveillance and Response Plan for Chronic Wasting Disease of Free-Ranging and Privately-owned/Captive Cervids (Michigan Department of Natural Resources/Department of Agriculture. 2002). In 2008, 9,151 free-ranging deer were tested for CWD statewide, including 1,523 from a nine-township area surrounding the infected captive facility. All were negative. The first occurrence of CWD in free-ranging deer in Michigan was confirmed in 2015, and since then CWD has been confirmed in free-ranging white-tailed deer in the Lower Peninsula from Clinton, Ionia, Ingham, Jackson, Kent, Gratiot, Eaton, and Montcalm counties. Presence of CWD in captive populations has been observed in eight cases since 2008.

Epizootic Hemorrhagic Disease (EHD) is an acute, infectious, often fatal viral disease of some wild ruminants. This malady is characterized by extensive hemorrhages. EHD has occurred in significant outbreaks in deer in the northern United States and southern Canada. Die-offs of white-tailed deer in Michigan occurred in 1955, 1974, 2006, and 2008. Total mortality in these events ranged between 50 and 200 deer. Because of its very high mortality rate, EHD can have a significant effect upon the deer population in a given area, reducing numbers drastically. There is no known treatment for the disease, and there is no evidence that the virus can infect humans.

Eastern Equine Encephalitis (EEE) is a fatal viral disease of horses that can infect a variety of avian and mammalian species but seldom causes clinical disease. It rarely occurs, but white-tailed deer can be infected, and the disease is fatal in infected animals. There have been single reports of mortality in deer in Georgia (Tate et al. 2005) and Wisconsin and multiple cases in Michigan (Schmitt et al. 2007). The die-off in Michigan occurred in 2005 in the southwestern portion of the state. Seven mortalities were documented in this outbreak. Due to a high mortality rate, EEE can have a significant effect on the deer population in a given area, but because it rarely occurs, it is not an important mortality factor to the state as a whole. Although it occurs rarely, humans are susceptible to this disease, and it can be fatal.

Lyme Disease is an illness caused by a spirochete bacterium (Borrelia burgdorferi). This disease is transmitted to humans and animals primarily by the bite of the tick, Ixodes scapularis. The white-tailed deer is a host for the adult stage of this tick and, therefore, can be involved in exposing humans to the tick, and consequently, to the bacterium. White-tailed deer do not develop disease when infected with Borrelia burgdorferi, and, therefore, this disease is not an important mortality factor (Brown and Burgess 2001). This disease is of public health significance as the bacterium can affect the cardiovascular system and the neurological system and cause severe arthritis.

Starvation, often due to a drop in available food over winter, is also a cause of mortality in deer. If deer are unable to find proper nutrition, they become more susceptible to illness. Deer can survive winter without ideal nutrition, losing as much as 25 percent to 30 percent of their body weight while surviving. However, when malnutrition is mixed with a severe winter, deer experience higher mortality rates.

Finally, predation is the last major factor in mortality. Deer are primarily predated by wolves and coyotes, as well as bears, bobcats, cougars, and humans (Patton et al., 2018). Deer become easy targets for coyotes at the end of winter when food is scarce. Coyotes will go after fawns and deer that are susceptible to predation such as old, sick, or injured individuals (VerCauteren & Hygnstrom, 2011). Hunting in Michigan accounts for a fair number of deer mortalities as well, with the state reporting 411,000 deer harvested in 2020 alone (Michigan Deer Harvest Report).

SOCIAL STRUCTURE AND BEHAVIOR

The social organization of white-tailed deer is largely matriarchal with the most common social group being an adult doe, some of her female offspring from previous years, and all their fawns. Sometimes three or four generations of related does are present in a family group. When fawning season arrives in mid-May, adult does leave the family group and remain alone to bear and rear their fawns.

Deer activity is usually highest during fall because of breeding behavior and the need to increase food consumption while preparing for winter. Deer decrease their activity in winter when food is limited, and their mobility is hindered due to snow. Non-migratory deer in the southwestern lower peninsula of Michigan had an estimated annual home range size of 0.2–2.9 square miles (Pusateri 2003). Yearling and adult does in south-central Michigan had seasonal home ranges of 0.3-0.8 square miles (Hiller 2007). Deer occupying better habitats can fulfill all their necessary requirements in smaller areas whereas deer residing in poorer ranges may have to travel further distances to find suitable food and cover. Males generally have larger home ranges than females.

Deer create familial groups typically composed of only female deer (other than male fawns), that are often related to one another, and contain two to 12 deer. (Innes, 2013). The makeup of these females typically consists of a maternal doe and her fawns from that year and previous years. The females stay in this group and the males disperse. Sometimes females in this group will not be related to one another. When deer are not related, studies have shown that they will be with individuals that share habitat interests throughout the year (Comer et al., 2005). These groups will stay together throughout the year except during the fawning period. After spending eight to 10 weeks with their fawns, deer will re-group into their families. Other exceptions to only females being in these groups is when there is limited food and in wide open fields; where herds can become integrated groups of males and females (Innes, 2013).

CARRYING CAPACITY

Carrying capacity is a term that refers to the maximum sustainable size of a population. Carrying capacity of a population is limited by any number of constraints, both biological (Biological Carrying Capacity) and social (Social Carrying Capacity). The effective and appropriate management of deer populations must consider both biological and social carrying capacities.

BIOLOGICAL CARRYING CAPACITY (BCC)

Biological carrying capacity is defined as the maximum number of animals that a given area can support over a prolonged period of time (McCullough 1984). BCC is determined by the capability of the area to provide the habitat components of a wildlife species – food, water, cover, and space.

As deer populations grow, individual animals compete for the resources that their habitat provides. In Michigan, healthy, well-fed does can produce triplet fawns and routinely produce twins. Under ideal conditions, even fawns can breed and produce their first young when they are about 1-year-old. However, as populations near BCC, adult does raise fewer fawns, fawn survival decreases, and fewer fawns are capable of breeding. Another impact when a deer population approaches BCC is antler development in yearling bucks may be slowed. In addition, more deer die from malnutrition. When BCC is reached, the number of deaths equals the number of births.

BCC varies throughout Michigan based on climate and the distribution of habitat. BCC may also change over time, if forests age without cutting or burning, and may fluctuate with annual variations in weather. Although these considerations mean that BCC cannot be exactly known in any given year and is somewhat of a moving target over time (Macnab 1985), using it as a context in setting population management objectives is possible if long-term trends are used to establish average conditions and short-term anxieties are acknowledged as having periodic significance in population dynamics (Strickland et al. 1994).

When deer populations remain at or above BCC for extended periods of time, BCC may be reduced due to vegetation damage that can result from the sustained browsing pressure of high deer populations. This sustained activity may alter the plant species, structural composition, or successional processes of the landscape, resulting in negative impacts on the habitat, which can result in cascading effects on other wildlife species long before negative impacts on the condition of deer occur (deCalesta 1997).

Westerfield et al, from their 2019 study “Methods for Managing Human-Deer Conflicts in Urban, Suburban, and Exurban Areas” describe BCC in its simplest form as the maximum number of deer that a habitat could support on a continuous basis, but warns that the BCC may not be a desirable management objective as a deer population at maximum BCC may negatively impact plant and animal communities within their range, and may spread disease at higher rates due to herd density. This study also cites increased availability of artificial food sources, such as agricultural farms, having an undue influence on maximum BCC and inflating populations beyond capacity of wildland environments.

Wild deer populations are sustained by the habitat components of food, water, cover, and space. As deer populations increase, individual animals compete for these resources, resulting in an overall lower quantity and quality of these resources being available to each individual animal.

SOCIAL CARRYING CAPACITY (SCC)

The deer population level at which the local human population can tolerate or accept the problems associated with a deer herd is commonly referred to as the social or cultural carrying capacity. The SCC is related to the identification and state of negative impacts created by deer (Westerfield et al., 2019).

The concept of SCC proposes the abundance of a wildlife species is limited by the human social environment or human tolerance for that wildlife species. The SCC is not simply the highest level of deer abundance that will be accepted. SCC is a notion proposing that human society represents a social environment capable of setting limits on the number and distribution of a wildlife species.

SCC is defined by both the maximum and minimum population sizes society will tolerate. That is, Michigan society may not tolerate too many deer, but it may not tolerate too few either. SCC is also defined by the interactions between humans and a wildlife species. Issues and conflicts are created when stakeholders disagree on what level of interactions is acceptable. The status of such deer-related issues is a critical feature of the SCC model. Deer management can be less about management of deer than about managing the issues created by deer–human interactions (which can be both negative and positive) and differences in stakeholder tolerances regarding those interactions.

A SCC for deer is defined by the level of abundance and interactions acceptable to enough stakeholders such that there is a low level of deer-related issues (Minnis and Peyton 1995). When deer abundance and interactions with stakeholders fall within a range that most stakeholders can accept, deer are being managed within SCC. If no range is agreeable to key stakeholders, a SCC does not exist and could only be created by shifting attitudes and tolerances of stakeholders. The SCC at the Metroparks has been defined between the minimum of providing public enjoyment of wildlife opportunities and promoting a healthy deer herd and a maximum where impact of deer become detrimental to other plant and wildlife populations within the rest of the ecosystem.

ECOLOGICAL IMPACTS

White-tailed deer evolved in a forested environment, and it is likely that there are both wildlife and plant species that benefit from the presence of deer and their activities. By foraging selectively, deer affect the growth and survival of many herbaceous, shrub and tree species, modifying patterns of relative abundance and species interactions. When populations are not in balance with habitat, deer can alter their environment by over-browsing preferred plants and destroying the vegetative cover upon which they and other species depend.

Over-browsing can result in reduced availability of adequate ground level vegetation (herbaceous plants, seedlings, saplings, and shrubs) that provides the food and cover required by deer (Alverson et al. 1988). In addition to impacts on deer habitat, over-browsing by deer can degrade the quality of habitats for other wildlife species and alter entire ecosystems. Numerous wildlife species use ground level and mid-story vegetation of forests in Michigan for nesting and escape cover that may be negatively impacted by intense deer browsing (deCalesta 1997, Cote et al. 2004). In addition, deer compete directly with wild turkeys, ruffed grouse, squirrels, and a variety of other birds and small mammals for acorns, fruits, and other mast.

Deer browsing can impact the quality and viability of entire natural communities. Damage to natural communities extends to a variety of other species including insects, birds, reptiles, amphibians, and other mammals that are dependent on those communities. Impacts on rare plants, animals, and communities are of special concern as years of over-browsing can threaten viability of local populations. In addition, over-browsing of native vegetation facilitates invasion of aggressive, nonnative plant species like garlic mustard. Many of these invasive plants degrade habitat for deer and other species by crowding out preferred deer forage and changing ground flora to species that provide little or no benefit to most wildlife species. Management activities designed to benefit deer must ensure that other resources are not negatively impacted. It is important that deer numbers are kept below levels where they may cause long-term damage to the ecosystems in which they live.

An ecosystem may seem healthy at first glance but may be experiencing ecological disturbance. Just one disturbance can generate several negative impacts on an ecosystem. White-tailed deer are opportunistic and selective browsers; consuming what is available to them in the area as well as choosing based on nutritional value. Deer impact the food chain (trophic levels) directly and indirectly. This impact on the plant community will cascade to other environmental factors such as soil nutrients and resource availability for vegetation (Patton et al., 2018). When deer preferentially consume a plant species in an area, this will harm not only the individual plant species but also other organisms within the area, creating a ripple effect (Shelton et al. 2018).

If deer preferentially consume acorns found in one area of the forest floor, oak tree generation will be suppressed. This impact will result in a lower density of oaks, changing the composition of plant density in that area (McShea, 2012). A reduction in canopy, and overall density of vegetation impacts other animals and organisms that rely on these features for food and habitat. This may cause a dependent species to leave a habitat in search of food and shelter, where they may suffer mortality from competition and predation. This migration may affect predator-prey relationships as well, diminishing available prey for predators, resulting in population decline. Similarly, the exodus of a predator from an area due to habitat change may result in a boom of prey species population, which can further drive habitat change as browse pressure increases.

Changes in structure and diversity of plant habitat can drive a reduction in availability of quality food sources for desirable species, and increase competition among individuals of a species, or between species. This cycle can lead to population booms and busts, and a new equilibrium is reached.

In addition to overall population, selective browsing pressure can severely impact individual species and change community composition. Great white trillium ranks high on the preferential hierarchy of deer foraging behavior. Deer may prefer to browse all the trillium in one area, impacting other organisms that rely on trillium as a food source as well, such as the spine-waisted ant (Aphaenogaster spp.), which will in turn result in cascading effects on that community. With trillium depleted, ants must find a new source of food. The disturbance created by the complete removal of this species from the landscape create an opportunity for invasive species to rapidly occupy available habitat. While these invasive species may occupy the same physical space, and represent vegetation cover, these species do not provide the same ecological services as the native trillium provided, in food, habitat and community complexity. This loss in diversity will drive competition for remaining quality resources and increase pressure on native plant and animal species. If competition is sufficiently fierce, a species may relocate from the area entirely, further driving a loss in biodiversity and community complexity or quality.

CONFLICTS BETWEEN HUMANS AND DEER

While white-tailed deer are highly valued by Michigan residents, conflicts between deer and humans occur at various levels of intensity across the state. Damage to agricultural and horticultural crops, suppressed forest regeneration, high rates of deer-vehicle collisions, and destruction of landscaping and other property by deer in urban/suburban areas can be significant.

Deer readily feed on a variety of agricultural crops and can reduce yields significantly. Agriculture is an enormous part of Michigan’s economy and in 2007 more than 55,000 farms encompassing over 10 million acres, produced a net farm income of $2.03 billion and generated $71.3 billion in economic activity. Michigan ranks 19th nationally in total cash receipts for agricultural products and is the leading producer of crops such as dry beans, blueberries, cherries, cucumbers, and bedding and garden plants in the U.S. (USDA 2009). Agricultural crops are damaged by deer in most Michigan counties, but most significant damage occurs in areas where deer numbers are high and agricultural crops are common on the landscape. It is estimated that deer cause on average a third of all wildlife generated crop damage to corn in the United States (VerCauteren & Hygnstrom, 2011).

Another significant conflict between deer and humans is deer-vehicle collisions. Approximately 1.5 million deer-vehicle collisions occur on U.S. roads annually and Michigan ranks fourth in the country in reported collisions. In 2021, 51,103 deer-vehicle collisions were reported in Michigan resulting in 4 human deaths and 1,143 injuries to the persons involved (Michigan Traffic Crash Facts 2021). Reduction of deer numbers in areas where deer vehicle collisions present a significant public safety concern is imperative, as are education campaigns that promote safe driving and explain what to do when deer are present on roads.

Among the conflicts that can occur between humans and deer are, spread of zoonotic diseases (disease that is passed from an animal to human), car-deer collisions and injuries, and crop damage. White-tailed deer provide a good host for ticks due to their thick fur and contribute to the transmission of tick-borne disease. Lyme disease is a major concern for human health, creating conflict as deer are a main host for various types of ticks. A human can be infected by Lyme disease if a deer tick, (also known as black-legged tick) which is carrying Lyme disease, bites and attaches for two or more days. However, recent studies are exploring a documented increase in the speed of transmission of Lyme disease from tick bite to infection in humans.

Bovine Tuberculosis (bTB) represents another potential conflict, as bTB has the potential to spread to humans. While rare, humans that encounter infected deer may become infected. Among human cases of TB in the United States, bTB makes up less than 2 percent of all infections. (CDC.gov)

Physical conflict between humans and deer are not limited to car-deer collisions but can occur as direct physical injury to humans. While wildlife lovers enjoy experiencing deer in the wild, deer can become habituated to regular or close contact with humans. Interactions between deer and humans can become detrimental to both parties when they alter a deer's natural behavior. This can expose the animal to hazards such as road traffic as they become habituated to seeking out human interaction. Likewise, this altered behavior may become a hazard to humans interacting with deer, as the animal's behavior may be erratic or aggressive in seeking out human interactions, especially where food is involved. This learned behavior can become more pronounced when humans are engaging in feeding of wildlife, which is prohibited by the state. Wildlife is inherently 'wild', and the unpredictable nature of animal behavior can result in injury to humans. This is particularly the case during mating and breeding season, or with animals protecting their young. While animals in a park or urban setting may become unafraid or habituated to human presence, at any point their innate animal instinct to fight or flee can rise to the top, resulting in injury to humans who have come too close.

URBAN/SUBURBAN DEER HERD MANAGEMENT

White-tailed deer are an important part of the culture in Michigan. As white-tailed deer have expanded in number and adjusted to living in and around urban areas, they have taken up permanent or semi-permanent residence in many Michigan communities. With adequate cover and food available deer successfully navigate sidewalks, traffic, and backyard fences, appearing quite comfortable with daily interactions involving humans, barking dogs and vehicles. Management of urban/suburban deer populations can be difficult. Similarly, as deer populations increase and conflicts with deer arise, different expectations, concerns, and values make addressing these conflicts problematic.

Deer populations in rural settings are managed nearly exclusively by recreational hunting apart from utilizing deer damage shooting permits for addressing specific situations. However, these lethal techniques face several challenges to application in many urban/suburban areas including: (1) real or perceived safety concerns, (2) conflicting social attitudes and perceptions about wildlife, (3) hunting and firearm discharge restrictions, and (4) liability or public relations concerns. (DeNicola 2000). Lethal tools are more effective than others but may be unacceptable in areas where social or safety concerns are an issue. Applying a combination of several techniques specifically tailored for each situation should prove to be more successful than utilizing a single tool.

EDUCATION AND PUBLIC PERCEPTION

Johnson and Horowitz (2014) surveyed the public's perception of ecological impacts caused by deer. This survey evaluated participants' acceptance of deer populations in a wetland setting, if nothing was done to control deer population. The study targeted residents living in the surrounding area and asked them to rate the area based on "biodiversity and condition, personally important uses, and preferred management approaches," as well as deer-specific questions and general environmental views. The survey determined that making additional educational resources available to the public about deer impacts to an ecosystem may lead to increased support for population management.

HCMA is committed to the transparent disclosure of the processes used to preserve wildlife and their surrounding ecosystems.

PREFERENTIAL BROWSING

Deer are selective feeders and the effects of preferential browsing by deer can be seen in trees and forbs alike. Overabundant deer populations can have devastating effects on many native tree populations including maple, oak, and dogwoods. Impacts may not be immediately apparent on large, established trees, but saplings represent an ideal height and tenderness for deer to browse. Forested communities are resilient and naturally withstand some browsing, but excessive browsing results in these communities struggling to regenerate as older trees mature and die (Aronson & Handel, 2011). A more subtle, yet immediate impact can be seen when comparing numbers and diversity of spring wildflowers over consecutive years.

Often, invasive plants are avoided by the deer and other herbivores leaving them with little in the way of competition. Plants such as Japanese barberry, garlic mustard, and Japanese stiltgrass are consistently avoided by deer, while Asian bittersweet, common privet and certain honeysuckles are sought after (Averill et al., 2016). The unfortunate consequence is that there is increased pressure on native plants as deer seek out other, more desirable options. Both avoidance and attraction by deer can contribute to the proliferation of an invasive plant. In cases where the plant is avoided, growth goes unchecked and native plants are crowded out. In cases where animals are attracted to the plant, it is often the fruits of that plant that are consumed, allowing seeds to spread elsewhere, such as with autumn olive and multiflora rose. Autumn olive and Asian bittersweet, for example, have berries that deer are attracted to and spread via their consumption. Tree of heaven (pictured left), an invasive sumac species, is preferred browse for deer when alternatives are sparse.

SOIL DISTURBANCES

Soil is made up of a combination of broken-down bedrock and decomposed organic material and serves as a major determinate of habitat (Dickman and Leefers, 2003). Soil is also home to bacteria and fungus that help break down waste and convert it to nutrients for uptake by plants. Nutrients, such as nitrogen, are converted from waste in the soil and are needed by plants. Soil is a full living system, and as such it is also vulnerable to change when the conditions around it change.

SPREAD OF SEEDS

Plants have adapted many ways in which to spread their seeds to further distances than their immediate area. Rather than conscious decisions, these are adaptations that make it more likely the seeds may catch on the wind, be eaten by an animal, or hitch a ride in fur, for example. Deer are certainly a part of this dispersal and frequently carry seeds in their fur. They are also responsible for the spread of seeds through consumption of berries, as deer enjoy the fruit of a variety of invasive plants. Asian bittersweet, honeysuckle, and wild raspberries are all preferred fruits sought preferentially by deer (Averill et al., 2016). The seeds of Asian bittersweet rely on an animal digesting its seeds to remove the seed's coating, in a process called scarifying.



(Pictured above: Asian Bittersweet, Honeysuckle, Wild raspberry)

CHANGE IN CANOPY STRUCTURE

One of the more alarming effects of deer overabundance in forested communities is the alteration of the forest canopy. Changes in forest canopy structure are being driven by changes in climate and will continue change rapidly as this process alters our landscapes. While deer preferentially browse fresh green plants during most of the year, winter forage shifts their diets to consumption of woody plants as a sustenance food source.

Forested communities are adapted to withstand browsing, as trees will put off many more seedlings and suckers than what are needed to maintain regeneration. When trees have been excessively browsed, there may not be enough regeneration to reforest an area that has been logged, experienced a storm, or that simply has a high number of aging trees (Aronson & Handel, 2011). Particularly susceptible tree species include red oak and sugar maple, in fact, up to 60 percent of red oak seedlings are browsed by deer (Blossey, Curtis, Boulanger, and Davalos, 2019). Gaps left in the forest floor coupled with sunlight let in from reduced canopy cover then leave room for invasive species to establish themselves putting additional stress on native species.

ENVIRONMENTAL CONTAMINATION AND BIOACCUMULATION

In October 2018, the Michigan Department of Health and Human Services (MDHHS) and MDNR issued a 'Do Not Eat' advisory for deer taken within five miles of Clark's Marsh in Oscoda Township. The advisory was due to high levels of PFAS chemicals found in deer taken within five miles of the Marsh. One deer out of twenty tested around the former Wurtsmith Air Force Base was found to have high levels of PFOS, a type of PFAS. The level of PFOS in the muscle of the deer was 547 parts per billion, exceeding the level of 300 ppb at which action is recommended. PFAS was either not found or was at low levels in muscle samples from the other 19 deer. Although only one deer of this group tested at such high levels, the advisory was issued to protect the health of anyone eating venison taken within approximately five miles of Clark's Marsh.

After these findings, in 2019 deer in Oakland County's Proud Lake Recreation Area were investigated because elevated PFOS levels had been identified in fish collected from Kent Lake. Surface water samples collected in July, August, and October 2018 from Norton Creek (which flows into the Huron River) and from the Huron River (downstream of Norton Creek) had elevated levels of PFOS. In April of that year, samples were taken from 20 white-tailed deer within five miles of Norton Creek (Lyon Township, Oakland Co.) to test for PFAS. Samples of muscle, liver, kidney, and heart were tested for multiple PFAS chemicals.

No PFAS were found in any muscle or heart samples. In liver and kidney samples, PFOS was the only PFAS found. Based on this data, MDHHS concluded consumption guidelines were not needed for deer from the Norton Creek area. This said, organs including the liver and kidneys may contain higher levels of chemicals than muscle, thus MDHHS recommended that people not eat the organs.

Integrated Management Strategies

No single technique or strategy is universally appropriate. The complexities of suburban deer issues and the current limitations of available techniques make quick fix solutions unlikely. Resolving conflicts associated with deer often requires an integrated management program. Short-term strategies can relieve immediate problems, while long-term approaches will maintain deer populations at target levels. Combining two or more methods may improve results and increase the acceptability of the program for a wider range of stakeholders. Management programs should be monitored to assess their impacts. Baseline data (e.g., roadkill reports, vegetation impacts, deer health, population census and homeowner complaints) will be required to determine accurately the effects of any management action and to evaluate program effectiveness.

NONLETHAL MANAGEMENT OPTIONS

Nonlethal techniques are generally well accepted by the public. However, limited effectiveness and/or high cost may prevent their exclusive use to resolve deer conflicts. Nonlethal techniques can be justified when the potential financial savings from their applications are equal to or greater than the cost for implementation. Nonlethal techniques may not affect deer impacts to plants and animals on a community wide scale because these methods were designed to supplement, not replace, deer population management. Consequently, nonlethal alternatives are best employed within the context of a comprehensive management program.

HABITAT MODIFICATION

Deer adapt well to nearly all human modified environments, except for downtown urban locations and other large areas that are devoid of woodland cover. These intensely developed urban areas are usually less aesthetically appealing to people than suburban landscapes that contain a patchwork of woodlots and homes. Therefore, habitat modifications to discourage deer presence are rarely practical.

BAN ON DEER FEEDING

At the time of this writing (fall 2021), the Michigan DNR has banned baiting and feeding in the entirety of the lower peninsula of Michigan.

UNPALATABLE LANDSCAPE PLANTS

Although deer are generalist foragers, they do have preferences for certain plant species. Selecting less palatable herbaceous and woody plants can minimize deer browsing to ornamental plants (Cummings et al. 1980, Fargione et al. 1991, Craven and Hygnstrom. 1994, Curtis and Richmond 1994). Careful plant selection for home landscapes, combined with the selective use of repellents, may minimize damage if deer-feeding pressure is low to moderate.

Few ornamental plant varieties, however, are classified as rarely damaged by deer, and application of this technique is limited in areas with high deer densities.

REPELLENTS

Repellents are best suited for use in orchards, nurseries, gardens, and on ornamentals or other high value plants. High application cost, label restrictions on use, and variable effectiveness make most repellents impractical for row crops, pastures, or other low value commodities. Success with repellents is measured in reduction of damage; total elimination of damage should not be expected (Craven and Hygnstrorn, 1994). Repellents work by reducing the attractiveness and palatability of treated plants to a level lower than that for other available forage. Repellents are more effective on less palatable plant species than for those that are highly preferred (Swihart et al. 1991). Effectiveness also depends on the availability of alternate forage (Conover 1987, Conover and Kania 1988, Andelt et al, 1991), and repellent performance seems to be negatively correlated with deer density. Scientists have classified repellents by four specific modes of action: fear, conditioned aversion, pain, and taste (Beauchamp 1997, Mason 1997).

Fear inducing repellents emit sulfurous odors that mimic predator scents. Conditioned aversion is an avoidance response associated with a treated item and an illness. Pain inducing repellents affect the trigerninal receptors located in the mucous membranes of the eyes, nose, mouth, and throat. Taste repellents generally include a bitter agent that makes treated items unpalatable. In addition to mode of action, several other factors that influence the effectiveness of repellents must be considered. Some repellents weather poorly, so it is usually best to use products that contain a commercial “sticker" or adherent. Also, repellents only protect the foliage to which they are applied. New growth that emerges after the application of the treatment is unprotected. (Allan et al. 1984). Therefore, repellents have to be reapplied repeatedly during the growing season to retain their effectiveness (Sullivan et al, 1985, DeYbe and Schapp, 1987, Andelt et al, 1991). For peak efficacy, many repellents should be reapplied every four to five weeks as long as deer feeding pressure remains high. (Sayre and Richmond 1992).

SUPPLEMENTAL FEEDING

At the time of this writing (Fall 2021), the Michigan DNR has banned baiting and feeding in the entirety of the lower peninsula of Michigan. This ban makes the practice of supplemental feeding illegal and not viable for the maintenance of deer populations.

FENCING

Fencing is a reliable method to address site specific problems such as landscape or agricultural damage or airport conflicts (Caslick and Decker 1979, Craven and Hygnstrom 1994, Curtis et al. 1994). Fencing also can be used to protect public health in areas where there is a high prevalence of tick-borne diseases (Daniels et al. 1993, Stafford 1993). Agencies often recommend barrier fencing around schoolyards and other high-risk areas to minimize deer access, tick abundance, and the associated risks of contracting Lyme disease. Several factors should be assessed before using fencing as a deer control option. These include fence design, site history, deer density, crop or landscape value, local ordinances, and the size of the area to be protected (McAninch et al. 1983). For a given deer density, the potential for damage will often be greater on larger areas than smaller ones (Caslick and Decker 1979, McAninch et al. 1983). Consequently, large areas often require more substantial fencing designs to achieve a level of protection like small areas. Blocks larger than 50 acres usually require eight-foot-high, woven wire fencing to reliably prevent deer from entering the area if feeding pressure is high.

HAZING AND FRIGHTENING TECHNIQUES

Several techniques can be used to frighten deer away from specific areas. Hazing has been effective under certain circumstances; however, deer often habituate to novel disturbances. In addition, deer may not leave the general vicinity and complaints may arise from neighbors about the noise made by the devices. Hazing is most effective if implemented either before or at the initial stages of a conflict situation. Deer movements or behavioral patterns are difficult to modify once they have been established. Pyrotechnics provide quick but temporary relief from deer damage. Motion-sensing detectors have been used to trigger both audible and ultrasonic devices for freighting deer to minimize habituation. Strobes, siren, water sprays, and other devices have been used to frighten deer with limited effectiveness. Although deer can detect ultrasound, they are not repelled by it because they do not associate the disturbance with danger (Curtis et al. 1995). The limited efficacy of these nonlethal methods and the established behavior of the deer herd at the Metroparks make these methods impractical for maintaining a healthy herd.

Population Reduction Methods

Population control programs have two phases: the initial reduction phase when the number of deer removed is high, and the maintenance phase after deer densities have been lowered and fewer deer are handled. It should be emphasized that any population control effort requires long-term maintenance. Management efforts typically occur annually following attainment of population density goals or less frequently depending on program efficiency and local wildlife management objectives. Regardless of the culling frequency, the commitment should be to long-term population control program to maintain the deer density near a determined goal. With any technique, the cost per deer handled will increase as the proportion of the population removed or treated increases (Rudolph et al. 2000). High costs associated with diminishing returns may prevent achieving population goals with some techniques. Deer learn to avoid threatening situations, and the use of a variety of methods to capture or kill deer can help maintain program efficiency.

TRAP AND TRANSFER

Trapping and translocation requires the use of traps, nets, and/or remote chemical immobilization (i.e., darting) to restrain deer and shipping crates to translocate captured animals. Most deer immobilization drugs are classified as controlled substances, and their use requires U.S. Drug Enforcement Agency licenses. Capture and translocation has been demonstrated to be impractical, stressful to the deer handled, and may result in high post-release mortality. Deaths of translocated deer have been attributed to capture myopathy (Beringer et al. 1996), unfamiliarity with the release site, and encounters with novel mortality agents (Jones and Witham 1990, Bryant and Ishmael 199 1, Jones et al. 1997, Cromwell et al. 1999).

Even relocations over short distances result in greater rates of mortality and have the added negative result of most deer simply leaving their relocated area (Cromwell et al. 1999). Capture myopathy is a stress-related disease that results in delayed mortality of captured deer. O'Bryan and McCullough (1985) documented 85 percent mortality after one year for deer captured and translocated in California at a cost of $431 per deer. Other capture and relocation programs have recorded costs ranging from $400 to $2,931 per deer (Ishmael and Rongstad 1984, Drummond 1995, Ishmael et al. 1995, Mayer et al. 1995).

Trap and translocation programs also require release sites that can receive deer, and such areas are often scarce. An additional concern associated with translocation of deer, especially from an overpopulated range, is the potential for spreading disease. The presence of Lyme disease and tuberculosis in some areas of North America makes this a serious consideration. Also, tame deer often seek out comparable residential locations and may create problems like those identified at the trapping location (O'Bryan and McCullough 1988). Land use conflicts and disease concerns caused by relocated deer could lead to questions of liability.

TRAP AND EUTHANASIA

Capture with box traps, Clover traps, drop nets, or rocket nets followed by euthanasia has been assessed or considered in only a few locations (Jordan et al. 1995). This technique can be used in areas where there is a concern about the discharge of firearms or in areas with very high deer densities to complement a sharpshooting program. This method, however, is inefficient and expensive, with costs likely exceeding $300 per deer. Physical restraint and euthanasia of deer in traps is sometimes preferred over chemical means because it allows for the consumption of meat from the deer. Deer are greatly stressed, however, during the restraint phase of the capturing process (DeNicola and Swihart 1997).

SHARPSHOOTING

Several communities have employed trained, experienced personnel to lethally remove deer through sharpshooting with considerable success (Deblinger et al. 1995, Drummond 1995, Jones and Witham 1995, Stradtmann et al. 1995, Ver Steeg et al. 1995, Butfiloski et al. 1997, DeNicola et al. 1997c). Sharpshooting programs have shown a 70 percent deer density reduction on parkland, with a corresponding 31 percent increase in native plant diversity, and a 50 percent reduction of urban deer population in a community sharp shooting program. (Warren, 2011).

A variety of techniques can be used in sharpshooting programs to maximize safety, humaneness, discretion, and efficiency. The cost per deer for sharpshooting programs has varied, ranging from $91 to $310 per deer. The noise associated with discharging firearms after dark in suburban areas must be considered when developing a sharpshooting program. Often the negative public reaction to sharpshooting is minimal if firearms are fitted with suppressors. Also, public safety can be enhanced by having police or other uniformed officials responsible for shooting the deer and/or providing on site security.

The level of experience of the personnel involved and the program design should be thoroughly assessed. As for any population reduction method, the extent and distribution of access to deer on private or public property will directly affect program efficiency and outcomes. The following methods are recommended for sharpshooting programs: (1) use baits to attract deer to designated areas prior to removal efforts, (2) shoot deer from portable tree stands, around blinds, or from a vehicle during the day or night, (3) when possible, select head (brain) or neck (spine) shots to ensure quick and humane death, (4) process deer in a closed and sheltered facility, and (5) donate meat to food banks for distribution to needy people in the community.

Archery equipment has been used to remove deer in suburban areas, usually when firearms discharge was not permitted. Compound bows or cross bows with a minimum peak draw weight of 50 pounds are recommended. In one New York community only a few square miles in size, deer were shot at close range (10 to 15 yards) while feeding at bait piles, like the procedure described for sharpshooting. More than 500 deer were removed from this community using bow and arrows in less than two years.

CONTROLLED HUNTING

Another option in controversial management areas is the use of controlled hunts. (Ellingwood 1991). Controlled hunting is the application of legal, regulated deer hunting methods in combination with more stringent controls or restrictions as dictated by the landowner or elected officials. Controlled hunts have been successful in several locations (Sigmund and Bernier 1994, Deblinger et al. 1995, Kilpatrick et al. 1997, Mitchell et al. 1997, McDonald et al. 1998, Kilpatrick and Walter 1999). The potential for intervention and/or interference by activist groups is often high when using hunters to manage locally overabundant deer populations. Thus, in controversial situations where hunters are used, intensive involvement of state agency and law enforcement personnel is required. The site must be assessed and patrolled to minimize ingress by protesters, trespassers, and vandals. Costs for law enforcement personnel should be considered in the planning process. Examples of indirect costs affiliated with controlled hunts have ranged from $160 per deer harvested (Connecticut) to $622 per deer harvested (New Jersey) (Sigmund and Bernier 1994, Deblinger et al. 1995, Connecticut Department of Environmental Protection 1996).

Selection of hunting techniques will depend on local circumstances, including parcel size, deer numbers, problem severity, and the potential for conflict. Archery hunting for deer has the advantage of being a relatively discreet and silent activity. The limited shooting range for archery equipment, coupled with the tendency of archers to hunt from tree stands (which ensures a backstop for shots), makes archery hunting a safe and non-disruptive removal technique (Richter and Reed 1998).

Archery has the disadvantage of being less efficient at reducing deer density than firearms hunting because of lower success rates for bowhunters. Special archery seasons may be longer than firearm hunts to allow for sufficient deer harvest over time. The length of the hunt should be thoroughly evaluated if an area is closed to public access because of the incompatibility of archery hunting with other activities. An additional disadvantage, particularly on small parcels, is that even deer that are mortally wounded with an arrow can travel 100 yards or more before succumbing. In developed areas, this could result in fatally struck deer dying on adjacent properties.

When feasible, shotguns loaded with slugs should be used to maximize program efficiency and help ensure that management goals are attained. Shotguns should be equipped with rifle sights or a scope and a rifled barrel to help ensure accurate shot placement. Where legal, rifles are the firearm of choice in expansive rural areas.

RESTORING NATURAL PREDATORS

Predator restoration for deer control has limited applicability, particularly in urban and suburban areas, because of the potential, both real and perceived, for predator–human conflicts. This said, there are two instances where native predators, specifically bobcats, have controlled deer populations in more developed areas. One, Cumberland Island is a national seashore located in an exurban area near the Georgia-Florida border. The other is Kiawah Island, South Carolina – a heavily developed resort town.

Cumberland Island's deer herd and plant community was studied for a 15-year period before, during, and after bobcat restoration. Within a few years after bobcat restoration, deer herd abundance on the island decreased by about 50 percent, while the age and sex-specific bodyweights of deer increased significantly, reflecting a decrease in intraspecific competition. When data from vegetation plots collected before bobcat restoration was compared with data collected from the same plots nine years after bobcat restoration, the recovery of the plant community was evident with both oak sprout height and number of seedlings increasing significantly (Warren 2011).

Kiawah Island is developed as a residential and resort community with approximately 3,200 homes and condominiums. Ecotourism is an important attraction on site, and the Kiawah Island Conservancy works actively to educate residents and seeks to preserve the island's habitats. Bobcats were not extirpated from Kiawah Island, and they have adapted well to the island's 'environmentally friendly' pattern of development. A four-year study in which the survival of 134 radio-collared, white-tailed deer fawns on Kiawah Island was monitored showed the average annual mortality of the fawns was 78 percent, most of which (67 percent), were killed by bobcats. Bobcats generally avoid humans on the island, and most residents have adapted to them (Warren 2011).

In the near-term, predator reintroduction presents a difficult and complicated solution to implement. Predator reintroduction has shown promise as an effective deer management tool. It is highly likely that the reintroduction of natural predators would be accompanied by human-predator conflicts and elicit concerns around public safety.

Alternative Control Methods

FERTILITY CONTROL AGENTS

The applicability of immunocontraception to wild, free-ranging deer populations depends on the vaccine effectiveness, accessibility of deer for treatment, and site-specific birth, death, immigration, and emigration rates. As such, these methods may primarily be applicable to localized herds in isolated or fenced areas, and as much as 10 years of treatment may be required before a significant decrease in the treated deer herd occurs, as this decrease would result from natural mortality combined with reduced birth rates. Despite the relatively low cost of the immunocontraceptive vaccines, the labor necessary to apply them to deer populations can make immunocontraception programs very costly. Furthermore, regulatory authority for treating deer with immunocontraceptive vaccines requires both federal and state agency approval.

ANTIFERTILITY AGENTS

The two general categories of fertility control agents include: (1) drugs or vaccines that prevent conception (contraception) and (2) chemicals that are administered postconception to terminate pregnancy (abortifacient or contragestation).

STEROID CONTRACEPTION

Fertility control with steroids (i.e., synthetic progestins and estrogens) has been evaluated for controlling deer reproduction during the past 25 years. Orally delivered steroids have shown limited success in preventing deer reproduction (Matschke 1977, Roughton 1979). However, implants containing synthetic steroids have been effective in some studies (Matschke 1980, Plotka and Seal 1989, Jacobsen et al. 1995, DeNicola et al. 1997a). Regardless of proven efficacy, the FDA will not permit the use of steroidal agents on free ranging deer because of unresolved questions regarding, the effect of long term steroid exposure on deer, the impact of steroid treated carcasses on animals in the food chain, and concerns about steroid consumption by humans.

IMMUNOCONTRACEPTION

Immunocontraceptive vaccines control fertility by stimulating the production of antibodies against proteins and hormones that are essential for reproduction. The antibodies interfere with the normal physiological activity of these reproductive agents (Talwar and Gaut 1987). Immunofertility agents (e.g., Porcine Zona Pellucida) [PZP] and Gonadotropin Releasing Hormone [GnRH]) have been successfully employed to control reproduction in individual deer. (Turner et al. 1992, 1996; Miller et al. 1998).

The immunocontraceptive vaccine SpayVac has been shown to cause infertility for several years in a variety of mammals (http://www.terramar.bc.ca). The vaccine contains a protein (PZP; porcine zona pellucida) plus an adjuvant (designed to stimulate the immune response and increase the vaccine's efficacy). The adjuvant used in most early experimental trials with SpayVac was Freund's Complete Adjuvant (FCA), which uses proteins from mycobacterium to increase the potency of the vaccine. Injecting a female deer with SpayVac causes the doe's immune system to produce antibodies that attach to her own ova, thus blocking sperm binding and fertilization. Fraker et al. 45 showed that fallow deer (Dama dama) does treated with a single dose of SpayVac with the FCA adjuvant did not have fawns for at least three years. The US Food and Drug Administration has objected to the use of FCA because of possible adverse reactions in some individual animals that have received vaccines containing FCA. Therefore, vaccines containing FCA likely cannot be used in free-ranging wildlife species.

Alternatively, porcine zona pellucida (PZP) antigen is the core active ingredient of the ZonaStat-H, another contraceptive vaccine for use in wildlife. It is intended to provide an environmentally safe, effective, and humane means of regulating wildlife populations. While testing on deer has occurred, as labeled, ZonaStat-H is currently only approved by the FDA for use on wild horses and burros.

CONTRAGESTATION

One contragestation agent, prostaglandin (PGF2(x), has proven to be both safe and highly effective in white tailed deer (DeNicola 1996, DeNicola et al. 1997b). Risk to secondary consumers is minimal because PGF2(x) is metabolized readily in the lungs of treated animals. (Piper et al. 1970). In addition, prostaglandin can be remotely delivered using the biobullet delivery system.

A limited number of delivery methods are available for antifertility agents. The usefulness of each depends on the site conditions, deer behavior, MDNR permitting and number of deer to be treated.

SURGICAL STERILIZATION OR IMPLANTATION

Implantation is effective, but it requires animal restraint and is stressful to the treated animal, time consuming and costly (Eagle et al. 1992, Garrott et al. 1992). Surgical sterilization by implants or tubal ligation has been evaluated (Plotka and Seal 1989), however, this approach has significant limitations because of the effort required to capture and handle individual deer. This method may be practical in small (less than two square miles), isolated or enclosed parks, arboretums, and corporate complexes with few deer and thus is not practical for HCMA as deer populations are free ranging and vast.

REMOTE DELIVERY

Antifertility agents have been administered using darts and biobullets. Biobullets are biodegradable hydroxypropyl cellulose and calcium carbonate projectiles used to administer antifertility agents, vaccines, anthelminthics, antibiotics, and immobilization agents (Herriges et al. 1991, Jessup et al. 1992, DeNicola et al. 1996). The biobullet system allows for the remote delivery of intramuscular treatments. Remote delivery reduces the probability of direct consumption of fertility control agents by non-target species. The limited life expectancy of implants, the expense involved in treatment, and the difficulty of treating an adequate portion of the herd suggests that large scale implant programs would be impractical, yet remote delivery may have value in controlling small, isolated deer herds. As the deer herds within the Metroparks are large and free ranging, this method is not practical for utilization at this scale.

ORAL APPLICATION OF ANTIFERTILITY AGENTS

To allow for practical application of fertility control agents to larger populations or areas (two square miles or more), it will be necessary to develop an oral delivery system. Presently no orally active, nonsteroidal, antifertility agent is available. Additional major obstacles to oral contraception in deer include dosage control absorption of active agents, and ingestion of bait by non-target wildlife. Based on these concerns and past studies, much research is still required before an oral antifertility agent becomes available. Even where they to become available, the transitory nature of deer and the landscape context of HCMA properties would make this method of control impractical. Additionally, the method of delivery for orally applied antifertility agents is troublesome as it conflicts directly with the state of Michigan’s moratorium on supplemental feeding or baiting and would require that herds congregate and exchange saliva to ingest these agents.

CONCLUSION: NOT EFFECTIVE

In conclusion, there is no evidence to date that supports fertility control alone as a method to sufficiently reduce free-ranging deer populations. To date, no study has shown fertility control efforts to impact plant growth or changes in plant communities. As the restoration and preservation of ecological functionality of these habitats is the goal of this deer herd and ecosystem management plan, this method alone with be insufficient.

In studies utilizing Querus rubra (Red Oak) as an indicator species for browse pressure, there was no evidence that fertility control was a viable tool for reducing herbivore populations or browse rates on Querus rubra seedlings in a fragmented suburban landscape. Despite a greater than 90 percent doe sterilization rate and near elimination of deer fawns in studied sterilization zones, deer populations remained stable due to immigration. These results offer no support for fertility control as a means to reduce deer browsing pressure (Blossey Curtis, Boulanger, and Davalos, 2019). The cost of labor and materials and the practicality of treating an adequate number of deer limit the use of immunocontraceptives to small insular herds that are habituated to humans (Curtis et al. 1998, Walter 2000, Rudolph et al. 2000). Furthermore, with low annual mortality rates for suburban deer, as well as immigration, populations will remain at high levels even with the initiation of a contraception program.

REGULATORY AND PERMIT REQUIREMENTS FOR ANTIFERTILITY RESEARCH

Antifertility agents for wildlife are not commercially available. All antifertility agents are currently classified as experimental drugs and are only produced in a few research laboratories. Experimental drugs can only be administered to deer following U.S. Food and Drug Administration (FDA) guidelines. A federal Investigational New Animal Drug permit and state or provincial wildlife agency approval are necessary to capture or treat any deer with drugs. Consequently, in North America, treatment of deer with contraceptive vaccines is only being conducted in research projects by universities, state and federal wildlife agencies, and the Humane Society of the United States. The FDA has concerns about the safety of consuming deer treated with experimental drugs and currently requires that all treated, free ranging deer be marked with warning that stipulate consumption restrictions. It is not clear if or when FDA restrictions on consumption of deer meat treated with experimental drugs will be modified. In addition, fertility control agents are usually delivered to deer using either dart rifles or biobullets. Restrictions on firearms discharge in suburban areas often limits practical delivery of drugs to free ranging deer. Consequently, there are many aspects of the regulatory and delivery systems effectively that still need to be developed before contraceptive vaccines can be a viable management alternative for communities with overabundant deer herds.

Vegetation Surveys

Multiple studies (Shelton 2014, Rawinski 2014, Waller 2014) note that deer overbrowsing can change forest habitat by reducing tree reproduction, changing tree species composition, reducing the abundance and diversity to herbaceous understory species and reducing the habitat of canopy-nesting birds. Other studies demonstrate that overbrowsing also contributes to the decline of several bird and butterfly species. (Cutright & Kearns 2005, Casey and Hein 1983, Miller et al. 1992, deCalesta 1994, McGuinness & deCalesta 1996). Consistent with this current ecological literature, park officials had noticed the effects of overabundant deer since the 1980s. In response to these concerns, the HCMA installed several vegetation enclosures (deer exclosures) in Kensington Metropark in 1996, to help quantify the loss of habitat. After two years, the data collected from these plots strongly suggested that deer browsing was affecting species diversity and density of local plant types. Vegetation density in exclosures was estimated to be three times greater in exclosures than the control sites.

Subsequently, additional vegetation enclosures (deer exclosures) were installed throughout the park system. An initial study (Courteau, Nov. 1998) detailed the methodology of this sampling process. The survey concluded that “the Kensington Metropark deer exclosures shows a pattern of higher species diversity and density where vegetation has been protected from browsing deer for two seasons” and that “data on browse damage and mortality clearly demonstrate the extent of deer browsing and its correlation with seedling mortality. These data comprise the strongest direct evidence that deer are, indeed, over browsing vegetation past the point of recovery, in some cases.” Additional research goals (Courteau 1999 & 2000) have since been established to further compile quantitative scientific data.

As an example, in 2002, at one exclosure site, 23 trillium were recorded inside the exclosure with none documented in the surrounding area. By 2013, trillium carpeted the interior of the exclosure. In 2021, an observation sheet at the same exclosure indicated 200-300 trillium inside with only 10 trillium plants in bloom outside of the exclosure. Although, the blossoms are difficult to see in the photo below, what can be seen is the browse evidence. More greenery is evident inside the exclosure as compared to the adjacent area outside.

(Kensington Deer Exclosure 2013)

(Wildwing Deer Exclosure 2021)

For this reason, interpretive staff records their findings on the observation sheet. See an example of an observation sheet on the next page. It should also be noted that staff marked “Yes” to the question “Obvious browse line present outside exclosure as compared to inside?” As browse line is defined as the boundary between upper normal plant growth and lower stripped and eaten-back growth that indicates the height reached in feeding by the larger browsers (animals that eat plants) (Merriam Webster).

The need for management at new sites is determined on a continuous basis where significant browse damage is observed. Where this damage is observed, a deer exclosure would be installed to determine the level of browse pressure the deer population is putting on vegetation. As of the update of this document in fall of 2021, additional exclosures are scheduled for installation at Dexter-Huron and Delhi Metroparks where browse damage has been observed and reported.

This ongoing data collection process will continue to aid the HCMA in its management decisions and to assess the effectiveness of its policies regarding deer management in the Metroparks.

Kelsey Lang
Stephanie Kozak

Deer Exclosure Floristic Observations Data Sheet Name of Observer Aubrey Gauthier

(see attached completion instructions for explanatory information before completing form)

Park Name: Kensington Exclosure ID Name: wildwing Date: 5/8/2021

1. Exclosure placed in expected deer-use area (check one): ___ Marginal, X Good, ___ Excellent
2. Obvious Browse Line present outside Exclosure (Exc.) as compared to inside? Circle (Y/ N)
3. Photo-recording: If obvious difference between inside and outside Exclosure vegetation is apparent, please provide a digital photo of Exclosure effect. Photo collected: Circle (Y/ N)

Character	% Cover or % Browsed (mark box with "x")						
	0	0-5 very little	6-35 < half	36-64 about half	65-94 > half	95-100 a lot	100
Overall Inside Exc. Ground* Green				X			
Overall Outside Exc. Ground Green				X			
Woody plants 2-6 ft. tall Leaf Cover Inside				X			
Woody Plants 2-6 ft. tall Leaf Cover Outside			X				
Plants Inside w/Browse Evidence	X						
Plants Outside w/Browse Evidence					X		

* "Ground" - Green herbaceous plant cover present, approximate 2 ft. height or less

4. List Plant Species viewed exclusively Inside Exclosure, but not Outside (any outside area in view, not just "Control"* area)

Plant Name	Number of Plants noted inside (mark box with "x") 0-5	6-30	Numerous
none			

Contact Natural Resources Dept. asap if you see exclusive plants and are unsure of identification

5. List Plant Species Obviously Different in Numbers Present Inside vs. Outside Exclosure, using the comparable 8 ft. Control* perimeter outside typical exclosure

Plant Name	# Inside Exc.**	vs.	# Outside Exc.**
Trillium	200-300	vs.	10
wild geranium	500	vs.	100
		vs.	
		vs.	
		vs.	

** enter: approximate # counted (if <30), or ranges "30-100", ">100", ">(you select even larger #)"

Contact Natural Resources Dept. asap if you see obviously different plants #s and are unsure of identification

6. If no species are listed in 4. or 5., please mark & complete one:

N/A	I noticed no obvious Exclosure effects
___	I contacted (enter name)___________ at NR Dept for help

Note any maintenance or other issues with Exclosure Multiple trees down on fencing. See photos.

Note any General Observations such as improved or diminished vegetation character throughout the Park (attach additional sheet if desired). N/A

Deer Exclosure Data Recording Form and Instructions (double-sided)

Deer Population Surveys

Several methods have been used in assessing the population of deer throughout the Metropark system:

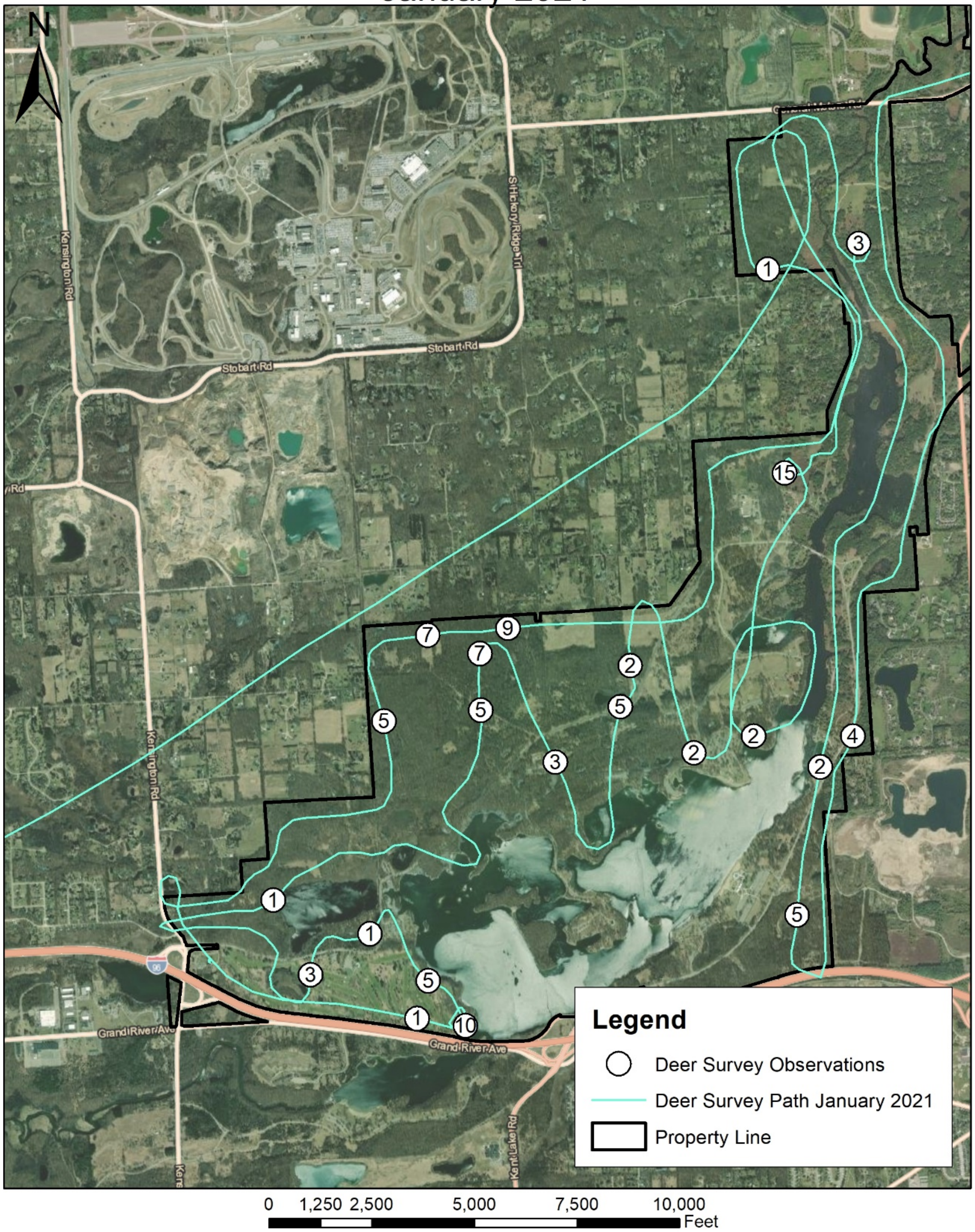
- Aerial (helicopter) surveys – This method consists of several people (typically 4) flying over the park and visually counting deer. Optimal conditions for this method are after several inches of snowfall.
- Infrared surveys – In this method, a plane equipped with an infrared camera mounted on the underside of the plane flies over the park at night. The camera detects the heat generated from the deer and other heat-producing objects and animals. Measurements and calculations identify deer from other animals. This method is best done when the weather has turned cold and after the leaves have fallen off the trees.
- Visual monitoring – Metroparks staff drive designated routes and count deer on a regular basis throughout the year. This information will continually be gathered and assessed to see what, if any, trends develop.
- Vegetation Monitoring – Used as a proxy for deer populations, vegetation monitoring allows HCMA to assess the impact deer are having on a given ecosystem.

The actual number of deer within an area is difficult to determine. Numbers change daily as deer move throughout their natural range. Surveys typically reflect only a percentage of the population but produce valuable baseline population estimates of the approximate deer density. Visual monitoring provides a relative index as an indicator of deer densities or changes in deer abundance. It is also useful in the planning process to estimate deer populations when an actual survey is not feasible. This estimating process is conducted in a consistent, scientific manner using the most recent survey data available.

Deer concentrations are surveyed at least every five years in order to set management goals for the individual parks and determine necessary actions. Several methods have been used to gather this data. The most efficient survey method used is by helicopter. This method has been used since the beginning of the program. Surveys are typically conducted in January or February with sufficient snow cover (6-inch +) to provide good visibility. Three spotters plus a pilot fly approximately 1/8-mile-wide transects across the parks at a height of 500 to 700 feet depending on conditions.

Vegetation monitoring is ongoing and recorded on an annual basis. Differences in vegetation are observed at each exclosure. Most sites in 2020 noted an increase in wildflower or sapling abundance within exclosures, with several sites showing key species present only within exclosures, and absent outside.

Kensington Metropark
Aerial Deer Population Survey
January 2021



* Number on observation point indicates number of deer observed.

The survey data is used in a population model to predict the herd size the following year. Indications are that approximately 80 percent of the deer are counted during aerial surveys. The 20% error is not factored into the prediction models, so actual population estimates are undoubtedly conservative. In general, a population density of between 15-20 deer per square mile is the preferred carrying capacity for habitats within the Metroparks. The MDNR population density threshold is between 15-20. In 2021, population densities averaged 19.5

deer per square mile with the highest density at Oakwoods Metropark with 48 deer per square mile (last surveyed in 2017).

Other Agency Control Methods

HCMA staff continues to monitor the management experiences of other agencies to help determine the efficacy of using various methods in managing deer within the Metroparks.

The list of agencies below is not exhaustive, but it gives an idea of the breadth of this park management issue. Metroparks has been in direct contact with many of these agencies to get their help and advice. Some have provided in-depth management reports that are available upon request.

Other Agencies	Management Type
1. Oakland County Parks Commission	Controlled firearms hunts at Addison Oaks Open bow hunting at several other parks
2. Indiana State Parks	Controlled firearms hunts in several parks
3. Hennepin Regional Park District (MN	Controlled shotgun and archery hunts; Sharpshooting in one park
4. Cleveland Metroparks (OH)	Sharpshooting
5. Lake County Forest Preserves (IL)	Sharpshooting
6. Columbus and Franklin County Metroparks (OH)	Controlled public hunts, sharpshooting, trap and transfer
7. Milwaukee County Parks (WI)	Sharpshooting
8. Milwaukee Zoo (WI)	Sterilization
9. Cook County Forest Preserve (IL)	Sharpshooting
10. Dupage County Forest Preserve (IL)	Sharpshooting

11. Chippewa Nature Center (MI)	Controlled bow hunting
12. Morris County Parks (NJ)	Controlled hunts
13. Hunterdon County Parks (NJ)	Controlled hunts
13. Watchung State Park (NJ)	Controlled hunts, sharpshooting
14. Tyler State Park (PA)	Controlled hunts
15. Eden Prairie (MN)	Sharpshooting
16. Briarcliffe Acres (SC)	Sharpshooting using arrow gun
17. Missouri Department of Conservation	Controlled public hunts in urban area
18. City of Ann Arbor	Sharpshooting*

* Notates no current herd control effort in effect in 2021.

Historical Program Performance

In 1998 it was determined by the Metroparks Wildlife Management Advisory Council (MWMAC) that a variety of control measures should be instituted for two years to help determine the best method to harvest deer. Controlled deer harvests at Stony Creek using both firearms and archery were conducted by qualified volunteers from Metro Wildlife Management Base Inc. (MWMBI) in 1999. Archery was used exclusively by MWMBI at Hudson Mills in 1999. Only firearms were used by MWMBI at Stony Creek and Hudson Mills in 2000/2001. HCMA police officers trained as sharpshooters were used in reducing the herd in Kensington Metropark in both 1999/2000 and 2000/2001.

Over the lifetime of the Program, the Metroparks Natural Resources Division has determined that the efficiency of control measures vary from park to park, and staff continue to work toward utilizing the most efficient and cost-effective method available as allowed through MDNR permits. The focus of this effort is to reduce the population by taking primarily antlerless deer. Antlered deer may be taken when part of a group of antlerless deer, however all antlers must be given to the MDNR.

As of 2021, 4,200 deer have been removed from the Metropark system. In total, more than 183,000 pounds of venison was distributed to food banks throughout Michigan, providing more than 580,000 meals to those in need. The Michigan Sportsmen Against Hunger program have sponsored the cost of meat processing each year for the entirety of the program. Totals are provided in the table on next page. Success at harvesting the determined number of deer is variable and dependent on weather conditions including snowfall and temperature.

HCMA Deer Removal

Year	KENSINGTON	STONY CREEK	HUDSON MILLS	LOWER HURON	INDIAN SPRINGS	OAKWOODS	LAKE ERIE	WILLOW	HURON MEADOWS
	Park								
1999/00	246	122	32	-	-	-	-	-	-
2000/01	93	96	58	-	-	-	-	-	-
2001/02	110	218	73	-	89	-	-	-	-
2002/03	33	82	35	-	37	91	-	-	47
2003/04	51	127	24	-	32	56	-	47	3
2004/05	44	139	30	-	12	44	-	6	5
2005/06	68	128	26	-	29	34	-	22	2
2006/07	37	93	-	-	34	18	-	25	-
2007/08	-	-	-	-	-	-	-	-	-
2008/09	62	18	-	15	26	26	-	4	-
2009/10	33	105	8	1	34	22	-	15	-
2010/11	27	-	-	1	22	24	-	13	-
2011/12	21	21	-	-	25	20	-	-	-
2012/13	30	21	-	-	16	21	-	-	-
2013/14	2	16	11	-	8	10	-	-	-
2014/15	16	22	30	-	-	30	27	-	-
2015/16	35	34	13	-	10	-	25	-	-
2016/17	21	41	-	1	-	31	-	-	-
2017/18	45	41	39	-	18	30	-	38	-
2018/19	-	28	-	-	27	70	-	-	-
2019/20	64	28	-	-	34	42	-	31	-
2020/21	-	-	-	-	-	53	-	-	-
Total	1038	1380	379	18	453	622	52	201	57
Combined total	4200								

SAFETY

Regardless of the harvesting technique utilized, safety has always been of utmost importance. In years past, prior to each controlled hunt, qualified volunteers participated in an orientation which reviewed hunting and safety procedures, state regulations and HCMA requirements. For the hunt, volunteers were placed in specific predetermined locations throughout the management area. Locations were spaced apart and shooting zones established to provide safety to the participants, employees, and the surrounding landholders. Participants were allowed to take animals only within the shooting lanes specified. Once placed at a location, the volunteers were required to remain there until Metroparks staff picked them up. Other hunting techniques have been explored and are possible, and each specific technique is thoroughly reviewed and approved by the HCMA prior to initiation.

Today, deer culling is performed primarily by specially trained Metroparks Police Officers. Occasionally, specially trained volunteers are used to assist with deer management at Indian Springs Metropark. Recreational hunting activities are permitted within state parks, some of which are adjacent to Metropark locations. Recreational hunting is not a viable option within the Metropark system.

The Metropark sharpshooting team is comprised of trained marksman led by a coordinating unit leader. The unit leader is responsible for directing other park rangers to secure areas of the park prior to harvesting operations, assigning the shooting teams and support vehicles to the culling site, and dealing with public incidents. Each officer is in constant radio contact with all other members of the team and the unit leader.

Shooting typically takes place from a platform over a baited area, assuring a downward trajectory of the shot. As of 2021, the MDNR bait ban applies to all recreational activity and Deer Management Assistance Program (DMAP) Permits. These programs apply to the regular Michigan Deer Hunting season and are based off rules that vary from Oct. 1 – Jan. 31. The out-of-season permit typically issued to the Metroparks allows for the use of firearms outside of the season guidelines and allows the use of bait during the period Feb. 1 – 29. Baiting under the permit outlines the use of limited bait in a limited scope as an exemption to the regular season baiting ban.

All state mandated safety distances from occupied dwellings are adhered to as a minimum. With both culling methods, shots are placed toward the interior of the park, away from park boundaries, roadways, areas of the parks still open to the public and private property.

Park closures will be planned to ensure community safety during all planned hunts. Additionally, any threat made against members of the Metroparks team or others participating in culling activities will be turned over to local law enforcement.

ANIMAL HANDLING

Animals taken during the culling process are tagged and the sex and location where the animal was taken are documented as required by MDNR/HCMA. The animals are promptly taken back to a designated building where they are dressed out, and when required by the MDNR, biological data is taken. Animals are transported to a food processor approved by the MDNR and Michigan Department of Agriculture and Rural Development for final processing. The Michigan Sportsmen Against Hunger program and other sportsmen volunteer organizations have regularly assisted in covering the cost of meat processing and distribution of the venison to area food banks.

BIOLOGICAL DATA

Biological data is taken from the deer during the Metropark deer culls. Initially, this included the age, sex, and weight of the animal as well as blood samples, fat analysis and the observance of any parasites. Preliminary analysis from the MDNR indicated nutritional stress and herd productivity less than would be expected for a healthy well-fed deer herd in southern Michigan. Evidence of deer ticks was not found in a study conducted by the Oakland County Public Health and the Michigan Lyme Disease Association. Data continues to be collected including age, sex, weight, and reproductive rates.

PUBLIC INFORMATION

HCMA understands and appreciates the wide range of passionate viewpoints this issue evokes. Metroparks is committed to the transparent sharing of information and creating awareness that all options are continually being weighed and available data carefully assessed.

Knowing discussions of wildlife management can be controversial, both from the aspect of controlling deer populations or from not being proactive enough to reduce deer damage to the parks' ecosystems, Metroparks has instituted a process to provide the public with the information gathered from the MWMAC data.

Public informational meetings have been held, as well as meetings with local officials. The public also has opportunities to express their opinion at regularly scheduled monthly HCMA Board of Commissioners meetings.

All public inquiries related to wildlife management at the Metroparks should be directed the Metroparks Deputy Director.

2022 - 2026 DEER HERD AND ECOSYSTEM MANAGEMENT PLAN

Introduction

Managing white-tailed deer populations within the Huron-Clinton Metroparks is a necessary part of managing the parks for the foreseeable future. As stewards of the parklands, if we are to repair and preserve the biodiversity within the parks, as well as maintain the health of the deer themselves, we must have a plan and processes for how we preserve deer herds and protect the ecosystems that sustain them. We see this as a necessary part of doing business.

The Metroparks continue to build on the original research work of the Metroparks Wildlife Management Advisory Committee, as well as on 20 years of active management experience and the review of new research and information gathered on an annual basis. The first two years of managing deer showed that deer can be safely and efficiently removed using various lethal methods. Since then, it has been determined that depending on the physical properties or constraints of the park, weather conditions, and volunteer availability, a combination of these methods should be considered to efficiently control numbers.

Assessment of deer populations using various survey techniques and monitoring of changes in the flora within the parks will continue throughout the program. Working with interested groups, staff will continue to research and evaluate the possible use of nonlethal measures and deterrents such as vegetative management strategies, repellants or fencing, which will all be considered under certain situations in this integrated strategy.

Management Goal

The goal of the plan to preserve and manage wildlife within the Metroparks is to maintain the biodiversity within the Metroparks, while maintaining a visible, healthy deer herd. As responsible stewards and managers of the natural resources within the Metroparks, HCMA is committed to maintaining healthy, natural ecosystems that support a diversity of flora and fauna for park guests to study and enjoy today and in the future.

Methods of Analyzing the Need to Control Deer Populations

The decision to actively control deer in a particular park will be based on deer population assessments and on the condition and changes in flora and fauna of that park. Deer populations will continue to be assessed by using aerial counts from a helicopter and/or infrared survey from a plane depending on climatic and snow-cover conditions. Sample surveys along park roads will no longer be conducted as they have been found to be the least accurate method. Aerial counts will be done at least every five years or in compliance with MDNR permit requirement to establish reliable population trends.

Vegetation surveys will continue to be conducted, and flora changes will be analyzed by monitoring the deer exclosure plots and control plots that exist in the parks. Established HCMA protocols for vegetation monitoring as well as photo monitoring will be utilized at points selected in various habitats of the parks. Plant flowering records and anecdotal reports compiled by the parks' interpreters and other park staff will also be compiled and analyzed.

The above metric will serve as a proxy for the biological carrying capacity (BCC) of an ecosystem which is the number of deer that the system can support over an extended period without damaging that habitat beyond its capacity to recover or without changing its character. Social Carrying Capacity (SCC) is defined by both the maximum and minimum population sizes society will tolerate. That is, society may not tolerate too many deer, but it may not tolerate too few either. SCC is also defined by the interactions between humans and a wildlife species. A SCC for deer is defined by the level of abundance and interactions acceptable to enough stakeholders such that there is a low level of deer-related issues (Minnis and Peyton 1995).

The Metroparks Wildlife Management Advisory Committee (MWMAC) originally set a general Social Carrying Capacity for the Metroparks at 20-25 deer per square mile. Many wildlife biologists and ecologists recommend a Biological Carrying Capacity of between 15-20 deer per square mile. The MDNR also recommends a population density of 15-20 per square mile. It is also recognized that land use, vegetation and deer population levels are not uniform throughout a park and the biological carrying capacities vary throughout the park. Given both the SCC and BCC goals, the Metroparks general recommendation is to work toward a stable goal of 15–20 deer per square mile.

HCMA will consider actively controlling deer in a park when:

- Population assessments show the density is greater than 15-20 deer per square mile;
- Flora monitoring by HCMA professional Interpreters and staff, and analyzed by Natural Resource Management staff, indicates that deer browsing is damaging the vegetation beyond its capacity to recover;

- When available, biological data collected on park deer indicates that the deer population is under nutritional stress.

The focus of the management effort is to reduce the population by taking primarily antlerless deer. As outlined in the MDNR permit, antlered deer may be taken when part of a group of antlerless deer. Individual animals that are recognized to be unique, unusual, or uncommon and hold value either biologically or socially, will not be targeted. These unique individuals, recognized as bringing added value to the Metroparks, will be protected for the public interest and enjoyment, or environmental/genetic diversity, unless determined by the Metroparks and/or MDNR to be detrimental to public or environmental (including deer or other plant or animal species) health, safety, and welfare.

Methods of Controlling Deer Populations

Currently, lethal removal of deer is the only practical way of controlling deer populations within the Metroparks. Based on research conducted regarding methods for controlling deer populations in the Metroparks nonlethal methods would not be effective in reducing deer populations given the large size of the parks, the parks' open borders, the large numbers of deer, and the current state of technology of nonlethal methods such as immunocontraception, and sterilization. Additionally, all control methods must be approved by the MDNR via a permit. The MDNR has not previously approved immunocontraceptives, and while it has previously approved sterilization as a limited case study, it does not authorize this method as a means of control broadly.

Read more at
https://www.michigan.gov/documents/dnr/Sec._401149_PA_390_of_2018_Preliminary_Report_on_Sterilization_of_Game_in_Michigan_122120_711201_7.pdf

An integrated management strategy using the various forms of both nonlethal deterrents as well as the lethal removal methods that were successfully implemented in the first two years of active management at Kensington, Stony Creek and Hudson Mills Metroparks. Sharpshooting has proved to be safe, efficient, and effective in decreasing deer numbers. Modifications in methods of administering the sharpshooting operations and in making personnel assignments for them, along with continued volunteer help, are expected to make the operations more effective and cost efficient.

Plan Implementation

The deer numbers in several parks continue to remain above the desired level of 15-20 deer per square mile, but all indications are that the remedial effect of current management efforts on the parks' flora are very promising. Therefore, an integrated management strategy using a combination of control techniques including the mixture of lethal control methods employed should be continued to be used with the objective of reducing the population densities in any park requiring deer management to 15-20 deer per square mile.

Trained HCMA sharpshooters, and on occasion specially trained volunteers, will continue to be used to cull deer during the early winter months, after the statewide hunting season has closed, including parts of Kensington where hunting is not allowed due to Milford Township ordinances, as well as in other parks.

The safety of the public, volunteers, participants, and employees will remain the highest priority. All safety procedures, guidelines, state regulations and proficiency testing for volunteer participants as outlined in the current program will be strictly adhered to. Any deer removed under special permits issued to the HCMA by the MDNR will continue to be donated to area food banks. Animal handling and processing procedures as outlined in the current program will continue. Active support from area volunteer organizations will continue to be sought to help defray the costs of processing the meat.

As before, parks will be kept open to the public for general use as much as safely possible while these control measures are being implemented. All parks will continue to be monitored and active management strategies will be considered for implementation using the criteria mentioned earlier. All necessary permits will be obtained from the MDNR before any deer management is implemented. Roles and responsibilities of specific staff members, staff scheduling, and processing procedures, as outlined in the HCMA Deer Management Cull and Processing Procedures, 2008 shall be followed. Those procedures are outlined in Appendix I.

Plan Evaluation

The effectiveness of the Deer Herd and Ecosystem Management Plan will be evaluated every five years using the methods of analyzing stated previously. The methods used to control deer will also be evaluated and compared annually using criteria including:

- Safety of the procedure
- Number of deer taken compared to the goal set for the park
- Cost to the HCMA per deer
- Number of days the park, or part of the park, is closed to other uses while control methods are implemented
- The "loss rate" of deer
- Reaction and comments by participants
- The number of volunteers and volunteer hours the method generates

Use of Sharpshooters

Only Metroparks Police Officers or specially trained volunteers are permitted as sharpshooters and only those officers or specially trained volunteers specifically listed under the MDNR-issued permit can serve as authorized sharpshooters. All procedures and protocols as outlined under the issued MDNR permit and the Metroparks Police Department Policies & Procedures Manual will be strictly followed. Failure to follow sharpshooter protocols and procedures, may result in the removal of the officer from the sharpshooting team and disciplinary action up to and including termination.

TRAINING OF SHARPSHOOTERS

Training of HCMA police officers as sharpshooters for use in deer management at the Metroparks takes place annually. The stated goals and objectives of this training are as follows:

- Safety and operating system of the rifle is the number one concern
- Safe functioning of the firearm system
- Maintenance requirements of the firearm system
- Specialized shooting skills required
- Shot placement

Officers are trained to treat all guns as loaded. They are taught to keep their fingers off the trigger and outside of the trigger guard with the safety on until they are aimed at the target and ready to shoot. Lastly, they must positively identify their target and any potential hazards behind their target. Officers must wear personal protective gear whenever using firearms.

REMEDIAL ACTION

If any officer is unable to comply with safety and program rules as they relate to deer herd control the following remedial actions will be taken. This plan is adopted from the Metroparks Police Handbook section 8-1, specifically sub-section N. This handbook also contains additional safety and training information that is required for all Metroparks police officers (Section 8-1 - E.1.a.i, F.1.a i-v and c.i-iii, K, and L and Section 8-2).

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APPENDIX 1: DEER HERD AND ECOSYSTEM MANAGEMENT PLAN PROCEDURES

Introduction

The population of white-tailed deer has increased dramatically throughout southeast Michigan including the Metroparks system. This growth can be attributed to many factors including the deer's own high reproductive rate, the absence of natural predators and the restriction of open hunting on park property. At high densities, deer have placed a heavy burden on the natural communities by reducing species diversity of both plants and other wildlife as well as impairing forest regeneration.

As responsible stewards and managers of the natural resources within the Metroparks, it's imperative to maintain the natural environments in a manner that supports a diversity of flora and fauna for park guests to enjoy and study, now and into the future. To accomplish that aim, the HCMA board initiated a management plan to control white-tailed deer populations back in 2001. Through the review of best practices, research and experiences with managing wildlife at the Metroparks, that plan has evolved in its efforts to preserve biodiversity within the Metroparks, while maintaining a healthy, visible deer herd, and to do so in a safe, humane and efficient manner.

These procedures are intended to serve as a guiding document. They are subject to change as necessary in order to comply with any permitting changes, staffing changes, environmental conditions or as otherwise required.

Purpose

To actively manage the Metroparks white-tailed deer population using a variety of control measures in order to promote biodiversity within the park system, while maintaining a healthy visible deer herd and to do so in a safe, humane and efficient manner.

Scope

All HCMA Metroparks.

Responsibilities

CHIEF OF POLICE OR DESIGNEE

- To ensure public safety and the safety of Metroparks employees during deer management operations.
- In cooperation with the Chief of Natural Resources and Regulatory Compliance, to facilitate the organization of sharp shooting activities, determine dates and times of sharp shooting and the utilization of police and park staff during culling operations.
- To ensure that park facilities are secured from the public, and Metroparks employees who are not involved in the cull or processing operation, during scheduled culling operations such as shooting zones, and the processing warehouses.
- To be responsible for all sharp shooting field operations to ensure all deer are taken in a safe and humane manner.
- To oversee sharp shooting transport teams to ensure all deer are removed as to minimize any public attention to the program.
- To maintain permits for Michigan special weapons training for police staff involved in sharp shooting activities, and all other permits or certification required to maintain sharp shooting operations.

DISTRICT PARK SUPERINTENDENT

- Schedule or assign employees as necessary for deer management operations.
- Notify park personnel of scheduled times and dates of controlled hunts, sharp shooting activities and related processing activity.
- In cooperation with the Chief of Natural Resources and Regulatory Compliance, to facilitate the assistance of volunteer organizations, determine dates and times of controlled hunts and utilization of park staff during culling operations.
- In cooperation with the Chief of Police or designee, to prepare park for controlled hunts or sharp shooting activities by closing the park in order to facilitate the cull without jeopardizing public safety.
- To ensure that park equipment, facilities and other required resources are available and properly equipped for deer management operations including hunter / sharpshooter support, transportation, processing and waste disposal.
- Re-schedule or reassign any employee whose work area may be adversely affected by deer management operations.
- To notify all adjacent property owners and the local municipality of the intent of the Metroparks to conduct deer management operations.

- To track all employee and equipment costs associated with deer management activities and submit that information to the Deputy Director as requested.

CHIEF OF NATURAL RESOURCES AND REGULATORY COMPLIANCE

- To work with the Michigan Department of Natural Resources (MDNR) to establish specifications and guidelines and to secure permits each year for controlled hunts and sharp shooting operations.
- To produce population estimates / survey data to establish animal reduction goals.
- In cooperation with the Chief of Interpretive Services and the MDNR, to prepare and conduct annual population surveys and collection of bio-data.
- In cooperation with the Chief of Interpretive Services, to establish guidelines for and conduct vegetative surveys throughout the park system.
- To collect data, track trends, provide accounting of permits and process and prepare activity reports as required by the MDNR.
- In cooperation with the District Park Superintendents, to facilitate the assistance of volunteer organizations, determine dates and times of controlled hunts and utilization of park staff during cull operations.
- In cooperation with the Chief of Police or designee, to facilitate the organization of sharp shooting activities, determine dates and times of sharp shooting and utilization of police and other park staff during cull operations.
- To facilitate and oversee all controlled hunting and sharp shooting activities, cleaning and disposition of deer and other related activities.
- To prepare and present annual Deer Management Report to the HCMA Board of Commissioners as determined by the Director.

CHIEF OF INTERPRETIVE SERVICES

- In cooperation with the Chief of Natural Resources and Regulatory Compliance and the MDNR, to assist in annual population surveys and collection of bio-data.
- In cooperation with the Chief of Natural Resources and Regulatory Compliance, to establish guidelines for and conduct vegetative surveys throughout the park system and to submit reports for analysis to the Chief of Natural Resources and Regulatory Compliance and Deputy Director.
- In cooperation with the Chief of Natural Resources and Regulatory Compliance, to provide data and information to promote biodiversity within the park system.
- In cooperation with the Chief of Natural Resources and Regulatory Compliance, develop and maintain an educational component from the culling activities, so as to help the people of southeast Michigan gain a better understanding of objectives and long-term benefits of this stewardship plan.

Procedures

SCHEDULING

- The District Park Superintendent, in cooperation with the Chief of Natural Resources and Regulatory Compliance, the volunteer sportsman organizations and as approved by the Director, will determine dates and times of controlled hunts and utilization of park staff during culling operations.
- The Chief of Police or designee, in cooperation with the Chief of Natural Resources and Regulatory Compliance and as approved by the Director, will determine dates and times of sharp shooting and the utilization of police and park staff during culling operations.
- The scheduling of Metroparks police officers participating in the sharp shooting operations is the sole responsibility of the Chief of Police or designee.
- The scheduling of employees as support personnel is the sole responsibility of the District Park Superintendent. Those individuals involved in hunter drop off/pickup, assist in animal recovery, animal processing and transport are considered support personnel. Support teams will be comprised of no more than two employees per transport truck for recovery and transport activities.

NOTIFICATION

- The District Park Superintendent will coordinate public notification with the Chief of Marketing and Communications to ensure notification messaging aligns with the Metroparks brand guidelines and messages are stated in a manner that considers public sensitivities and provides links or access to additional information.
    - Public inquiries related to deer culling should be forwarded to the Metroparks Deputy Director.
    - All media questions should be referred to the Chief of Marketing and Communications who will then determine who best to respond.
- The District Park Superintendent will notify all immediately adjacent property owners and the local municipality of the intent of the Metroparks to conduct deer management operations no less than two days prior to the date of a cull
    - To ensure the safety of all staff and volunteers, exact dates of any scheduled deer cull will not be released to the public.
- The District Park Superintendent will inform employees of their assigned duties for deer management operations as well as those employees whose job may be affected by the operation in accordance with contractual obligations.
    - To ensure the safety of all staff and volunteers, front line staff within parks, that are not part of management activities, will be not be notified of deer cull dates until the day of a management activity.

TIMES OF HUNT

- Deer culling operations will take place as determined to be necessary to ensure the health of the deer herd and Metroparks ecosystem and as allowed by the MDNR. All methods, type of activity and times of hunting will follow the State of Michigan guidelines as determined by the MDNR or otherwise permitted by the MDNR. Sharp shooting activities may occur at any time within a 24-hour period and within the guidelines and limitations as stated with the permit issued by the or as otherwise permitted by the MDNR.

PROCESSING

- Initial processing of deer will take place in heated, well-lit areas. Processing teams will consist of no more than three employees. The use of volunteers from the supporting sportsman groups is encouraged. During the processing procedure, every attempt should be made to keep a safe and organized workspace. Deer remains should be removed from the workspace on a regular basis. All remains from the processing procedure shall be disposed of in an approved, lined waste container and shall be disposed of off-site by a regulated, licensed waste hauler in a timely manner.
- The District Park Superintendent shall be responsible for arranging waste removal. Those facilities connected to sanitary sewer should be washed down frequently during processing. Those facilities not connected to sanitary sewer will employ the use of plastic or other non-porous floor covering along with an absorbent material to be used liberally during the processing to insure safe working conditions. Plastic gloves and Tyvec suits (or equivalent) shall be made available to employees involved in the processing procedure.
- Washing down processing areas into storm drains is strictly prohibited.
- All antlers collected during processing will be retained by the Chief of Natural Resources and Regulatory Compliance and subsequently given to the MDNR for disposal.

TRANSPORTATION

- After initial processing, all deer shall be hung to cool in a cool/cold dry environment until transported to the meat processor. Transportation will take place in an approved covered trailer or a clean covered truck. Every attempt shall be made to keep the deer clean and dry during the transportation process. All deer shall be transported to the processor the following morning and / or no later than 24 hours after the animal was taken. The meat processor shall be contacted by the Chief of Natural Resources and Regulatory Compliance or delegated staff member 24 hours in advance to arrange delivery time. Selection of a USDA approved meat processor will be the responsibility of the Chief of Natural Resources and Regulatory Compliance and Environmental Compliance or as permitted by the MDNR.

QUARANTINED AREAS

- Those areas within the park system that are closed for sharp shooting activities and those areas used for support/processing shall remain off limits to all members of the public and to all employees unless otherwise authorized by the Director, Chief of Police or designee, Chief of Natural Resources and Regulatory Compliance or District Park Superintendent until all activities, including processing and cleanup are completed. Employees not involved in the deer management activities but are affected by the management activities taking place in their workspace during regularly scheduled work time, may upon request, be reassigned to other areas of the park to perform other duties as assigned by the Park Superintendent.

BIO-DATA COLLECTION

- When required by the MDNR or Chief of Natural Resources and Regulatory Compliance, bio-data will be collected during the processing procedure. It will be the responsibility of the Chief of Natural Resources and Regulatory Compliance or the Chief of Interpretive Services to arrange for staff or contracted personnel to collect and record such data. Bio-data will be used to help determine the success of the program, potential disease threats and general health of the deer herd. The MDNR may at times require parts of the deer to be made available to them for further disease testing. When required, those items will be gathered by the individuals collecting data, bagged in a sealable plastic container and stored with the deer awaiting transport or other suitable area away from normal maintenance activities or exposure to employees during their normal working day, until transportation can be arranged to a MDNR facility.

MISCELLANEOUS

- It is intended that any employee involved in the deer management process does so voluntarily. It is recognized that duties assigned, and the hours worked in this process can be unusual and arduous and should be undertaken by the employees' own accord. It is also intended that when deer management duties are assigned, that they are considered a normal part of the employees work week.
- At no time will photographs or digital images of any kind be allowed to be taken of the deer management process.

APPENDIX 2: KENSINGTON METROPARK FLORA AND FAUNA MONITORING PERSONAL ACCOUNTS

As stated in the article “Impacts on an Ecosystem”, the relationships between flora and fauna are connected in many ways. The following accounts explore staff’s first-hand monitoring at Kensington Metropark over the years.

April, 1998 - B. Hotaling, Naturalist

I joined the staff of Kensington Nature Center in October of 1972. From the beginning, I had a particular interest in wildflowers. Strong images of spring wildflower, in particular, have been retained in memory. Some species existed in masses of color; other species may not have been in masses, but nevertheless, were widespread and easy to find. Such is not the today for many of these plants. It’s a great loss and detracts greatly from the aesthetics of the trails.

Impressions: A May walk around Tamarack Trail would have shown hundreds of flowering trilliums, especially on the back side of the trail. On the section of trail by the boardwalk, we would view large numbers of large-flowered bellworts. Wild Sarsaparilla was commonly seen.

Hepatica was commonly found throughout the Nature Area, especially along Deer Run. Starry false Solomon’s seal was profuse. In late May, the lady’s-slippers appeared. Yellow lady’s-slippers were the most prevalent. Near the Deer Run Swamp Shortcut, there were concentrations of showy lady’s-slippers, as well as a few pinks. In various sites along Deer Run, Tamarack, and Aspen, grew small white lady’s-slippers.

In 1997, the situation was changed somewhat dramatically. While trilliums still exist, the numbers were few and far between. The best site was the vegetative enclosure along Wildwing. There are no known bellworts or sarsaparillas in the entire park.

April, 1998 - P. Carlson, Supervising Naturalist

General notes on wildflowers populations 1968-mid 1980s

A “carpet” of 100’s of Bloodroot at the junction of Labadie and Tamarack return extended back from both trails for 100 feet – a beautiful early spring display.

This was a great area for wildflowers -from early spring through the fall season. In the growing season, there wasn’t a time when we couldn’t find plants in bloom to show our trail groups. Fields of hawkweed in late spring-early summer were a treat. Fields of asters contrasting with goldenrods were spectacular in the late summer and fall. Wildflower walks were a staple of our program schedule.

The decline in numbers of plants and species first become observable in the mid-80's. Today some flowers are gone…some are rare…some are hanging on in greatly reduced numbers. There are not many species that exist in great numbers—certainly nothing approaching the numbers found in the past.

In the mid-seventies, we had trail labels for over 380 species of wildflowers, 15 species of ferns, 45 species of trees and over 50 species of shrubs.

The following is an account taken from an article entitled, "Diminished Wildflower List 1998"

In summation: There are records of ten known species of orchids within Kensington Metropark; none have been recorded outside of the Nature Area. Four species were found in 1998, after an extensive search.

Some long-term changes in Kensington Metropark Wildlife

Extensive birds, mammal, reptile and amphibian records have been maintained for nearly thirty years. Listed below are some obvious changes in animal populations. The causes for these changes are not always known, but may include plant succession, competition from alien species, increased predation, and development (mostly outside of park).

Vanished residents:

Vesper Sparrow (last reported in 1990)
Grasshopper Sparrow (last reported in 1991)
Badger (last probable report in 1978)

New residents:

Wild Turkey (new in 1998; nesting?)
Great Egret (now nesting in heron rookery)
Grey Fox (first reported in 1990)
Coyote (first reported in 1990)

“Plant Changes in Kensington Since 1998” September 8, 2000 - B. Hotaling

> Our primary concerns are for species that were once well-established wildflowers whose disappearance cannot be explained simply by habitat changes. The changes
>
> in populations for these species have been dramatic, mostly with the last 10 years. While there are still many plants in the park, the diversity has suffered. Many of the herbaceous plants that continue to thrive are poisonous or otherwise inedible. And, many of the plants that have been lost are among the more colorful species. Our woodlands, especially in spring, are largely devoid of color.

These documented accounts are valuable in assessing and analyzing the health of the ecosystems at Kensington Metropark. It is clear the floral and faunal diversity in Kensington Metropark has diminished; particularly noticed and recorded in the 1990s. Because of these observations, monitoring efforts have been increased to establish a scientific method for comparing various sites within the Metroparks.

HURON-CLINTON
METROPARKS