STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
LANSING

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GOVERNOR

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DIRECTOR

SUBMITTED: October 17, 2016

To: Keith Creagh, Director

Information: Natural Resources Commission

Subject: Michigan Deer Management Plan

Authority:

The Natural Resources and Environmental Protection Act, 1994 PA 451, authorizes the Department of Natural Resources "the Department" to plan and conduct wildlife management within Michigan.

Discussion and Background:

In 2010, the Department finalized the Michigan Deer Management Plan (DMP). The plan was developed to provide strategic guidance to Department staff and involved stakeholders for the management of white-tailed deer (*Odocoileus virginianus*). While the Department is the lead agency for deer management, collaboration with Federal and State agencies and Tribal governments, as well as private landowners, hunters, and other partners and stakeholders is critical to the success of management efforts. The DMP encourages cooperation and consistent approaches among partners in all efforts to manage deer in Michigan. The 2010 DMP called for a review and update in five years to address ecological, social, and regulatory shifts that have occurred since the approval of the DMP, as well as incorporate the latest scientific information that has been developed over the past five years.

The update to the 2016 DMP is not meant to overhaul the original DMP, but rather to provide refreshed information so the document stays current as it ages. The DMP ties together other statewide plans pertaining to deer, including the Chronic Wasting Disease Response Plan, the Hunting Access Program Plan, the State Forest Management Plan, and the Wildlife Action Plan, amongst others. Other changes to the 2016 DMP from the 2010 DMP include:

- Updating deer harvest data in figures to reflect accurate historical information that is current.
- Shifting away from population based management to an approach focused on more trends using various metrics. This change will allow the Department to highlight its relationships with partners and stakeholders in evaluating the impact of white-tailed deer on the environment, as well as prioritizing the valuable data already collected from check stations and hunter harvest surveys.
- Streamlining objectives to eliminate overlap between goals.

There are no operational plans in the DMP. It does not discuss specifics on regulations or operational details. Rather, it focuses on the commitment that the agency has towards deer

management, focusing on the goals and objectives that shape management decisions. The six primary goals of the original DMP remain the same, as do many of the same objectives. The updated DMP is a culmination of input received by stakeholder groups with a long history of working collaboratively with the Department, Department staff, Regional Deer Advisory Teams, Upper Peninsula sportsmen's groups, and the public.

This updated DMP identifies that many of the goals and objectives developed in 2010 still hold true today. The update of the DMP more accurately reflects the approach and process involved with developing regulations, one based on adaptive management framework through rigorous monitoring of critical trends overtime. The Department will continue to monitor these trends, making adjustments as necessary based on a combination of biological and social trends gathered through check stations and hunter harvest surveys, as well as receiving input from stakeholders and partners.

The *Michigan Deer Management Plan* is submitted for information and consideration. It will be resubmitted for final action in December 2016.

MICHIGAN DEER MANAGEMENT PLAN

Michigan Department of Natural Resources
Wildlife Division Report No. 3626

MICHIGAN DEER MANAGEMENT PLAN

Approved:

_____

Keith Creagh, Director
Michigan Department of Natural Resources
Lansing, Michigan

Date: _____

ACKNOWLEDGMENTS

The Michigan Department of Natural Resources (DNR) appreciates the valuable contributions offered by many individuals, agencies, and organizations during the development of this plan. Special thanks to the Michigan United Conservation Clubs (MUCC) and the Department of Fisheries and Wildlife at Michigan State University for their assistance in initiating and providing guidance to the development and updates of the 2008 Plan.

We thank the many Michigan residents who contributed to development of this plan through their participation in public meetings and through the input they provided during public-comment periods and through communication with Wildlife Division staff.

We express our appreciation to the representatives of the organizations that formed the Michigan Deer Advisory Team (DAT) and to Jordan Burroughs (DAT facilitator) of Michigan State University for their dedication and hard work as they worked together to develop a set of recommendations to help guide deer management in Michigan. Those recommendations are reflected in the management strategies outlined in this document.

Finally, we also thank our Federal and State agency partners and Tribal governments for their cooperation in deer management and for the information and feedback they offered throughout the planning process.

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PROLOGUE TO THE 2016 DEER MANAGEMENT PLAN

Michigan is emerging from economic crisis; double-digit unemployment, historic budget deficits, and the downsizing and outright disappearance of major employers are in the past. The Department of Natural Resources enjoys better funding and perhaps greater public support than at any time in the recent past. Nearly one million of us go to the woods and fields every fall to hunt and otherwise experience wildlife and open lands. We stand poised to capitalize on unique strengths –plentiful water, abundant natural resources, and vast expanses of public land. Michigan has a proud and vibrant hunting tradition and a well-deserved reputation for responsible and innovative conservation. Hunting and hunter-conservationists are leading advocates for Michigan's strong natural resource economy, and at the center of their interests and enthusiasm is the management of white-tailed deer.

The 2016 Michigan Deer Management Plan Update represents a partnership among the DNR, Federal and other State Agencies, Tribal Governments, Non-Governmental Organizations, and the general hunting public. Special thanks are due to the members of the Deer Advisory Team and to the Michigan United Conservation Clubs for the months of effort they have invested in the process. It should come as no surprise that the principle theme in this update is continuing emphasis on the development and conservation of a healthy deer herd in balance with abundant and well-managed habitat. If nothing else, recent experiences with the impacts of epizootic hemorrhagic disease (EHD) and the potential impacts of Chronic Wasting Disease (CWD) have made these objectives even more critical. Together, using the Updated Deer Plan as the overarching framework, my goal is for the DNR and her partners to move forward and chart a course for Michigan deer, for hunting, and the management of young forest habitats on which deer and other species of wildlife depend. As you read this update, I encourage you to think about how you and your friends and colleagues can join with us in this partnership to maintain healthy deer, habitats, and hunting traditions.

Russ Mason, Ph.D.
Chief, DNR Wildlife Division

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INTRODUCTION

A. Purpose of Plan

This plan provides strategic guidance to Michigan Department of Natural Resources (DNR) staff and involved stakeholders for the management of white-tailed deer (*Odocoileus virginianus*) in Michigan, in support of the mission: *to maintain a healthy white-tailed deer population, using sound scientific management, maximizing recreational opportunities while minimizing negative impacts on ecosystems and other wildlife species and without creating undue hardship to private interests*.

Management of Michigan's deer herd is essential to maximize its positive and minimize its negative effects on social, biological, ecological, and economic values. While the DNR is the lead agency for deer management, collaboration with Federal and State agencies and Tribal governments, as well as private landowners, hunters, and other partners and stakeholders is critical to the success of management efforts. Consequently, this plan encourages cooperation and consistent approaches among partners in all efforts to manage deer in Michigan.

This plan does not outline operational details of deer management in Michigan. Operational details will be specified at regional levels within an adaptive-management framework in which specific management methods are routinely adjusted and updated as local conditions, technology, regulations, and other aspects of management change. Direction from this plan will be reflected in annual work plans and specific products identified as Actions in this plan. This adaptive management approach will be implemented through the established deer management regulatory framework described in Section 1.2 of this plan.

B. Current Management Authority and Process

The DNR has a public trust responsibility for the management of all wildlife species and populations. Primary legal authority for wildlife management and regulation comes from the Natural Resources and Environmental Protection Act, Public Act 451 of 1994 (www.legislature.mi.gov). Part 401 of Public Act 451 gives authority to the Natural Resources Commission (NRC) and the DNR Director to issue orders specific to wildlife management and hunting.

In 1996, Michigan voters supported a ballot initiative requiring that the NRC "to the greatest extent practicable, utilize principles of sound scientific management" in making decisions concerning the taking of wildlife. This legislation gave exclusive authority to the NRC over the method and manner of take for game species. Following passage of the initiative, it was codified as Section 40113a of Public Act 451 of the Public Acts of 1994, MCL 324.40113a. In 2014, an initiation of legislation to enact the Scientific Fish and Wildlife Conservation Act was passed that would ensure that decisions affecting the taking of sport fish and wildlife are made using

principles of sound scientific fish and wildlife management. Following passage of the initiative, it was codified as Section 40113a of Public Act 451 of the Public Acts of 1994, MCL 324.40110. The regulations established by the NRC pursuant to Public Act 451 for the taking of game in the state of Michigan are found in the Wildlife Conservation Order (WCO), which can be viewed online at mi.gov/dnr.

Scientific information is obtained from many sources including research, in-state surveys, communication with national and international experts, and published literature. Social issues associated with deer are also important factors that should be considered when making decisions regarding deer management in Michigan. Qualitative social information is obtained from discussions with Tribal governments, hunters and other stakeholders, DNR field staff, and other agency staff, as well as through surveys such as the annual Michigan Deer Harvest Survey, and periodic hunter opinion surveys that ask questions pertaining to specific management options or objectives. Additional social information, not necessarily associated with hunting, also is obtained through surveys.

Scientific management incorporates the concept of adaptive resource management, which is an iterative process by which changes in management actions (e.g., hunting regulations or educational efforts) are evaluated to determine if these changes achieve management goals. Management efforts over time are modified as new information is obtained, new analyses are conducted, changes are requested for social reasons, or as changes occur in factors that substantially influence deer populations.

The current deer management program includes research to help understand the ecology of deer and the opinions and concerns of Michigan's residents regarding deer. In addition, the DNR provides information to the public about deer and technical assistance to landowners on deer habitat issues and conflicts with deer. Hunting provides recreational opportunities, is important as a cultural and social activity, and is the primary tool used to manage the size and distribution of Michigan's statewide deer population.

Decisions about deer management in Michigan historically have been developed through interactions between the Wildlife Division's field staff, wildlife research and management specialists, and the Wildlife Division leadership who make many budget and staffing decisions and provide regulation recommendations to the NRC. Recommendations are also discussed with, and sometimes originate from, interested deer hunting organizations or individuals. All regulations recommendations also go through the NRC process, which mandates opportunities for open public comment before the NRC makes final decisions. Currently, the DNR and NRC have adopted a pattern of stabilized regulations to allow for recommendations to be fully evaluated on a 3-year time period. Exceptions within this cycle are admitted for extreme circumstances, such as the new location of a disease or extreme fluctuation in deer numbers due to events occurring outside of the hunting season. The purpose of this document is to outline the legal framework and procedural requirements for deer management in Michigan, and to provide statewide strategic guidance and outline the goals of Michigan's deer management program.

PLANNING PROCESS

The Deer Management Plan was initially developed in 2008 and finalized in 2010 through a process that included review of the best available scientific information and substantial involvement of affected stakeholder groups and the public. The plan development process included the following nine stages:

1. Intra- and inter-agency scoping
2. Deer symposium: the science of deer management
3. Public issue scoping meetings
4. Review of science relevant to deer management in Michigan
5. Michigan Deer Advisory Team deliberations
6. Tribal Input
7. Public opinion survey
8. Plan writing
9. Public review and comment

The information compiled and evaluated during all of these stages was used to produce a plan based on sound science, and on careful and respectful consideration of the diverse perspectives held by Michigan's residents. A summary of the stages used to create the original plan are described under Appendix A.

This 2016 Deer Management Plan Update undertook a similar process, though the input process was somewhat less intensive. This updated plan reflects the strong belief that the objectives and priorities laid out in the 2010 plan remain current and important. The update process kicked off with a Deer Forum that was held in Roscommon on April 11, 2015. The Forum was attended by 17 different organizations or institutions who work closely with the DNR on deer management issues. Participants provided feedback on how the Deer Management Plan affected their group over the past five years.

The DNR then met with individuals representing a diverse array of stakeholders and partners. As well, there was a meeting with Tribal biologists representing the sovereign governments of the Sault Ste. Marie Tribe of Chippewa Indians, Grand Traverse Band of Ottawa and Chippewa Indians, Little River Band of Ottawa Indians, and the Little Traverse Bay Bands of Odawa Indians. In each instance, opportunities were provided to discuss concerns and approaches from their perspective with the original Deer Management Plan. Finally, the DNR met with representatives from the Southern Deer Advisory Team, the Northern Deer Advisory Team, and select members of UP Coalitions to discuss updated language and important items that needed inclusion or amendment in the update.

Once completed, the draft update was distributed for public comment on June 7, 2016 with comments and opinions collected and categorized. Topics receiving significant comments or concerns were returned to the Deer Advisory Teams and Coalitions for consideration.

DEER IN MICHIGAN

A. History of Deer and Deer Hunting in Michigan

Prior to European settlement, Michigan had an abundant deer herd in the southern part of the state. The mixture of hardwoods, wetlands, bogs, forest openings, and prairies was ideal for deer. There were fewer deer in the forests of the north, which were also inhabited by moose and woodland caribou. These mature forests allowed little sunlight to reach the forest floor and deer browse was limited except in burned-over areas, blow-downs, or other areas of significant disturbance.

As farmers and settlers moved into southern Michigan in the 1800s, deer habitat was altered dramatically by removal of cover for crop fields. The shooting of deer for food was unregulated and deer were mostly gone from the SLP by 1870. Logging of forests in the north produced the opposite effect. More openings, brush, and young forests provided cover and browse and the northern herd climbed to an estimated one million deer in the 1880s. As railroads developed and provided access into the wilderness, market hunters shot hundreds of thousands of deer. Early measures to control market hunting by restricting the timeframe to take deer, but not the number of deer taken, were unsuccessful. What followed were decades of ups and downs in the deer population resulting from changes in hunting regulations and available habitat.

The first regulation enacted to limit the taking of deer in Michigan occurred in 1859, when the State Legislature limited the taking of deer to the period of August 1 through December 31. In 1887, the use of dogs and artificial lights became illegal. The State Legislature shortened the season to 25 days with the first bag limit (five deer) and created the first deer license in 1895, selling 14,477 licenses for 50 cents each with 22 non-residents paying $25 for a Michigan deer license. In 1909, the bag limit was reduced to three deer and market hunting and the selling of venison became illegal.

In 1914, Game Commissioner William R. Oates estimated that there were only 45,000 deer in Michigan. He recommended changing regulations limiting hunters to one deer per season with the goal to increase the size of the deer herd. That year, 21,061 resident licenses and 178 non-resident deer licenses were sold.

In 1921, the three inch rule was enacted limiting hunters to antlered deer only. The deer herd began to rebound. The population increase was driven by the protection of antlerless deer and changing habitat conditions as the vegetative response to an increase in forest-fire control (resulting from legislation passed in 1915), timber harvests and abandonment of agricultural fields across northern Michigan produced abundant deer cover and browse.

By 1930, the increasing abundance of deer was recognized and the first discussions of deer-vehicle accidents began. There also was a significant amount of winter starvation and over-browsing in cedar swamps where field investigators reported a shortage of food and cover for the growing herd. Mr. Ilo Bartlett, the State's first deer biologist, reported that there were 1.125 million deer in the state in 1937, and began to talk about the "deer problem." About one-third of

the deer at this time were in the UP and two-thirds in the NLP - only a few deer were present in southern Michigan.

The deer population continued to grow and peaked at about 1.5 million deer in the late 1940s. Antlerless deer were once again allowed to be taken by hunters in an attempt to reduce the size of the deer herd. However, before that could happen, the habitat for deer collapsed, due to a combination of pressure from a large herd and an increase in forested areas, as mature stands of timber once again began to develop on formerly logged lands.

To address the habitat problem, the legislature directed the DNR to develop what has become known as the Deer Range Improvement Program (DRIP) in 1971. This program was designed to acquire and manage critical deer habitat, with a goal of increasing the deer herd to one million deer by the spring of 1981. Through DRIP, $1.50 from every deer license is placed in a restricted fund and used for acquisition and management of deer habitat. Impacts of the DRIP, a substantial increase in commercial timber harvest throughout the State, a series of mild winters, and a rapidly expanding deer population in the farm country of southern Michigan combined to propel the herd to a new peak of 2.2 million deer in 1995. While deer were still abundant in northern Michigan, the increasing populations in southern Michigan caused a shift of population balance from north to south that is even more pronounced today. Signs of distress in the herd appeared again. State records for deer hunting participation were set in 1998, when 785,000 hunters pursued deer during Michigan's firearm deer season (Figure 1) and when an estimated 582,000 deer were harvested (Figure 2).

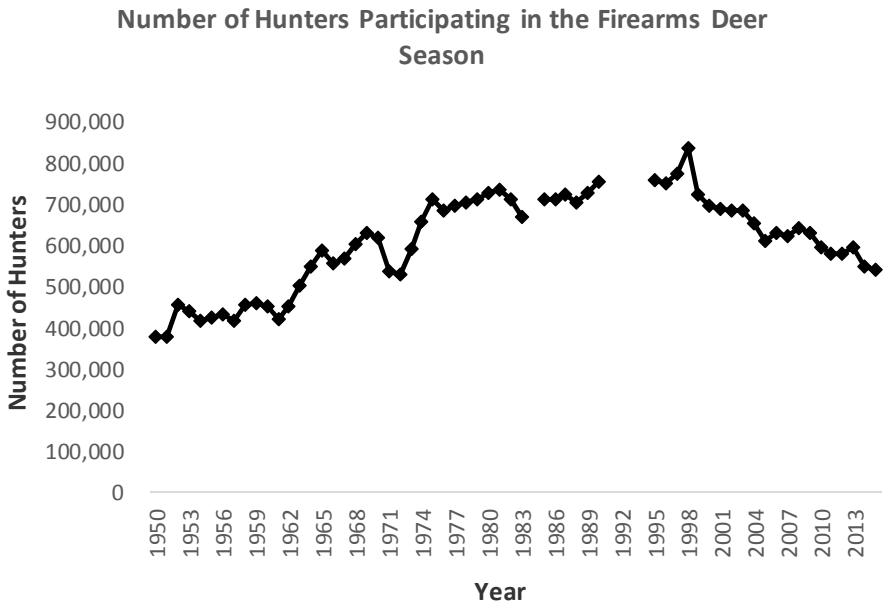


Figure 1. Number of firearm deer hunters in Michigan 1965-2015.

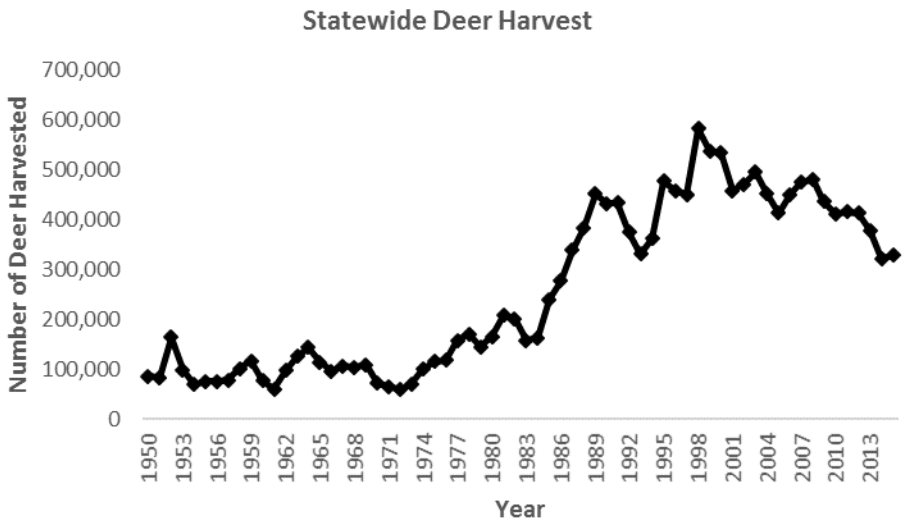


Figure 2. Estimated annual statewide deer harvest 1965-2015.

B. Current Population Status and Range in Michigan

Regional deer densities in Michigan have changed a great deal since the 1970s. Historically, deer hunting opportunities in the UP and NLP attracted hunters from southern Michigan to hunt the relatively abundant deer populations of the north woods. Statewide deer population estimates indicate that the Michigan deer population grew steadily through the '70s, '80s, and early '90s, but has experienced a gradual long-term declining trend since 1995. Population trends are not consistent across the State, as this statewide decline has been driven by declines in both the UP and NLP even as the SLP population continued to grow for a number of additional years before also declining in that region.

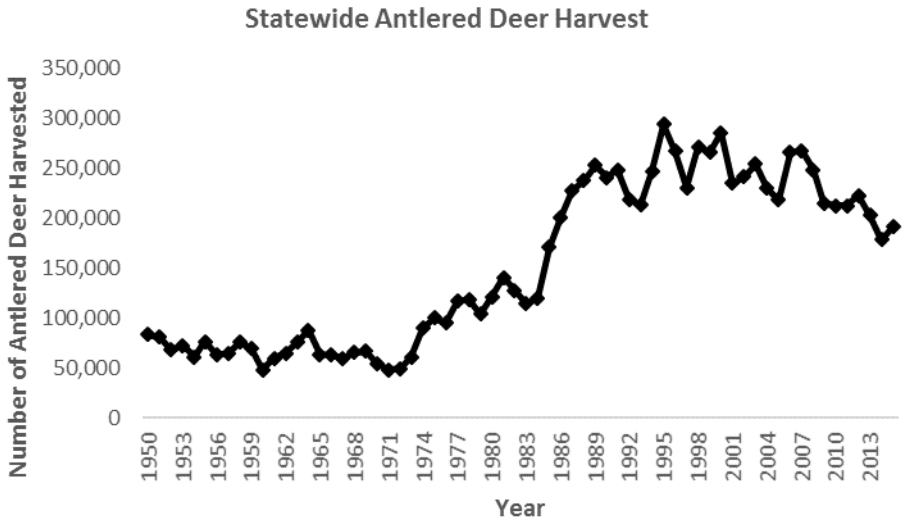


Figure 3. Estimated antlered deer harvest, 1965-2015.

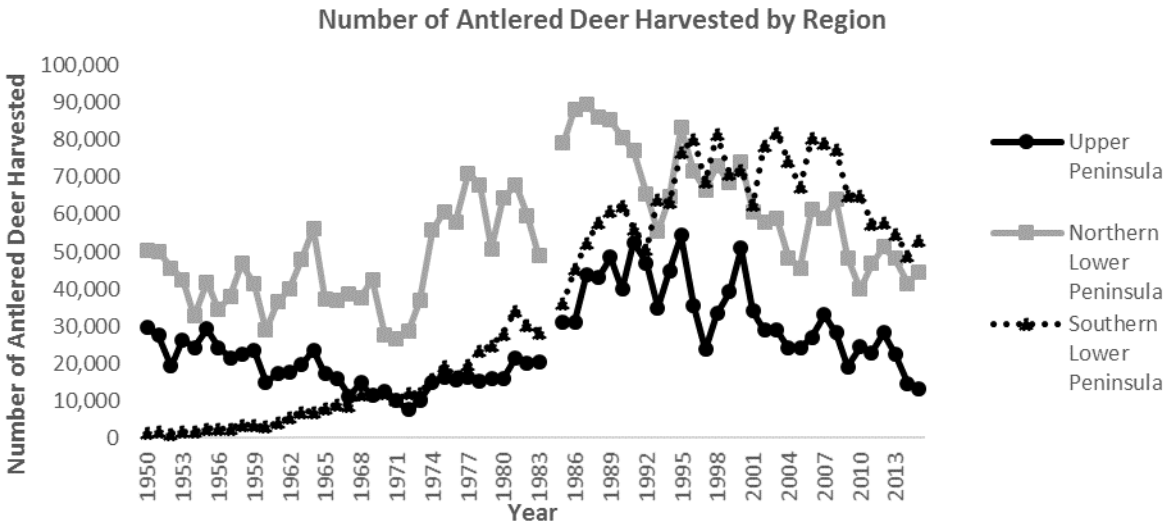
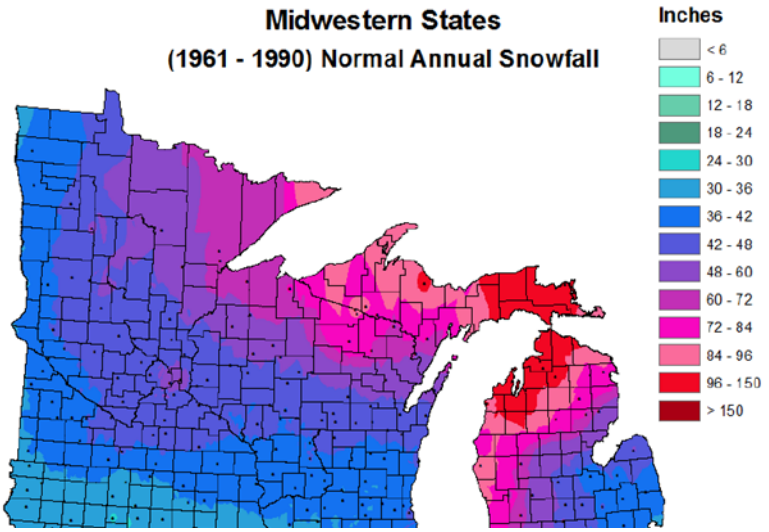


Figure 4. Estimated antlered deer harvest by region, 1965-2015.

Today, deer densities and harvest numbers in Michigan are generally lower in the north than in the south. Deer populations are lowest in the UP as complex predator loads and lake-effect snow associated with Lake Superior makes winter conditions challenging to deer. Deer in this area are forced to seek out lowland conifer swamps or migrate south in early winter to areas that typically receive less snow. Areas of the state that receive deep snow and cold winter temperatures often observe increased winter mortality and low fawn recruitment in comparison with areas of the state that receive milder winter conditions. Snow depth data (Figure 5) demonstrates increased snowfall in recent years in areas of the state that typically receive the highest annual snowfalls and may be subjected to lower deer densities where this increased snowfall occurs repeatedly. In the southern one-third of the state, where winter conditions are less severe and agricultural crops are more common, deer are generally more abundant than in northern regions, and sustain higher harvest levels.



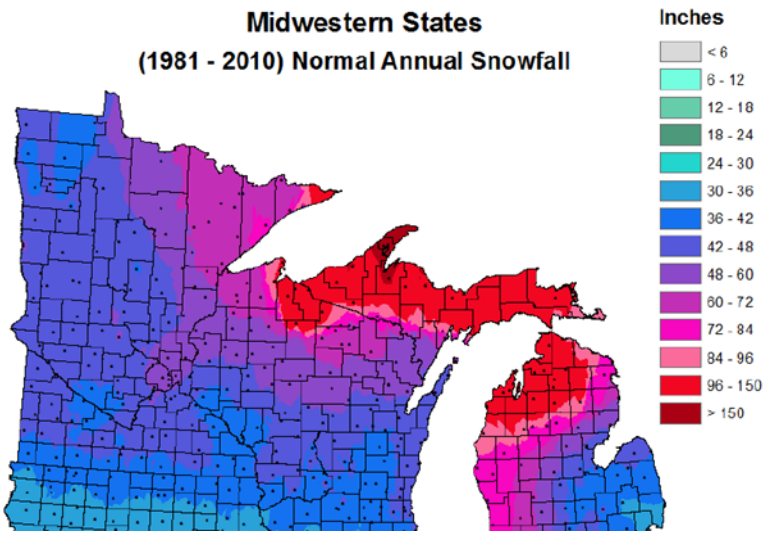


Figure 5. Average annual snowfall depths in Michigan, 1961-1990, and 1981-2010.

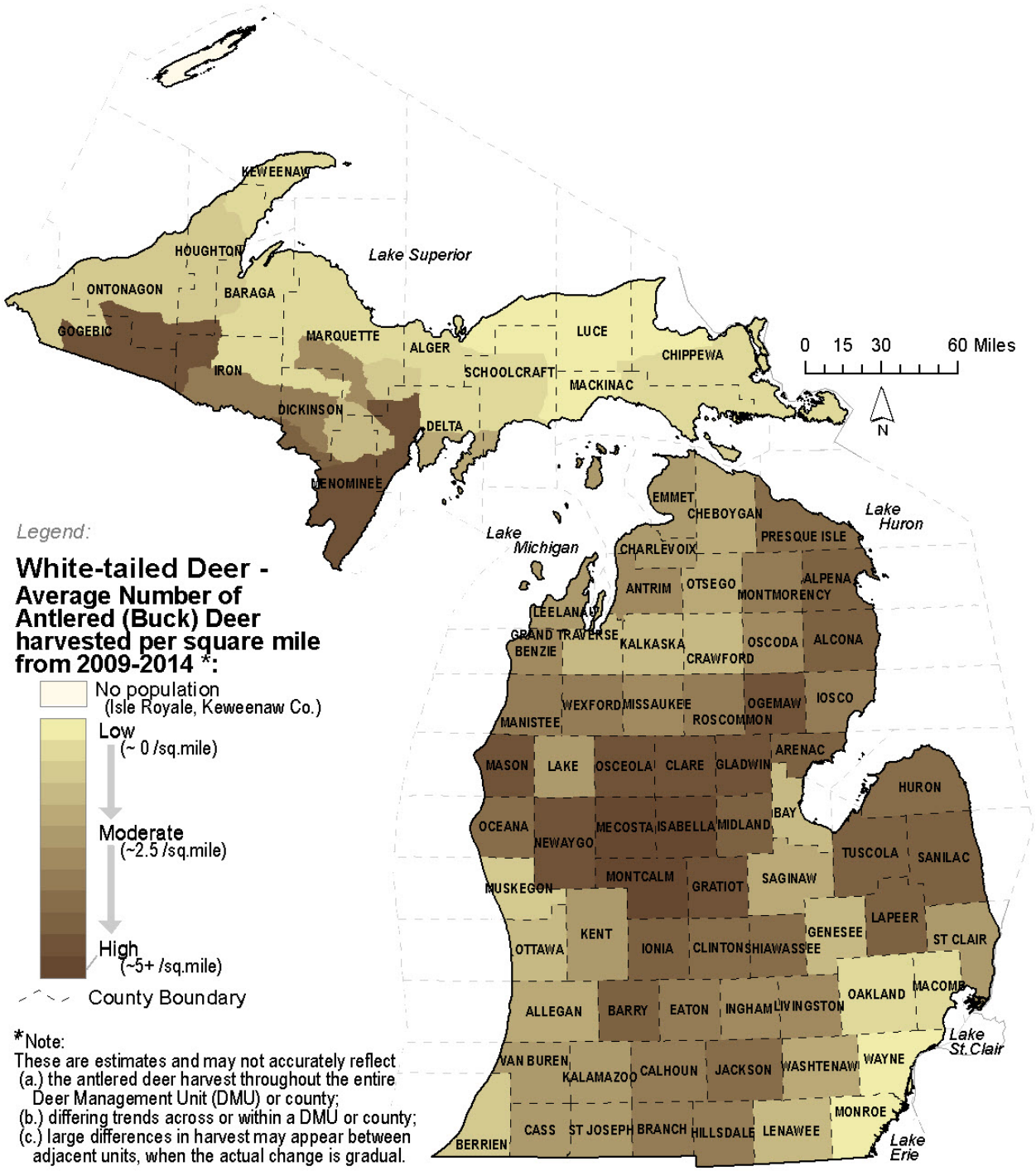


Figure 6. Estimated harvest of antlered deer per square mile in Michigan, 2009-2014.

In the NLP, when harsh winter conditions occur, herd size can be noticeably reduced by high winter mortality rates and low fawn recruitment. The presence of bovine tuberculosis (TB) in the northeast part of the NLP continues to remain a management challenge, as efforts to eradicate the disease have produced notable results, but ultimately the disease has not been eliminated.

In the SLP, deer populations are highly productive, with many factors working together to produce a challenging management scenario. The abundance of food in the form of available agricultural crops combined with the more than adequate cover of scattered woodlots and idle fields provide near perfect white-tailed deer habitat. In addition, relatively mild winter conditions, the near elimination of natural predators, and limited hunting access on private land (including numerous parcels where no deer hunting occurs at all) contribute to the growth of these populations. The SLP has recently experienced sporadic outbreaks of epizootic hemorrhagic disease (EHD) at varying intensities that has impacted deer populations in certain areas for several years. With the discovery of chronic wasting disease (CWD) in the SLP in 2015, these factors present tremendous challenges to managing this disease.

DEER MANAGEMENT GOALS, OBJECTIVES AND ACTIONS

DNR staff identified six principal Goals that incorporate issues and values identified through the 2008-2009 public input process: 1) manage deer populations at levels that do not degrade the vegetation upon which deer and other wildlife depend; 2) promote deer hunting to provide quality recreational opportunities, as the primary tool to achieve population goals, and as an important social and cultural activity; 3) manage habitat to provide for the long-term viability of white-tailed deer in Michigan while limiting negative impacts to the habitats of other wildlife species; 4) reduce conflict between humans and deer; 5) reduce the threats and impacts of disease on the wild deer population and on Michigan's economy; and 6) enhance public engagement in and awareness of deer management issues and knowledge of deer ecology and management.

To achieve these Goals, the DNR will use sound scientific management principles and will consider the complex interactions of many biological, social, and economic factors while implementing measures that assure adequate protection and conservation of white-tailed deer in Michigan. Considering the myriad aspects of deer management, this plan outlines a strategic management effort that addresses deer management issues that are important to the people of Michigan. By focusing on the Goals identified in this plan, the DNR strives to create the best and most appropriate management effort for Michigan's white-tailed deer herd and for the people of the State of Michigan.

Many stakeholder groups and individuals often have differing views and needs regarding deer management. This plan reflects efforts to identify an appropriate balance among the biological needs of the species, the benefits deer provide to some segments of society, the costs they impose on others, and the acceptability and feasibility of particular management methods.

The following deer management Goals, Objectives, and Actions will be implemented to achieve the principal purposes of the Michigan Deer Management Plan. They provide guidance for the management of several deer-related issues at the strategic level. The ensuing headings indicate strategic Goals (in bold; e.g., **Goal 1**), Objectives (underlined; e.g., 1.1), and Actions. These headings partition broad needs into manageable segments, and thus provide a structure for

addressing individual management issues. Implementation of the Actions described in this plan will require a considerable amount of funding and effort and will occur over a period of the next several years. Prioritization of the Objectives and Actions within each Goal will be the first step toward implementation of this plan. Some of the Actions identified in this plan are purposely worded in a general and less urgent manner and are intended to provide long-term direction, while others are more direct in nature and call for immediate specific action. In general, those worded more specifically address items that were identified by DNR staff or the public as high priority. Specific Actions may be listed more than once in this plan if they are critical to achievement of more than one Goal or Objective.

Goal 1. Manage deer populations at levels that do not degrade the vegetation upon which deer and other wildlife depend.

White-tailed deer have been designated Michigan's official game animal and are likely the signature wildlife species in the State. In addition, deer have been identified by the DNR as a Featured Species, which is a designation that indicates a species that is highly valued by the citizens of Michigan and has habitat issues that can be addressed through active management. Deer are important to the people of Michigan, and for many Michigan residents deer season is the focal point of the year, providing the opportunity to reconnect with family, friends, and the natural world. Deer hunting provides revenue that is critical to the conservation of Michigan's natural resources and is important to stores, shops, and restaurants of rural towns where hunters spend money on lodging, food, and supplies. Recruitment of new hunters and retention of hunting traditions are important to the culture of Michigan, yet management efforts designed to provide sufficient deer abundance to meet the recreational needs of Michigan's citizens also must consider the impacts of deer on the landscape. Deer management efforts of the DNR seek to maintain a healthy and balanced deer herd that meets the social, economic, and recreational demands of the public, while conserving sustainable habitat for deer and other wildlife species. Protection of native plant communities, agriculture, horticulture, silviculture, and safety of Michigan's citizens must be included in planning and implementation of deer management.

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, species interactions, and potentially altering successional pathways (Stromayer and Warren 1997, Cote et al 2004). When populations are not in balance with habitat, deer have the ability to 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, Cote et al 2004). 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). Once these deleterious effects have been observed, hunting has proven to allow the recovery of degraded plant communities (Jenkins et al 2014). 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, non-native plant species like garlic mustard (*Alliaria petiolata*). 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 impacts are kept below levels where they may cause long-term damage to the ecosystems in which they live.

In addition to consideration of the impacts that deer have on ecosystems and on other wildlife species, it is important to consider the impacts of other species on deer. Predators that prey on deer in Michigan include coyotes (*Canis latrans*), wolves (*Canis lupus*), black bears (*Ursus americanus*), and bobcats (*Lynx rufus*). Impacts of predators should be considered when making deer management decisions.

Successful deer management requires assessment of deer populations so that goals and management activities can be identified, implemented, and evaluated. Historically, deer management has typically included the development of population estimates, population goals, and population management activities related to these goals despite the difficulty in accurately and precisely estimating population size of free-ranging deer. Previously, the DNR used the sex-age-kill (SAK) technique as its primary tool to estimate deer populations where sufficient data was available. The procedure was originally formulated by Eberhardt (1960), and has been adopted for use in other states and with various modifications (Creed et al. 1984). The SAK is a complex, scientifically valid population reconstruction method that uses the biodata from the deer herd gathered at voluntary deer check stations along with hunter harvest information from the harvest mail survey to estimate deer numbers. Some limitations to reliably applying SAK exist, such as when substantial changes occur in regulations, hunter selectivity, or population size or where limited biological data are available (Mattson and Moritz 2008, Millspaugh et al. 2009). Proposed deer population goals were developed by DNR Wildlife Division staff for each DMU in 2005 for the period 2006 - 2010. While public opinions of the proposed goals varied across the State and among stakeholder groups, many vocal stakeholders questioned the accuracy of DNR population estimates and subsequently felt the proposed population goals for many DMUs were too low. Controversy over the proposed 2006 - 2010 goals was significant, and the draft goals were never accepted as operational.

While deer population estimates and goals are helpful when considering deer management strategies and when providing information to the public, reliable estimates of free-ranging wildlife require a large amount of data, are not always accurate, and do not necessarily provide information that is critical to management. It is generally more feasible and sufficient to know whether deer population trends are increasing, decreasing, or stable, and to consider what

impacts relative deer densities have on the average condition of deer in the population, their environment, and on people.

The concept of managing impacts of deer rather than focusing exclusively on deer numbers (Lischka et al. 2008) is supported by biologists from Michigan and in other states, and was identified in the original DAT report, and in the report on the public survey implemented by Michigan State University (Riley and Lischka 2009) in preparation for completion of the original plan. The concept of Adaptive Impact Management (AIM) allows for wildlife professionals to integrate both ecological and human dimensions into wildlife management. It emphasizes stakeholder involvement and places focus on management impacts on society rather than conditions of wildlife populations or habitat (Riley et al 2003). For these reasons, the DNR has shifted their management strategy from developing population estimates and goals to monitoring multiple trends that reflect the direction a deer herd is changing and the impacts associated with those trends. Understanding the impact of deer on their environment and the recent trends are most important to making regulatory changes and aligns well with the mission statement of the deer program to monitor and limit negative impacts associated with abundant deer populations. These impacts will be monitored annually based on staff observations and a number of indicators, such as antlered harvest, crop damage permits, deer vehicle collisions, and habitat impacts.

Much of the information previously collected to develop population estimates will still be utilized to evaluate trends in DMUs. One important activity in monitoring Michigan's deer herd is through the collection of biological data (biodata) from a sample of the harvested deer at voluntary check stations located throughout the State. These data are used to monitor the size, composition, and health of the deer herd. In addition, the annual deer harvest mail survey, sent to a randomly-selected sample of deer hunting license buyers, uses a statistically-based, stratified sampling design to develop estimates of various factors of the annual harvest (e.g., number of antlered and antlerless deer harvested, the number of hunters pursuing deer, the number of days hunters spent pursuing deer), and will continue to be used to quantify additional important factors, such as hunter satisfaction and success rates. Other factors, such as landownership patterns, habitat quality, and climate changes will also be used in consideration of deer harvest trends.

In order to provide Michigan deer hunters with clear and understandable deer hunting regulations, it is important that the framework for deer management and deer hunting regulations are consistent across the State whenever possible. However, Michigan has a diverse landscape with soils, climate, land use patterns, human population densities, and other factors that vary significantly across the state. Similarly, deer densities and habitat quantity and quality can be very different from one part of the State to the next. When necessary, deer management regulations should accommodate these differences, and be applied so that regional issues can be addressed at the appropriate scale. Historically, deer management in Michigan has been implemented at the relatively small scale of the DMU. Current DMUs range in size from five to 2,615 square miles and average approximately 700 square miles. The smaller DMUs are typically islands or special management units. Sufficient data have proven difficult to acquire at the DMU level and deer management decisions and efforts are generally more appropriate when focused on larger and more ecologically-similar areas. Consequently, results and analyses

pertaining to deer harvest will be analyzed at both the DMU and the Wildlife Management Region scale in the future (Figure 7). Regional management of deer in Michigan is supported by DNR leadership, recommendations from the DAT, and the public survey report (Riley and Lischka 2009).

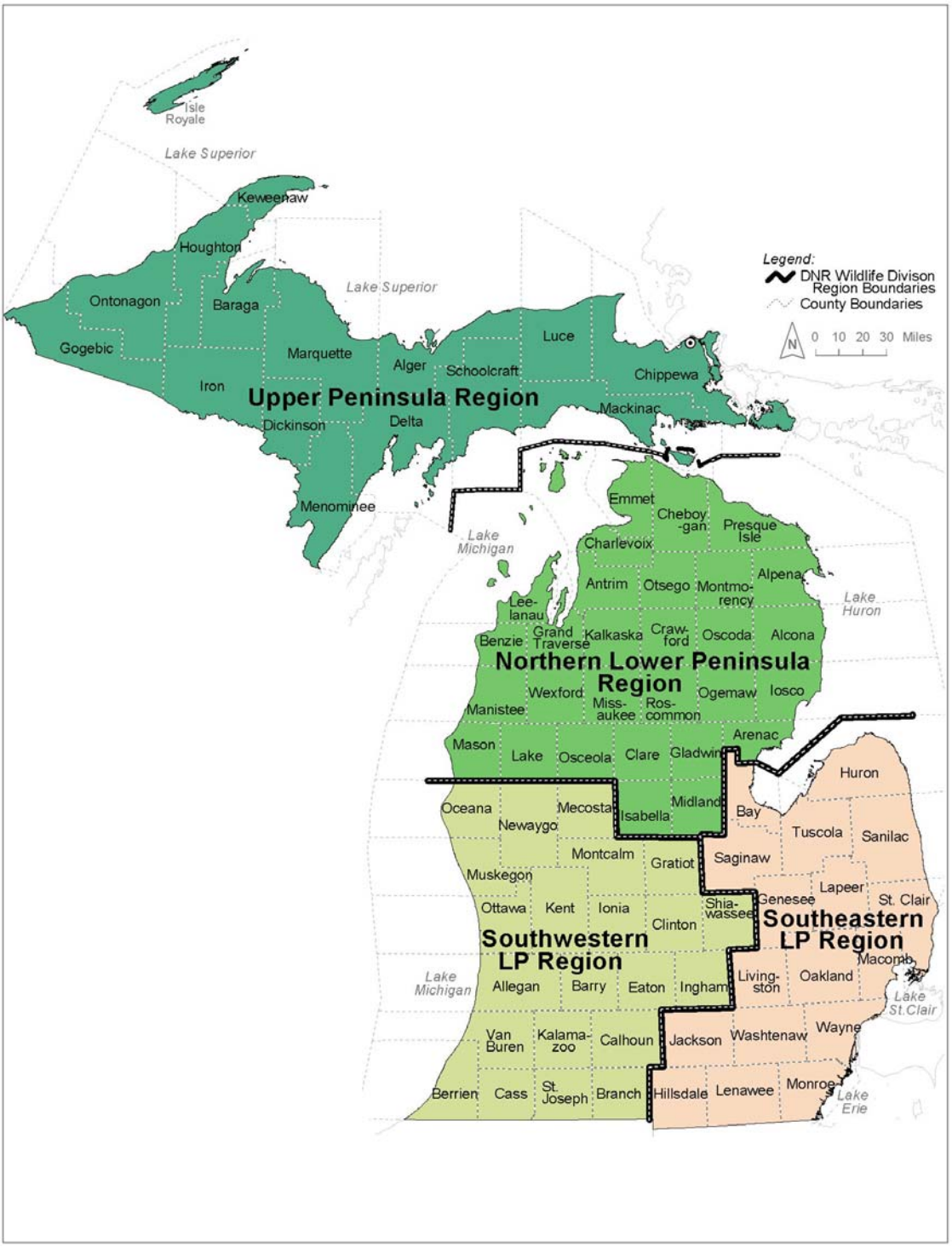


Figure 7. Wildlife Management Regions of Michigan.

The following Objectives and Actions have been identified to help overcome many of the challenges identified above. To the extent the Objectives are achieved, deer impacts will be compatible with available habitat.

1.1 Manage deer for sustainable harvest opportunities considering impacts of deer on the landscape and on other species.

Action 1: Maintain and consult with Regional Deer Advisory Teams (RDATs) and/or Coalitions for each ecologically-based region of Michigan (SLP, NLP, and UP) to help identify and provide stakeholder input on regional deer management issues. RDATs will be led by DNR Wildlife Division staff and may include representatives from DNR Forest Management, Parks and Recreation, and Law Enforcement Divisions, appropriate Federal and Tribal agencies, as well as stakeholders, partners, and individuals interested in deer management.

Action 2: Investigate and implement methods to assess and incorporate ecosystem impacts, hunter satisfaction, human-deer conflicts, and other factors cited in this plan when establishing deer regulations.

Action 3: Consider impacts of deer on other species, communities and ecosystems especially as identified in other resource management plans (e.g., Wildlife Action Plan (WAP), State Forest Management Plan, High Conservation Value Area Plans, etc.) when setting deer regulations.

Action 4: Evaluate and consider impacts of predators on deer densities.

Action 5: Identify and establish harvest goals for each DMU and region based on hunter satisfaction and success rates, impacts to ecosystems (e.g., extent of damage to native plant communities, forest regeneration), conflicts with humans (e.g., deer-vehicle collisions, urban deer issues, extent of crop damage), and other factors (predation, weather and climate changes, disease, etc.) and issues specific to the area.

1.2 Assess and monitor deer trends using the best available science-based and cost effective techniques.

Action 1: Evaluate current and potential data collection and population monitoring techniques, and use the best and most appropriate science-based methods to accurately assess populations at the DMU or regional scale.

Action 2: Develop, implement, and evaluate methods of quantifying impacts of deer on vegetation (e.g., native plant communities, forest health and regeneration, crop damage).

Action 3: Continue biological check stations and investigate additional ways to monitor the health of the deer herd to ensure deer are sustainable and balanced with habitat requirements, including consideration of herd condition as exhibited by appropriate age distribution, sex ratios, reproductive rates, antler development by age, and good physical condition.

1.3 Use appropriate tools to manage deer population size and composition.

Action 4: Evaluate current and potential deer hunting regulations and other programs to adequately balance harvest of bucks and does in efforts to reach DMU and regional goals.

Action 5: Investigate, implement, and evaluate programs designed to increase hunter recruitment, retention, and access so that hunting remains an effective population management tool.

Goal 2. Promote deer hunting to provide quality recreational opportunities, as the primary tool to achieve management goals, and as an important social and cultural activity.

Deer hunting is an important social and cultural activity for many hunters, as family and friends enjoy traditions revolving around deer hunting that go back for generations. Many people view deer hunting as a special experience shared with family and friends with the actual harvest of a deer as a secondary benefit. Most hunters would find it difficult to put a price on the value of deer hunting and of putting wild game on their tables. Michigan has a strong and proud deer hunting tradition and is at or near the top of the list of deer hunting states in number of deer hunters, number of days spent hunting, and number of deer harvested each year.

Deer hunting is the primary tool used by the DNR to manage the deer population. Where habitat conditions are good, winter climates are mild, hunter access is appropriate, and large predators are absent, harvest by deer hunters provides the only means through which the deer population can be kept from growing unchecked. Hunting therefore minimizes conflicts between people and deer and impacts of deer on other animal and plant communities. Proper implementation of this tool is critical to successful management of deer in Michigan and is a cooperative effort of the DNR and Michigan's deer hunters to maintain the deer population at appropriate levels. Deer hunting regulations and traditions in Michigan have historically focused on shooting of bucks. A culture shift toward reducing buck harvest and recognizing the value of harvesting antlerless deer would increase the effectiveness of hunting as a population management tool. Regulations mandating a shift in harvest pressure from bucks to antlerless deer may be equally effective, but would likely be opposed by many hunters at this time. The DNR staff must investigate and implement appropriate deer season structures, hunting regulations, and outreach programs to ensure that hunting traditions are maintained and that appropriate antlerless harvest occurs. The DNR staff must actively encourage the culture shift from nearly exclusively hunting bucks to a more balanced harvest where appropriate to benefit deer management even outside of the regulatory process.

The primary deer seasons in Michigan have traditionally consisted of the archery seasons (October 1-November 14 and December 1-January 1), the regular firearm season (November 15-30), and the December muzzleloading season (in the UP and NLP, 10 days starting on the first Friday in December and in the SLP, 17 days starting on the first Friday in December). In recent years, additional seasons designed to increase antlerless harvest where needed and to provide special opportunities for youth hunters or hunters with disabilities have also been established.

These include an early antlerless deer season (the weekend following September 15 on private land in select areas), the Liberty Hunt for youth and hunters with disabilities (statewide the weekend following September 15), the Independence Hunt for hunters with disabilities (4 days starting the Thursday prior to the third Saturday in October, on private land and some participating public land areas requiring an access permit), and a late antlerless season (the Monday following the third Saturday in December through January 1 on private land in select areas).

In addition, deer hunting is important to Michigan's economy. The most recent data from the U.S. Fish and Wildlife Service indicate hunting expenditures in Michigan amount to over $2.3 billion in economic impact and support more than 34,000 jobs (USFWS 2012). About 90% of Michigan hunters pursue deer, and 60% only hunt deer within a given year, which means a substantial proportion of this economic impact is produced by the over 600,000 hunters that hunt deer annually in Michigan each year (Frawley 2006). License fees and federal excise taxes on equipment provide funding for much of the conservation and management efforts of the DNR. In addition, deer hunters harvest over 300,000 deer per year, and in 2013 provided between 26-33 million pounds of venison to nearly two million individuals (Gougen 2015). The harvest of deer through hunting also helps minimize impacts on the agricultural and forest product industries.

Although Michigan does have a strong deer hunting tradition, numbers of annual deer hunters have declined during the last decade from a high of 870,000 in 1997 to 616,000 in 2014. This decline is a major cause for concern because of deer hunting's role in Michigan culture and in population management.

One factor that impacts both the number of deer hunters and the effectiveness of hunting as a population management tool, is the ability of hunters to access private lands where deer densities are high and deer-human conflicts are common. This situation typically occurs where private land predominates, landowners control hunting access, and there is insufficient harvest of antlerless deer. Programs designed to increase hunter access to private lands, especially where deer are abundant, may be effective at achieving appropriate antlerless harvests and increasing recreational opportunities for hunters.

In efforts to increase hunter recruitment and retention and to increase hunter access to hunting opportunities on private land, the State of Michigan has implemented various programs over the years which provided landowners with a payment in return for allowing hunters to access their land. These programs have had limited success. In 1936, the Michigan Department of Conservation, the predecessor to the DNR, initiated the Cooperative Farm Game Management Plan which enrolled nearly 500,000 acres during the early years. Participation of landowners dropped quickly, however, and the program was soon discontinued. Similar programs were re-initiated in 1948, and again in 1977, but have not been sustainable. The current program, known as the Hunter Access Program (HAP), has shown promise. As of 2015, the HAP has approximately 17,000 acres enrolled and has been steadily increasing enrollment since 2011 when there were only 7,400 acres. Other states, most notably Kansas, North Dakota, and South Dakota have had success with similar programs indicating the potential for success. However, the most effective programs occur in western states where land values and hunting pressure are

generally lower than in Michigan, making the programs more attractive to landowners in those states.

Other programs and deer hunting regulations designed to provide hunting opportunities and to increase recruitment and retention of hunters have been implemented including: youth seasons and opportunities for hunters with disabilities, expanded crossbow hunting opportunities, reduced minimum age requirements for hunting, and the Archery in the Schools program. These programs are likely at least partially accountable for more than 30,000 additional youth purchasing a deer license in each of the past few years and nearly stabilizing the previously declining trend of participation in the archery season (Frawley 2015). The influence of each of these individual efforts has not been fully evaluated. In times of shrinking budgets and reductions in staffing, continued and intensified evaluation is critical to determine if positive outcomes have been commensurate with the effort and resources invested, or if changes to these programs or initiation of entirely new efforts is required.

As important as recreational deer hunting is in Michigan, it is not supported by all citizens of the State. The benefits associated with deer hunting must be communicated to the non-hunting community so that deer hunting remains socially and politically acceptable. This concept was identified by all forms of public input to this plan including the DAT report and the public survey report (Riley and Lischka 2009).

In addition, positive images of hunting must be reinforced and negative stereotypes and examples of unethical behavior associated with deer hunting must be eliminated so that recreational hunting can continue to thrive in Michigan. Recognizing that opinions on the ethics of hunting-related activities vary widely among individuals, the DNR promotes “fair chase” principles through education and outreach, using regulations to ban specific behaviors or activities when such activities represent a serious threat to the long-term viability of deer, deer habitat, or deer hunting, or are an infringement on the rights of others.

Fair chase principles address the sporting, lawful pursuit of free-ranging wild game animals and extend beyond the hunt itself, as an attitude and a way of life based in a deep-seated respect for wildlife, for the environment, and for other individuals who share the bounty of this state’s natural resources. Fair chase principles are built into the DNR Hunter Safety Program and all DNR information, education and outreach efforts should embrace and promote fair chase concepts.

The DNR supports the following definition of “hunting ethics” from the Boone and Crockett Club (www.boone-crockett.org):

Fundamental to all hunting is the concept of conservation of natural resources. Hunting in today’s world involves the regulated harvest of individual animals in a manner that conserves, protects, and perpetuates the hunted population. The hunter engages in a one-to-one relationship with the quarry and his or her hunting should be guided by a hierarchy of ethics related to hunting, which includes the following tenets:

1. *Obey all applicable laws and regulations.*
2. *Respect the customs of the locale where the hunting occurs.*

3. *Exercise a personal code of behavior that reflects favorably on your abilities and sensibilities as a hunter.*
4. *Attain and maintain the skills necessary to make the kill as certain and quick as possible.*
5. *Behave in a way that will bring no dishonor to the hunter, the hunted, or the environment.*
6. *Recognize that these tenets are intended to enhance the hunter's experience of the relationship between predator and prey, which is one of the most fundamental relationships of humans and their environment.*

The following Objectives and Actions have been identified to help overcome many of the challenges identified above. To the extent the Objectives are achieved, opportunities for high quality hunting-related recreation and the ability to manage deer populations through hunting are expected to improve.

2.1 Promote deer hunting as the primary tool to manage deer.

Action 1: Continue and expand the HAP program to reach approximately 24,000 acres by 2018.
Action 2: Investigate and implement additional programs, as needed, to improve hunter access to private land.
Action 3: Investigate the impacts of declining hunter numbers on the ability of hunting to maintain the deer harvest at appropriate levels.
Action 4: Work with communities and local governments to consider hunting as the primary tool to address urban/suburban deer issues.

2.2 Evaluate and implement programs designed to improve recruitment and retention of deer hunters.

Action 1: Continue to investigate and determine the primary factors involved with the decline in recruitment and retention of deer hunters, and implement and evaluate programs or regulations to improve recruitment and retention of deer hunters, if possible.
Action 2: Facilitate cooperation among educational institutions, governmental and non-governmental organizations, and the hunting/mentoring community to develop programs targeted toward hunter retention and recruitment.

2.3 Establish deer hunting programs and regulations that will result in high quality opportunities for deer hunters and will allow population control through appropriate harvest of deer.

Action 1: Continually evaluate and implement, at appropriate regulations cycles, deer hunting season structures, regulations, and outreach programs to improve opportunities associated with deer hunting to reach a desired harvest of deer.

Action 2: Investigate and implement programs designed to improve hunter access to land including additional public land acquisition, public hunting on private lands, and information and education on landowner liabilities regarding hunters.

Action 3: Continue to regulate hunting methods and human behaviors that pose a detriment to the resources or the rights or safety of others.

Goal 3. Manage habitat to provide for the long-term viability of white-tailed deer in Michigan while limiting negative impacts to the habitats of other wildlife species.

Creating and maintaining quality deer habitat that produces healthy and abundant deer is an important component of deer management in Michigan. While white-tailed deer prefer young, dense forests mixed with agricultural lands where food and cover are abundant, they are generalists that can be found in a variety of cover types ranging from grasslands, wetlands, and forests to intensively-farmed agricultural lands and even urban areas. White-tailed deer use habitats seasonally, and in order for deer to thrive they must have access to habitat that meets all of their year-round requirements. Habitat conditions are different across the state because climate, land use, human population density and other factors vary by region. Impacts of habitat management efforts will be greatest when projects address specific regional needs.

Habitat quality in most of Michigan is adequate to support deer at some level. Throughout most of the UP, the habitat factors limiting deer are the availability of vegetation that provides quality browse, shelter from accumulation of deep snow, and thermal cover (Beyer et al. 2010). These factors are particularly important in winter and early spring. Deer wintering complexes, typically consisting of coniferous forests dominated by northern white cedar, eastern hemlock, white pine, spruce, and balsam fir are critical to deer in these areas as they provide refuge from deep snow, cold temperatures, and windy conditions. In the NLP, conditions are generally less harsh although deer are still influenced by winter severity and the quality of wintering complexes. In the SLP, intensive agriculture and scattered woodlots and swamps provide an abundance of food and cover and winter conditions are relatively mild. Deer in the SLP are rarely limited by habitat quality except for some highly urbanized and intensively farmed areas where suitable cover is scarce.

Habitat management concerns and efforts vary not only across the regions of Michigan, but depend on ownership patterns as well. The proportion of public and private lands varies across the regions of the State, with four percent of the SLP, 30 percent of the NLP, and 39 percent of the UP under federal or state ownership. Statewide, about 79 percent of the land area is privately owned. Management goals are often different on private and public land. Generally, private and public landowners operate at different scales, with different levels of public input, and under different management objectives and mandates.

Michigan has more public land than any state east of the Mississippi River. Public land in Michigan consists primarily of National Forests (over 3 million acres), State Forests (approximately 4 million acres), State Game and Wildlife Areas (approximately 400,000 acres) and State Parks and Recreation Areas (approximately 300,000 acres). While the various types of public land are managed with different goals and objectives, they all have deer residing on them and nearly all of this public land is open to deer hunting.

National Forest lands are predominantly located in the northern two-thirds of the State and there are three National Forests in Michigan: Ottawa, Hiawatha, and Huron-Manistee. Although the State of Michigan has legal authority for the wildlife found across the state, it does not dictate land management practices on these Federal lands, which are managed by the United States Forest Service.

State Forest lands are found primarily in the northern two-thirds of the state, with scattered State Parks throughout the state. The State Forest lands are co-managed by the DNR Forest Management and Wildlife divisions. These forests cover approximately four million acres and have adopted a multi-use framework, managing for several resources including timber, wildlife, minerals, and oil and gas, while providing a diverse array of recreational opportunities. The Michigan State Forest Management Plan provides overall direction and guidance for management of state forest lands. Regional State Forest Management plans were developed and finalized in 2013 and provide more details and direction on particular regions (western and eastern Upper Peninsula, and northern Lower Peninsula). For annual operating plans, the State forest system has 10% of its land base inventoried every year and forest treatments are proposed by DNR professionals. These treatments or prescriptions are posted for public review and comment before final approvals are made at the compartment review meeting. There are also planning documents and management guidance for specific areas such as Natural Areas, Wildlife Management Areas, and State Game Areas.

In southern Michigan, less than four percent of the land is publicly owned. Public lands in southern Michigan consist primarily of State Game and Wildlife Areas, State Parks and Recreation Areas. State Game and Wildlife Areas are managed for wildlife and wildlife-associated recreation, while Parks and Recreation Areas are managed for a variety of uses focusing on recreation but including preservation and management of Michigan's unique natural resources.

Federal and State agencies manage public lands with a diverse set of goals and objectives involving conservation and restoration of native plants, animals and communities along with provision of opportunities for associated recreation. Management efforts often seek to address habitat for game and non-game species alike with special consideration for featured species (highly valued species at a local, regional, or statewide level) and for rare or threatened species. Habitat management activities include: commercial and non-commercial timber operations; planting of herbaceous vegetation for nesting, thermal and escape cover; maintenance of wetlands and wildlife openings; and the application of prescribed fire, mowing, and herbicide. In some cases, food plots are planted to provide highly attractive food sources for deer and other wildlife.

The most influential treatments that occur on public land are commercial timber sales, which can result in a diverse array of wildlife habitat conditions. Deer benefit when felled tops are available during logging operations, particularly in winter when other forage is scarce, and again when new tree saplings regenerate the harvested stands. Additional forest treatments implemented on public land include planting, seeding, burning, and scarifying to regenerate forests after harvest. In addition, wildlife biologists and foresters implement non-commercial treatments such as planting of tree seedlings, herbaceous plantings in forest openings, prescribed burns to reduce woody encroachment, and roller chopping to create or limit brush growth. These treatments are frequently funded by DRIP and may include public partners, such as conservation organizations or local sportsman groups.

A manual created to guide implementation of DRIP in the 1970's emphasized the creation of young forests dominated by aspen, upland brush, grass openings, oak, and other forest types that are beneficial to deer during spring, summer, and fall. The winter range portion of the DRIP manual gave guidance on how to harvest and regenerate conifer swamps to provide rejuvenated food and cover conditions for deer. Although the principles of deer habitat management have remained much the same, the DRIP manual is now nearly 40 years old and is being updated.

Wildlife Division staff continue to work with the Forest Resources Division to ensure that young forest conditions prevail in appropriate locations and amounts, and they implement special projects to enhance deer habitat, such as planting of clover in forest openings, and planting of oak seedlings to provide future acorns. The DRIP funds, in concert with Michigan Natural Resources Trust Fund dollars (revenues generated by sale and leases of oil, gas and minerals from state lands), have been increasingly used to purchase lands that are viewed as important to wintering deer, particularly in the UP, where the loss of quality winter habitat appears to be greatest over the past half century.

Soil types and land cover types are not equally distributed between public and private lands in Michigan. This inequitable distribution often results in higher quality deer habitat occurring on private land. Agricultural lands are almost entirely (99 percent) found on private land and the abundant nutritional forage provided by crops allows for tremendous deer productivity. According to the Michigan Gap Analysis Project (Donovan et al. 2004), over 70 percent of the oak forests in Michigan are found on private land with the hard mast produced by these forests allowing deer to take on critical fat deposits as they enter the lean winter months. About 65 percent of Michigan's aspen forest is found on private land and deer benefit from browse available in regenerating forests, particularly those with aspen. In parts of northern Michigan, deer display seasonal migratory behavior where they seek out traditional wintering complexes consisting of large lowland conifer blocks that provide thermal cover and shelter from deep snow accumulation (Beyer et al. 2010). More than 57 percent of the lowland conifer and 60 percent of the identified wintering complexes are found on private land.

Private landowners and the properties they own range from rural homeowners that live on parcels of less than an acre to huge corporations whose ownership may be in the hundreds of thousands of acres. Land management interests range from nicely landscaped backyards to private hunting spots to maximized production of agricultural and forestry products.

Commercial forest management, agricultural activities, and human development have the largest impact on deer habitat on private land; smaller scale efforts, including non-commercial forest manipulations and food and cover plots established by deer hunters, can have local impacts.

With nearly 80 percent of the land base and the majority of the most productive forests and agricultural lands under control of private landowners, there is considerable potential for habitat management activities on these lands to influence deer densities. This influence will increase in significance if landowners work together to identify regional habitat limitations and to address these limitations with appropriate projects. The potential for this type of cooperation is high in the northern portions of the state where corporations often enroll large tracts of land in the Commercial Forest Act (CFA), which provides a property tax reduction to private landowners as an incentive to retain and manage forestland for long-term timber production. The CFA also stipulates that public hunting be allowed on all parcels enrolled in the program. In 2009, there were approximately 2.2 million acres enrolled in this program by nearly 1,700 different landowners (Michigan Department of Natural Resources 2010). In addition, in parts of northern Michigan, large hunt clubs often consisting of tens of thousands of contiguous acres aggressively manage for deer and control enough land to impact local habitat conditions. In southern Michigan, deer management co-ops are becoming increasingly common, which are areas that involve groups of landowners working together on habitat projects and wildlife management activities (Mitterling 2013). For these variety of reasons, cooperative land management appears to be a growing trend throughout Michigan.

The DNR has identified white-tailed deer as a featured species, a species that is highly valued by the citizens of Michigan, with habitat concerns that can be realistically addressed through active management. Even so, land managers must include the habitat needs and requirements of other species when considering managing habitat for deer. Management practices implemented to improve habitat for one species nearly always result in a decrease in habitat quality for other species and proper habitat planning is a process of balancing the needs and requirements of a host of species. Improving habitat for white-tailed deer decreases habitat quality for some other species, especially those that require large tracts of mature forest.

The following Objectives and Actions have been identified to help overcome many of the challenges identified above. To the extent the Objectives are achieved, habitat conditions for deer and some additional species across the state should improve.

3.1 Identify and address critical habitat needs of white-tailed deer by region.

Action 1: Evaluate existing deer habitat conditions, especially wintering habitat, and identify strategies to address regional habitat issues.

Action 2: Update the DRIP Manual to ensure that habitat improvement projects and land acquisition strategies successfully improve and increase deer habitat in the highest priority areas.

Action 3: Identify and implement habitat projects on DNR-managed lands to address specific deer habitat needs.

Action 4: Work closely with agencies and individuals responsible for vegetation management on non-DNR public land including those managed by USFS, USFWS, USDA-NRCS, NGOs, Conservation Districts, and private landowners, particularly those enrolled in the CFA, or managed as hunt clubs or deer management cooperatives, to identify deer habitat issues and to implement habitat improvements.

Action 5: Continue to identify and acquire land parcels containing critical winter habitat, especially where quality habitat is in danger of being converted or destroyed.

3.2 Consider habitat needs and requirements of other wildlife species and impacts on natural communities when planning and implementing deer habitat projects.

Action 1: Balancing impacts on habitat of other wildlife species and on native plant species, communities and ecosystems, especially as identified in other resource management plans (e.g., WAP, State Forest Management Plan, Regional State Forest Management Plans, High Conservation Value Area Plans) when planning and implementing deer habitat improvements on DNR-managed lands.

Action 2**:** Consult with other significant land managers including the USFS, USFWS, NGOs, and private landowners, particularly those enrolled in CFA, or managed as hunt clubs or deer management cooperatives, on impacts of deer habitat improvement projects on other species.

Goal 4. Reduce conflict 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. People engaged in these conflicts frequently request assistance from the DNR and these conflicts must be considered when deer management decisions and policies are developed. While the DNR attempts to minimize deer-human conflicts by managing deer at appropriate levels through hunting, development and implementation of new strategies will be necessary to successfully manage deer in areas where hunting has not been effective.

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 2014 more than 51,000 farms encompassing over 9.9 million acres, produced a net farm income of $2.2 billion (USDA 2014) and generated $91.4 billion in economic activity (MDARD 2012). Michigan ranks 18th nationally in total cash receipts for agricultural products and is the leading U.S. producer of crops such as dry beans, blueberries, cherries, and cucumbers (USDA 2014). Agricultural crops

are damaged by deer in most Michigan counties, but most significant damage occurs in areas where deer densities are high and agricultural crops are common on the landscape.

The DNR attempts to minimize deer damage to crops and ornamental plants through a variety of tools. Non-lethal methods that are frequently recommended to landowners by DNR staff include the use of fencing, repellents, habitat alterations, and dogs. These methods have shown some short-term effectiveness, but can be expensive and labor-intensive. Regulated shooting of deer in conjunction with non-lethal methods has generally been the most effective strategy. The DNR issues Deer Damage Control Permits (DDCPs) to farmers experiencing excessive crop damage during the growing season, and provides opportunities for appropriate harvest of antlerless deer during the hunting seasons by making sufficient antlerless licenses available. Where necessary, the DNR issues the authority to purchase additional antlerless deer licenses called Deer Management Assistance Permits (DMAPs) to eligible land owners for use during the hunting seasons. In some areas, these tools have not been effective at reducing crop damage and alternative methods are needed.

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 tenth in the country in reported collisions. In 2014, 45,690 deer-vehicle collisions were reported in Michigan resulting in 6 human deaths and 1,072 injuries to the persons involved (Michigan Office of Highway Safety Planning 2014). Reduction of deer 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.

As deer have adapted to living among humans and densely populated areas, they have moved into urban/suburban areas across the state. Increasing numbers of urban deer-vehicle collisions and excessive damage to landscaping are the most common problems associated with deer in these settings. In addition, concerns of disease associated with an abundant deer population living so closely with humans (e.g. Lyme disease) also arise.

Perhaps the most challenging aspect in all of white-tailed deer management is the issue of how to best manage deer in these urban/suburban areas where use of lethal control as a management tool is frequently unavailable and community members often have highly polarized views and values regarding deer management. Successful resolution of urban/suburban deer issues requires that community leaders and DNR staff work together with stakeholders to gain acceptance of proven methods and utilize them to successfully reduce human-deer conflicts. Currently, the DNR advises community leaders, assists in the development of deer management plans, participates on local task forces, speaks at public meetings, conducts disease testing, and provides permits for lethal harvest, but lacks a defined process that can be implemented consistently across the State.

The DNR encourages additional harvest of antlerless deer, especially on private lands, in order to lower deer population levels in some areas. Discounted prices on antlerless licenses, additional antlerless seasons, and educational efforts aimed at increasing antlerless harvest have failed to encourage hunters to harvest enough antlerless deer to keep deer at reasonable levels in some areas of the state. Some landowners are unwilling to require their hunters to harvest antlerless deer and guest hunters often choose to focus harvest efforts on antlered bucks. DNR efforts to

engage organizations such as Michigan State University Extension, Farm Bureau, and MUCC to connect farmers seeking reductions in deer with hunters seeking hunting opportunities may be productive. In addition, the effectiveness of deer management tools must be evaluated thoroughly. Current programs may be too voluntary in nature, lacking adequate incentives to change behaviors and to increase the harvest of antlerless deer. It is foreseeable that recreational hunting may no longer be adequate to manage the deer herd in some places in southern Michigan.

The following Objectives and Actions have been identified to help overcome many of the challenges identified above. To the extent the Objectives are achieved, human-deer conflicts should be reduced.

4.1 Reduce damage done by deer to agricultural, silvicultural and horticultural crops**.**

Action 1: Consider extent of damage to agricultural, silvicultural, and horticultural crops when establishing regulations and setting antlerless quotas.

Action 2: Evaluate the effectiveness of current tools designed to reduce or maintain deer and to minimize damage to agricultural, silvicultural, and horticultural crops.

Action 3: Work with organizations to facilitate relationships between farmers and hunters to increase deer harvest and hunting access on private lands to meet landowner objectives.

Action 4: Report and record on a routine basis the number of deer permits (DDCPs, DMAPs, and DCPs) that are issued and used by region.

Action 5: Identify opportunities to implement new and innovative tools for managing deer populations where voluntary programs are not effective.

4.2 Reduce deer-vehicle collisions.

Action 1: Consider deer-vehicle collision rates when establishing regulations and setting antlerless quotas.

Action 2: DNR staff, as appropriate, will continue to work with the Michigan Deer Crash Coalition (MDCC) to develop and implement programs designed to increase driver awareness and reduce deer-vehicle collisions.

4.3 Increase effectiveness at managing deer impacts in urban and suburban areas, airports, etc.

Action 1: Develop a current urban/suburban deer policy and develop an urban/suburban deer management plan that provides specific,

consistent guidelines and recommendations for communities dealing with urban/suburban deer issues.

Action 2: Pursue policies that allow and encourage the use of hunting, including archery hunting in urban/suburban areas, to address urban/suburban deer issues.

Action 3: Provide educational materials with technical advice and tools for dealing with urban and suburban deer.

Goal 5. Reduce the threats and impacts of disease on the wild deer population and on Michigan's economy.

The Michigan DNR is responsible for safeguarding the health of free-ranging wildlife, including white-tailed deer through its management and regulatory authorities. Like all wildlife species, white-tailed deer are susceptible to a variety of diseases and parasites, many of which weaken affected animals, but generally are not fatal. Others can be deadly to individual animals either acutely or chronically, may potentially affect entire populations and can be transmitted to other species, including domestic animals and/or humans. Diseases that are of concern in Michigan include EHD, eastern equine encephalitis, Lyme disease, bovine tuberculosis (TB), and CWD. The discovery of bovine TB in wild deer and more recently the discovery of CWD in captive and free ranging deer have triggered intense public concern and influenced deer management decisions.

The bovine TB eradication effort has had a significant effect on the northern Michigan deer population, the livestock industry, and Michigan's economy since discovery of the disease in Michigan in 1975. In efforts to lower TB infection rates in deer, baiting and feeding of deer were banned in the TB management area (a portion of the NE Lower Peninsula) in 1998. Sufficient antlerless licenses and DCPs have been made available to hunters and landowners, and the deer population and harvest in that area was reduced dramatically since that time frame. However, as hunters observed fewer deer, they became less willing to sustain aggressive antlerless deer harvests and public resentment of control measures has grown.

Following confirmed diagnosis of CWD in a captive white-tailed deer in a Kent County facility in August 2008, the DNR intensified surveillance efforts as prescribed by the Michigan Surveillance and Response Plan for Chronic Wasting Disease of Free-Ranging and Privately-owned/Captive Cervids (Michigan DNR and Michigan MDARD 2002). In 2008, 9,151 free-ranging deer were tested for CWD statewide, including 1,523 from a nine-township area where mandatory deer check was initiated surrounding the infected captive facility. All were negative. In 2015, a doe in Ingham County exhibiting symptoms of CWD was taken by Meridian Township police. This deer turned out to be the first CWD positive wild deer in Michigan. Since the initial finding in 2016, sharpshooting efforts have revealed six additional positive deer, including deer in southern Clinton County. Extensive surveillance efforts continue to this day. Since 1998 and prior to CWD being discovered in Ingham County, over 34,000 free-ranging white-tailed deer have been tested statewide. CWD testing has also occurred on 1,600 elk and 70 moose in Michigan, with CWD failing to be detected in any previous sample.

Both simulation modeling and field research conducted in other states 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 (Miller et al. 2008, Wasserberg et al. 2009). Where CWD has become established, no characteristics of the disease make containment and control, let alone eradication, a likely result (Williams et al. 2002). Because the apparent presence of CWD poses such a significant threat to deer populations, actions taken by the DNR included placing further restrictions on captive deer facilities throughout the State, approving antlerless deer regulations designed to reduce the herd, and implementation of a ban on baiting and feeding of deer as dictated by the CWD Response Plan.

DNR management decisions and responses to disease risks must continue to be based on the best available science and consider relative risks to the health of deer, other wildlife species, livestock and agriculture, and human health and safety. The DNR strategies regarding the threat of disease must be clear, well communicated to the public, and appropriate to the seriousness of the threat. Recognizing that the state has two distinct deer sub-populations (UP and LP), disease prevention strategies should be addressed at the sub-population level rather than on a statewide basis. Similar to the plan completed for CWD, response plans for diseases that pose potential threats to Michigan's deer herd facilitate proactive and well-planned responses. Development of similar plans for other diseases of concern is likely to be beneficial in some circumstances.

The following Objectives and Actions have been identified to help overcome many of the challenges identified above. To the extent the Objectives are achieved, the threats and impacts of disease on the wild deer population and on Michigan's economy should be minimized.

5.1 Implement deer management programs and regulations designed to prevent the infection of deer by diseases that are not currently endemic to Michigan's deer herd and reduce prevalence rates and distribution of existing diseases in Michigan's deer population.

Action 1: Manage diseases (by containment, control, or eradication when appropriate) commensurate with the threats they pose to the sustainability of the deer population, human health, other wildlife, the economy, and agriculture.

Action 2: Develop, update, and follow disease response plans for diseases that are determined to pose significant threats to Michigan's deer herd.

Action 3: Implement guidelines and strategies provided by disease response plans to reduce or eradicate diseases that influence the well-being of deer or the health of humans, domestic animals, and other wildlife.

Action 4: Maintain existing programs and regulations designed to reduce the likelihood that diseases not currently found in Michigan deer will become established and to reduce prevalence rates and distribution of existing diseases. These include a ban on all baiting and feeding, restrictions on importation of deer parts from states with CWD, and monitoring of taxidermy facilities, captive deer facilities, and rehabilitation of deer.

Action 5: Consider use of all available tools to manage deer at levels where transmission rates of significant contagious diseases such as TB and CWD are minimized.

Action 6: Regulations aimed at addressing the impacts of disease on deer in Michigan, to the extent possible, will be focused regionally, rather than the entire statewide herd.

5.2 Adequately survey Michigan's deer herd for disease.

Action 1: Continue to test deer for TB, CWD, and EHD at levels sufficient to characterize the magnitude and distribution of each disease in Michigan's deer herd.

Action 2: Continue to test deer that exhibit behavior consistent with a neurologic disease, including loss of fear of humans, extreme emaciation, drooling, walking in circles, etc., and conduct investigations of deer die-offs or unusual events involving sick deer.

Action 3: Regularly report findings to the public on diseases of concern and the health status of the deer herd.

5.3 Disease prevention and management policies and regulations will incorporate the best and most recent scientific information pertaining to deer diseases in Michigan**.**

Action 1: Review appropriate scientific journals for new and more complete information regarding deer diseases relevant to Michigan.

Action 2: Conduct, evaluate, and review research on deer disease-related issues.

Goal 6. Enhance public engagement in and awareness of deer management issues and knowledge of deer ecology and management.

Deer are one of the most recognizable and most frequently observed wildlife species in Michigan, and the DNR has attempted education and outreach activities over the years to inform and educate the citizens of Michigan about deer and deer management. Despite the high profile nature of deer and DNR outreach efforts, the general public still holds many misconceptions about the species. Many members of the public do not fully understand the details of deer management in Michigan, and there is skepticism regarding DNR management efforts, especially with the accuracy of deer population estimates. The public survey report (Appendix E) identified a lack of trust of DNR deer management efforts among deer hunters, especially in the UP, and just 54% of deer hunters in 2012 indicated they trusted the DNR to establish appropriate deer hunting regulations (Frawley and Rudolph 2014). Clear and concise information describing how the DNR monitors and manages the deer herd is critical to building trust among stakeholders for the DNR. The public is interested in all aspects of deer and deer

management, and information and education programs that encourage interest and participation in deer hunting and deer management among Michigan's citizens should be comprehensive.

Deer hunting and deer management opinions and philosophies often elicit strong emotions among stakeholder groups and individuals. These opinions and philosophies can stem from long held traditions and ideals, which may be difficult to change. Developing educational materials that effectively impact Michigan citizens is difficult. The presentation of accurate, unbiased information that is based on sound science is essential when difficult or controversial ideas and concepts are being communicated.

Researchers, managers and stakeholder groups generally agree an informed public is critical in creating a successful deer management program. Efforts undertaken by DNR staff to provide the opportunity for public input leading up to development of this plan (i.e., the eight public meetings held throughout the State, interactions with the Michigan Deer Advisory Team, Tribal representatives, public opinion survey, and public review and comment period) reinforced awareness about the desire of the public to be well informed on deer management issues and the need for an effective deer information and education program.

Although the need for an effective deer management information and education program is widely recognized, development of such a program is not a simple task. Acquiring and incorporating input from and creating and providing information to a diverse group of organizations and individuals is challenging. Many stakeholders interested in deer management in Michigan are easily identified and willing to participate in public meetings. These groups have regular contact with DNR staff, and take notice of DNR press releases and outreach materials. However, there are many other individuals or groups that are much less engaged, but are equally interested or opinionated. Opinions and ideas of groups or individuals that are familiar and comfortable with traditional DNR outreach efforts are often over-represented compared to those who are unwilling or uninterested in making the efforts necessary for interaction with DNR staff and DNR outreach efforts.

A major challenge to the development of an effective education program has been a lack of priority within the agency. Although the DNR has engaged in several deer education and outreach activities during the past several years, it has lacked sufficient staff to develop and implement a comprehensive deer-based education program while maintaining all other priority activities.

Coordinating a deer education program in cooperation with partners (e.g., other agencies, Tribes, MSU Extension, Michigan Association of Conservation Districts, and private organizations) may be an effective way to overcome many challenges and barriers that exist with deer management. There is a need to identify target audiences, information needs, and the educational approaches that may be most effective. Partnerships with appropriate organizations and stakeholder groups can lend credibility to educational materials and help ensure those materials present unbiased, accurate information. A program involving such partners that utilize a diverse array of proven media outlets can effectively communicate information to broad audiences.

In addition, targeted information and education programs that involve partners, who possess the expertise and resources necessary to develop and implement an effective program, can improve the quality and accelerate the development and distribution of educational materials that address the specific needs and interests of target audiences. Some individuals, organizations, or businesses that are vested in deer management (e.g., hunting equipment manufacturers, agricultural and silvicultural interests, or those concerned about deer-vehicle accidents) have not fully participated in promoting deer management and deer hunting. Partnering with organizations associated with the hunting community, shooting sports industry, tourism industry, and non-government organizations should increase the credibility of outreach efforts. Public engagement efforts should be implemented at all geographic (statewide, regional, and local) levels. Communication strategies should be proactive in discovering, addressing and managing issues, while engaging partner organizations whenever possible.

Since it is difficult to take input from the large and diverse groups and individuals interested in deer management in Michigan, the RDATs and UP Sportsmen's Coalitions will assist DNR staff with information and education efforts regarding deer management issues that are specific to the different regions of the State. The RDATs will be helpful to the DNR as conduits between the DNR, stakeholders, and Michigan citizens. Similar advisory groups on black bears, furbearers, fisheries, and waterfowl have been established, and have proven effective.

The following Objectives and Actions have been identified to help overcome many of the challenges identified above. To the extent the Objectives are achieved, public awareness and understanding of deer management is expected to increase.

6.1 Engage stakeholders and partners as deer management decisions are considered and outcomes are communicated.

Action 1: Investigate and implement means to ensure a diversity of stakeholders and partners have opportunities to provide input when considering deer management issues.

Action 2: When necessary, engage various stakeholders by utilizing RDATs, UP Sportsmen's Coalitions, surveys, public forums, focus groups, or one-on-one conversations to ensure needs and interests of Michigan citizens are being considered.

6.2 Convey appropriate, accurate and consistent information to the public concerning deer ecology and deer management in Michigan.

Action 1: Develop a Deer Communication Strategy so that appropriate deer management information is communicated, such as the deer management methods and philosophies that are considered by DNR staff.

Action 2: Communicate appropriate information on deer hunting and deer population trends, such as the legal authorities and processes through

which pertinent laws and regulations are adopted; regional deer population information; public and private land hunting opportunities; deer harvest results and statistics; principles of fair chase; the role of hunting in deer management; and trespass laws and recreational liability for landowners.

Action 3: Present information that is science-based and factual.

Action 4: Recognize, incorporate, and promote the idea that deer hunting is more than a deer population management tool and has social, cultural, economic, subsistence, and spiritual value.

Action 5: Promote established principles of fair chase for free-ranging deer through education and outreach materials.

6.3 Coordinate with partners to develop and implement deer-based information and education efforts identified in the deer communication strategy.

Action 1: Identify and develop relationships with partners including government agencies, hunting and conservation organizations, businesses and organizations associated with deer hunting, agricultural, silvicultural, and insurance industries, etc., that can provide assistance (technical and/or financial) in the development of information and education programs and materials.

Action 2: Work with partners to develop, distribute, and evaluate materials, presentations, and programs that address the needs and interests of target audiences.

Action 3: Work with the media to present accurate information to broad audiences.

Action 4: When prudent, invite public and media participation in deer-related projects.

Action 5: Support efforts initiated and implemented by partners to provide positive deer-related information and to enhance relationships.

6.4 Support regional and national participation in scientific work groups and training opportunities for staff and partners involved in the deer-based Information and Education Program.

Action 1: DNR staff, as appropriate, will continue to participate in and provide leadership roles for national, regional, and state wildlife organizations and committees that focus on deer population and habitat management, wildlife health and diseases, public health and safety problems associated with deer, deer conflict resolutions, and research activities associated with each of these topics.

Action 2: Provide staff with the training and information resources necessary for effective participation in the information and education program.

Action 3: Share information with partners to facilitate understanding of current deer-related issues.

6.5 Evaluate the effectiveness of the Deer Communication Program.

Action 1: Work with RDATs, UP Sportsmen's Coalitions, partners, and research staff to complete a regular needs assessment and an evaluation of the effectiveness of the information and education program.

PLAN MONITORING AND REVIEW

Regular communication among the DNR, other agencies, stakeholder groups, and the general public allows interested parties to monitor progress made toward implementation of this plan. It also provides opportunities for DNR staff to receive input on specific management issues. The DNR Deer Program staff will work with the RDATs and take input from other interested organizations and individuals annually to ensure that the deer management plan is being implemented effectively. Progress toward implementation of specific Actions will be assessed and ultimately, success of the deer management program will be judged by evaluating achievement of the six Goals identified in this plan.

Deer abundance, distribution and the attitudes of Michigan residents concerning deer will likely continue to change through time. To address ecological, social and regulatory shifts in a timely manner, the DNR will review and update this plan at 10-year intervals. The plan-revision process will include review of the best available scientific information and substantial involvement by affected stakeholder groups and the public.

FUNDING

Much of the funding for wildlife management in Michigan has historically been derived from revenues generated by sportspersons. For example, the Michigan Game & Fish Fund and the DRIP, are generated by state hunting and fishing license revenues, and the Federal Aid in Wildlife Restoration Act (also known as the Pittman–Robertson Act) provides funds derived from a Federal tax on purchases of sporting arms and ammunition. Passage of the Pittman-Robertson Act in 1937 was a huge step forward for America's growing wildlife management programs. In Michigan, these funds have been, and continue to be, used for the acquisition and maintenance of state game lands and to fund important wildlife management efforts including planning, population surveys, research, and outreach activities including hunter education programs. Since more hunting licenses are purchased by deer hunters than any other group, deer hunters support a significant portion of the DNR's wildlife conservation activities. In addition, timber sale revenues from State forest lands and some State Game and Wildlife Areas also contribute toward wildlife management and conservation. At approximately 30 to 35 million dollars of timber revenues are generated on State forest lands each year. These funding sources are critical in Michigan since the DNR has gotten ten percent or less of its budget from the State of Michigan General Fund (general tax dollars). In the absence of other funding alternatives, the DNR deer management program has been supported primarily by these funding sources. As a

result, sportspersons have played a critical role in funding the conservation and management of deer in Michigan.

While sportspersons and other management partners have provided much of the funding for deer management, they currently represent only a small proportion of Michigan residents. Regardless of the inequities that may be associated with such a system, a funding approach that relies on the contributions of these groups may fall short of management needs in the future. This is especially true if the number of sportspersons continues to decline. This issue is not specific to funding for deer management, but applies to most major funding sources utilized for wildlife management in Michigan.

Successful efforts to obtain funding from alternative sources could spread the financial support for deer management among a greater variety of stakeholder groups who are impacted by deer. Such an approach could help sustain the required levels of funding, and it could provide the general public with a greater stake and interest in deer management. Pursuit of alternative funding sources for wildlife management will be coordinated at the Department level.

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