

# FINAL REPORT AND RECOMMENDATIONS

BY,

**WISCONSIN WHITE-TAILED DEER TRUSTEE AND REVIEW COMMITTEE**

**JUNE, 2012**

**Drs. James C. Kroll (Trustee), David C. Guynn, Jr. (Committee Member), and Gary L Alt (Committee Member)**

**Presented to,**

**Wisconsin Department of Administration**

**Madison, Wisconsin**

## **EXECUTIVE SUMMARY**

For some time, there has been growing public dissatisfaction with various issues related to white-tailed deer management and hunting in Wisconsin. During his campaign, Governor Scott Walker made a promise to appoint a “Deer Trustee” to review programs, activities and efforts by the Wisconsin Department of Natural Resources (WDNR) related to deer management, to help resolve these issues. In October, the Department of Administration (DOA) selected Dr. James C. Kroll to be the *Deer Trustee*. A contract for services (October, 2011) was developed between Dr. Kroll (Dr. Deer, Inc.) and the State of Wisconsin, through the DOA. This contract specified the following responsibilities:

*“Contractor, in consultation with two other recognized deer management experts (“Contractor’s Associates”) shall undertake an assessment of Wisconsin’s deer management plans and policies, hereinafter, “Services”, including, but not limited to: (i) The methodology and accuracy of population estimates for Wisconsin’s white-tailed deer herd; (ii) The necessity and effectiveness of Wisconsin’s policies in response to an infectious disease known as Chronic Wasting Disease (CWD); (iii) The significance of the impact of Wisconsin’s timber wolf population upon the white-tailed deer herd, and its impact upon white-tailed deer management policies and plans, if any; and (iv) The structure of Wisconsin’s deer hunting periods, including, but not limited to, the necessity and efficacy of hunting polices such as “Earn-A-Buck” and other policies and plans designed to control the size of Wisconsin’s white-tailed deer herd.”* [EAB was removed from consideration by legislation prior to initiation of this project.

The Deer Trustee Committee conducted an exhaustive study of deer management by the Department of Natural Resources, beginning in October, 2011 through 30 June, 2012. Hundreds of documents, data and other materials provided by the WDNR were reviewed by the committee, as well as conducting meetings with the WDNR, stakeholder groups, other state agencies associated with natural resources and the general public through six Town Hall meetings. We also obtained over a thousand comments via the Internet and numerous letters from professionals and private citizens. We met with biologists and

members of the Great Lakes Indian Fish & Wildlife Commission (GLIFWC), representing 11 Ojibwe tribes in Minnesota, Wisconsin and Michigan. Our Final Report (Appended) represents our findings and recommendations for re-establishing public trust between the citizens of Wisconsin, the Ojibwe Tribes and the Department of Natural Resources. However, before presenting our findings and recommendations, we wish to present our basic philosophy of deer management. Although there are many issues involved in evaluating the WDNR white-tailed deer management program, there were three basic areas to consider. Deer management has been likened to a three-legged stool (Kroll 1991); one leg representing population management, another habitat, and the third human dimensions (people "management"). The reason for choosing this analogy is each of the three legs is equally important; and, without one the stool is rendered useless. Giles (1978) defined wildlife management as "the science and art of making decisions and taking actions to manipulate the structure, dynamics, and relations of populations, habitats, and people to achieve specific human objectives by means of the wildlife resource." This long and cumbersome definition has many implications, but provides a meaningful context in which to frame a review of the deer management practices of the Wisconsin Department of Natural Resources.

Wildlife management is evolving from an art to a science. Despite the many scientific and technological advances that have occurred during the four decades since Giles wrote this definition, it is unlikely wildlife management ever will become a pure science. This is because the factors that affect habitats and deer population responses on the landscape scale are complex, difficult to define, even harder to measure and constantly changing. Public views and expectations for management of white-tailed deer populations vary from those who want more deer (recreational hunting) to those who want less or no deer (motorists, forest managers, farmers). McKean (2011) identified a number of factors that may contribute to declining deer harvests in a number of states including Wisconsin: 1) maturing forests, 2) increasing predator populations, 3) baiting issues, 4) habitat loss, 5) increasing public intolerance of high deer densities, 6) inadequate monitoring, and 7) unrealistic hunter expectations. Most state wildlife agencies have little if any control over these factors or lack the resources to monitor much less manage these factors.

Thus, our review of Wisconsin's deer management practices focused on the density and structure of white-tailed deer populations and how they are managed by recreational hunting and other means, white-tailed deer habitats and how they are described and quantified, and the human dimensions of deer management as it relates to cultural, economic, political and management concerns of the public. We also considered how various aspects of these three components (populations, habitat and people) are monitored and how this information is used in formulation of deer management policies and regulations similar to the 4-cornerstone approach of The Quality Deer Management Association (QDMA 2012).

In our Interim Report (March 2012), we concluded public confidence in the Wisconsin Department of Natural Resources in regard to deer management issues has seriously eroded over the last few decades. The reasons are complex and not easily solved, but

revolve primarily around two key issues— the current use of the SAK Population Model and the ineffectiveness of the CWD eradication program. However, lack of public involvement, particularly by landowners and Tribes, in goal setting and decision-making regarding deer management lie at the heart of the problem. As we noted above, these problems did not arise overnight and hence the solutions will also take time. Our Interim Report included a number of findings and conclusions. Since March, we are convinced these findings generally were correct, but came to additional conclusions based on information acquired since that time. This Executive Summary represents our final findings and recommendations. However, we would like to interject here we are in no way questioning the dedication, effort or commitment to deer management by the WDNR staff. We found these folks to be helpful and generous, in spite of undergoing such an intensive evaluation; we are grateful for their help. [The Interim Report was read 1,700 times on the drdeer.com web site.] If these recommendations are implemented, we are convinced they represent a “reset button” for WDNR-public relationships. If not, the situation will continue to deteriorate to one in which deer management falls victim to an increasingly political process.

## **FINAL RECOMMENDATIONS**

### **Population Management**

- 1. Limit the use of SAK/accounting style models to monitoring deer population size and trends at the state and regional levels.**
- 2. Do away with population goals and population estimates at the DMU level.**
- 3. Replace the current DMU population goal definition of comparing the deer population estimate with the desired population goal for the DMU with a simplified goal statement of increase, stabilize or decrease population density.**
- 4. Develop a set of metrics to monitor progress towards the DMU goal of increasing, stabilizing, or decreasing population density.**
- 5. Reduce the number of DMUs and combine the Farmland regions.**
- 6. Revise the Wisconsin Deer Management Plan.**

### **Hunting Regulations, Seasons and Bag Limits**

- 1. Simplify the regulatory process by setting antlerless harvest goals, harvest regulations and antlerless permit quotas on a 3-5 year cycle.**
- 2. Base Antlerless Permit Quotas on DMU historical demand.**
- 3. Increase the cost of all antlerless tags for Regular and Herd Control Units to \$12.**
- 4. Consider charging a fee for antlerless tags in the CWD Zone.**
- 5. Establish a public lands antlerless permit system.**
- 6. Limit antlerless deer harvest in Regular and Herd Control Zones.**
- 7. Establish a Deer Management Assistance Program (DMAP) antlerless permit system.**

8. Re-evaluate the effectiveness of the October antlerless seasons in the CWD Zone.
9. Maintain the current buck limit of one buck per Deer Gun License (may be used in muzzleloader season) and one buck per Archery Deer License.
10. Maintain the Bonus Buck Regulation in CWD Zone.
11. Resolve the cross-bow season issue through the public involvement process.
12. Resolve the baiting and feeding issue outside CWD affected areas.
13. Put the fun back into hunting by simplifying seasons, bag limits and youth qualifications!

#### **Predator Studies and Management**

1. Continue to conduct research on the impacts of predators on the deer herd.
2. Involve the public as much as practical with field-based research projects.
3. Revise the Wisconsin Wolf Management Plan to include updated information and provide current public attitudes to guide management decisions through the early years of this post-delisting era.
4. Establish a wolf population management program to limit/decrease wolf-societal conflicts.
5. Geospatial studies of predator distribution and densities, especially for wolves, should be encouraged and developed to assess long-term trends and issues.

#### **Chronic Wasting Disease**

1. We believe it is time to consider a more passive approach to CWD in the DMZ.
2. There is a clear need for a new sampling protocol for CWD in Wisconsin, one that gives a true picture of the progress of the disease; but more importantly, one designed to detect spread.
3. Dealing with wildlife diseases is not unlike responding to wild fires, and response plan should be developed on this model, focusing on early detection of “break outs” and citizen involvement (active approach).
4. We recommend implementation of a statewide DMAP program; and, nowhere is such a program needed more than in the DMZ.
5. There is a need to provide more information about concerns for humans contracting a CWD variant.
6. The time required to receive CWD test results from hunter-killed animals must be decreased to a few days.
7. An annual meeting of DMAP cooperators would be an excellent venue for reporting on various aspects of CWD, in addition to the topics discussed earlier. This would greatly enhance public awareness and WDNR credibility.

8. WDNR should work closely (through the local biologist) with the Conservation Congress in developing goals and strategies at the county level. we feel use of human dimensions research to anticipate, rather than reacting to issues as they arise would be very effective.
9. We feel use of human dimensions research to anticipate, rather than reacting to issues as they arise would be very effective.
10. Charlotte the Deer should become the “Smokey Bear” of CWD in Wisconsin, serving as the centerpiece for a public education program developed with stakeholder organizations such as QDMA, Whitetails of Wisconsin and Whitetails Unlimited.

#### Harvest Data, Herd Health and Productivity

1. Involving the public in data collection produces many benefits, including buy-in on management and harvest strategies and cost-efficiencies of data collection.
2. Each field biologist should be required to organize and conduct at least one field necropsy study each year, conducted along with cooperators and volunteers during late winter.
3. Training should be provided to biologists and technicians to standardize methodologies and educate them on deer anatomy and basic physiology.
4. An annual report should be prepared for each DMU and Region summarizing these studies and a Powerpoint/video presentation developed for annual DMAP workshops and public presentations.

#### Habitat

1. As both part of DMAP activities and public lands management, local biologists/technicians should be required to conduct annual range evaluations to assess habitat health and condition. Foresters also should be involved in these activities, public and private.
2. Training programs should be developed for state and private resource managers to standardize habitat/range assessment methodologies.
3. There is a need for modernizing the GIS and GPS capabilities of Wisconsin’s agencies.
4. A statewide geospatial information system, similar to that used in Texas, should be developed which provides seamless support to all state resource managers across agencies, which also supports economic development, emergency planning and response, and a host of citizen services.
5. Form a Young Forest Initiative Task Force.

6. Funding for these activities should arise from fees assessed by stakeholders and landowners using these data and services, as well as grants and contracts for various state agency activities.
7. The WDNR adopt an advocacy role in dealing with the National Forests of Wisconsin to encourage sustainable forest management, especially for early and mid-successional species (game and non-game).

### People

1. Implement a Deer Management Assistance Program (DMAP).
2. Each DMAP cooperator should receive an annual report summarizing current data and trend data over years to monitor progress toward goals.
3. Develop a public lands antlerless permit system.
4. In addition to providing hunting opportunities, the impacts of deer depredation on agricultural crops, forest regeneration and biodiversity, deer/vehicle collisions, the special significance of deer to the Ojibwe people and other factors also must be considered in management of Wisconsin's white-tailed deer resources. This will include strict adherence to all agreements with the Voight Intertribal Task Force (GLIFWC), the tribes serving as "co-managers" where appropriate.
5. Expand public education/outreach efforts to serve landowners whose goals include management for white-tailed deer and other wildlife species.

### DNR Research and Technical Publications

1. We strongly suggest establishment of a research steering committee, with representation from user groups, stakeholders and regional WDNR biologists, and Tribal representatives.
2. A significant effort should be developed in Human Dimensions research. Wisconsin is blessed with two excellent researchers (Holsman at UW-SP and Petchenik in house), and a plan for long-term monitoring of trends and issues should be developed between them.
3. We are concerned about long-term contracts for research services. There need to be milestones and project evaluations.
4. Projects should involve the public whenever practical.
5. There is a need for a long-term research plan (developed through 1), based on needs assessments, and prioritized for funding.
6. Synergies with other agencies and greater cooperative efforts, particularly with those in forestry and geospatial disciplines, would help leverage funding and strengthen projects.
7. Research projects should be of an applied nature, rather than basic research with clearly defined application to the needs for managing Wisconsin's deer and habitat resources.

8. Project results should be extended to the public through media, workshops and field days, as part of the DMAP program and regional stakeholder conferences.
9. In the long-term, we recommend developing a wildlife disease unit to: 1) respond quickly to CWD outbreaks; 2) monitor health and disease of other wildlife species; and, 2) train and support local biologists/technicians in conducting annual herd health surveys.

### Conservation Congress

1. We feel the Conservation Congress must have a more active role in deer management decision-making at the local level.

### Personnel

1. We strongly suggest addition of a Deer Management Assistance Coordinator, a highly qualified individual with the following characteristics: 1) considerable experience with DMAP or related programs; 2) well-respected in both the scientific and public communities; 3) highly skilled communicator; and, 4) highly motivated to work with the public.
2. We also recommend development of a “boots-on-the-ground” culture in the WDNR; and, job descriptions of field biologists be adjusted accordingly.

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### **PREAMBLE**

In the history of North American wildlife management few issues have been more contentious and challenging than the management of white-tailed deer. The root of this problem has been in defining a clear answer from society for the basic question "How many deer should there be?" The answer, of course, depends on who you ask and what their relationships have been with deer. Predictably, one portion of society will demand more deer to hunt, photograph, or just view, while another portion of society will demand fewer deer to reduce conflicts such as damage to crops, gardens, or forest ecosystems, or to reduce deer-vehicle collisions out of concern for public safety.

Managing deer is fundamentally different than managing most other species of game animals, leading to greater consequences both economically and ecologically. Aside from enormous economic impacts, both positive and negative, deer management has cascading long-term effects on forest ecosystems. Unlike managing bears, turkeys, rabbits, squirrels, upland wildlife or waterfowl, white-tailed deer, if allowed to become overly abundant for extended periods of time, can and will destroy their own habitat, as well as that of other species. This is why they often are referred to as a "Keystone Species." When this happens it is not in the best interest of the health and long-term sustainability of the forest, and most of the other plants and animals that live there—it is also not in the long-term best interest of the deer, the hunters or the future of hunting.

The reestablishment and recovery of the whitetail to its historic range has been celebrated as one of the great success stories of wildlife management in the 20<sup>th</sup> century; but attempting to balance those recovered populations with their habitat, and simultaneously maintaining numbers acceptable to sport hunters, is proving to be one of the greatest challenges for wildlife management in the 21<sup>st</sup> century. We strongly believe the decisions and associated impacts of deer management in Wisconsin should not be made in isolation as a single species, but rather need to be congruent with and guided by the states' (DNR's) greater responsibility for the management of all their natural resources, and for all the people of Wisconsin in current and future generations.

## BACKGROUND

For some time, there has been growing public dissatisfaction with various issues related to white-tailed deer management and hunting in Wisconsin. During his campaign, Governor Scott Walker made a promise to appoint a “Deer Trustee” to review programs, activities and efforts by the Wisconsin Department of Natural Resources (WDNR) related to deer management, to help resolve these issues. In October, the Department of Administration (DOA) selected Dr. James C. Kroll to be the *Deer Trustee*. A contract for services (October, 2011) was developed between Dr. Kroll (Dr. Deer, Inc.) and the State of Wisconsin, through the DOA. This contract specified the following responsibilities:

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Prior to initiation of the above charges, the Wisconsin Legislature subsequently eliminated “Earn-A-Buck” from consideration by legislative action.

## THE PROCESS

**Step One.**— As indicated in the contract, Dr. Kroll’s first responsibility was to designate two additional individuals to serve with him as the review committee. Drs. David Guynn and Gary Alt were asked to participate and agreed to commit to this project. The committee members were selected for their unique experiences in academic, agency and research aspects of whitetail science and management. Dr. Guynn has extensive experience in both biological and human dimensions research; is credited with developing the Mississippi Deer Management Assistance Program (DMAP), which has been a model for many states; and, his talents in public/landowner education and technical guidance. Dr. Alt is a well-known wildlife biologist who, although originally recognized as an accomplished predator (black bear) researcher, was appointed by Governor Tom Ridge to head the white-tailed deer program at the Pennsylvania Game Commission. The purpose of the appointment was to evaluate Pennsylvania’s deer management program and to coordinate necessary changes for improvement. Governor Ridge selected Dr. Alt because of his extensive experience with public relations and mass media to communicate with the public about wildlife management issues and his demonstrated success to solicit public support for necessary

changes. The positive impacts of Dr. Alt's work in Pennsylvania are widely acknowledged as significant and long-lasting. Together the three members of the review committee represent more than 100 years of professional experience.

**Step 2.**— Once the committee was selected, the second step was to develop a process that would develop information needed by the committee in a logical manner. Next we conducted a day-long meeting with the WDNR in Madison, which was attended by a large number of senior and mid-level staff, from several departments and sections. Prior to the meeting, we developed a information/data needs document (Appendix 1), which included 37 requests. The meeting was held on 8 November, 2011. We came away from this meeting very impressed by the dedication and positive attitude of WDNR staff. Most of the original material requested were delivered at this meeting (Appendix 2), either in hard copy or digital form. Initially, approximately 297 items were delivered. Dozens of additional copies also were presented. Oral presentations also were delivered by various staff and university cooperators on a variety of topics, ranging from population modeling to human dimensions. Subsequently, we requested many additional documents and data, as questions or needs arose. Most of these requests were delivered, some after the Interim Report was prepared and submitted.

We must point out, from the very beginning of our work, WDNR staff have been enthusiastically supportive of the process. Many of our requests were complex and we know involved considerable time by staff, and we appreciate the efforts made to provide us with requested materials and information. Speaking honestly, a process such as this cannot be comfortable for personnel of a state agency; yet, we detected no animosity from any individual within the Department. Our impression is WDNR staff are excited about helping forge a new, 21<sup>st</sup> Century model for managing deer. We look forward to working with them on the next phase of the project. We also wish to point out, to date there has not been a single attempt to influence or coerce us in any way by Governor Walker, members of the Wisconsin Legislature, Wisconsin Department of Natural Resources or Wisconsin Department of Administration. In these contentious political times, it is gratifying and a testament to the ethical integrity of these people and agencies, and we appreciate it very much.

**Step Three.**— The third step was to organize and conduct meetings with two groups we deemed critical to the success of this project. Our first meeting was held at the DOA administrative building on 9 January, 2012, and included a wide spectrum of stakeholders. Stakeholder groups were identified with the help of the WDNR, DOA, the Conservation Congress and interested individuals. Our intent was that no organized group would be denied access to this meeting. To date, no additional group has requested a hearing. The meeting was extremely helpful in identifying the key issues and concerns by these interest groups.

A second meeting was held at the same venue on 11 January, 2012, in which representatives from agencies and organizations which we felt directly or indirectly impact or influence deer management in Wisconsin. Representatives from Wisconsin universities and colleges who have related research programs also were invited to this meeting. Again, we felt the meeting was very

productive and we gained even more insights related to various components to Wisconsin deer management, and additional materials were acquired.

On 10 January, 2012 we attended a roundtable discussion conducted by Governor Walker with representatives of the Tribes and Bands of Wisconsin. The purpose of this meeting was to introduce ourselves to these representatives and to organize a follow-up meeting with Tribal biologists and managers. This meeting was very helpful to us in understanding the principal issues and needs of the Tribes. The meeting was followed by a conference call with Dr. Jon Gilbert, Ann McCammon Soltis and Dr. Jim Zorn to discuss the annual Deer Quota Process (Issue 98-2) and how the WDNR interacts with the Voight Intertribal Task Force (VITTF) to determine antlerless deer kill quotas and their apportionment between the Chippewa Tribes and State. Subsequently a meeting between Dr. Kroll and the Tribal Council was scheduled during February, 2012 at Dayton, Wisconsin. Unfortunately, a blizzard caused cancellation of Dr. Kroll's flights and he was not able to attend. The meeting was rescheduled for April 5, and this meeting was completed. We also conducted an additional teleconference with representatives in June, 2012 to brief Tribal representatives on our findings and recommendations for final input. Lastly, we conducted a teleconference with WDNR senior personnel (mid-June, 2012) to brief them on our findings and hear recommendations from them; we also received written recommendations from some personnel.

**Step Four.**— We also examined the results and recommendations of the four previous reviews of various activities and programs of the WDNR, plus conclusions of the Staples Marketing Report Focus Group, commissioned to evaluate public response and opinions related to the CWD eradication program. The purpose of this review was to gain insights into findings by other reviews, and to determine progress towards numerous recommendations resulting from them. We reviewed **Deer Management for 2000 and Beyond: A Wisconsin Conservation Congress Initiative** (Wisconsin Conservation Congress, 2000); the **CWD Response Plan Audit Committee's 2003 Report** (Fischer, et al. 2003) conducted for the WDNR; the **CWD Zone Eradication Program, Legislative Audit** (Mueller 2006); **An Evaluation of the SAK Model as Applied in Wisconsin** (Millspaugh, et al. 2006, 2009); the 15-year (2010-2025) **CWD Response Plan** (<http://dnr.wi.gov/org/land/wildlife/whealth/issues/CWD/plan.htm>); and **The Staples Marketing Study** (Staples 2011). **The complete reports can be viewed or downloaded from the drdeer.com web site.**

Since 2000, we estimated studies and audits cost in excess of \$1 million; and many of the recommendations and actions presented in these reports were not executed or achieved. For example, at the time of preparation of our Interim Report, 35 (47.3%) of the recommendations in the **Deer Management for 2000 and Beyond** report had been completed, 22 (29.8%) had been partially completed, and 17 (23.0%) were not completed. Uncompleted items were related to forest vegetation damage, educational programs, baiting and feeding, antler point restrictions, bag limit changes, CWD monitoring, tags for landowners, and landowner liability.

We concluded the general public (hunting and non-hunting) was unaware of the previous studies and reports, especially the recommendations made in them; and, there was no apparent

procedure for assessing follow-up by the WDNR. Hence, we included this material in our Interim Report.

**Step Five.— Dr. Deer Web Site**

In addition to all of the above, we provided a means for interested individuals to submit their concerns and comments via the Dr. Deer web site (<http://www.drdeer.com/Wisconsin.html>). The graph below summaries comments we received. Although certainly not scientific, concerns expressed by site visitors mirrored those identified in published studies (Holsman 2006, 2007). We received more than 1,100 submissions to date (cf., CD Appended), and numerous letters.. Of these, 486 identified themselves as landowners, 671 as hunters (Fig. 1); unfortunately we did not add a “both” category.

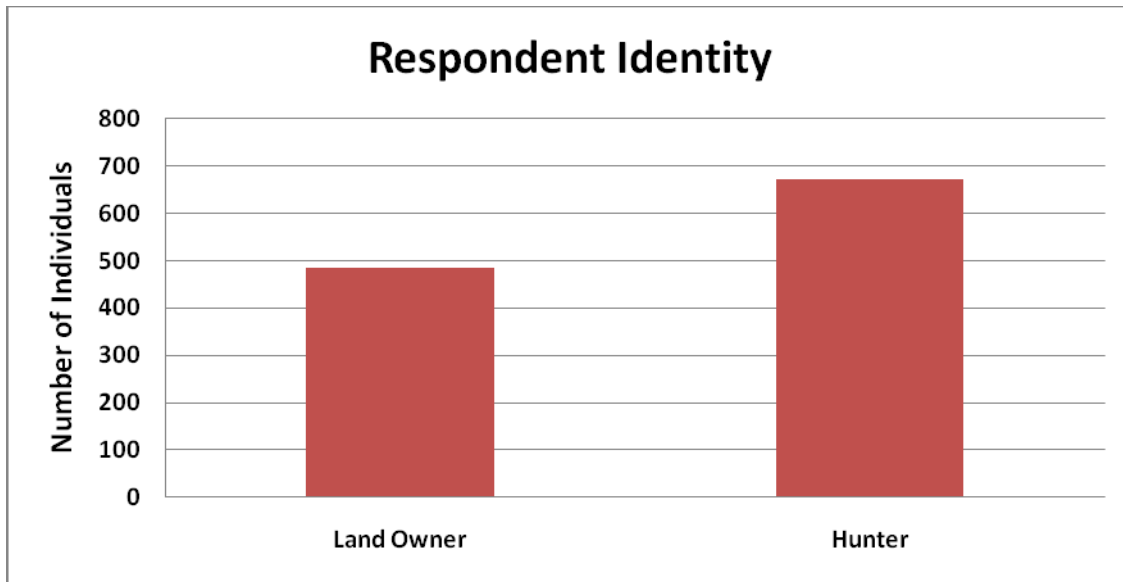


Figure 1. Respondents to the drdeer.com website portal were fairly balanced between individuals identifying themselves either as landowners or hunters, but we did not differentiate regarding landowner-hunter category.

The top five issues (Fig. 2), based on these responses, were:

1. **Too many predators.**
2. **DNR does not listen.**
3. **Inaccurate population estimates.**
4. **Come to a decision on baiting.**
5. **Eliminate Earn-a-Buck.**

Several individuals were contacted for further discussions, leading to additional insights into public opinion.

**Step Six.**—We conducted 6 Town Hall meetings in April, 2012, each lasting at least 3 hours. Meetings were organized for the committee to give a 45-minute to one hour presentation on our findings concerning issues, followed by an open period lasting two or more hours in which attendees were free to come forward to present their concerns and suggestions about solving problems. In addition, each meeting was broadcast live over the drdeer.com web site, and a recording of each made available for those who could not attend the meetings. These recordings still are posted on the web site; and, the total views to date have exceeded 5,000. We received many comments from individuals either who did not attend or who had suggestions and comments after the meetings. After these meetings, we also received comments and letters from professional biologists, foresters, veterinarians, etc. (Appendix 3), offering suggestions and critiques of our report. We considered all of these in our final deliberations.

**Step Seven.**—The final step in this process was the preparation of this final report, based on information from the above activities, inputs from the public and professional resource managers and scientists, plus our analyses of data and information.

## **OUR PHILOSOPHY CONCERNING WHITE-TAILED DEER MANAGEMENT**

Before presenting our findings and recommendations, we wish to present our basic philosophy of deer management. Although there are many issues involved in evaluating the WDNR white-tailed deer management program, there are three basic areas to consider. Deer management has been likened to a three-legged stool (Kroll 1991); one leg representing population management, another habitat, and the third human dimensions (people “management”). The reason for choosing this analogy is each of the three legs is equally important; and, without one the stool is rendered useless. Giles (1978) defined wildlife management as “the science and art of making decisions and taking actions to manipulate the structure, dynamics, and relations of populations, habitats, and people to achieve specific human objectives by means of the wildlife resource.” This long and cumbersome definition has many implications, but provides a meaningful context in which to frame a review of the deer management practices of the Wisconsin Department of Natural Resources.

Wildlife management is evolving from an art to a science. Despite the many scientific and technological advances that have occurred during the four decades since Giles wrote this definition, it is unlikely wildlife management ever will become a pure science. This is because the factors that affect habitats and deer population responses on the landscape scale are complex, difficult to define, even harder to measure and constantly changing. Public views and expectations for management of white-tailed deer populations vary from those who want more deer (recreational hunting) to those who want less or no deer (motorists, forest managers, farmers). McKean (2011) identified a number of factors that may contribute to declining deer harvests in a number of states including Wisconsin: 1) maturing forests, 2) increasing predator populations, 3) baiting issues, 4) habitat loss, 5) increasing public intolerance of high deer densities, 6) inadequate monitoring, and 7) unrealistic hunter expectations. Most state wildlife agencies have little if any control over these factors or lack the resources to monitor much less manage these factors.

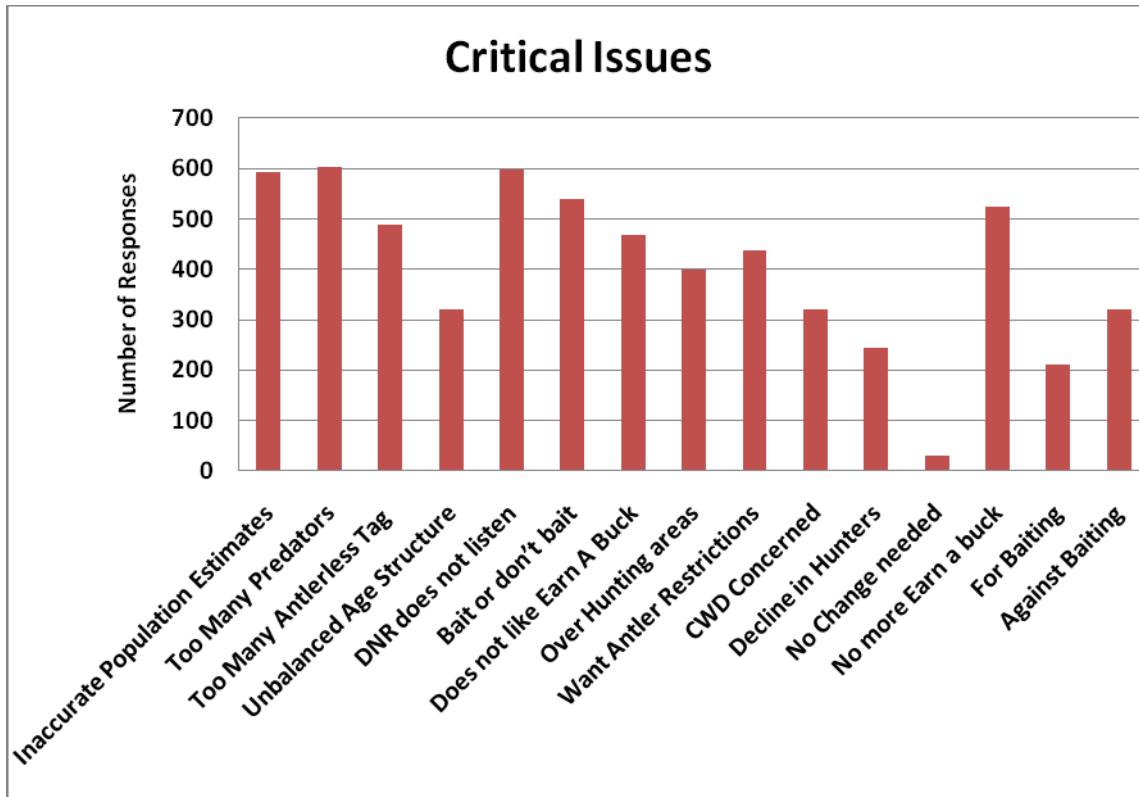


Figure 2. Number of responses to the question: What are the critical issues for deer management in Wisconsin?

Thus, our review of Wisconsin’s deer management practices focused on the density and structure of white-tailed deer populations and how they are managed by recreational hunting and other means, white-tailed deer habitats and how they are described and quantified, and the human dimensions of deer management as it relates to cultural, economic, political and management concerns of the public. We also considered how various aspects of these three components (populations, habitat and people) are monitored and how this information is used in formulation of deer management policies and regulations similar to the 4-cornerstone approach of The Quality Deer Management Association (QDMA 2012).

**SYNOPSIS OF PRELIMINARY FINDINGS (INTERIM REPORT, MARCH, 2012)**

In our Interim Report, we concluded public confidence in the Wisconsin Department of Natural Resources in regard to deer management issues has seriously eroded over the last few decades. The reasons are complex and not easily solved, but revolve primarily around two key issues—the current use of the SAK Population Model and the ineffectiveness of the CWD eradication program. However, lack of public involvement, particularly by landowners, in goal setting and decision-making regarding deer management lie at the heart of the problem. As we noted above, these problems did not arise overnight and hence the solutions will also take time. Our Interim Report included a number of findings and conclusions. Since March, we are convinced these



findings generally were correct, but came to additional conclusions based on information acquired since that time. We first will summarize our preliminary findings, followed by our additional findings and recommendations. However, we would like to interject here we are in no way questioning the dedication, effort or commitment to deer management by the WDNR staff. We found these folks to be helpful and generous, in spite of undergoing such an intensive evaluation; we are grateful for their help. [The Interim Report was read 1,700 times on the drdeer.com web site.]

## INTERIM REPORT CONCLUSIONS

It quickly became obvious there has existed for some time an intense dissatisfaction with and distrust of WDNR activities and methods used to carry out their mandate to conserve the white-tailed deer resources of Wisconsin. This was evidenced not only by the numerous inputs received by citizens, professionals, interest groups and NGOs, but also by scientific investigations and publications by professional human dimensions scientists, even within WDNR.

These problems have arisen over many years; stemming initially from use of the Sex-Age-Kill Excel Population Model (SAK) to establish population goals for Deer Management Units, and actions beginning ten years ago to eradicate chronic wasting disease (CWD) in the southern portion of the state.

As we discussed earlier, our review has not been the only one conducted over the last dozen years. Hence we included in the Interim Report summaries of these studies and recommendations. We did so for a very good reason. A great deal of effort and funds have been expended over the years, with mixed results. The public in general have been unaware of these studies, findings and recommendations, so we used the Interim Report to bring these to light. Among these were:

1. The **Deer Management for 2000 and Beyond** review, costing well over \$1,000,000.
2. CWD Response Plan Audit in 2003 (unknown cost).
3. The **SAK Review** in 2006, costing over \$40,000.
4. The **Staples Marketing Study** on CWD in 2011, costing about \$250,000.

Each of these studies produced criticisms and recommendations for remedies, including:

1. The **Deer Management for 2000 and Beyond** report listed 74 recommendations for changes in procedures and regulations. At the time of preparation of our report, 35 (47.3%) of these recommendations had been completed, 22 (29.8%) had been partially completed, and 17 (23.0%) were not completed. Some of those partially completed or not completed involve key issues, such as reducing the number of DMUs. Some recommendations were prohibited by law, lacked public support or lacked funding.

2. The SAK audit (2006) was conducted by a six person committee, representing a broad range of scientific disciplines. The committee arrived at 14 conclusions and recommendations. Subsequently, we have heard oral statements and read written claims that:
3. *“A recent audit (2006) by an international panel of experts found the department’s deer population modeling system to be a sound program, as good as or better than that of any state. Yet, no system is perfect and challenges remain, including hunter concerns with deer population model accuracy.” Wisconsin Department of Natural Resources. 2010. Investing in Wisconsin’s Whitetails. WM-528-2010. 14pp.*
4. Yet, we were unable to substantiate these claims. To the contrary, the audit committee questioned violation of the assumption of a stable age structure, the validity of estimates at the DMU level, the lack of precision expression for estimates and subjective estimation of key parameters. concluded: “When both demographic stochasticity and sampling error are considered at DMU levels, the resultant abundance estimates were within  $\pm 121.9\%$  of the true population level, 95% of the time.” The committee went on to opine,
5. *“Unrealistic assumptions required in the SAK model might be eliminated if auxiliary data were collected to estimate age- and sex-specific harvest rates. However, these data also could be used in alternative estimation methods, such as the statistical age-at-harvest approach (e.g., Gove et al. 2002), which might hold promise for deer estimation in Wisconsin.”* In a subsequent, peer-reviewed 2009 publication by the audit committee in the Journal of Wildlife Management, the authors further concluded:  
  
“Alternative models, such as statistical age-at-harvest models, which require similar data types, might allow for more robust, broad-scale demographic assessments.” However, these models also are likely cost prohibitive and logistically impossible at the DMU level.
6. The SAK Audit Report resulted in a companion study to determine deer hunter perceptions of the SAK Model process and deer populations in general (Holsman 2007). Holsman reported most respondents of the survey rated WDNR credibility relatively low with the majority of hunters believing that WDNR managers distort deer numbers to justify larger harvests, that WDNR managers were not experts in the science of estimating deer numbers, and that WDNR managers do not respond to hunter concerns when setting population goals and establishing regulations. Only one-in-four respondents thought WDNR managers were trustworthy for obtaining reliable information about deer numbers.
7. WDNR has credibility problems with deer hunters regarding their estimates of deer abundance and antlerless harvest goals at the DMU level. Holsman (2007) states current WDNR SAK Model estimates are a blend of science and value judgments that are impossible to defend.

8. The entire issue distills to one important point: using an indefensible number to set management goals. We agree with Holsman (2006) that, to escape the trap of trying to defend numeric estimates by moving to a system where deer management goals are expressed as a range of acceptable conditions across a set of criteria (harvest success or harvest levels, crop damage claims, deer vehicle collisions, forest regeneration success, health indicators etc.) within each DMU would be a sound approach.
9. We also concluded data being used in a deterministic population model (SAK) by WDNR often arise either from questionable sources or from studies conducted as much as 40-50 years ago (crippling loss). We were particularly concerned by the use of 1992 satellite imagery at 30 meter resolution to determine acres of deer range. Since deer populations are being reported as deer per square mile of deer range, this is a serious flaw in procedures. We will discuss this issue later (cf., HABITAT).
10. The SAK audit panel (2006) recommended conducting research on buck mortality and recruitment, two additionally important factors in the SAK model. These projects were not begun until 2010, and the first year's results create significant questions. Since there is no precision component to the SAK model, the reliability of each of the values used in the model are critical.

We also came to these additional conclusions regarding deer herd management:

1. For the most part in their history of using SAK, WDNR has been unsuccessful in achieving population goals for the deer herd in DMUs. This includes the CWD Zone (discussed later). Another approach obviously is warranted.
2. There are no stated goals for population age structure, sex ratio, buck harvest, physical condition or methods to align expectations of all sides of the situation.
3. The SAK model at best could be applied at the State level and some regions, but other models similar to those used in other states (Virginia for example) would better serve deer management in Wisconsin.
4. We were impressed greatly by the methodologies being used for Tribal lands, which establish thresholds for management decisions. A similar approach could be useful for the remainder of the State, and we considered these methods in our final recommendations.
5. Our review has led to the conclusion the CWD eradication effort was indeed unsuccessful, as evidenced by population estimates within the CWD Zone and current infection rates (discussed later).

In regard to CWD, we found:

1. There has been a serious erosion of public confidence and WDNR credibility as a result (Staples Marketing Report 2011).

2. There are no data available on the actual amount of mortality caused by CWD within the Zone. Initially we received no data, but later Dr. Chris Jenelle reported examining the WDNR database from 2003-2010 and found records for 91 deer “found dead” in the CWD Zone of which 11 (12.1%) were CWD+. This was in addition to 170 “suspect” (sick deer euthanized by WDNR staff) in the CWD Zone of which 40 (23.5%) were CWD+.
3. Estimates of deer population size have increased in many areas in the Zone and population goals have not been met.
4. Population control measures (viz., special seasons, bag limits) have not been effective.
5. There is considerable confusion by landowning hunters, non-landowning hunters, and non-hunting landowners within the Zone, in spite of education efforts, about many aspects of the disease. This is particularly obvious for issues dealing with human health.
6. Public concerns about CWD have diminished during the last 10 years.
7. Related to the above, the Legislature mandated improvement in reporting times for CWD tests, so hunters would feel comfortable consuming venison. We found time between sample submission and reporting actually has increased.

### The Tenets of Deer Management

The three tenets of deer management again are **populations, habitat and people**. We have concluded the WDNR has placed an inordinate emphasis on estimating population size and establishing population density goals (which commonly are not met), while giving much less emphasis to habitat and people (human dimension) factors.

Being a Keystone Species (the one having the greatest impact on the ecosystem), deer have a tremendous impact on habitat. A few professional biologists questioned designation of whitetails as a keystone species, but we remain firm on this issue. On the other side of the coin, however, habitat quality limits deer population health. We have concluded the following regarding habitat issues:

1. Deer range estimates are, for the most part at least 11 years old, and based on antiquated satellite imagery and other data. There was a claim early on that periodic reconnaissance was being employed to update deer range estimates by DMU, but we found no evidence these updates were being used. This conclusion was based on the acreages of deer range reported in historic SAK outputs that have remained the same over the past 11 years.
2. Deer management is site-specific, meaning each property on which deer reside is unique, requiring unique management strategies. This requires “boots on the ground” to assess both deer and ecosystem health. We found little evidence that local biologists are spending significant amounts of time in deer range and herd health assessments.

3. The Forestry Division of WDNR is fully capable and more than willing to aid in habitat assessments, but have not been adequately involved in aiding forest and range management or planning. [Later, we will discuss inadequacies in statewide geospatial databases and interagency access.]
4. Since there is no recent, high resolution imagery or annual field-based habitat and deer range appraisal, trends such as changes in ecosystem health, deer stocking levels, etc. have been based mostly on forestry data such as FIA, which is somewhat coarse in nature.
5. Emphasis has been on deer impacts on forests, which certainly is warranted, but there has been no consideration of forest management impacts on deer herd productivity and health.

### Harvest and Harvest Data

In regard to data collection, we found a lack of basic information needed to manage deer, especially at the DMU and landowner levels. We concluded:

1. The current check station and paper forms used for reporting deer should be modernized.
2. We heard complaints about having to check in deer at stations represented by bars and convenience stores, as well as dealing with unknowledgeable individuals.
3. The lag-time and effort needed to transfer these data is too long. Many states use electronic means such as Telecheck (discussed later) to accomplish this task.
4. We were surprised to see that “sublegal” spiked bucks were recorded as antlerless deer. We understand the thinking possibly behind this, but do not support it.
5. Important activities such as herd health checks performed by local biologists, range assessments, morphometric studies related to physical condition are notably absent.
6. We also were surprised, in spite of being a recognized “big buck” state, Wisconsin does not have a state-maintained big buck record book with free public access. On the surface this may appear to favor “trophy management,” when in reality it fosters information gathering, and provides yet another way for biologists and citizens to interact.

### Human Dimensions

From the aspect of human dimensions, there has been an obvious disconnect between stakeholders and the WDNR.

1. Although there have been considerable efforts toward public hearings, these have been poorly attended, primarily due to lack of confidence by the public their input is considered.

2. The WDNR certainly has used other public information media (Internet, print and TV), which appears to be useful to non-hunting landowners.
3. The vast majority of both forestlands (>60% of area) and farmlands (>90% of farms) have no formal agreement with WDNR to provide public access for deer hunting. This implies that access to most (likely >70%) deer habitat, deer populations and hunting/management opportunities is controlled by private landowners.
4. The private landowner (in spite of controlling the majority of deer habitat) has not been given adequate consideration, and we found no evidence of technical guidance activities by wildlife personnel, in spite of there being over 100 biologist and technician positions for 72 counties. We also searched the WDNR website as a "landowner" and could not find any contact information or link to "our" biologist. This stems from an inherent mindset that the function of WDNR is regulation, not facilitation of deer management by landowners, hunters, state and local forest land holders or non-governmental organizations. Later, we will propose a Deer Management Assistance Program (DMAP) which should involve both public and private lands.
5. Harvest regulations formulated by WDNR focus on antlerless harvest goals at the DMU level with no consideration for public/private ownership or variation in deer abundance within a DMU.
6. WDNR needs to find ways to involve landowners and hunters in the management process at a level with a finer scale than the DMU that is relevant to the land that they own and/or hunt.
7. Online input such as the Deer Hunter Wildlife Survey and Operation Deer Watch may be the beginning of such a communication process, but more emphasis should be directed at on-the-ground contact between WDNR staff and landowners/hunters in determination of local deer population trends.
8. Creating such a monitoring program would provide a sense of ownership for landowners (private and public) and hunters and provide opportunities to educate and inform them about various aspects of deer management. More importantly, it would build grass-roots relationships between WDNR and individuals that can create trust, understanding of values, and definition of shared goals.
9. Erosion of public confidence has not occurred over-night, and re-building this confidence also will not happen quickly. There is a need for a long-term plan to do so.
10. We were surprised to discover weak cooperative programs across departments, state/federal agencies and NGOs. We did not find significant cooperative relationships between the WDNR and the Wisconsin Agricultural Extension Service to produce educational materials, field days, workshops and result demonstrations to promote deer and deer habitat management by landowners and hunter groups. Unfortunately, this often is the case for many states.

11. In order to solve these problems the WDNR must redefine its role, particularly in regard to public services as they relate to societal needs. There is a need for a bottom-up, rather than top-down approach. Involving private landowners will be pivotal in solutions, as will ways to involve public hunters and Tribal co-management.
12. Lastly, in all of the printed and electronic media materials provided, we found few references concerning the economic value and impact of deer to Wisconsin.

### Predation and Predator Roles in Ecosystems

Concerns by landowners, hunters and non-hunters about predators have grown over the last decade. Our review produced the following conclusions:

1. The current wolf population is at least three times higher than the goal.
2. As with the deer herd, there are questions regarding precision of wolf population estimates, and issues need to be clarified.
3. This has not been due to inaction by the WDNR, rather federal regulations providing protection to wolves.
4. Impacts of predators on deer populations have not been adequately studied, and there are few data related to the role of predators in the deer ecosystem. This is a key need.
5. The recently initiated mortality and recruitment study will provide much needed information, but it is limited to only two study areas; understandably due to cost of such studies.
6. There was a significant delay between identification of key needs and actually starting this study.
7. Particularly absent are data on impacts of bobcats, coyotes and bears on deer recruitment, especially in relation to habitat quality.

### Research

In regards to research activities, the WDNR contains a Science Services Division, whose responsibilities include planning, conducting and supervising research. Our review produced the following conclusions:

1. WDNR personnel produced or contributed to about 50 peer-reviewed publications (based on bibliography submitted by WDNR) in the last decade, most of which were senior-authored by outside individuals. This is not unusual, in that many state wildlife agencies rely on outside scientists for support, and we see no real problems with this observation.

2. An analysis of contents of these publications revealed the majority dealt with CWD, and a smaller percentage on matters dealing with deer biology, habitat management and predation.
3. It also was obvious research efforts have been, for the most part, reactive rather than proactive. There does not appear to be any working process for establishment of long-term goals that anticipate management needs.
4. The strongest research capability and productivity has been in the area of human dimensions, with excellent productivity. Later, we will discuss expansion of this program.
5. Technical publications have not been updated in some time, most notably those related to deer management. Some date to the late 1990s, with the most recent being 2001. There is a significant need for making such publications current.

### Geospatial Sciences

1. We were quite surprised at the gap in technologies needed to provide critical services and effectively manage natural resources. In discussions with the State Cartographer's office and WDNR forestry and technology staff, we learned these individuals are keenly aware of these deficiencies and eager to address them. Our specific observations are: The State's geospatial database system is woefully inadequate to support, not only for wildlife and deer management, but also for many critical services. This is particularly true for economic development, emergency planning and response, and critical services for citizens.
2. Although the WDNR does have a GIS program, there is no statewide, seamless geographic information system (GIS), with layers (land cover, natural resources, critical infrastructure, public safety, etc.) of up-to-date information, which provides universal two-way access to Wisconsin's agencies, particularly in this case the WDNR.
3. It is our opinion, Wisconsin once was viewed as an innovator for geospatial information services, but has fallen behind. This primarily has been caused by lack of a coordinated program, and adequate funding. The economic benefits of such programs are well-established, and certainly would figure in current attempts to strengthen Wisconsin's economy.

### Seasons and Bag Limits

The process currently in use to establish annual seasons and bag limits is unpopular and much too complex. As a result, WDNR staff spend an inordinate amount of time "feeding" information demanded by the short time frame afforded for decisions. There is a clear need for simplification. Eliminating or reducing the use of the SAK model certainly would give staff more time for collecting data and evaluating information. We concluded:



1. The SAK model and its data needs seem to drive the entire management system.
2. The current season structure is unpopular and has contributed to erosion of hunter numbers and the quality of the hunting experience.
3. There is a need for changes in season structure that produces an “Opening Day Effect,” spoken fondly of by most Wisconsin hunters.
4. Current bag limits and harvest strategies have reduced deer in some cases (especially the CWD Zone) to a pest level perception, rather than the State’s most sociologically and economically important game animal.
5. Given adequate harvest and herd health data, keeping seasons and bag limits consistent for longer periods of time would allow better assessment of management progress. Changing seasons and bag limits often produces confusion and does not support sound decision-making.

## **CONCLUSIONS AND RECOMMENDATIONS LEADING TO FINAL REPORT**

The above material summarized our initial findings concerning white-tailed deer management in Wisconsin; and constituted the Interim Report submitted in March, 2012. This **FINAL REPORT** will be organized generally along the lines of populations, habitat and people; however, these three obviously overlap, making it difficult to separate all findings and recommendations into the three divisions. This Final Report further explains our findings in the Interim Report further when needed, and in some cases appends additional information, clarifies previous conclusions and presents additional concerns. Since, in our Interim Report there was a significant finding that two primary activities (use of the SAK model and the CWD response) contributed most to loss of public confidence in Wisconsin deer management, we begin with these two population-related management issues.

## **POPULATION MANAGEMENT**

### Methodology and Accuracy of Population Estimates

The Wisconsin Department of Natural Resources (WDNR) has used the Sex-Age-Kill (SAK) model to estimate white-tailed deer population density in deer management units (DMU) across the state since the early 1960’s. The SAK procedure was first developed by the Michigan Department of Conservation (Eberhardt1960) and similar models have been used by at least 20 state agencies to estimate deer and other wildlife species population size (Millspaugh et al. 2009). The SAK is used in Wisconsin as a population reconstruction process that uses the number of deer harvested and the sex and age composition of the harvest from the previous year as the primary data to estimate the pre-hunt population size the following year. Observations of fawn-to-doe ratios are collected annually to calculate recruitment. Assumptions of the buck recovery rate (% of total buck mortality represented by hunter harvest registration), sex ratio of fawns and expected winter-to-fall growth rates are used in the procedure. A detailed description of the SAK process can be found in WDNR (2001). Important underlying assumptions of the model are: 1) the age structure of bucks harvested is representative of the age structure of bucks in the population, 2) the % of 1.5 year-old bucks in the buck harvest is

representative of the adult (1.5 years and older) buck hunting mortality rate, 3) the population sex and age structure is stable, 4) the population size is stationary, and 5) all variable inputs are known with certainty. Thus, the SAK is a deterministic model.

### Estimates for Setting Antlerless Harvest Goals

SAK estimates of population size are used as the primary basis for formulating antlerless harvest goals for each DMU. Each DMU has an over-wintering population goal which is compared to the predicted fall pre-hunt population size. The predicted adult buck harvest, archery antlerless harvest and associated wounding and poaching losses are subtracted from the pre-hunt population and compared to the over-winter goal. The remaining difference between the fall population estimate and over-winter goal is the antlerless harvest goal. This goal may be adjusted to allow a high antlerless harvest goal to be spread over a period of years. The adjusted quota is then divided by the historical hunter success rate at that goal level to determine the number of antlerless permits to issue (WDNR 2001). The SAK has been shown to be sensitive to changes in buck harvest rates (Millspaugh et al. 2007) and is not used in the CWD Management Zone (earn-a-buck) DMUs where accounting style models and aerial surveys are used. Also, other adjustments may be made subjectively by professional judgment in the buck recovery rate and other parameters to account for hunting conditions (e.g. temperature and snowfall), predation and other factors.

### The 2006 SAK Model Audit

The estimates of deer abundance used by WDNR have long been controversial since the time of Aldo Leopold and use of the SAK model has undergone several reviews since the 1980's. The "Deer Management for 2000 and Beyond" public involvement process included a number of study groups. The "Believability Study Group" recommended continued use of the SAK as the best available method at the time, but called for an outside audit of the SAK (Wisconsin Conservation Congress 2000). A seven-person audit panel conducted an evaluation of the SAK model as used in Wisconsin during 2006-2007. The audit was commissioned by the Natural Resources Board with "the goal to improve the understanding and utility of SAK estimates by investigating structural issues, model assumptions, validity of impacts and procedural issues involving SAK use in Wisconsin". It is important to note that the resulting report issued by the Wisconsin SAK Audit panel represents the most extensive evaluation of the model to date and has important implications for use of the SAK and similar models in other states.

The SAK Audit report contained several major conclusions and recommendations (see 1.0 Executive Summary, Millspaugh et al. 2007). First, they concluded that Wisconsin has the most transparent deer management program and collects more annual demographic information to monitor deer populations than any of the 20 state agency programs that they reviewed. Second, the SAK model does reasonably well at estimating pre-hunting season population levels at the state level. At the state level, the model appears robust to changes in female harvest and produces only minor bias in estimates when the population is not stationary(i.e., increasing or decreasing) with a stable age distribution. However, several of their conclusions suggest major problems with the SAK model as used in Wisconsin for estimates of pre-hunt population size. These problems include: violation of the assumption of a stable age structure, validity of estimates of pre-hunt population size and future harvests at the DMU level,

precision of estimates of the winter-to-fall growth rate, and the inability to determine precision expressions (confidence intervals) for SAK estimates given the data inputs for the model. Each of these problems will be addressed separately.

### Violation of the Assumption of a Stable Age Structure

The SAK model is vulnerable to model assumption violations because of the focus on a single age class (1.5 year old bucks). SAK estimates appear to be very sensitive to sudden changes in the male harvest rate. Millspaugh et al. (2007, 2009) noted wide changes in SAK estimates compared with simulated known populations as a result of changing male harvest rates. The SAK estimates were opposite the true population trend when changes in the male harvest rate were introduced. Thus, any change in management that alters the male harvest rate (e.g., earn-a-buck, quality deer management) could bias population estimates. Jacques (2012) noted that the age structure of harvested bucks has changed dramatically in much of Wisconsin, especially the farmland regions, with the % yearling bucks in the buck harvest declining from 80-85% in the 1980's to 50-60 % in the mid 2000's. WDNR (2011) reported that the percentage of yearlings in the buck harvest was 40% for the Southern Farmland Region in 2010. The trend in buck harvest appears to be driven by earn-a-buck regulations or hunter selectivity as WDNR has no goals for antlered buck harvest or age structure. Nationwide, the % yearling bucks in the buck harvest declined from more than 60% in 1989 to 38% in 2010 (QDMA 2012). Other state agencies have experienced similar problems with SAK-type models ( K. Kammermyer, personal communication).

The erratic nature of SAK estimates of pre and post-hunt population abundance relative to post-hunt population goals, antlerless harvest quotas, and predicted harvests appears to escalate with the trend of declining yearling buck harvest rates (WDNR 2011). Situations such as occurred in DMU 36 in the 2010 season where 8,000 antlerless permits were issued after several years of no antlerless harvest make little sense to most hunters (S. Craven, personal communication, 1-2012). Concerns about inaccurate population estimates was the third most frequent comment from the Wisconsin Deer Trustee website ([www.drdeer.com](http://www.drdeer.com)) and was frequently mentioned by stakeholders during the January, 2012 meetings in Green Bay and Madison and during the Deer Trustee Town Hall meetings in April, 2012.

### Validity of Population Estimates at the DMU Level

Although SAK estimates may be precise at the state level, estimates at the DMU level are questionable at best (Millspaugh et al. 2007). This statement is particularly disturbing as the DMU level is where decisions of season structure and antlerless deer harvest quotas are made. Furthermore, the methods previously used to evaluate the ability of the SAK model to predict future harvests (WDNR 2001) are inappropriate because they do not directly relate to the same scale at which management decisions are made. For 16 DMUs examined, the SAK model explained up to 62% of the variability in the relationship between predicted versus actual harvests among years. However, for some DMUs, the SAK model does a poor job of predicting future harvests. They recommended that any evaluation of the predictive capabilities of the SAK model be applied to individual DMUs over time rather than across DMUs. Special attention should be paid to understanding deer harvests and populations in those DMUs where the SAK model performs poorly over time because it might provide insight for improving deer population

modeling in Wisconsin. Confidence in estimates at the DMU level is also hampered by small sample size. During the 2011 hunting season, less than 100 bucks were aged in 56 DMUs.

### Precision of Estimates of the Winter-to-Fall Population Growth Rate

In the Northern Forest Region, a regression model is used to estimate the population's winter-to-fall growth rate based on a winter severity index. Millspaugh et al. (2007) questioned if this procedure was adequate for precise projections of abundance from post-hunting season of one year to the next hunting season. The winter-to-fall rate of increase also may vary between DMUs within a year. The rest of Wisconsin does not have a formal model to estimate the winter-to-fall rate of increase and it is assumed a constant of 1.4. There is a great need to better understand the factors that influence the abundance of deer for the upcoming hunting season.

### Precision Expressions for SAK Estimates

Precision expressions such as confidence intervals for SAK estimates are currently unattainable given the data used in the model (Millspaugh et al. 2007). Confidence intervals for SAK estimates cannot be determined without sufficient empirical estimates for parameters of all input variables (Norton 2010). Currently, empirical estimates are available for the following parameters: the proportion of 1.5 year old males in the adult buck segment of the population, proportion of 1.5 year old females in the adult female segment of the population, estimated ratio of juveniles to adult females in the population, and the winter-to-fall growth rate for the Northern Forest region, but not elsewhere. These inputs are not available for all DMUs and/or during all years and WDNR sometimes pools data across space and time. Pooling and substituting data may provide cost savings and increase precision because of increased sample size, but additional bias may occur if the population is not stable and stationary. Empirical estimators of the following input variables are currently unavailable: sex ratio of yearlings at the time of recruitment into the adult population, proportion of total annual mortality of adult males associated with sport harvest (the buck recovery rate), and the estimated adult buck harvest in the next year. If statistically rigorous measures of precision are desired for population estimates by DMU, the following data are required: harvest reporting rate, buck reporting rate, and wounding loss rate. Millspaugh et al. (2007) further state that collecting sufficient data to obtain a statistical measure of precision for estimates in all DMUs is likely cost prohibitive and logistically impossible. Unfortunately, this conclusion also applies to alternative methods such as age-at-harvest models suggested by Millspaugh et al. (2009).

### WDNR Response to the SAK Audit Report

The WDNR response to the SAK Audit Report is summarized in the document entitled "Investing in Wisconsin's Whitetails" (WDNR 2010). The goals of the document were to increase awareness of WDNR actions to improve the deer monitoring system, optimize the accuracy and precision of deer population estimates and projections, and increase public confidence in WDNR deer population estimates and management. Changes in the SAK modeling process as a result of the SAK Audit Report include:

- 1) expressing deer population size as abundance rather than density,
- 2) use of 5-year running averages of yearling buck and doe age structure rather than annual values, and
- 3) use of August and September observations instead of July observations to estimate fawn-to-doe ratios.

WDNR also reported on new research projects and data analyses that will address specific concerns of the SAK Audit Report that included:

- 1) relationship of overwinter and fall population size (winter-to-fall population growth rate),
- 2) buck mortality study (buck recovery rate),
- 3) predation and fawn recruitment studies,
- 4) deer population goals in the Northern Forest region,
- 5) definition and consolidation of DMUs,
- 6) use of aerial distance-sampling techniques to estimate population size,
- 7) deer hunter studies with the goal of increasing hunter participation and retention, and
- 8) Chronic Wasting Disease studies.

Other topics discussed in the report included:

- 1) use of other information on deer abundance (vehicle collision data, alternative model population estimates),
- 2) involving hunters in data collection,
- 3) updating deer range descriptions (current estimates based on 1992 Landsat data),
- 4) updating the deer population environmental assessment (WDNR 1992),
- 5) updating the deer management guide (WDNR 1998), and
- 6) communicating with stakeholders on survey findings, research results, and WDNR procedures.

It is our opinion the WDNR has made an exhaustive effort to address the concerns and recommendations of the SAK Audit Report that feasibly can be addressed. However, these actions collectively will do little to rectify the major problems discussed previously with the SAK Model process as used by the WDNR. Even with these problems, the SAK Model process still receives the support of professionals within the WDNR and the Wisconsin Chapter of The Wildlife Society (Appendix 3).

#### Impacts of SAK Model Estimates on WDNR Credibility

The SAK Audit Report resulted in a companion study to determine deer hunter perceptions of the SAK Model process and deer populations in general (Holsman 2007). Holsman reported that most respondents of the survey rated WDNR credibility relatively low with the majority of hunters believing that WDNR managers distort deer numbers to justify larger harvests, that WDNR managers were not experts in the science of estimating deer numbers, and that WDNR managers do not respond to hunter concerns when setting population goals and establishing regulations. Only one-in-four respondents thought WDNR managers were trustworthy for obtaining reliable information about deer numbers.

Holsman (2007) concluded that hunter perception of deer abundance is based on how many deer they see (68%) and how many deer their hunting companions see (58%), and that they trust little else. Most

hunters were unaware or had little knowledge of the SAK model (55%) and did not know the population goal for their DMU (74%). Thus, the debate about the merits of the SAK Model is largely between deer managers and opinion leaders of hunting groups as most hunters are not aware of the SAK Model or estimates of population abundance. Further, the conflict is likely more about preferences for population goals than about concerns of the validity or accuracy of population estimates. Most (62%) hunters believed that there were fewer deer in the DMU where they hunted than 5 years ago and they often estimated deer densities that were one-half to one-third of WDNR estimates.

WDNR has credibility problems with deer hunters regarding their estimates of deer abundance and antlerless harvest goals at the DMU level. Holsman (2007) states that current WDNR SAK Model estimates are a blend of science and value judgments that are impossible to defend. The findings of the SAK Audit Report regarding the violation of the stable age distribution assumption and the inability to determine precision expressions for population estimates at the DMU level provide strong support for this statement. Given this, Holsman (2006) suggests to escape the trap of trying to defend numeric estimates by moving to a system where deer management goals are expressed as a range of acceptable conditions across a set of criteria (harvest success or harvest levels, crop damage claims, deer vehicle collisions, forest regeneration success, etc.) within each DMU. The primary advantage of such an outcome-driven goals system is the link between social and ecological considerations. Such an approach would allow opportunities to build a greater sense of shared values between hunters, WDNR deer managers and others. Holsman (2006) also noted that the quality of the science may not be as important as trust, fairness, and shared values in defining how hunters perceive the credibility of WDNR.

Holsman (2009) provided further evidence reaffirming that most hunters have little faith in WDNR population estimates for the DMU in which they hunt even though there was widespread unawareness of the SAK process. Results also suggested a pervasive skepticism regarding WDNR's approach to deer management in general. Landowners and hunters feel disenfranchised regarding their role and influence in formulation of WDNR deer management policy and their role in managing the deer resource. Ownership of deer herds and arrogance on the part of WDNR were recurring themes in comments by landowners and hunters at the Deer Trustee stakeholder and Town Hall meetings. Even though perceptions of population abundance and desired population goals are divergent, landowners and hunters must be viewed as partners by WDNR. Without hunters, the primary funding sources for wildlife management are gone and the primary means of managing deer populations is gone. Holsman (2009) states "agencies that ignore or discount public preferences without clear and defensible rationale are likely to see their statutory and administrative management authority challenged through judicial or legislative means". The appointment of the Wisconsin Deer Trustee by Governor Walker and the repeal of the earn-a-buck regulation by legislative action in 2011 are clear indications that this is happening in Wisconsin.

## RECOMMENDATIONS

- 1) **Limit the use of SAK/accounting style models to monitoring deer population size and trends at the state and regional levels.** We agree with the 2006 SAK Audit Report that estimates at the state level likely reflect actual conditions, and this is the scale at which most other states that use similar models report estimates of population size. With increased sample sizes of deer bio-checked by DMAP cooperators, precision of estimates at the

regional level may be appropriate for setting policy and monitoring trends at that level. Statistical estimates such as those from aerial surveys in the CWD management zone should be used for estimates at the DMU or finer scale as appropriate. Unfortunately, we cannot recommend alternative population estimating procedures that are less susceptible to assumption violations or sample size requirements at the DMU level.

- 2) **Do away with population goals and population estimates at the DMU level.** This recommendation is particularly relevant in the Eastern and Western Farmland Regions where WDNR has limited or no ability to increase harvest on private lands and thus cannot manage for population goals as currently defined. Population goals have become meaningless numbers and population estimates cannot be defended from a statistical standpoint. The constant argument about annual estimates of deer numbers is pointless with only negative consequences in terms of WDNR credibility. DMAP and WDACP may present opportunities to increase antlerless harvest at the local scale. Antlerless harvest goals and permit quotas should be based on historical harvest, historical demand for antlerless permits and the desired status of population size change.
- 3) **Replace the current DMU population goal definition of comparing the deer population estimate with the desired population goal for the DMU with a simplified goal statement of increase, stabilize or decrease population density.** Population estimates at the DMU level are suspect from questions of accuracy and precision, and the procedures for deriving the estimates are difficult to explain and communicate. When a hunter or landowner sees a number describing the deer population on lands that they hunt or own that is counter to their perception of population size, it is only natural to ask “where did this come from?” Most people will not support what they do not or cannot understand, especially if a meaningless, sometimes volatile, number becomes the focus of their concern over time. Other states such as Virginia (VDGIF 2007) use this approach as a foundation for their deer management plan.
- 4) **Develop a set of metrics to monitor progress towards the DMU goal of increasing, stabilizing, or decreasing population density.** The Deer 2000 and Beyond Report and the 2009 DMU Public Stakeholder Advisory Panel Report ([www.widmu.org](http://www.widmu.org)) called for development of various metrics to be used in the population goal setting process. Metrics should reflect the basic considerations that dictate cultural carrying capacity (the number of deer that coexist compatibly with humans) such as deer density, hunter success, deer-vehicle collisions, agricultural damage, forest regeneration problems, CWD incidence, and concerns for biodiversity. SAK or accounting style procedures could be used to calculate a simple index of population density for monitoring trends that indicate if the population is increasing, stable or decreasing. This expression should be easier to grasp than a questionable number that is portrayed as an accurate estimate of population size. A change in population status might be defined as a change of 10% or more in the index value over a defined time period (3-5 years). Similarly, indices could be developed for the other metrics. Buck or total harvest density could be used to monitor hunter success as well as changes in population size. We understand that data sets exist for deer-vehicle collisions and agricultural damage, but that there are problems of reporting (collisions) and participation (damage). Development of a forest regeneration metric should be facilitated through the Division of Forestry whose Foresters work with 9,000 landowners each year. Results of forest certification audits on MFL lands that relate to the impacts of deer herbivory on regeneration and biodiversity could also be used. Occurrence, distribution and infection rates of CWD would be meaningful metrics for this disease. Keyser et al. (2005) described population density-physical parameter relationships that can be used to monitor physical condition trends. Development of reliable indices will require collaboration with other entities and will take time to test and validate, but should prove invaluable in diverting attention from

population estimates and demonstrating the need for deer population management actions to hunters and others. Consistency across this set of metrics and in their interpretation is sorely needed to justify the herd control policies of WDNR over the past two decades and into the future.

- 5) **Reduce the number of DMUs.** Decreasing the number of DMUs should improve the reliability of all metrics used for the simplified population goal system. Reduction in the number of DMUs has also been recommended by the Deer 2000 and 2006 SAK Audit Reports, but was not supported by the public because of concerns about management at the local level. Development of a DMAP as discussed elsewhere in this report would address these concerns by providing site-specific management options. Consideration could also be given to reducing the number of regions by combining the Farmland Regions.
- 6) **Revise the Wisconsin Deer Management Plan.** The document entitled “Wisconsin’s Deer Management Program: the Issues Involved in Decision Making” posted on the WDNR website is dated 1998. Many events, such as the occurrence of CWD, implementation of recommendations from the Deer 2000 and 2006 SAK Audit Reports, and recommendations that may be implemented from the Deer Trustee Report, render the 1998 document obsolete. Related documents such as VanderZouwen and Warke (1995) and WDNR (2001) also should be updated. The revised plan should be updated periodically, at least every five years.

## HUNTING REGULATIONS, SEASONS AND BAG LIMITS

Use of SAK model estimates of population size to determine antlerless harvest quotas and evaluate progress toward population goals at the DMU level has led to a host of seasons, bag limits and strategies aimed at reducing deer populations over the past two decades. Our review of the annual process used to develop antlerless harvest quotas suggests that management actions have not accomplished harvest goals in most DMUs and years. Further, we question the impacts of special antlerless deer only seasons on total harvest, as evidenced by the one area where the heaviest antlerless harvest was imposed, the CWD DMZ. In our discussions with the hunting public, we often were asked: “Whatever you recommend, will it put the FUN back in deer hunting?” With these discussions, it became obvious that, as the CWD Audit committee pointed out”...***the deer depopulation process will have long-term negative effects on the hunting culture and tradition.***” It also is obvious that the annual process of rules and regulations development has become so burdensome and time-consuming to WDNR staff that important issues such as data acquisition and working with the public (landowners, hunters, stakeholders, etc.) have suffered. Strategies and seasons used by the WDNR to date include:

1. Earn-A-Buck.
2. Archery Season.
3. Early Antlerless Firearm Season.
4. Traditional 9-day Firearm Season.
5. 10-day Muzzleloader-only Season.
6. Later Firearm Season.
7. Holiday Antlerless Firearm Season.
8. Youth Deer Hunt.
9. T-zone.

Recently, crossbow hunters have also asked for a separate season or one coincident with the traditional archery season. As deer hunting has matured, emergence of new technologies in firearms and weapons have tended to fragment traditional seasons. Considerable controversy



concerning the issue of baiting was also noted. One attendee of a Town Hall Meeting proclaimed, "I have to take a lawyer with me to the field to hunt deer, it is that confusing!"

### Antlerless Harvest Framework and Fee Structure

Three types of antlerless harvest frameworks (Regular, Herd Control, and CWD) were used for the vast majority of DMUs during the 2011 hunting season. DMUs that are at or near population goal are referred to as Regular Units and may be bucks only or have a limited number of unit-specific antlerless deer carcass tags available. Antlerless tags go on sale in mid-August and remain available until sold out or the hunting season ends. Hunters may purchase one antlerless tag per day. Fees are \$12 each for residents and \$20 each for non-residents. Hunting seasons during 2011 for all three frameworks included the Youth Gun, 9-day Gun, Holiday Antlerless Deer Only Gun, Archery, and Muzzleloader seasons.

Herd Control Units are designated when deer population estimates are expected to remain 20% or more above overwinter goals following the harvest. One free antlerless Deer Carcass Tag that may be used in any Herd Control or CWD Unit is issued with each gun deer license and with each archery license sold to persons age 10 or older. There is no limit on the number of additional Antlerless Deer Carcass Tags that can be purchased at \$2 each in Herd Control Units.

CWD Units allow unlimited antlerless deer harvest and deer hunters can obtain CWD Deer Carcass Tags free of charge (limit of 4 per hunter per day) at registration stations and license vendors in the CWD Management Zone. The Earn-A-Buck (EAB) regulation requiring a hunter to harvest an antlerless deer prior to taking an antlered buck was repealed by the Wisconsin Legislature during fall 2011 prior to the start of this evaluation. Subsequently, a Bonus Buck Permit was authorized during the 2011 season allowing a hunter to harvest either an antlered buck or antlerless deer as their first deer. Hunters wishing to pursue additional deer including antlered bucks could do so only after harvesting an antlerless deer. A 4-day antlerless only gun season during October approved under emergency rule order and a Holiday Gun Season were held in all CWD DMUs in 2011 and have been recommended for 2012.

Metro Units are Herd Control Units in metropolitan areas with extended regular gun seasons and extended late archery seasons in 2011. Other season dates that applied to Regular Units were in effect. Most Metro Units have restrictions on the use of rifles.

State Park Units allow deer hunting during one or more deer hunting seasons. Hunters, wishing to hunt in state parks must purchase a \$3 State Park Access Permit. A state park sticker is required for all vehicles in a state park. Access permits are also required to deer hunt in state parks that allow deer hunting within the CWD Management Zone, but the permits are free of charge and are not limited in quantity.

### Deer Age and Sex Ratio Goals

There are no age or sex ratio goals for the state or any DMU. Hunters appear to be most concerned with harvest rates of buck fawns (future mature bucks) and age composition of adult bucks. It should be noted that the age composition of bucks has steadily changed to an older

population over the last 20 years (from 90% yearlings in some units to less than 53% yearlings statewide in 2011). Trends in land access, hunting methods (less drives, more stand hunting), hunter selectivity, deer abundance relative to hunter numbers, and EAB regulations have probably contributed to this age ratio trend. Despite the lack of goals for age and sex structure, Wisconsin leads the Nation in the number of Pope and Young and Boone and Crockett record book entries per thousand square miles of deer habitat (QDMA 2011).

### The Annual Process of Setting Harvest Regulations

We reviewed the decision-making process in establishing harvest regulations such as those related to herd control. These are based on existing rule authority, and the statute requires changes to existing seasons be made by administrative rule (“...a regulation, standard, policy statement, or order of general application promulgated by a state agency,” with the force and effect of law). Rules are established by the Secretary of the Natural Resources Board (NRB) and the Governor, but the Conservation Congress (WCC) can offer input through a complex process. We were provided the outline below to illustrate the annual rule-making process.

#### ***ACT 21 Administrative Rules Legislation – Timeline Joint Fish & Wildlife Management, odd year hearing format***

**June 1, 2011** - Rules coordinator sends request for proposals to field staff, refers 2011 Conservation Congress Resolutions to standing wildlife committees where appropriate, and drafts other congress statewide resolutions. Consideration by a WDNR Wildlife Management Bureau Committee should happen now if that is appropriate.

**Fall, 2011** - Policy team rules meeting for approval and tribal consultation (WM, LE, LS, WCC, GLIFWC, etc.).

**Winter, 2012** - Pink sheet/scope statement drafting & approval; all elements of the rule must be included in the scope

**April, 2012** - Scope statement submitted to governor’s office for approval.

**May, 2012** - Scope statement appears in Administrative Register.

**June (board meeting), 2012** - NRB approval of scope statement (no more passive review)

**July, 2012** – Draft the rule

**August, 2012** - Green sheet package including board memo, fiscal statement, and board order is due to the secretary’s office for signature.

**September, 2012** - Department takes rule proposal to NRB for approval to solicit public input and to hold public hearings.

**October – December, 2012** - Public comments on economic impact of the proposal are solicited. Following solicitation, an economic impact analysis document is prepared. Submission of economic impact analysis, proposed rule, and hearing notice to Legislative Rules Clearinghouse, Legislative Reference Bureau, Governor’s Office, DOA, and Legislature.

**January, 2013** – CC Executive Council meeting (however, spring hearing agenda is already set?). Spring hearing questionnaire sent to printer.

**April, 2013 - Hearings on the proposed rule can be held.** Department coordinates economic impact analysis with local units of governments who are affected. Department consults with those who indicated they are affected and attempts to address their concerns. DOA required approval if impact over \$20 million. Department modifies rule proposal based on public comments. If the scope of the rule changes, new scope statement must be approved and published. If rule changes significantly affect economic impact, the EIA must be updated and resubmitted.

**May, 2013** - Green sheet rules package for adoption due to secretary's office for approval.

**June, 2013** - Rule adopted by NRB, Governor approves final rule language. This is also when work begins to prepare for the 2015 spring hearings; request for proposals to field staff and referral of Conservation Congress resolutions.

**July through December 2013** - Legislative review. During the first part of legislative review, all proposals are forwarded to standing committees in each house of the legislature. This process normally occurs over 60 days but can take longer. During the second part, the Joint Committee for the Review of Administrative Rules reviews the rule for 30 days but, potentially, longer. During each part of the process, a committee can take no action and the rule will advance to the next step of the process. A committee can also hold a hearing but, if it takes to additional action, the rule advances. A committee can request modifications, which results in the rule going back to the agency to consider the introduction of legislation that could prevent the agency from promulgating the rule.

**January, 2014** - Rule is received from the legislature. Signature and filing occurs including final governor's approval if there were modifications made during legislative review. It is now safe to print 2014 regulations pamphlets.

**February, 2014** - Publication in the Administrative Register.

**March, 2014** - New rules go into effect if no delayed effective dates.

## **SUMMARY AND CONCLUSIONS**

WDNR Deer Program Goals and procedures for development of DMU population goals, antlerless deer harvest goals and permit allotments are established by state statute and administrative rule. DMU population goals are reviewed every three years. However, antlerless deer harvest goals are determined for each DMU annually using SAK/ accounting-style estimates. All estimates are deterministic and many input variable values are based on professional opinion with limited or dated empirical data. Thus, we agree with Holsman's (2007) conclusion current SAK estimates are a blend of science and professional value judgments that are impossible to defend. The annual process is complex and requires significant WDNR staff time, but allows frequent stakeholder input. As experienced deer managers, we question the logic behind this process; particularly since it is impossible to measure impacts to and responses of

deer populations to changes in harvest regulations in 1-2 years! When coupled with annual SAK modeling efforts by a large proportion of WDNR staff, little time is left for staff to work with the public, gather herd and habitat health data, etc. The entire process has become too burdensome and confusing to the hunting public; as well as having a significant negative impact on the Wisconsin Deer Hunting Heritage. Most notable is the loss of focus on “Opening Day” of the traditional November deer gun season. A season of some type often begins in September and extends into January. This can have significant impacts on non-hunters attempting to recreate on lands with public access. We received many comments about this issue.

Population estimates and goals, antlerless permit allotments and season structures are controversial and WDNR credibility with landowners and hunters is poor, particularly in the CWD Management Zone (Holsman 2007, 2009; Staples Marketing 2011a, 2011b). This annual process likely intensifies the controversy as the issues are continually in the media and it is difficult to explain the erratic nature of population estimates, season structures and antlerless permit allotments. Consideration should be given to setting antlerless harvest goals for each DMU on at least three-year intervals in sync with the setting of DMU population goals. The primary focus of the annual process has become a population numbers-based goal process based on SAK estimates at the DMU level that often seem illogical to the public and, more importantly, cannot be objectively defended. We agree with Holsman’s (2007) suggestion that to escape the trap of trying to defend these numeric estimates by moving to an outcome-driven goals system whereby deer management goals are expressed as a range of acceptable conditions across a set of criteria (harvest success or harvest level, crop damage claims, deer vehicle collisions, forest regeneration success, etc.) within each DMU. Such an approach would provide opportunities to build a greater sense of shared values between landowners, hunters, and WDNR staff.

## **RECOMMENDATIONS REGARDING THE REGULATORY PROCESS, SEASONS AND BAG LIMITS**

- 1) **Simplify the regulatory process by setting antlerless harvest goals, harvest regulations and antlerless permit quotas on a 3-5 year cycle.** The annual process of changing regulations, population estimates and antlerless permit quotas magnifies media coverage and public discontent. The annual turmoil and arguments over deer number estimates is pointless with only negative consequences. Increasing the length of the regulatory cycle should also provide better insight into population response to harvest regulations.
- 2) **Base Antlerless Permit Quotas on DMU historical demand.** Even when justified by SAK Indices or other indicators of population size, unlimited or large antlerless permit quotas that greatly exceed historical demand do little to increase actual harvest. However, they are likely to be met with concern and resistance by hunters. We commend the WDNR for using this approach in their 2012 Deer Season Recommendations.
- 3) **Increase the cost of all antlerless tags for Regular and Herd Control Units to \$12.** The cost of \$2 for an antlerless permit in Herd Control Units seems ridiculously low and many hunters see herd control designation as a downgrade in how WDNR values the deer resource. In past years many Herd Control Units had unlimited antlerless tag quotas or quotas where demand was half or less of

supply. The reduction in the number of Herd Control Units from 64 in 2011 to 45 in 2012 was a positive step for improving the image of WDNR. Charging \$12 instead of \$2 per antlerless also will increase funding for damage abatement and compensation under the WDACP. Excess funds generated by this fee increase not used in the WDACP could be redirected to other needs such as funding for applied research to answer management questions. This recommendation could be adopted for all DMUs outside the CWD units by doing away with the Herd Control Unit designation.

- 4) **Consider charging a fee for antlerless tags in the CWD Zone.** CWD DMUs allow unlimited antlerless deer harvest and antlerless carcass tags are free of charge (limit of four per hunter per day) which implies deer have little or negative value in these areas. Charging a modest fee of \$5-10 per set of four tags would signify some positive value for deer and generated funds could be earmarked for CWD monitoring, research or outreach efforts.
- 5) **Establish a public lands antlerless permit system.** A public lands antlerless permit system would address public concerns about potential overharvest of deer on these lands, especially the National Forests, and allow the WDNR to affirm the value of public lands to deer hunters and better respond to the potential impacts of maturing forests and predation on deer populations. During the Town Hall Meetings, we heard many comments about private landowners killing antlerless deer on public lands but not on their own land. This issue could be addressed through the DMAP for public access lands enrolled in the program.
- 6) **In implementing 5 above, care must be taken to assure Tribal rights under the Voight agreement become part of the process.** Tribal hunters have no land and fair access to public lands is critical to meeting their needs. It must be remembered, these peoples have been stewards of the resources for millennia and have done a good job in the process. Hunting to the Tribes is more than recreation, it is a way of life and a source of sustenance.
- 7) **Limit antlerless deer harvest in Regular and Herd Control Zones.** Limiting the number of Antlerless Deer Carcass Tags that can be purchased by an individual hunter to two-four should alleviate complaints that a few hunters are taking a disproportionate share of the harvest. The limit could be in addition to the free Antlerless Deer Carcass Tag provided with the Gun Deer or Archery Deer licenses effectively making the limit three-five antlerless deer per hunter. Those hunters purchasing both gun and archery licenses could harvest one additional antlerless deer. The impacts of limiting the number of tags that are sold on antlerless harvest and funds generated should be assessed.
- 8) **Establish a DMAP antlerless permit system.** Regulations pertaining to DMAP Antlerless Carcass Tags will need to be developed. Major considerations include how tags are issued (individual tags sold to hunters or bundle of tags issued to cooperator for a specific property), private access or public access lands, fees, limits (per hunter, per unit of land area, Deer Management Zone), and establishment and allocation of funds generated from fees. DMAP permits are in lieu of tags issued with a license and are valid only on the specified DMAP property during regular hunting seasons.
- 9) **Re-evaluate the effectiveness of the October antlerless seasons in the CWD Zone.** Just over 2,000 deer were harvested during the 2011 CWD October hunt. Van Deelan et al. (2006) reported that harvest during antlerless-only hunts such as the October hunt is additive to that taken during other seasons. Analyses presented in the CWD section of this report are counter to this conclusion. With this level of harvest, it is questionable if the additive effect of harvest in the October hunt is

worth the concerns of hunters about the impacts of this hunt on deer behavior during the 9-day November gun season. We recognize the challenges of WDNR and most state wildlife agencies in managing overabundant deer herds through regulated hunting as discussed by Holsman (2000) and Vercauteren et al. (2011), but this gesture would increase focus on the opening day of the 9-day gun season that many hunters desire. The youth, archery, muzzleloading, and other antlerless seasons would remain unchanged.

- 10) **Maintain the current buck limit of one buck per Deer Gun License (may be used in muzzleloader season) and one buck per Archery Deer License.** Hunters appear to be content with current limits on buck harvest although some desired that a limit of one buck over all seasons per year.
- 11) **Maintain the Bonus Buck Regulation in CWD Zone.** The EAB regulation was repealed by the Wisconsin Legislature in 2011 prior to the beginning of this evaluation. The regulation was highly effective in increasing antlerless harvest (Van Deelen et al. 2006), but was unpopular with hunters because of the requirement that an antlerless deer be harvested prior to taking a buck. Beginning in the 2011 hunting season, hunters in the CWD Zone were able to harvest either an antlered buck or an antlerless deer as their first deer. Hunters wishing to pursue additional deer including antlered bucks were able to do so under a Bonus Buck permit. Virginia uses a similar strategy on private lands by allowing hunters to first harvest a buck, but then requires the hunter to harvest at least one antlerless deer before a second buck can be taken. This strategy has been effective in increasing antlerless harvest and popular with hunters (<http://www.dgif.virginia.gov/wildlife/deer/eab/>). The original EAB concept could be applied on private DMAP lands and even enhanced by requiring the harvest of two or more antlerless deer prior to taking a buck if the property owner so chooses. This is a common practice used on private lands in the southeastern United States.
- 12) **Resolve the cross-bow season issue through the public involvement process.** The nationwide trend is toward accommodating cross-bow archers in some way, be it special seasons, over-lapping seasons or age-limited use in all seasons. Studies in Ohio have shown crossbows attract younger hunters to archery and allow older hunters to remain in the field, in spite of physical limitations.
- 13) **Resolve the baiting and feeding issue outside CWD affected areas.** The primary concerns expressed about baiting at the Town Hall and stakeholder meetings were the effects on deer behavior (becoming nocturnal) and potential conflicts with other hunters on public lands. While legality of baiting varies among states due to past customs, several aspects of baiting are cause for concern, especially transmission of diseases. Although Wisconsin has the most strict baiting regulations in the nation, with the current extent of CWD in the Farmland Regions and the recent discovery of a CWD positive deer in Washburn County, it is time to resolve the baiting and feeding issue as soon as possible. Involving human dimensions studies would help considerably. If not resolved, we feel spread of CWD will render this a moot point!
- 14) **Put the fun back into hunting!** We received numerous comments that most hunters are weary of the controversies surrounding deer hunting in Wisconsin and sincerely want resolution that will allow them to feel some ownership in the deer management process. The WDNR is already moving in this direction with more emphasis on people management as evidenced by improvements to the WDNR website including online forums for public inputs, public involvement in research activities, and the recommendations for the 2012 deer seasons submitted to the Natural Resources Board in April. Working with hunters and landowners through the DMAP and other educational efforts should build on these successes.

## **PREDATOR ISSUES AND MANAGEMENT**

Wolves, black bears, coyotes and bobcats are the only predators that occur in Wisconsin with any significant potential to impact the state's deer herd and deer management program. This section will provide some background information and history for each of these predators along with a discussion of their potential impacts to Wisconsin's deer herd and deer management.

### **Historical Background and Current Status of Potential Deer Predators**

#### Wolves

Wolf populations went from abundant and widespread in Wisconsin to extermination in about 130 years. It is estimated approximately 3,000 to 5,000 wolves lived throughout Wisconsin in the 1830's, prior to significant European settlement (WDNR 2012a). Due to habitat conversion to farmland, extirpation (elk and bison) or reduction (deer) of prey species, wolf bounties, and indiscriminate killing, wolves had disappeared from the lower two-thirds of Wisconsin by 1900, and were exterminated from the entire state by 1960 (WDNR 2012a).

Wolves have made a dramatic recovery in Wisconsin in response to federal and state protection over the past four decades. Wisconsin wolves first were given federal protection when they were federally listed as endangered in 1974, and they were first given state protection when they were listed as state endangered in 1975. The recovery of wolves in Wisconsin began in the mid-1970's when a few had dispersed in from an expanding adjacent Minnesota population. The Wisconsin wolf population has been intensively monitored ever since 1979. In 1980, the winter statewide population consisted of only 25 wolves in 5 packs (WDNR 2012a). The wolf population grew slowly in the 1980s and early 1990's, but grew much more rapidly after the mid-1990s through the 2000s, increasing to about 800 wolves in over 200 packs by 2011 (*cf.*, Fig. 3, WDNR 2012a). However, the rate of wolf population growth appears to be slowing down in recent years and is suspected to be currently limited more by the intraspecific social pressures of available space (suitable habitat) than by available food (deer) (Van Deelen 2009). The Wisconsin wolf range is restricted primarily to the larger forested areas in the Northern Forest and Central Forest Regions of the state (*cf.*, Fig. 4, WDNR 2012a).

The level of federal protection for timber wolves in Wisconsin was listed as endangered in 1967 and 1974, reclassified to threatened in 1999, and delisted in 2004 in response to the increasing population size of a successful recovery effort. However, due to multiple law suits, the federal protection status of wolves in Wisconsin oscillated back and forth from listed to de-listed five times between 2005 and 2012. In the most recent decision, on January 27, 2012, the United States Fish and Wildlife Service officially delisted the wolves, returning the management of wolves in Wisconsin back to the Wisconsin DNR.

The level of state protection and management goals for Wisconsin wolves were defined in the Wisconsin DNR wolf management plans of 1989 (WDNR 1989) and 1999 (WDNR 1999). Wolves were listed as a state endangered species in 1975, reclassified as threatened in 1999, delisted to Protected Wild Animal status in 2004, and designated a game species in 2012 as the wolf population increased and the need for protection declined. The 1999 management plan set a statewide management goal of 350 wolves outside of Indian Reservations. Once the population goal of 350 was met or exceeded, the 1999 plan called for depredation permits that could be issued to landowners; government trappers could conduct proactive population control activities; and public harvest of wolves could be considered after federal delisting was completed.

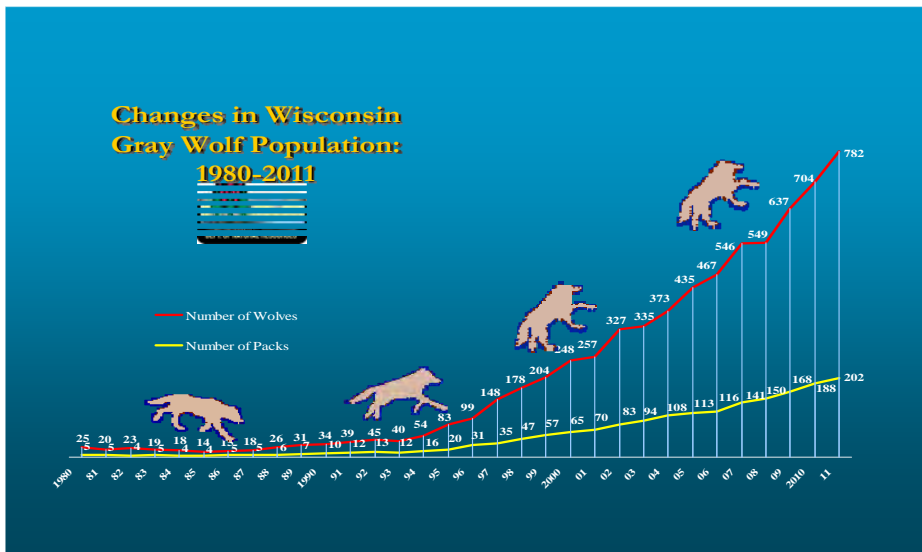


Figure 3. Changes in Wisconsin gray wolf population, 1980-2011. (Source: WDNR 2012a).

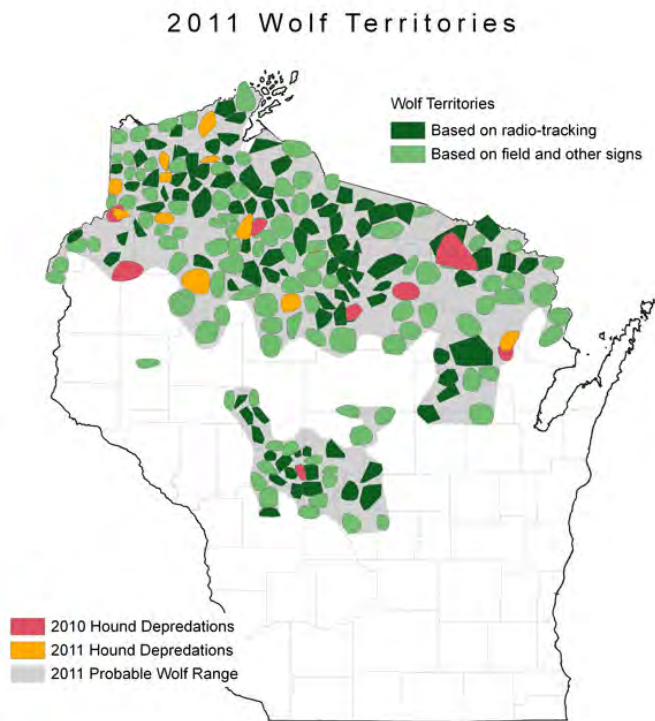


Figure 4. Probable wolf range and wolf territories in Wisconsin in 2011. (Source: WDNR 2012a).



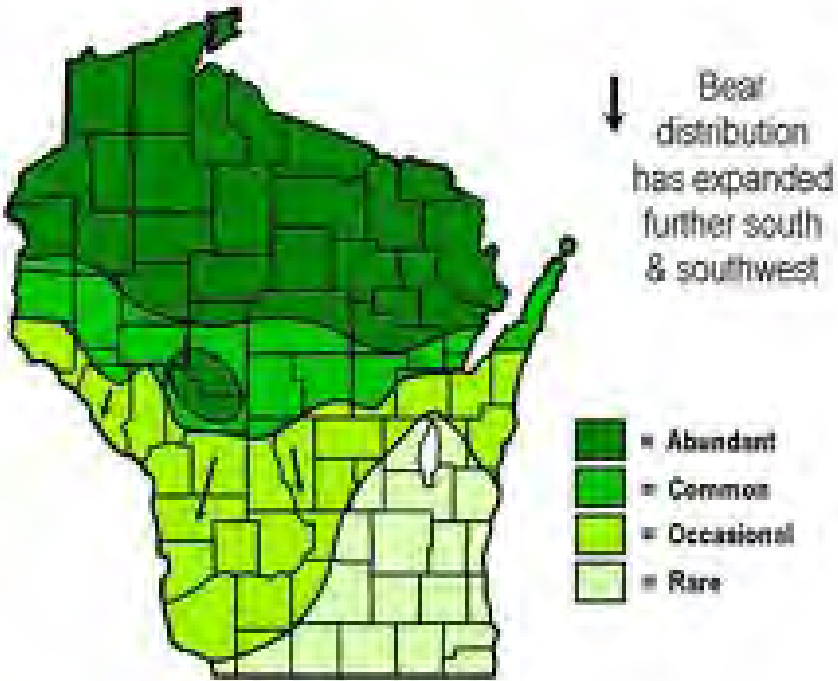


Figure 5. Wisconsin black bear distribution (Source: WDNR 2012b).

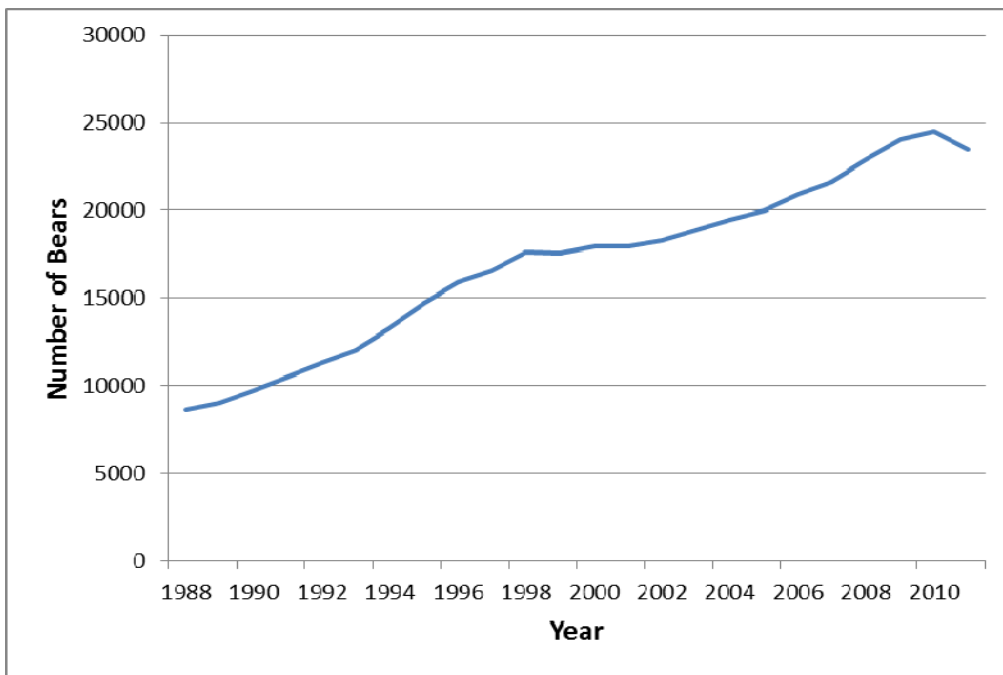
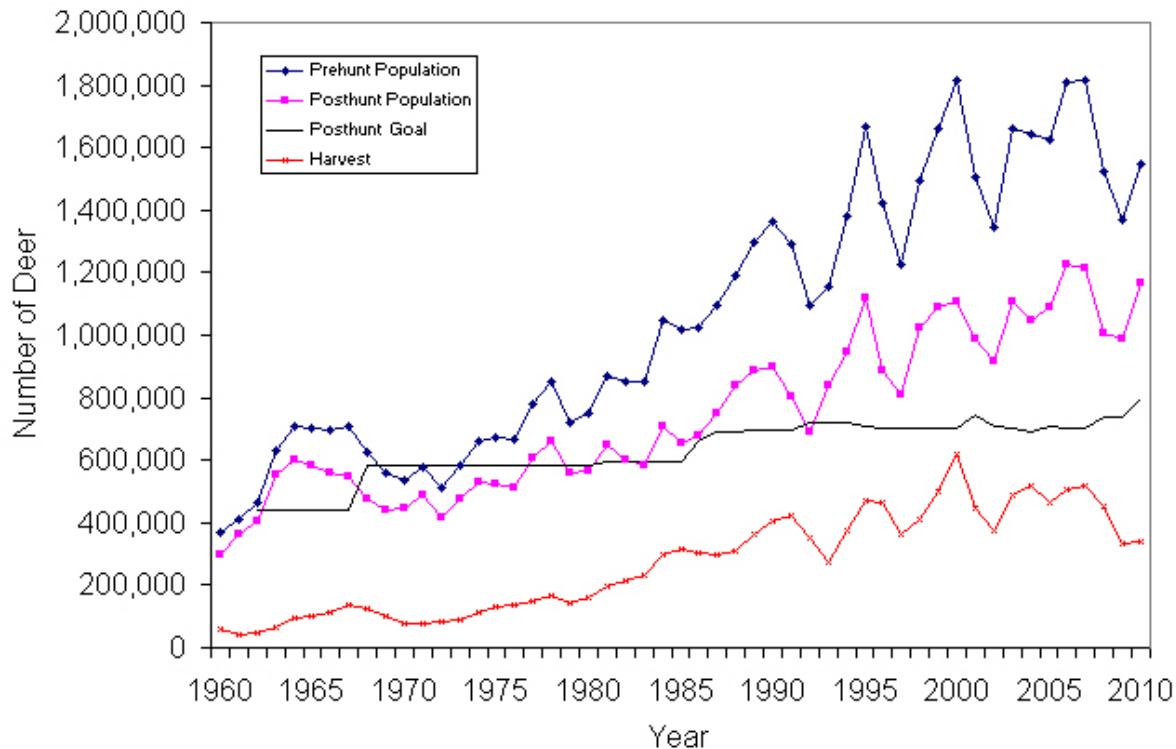


Figure 6. Modeled bear population estimates for Wisconsin, 1988-2011. Source: Rolley and MacFarland 2012.

**WI Prehunt and Posthunt Deer Population Estimates, Harvest, and Goal (1960-2010)**



**Figure 7. Wisconsin Prehunt and Posthunt Deer Population Estimates and Goal (1960-2010). Source: WDNR at [http://dnr.wi.gov/org/land/wildlife/images/hunt/deer/deer\\_pop.htm](http://dnr.wi.gov/org/land/wildlife/images/hunt/deer/deer_pop.htm) accessed 6/21/12.**

However, even though the wolf population exceeded the management goal, and all of the state and federal goals for delisting since about 2004; transfer of management to the Wisconsin DNR was delayed due to federal law suits preventing the United States Fish and Wildlife Service from delisting it. Most recently (January 27, 2012) the wolf was delisted federally again and the Wisconsin DNR is now planning to implement management actions from their management plan, including a proposed wolf hunting and trapping season to be held October 15, 2012 through February 28, 2013.

The establishment and maintenance of a wolf population is consistent with the state's broader responsibility of ecosystem management and biodiversity. However, conflicts between wolves and people predictably have increased in number and geographical area as the occupied wolf range and population has recovered. Annual depredation payments, for example, have increased from just a few thousand dollars in the early 1990s to over \$200,000 in the last few years (WDNR 2012a). We agree with the proposed actions of the WDNR to begin holding annual wolf harvests in an effort to limit depredation and other societal conflicts with wolves.

## Black Bears

Black bears, like the wolves, occurred throughout Wisconsin prior to significant European settlement. The range and numbers of black bears suffered due to large scale conversion of forest habitat to agriculture and due to bounties and excessive killing throughout much of the 1800s and 1900s. This resulted in extermination of black bears from some portions of southern Wisconsin and reduced the total statewide population (WDNR 2012b).

The primary range of black bears in Wisconsin is concentrated in the extensive forested areas of the northern third of the state, but the bear range has been expanding further south and southwest in response to expansion of forest succession due to abandoned agricultural fields (*cf.*, Fig. 5, WDNR 2012b).

Prior to 1985, unlimited and increasing harvests caused the bear population to decline rapidly. Bear hunting was closed in 1985 and changes in bear hunting and harvest control starting in 1986 resulting in an increase in the bear population (WDNR 2012b). The WDNR Wisconsin black bear population estimates have nearly tripled in the past 24 years from 8,600 in 1988 to 23,500 in 2011, based on a bait station-accounting model (Rolley and MacFarland 2012) (*cf.*, Fig. 6). An independent black bear statewide population estimate derived from a tetracycline-laced bait survey (Garshelis and Visser 1997) estimated the population in 2006 at about 33,600 with a 95% confidence interval ranging from roughly 27,800 to 39,500. Regardless of the discrepancy in the point estimates of the statewide black bear population using two different techniques, the WDNR feels confident that the bear population has increased dramatically, on the order of tripling in size, since 1986 (David MacFarland, personal communication).

## Coyotes

Coyotes occurred throughout Wisconsin prior to 1900 and reportedly were abundant both in the north and the south (WDNR 2012c). As human development increased in the 1900s, particularly in the south, conflicts between coyotes and humans led to heavy hunting and killing that decreased coyote populations in southern Wisconsin. Year-round hunting with no bag limits still exists today, but a defined trapping season was instituted in 1981. There are no population estimates for coyotes in Wisconsin; however, WDNR has been conducting an annual small game harvest survey since 1983 which indicates an increasing trend in coyote harvests since about 1996 (Dhuey 2011). Coyote harvests hovered in the 8,000 to 20,000 range between 1983 and 1996, but has been increasing significantly since. In the 2010-11 *Small Game Harvest Report* coyote harvest was estimated at about 44,000 (Dhuey 2011). WDNR sighting surveys have indicated a 3-5 fold increase in the number of coyote sightings between 1998 and 2009 throughout Wisconsin, except for the northern forest region, where sightings remained relatively stable from 1988 through 1998, then slowly increased since 2000 (Kitchell 2009, as cited by Jacques and Van Deelen 2012).

## Bobcats

Bobcats once lived throughout Wisconsin but, like the wolves and bears, conversion of habitat to agriculture and overexploitation removed them from the southern portions of the state and their current range primarily is in the remaining forested regions in the north (Chiamulera et al. 2012). Wisconsin had a bounty on bobcats for nearly a century from 1867 to 1963 and unregulated hunting continued until 1970. Bobcat harvests for the past three decades (1980-2010) have averaged 231 but have ranged from a low of 71 in 1991 to a high of 477 in 2007 (Dhuey and

Olson 2011). Starting in 1983 the WDNR made it mandatory to turn in harvested bobcat carcasses for collection of age, sex, and reproductive information which was combined with harvest data in a model to estimate population size (Chiamulera et al. 2012). The Wisconsin bobcat population increased from about 1,600 to about 3,600 during the 1990s and early 2000s but the population appears to have stabilized and declined slightly in recent years (Rolley and MacFarland 2012d).

## **Impacts of Predators on Deer Herd and Deer Management**

### **Statewide**

Wisconsin deer population estimates and harvest data appear to support the concept predators have not had an obvious negative impact on the statewide deer herd size or quality. The trend in statewide deer population estimates has continued to increase since the early 1970s, throughout the entire period of wolf recovery, and in the face of significant increases in the black bear population (*cf.*, Fig. 7, WDNR 2012c). In addition, the statewide estimated deer population has remained above management goals for approximately the last 25 years. In a national survey of the status of white-tailed deer conducted by the Quality Deer Management Association, Wisconsin averaged 4.4 bucks harvested per square mile which earned it the rank of third highest in the country for 2010, and with a total buck harvest of 148,378 Wisconsin ranked fourth in the country for size of buck harvests in 2010 (Adams et al. 2012). In the same survey Wisconsin's 2010 antlerless harvest was ranked sixth in the country for size (185,211) and tied for 6th in the number of antlerless deer harvested per square mile (5.4).

Fawn recruitment rates, defined by the WDNR as the number of fawns per adult doe (1.5 years and older) alive in the fall pre-hunt population, is a measure of herd productivity and is used to detect high fawn predation rates. As predation rates increase, fawn survival and thus fawn recruitment rates tend to decline. In QDMA's survey, Wisconsin had the second highest fawn recruitment rates in the country and Wisconsin fawn recruitment rates were almost identical at 1.06, 1.07, and 1.07 fawns/doe for 2000, 2005, and 2010, respectively (Adams *et al.* 2012). This suggests there has not been a significant change in fawn survival rates in Wisconsin over the past decade on a statewide basis.

### **Impacts in Northern and Central Forest Regions**

Considering all of the state's wolves and most of the black bears and bobcats are concentrated in northern and central Wisconsin, that is where you would most expect to detect a predator impact on the deer herd. Jacques and Van Deelen (2012) estimated potential bear and wolf effects on deer population growth and recruitment across northern and central Wisconsin for the decade 1998 through 2008. They used a mixed effects regression model with a repeated measures design. From their analysis they reported wolf effects were virtually nonexistent; however, there was some evidence bears appeared to have a slight effect on both deer population growth rates and recruitment rates. Nonetheless, they indicated their findings were based largely on correlational (theoretical) analyses rather than field based research, these results should be interpreted with caution, and recommended further investigation through field-based research.

## Wolf Impacts

There is evidence to suggest it is unlikely wolves would be a significant limiting factor for Wisconsin's deer herd, by themselves, based on previous research results of wolf-deer relationships. This concept was very well-illustrated and documented in a paragraph by Jacques and Van Deelen (2012) as follows:

*"...previous research indicates that deer populations would normally need to be reduced to fewer than 3 deer/m<sup>2</sup> for wolves to limit deer population growth (Mech 1984). Wolf predation is not generally a major mortality factor until deer densities decline below 10 deer/m<sup>2</sup> (Wydeven 1995). Deer densities of fewer than 10 deer/m<sup>2</sup> occur infrequently in Wisconsin. Wolves in the Great Lakes Region normally consume 15-19 adult-sized deer (or their equivalent) per wolf per year (Fuller 1995, Mech and Peterson 2003). At a rate of 19 deer per wolf per year, an average Wisconsin wolf pack of four wolves on a 70 m<sup>2</sup> territory would consume approximately 76 deer or about 1 deer per square mile. Thus, Wisconsin's wolf population during late winter 2009, which consisted of 626-662 wolves, may have consumed between 9,390 and 12,578 deer. Importantly, the total 2008 deer harvest within the central and northern forest zones where wolves occur sympatric with deer was 122,000 (gun and archery)."*

With the current (2012) wolf population estimated at roughly 800 and an annual predation rate of approximately 19 deer/wolf, this would come out to about 15,200 deer killed by wolves each year. Considering the fall deer population for northern and central Wisconsin has been averaging over 450,000, the proportion of that population expected to be taken by wolves would only be about 3 percent. Yet, we know little about the interaction between predation and decline in deer habitat quality, or minimum deer population size for sustainability in the presence of predators. This is a research area of high importance in our opinion.

## Black Bear Impacts

In the case of black bears, most white-tailed deer predation is very seasonal and primarily involves fawns less than two weeks old, but may include fawns up to about six weeks old (Ozoga and Verme 1982, Mathews and Porter 1988, Vreeland et al. 2004). Jacques and Van Deelen (2012) reported bear predation rates on radio-collared deer fawns of 10 to 57% for a variety of studies conducted throughout the country but that few of those studies determined how important such predation was on deer population growth. As stated above, Jacques and Van Deelen (2012) reported evidence bears appeared to have a slight effect on both deer population growth rates and recruitment rates for the northern and central forest regions.

## Coyote Impacts

In areas where predation on fawns reduce recruitment, intensive predator removal prior to the fawning season may be effective at increasing recruitment in some areas where herd productivity does not meet management objectives. Ballard et al. (2001) reviewed a number of studies on mule deer, black-tailed deer, and white-tailed deer where coyote populations were reduced to increase deer populations and provided the following insights as referenced by Peek et al. 2012. Coyote control was effective at increasing deer populations when deer were below KCC and, 1) predation was the limiting factor; 2) predators were reduced enough to yield results, 3) control efforts were timed to be most effective, and 4) the control was confined to a limited area. Predator control was not effective when deer populations were near KCC, predation was not limiting, predators were not reduced enough, and the control was practiced over a broad area.

One caution was provided by Ballard et al. (2001) concerning predator control and habitat damage. If predator reductions resulted in increases in deer populations at or above KCC then this could result in subsequent habitat deterioration due to over-browsing or overgrazing, causing a reduction in condition and productivity of the deer. Accordingly, hunter harvest needed to be intensive enough to control deer populations if predators were reduced

Jacques and Van Deelen (2012) conducted a literature review on coyote predation impacts to deer populations. The following highlights some of their findings as it may relate to coyote predation on deer in a general way. White-tailed deer are a primary prey species of eastern coyotes in most forested areas of northeastern North America. The extent and timing of predation varies both spatially and temporally within an area. Late born fawns (July to September, more of an issue in SE USA) may be more susceptible to coyote predation because their births coincide with the greatest hunting population of coyotes, because pre-dispersal coyote pups are hunting independently at that time. Estimates of the percent of fawn mortalities attributed to coyote predation are well documented in the ecological literature, ranging from 0 to nearly 100%. Low coyote mortality in some areas have been hypothesized to be caused by an abundance of alternative food sources for coyotes and/or dense ground cover that provides fawns with additional protection to hide. Coyotes can be a significant source of mortality for adult deer too, particularly during severe winters in the northern portions of the whitetail's range.

Landscape and habitat characteristics may impact fawn vulnerability to coyote predation. Reduced coyote predation rates occurred in years with increased availability of hiding cover for fawns. Fawns killed by coyotes tended to occupy home ranges in open habitat and fields. Several studies showed that coyotes prefer more open habitats as opposed to forested habitats and that fawns seeking cover in large forested areas may be less vulnerable to coyote predation than fawns inhabiting relatively more open habitats, other cover types, or smaller forest patches. This may have relevance in Wisconsin as ecological landscapes are dramatically different with an abundance of agriculture and higher coyote densities in the farmland deer management regions in the south compared to the northern forest region.

Jacques and Van Deelen (2012) presented evidence coyote predation may be having an increased impact on Wisconsin's deer herd in the agricultural areas in the south in recent years, but no significant change in coyote predation impacts in the northern forest region, corresponding with levels of coyote abundance during the same periods. Percentages of yearling female deer comprising the annual gun harvest averaged 27% during the past 40 years across the northern forest region with no sustained downward trend since the late 1990s. In contrast, the percentage of yearling females harvested across the southern farmland region has declined from 49% during the mid-1980's to 29% in 2009 which corresponded to expanding coyote populations throughout the southern farmland region.

### Bobcat Impacts

The impact of bobcats on Wisconsin's deer herd is likely to be minimal for a number of reasons. Bobcats tend to prey on smaller animals such as rabbits, hares, squirrels, small mammals and birds, when they do prey on deer it is usually fawns and the intensity is usually not enough to affect abundance, and bobcat population size is small relative to the Wisconsin deer population (Jacques and Van Deelen 2012).

## Positive Effects from Predation

There is no denying predation has negative impacts on individual deer, after all they are being killed; however, we would be remiss if we did not also point out predation can have a positive impact on the deer population and their ecosystem. Selective predation on the weaker, slower, or sick individuals can be beneficial, in the long term, to increasing fitness for the surviving population. Predation may also be beneficial in suppressing disease in deer populations. Wild et al. (2011) suggested as CWD distribution and wolf range overlap, wolf predation may suppress disease emergence or limit prevalence. [However, the current CWD geographic distribution and Wisconsin wolf ranges do not yet overlap.] In addition, predation can be beneficial in helping to balance deer populations with their environment which may reduce the negative impacts of over-browsing on forest regeneration and biodiversity. This is particularly true of large roadless areas where hunters may be less effective at controlling deer populations.

## Overview of Predation Impacts

Predators have increased dramatically in Wisconsin in recent decades. Wolves have gone from being extinct in the early 1970s to a current population of about 800. Black bears have roughly tripled since 1985, with a 2006 population estimate of roughly 33,000 based on a tetracycline survey. The bobcat population more than doubled between 1993 and 2003, going from roughly 1,600 to about 3,600, but has dropped back down to about 2,500 in the past few years. Though population estimates do not exist for Wisconsin coyotes, annual harvests have more than doubled since the early 1990s, and coyote sightings have made a 3-5 fold increase since the late 1990s throughout Wisconsin, except for the northern forest region, where sightings remained relatively stable through the 1990s, but have been slowly increasing since about 2000. The increases in wolves, bears, and bobcats all have occurred in a similar area geographically, primarily in the northern and central forest regions, while the major increase in coyotes appear to be in the rest of the state.

With the large increase in predator numbers in recent decades one might intuitively expect to see obvious negative impacts on the deer population. However, predator/ungulate relationships and all the other factors in their environment (winter severity, habitat quality, etc.) are complex and not always intuitive. Statewide deer population estimates have continued to increase throughout the entire period of wolf recovery and concurrent increases in black bear, coyote and bobcat. In addition, Wisconsin continues to maintain some of the largest white-tailed deer buck and antlerless harvests in total, and per square mile, as well as one of the highest in herd productivity (recruitment rates) in the country.

Though Wisconsin's statewide deer population estimates and harvests do not demonstrate a corresponding decline as predators increased, that does not mean predators are not having a significant impact in some areas of the state. We would expect the greatest predator impact to occur in the forested regions of central and northern Wisconsin which corresponds with the bulk of the wolf, black bear and bobcat populations. Results from a theoretical correlational analysis failed to detect any significant effects of wolves and only a slight effect from black bears on deer population growth and recruitment across northern and central Wisconsin (Jacques and Van Deelen 2012). However, the authors did advise to interpret these result with caution and recommended further investigation through field-based research.

**At the present time, sufficient scientific evidence to measure the impacts of predation on Wisconsin's deer herd is lacking and there is a great need to conduct research to learn**

**more about these relationships.** To their credit, in 2011 the WDNR initiated a research program in northern (Sawyer, Price, and Rusk counties) and east-central (Shawano, Waupaca, and Outagamie counties) Wisconsin using radio telemetry to track fawns and adults to evaluate survival and cause-specific mortality. As of December 31, 2011 adult and yearling mortality consisted primarily of hunter harvest (38%) and predation (26%) on the northern study area while on the east-central study area it involved hunter harvest (61%) and vehicle collisions (24%) (Jacques 2012). Of the 10 adult and yearling deer killed by predators (for which predator was identified) on the northern study area, 4 were killed by wolves, 3 by bobcats, 2 by coyotes and 1 by a black bear. With regard to fawn mortality in the northern study area, 73% of the 30 radio collared fawns died and most (64%) of the fawn mortalities were attributed to predation to bears (5) and bobcats (2). Of the east-central study area fawns, 38% (18 of 48) died by the end of 2011. Fawn mortalities consisted of 33% due to predation, 33% due to starvation, and 17% due to vehicle collisions. Of the six fawns killed by predators on the east-central study area; 4 were taken by coyotes, 1 by a black bear, and 1 by an unknown predator. **The preliminary results of this field-based research study certainly suggests greater levels of predation of deer on the northern as compared to the east-central study area.** This should not be surprising considering the concentration of wolves, bears and bobcats in the northern study area (=additive predation effects).

As this survival and cause-specific deer mortality study continues it undoubtedly will provide important quantifiable predator impacts on the deer population that will aid in improving management of Wisconsin's deer herd. During our Town Hall meetings in April 2012 we heard from several volunteers who had been assisting with the field work on the mortality and recruitment study and they provided extremely positive comments concerning their excitement, appreciation, support, and respect for this WDNR research project. These are the kinds of activities that are very important to improve the relationship between the WDNR, sportsmen, land owners and the general public at large. We applaud the WDNR for their efforts on this research project and for their involvement of the general public to assist with field activities on the study (discussed again later).

## **RECOMMENDATIONS REGARDING PREDATOR-DEER MANAGEMENT**

- 1) Continue to conduct research on the impacts of predators on the deer herd.** Widely differing opinions of public and academic origin exist on the impacts of predators on Wisconsin's deer herd, but sufficient documentation of these relationships has been lacking. The recently initiated survival and cause-specific mortality study in northern and east-central Wisconsin is a great step in the right direction to provide much needed information for management. We recommend conducting similar types of field-based research studies in other locations across the state, as resources become available, to document the variability of predator impacts in various regions with differing landscape and habitat characteristics.
- 2) Involve the public as much as practical with field-based research projects.** The involvement of the public in field work for these types of studies is extremely valuable in increasing public confidence, credibility, and support for the WDNR. When we were conducting our Town Hall meetings we were impressed by several volunteers who had assisted with the WDNR survival and cause-specific deer mortality study and spoke very highly of the WDNR and this study. It is hard to overestimate the positive impacts created for the WDNR by establishing local non-governmental public supporters for department research and management activities by having them involved in field activities.



- 3) **Revise the Wisconsin Wolf Management Plan to include updated information and provide current public attitudes to guide management decisions through the early years of this post-delisting era.** Wisconsin has had two wolf management plans, so far. The original was created in 1989 and the second management plan was created in 1999, both of which helped guide the management of wolves during the population recovery era. It has been 13 years since the last wolf management plan was written, and due to the recent federal delisting, the responsibility for wolf management in Wisconsin has been passed from the United States Fish and Wildlife Service to the WDNR. This change in protection status and interagency shift of management responsibilities creates a whole new era of wolf management, not the least of which includes population control measures. Human dimensions research should be conducted on a cross-section of Wisconsin citizens to get unbiased input to guide the WDNR for future management decisions. A newly revised Wisconsin Wolf Management Plan should be created to guide management through this post-delisting era.
- 4) **Establish a wolf population management program to limit/decrease wolf-societal conflicts.** Human dimensions surveys should be conducted to determine the level of acceptance of wolves (cultural carrying capacity) by a cross-section of Wisconsin society with the goal of limiting or decreasing wolf depredation to a level acceptable to the citizens of Wisconsin. The goal should be to limit/decrease wolf societal conflicts rather than a goal to sustain some specific number of wolves in Wisconsin. We believe that the initial wolf population control program should be conservative and follow the recommendations of Mech (2010) to reduce the probability of legal challenge and, if it is challenged, to reduce the probability that the challenge will be successful in stopping the control program.
- 5) **Geospatial studies of predator distribution and densities, especially for wolves, should be encouraged and developed to assess long-term trends and issues.** The geographical documentation of annual harvests, observations, or other potential geospatial data on predators that might help describe the distribution or density of predators is encouraged to assess current and future trends.

## CHRONIC WASTING DISEASE

Transmissible Spongiform Encephalopathies are a group of strange diseases known to affect a number of mammalian species including humans, deer (Cervidae), cattle (Bovidae), sheep (Ovidae), mink (Mustelidae), hamsters (Muridae) and other mammalian families. The human forms include Creutzfeldt-Jakob Disease (CJD, Gibbs et al. 1979, Sawcer et al. 1993) and Kuru (Wadsworth, et al. 2008), occurring at an estimated rate of one to two per million individuals. It is thought CJD develops spontaneously and Kuru may be transmitted by unique dietary habits (mortuary feasts) of indigenous peoples in Eastern Highlands of Papua New Guinea (De Silva 1994a, De Silva 1994b). It is germane to note CJD occurrence increases with age (50+ years), occurs spontaneously in about 85% of cases, with the remainder occurring as mutations of the prion ("pree-on") protein gene. Recent appearances of the disease in deer in New Mexico and possibly northern Wisconsin may support a spontaneous origin for the disease in these mammals. Once established, however, the modified protein agent (prions) can be infective either from ingestion or individual contact (direct and indirect).

TSEs perhaps are best known from worldwide publicity generated by the appearance of “mad cow disease” in the UK. A significant panic erupted subsequently, significantly damaging the livestock industry in the UK, due primarily to concerns for human health (Collinge, et al. 1996).

Chronic wasting disease (CWD) became known on a limited basis in the late 1960s (ca. 1967), when it first was observed among cervids residing in a Colorado State research facility (Foothills Wildlife Research Facility) near Ft. Collins. The first “official” recognition for the disease came about 10 years later, and subsequently (1979) reported in another state research facility (Wyoming Gish and Game Department’s Sybille Wildlife Research Facility). Although reported scientifically (Williams 2005, Mathiason, et al. 2006, MaWhinney 2006), the disease remained relatively obscure until the well-known outbreak of so-called “mad cow disease” (Bovine Transmissible Spongiform Encephalopathy, BSE) in the United Kingdom (Brown and Braddley 1998). The first known occurrence of the disease in wild cervids occurred in 1981 (elk) and again in 1985 (mule deer). Increased surveillance by state and federal agencies eventually led to reports of the disease in several additional states, including Nebraska, New Mexico, South Dakota and Utah to the west and Illinois and Wisconsin to the east. Since then several more states have been added to the distribution of the disease. The first known report of farmed cervid infection was in 1979, followed by a report in 1996 in Saskatchewan, then captive herds in at least 8 states. As of 2012, 18 states and two Canadian provinces have reported CWD presence.

In February 2002, the Wisconsin Department of Natural Resources reported occurrence of CWD in three wild white-tailed deer harvested in 2001 in Dane and Iowa counties. Eleven additional infected animals were reported later. The same year, Illinois also reported the disease in wild deer in the northern portion of the state, linking occurrence to Wisconsin. Tests conducted subsequent to the first report produced 11 positive animals out of 516 tested animals. The WDNR developed a response plan which included depopulation of a 287 square-mile eradication zone, containing an estimated 15,000 deer (Heberlein 2004). Then Governor Scott McCallum requested \$18.5 million in federal funds to support the response effort. Additional funding from state and federal sources has been acquired over the last decade.

Wisconsin DNR imposed a multi-faceted approach to eradicate CWD, including sharpshooting and expansion/modification of seasons and bag limits. Further, innovative approaches such as “Earn-A-Buck,” in which a hunter must harvest an antlerless deer (fawn, doe or “sublegal buck”) prior to harvesting an antlered buck, were implemented. According to the WDNR, some 172,000 animals have been removed from the CWD Zone since efforts began a decade ago (Figs. 8&9). About 1,800 have tested positive to the disease as of February 2012. The general trend is reported (April 2012) to be an increasing infection rate, especially in older age class animals. We will discuss relevance of these findings later.

From a geospatial context, there appear to be two centers of infection (exclusive of the recent Shell Lake occurrence), the largest being just west of Madison. The highest infection rates appear to occur in Management Units (MUs) 70A-CWD, 70C-CWD and 70D-CWD.

Numerous research projects have been completed or are in progress dealing with a variety of issues related to CWD control/management. As we will discuss later, an unfortunate

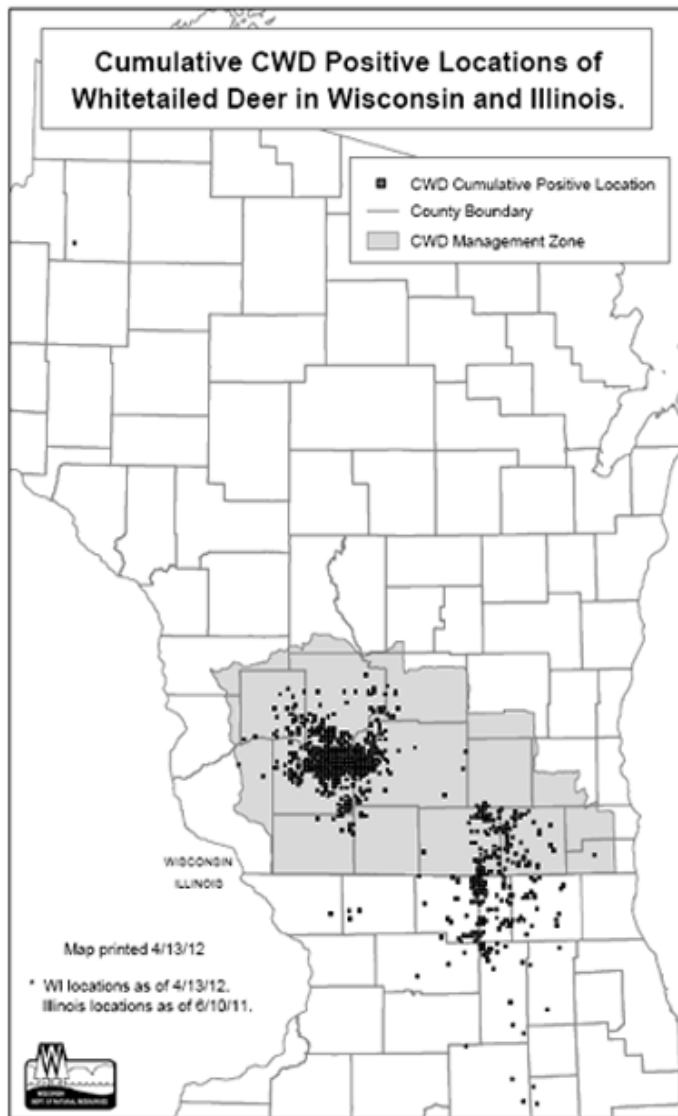
consequence to this significant effort has been diversion of funds and manpower away from other key deer/habitat/people management issues; understandable in light of concerns early on in the process. Notable among this research has been the human dimensions of an eradication effort, particularly since the eradication approach in many ways represents “new ground” in a state response to a wildlife disease (Petchenik, 2006, Holsman, et al. 2010). In 2003, the WDNR’s CWD Response Plan was audited by an independent, peer-review committee (Fischer, et al. 2003). In general, the committee found the plan to be sound, based on current scientific information, but concluded:

*“Criticism of the Wisconsin CWD Management Plan arose, in part, because the DNR chose a strategy that has not yet been proven effective for CWD management in free- ranging cervids, and therefore, its success could not be guaranteed. Wildlife disease management strategies are based upon manipulation of the disease agents, the hosts, the environment, and human activities. Disease control efforts often are hindered by a number of factors, including the inherent difficulties of dealing with free-ranging wildlife and a paucity of tools documented to be effective under field conditions. Nevertheless, the lack of proven methods for management of CWD or other diseases in wild populations cannot be used to justify inaction by agencies charged with conserving valuable natural resources: Increased infection rates and geographic spread of CWD are the anticipated consequences of an inadequate management response.”*

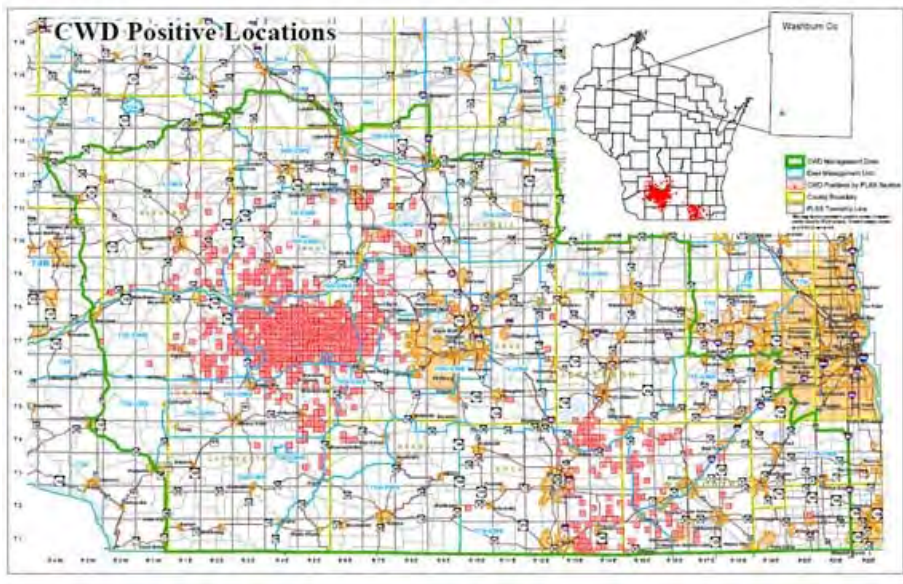
By 2006, public acceptance of the CWD Eradication Program had begun to deteriorate (Holsman and Petchinak 2006). Holsman, et al. (2010) summarized the sources of the problem:

*“Eight years after undertaking an unprecedented attempt to eradicate chronic wasting disease (CWD) from its free-ranging white-tailed deer (*Odocoileus virginianus*) population, Wisconsin wildlife managers are rethinking their strategies in the face of public opposition to their efforts. ...These include opposition to the population goal, conflicts with traditions, conflicts with consumption norms, the uncertainty of the plan’s efficacy, and perceived lack of credibility in the agency. We argue that these six clusters of attitudinal beliefs made it unlikely that hunter support could have been cultivated regardless of the scope or pace of the CWD eradication effort. Our findings call into question the use of recreational hunting as a viable tool for bringing about severe deer population reductions for disease management.”*

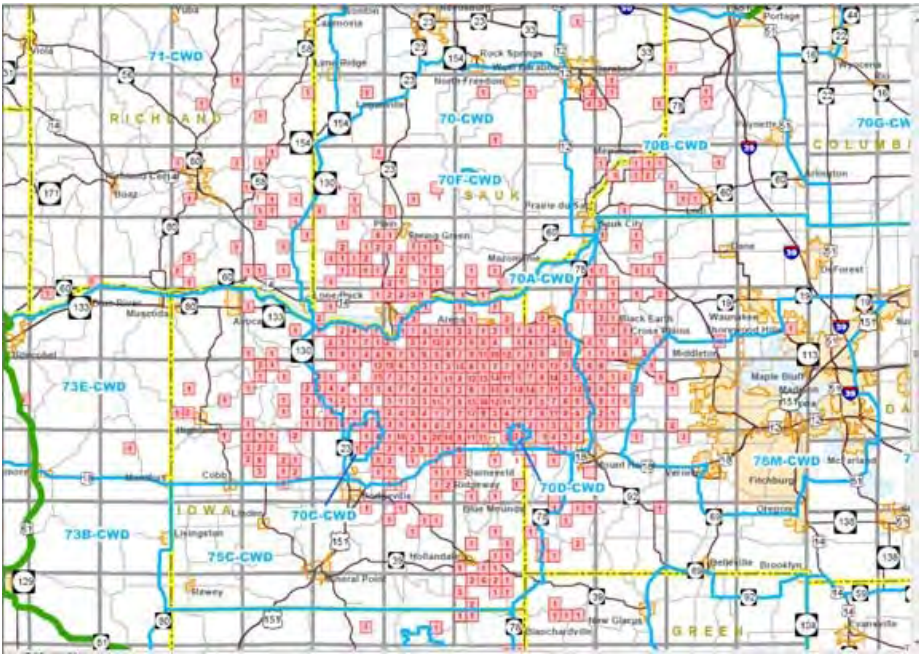
The response to CWD by Illinois included expanding public hunting and targeting of local populations by sharpshooters; results at this time are encouraging. Sharpshooting is only effective when a disease is limited in range and numbers of infected animals are relatively low. For example, in 1924 a concurrent outbreak of foot-and-mouth disease in California cattle and black-tailed deer (*Odocoileus hemionus*) was eradicated by killing more than 22,000 deer, along with cattle in a localized area (Stanislaus National Forest) (Keane 1927). Elimination of a wildlife disease by eradication of larger populations has not been successful (Wobeser 2002). Lack of public support for the eradication program also was tied to issues related to estimating deer numbers within the disease eradication zone (DEZ). Population goals (Fig. 10) established by



**Figure 8. Distribution of Chronic Wasting Disease in Wisconsin and Illinois as of April 13, 2012.**  
 Source: WDNR (<http://dnr.wi.gov/topic/wildlifehabitat/prevalence.html>)

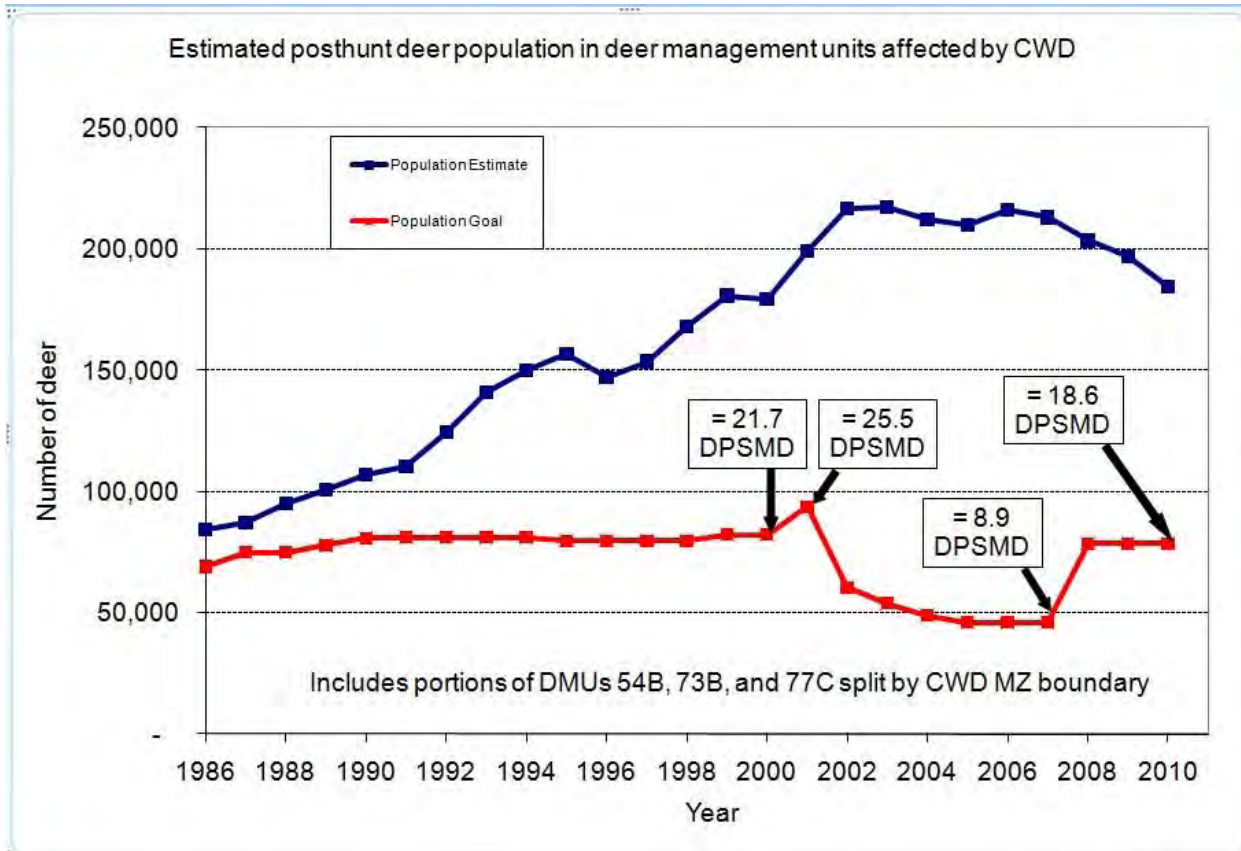


**Figure 9. Geographic distribution of CWD positive deer in Wisconsin as of April 13, 2012. An additional deer (female) was found to be positive at Shell Lake (Washburn County) in northern Wisconsin on March 30, 2012. Distribution (see map below) is concentrated in a core area. Source: WDNR**



WDNR using the SAK model and “supplementary” estimates (accounting-style population models, and aerial surveys; helicopter quadrat and fixed-wing transect surveys) seldom were

achieved (Fig. 10). This led to frustration both on the part of the public and professional biologists, exacerbating loss of public confidence in the program and credibility of WDNR.



**Figure 10. The population goals established by the WDNR for the CWD DEZ have not been achieved since the disease was detected in 2002. (Source: WDNR)**

In addition to the initial peer-review of the CWD Eradication Program, there were two additional reviews, one by the Wisconsin Legislature and another commissioned by the WDNR (Staples Marketing Report 2011). The legislative audit was released on November 16, 2006, certified by Janice Mueller, State Auditor. The findings of the committee included the following:

1. The DNR accounted for \$26.8 million of the \$32.3 million spent on CWD through FY 2005-06.
2. To date (2006), DNR's efforts to eradicate CWD have not been effective.
3. DATCP has taken steps to limit the spread of CWD in farm-raised deer.
4. Hunters must wait longer to receive CWD testing results for their deer.
5. DHFS reviews potential effects of CWD on human health.
6. Wisconsin's approach to CWD should be re-evaluated.

Stables Marketing, LLC was contracted to conduct a study on the CWD eradication program and its various aspects related to public perceptions and relations. Staples used focus groups, phone

surveys and message testing to evaluate WDNR efforts. According to Staples, the objectives of this research were to understand:

1. *The level of awareness of the chronic wasting disease (CWD) situation among deer hunters and landowners in the CWD Management Zone.*
2. *The situation, what CWD is about, the key issues, risks, concerns, etc. to hunters and landowners.*
3. *Beliefs about how CWD impacts them personally.*
4. *Opinions about possible ways to control or eradicate the disease.*
5. *Most effective ways for the DNR to communicate about CWD with hunters and landowners.*

A total of 600 hunters and landowners were surveyed by phone (June/July, 2010) and focus group meetings were held during May 12-13, 2010. In addition, they conducted CWD messaging tests on the Hunt.Harvest.Help marketing effort. Staples issued a report dated August 8, 2011. The study cost approximately \$250,000. In general, Staples reported Non-landowner hunters appeared to be less anti-DNR than hunting landowners; however, both groups considered the WDNR as not a credible source of information concerning CWD. Non-landowner hunters were unconvinced CWD was a significant problem, unaware of efforts in other states, were unaware of the Conservation Congress, and were less informed about CWD than landowning hunters. Much of the unhappiness with the WDNR approach to CWD was major changes to what is considered to be "traditional" hunting seasons. These individuals were resistant to harvesting additional animals. Much of the reported distrust came from landowner-hunters, followed by non-landowning hunters; while non-hunting landowners were reported as more supported, yet less informed than the former.

The question arises: Have the WDNR's CWD eradication efforts been effective? In order to answer this question, we propose the following criteria, based on the original goals of the program:

- ✓ **Has the CWD eradication (management) program reduced the incidence of the disease?**
- ✓ **Has the CWD eradication (management) program prevented spread of the disease?**
- ✓ **Has sport hunting been an effective means to achieve the population goal (20-25 deer per square mile of deer range) and disease reduction goals set by the WDNR?**

In regard to Question 1, the WDNR reports CWD infection rates have increased since 2002 in all sex and age classes. The apparent rate has increased in adult males from about 8% to over 16%, and in adult females from 3% to 7%. Hence, on the surface, the answer to the first question appears to be "no;" however, data provided by the WDNR on harvest and age structure from deer harvested in the DEZ create additional questions. We were supplied with an Excel™ spreadsheet

document containing two sheets: one labeled “*Age and sex distribution of harvested deer sampled for CWD in units associated with the CWD Management Zone, 2002-2011*” and the other, “*Harvest age composition of antlered and antlerless deer in units associated with the CWD Management Zone, opening weekend of the gun season 1992-2011.*” We also received another spreadsheet labeled, “*Harvest age composition of antlered and antlerless deer in units associated with the CWD Management Zone, opening weekend of the gun season 1992-2011.*” Both of these documents were created on May 3, 2012 (2:45 pm), and emailed to us on the same day. Figures 11&12 present the age distribution of bucks harvested from units associated with the CWD Management Zone on opening weekend from 1992-2011. Data were missing for the years 2002, 2004-2006, which is understandable considering issues relating to controlling CWD probably suspended aging of deer. Of interest is the decline in the percentage of yearling bucks in the harvest, with an apparent increase in older age classes. This may be attributed either to effects of “Earn-A-Buck” or to decreased recruitment due to heavy fawn harvests. Considering the role yearling buck harvest plays in SAK population estimates, population estimates should have been affected. Indeed, this is supported by the data. When we compared buck age classes prior to and after the CWD program, there appear to be more older age class bucks in the harvest, again probably due to “Earn-A-Buck” or additional factors. From a hunter standpoint, this can be viewed as a positive outcome; while from a disease control standpoint a negative.

Antlerless harvest age structure and composition is presented in Fig. 13. In general, a large amount of the harvest has shifted to the fawn segment of the herd, reflected in the decline of yearlings and two year olds in the harvest. Hence, herd reduction efforts have affected recruitment. At the same time, however, older age class does have increased in the harvest, suggesting the herd is aging in spite of heavy harvests. If population goals were being met, one would expect older age class animals to be diminished proportionally or even absent.

There appear to be two separate data sets regarding ages of deer harvested or removed from the CWD Zone. One set is designated as from opening weekend harvest data for 1992-2011, with some data missing (1992, 2004-2006). The second represents a separate dataset taken from deer sampled for CWD.

The new 15-year management plan (WDNR 2010) stresses there has been an increase in infection rates within the DEZ (cf., Fig. 4 in document; Fig. 14 here):

“Since 2002, prevalence in the western core among adult males has risen from about 10% to over 12%, and in adult females from about 4% to about 6%. In the same area during the same period, prevalence in yearling males has increased from about 2% to about 4%, and in yearling females from 2% to nearly 6%.”



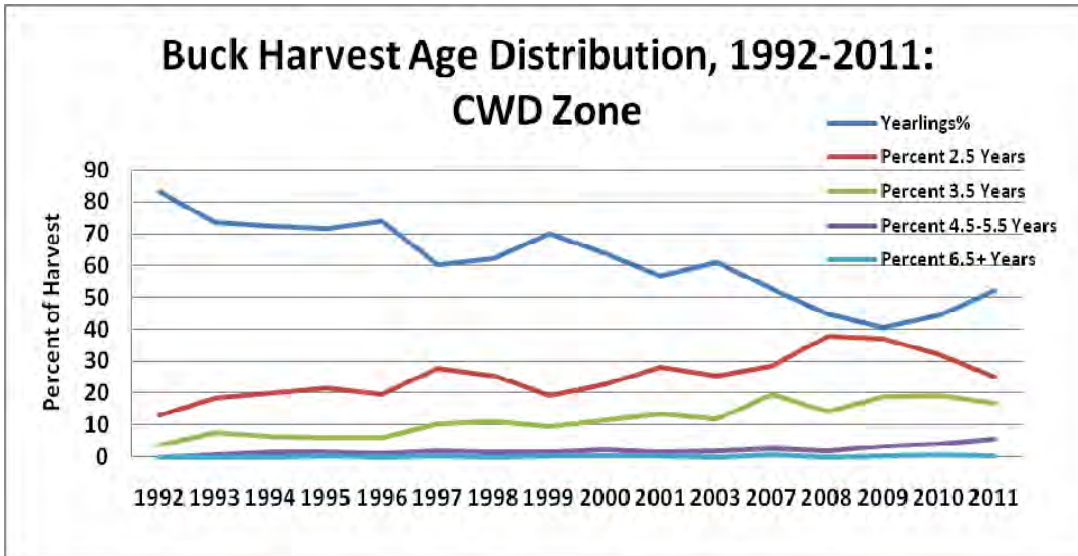


Figure 11. Yearling buck harvests have declined over the last 19 years in the CWD DEZ.

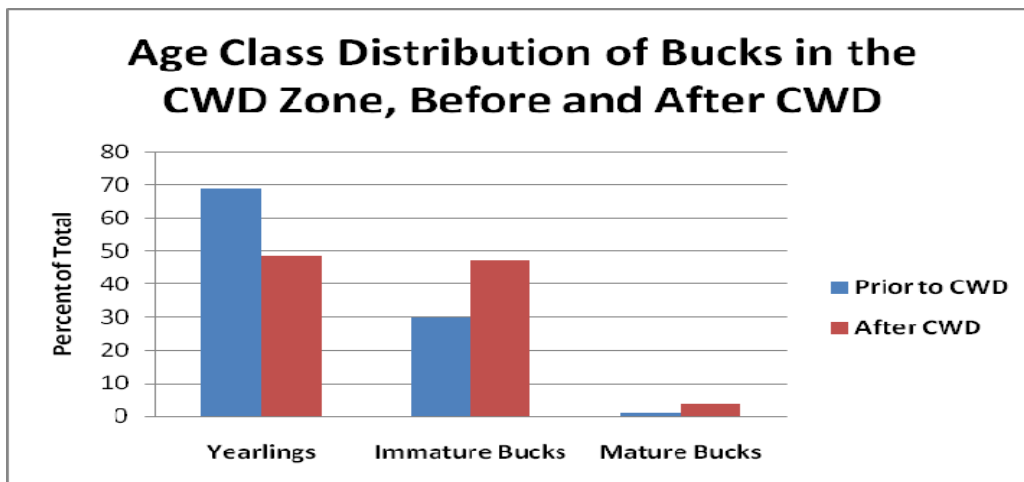


Figure 12. Older age class bucks have increased under the CWD management program.

Figure 14 presents graphs used in the planning document. The graphs imply (using fitted exponential trend lines) an upward trend in infection rates, even for yearlings. Yet, the graphs also present 95% confidence limits for each year; and, in every case these limits overlap. From a statistical standpoint, this means there were no significant differences between years!

Table 1 presents age-related “infection rates” supplied by the WDNR. Unfortunately, these data do not reflect true infection rates for age classes of bucks and does, only the distribution of “positives” from CWD testing. In order to do so, the data should include the percentage of positives from the total sample by age class. The data do, however, suggest infection rate probably increases with age, a fact commonly supported by the literature for many TSE diseases. Hence, it would make sense the higher the proportion of older age class animals in any sampling protocol could influence the results.

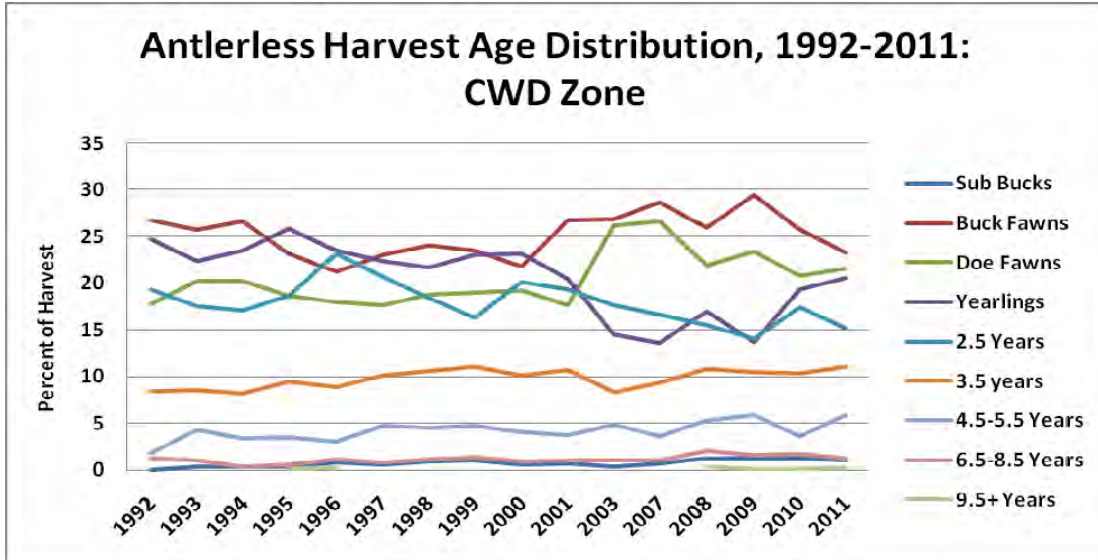


Figure 13. Antlerless harvests in the CWD DEZ indicate a heavy fawn harvest (bucks and does), followed generally by a decrease in yearlings and two year olds. Older age classes have not been diminished.

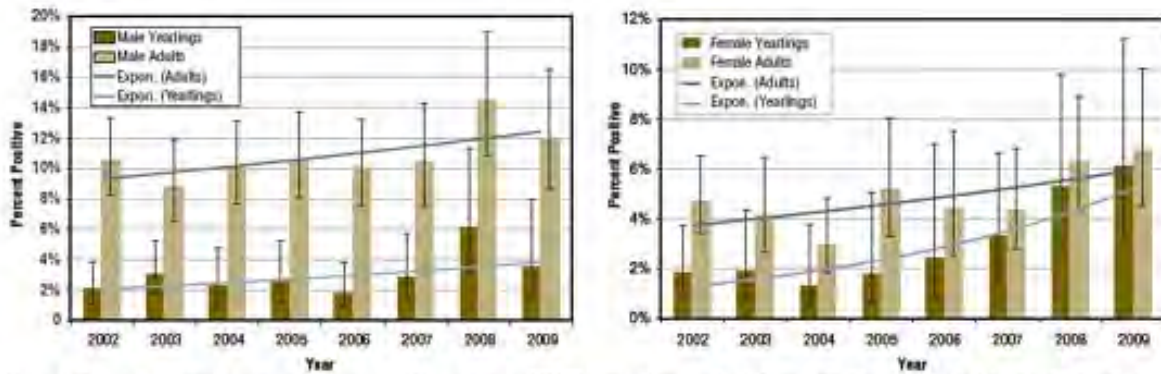


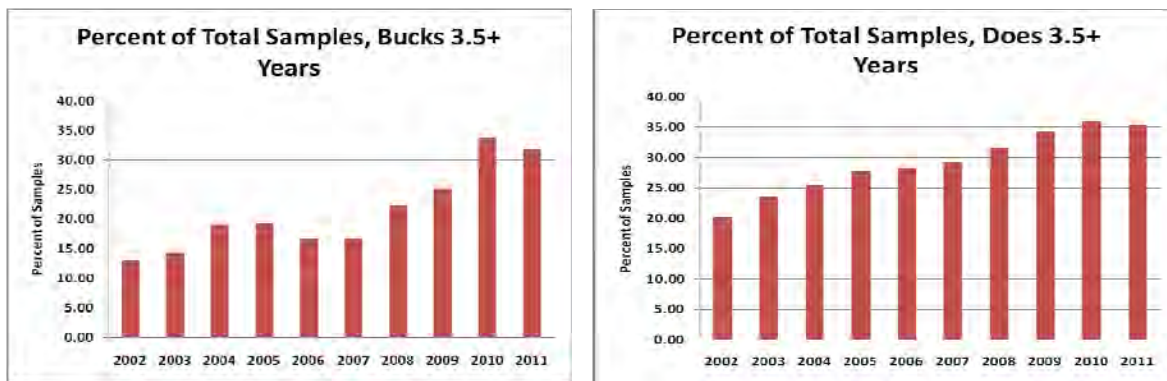
Figure 4. Estimated prevalence and exponential trend lines of CWD in yearling and adult male (left) and female (right) white-tailed deer from the western core monitoring area, 2002-2009. Vertical lines are 95% confidence intervals.

Figure 14. These graphical representations of historic CWD infection rates in the 2010 CWD Plan do not indicate either an exponential growth rate in infection or significant year to year differences.

We examined and compared the two aging data sets for the CWD DEZ, and this work created additional questions. First, when we calculated the percentage of individuals sampled by sex and age (Fig. 15), the proportion of samples arising from older age classes has increased over time (2002-2011). This suggests a bias in calculating infection rates could be in play. Since two aging data sets were supplied from the CWD DEZ, and WDNR staff confirmed they represent two different sets of data (i.e., one is not a subset of the other), we compared age distribution of deer harvested on opening weekend of the rifle season to the CWD sample (Figs. 16 and 17). There is a distinct disparity between the two data sets, revealing the CWD sample data generally represent more deer 3.5+ years of age. Although there is the potential for this to be an “apple to oranges” comparison, it does create additional concerns for bias.

**Table 1. Distribution of CWD infection rates among bucks and does sampled for the disease.**

Age of Deer	% Positive Bucks	% Positive Does
Fawn	1.14	2.07
Yearling	17.05	18.37
2.5 Years	40.25	33.19
3.5 Years	33.30	24.44
4.5-5.5 Years	6.59	13.78
6.5-8.5 Years	0.35	6.67
9.5-11.5 Years	0	0
12.5+ Years	0	0



**Figure 15. The percentage of CWD samples from older age class (3.5+ years) bucks and does has increased from 2002 to 2011.**

We next turned to sampling effort in regard to geospatial distribution of samples. In 2002, there were 19 sampling units represented by 50+ samples, yet by 2011 the number was reduced to 10 (Fig. 18). Finally, we examined the trend in proportional sampling from the core of the CWD DEZ (DMU70-A); viz., the proportion of total sampling effort from this DMU (Fig. 19). The percentage of samples from DMU 70-A declined until 2007, when average percentage of the total samples increased to 23.1% for bucks and 21.5% for does. When we looked at all sampling from DMU 70 (70, 70A, B, C, D, E and G), the average percentage of all bucks from that DMU was 27.4% prior to 2007 and 40.8% from 2007-2011. Average sampling for does was 28.1% prior to 2007 and 38.2% from 2007-2011. Non-uniform sampling probably affected estimates of infection rates within the DEZ significantly.

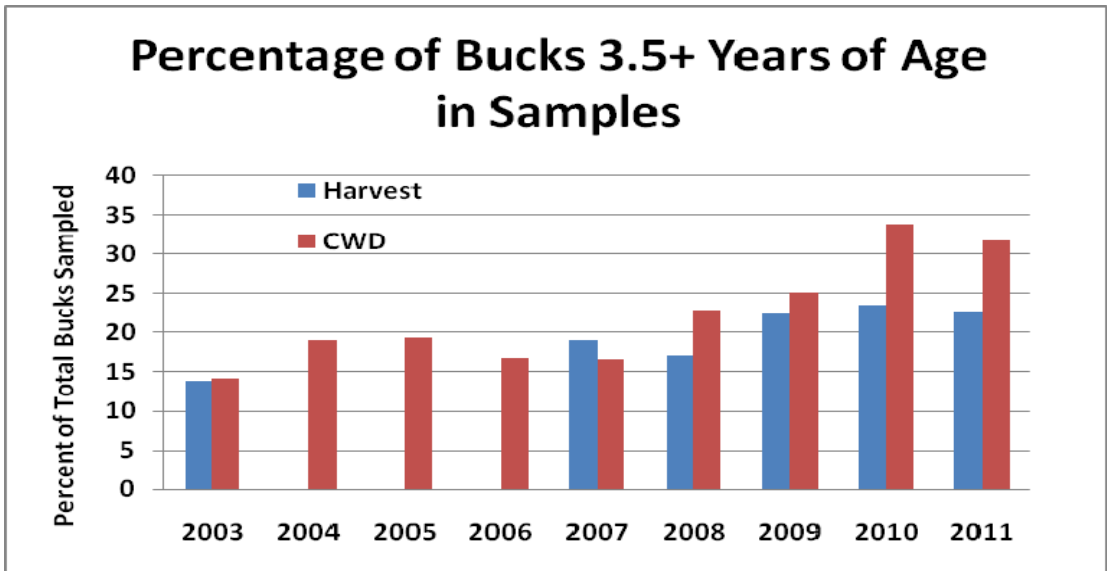


Figure 16. Comparison of older age class bucks (3.5+ years) from two data sets supplied by the WDNR for the CWD DEZ.

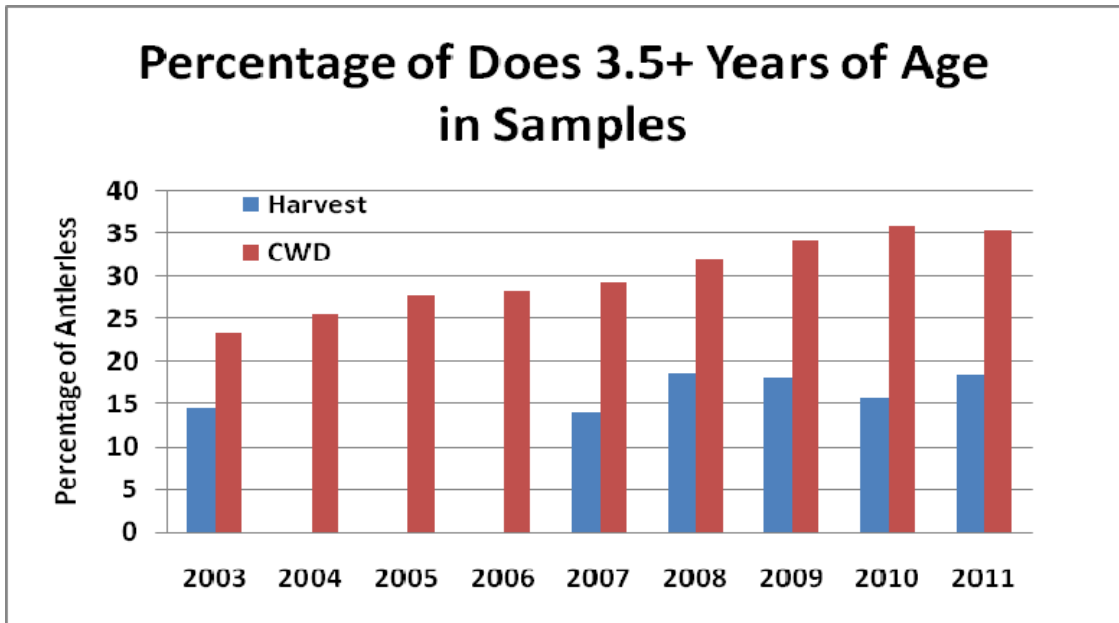


Figure 17. Comparison of older age class does (3.5+ years) from two data sets supplied by the WDNR for the CWD DEZ.

A host of seasons and bag limits have been imposed within the DEZ in order to achieve the stated population goal. These include: early archery, youth season, October antlerless season, 9-day gun season, muzzleloader season, late CWD season, December antlerless only season, and later archery season. We examined harvest for the were not in play during 10 years prior to and the 10 years after discovery of CWD. Most of the above seasons were not in play during the 10

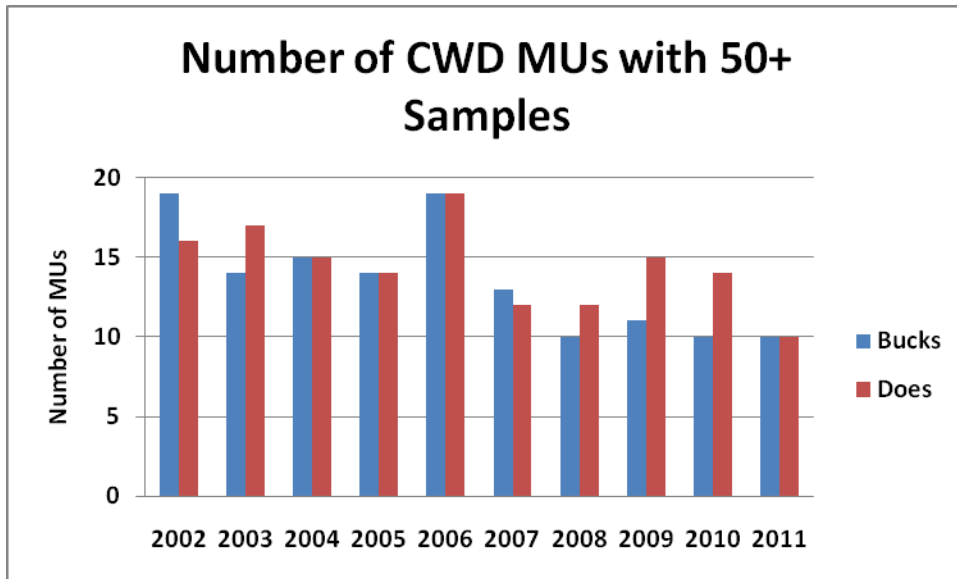


Figure 18. Sampling effort by DMUs from 2002-2011 for bucks and does.

years prior to discovery, so logic would suggest the harvest should have been significantly higher from 2002 on. There was no significant difference in harvest density for the 10 years prior to discovery and the 10 years after (17.04 vs. 17.58). This contradicts public opinions regarding

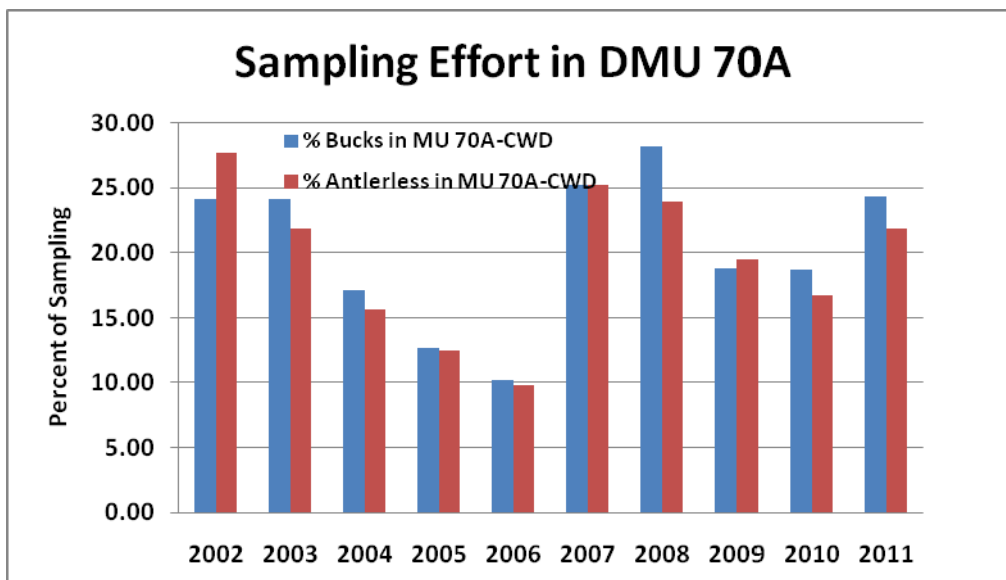


Figure 19. Percentage of total CWD samples taken from DMU 70-A from 2002-2011.

deer harvest, but also suggests hunting was not effective in achieving the state CWD eradication goals.

## CONCLUSIONS

The Wisconsin Department of Natural Resources staff has put forward a heroic effort to protect the whitetail resources of Wisconsin. Unfortunately, the attempt first to eradicate the disease, and later to manage it have not been successful. The impact of the various attempts have reduced public confidence, affecting deer management within and outside the DEZ. We must emphasize, as did the CWD Response Plan (2003) peer-review team, the WDNR was faced with a situation unique to wildlife management. They were forced to proceed with the best available knowledge and science. We do not and will not question the motivations or dedication of WDNR staff; they have been exemplary in caring for the resources entrusted to each of the staff. However, an “in the rearview mirror” look at these efforts and the results suggest the WDNR approach was inappropriate and unsuccessful. Further, changes in sampling protocols (focusing on older age classes and specific geographic areas) for CWD appears to have had a significant effect on infection rate trends. Among these are the conclusions put forward in the 15-year planning document that infection rates are increasing exponentially, when there does not appear to be significant differences or exponential increases, in spite of sampling issues. Our additional findings follow conclusions:

We remain convinced of our original findings regarding CWD eradication efforts, but also add the following:

1. There has been a significant sampling bias in the CWD monitoring program, which has affected estimates of infection rates.
2. There are no statistically valid results which substantiate an exponential increase in the disease within the DEZ.
3. In light of the above it is not possible to provide an accurate answer to Q-2.
4. Sport hunting has not been effective in achieving the stated population goals; however, there may be additional problems with using the SAK model (and reportedly other models) due to a decline in yearling buck harvests and resulting age structure impacts. In other words, the actual population may be less than SAK predicts.
5. Based on aging data, the deer herd within the DEZ has increased in age within some areas, increasing probability of a higher clinical occurrence of CWD, and may be an “unintended” consequence of EAB.
6. One of the points made by referees in the 2003 External Review of Chronic Wasting Disease Management in Wisconsin was, “The DNR should continue to closely monitor the effects of its management strategies on CWD in the state and should be prepared to shift to a more passive plan if the aggressive efforts to eradicate CWD via deer depopulation become clearly unsuccessful.”

## RECOMMENDATIONS REGARDING CWD MANAGEMENT

Some of the following recommendations are similar to or the same as discussed in the new CWD management plan (WDNR 2010); however, there are some aspects on which we differ.

1. **We believe it is time to consider a more passive approach to CWD in the DMZ.** As noted by the 2003 Audit Committee, “Severe deer population reduction in affected areas is not a benign treatment, and like the disease, the deer depopulation process will have long-term negative effects on the hunting culture and tradition. Because of this, efforts to depopulate free-ranging deer should not be continued any longer than there is reasonable hope that they will be effective.” We feel that time is NOW!
2. **There is a clear need for a new sampling protocol for CWD in Wisconsin, one that gives a true picture of the progress of the disease; but more importantly, one designed to detect spread.** Sampling should continue within the DEZ to monitor conditions over time; but resources should be focused on detecting new cases outside the DEZ to support detection of outbreaks and rapid response.
3. **We recommend changing the designation of the DEZ to the Disease Management Zone (DMZ).** This may seem like a small move, but words matter to people.
4. **Dealing with wildlife diseases is not unlike responding to wild fires, and response plan should be developed on this model, focusing on early detection of “break outs” and citizen involvement.** EARLY detection of CWD in the current DMZ may have allowed a focused eradication effort using trained sharpshooters. Yet, no one ever will know. In the wild fire analogy, a fire is controlled easily when it first starts, but uncontrolled there is a point where control is out of the question; leading to a fall back strategy to defend what is in its path. We believe this is the case for the DMZ. Hence, the reaction to the Shell Lake infected deer, although much more reasoned than in 2002, should have included a faster response to determine the extent of distribution. Waiting until deer season in fall of 2012 to sample for CWD is not adequate. A proper approach would have been use of a health check/surveillance team (discussed later) deployed immediately on such a finding. In addition, use of local observers and cooperators to find and report sick or dead deer would have provided a non-lethal first response. Once the geographic context is determined, the appropriate action should be focused, localized eradication. Mistakes were made in this particular case, including leaving an infected carcass on the landscape for some time and delays in testing the suspected animal.
5. **We recommend implementation of a statewide DMAP program; and, nowhere is such a program needed more than in the DMZ.** We strongly recommend immediate development of cooperator DMAP management plans involving landowners, hunters and stakeholder groups. Establishing DMAP in the DMZ should be a high priority in implementing our recommendations. The benefits are significant. Improved landowner confidence in WDNR field biologists will serve to increase surveillance for clinically ill or recently dead animals, making possible more tracking of CWD-caused mortality. Further,

this will increase buy-in by all individuals, especially in regard to population control through harvest management.

6. In spite of considerable efforts to the contrary, public education remains a problem in the DMZ. **There is a need to provide more information about concerns for humans contracting a CWD variant.** Long-term occurrence rates of Creutzfeldt-Jakob disease or suspected related cases within the zone should be monitored. Data should be available for the period prior to and after CWD.
7. In relation to 6, **the time required to receive CWD test results from hunter-killed animals must be decreased to a few days.** We applaud Wisconsin for providing these tests free-of-charge. A permanent fund should be established to support this work, perhaps using a small increase in hunting license or tag fees.
8. **An annual meeting of DMAP cooperators would be an excellent venue for reporting on various aspects of CWD, in addition to the topics discussed earlier. This would greatly enhance public awareness and WDNR credibility.**
9. **WDNR should work closely (through the local biologist) with the Conservation Congress in developing goals and strategies at the county level.**
10. We will discuss at length suggested research activities in that section of our report, but **we feel use of human dimensions research to anticipate, rather than reacting to issues as they arise would be very effective.**

### **Charlotte, The Deer**

After initiating this project, we were assigned an added task of deciding what to do about a doe picked up as an “orphan” fawn by a private citizen near Lake Geneva (Walworth County). This deer received considerable press coverage and was spared by Governor Walker from being euthanized. We received helpful input from Dr. Robert Ehlenfeldt (Appendix 3), State Veterinarian of Wisconsin, and found his comments consistent with our findings. Unfortunately, to euthanize this deer would produce a strong negative response by the people of Wisconsin, and in this one case, we defer to an act of kindness. However, “Charlotte” will have to be housed in a secure manner to avoid contact with free-ranging deer, and her health monitored. Since she was picked up in or near the CWD area, she should be maintained in that geographic area. Charlotte should be useful for educational purposes aimed at emphasizing the problems created when someone “rescues” a fawn. Charlotte can become the “Smokey the Bear” for CWD management in Wisconsin. Various media (digital, video, print, etc.) for classroom use should be developed. We agree with Dr. Ehlenfeldt public education is the key to preventing such actions in the future. However, we also support strong legal action in regard to the future. A component of the public education program should be to make clear future cases will result in euthanizing an innocent animal. We also suggest involving the Whitetails of Wisconsin Association (WOW), Quality Deer Management Association (QDMA) and Whitetails Unlimited (WU) in the education program, which will have a two-fold benefit. First, it will provide a volunteer workforce; and second, it will



produce buy-in from this user group to help prevent future infractions. As Dr. Ehlenfeldt pointed out, “*CWD has been found on eight WTD farms and one elk farm. Every infected WTD farm but one had either historically started with captured wild WTD or adopted orphan fawns.*” A prudent operator should never risk his/her investment exposing a captive cervid herd to a deer from the wild.

All this said, we must emphasize here there unfortunately are many “Charlottes” around the state. Sad as it is to consider, these and future deer will have to be euthanized in a compassionate manner. Yet, their loss should be clearly linked to the illegal and unnecessary actions by well-meaning private citizens. This also places responsibility on the DNR to have a plan in place to respond quickly to citizen reports of “orphan” fawns, and train personnel in dealing with and making decisions as to the disposition of each animal.

### Annual Deer Harvest Monitoring

The Wisconsin DNR relies on check stations and paper reporting of deer harvested by its hunters. Although check stations once were useful in acquiring harvest data, modern techniques such as Telecheck and on-line systems are used by several states (Missouri, Illinois, Virginia, Kentucky, etc. (Hansen, et al. 2006). These systems offer reduced costs and can provide an efficient, reliable means of tracking and timely reporting hunting harvest.

States using DMAP also generate data and analyses collected by DMAP participants. Our experience has been, with proper training, cooperators can provide extremely useful data on both deer harvest, harvested animals (age, weight, antler measurements) and deer observations. DMAP data are an excellent supplement to traditional check station or Telecheck data.

### Herd Health and Productivity

Accurately estimating deer numbers or densities is very difficult proposition, and we assert one not of high priority in managing the species. There are much better ways to obtain reliable information about progress in achieving management goals. Among these are herd health indices (habitat health indices discussed later) such as sex-age-specific dressed weights, age-specific antler measurements, fetal counts, fawn-at-heel counts, buck:doe ratios, buck and doe survival and recruitment. Much of these data arise from DMAP cooperators, plus field activities by public and private biologists, Foresters, cooperators and volunteers. Annual necropsies (autopsies) conducted by biologists, with the public participating and observing, provide significant data related to herd health, especially if herd health metrics have been developed through geographically relevant research. Infrared-triggered trail cameras also can provide excellent information on a host of herd health metrics (Jacobson, et al. 1997, Koerth, et al. 1997, Koerth and Kroll 2000), including fawn crop and true recruitment (viz., percentage of fawns that reach one year of age).

## RECOMMENDATIONS REGARDING COLLECTION OF HARVEST, HERD HEALTH AND PRODUCTIVITY DATA

We recommend revising the current deer registration system for acquiring harvest data at check stations, opting for a Telecheck and on-line system, especially for registering deer outside of the 9-day rifle season. The mandatory registration system would be maintained, but hunters harvesting deer outside the 9-day gun season in November would be allowed the option to use a Telecheck or web-based system. Maintaining the traditional mandatory registration stations during the November gun season will allow WDNR to continue collection of data and samples. This would permit rapid assessment and reporting of deer harvest by DMU, region and statewide, and could be used to acquire data (relative age indicators; Illinois) not currently obtained from checked deer. We also provide the following recommendations:

1. As we have noted, **involving the public in data collection produces many benefits, including buy-in on management and harvest strategies and cost-efficiencies of data collection.** Hence, we recommend each field biologist develop a volunteer-based data collection program. Examples would be infrared trail camera studies and fawn-at-heel observation sessions. Cooperators should represent stakeholders and both private land and public land hunters.
2. **Each field biologist should be required to organize and conduct at least one field necropsy study each year, conducted along with cooperators and volunteers during late winter.** Our experience has been that no activity at the field level produces as much credibility and public buy-in as necropsies. Each animal examined presents a “teachable moment,” in addition to providing critical data. Furthermore, hunters appreciate learning when their deer breed and the sex and age of fetuses.
3. **Training should be provided to biologists and technicians to standardize methodologies and educate them on deer anatomy and basic physiology.** Often it is assumed biologists are trained in these matters, but often that is not correct.
4. **An annual report should be prepared for each DMU and Region summarizing these studies and a Powerpoint/video presentation developed for annual DMAP workshops and public presentations.** Health indices such as average number of fetuses by age, breeding phenology, lactation rates, true recruitment and antler development should be discussed.

## HABITAT

Habitat is a key element in deer management, often having more impact than harvest or predation. Yet, this is the element most often neglected by deer managers and landowners. Whitetails are a “Keystone Species,” meaning they have the ability to substantially influence the ecosystems in which they live. For example, it is well-documented over-browsing by deer can negatively impact song birds and other small animals (deCelesta 1994, Jacobson and Kroll 1994). Further, deer can have significant impacts on forest productivity and reproduction

(Rawinski 2008), as well as herbaceous plants (Augustine and Frelich 1998) such as those used by Native Americans as medicinal plants (Fig. 20).

### Wisconsin's Forests

Forests cover 16.8 million acres or 48% of Wisconsin and support the largest forest products industry in the United States with an annual value of \$17 billion and secondary impacts of \$10 billion. Forest based recreation adds an additional \$5.5 billion annually. Major forest types include maple-beech-birch (27%), oak-hickory (21%), aspen-birch (20%) and pine (9%). The majority of forest lands (11.8 M acres) are owned by the forest products industry and non-industrial private forest (NIPF) landowners. Major public forest land ownerships include federal (1.6 M acres), state (1.2 M acres) and county and municipal (2.3 M acres). Essentially all public lands (5.1 M acres) are open to hunting, but most private lands are closed to public hunting access. The Wisconsin Managed Forest Law (MFL) is a landowner incentive program that promotes sustainable forest management on private forest lands. Both corporate and NIPF landowners who enroll in the MFL manage their forests under an approved management plan and are eligible for reduced property tax rates. Those who allow public access for hunting are eligible for an additional reduction in property tax rates. Over 3 million acres of private forest lands are



***Figure 20. White-tailed deer are herbivores that depend on quality, diverse forages within 4-5 feet of ground level. Sustainable forest management assures both healthy forests and healthy deer herds.***

enrolled in the MFL program, but only 1.3 million acres are open to public hunting. Thus, about 40% (6.5 M acres) of Wisconsin's forest lands are open to public access for hunting.

The professional forestry community and others have expressed concerns about the impacts of deer herbivory on forest regeneration (especially oaks), sustainable forestry and biodiversity (Wisconsin Society of American Foresters, Forest Stewardship Council, and Wisconsin Council

on Forestry) and strongly support WDNR policies to reduce deer population levels. Approximately 43% of the forest land in Wisconsin is certified under one or more third party standards such as the Sustainable Forestry Initiative or the Forest Stewardship Council. There have been numerous certification audit results that noted deer issues regarding regeneration success including successful regeneration where deer numbers were in check. Potential negative impacts of deer browsing include regeneration failure, increased regeneration costs, reduced timber productivity, altered plant and animal communities and certification issues.

There also have been increasing concerns about the ecological consequences of overabundant deer populations on the flora and fauna of the forests that they impact (Mudrak et al. 2009, Cote et al. 2004, Rooney and Waller 2003, Waller and Alverson 1997). Waller and Alverson (1997) concluded that the white-tailed deer is a keystone herbivore in the eastern deciduous forests of the United States because they can: (1) affect the distribution or abundance of many other species, (2) affect community structure by strongly modifying patterns of relative abundance among competing species, and (3) affect community structure by impacting the abundance of species at multiple trophic levels. Impacts of keystone species may require decades or centuries to be fully manifested (Terborgh 1986). In 1995, the WDNR evaluated the ecological impacts of their deer management policies via a comprehensive environmental assessment (VanderZouren and Warke 1995). Partly in response to this assessment, the WDNR instituted hunting regulations such as “Earn-a Buck” to increase the harvest of antlerless deer in areas of the state. “Earn-a Buck” regulations were highly effective at increasing antlerless harvest (Van Deelen et al. 2006), but proved political untenable and were repealed by the Wisconsin Legislature in 2011.

#### Wisconsin's Agricultural Lands

Approximately 78,000 farms encompassing 15.2 million acres or 45% of Wisconsin supports an annual agricultural industry of \$9 billion. Major crops include grain corn, forage and soy beans. The Wildlife Damage Abatement and Claims Program (WDACP) provides relief to farmers with wildlife damage through removal of animals, damage abatement, damage claims and venison processing programs. The WDACP is a state program; however it is administered by each participating county. Currently 70 of 72 counties in Wisconsin participate in the program. The WDACP is funded by a \$2-4 surcharge on hunting licenses which generates just over \$2.2 million per year. Also, monies from the sale of Bonus Antlerless Deer Permits, \$12 for residents and \$20 for nonresidents, are earmarked for the WDACP. Annual bonus permit revenues vary depending on antlerless goals of individual DMUs and have ranged from \$260,000 to \$2.8 million.

Enrollment in the WDACP is voluntary. When enrolling in the program for deer damage, enrollees must choose whether they do, or do not wish to allow public access to their lands during the deer hunting seasons. Those who allow public hunting access are eligible for damage abatement assistance (deer shooting permits, repellents, and public hunting) and also partial compensation for deer damages. Those who do not allow public hunting are not eligible for compensation and they can only receive a deer shooting permit as abatement. In 2010, 655 agricultural producers enrolled in the WDACP for damages caused by deer. Of these enrollees, 491 choose to allow public hunting access while 164 chose not to allow public access and only receive a deer shooting permit as abatement. WDACP appraisals of deer damage to agricultural crops have

declined over the last decade from \$2.1 million in 2002 to \$1.2 million in 2010 (Deer Trustee Meeting, Nov 2011). Similar declining trends were reported for number of enrollees (832 in 2008 to 643 in 2011), number of deer damage claims (420 in 2008 to 294 in 2010), number of deer shooting permits issued (817 in 2008 to 500 in 2010), number of deer shot (7,902 in 2004 to 2,854 in 2010), and acres damaged by deer (10,286 in 2006 to 6,051 in 2010). More importantly, the number of hunters registering deer on agricultural damage shooting permits peaked at 3,515 in 2005 and has declined to 1,515 in 2010. Agricultural areas reporting deer damage could represent a way to increase public hunting opportunities, especially by Tribal hunters, but require innovative strategies developed at the local level.

### Habitat and Forest Health

Since habitats include both natural and man-made landscape elements, assessment of ecosystem health should be a critical component of deer management in Wisconsin. Although there are numerous reports and studies (see earlier) regarding negative forest and agricultural impacts of high deer populations on forests and agricultural crops, we were unable to identify strategies or activities related to managing these landscapes for deer, only “defending” them from deer. Although we confirm that maintaining high deer populations results in ecological damage, we assert healthy deer herds and forests are not incompatible goals, even when predators are factored into the management equation. Habitat management strategies should be addressed in forest, deer, and other natural resources management plans with inputs from wildlife biologists, foresters, other professionals and tribal representatives as appropriate.

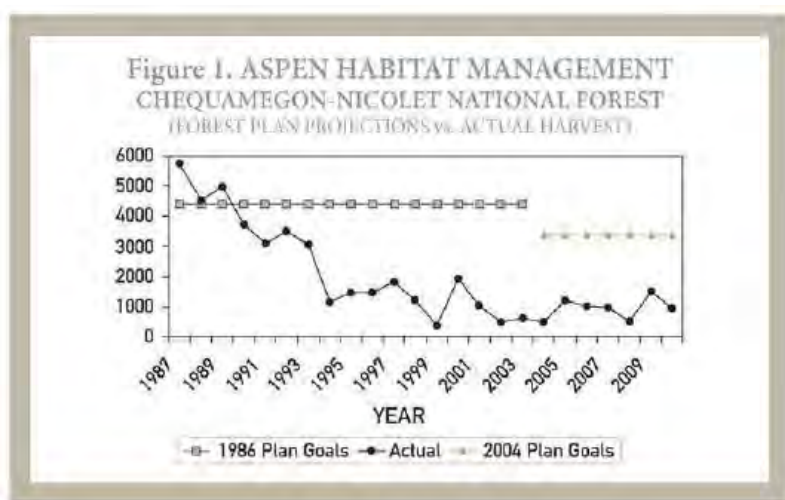
There are four categories of forests in Wisconsin: private non-industrial, industrial, county and state and federal. Wisconsin enjoys considerable management support by the WDNR and various agencies for most of these lands, and many lands are certified as “sustainable.” However, there are issues with federal lands such as the Chequamegon-Nicolet National Forest stemming from legal challenges using the National Forest Management Act (NFMA) and the Environmental Policy Act (NEPA) (Zimmer 2011, 2012).

Since there is a significant area of National Forest lands in northern Wisconsin, National Forest management policy has had a dramatic impact on deer herd productivity (Fig. 21). Unfortunately, these problems cannot be affected by the WDNR. Until there are policy changes at the federal level, the solution to developing sustainable forests and deer habitat in this region will have to involve active management of privately and publicly owned (state, county, etc.) lands interspersed with or adjacent to the National Forests.

We have noted on many occasions the best way to set and evaluate deer management goals is through metrics of herd and habitat health. Metrics can involve components such as recruitment, condition, morphometrics, human tolerances, habitat condition and health, etc. Wildlife biologists and managers often use range evaluations (Lay 1967) to determine stocking levels for deer, rather than estimating population size or density. Stocking level is a more useful way to assess relative abundance of deer, since this methodology relates to the ability of the habitat to support a

sustainable deer herd at a point in time. These methods are used commonly by range managers for assessing livestock impacts on native grasslands. Using field evaluations of browse utilization levels, the biologist classifies deer habitats as, under-stocked, fully stocked or over-stocked. When used over time, managers are better able to assess responses to deer management strategies, especially when coupled with herd productivity and health metrics.

Unfortunately, WDNR biologists have focused decision-making predominately on comparisons of harvest estimates weighed against SAK-derived population goals; and, have not employed field assessments of habitat health such as range evaluations. Our experience has been range assessments not only are more useful, but when conducted with landowners and/or hunters present substantially increase public acceptance of deer harvest recommendations and credibility of management programs.



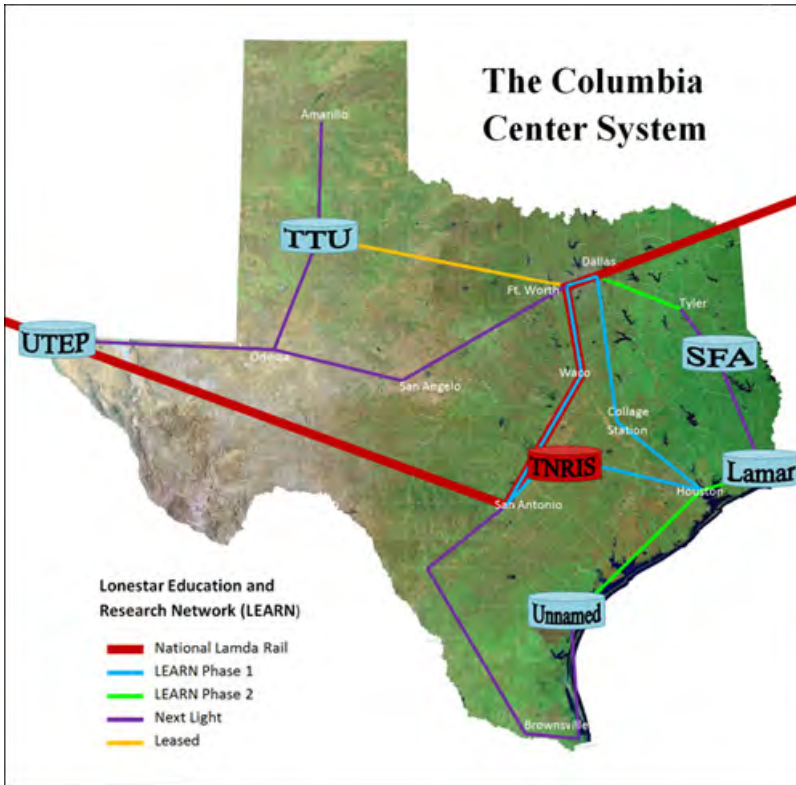
**Figure 21.** *Since 1989 the Chequamegon-Nicolet National Forest has not achieved its annual goal for aspen harvest, primarily due to legal challenges. Lack of active timber management has affected many early successional species, including ruffed grouse and white-tailed deer. (from Zimmer 2011).*

Exclosures have been used as an educational tool to demonstrate and measure the impacts of deer browsing on plant communities. The WDNR has developed several of these around the state and we applaud their efforts; and, encourage continuing this practice. Educational programs and workshops should include trips to or media developed from these structures.

Geospatial Support and Wisconsin Land Cover Map

In our Interim Report, we pointed out Wisconsin once was a national model for geospatial data development and use. The WDNR has used estimates of “deer range” as a basis for SAK model outputs in “deer per square mile of deer range;” a confusing term to the general public. Other reviews of SAK also reported this weakness and changes have been made to procedures. However, we noted problems in two areas: 1) the definition of deer range, and 2) the data being used to define deer range was significantly out of date.

**Figure 22. The Columbia Regional Geospatial Service Center System was developed to provide geospatial services to a host of user groups, including resource managers, economic planners, emergency planners and first responders, educators, policy-makers and the general public (except when national security is involved). The Texas Natural Resources Information System (TNRIS) provides the network hub. The system has been a success, but continued financial support at the federal level has waned, in spite of successes in recovery of the Shuttle Columbia, three major hurricanes and a millennial drought.**



There is a significant need to modernize the GIS and GPS technologies of Wisconsin, particularly as they are used by professional resource managers. Data used in developing the *WISCLAND* (Wisconsin Initiative for Statewide Cooperation on Landscape Analysis and Data) was a public-private partnership program formed in 1993. Unfortunately, this program has not been active since the late 1990s, and only produced a single statewide land cover map, based on 1992 Landsat imagery. The minimum mapping unit size (resolution) was 5 acres ( $\pm 30$  meters). Obviously, the Wisconsin landscape has changed dramatically in the last 20+ years, making land cover and deer range assessments inaccurate. We also found little evidence of cooperative efforts in data acquisition and sharing between state agencies and no centralized system for coordinating these and other activities. At this time, it is our understanding the Wisconsin State Cartographer's Office is responsible for *WISLAND*. Funding support for this program has been absent or reduced for a number of years.

In the late 1990s, Texas modeled its geospatial service center system (Fig. 22) after *WISCLAND* and other state and national programs. In Texas, collection of geospatial data by various state agencies is coordinated through the Texas Natural Resources Information System (TNRIS), part

of the Texas Water Development Board. TNRIS oversees and coordinates many geospatial activities and services, most significantly the StratMap (Strategic Mapping Program). This program was established in 1997 as a “cost-saving measure to produce, maintain and enhance statewide digital geographic data layers.” The goals of StratMap are:

1. Establish and maintain a common base map for the State of Texas.
2. Combine funding from state and federal sources to lower costs and avoid duplication.
3. Continuously improve the quality and accuracy of data.
4. Develop data using national and international standards to ensure compatibility.

Both public and private users have easy access to various data layers within the system. Data layers include imagery (satellite, digital orthophotography, etc.), LiDAR, transportation, cadastral data, hydrology, boundaries, soils, etc. Data are available as images or FTP downloads. The system receives heavy use by a host of constituencies, and enjoys high public support. Of course there are some datasets which are involved in homeland security which are not generally available.

A geospatial service center system obviously involves a considerable investment; however, the investment is leveraged by users and public/private benefits derived by having easily accessible, up-to-date data. We estimate a \$2-3 million investment is needed to develop and modernize such a system for Wisconsin. The value of the system in Texas has been demonstrated many times, including the successful support to recovery efforts for the Space Shuttle Columbia disaster, three hurricanes (Ike, Katrina and Rita), numerous wild fires and drought response. In addition, the system is used heavily in economic planning and feasibility studies such as development of forest-derived bio-fuels power plant location. Hence, such systems support many activities in addition to wildlife management. The economic value of the Texas system has been exceptional, with a high cost:economic benefit ratio and leveraging of state resources.

## **RECOMMENDATIONS**

We suggest research and development related to habitat health and range assessment, modeled after Lay (1967).

1. **As both part of DMAP activities and public lands management, local biologists/technicians should be required to conduct annual range evaluations to assess habitat health and condition.** These assessments would have direct field involvement by the public and DMAP cooperators.
1. **Training programs (Extension) should be developed for state and private resource managers to standardize habitat/range assessment methodologies.**
2. **There is a need for modernizing the GIS and GPS capabilities of Wisconsin’s agencies.**



3. **A statewide geospatial information system, similar to that developed for Texas, should be developed which provides seamless support to all state resource managers across agencies.** This would include both access to and generation of geospatial data, and coordinated by the Wisconsin State Cartographer's Office. This would permit significant leveraging of research and development dollars by allowing data generated for a specific project to be used by all. For example, a land cover map could be used to support commercial development of forest products, but at the same time support everything from deer management to emergency response and preparedness to economic development and feasibility.
4. **Funding for these activities should arise from fees assessed by stakeholders and landowners using these data and services, as well as grants and contracts for various state agency activities.**
5. **The WDNR adopt an advocacy role in dealing with the National Forests of Wisconsin to encourage sustainable forest management, especially for early and mid-successional species (game and non-game).** We also suggest and encourage action by Wisconsin federal representatives to improve the sustainability of Wisconsin's federal lands.
6. **Form a Young Forest Initiative Task Force.** Concerns about the decreasing areas of early successional forest habitats in the Northern and Central Forests were expressed at the Deer Trustee meetings with WDNR (November 2011) and with other agency and NGO stakeholders (January 2012) as well as by participants of the April Town Hall meetings. Maturing forests with decreasing early successional habitats also has been identified as a major factor leading to declining deer harvests in several states (McKean 2011). The QDMA (2009) reported that while total forested area in Wisconsin increased by 446,000 acres from 1996-2007, the area of early-successional forests declined by 1.3 million acres. This trend is particularly disturbing on public lands, especially the National Forests, and has been driven by public concerns about clear cutting and protecting the environment, depressed timber markets, and cumbersome planning processes and litigation against proposed timber harvests on National Forest lands (Thomas and Sienkiewicz 2011a, b). The decline of early successional forest habitats also has serious implications for other game species such as ruffed grouse and nongame species such as Kirtland's Warbler which needs large areas of dense young Jack Pine stands for breeding habitat. Thus, we recommend the formation of a Wisconsin Young Forest Initiative Task Force to assess the decline of young forests across the state and define appropriate actions to slow or reverse this trend. The importance of fire as a disturbance factor in creation of forest communities and the impacts of invasive species also should be included in their charge. The Task Force should pay particular attention to lands in the MFL program as well as National Forest Lands. The Task Force should include representatives from the US Forest Service, state, county and municipal foresters, consulting foresters, the forest industry, the Wisconsin Conservation Congress, NIPF landowners, the Wisconsin Wildlife Federation, NGOs such as QDMA, WU, NWTF, RGS, and others.

## PEOPLE

### Landowner Relations and Involvement in Deer Management

Forests and farmlands are the basis for the vast majority of white-tailed deer habitats in Wisconsin. These lands form a complex and dynamic mosaic of land ownership, land use, wildlife habitats, and accessibility to hunting critical to deer management decisions at the state, DMU and local levels. Deer hunting is enjoyed by nearly 700,000 hunters in the state, providing nearly 7 million days of recreation, and generating nearly \$1.4 billion in total impact to the state's economy each year (WDNR 2010). **In addition to providing hunting opportunities, the impacts of deer depredation on agricultural crops, forest regeneration and biodiversity, deer/vehicle collisions, the special significance of deer to the Ojibwe people and other factors also must be considered in management of Wisconsin's white-tailed deer resources.**

#### The Public/Private Land Complex of Deer Habitats, Populations and Hunting

The vast majority of forestlands (>60% of area) and farmlands (>90% of farms) have no formal agreement with WDNR to provide public access for deer hunting. This implies that access to most (likely >70%) deer habitat, deer populations and hunting/management opportunities is controlled by private landowners. We cannot determine the exact public/private habitat composition due to the definition of deer habitat used by WDNR (2001). However, WDNR data indicate that approximately 70% of deer hunting effort (recreational days) occurred on private lands over the period of 1992 to 2010 and that about 75% of the total deer harvest in Wisconsin comes from private lands. The majority of both archery (66%) and firearm hunters (57%) indicated that they hunted exclusively on private lands during the 2006 season and 90% of all hunters indicated that they hunted private lands for at least part of that season (Holsman 2007). Archery hunters (34%) were more likely to own lands that they hunted than were gun hunters (29%). Less than 4% of hunters leased private lands on which they hunted.

#### Landowner Relations and Involvement with WDNR

Harvest regulations formulated by WDNR focus on antlerless harvest goals at the DMU level with no consideration for public/private ownership or variation in deer abundance within a DMU. To our knowledge, the only programs that WDNR have in place to cooperate with private landowners in deer management activities are the MFL and WDACP. These programs are designed to address deer damage problems by increasing deer harvest with public access to private lands. WDNR makes no distinction in harvest goals or regulations between public and private lands. Petchenik (2011, Deer Trustee Meeting) reported that the majority (74%) of private landowners had no interest in the WDACP or MFL public access programs even with payment (64%). He also reported that 90% of all private lands had been hunted during the past 5 years and that most landowners (56%) hunted deer on their property during that time. He also reported that most landowners felt some degree of personal responsibility for helping with deer management.

Petchenik (2011, Deer Trustee Meeting) identified two long-term/recurring challenges facing the WDNR: 1) hunters / landowners and CWD, and 2) the role of private landowners in deer

management. Over half of deer hunters responding to a 2008 survey believed that private landowners influenced deer management more than WDNR (Holsman 2009). A noteworthy finding of this study was that people who owned recreational hunting land expressed attitudes that were most in opposition to WDNR policies and goals and were likely to hold back on filling available tags to conserve deer. Recreational landowners represented about one in five deer hunters in the survey. These findings suggest that a sizable contingent of hunters has taken deer management into their own hands because they do not share the same goals as WDNR. Holsman et al. (2010) reported that such behavior by landowners in the Chronic Wasting Disease Zone was a major reason for the lack of success in WDNR's efforts to significantly reduce deer populations in those areas.

Landowners and hunters who hunt private lands can manage deer herds on their lands within the regulatory guidelines imposed by WDNR. They may choose to selectively harvest bucks to increase age structure and harvest few if any antlerless deer to increase population abundance in defiance of WDNR population goals. Changes in adult buck age structure over the past 20 years that have likely contributed to the erratic performance of SAK estimates are in part probably the result of such actions.

Holsman (2009) suggested that WDNR's best chance to improve their credibility with the hunting public was to incorporate landowner and hunter observations into the deer management process. Petchenik (2011, Deer Trustee Meeting) reported that 68% of landowners and hunters believed that including their inputs into the management process would improve the credibility of WDNR. Wisconsin deer hunters are passionate about their sport as 62% of those surveyed indicated that deer hunting was the most important activity that they pursued (Holsman 2007). Landowners and hunters feel disenfranchised regarding their role in WDNR procedures for setting population and antlerless harvest goals. WDNR needs to find ways to involve landowners and hunters in the management process at a level with a finer scale than the DMU that is relevant to the land that they own or hunt. Online input such as the Deer Hunter Wildlife Survey and Operation Deer Watch may be the beginning of such a communication process, but more emphasis should be directed at on-the-ground contact between WDNR staff and landowners/hunters in determination of local deer population trends. Numerous comments praising WDNR were made by participants of the Deer Trustee Town Hall Meetings concerning public involvement in trapping of deer for the buck mortality study and the predation and fawn mortality study being conducted in northern and east-central Wisconsin. Tapping into this interest may not only improve WDNR credibility with landowners and hunters, but create a monitoring system that can anticipate or avert situations where abundance and harvest predictions perform poorly such as for the 2008 season (Holsman 2009). Creating such a monitoring program would provide a sense of ownership for landowners and hunters and provide opportunities to educate and inform them about various aspects of deer management. More importantly, it would build grass-roots relationships between WDNR and individuals that can create trust, understanding of values, and definition of shared goals.

The importance of landowner and hunter relationships with WDNR to the success of deer management in Wisconsin was emphasized in the following statement by Secretary Cathy Stepp in her 2012 Deer Season Recommendations to the NRB:

*“Hunters are the backbone of our deer management system and we are striving to make the hunting season enjoyable and satisfying while fulfilling our obligations as herd managers. Without the enthusiasm and participation of hunters and landowners, any management goal is unachievable. We need our partners, the landowners and the hunters, to help manage the deer herd.”*

It is in this spirit that we offer the following recommendations.

## **RECOMMENDATIONS**

**1) Implement a Deer Management Assistance Program.** A growing number of state wildlife agencies, including AL, AR, CT, DE, FL, IN, KY, LA, MD, MO, MS, NC, NJ, NY, OK, PA, SC, TN, TX, and VA, have developed Deer Management Assistance Programs (DMAP) to facilitate deer management on private lands at the local level by involving landowners and hunters. Guynn et al. (1983) reported on a seven-year pilot study in Mississippi designed to: 1) develop a system for collection, analysis, and reporting of harvest data, 2) actively involve sportsmen in the process, 3) reduce deer density and crop depredation, and 4) improve the quality of the deer herd. The Mississippi DMAP was implemented statewide in 1983 and Hunt et al. (2006) evaluated program cooperators' satisfaction with the program and attitudes toward program success and service quality by agency personnel. The primary goal of most DMAPs is to allow landowners and hunters to work together with the state agency to manage deer on a site-specific basis. Landowners/hunt clubs have the option to increase, stabilize or decrease the deer population on their property enrolled in DMAP. These objectives are accomplished by controlling the number of antlerless deer (does and male fawns) harvested, primarily through the issuance of DMAP antlerless tags. The DMAP tags are valid only on the enrolled property and may not be used for antlered bucks. Other major goals of DMAPs are to increase the biological data base for the state agency and to improve communication and build trust between deer hunters, landowners and the state agency. For example, the DMAP administered by the Virginia Department of Game and Inland Fisheries (VDGIF) was implemented in 1988 and currently serves 860 cooperators on more than 1.5 million acres with 18,000 members (Personal communication, Matt Knox, VDGIF). The DMAP costs about \$100,000 per year (PR funded) to administer and yields high quality biological data (age, weight, antler development, etc.) on 20,000-25,000 deer per year (about 10% of the total statewide harvest). The program is viewed as “the most cost efficient and best public relations program in the Department” (Personal communication, Matt Knox, VDGIF).

We strongly recommend that a Wisconsin DMAP be developed and implemented with the objectives to: 1) improve relationships between hunters, landowners and the WDNR; 2) provide a means for site-specific management of antlerless deer; and 3) provide a data base for site-specific management that can also be used to supplement data bases for management decisions at the DMU and state levels. Specific DMAP components that need consideration include:

- a) **Applicability to private and public lands.** Although DMAPs are generally developed for deer management on private lands, the concept has application to lands open to public hunting access as well. The Pennsylvania DMAP is open to all public landowners, private landowners, and lessees where no fee for hunting access is charged, and any defined

hunting club. In Pennsylvania, the Allegheny National Forest is a DMAP cooperator with DMAP permits issued to and administered by their office. The Pennsylvania Bureau of Forestry also uses the DMAP to manage deer on state forest lands. Wisconsin landowners enrolled in the MFL and WDACP could benefit from a DMAP, especially those who consider wildlife, biodiversity, and recreational objectives in their overall management goals. Landowners with written management plans under the MFL could benefit greatly with the input of WDNR wildlife biologists and foresters working in concert. There may also be applications for DMAP on state, county, and municipal forests where DMAP antlerless permits are issued by random draw or on a first-come/first-serve basis. DMAP should not be considered as a replacement for WDACP. Again, however, this has to include strict adherence to Tribal rights.

- b) **Initial area eligible to participate in DMAP.** Although a statewide DMAP in Wisconsin to allow local management within DMUs is desirable, launching such a program could overwhelm WDNR personnel and resources. Many states have launched DMAPs within a region of the state to allow the DNR to reassign duties and train personnel, test approaches and procedures, revise program materials, and assess outreach and educational needs before making DMAP a statewide program. Major considerations in defining the initial DMAP area include average ownership size (larger is better), landowner/hunter interest and interactions with the state agency, and available WDNR personnel within the area. However, with the experience and materials already developed by other state DMAPs, Wisconsin may be in a position to launch a statewide DMAP. The CWD Zone, perhaps the region with the greatest need for improved WDNR credibility, should be included in the initial DMAP. Given past events in the CWD Zone, this will present challenges in establishing relationships with DMAP participants and to increasing antlerless harvests beyond current levels.
- c) **Administration of DMAP.** The success of a DMAP in Wisconsin will in large part depend on the relationships developed between local WDNR Wildlife Biologists/Technicians and landowners/hunters, and the services provided to landowners/hunters. However, it is important that the DMAP have an overall coordinator who will direct DMAP activities and serve as the “face” of WDNR in DMAP promotional and educational efforts. These duties could be assigned to the current Big Game Coordinator, but would greatly increase his/her responsibilities. Many states with DMAPs have a Deer Management Coordinator position that oversees the program. Most of these positions require a person with a graduate degree in wildlife ecology/management, several years of experience, and excellent people/communication skills.
- d) **Funding for DMAP.** All enrollment fees and a portion of antlerless permit fees associated with the DMAP should be earmarked for the program. These funds can be used as the state match for Federal PR funding under the Grant Title of “Wildlife Conservation Program” (VA DMAP). Some portion of DMAP antlerless permit fees will need to be allocated to the WDACP to maintain that program’s viability.
- e) **Personnel and training for DMAP.** The success of any DMAP is dependent upon the technical expertise and communication skills of wildlife biologists/technicians interacting with

landowners, hunters and other stakeholders. This will often require knowledge on the ecology, population management, and habitat needs of white-tailed deer and other wildlife species, taxonomy of native and invasive flora, management of natural vegetation, agronomic habitat enhancements, collection and interpretation of harvest data, and how to deal and communicate with people. We assume that a DMAP in Wisconsin will be delivered by current employees that may result in significant changes in job duties for many who will need or desire training in one or more areas. State agencies with current DMAPs can provide insight, resources and materials relevant to training needs. The QDMA has conducted training sessions for the wildlife agencies in Delaware, Kentucky, and Missouri that focused on deer ecology, population management, habitat management, hunter management and monitoring. Much of this material is contained in the QDMA Deer Steward Level I Course which is offered in live workshop and online formats. The NWTF and other conservation organizations also have programs directed at working with and providing information to landowners. The cooperative extension and outreach programs in the Department of Forest and Wildlife Ecology at University of Wisconsin should also be involved.

- f) **Minimum property size to participate in DMAP.** A minimum acreage requirement for participation in a DMAP is a primary way to control staff work load and time allocations. Management relevance is also a function of property size, but the educational and goodwill opportunities/accomplishments can be just as important for a landowner with 10 acres as for a landowner with 1,000 acres or more. Minimum property size for participation in DMAPs ranges from none (VA, TX) to 1,000 acres (OK, NC, TN). Most DMAPs allow adjoining landowners to combine their properties and form cooperatives to meet minimum acreage requirements. The North Carolina DMAP has different minimum acreage requirements (500-1,000 acres) for different regions of the state that reflect differences in landownership patterns, habitats and deer density. New York has different minimum acreage requirements according to management objectives: none (agricultural damage, municipalities, natural communities), 100 acres (forest regeneration), and 1,000 acres (recreational hunting). With over 360,000 forest landowners and an average parcel size of about 30 acres, emphasis should be placed on the formation of cooperatives of adjacent properties.
- g) **DMAP fees.** Fees for participation in DMAPs range from no fees (TX, VA) to \$400-\$1,000 (OK, TN). Tennessee charges \$1,000 for DMAP participants who do not choose to develop an approved management plan, but reduces the fee to \$350 for participants that do. The higher fees are generally related to large properties of 1,000 acres or more. Some states have fee schedules based on acreage. Oklahoma charges an annual enrollment fee of \$200 for properties less than 5,000 acres and \$400 for properties greater than 5,000 acres. It should be noted that many Oklahoma DMAP participants represent cooperatives of multiple landowners. Louisiana charges a \$25 registration fee plus \$0.05 per acre. Pennsylvania sells individual DMAP antlerless harvest permits, \$10.70 for residents and \$35.70 for nonresidents, as does New Jersey which charges \$28 (\$14 for youth) per DMAP permit sold to hunters selected by the DMAP applicant. DMAP permits are generally valid only on the

enrolled property during regular deer hunting seasons, may not be used for antlered deer, and are issued to the landowner who distributes them to individual hunters.

- h) **DMAP participation requirements.** DMAP participants generally must have a written statement of objectives or a written management plan, provide a map or aerial photograph defining property boundaries, an on-site visit by a wildlife biologist/technician to assess habitat conditions and deer density, and collect data on all deer harvested on the property. The on-site visit is extremely important for establishing a relationship with landowners/hunters and enhancing agency credibility. Agency personnel conducting on-site visits should be prepared with relevant materials (brochures, Power Point presentations, etc.), able to answer a variety of management related questions including plant identification, and provide timely feedback on the visit to the landowner. For DMAP cooperators who desire a written management plan, agency personnel should be able to work with other natural professionals such as foresters. The importance of interactions between DMAP participants in Mississippi and their wildlife biologist was a major determinant of their satisfaction with the program (Hunt et al. 2006). WDNR Biologists/Technicians should work with the landowner/cooperative to establish written goals and management plans that focus on the enrolled property, but also provide a larger landscape perspective that considers critical habitat needs for white-tailed deer, such as winter thermal cover, and for other wildlife species. Management plans should include a statement of goals and objectives; actions related to deer population management, forest management, habitat management, hunting regulations and hunter expectations; definition of metrics for measuring success; and monitoring procedures for data collection. We anticipate both biologists and foresters working side-by-side on these plans.
- i) **DMAP data collection requirements.** Required data usually include date and method of harvest, sex, age or a mandible, weight, antler measurements, and lactation status for all deer harvested on the DMAP property. Harvest data and other information must be submitted to the state agency in a timely manner to continue participation in the DMAP. Virginia requires that harvest data be collected for one year before the participant can be issued DMAP permits. The data collection requirements for the Wisconsin DMAP should at minimum mimic those of registration stations manned by WDNR staff to bio-check harvested deer to insure compatibility with existing data bases. DMAP harvest data could substantially increase sample sizes by supplementing WDNR collected data and provide much needed data on a DMU and finer scale. DMAP data can become a primary source of biological data from harvested deer for a state agency. The Virginia DMAP provides harvest data on about 10% of the statewide harvest. Supplemental data on the number of deer at which shots are taken and the number of deer hit but not recovered could provide insight into buck recovery rates. Many landowners/hunters use game cameras to assess deer populations and scout for hunting. Photos of deer taken during September could provide statistically valid estimates of fawn recruitment rates and less biased estimates of buck age structure than estimates derived from harvest data. Site-specific data could be pooled to provide estimates at the DMU, region, and state levels, which could improve confidence in SAK indices. Sighting rates and trends, a key determinant of hunter satisfaction (Holsman 2007), could be

estimated by maintaining hunting logs that record hours hunted and sightings of antlered, antlerless, and unknown deer.

- j) **Registration of deer harvested on DMAP properties.** States that require that all harvested deer be registered at official stations may allow DMAP cooperators to serve as registration stations since they are collecting more data than typically taken at these stations (OK, VA). This eliminates the need to transport and register deer elsewhere and reduces the chance of double registration. Electronic (telephone, website) registration options which are more convenient for hunters have proved successful in Virginia and Missouri (Hansen et al. 2006).
- k) **DMAP data analysis and reporting.** Each DMAP cooperator should receive an annual report summarizing current data and trend data over years to monitor progress toward goals (Appendix 4) from the Virginia DMAP as an example). Most of the report generation can be computerized and cooperators should be provided an option to allow online submission of data to reduce staff time commitments. It is desirable to provide a report of all DMAP cooperators within a DMU or other region to allow the cooperators to compare deer herd metrics on their property with overall herd conditions within their area.
- l) **Assessment of DMAP effectiveness.** In addition to metrics such as number of cooperators, area enrolled, biological data collected, etc., overall program effectiveness should also be assessed by studies to evaluate cooperators' satisfaction with the program and attitudes toward program success and service quality by WDNR staff.

**2) Develop a public lands antlerless permit system.** We also recommend that issuance of antlerless deer permits be separate for private and public lands. A public lands antlerless permit system is especially needed for the Northern and Central Forest Zones. Lands enrolled in the Wisconsin MFL program and WACAP as well as US Forest Service National Forests and state, county, and municipal forests open to public hunting could be included in the DMAP if the landowner or administrator so chooses. However, some landowners or administrators may not choose to enroll in the DMAP and an alternative process for issuance of permits on these public access properties may be needed. A public lands permit system would address public and Tribal concerns about potential overharvest of antlerless deer on these lands, allow the WDNR to affirm the value of public lands to deer hunters and Tribal hunters, respond to the impacts of changing habitat conditions due to maturing forests, focus antlerless harvest on local areas of deer overabundance, and respond to the possible increasing impacts of predation to deer populations on these lands. On many of these public lands, primary management goals will be enhancement of biodiversity and forest regeneration which will rely on hunter harvest of deer.

**3) Expand public education/outreach efforts to serve landowners whose goals include management for white-tailed deer and other wildlife species.** The WDNR should provide technical assistance to landowners interested in wildlife management similar to that provided to landowners interested in timber management. Technical assistance should include on-site consultations by wildlife biologists/technicians and other natural resource specialists (forestry, fisheries, agriculture, etc.), development of management plans, field days at demonstration sites,



workshops, and written and online materials. Management plans should be developed from an ecosystem perspective relative to landowner goals. These activities could be facilitated by DMAP cooperators, NGOs such as QDMA, WU, NWTF and RGS, and the cooperative extension and outreach programs at the University of Wisconsin. Other information popular with deer hunters such as the Wisconsin Big Game Records maintained by the Wisconsin Buck and Bear Club and QDMA's Annual Deer Report could be linked to the WDNR website.

## **DNR RESEARCH AND TECHNICAL PUBLICATIONS**

We requested and subsequently reviewed existing research projects and publications either senior authored or co-authored by DNR staff during the last 10 years. We were surprised from two findings from these requests. First, the delay between data needs being identified and initiation of organized research. Referring back to recommendations from the four previous studies and reviews (see earlier), some of the most vital needs are just being addressed. Striking examples are the predator impact and mortality studies, entitled:

*Evaluating survival and cause-specific mortality in adult and fawn white-tailed deer in northern and east-central Wisconsin.*

In the PDF copy of a white paper prepared by the WDNR, these studies were described as follows:

*“One study in northern Wisconsin will use radio telemetry to track fawns and determine how many are killed by predators and by which predators. Almost nothing is known, for example, about the impact of coyote and bobcat predation on deer in Wisconsin. Similar research is underway in Michigan’s Upper Peninsula, and the two states are sharing results.”*

*“Another study (Report 2/11/2011), set to run for five years, will use a combination of field research methods, including radio telemetry, to study buck mortality. This research, on the DNR wish list for more than a decade, was recommended by independent auditors in 2006 to fine tune Wisconsin’s procedures for estimating herd size.”*

We recognize there often are lag times between identification of research needs and initiation of the project; and, there often are funding issues limiting the timeliness of research. Yet, the mortality study mentioned above was first recommended in 2006 but actually began in 2010. Since the S-A-K accounting model has continued to draw criticism from lay people, stakeholders and other scientists, studies to answer these questions should have been initiated long ago.

Appendix 5 presents publications (mostly peer-reviewed) submitted to us as a bibliography from the last decade. Herein we are assuming this list is complete, and we were led to believe so in our conversations with WDNR senior staff. Analyzing these bibliographical data was enlightening. Of the 55 publication citations submitted, less than ten were senior-authored by WDNR staff; yet more importantly, the vast majority (%) dealt with CWD. Further, 15 papers were related in some way to whitetail biology or management; six could be related to issues related to the States

management program outside of CWD. Reviewing titles and papers from this list led us to conclude the WDNR research program has been almost totally reactive, rather than proactive. The predator impact and mortality study begun in 2010 recently produced a “talking points” document, reporting one-year results. The relevance of this report to the S-A-K accounting model are discussed in the Predation section of our interim report. Clearly there is a need for development of a long-term research program, in which priorities are assigned to these projects. This is accentuated by the excellent papers by R. H. Holsman (UW-Stephens Point) and J. Petchenik (WDNR) on human dimensions topics stemming from issues arising with CWD, S-A-K, etc. The talents of these two respected researchers could be put to even better use through proactive projects. Lastly, it would serve the WDNR well to involve landowners and lay people in data collection more, as an expansion of similar efforts in some studies, especially the on-going mortality study.

## CONCLUSIONS

Research appears to be mostly reactive in nature, and logically focused heavily on CWD issues. As we have noted previously, the appearance of CWD diverted significant financial and human resources away from critical needs in deer management. However, as the Wisconsin Legislative Audit reported, significant funds (exceeding \$30 million) have been provided for the response from state and federal sources.

We found the following areas lacking in WDNR research to date:

1. Regional studies on age-related morphometrics of Wisconsin whitetails. This information will be important in assessing herd health, and could provide the basis for future management strategies such as antler restrictions should the public support them.
2. Herd and habitat (forest, range and agricultural) health indicators and diagnostics. There is a distinct need to develop habitat and range evaluation techniques (Lay 1967), which can be used by field biologists.
3. We strongly recommend involving the Tribes in forest health research, particularly indicators related to plants important to them for medicine, food, etc. Their biologists and managers indicated a high interest in this work.
4. Predator role(s) in the deer-human-habitat system, and management strategies. The new study on survival and mortality should be expanded to include more regions.
5. Production models for managing forests and wildlife in an ecologically/economically sound manner. This should be focused on private lands and those controlled by counties and state lands.
6. Genetic management strategies for CWD in the long-term.
7. CWD-caused mortality rates for deer.
8. Human health issues related to CWD.

We also feel there is a significant need for cooperative research in geospatial data generation, most notably a well-maintained land cover map (we discussed this in the *HABITAT* section).

On numerous occasions, WDNR research staff asserted they make a significant attempt to maintain objectivity in all projects, adhering strictly to the scientific method. We have absolutely no reason to doubt these claims. However, there are significant human and financial resources from various sources being used for in-house research; and, there is a need for oversight of these activities. Given the documented deterioration of public confidence (Staples Marketing Report and others) in WDNR deer management, there is a need for modification of the research process. As noted above, it is obvious much of the research conducted by or contracted through the WDNR has been reactionary in nature. It seems a problem arises, which in turn elicits a research project to deal with the issue. The public is left with the impression WDNR is “justifying” its actions with *a posteriori* science. Although often necessary, conducting a research program in this manner ultimately results in a fragmented approach to knowledge and technology development. There is a clear need for a more proactive approach, particularly for Human Dimensions projects, that are aimed at anticipating issues and needs (Bruggers 2009)..

### **Recommendations**

- 1. We strongly suggest establishment of a research steering committee, with representation from user groups, stakeholders and regional WDNR biologists, and Tribal representatives.** This group should identify knowledge gaps and technology needs, and set priorities for projects.
- 2. A significant effort should be developed in Human Dimensions research. Wisconsin is blessed with two excellent researchers (Holsman at UW-SP and Petchenik in house), and a plan for long-term monitoring of trends and issues should be developed between them.** This does not exclude other scientists at the various campuses, however.
- 3. We are concerned about long-term contracts for services.** We caution such contracts often become “cash cows” for scientists, requiring establishment of concrete goals, benchmarks and termination dates for each project.
- 4. Projects should involve the public whenever practical.** The model being set by the survival and mortality study is an excellent example of the use of volunteers and the positive benefits that accrue.
- 5. There is a need for a long-term research plan (developed through 1), based on needs assessments, and prioritized for funding.**
- 6. Synergies with other agencies and greater cooperative efforts, particularly with those in forestry and geospatial disciplines, would help leverage funding and strengthen projects.**
- 7. Research projects should be of an applied nature, rather than basic research, with clearly defined application to the needs for managing Wisconsin’s deer and habitat resources.**

Funding arising from hunting revenues and related federal programs such as Pittman-Robertson funds should be prioritized for game and habitat management related studies.

8. **Project results should be extended to the public through media, workshops and field days, as part of the DMAP program and regional stakeholder conferences. This will increase credibility of WDNR and techniques used to manage deer, habitats and people.**
9. **In the long-term, we recommend developing a wildlife disease unit to: 1) respond quickly to CWD outbreaks; 2) monitor health and disease of other wildlife species; and, 2) train and support local biologists/technicians in conducting annual herd health surveys.**

### Public Involvement in Research

One of our primary findings (Interim Report) was a distinct loss of public confidence and credibility; we believe stemming from a growing disconnect between stakeholders and the WDNR. Eliminating this divide is the principle focus of our recommendations. This particularly is true for white-tailed deer research and management. Our experiences substantiate giving a proprietary interest to the public through harvest, herd and habitat data acquisition and participation in research projects (physically or materially) does more to generate good will and positive credibility than any activity.

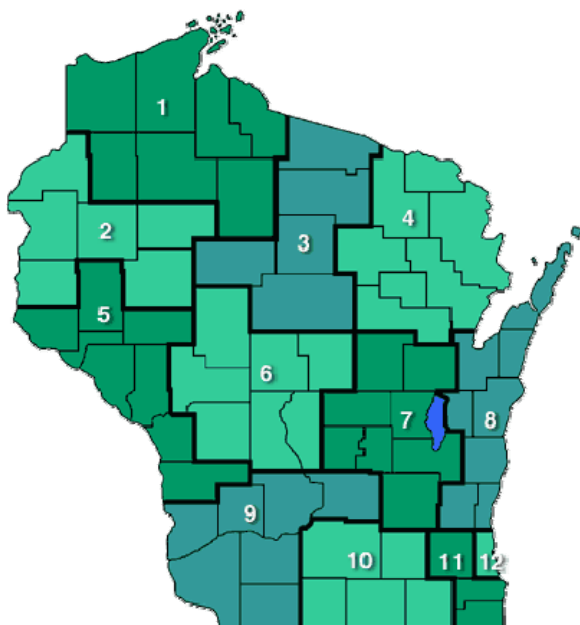


**Figure 23. Public involvement in wildlife research projects has many benefits, including cost reductions, public buy-in and credibility of results. Photos courtesy of WDNR.**

As noted above, a perfect example and model is the recent deer survival and mortality study conducted by the WDNR (Fig. 23). We applaud their efforts and STRONGLY recommend expansion of these activities to as many projects as possible. When coupled with having input into research direction, it is a WIN-WIN for the WDNR, the public and the white-tailed deer.

## CONSERVATION CONGRESS

The Wisconsin State Conservation Commission, now the Natural Resources Board (NRB), created the Conservation Congress in 1934, with the expressed purpose of providing "...a local avenue for input and exchange concerning conservation issues. Later,



**Figure 24. The Conservation Congress is made up of representatives from 12 districts, representing the citizens of Wisconsin to the Natural Resources Board.**

Governor Patrick Lucy signed legislation legally establishing the Congress in 1972, designating these representatives to be a liaison between the WDNR and NRB. The role of the Congress was identified as, "The conservation congress shall be an independent organization of citizens of the state and shall serve in an advisory capacity to the natural resources board on all matters under the jurisdiction of the board. Its records, budgets, studies and surveys shall be kept and established in conjunction with the department of natural resources. Its reports shall be an independent advisory opinion of such congress (s. 15.348, Wisconsin Statutes)." (<http://dnr.wi.gov/org/nrboard/congress/history/>).

The Conservation Congress we believe is unique to Wisconsin, dating back to the time of Aldo Leopold. The basic idea was to give a voice to local interests, using an administrative structure that is bottom-up, rather than top-down. There currently are 12 regions (Fig. 24) in the Congress. The administrative flow goes from citizens to local county delegates, county chairs and vice-chairs, upward to the district level and executive council, executive committee and finally to the

NRB (appointed by the Governor). Currently there also are 24 Advisory/Study Committees, with a broad range of responsibilities. The original intent of Congress involvement appears to have weakened somewhat over the years as decision-making shifted to the state level. In an early report by the Conservation Commission, it was stressed that, *“In the final analysis, no matter what the commission or department believes to be in the best interest of the state, if the citizenry are not in accord, any program set up would eventually be doomed to failure. The birds, animals and fish belong to the people of the state.”* (<http://dnr.wi.gov/wnrmaq/2009/04/congress.htm#1>). We affirm this position.

## RECOMMENDATIONS REGARDING THE CONSERVATION CONGRESS ROLE

**We feel the Conservation Congress must have a more active role in deer management decision-making at the local level.** The model we have put forward relies on DMAP, which focuses on site-specific development of management plans. Hence, we suggest a committee be formed at the county level by the local DNR biologist, comprised of stakeholder and Tribal (when appropriate) representatives, chaired by local Congress representatives, to annually review a landscape-based plan and deer-habitat management progress. The local and regional DNR biologists will work closely with these committees. Since deer management involves a patchwork of private and public land holdings, this landscape approach to planning must involve inputs from all interests. The Congress should be responsible for communicating the goals and accomplishments of local deer management efforts. The only downside we see to such a system is the potential for Tribal interests to become diluted as a “participant” in local management. We must remember, the Tribes are co-managers of this valuable resource.

## PERSONNEL

We found the current WDNR staff remarkably well-trained, technically competent, hard-working and dedicated to the mission of the department. Our evaluations have been aimed at issues and programs, not individuals. Although we do not feel the scope of our assignment includes personnel recommendations, the changes and new programs recommended in this report will impact personnel. In these times of budget shortfalls and waning funding for public services, new programs—no matter their merits— may not be possible if significant shifts in personnel or funding are required. That said, we reviewed current wildlife staffing (Table 2), and were impressed by the number of approved positions, so WDNR is well-positioned to provide adequate support for recommended activities.

Fifty-three biologist and 56 technician positions currently are approved for work in Wisconsin's 72 counties. In addition, there are 139 approved Limited Term Employee (LTE, 1040 hour) positions. The ratio of supervisors to biologists/technicians is 1:6.8, a reasonable ratio. In addition, WDNR recently filled a Big Game Program Leader position to oversee work on the State's big game species (deer, bear, turkey and elk); presumably wolves also will be included in these responsibilities. Although this position should be adequate for most activities related to white-tailed deer, **we strongly suggest addition of a Deer Management Assistance Coordinator (see DMAP section). This would require hiring a highly qualified individual with the following characteristics: 1) considerable experience with DMAP or related programs; 2)**

**well-respected in both the scientific and public communities; 3) highly skilled communicator; and, 4) highly motivated to work with the public.** Technical competence in deer biology and management would logically be included in these traits. This individual would coordinate and oversee all activities related to DMAP, working closely with regional and local biologists/technicians. He/she would also have responsibilities for developing strong cooperative relationships with other Wisconsin state agencies, federal agencies and most importantly the Cooperative Extension Service, forestry and university scientists/researchers and Tribal management needs. The incumbent would be expected to develop protocols for development of private land management plans that include deer, habitat, forestry and agricultural considerations. This position also would be responsible for production of annual reports in multiple media for cooperators and stakeholders, concerning progress and conditions of the deer-habitat-human-predator ecosystem.

### **Boots on the Ground**

We also reviewed the job description for a generic wildlife biologist (Appendix 6). We recommend including responsibilities for working with the public and stakeholders in matters related to DMAP and landowner/stakeholder management plan development. The position should be expected to work closely with foresters and agricultural specialists in development of these plans; and, to develop local management teams that include professional resource managers, landowners and other stakeholders. Among these should be Tribal representatives to assure their interests are included in all deer management planning. The Tribes should be treated as “co-managers” of the deer ecosystem whenever appropriate. The percentages of time allocated to these activities should be adjusted appropriately. Finally, we are unaware of the annual employee review and performance evaluation process for Wisconsin; however, we strongly suggest, where appropriate, these evaluations include: 1) performance in establishing a local management team; 2) success in establishing DMAP cooperators; and, 3) demonstrated involvement in the local community (viz., area of responsibility) in deer management and public education.

### **ADMONITION**

We believe the single most important challenge facing deer management today in Wisconsin is the relationship between the deer hunters and the WDNR. Over the past decade, in its attempts to eradicate CWD, and to balance an overly-abundant deer herd with its environment, the WDNR implemented increasingly aggressive policies. The agency was doing what it felt needed to be done to meet their governmental responsibility to properly manage all the wildlife, and their habitats, for all the people of Wisconsin. Unfortunately, these increasingly aggressive deer management policies led to anger, frustration and distrust of the WDNR for significant numbers of hunters. Those angry and frustrated hunters went to legislators who successfully repealed some of the most effective WDNR policies for controlling overabundant deer herds, including earn-a-buck. In addition, angry sportsmen were sufficiently vocal to make this an issue for Governor Walker during his election campaign which, in turn, led to this current review of the WDNR deer management program. In a state like Wisconsin, where greater than 10% of all the

**Table 2. Currently approved WDNR positions related to white-tailed deer management activities.**

District	Area	Supervisor	Biologists	Technicians	1040 hour LTEs
Northeast	Phestigo	1	6	5	9
	Oshkosh	1	4	4	2
	Lakeshore	1	3	3	6
Northern	Crex		1	3	6
	Headwaters	1	3	3	2
	Lake Superior	1	3	2	4
	St Croix	1	3	2	6
	Upper Chippewa	1	4	3	6
Southern	Columbia Cnty		1	1	2
	Madison/CWD	1	4	2	16
	Game Farm	1	0	4	17
	Upper Rock	1	3	3	9
	Dodgeville	1	4	2	8
	Southern Fox	1	1	3	14
West Central	Eau Claire	1	3	4	17
	La Cross/BRF	1	5	3	6
	Sandhill	1	2	3	2
	Wisconsin Rapids1	1	3	2	2
	Mead	1	0	4	5
		16	53	56	139

citizens are licensed deer hunters, that is a political force to reckon with if you are the agency responsible for deer management.

This conflict between state agencies responsible for deer management and deer hunters is not unique to Wisconsin. It is a problem in many states throughout the country. A conflict very similar to Wisconsin's current situation occurred between the Pennsylvania Game Commission and deer hunters in 1998, when Governor Tom Ridge was running for re-election. After his successful re-election, Governor Ridge took actions that ultimately led to some of the most sweeping and beneficial changes ever made to deer management in Pennsylvania. Handled



appropriately, these conflicts can and should have a positive outcome for deer management. But handled inappropriately, it can make a bad situation even worse.

Ideally, differences between what is needed for proper management by the agency and what is wanted by hunters can be worked out with a healthy communication network, and with some compromises. Flexibility and successful outreach on the part of the wildlife agency can go a long way to prevent or resolve some of these conflicts; however, unrealistic expectations on the part of hunters is also a big part of this problem. Hunters tend to rate their hunting experiences, not on what they kill, but on what they see. They often want to see more deer than what the land can sustain. And if they don't see sufficient numbers of deer, they demand the wildlife agency take actions to let the deer herd size increase without regard to negative impacts to the other resources and conflicts with the rest of society.

This demand by hunters for deer populations to be maintained at densities higher than what the land can sustain, in the long term, is not in the best interest of the deer herd, the future of hunting, or even the hunters themselves. Ironically, by attempting to raise more deer than the land can sustain, they wind up with fewer deer, instead of more, when the habitat gets degraded from over-browsing. Overly abundant deer herds result in excessive numbers of deer-vehicle collisions and negatively impact forest regeneration and the sustainability of enormous economic engines such as the forest products industry and agriculture. Perpetuating the rich tradition of deer hunting for future generations, cherished by so many sportsmen in Wisconsin and throughout the country, would certainly be better served by helping society meet their needs than to pit themselves between a society and their needs.

In spite of these challenges, we remain optimistic about the future of deer management in Wisconsin. During our town hall tour of the state it was impressive and stimulating to see the large numbers of people that were so passionate about deer management, most of which were reasonable about seeking out possible solutions to this conflict. The high degree of professionalism, competence, and devotion of WDNR employees to "do the right thing" for the resource was equally impressive and stimulating. It has been an honor and a pleasure for us to work with the hunters of Wisconsin and with the employees of the WDNR over the past nine months. We have strived to make an honest and candid review of Wisconsin's deer management program and to provide specific recommendations for improving its future. In the end, as always, the future of deer management will ultimately be decided by the people of Wisconsin. We have faith and confidence that the people of Wisconsin will make the right choices.

## REFERENCES CITED

- Adams, K., J. Hamilton, and M. Ross. 2012. QDMA's Whitetail Report 2012. <http://www.qdma.com/uploads/pdf/WR2012.pdf> accessed 6/17/12.
- Augustine, D. J., and L. E. Frelich. 1998. Effects of white-tailed deer on populations of an understory forb in fragmented deciduous forests. *Conservation Biology* 12(5): 995-1004.
- Ballard, W. B., D. Lutz, T. W. Keegan, L. H. Carpenter, and J. C. DeVos, Jr. 2001. Deer-predator relationships: a review of recent North American studies with emphasis on mule and black-tailed deer. *Wildlife Society Bulletin* 29:99-115.
- Brown, P., and R. Braddley. 1998. A historical primer of transmissible spongiform encephalopathy. *British Medical Journal*: 317:1688-1692.
- Bruggers, R. L. 2009. Setting research priorities at Wildlife Services' National Wildlife Research Center. *Human-Wildlife Conflicts* 3(2):161-164.
- Chiamulera, J., E. Kruger, and C. Yarbrough. 2012. Bobcat Natural History. Source: <http://www4.uwsp.edu/wildlife/carnivore/Bobcat%20Natural%20Historyfiles/Bobcat> accessed 6/23/12.
- Collinge, J., K. C. Sidle, J. Meads, J. Ironside, and A. F. Hill. 1996. Molecular analysis of prion strain variation and the aetiology of 'new variant' CJD. *Nature*, 383(6602):685-690.
- Cote, S. D., T. P. Rooney, J. P. Tremley, C. Dussault and D. M. Waller. 2004. Ecological impacts of deer overabundance. *Ann. Rev. Ecol. System.* 35:113-147.
- deCelesta, D. S. 1994. Impact of white-tailed deer on resources within intensively managed northern hardwood forests. *Proc. Annual Meeting Southeast Deer Study Group* 17:11-12.
- De Silva R, Ironside J. W., McCardle L, Esmonde TFG, Bell JE, Will RG. 1994a. Neuropathological phenotype and "prion protein" genotype correlation in sporadic Creutzfeldt-Jakob disease. *Neurosciences Letters* 1994; 179:50-52.
- \_\_\_\_\_, Windl O, Dempster M, Estibeiro P, Esmonde T, Lathe R, Ironside JW, Will RG. 1994b. Prion protein genotype in Creutzfeldt-Jakob disease: the Edinburgh experience. *Ann Neurol* 1994; 36(2):272.
- Dhuey, B. 2011. Small Game Harvest: 2010-11. Wisconsin Department of Natural Resources. 5 pp.
- \_\_\_\_\_, and John Olson. 2011. Bobcat Harvest 2010. Wisconsin Department of Natural Resources. 4 pp.
- Eberhardt, L. 1960. Estimations of vital characteristics of Michigan deer herds. Michigan Dept. of Conservation. Game Division Report 2282.
- Fischer, J. R., L. H. Creekmore, R. L. Marchinton, S. J. Riley, S. M. Schmitt, and E. S.

- Williams. 2003. External review of chronic wasting disease management in Wisconsin. October 10, 2003. 20pp.
- Fuller, T. K. 1995. Guidelines for gray wolf management in the northern Great Lakes region. International Wolf Center, Technical Publication 271. Ely, Minnesota. 19 pp.
- Garshelis, D. L. and L. G. Visser. 1997. Enumerating megapopulations of wild bears with an ingested biomarker. *Journal of Wildlife Management* 61:466-480.
- Gibbs, C. J. Jr., C. L. Masters, D. C. Gajdusek. 1979. Bibliography of Creutzfeldt-Jakob disease. U.S. Dept. of Health, Education, and Welfare, Public Health Service, National Institutes of Health. Washington, D. C.
- Giles, R. H. 1978. *Wildlife Management*. W. H. Freeman Co., San Francisco, USA. 416 pp.
- Gove, N. E., J. R. Skalski, P. Zager, and R. Townsend. 2002. Statistical models for population reconstruction using age-at-harvest data. *J. Wildlife Management* 66:310-320.
- Guynn, D. C., S. P. Mott, W. D. Cotton, and H. A. Jacobson. 1983. Cooperative management of white-tailed deer on private lands in Mississippi. *Wildlife Society Bulletin*. 11:211-214.
- Hansen, L. P., M. Wallendorf, and J. Beringer. 2006. A comparison of deer and turkey harvest data collection methods in Missouri. *Wildlife Society Bulletin*. 34(5):1356-1361.
- Heberlein, T. A. 2004. "Fire in the Sistine Chapel:" How Wisconsin responded to chronic wasting disease. *Human Dimensions of Wildlife*, 9:165-179.
- Holsman, R. H. 2000. Goodwill hunting? Exploring the role of hunters as ecosystem stewards. *Wildlife Society Bulletin*. 28(4):808-816.
- \_\_\_\_\_. 2006. Hunter and nonhunter beliefs about chronic wasting disease in Wisconsin. *J. Wildlife Management* 71:1739-1744.
- \_\_\_\_\_. 2007. What Wisconsin deer hunters think about SAK, deer populations and DNR credibility: Results of a 2006 statewide survey. College of Natural Resources: University of Wisconsin-Stevens Point.
- \_\_\_\_\_. 2009. Deer managers and deer hunters in Wisconsin: Irreconcilable differences? A report on a 2008 survey of DNR credibility. College of Natural Resources: University of Wisconsin-Stevens Point.
- \_\_\_\_\_, J. Petchenik and E. E. Cooney. 2010. CWD after "the fire:" Six reasons why hunters resisted Wisconsin's eradication effort. *Human Dimensions of Wildlife* 15(3):180-193.
- Hunt, K. M., K. D. Brunke, S. D. Fuller, B. Lunceford, and L. D. Castle. 2006. Mississippi deer management assistance program cooperators' satisfaction with and attitudes toward

program success and service quality. Proc. Annu. Southeast. Assoc. Fish and Wildl. Agencies 60:70-76.

Jacobson, H. A., and J. C. Kroll. 1994. The white-tailed deer (*Odocoileus virginianus*) – “the most managed and mismanaged species.” Proc. 3<sup>rd</sup> International Congress on the Biology of Deer. J. A. Milne, ed. pp 25-35.

\_\_\_\_\_, J. C. Kroll, R. W. Browning, B. H. Koerth, and M. H. Conway. 1997. Infrared-triggered cameras for censusing white-tailed deer. Wildlife Society Bulletin 25:547-556.

Jacques, C. N. 2012. Evaluating survival and cause-specific mortality in adult and fawn white-tailed deer in northern and east-central Wisconsin. Wisconsin Department of Natural Resources. Bureau of Sciences Services.

\_\_\_\_\_, and T. R. Van Deelen. 2012. Wisconsin Department of Natural Resources Website: <http://dnr.wi.gov/org/land/wildlife/harvest/reports/predators.pdf> accessed on 6/18/12.

Keane, C. 1927. The outbreak of foot and mouth disease among deer in the Stanislaus National Forest. California State Dep. Agric. Mon. Bull. 16:213-226.

Keyser, P. D., D. C. Guynn, Jr. and H. S. Hill. 2005. Population density-physical parameter relationships in white-tailed deer. Journal of Wildlife Management. 69(1):356-365.

Kitchell, J. 2009. Summer Wildlife Inquiry 2008. Pages 5-12 in J. Kitchell and B.J. Dhuey, editors. Wisconsin Wildlife Surveys--April 2009. Wisconsin Department of Natural Resources, Monona, Wisconsin. 130 pp.

Koerth, B. H., and J. C. Kroll. 2000. Bait type and timing for deer counts using cameras triggered by infrared monitors. Wildlife Society Bull. 28:630-635.

\_\_\_\_\_, C. D. McKown, and J. C. Kroll. 1997. Wildlife Society Bull. 25:557-562.

Kroll, J. C. 1991. A practical guide to producing and harvesting white-tailed deer. Center for Applied Studies in Forestry, Stephen F. Austin State University, Nacogdoches, TX 590 pp.

Lay, D. W. 1967. Deer range appraisal in eastern Texas. J. Wildlife Manage. 31(3):426-432.

Mathews, N. E., and W. F. Porter. 1988. Black bear predation of white-tailed deer neonates in the central Adirondacks. Canadian Journal of Zoology 66:1241-1242.

Mathiason, C. K., J. G. Powers, S. J. Dahmes, D. A. Osborn, K.V. Miller, R. J. Warren, G. L. Mason, S. A. Hays, J. Hayes-Klug, D. M. Seelig, M.A. Wild, L. L. Wolfe, T. R. Spraker, M. W. Miller, C. J. Sigurdson, G. C. Telling, E. A. Hoover. 2006. Infectious Prions in the Saliva and Blood of Deer with Chronic Wasting Disease. Science 314:133-136.

MaWhinney S., W. J. Pape, J. E. Forster, C. A. Anderson, P. Bosque, M. W. Miller. 2006

Human prion disease and relative risk associated with chronic wasting disease. *Emerg Infect Dis*. Available from <http://www.cdc.gov/ncidod/EID/vol12no10/06-0019.htm>.

McKean, A. 2011. Deer depression. *Outdoor Life*. Vol. 218(6):61-66,81.

Mech, L. D. 1984. Predator and predation. Pages 189-200 in L. K. Halls, editor. *White-tailed deer: Ecology and management*. Stackpole Books, Harrisbur, PA, USA

\_\_\_\_\_. 2010. Considerations for developing wolf harvesting regulations in the contiguous United States. *Journal of Wildlife Management* 74(7):1421-1424.

\_\_\_\_\_, and R. O. Peterson. 2003. Wolf-prey relations. Pages 131-160 in L. D. Mech and L. Boitani, editors. *Wolves: Behavior, Ecology and Conservation*. University of Chicago Press, Chicago, IL, USA.

Millspaugh, J.J., J. R. Skalski, R. L. Townsend, D. R. Diefenbach, M. S. Boyce, L. P. Hansen, and K. Kammermeyer. 2007. An evaluation of the SAK model as applied in Wisconsin. Wisconsin, Department of Natural Resources, Madison, USA.

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_. 2009. An evaluation of Sex-Age-Kill model performance. *J. Wildlife Management*. 73:442-451.

Mueller, J. 2006. CWD Zone Eradication Program, Legislative Audit. Wisconsin State Legislature and State Auditor's Office.

Mudrak, E. L., S. E. Johnson, and D. M. Waller. 2009. Forty-seven year changes in vegetation at Apostle Island: Effects of deer on forest understory. *Natural Areas Journal*. 29: 2482-2492.

Norton, A. S. 2010. An evaluation of the Pennsylvania Sex-Age-Kill Model for white-tailed deer. M. S. Thesis. Penn. State Univ. 86 pp.

Ozoga, J. J., and L. J. Verme. 1982. Predation by black bears on newborn white-tailed deer. *Journal of Mammalogy* 63:695-696.

Patchenik, J. 2006. Landowner responses to harvest incentives in Wisconsin's southwest chronic wasting disease eradication zone. *Human Dimensions of Wildlife*, 11:225-226.

Peek, J., B. Dale, H. Hristienko, L. Kantar, K. A. Loyd, S. Mahoney, C. Miller, D. Murray, L. Olver, and C. Soulliere. 2012. Management of large mammalian carnivores in North America. *The Wildlife Society Technical Review* 12-01, March 2012. The Wildlife Society, Bethesda. Maryland, USA.

Quality Deer Management Association. 2009. QDMA Whitetail Report. QDMA. Bogart, GA. [www.QDMA.com](http://www.QDMA.com).

\_\_\_\_\_. 2011. QDMA Whitetail Report. QDMA. Bogart, GA. [www.QDMA.com](http://www.QDMA.com).

\_\_\_\_\_. 2012. Whitetail Report 2012. Bogart, GA. [www.QDMA.com](http://www.QDMA.com).

- Rawinski, T. J. 2008. Impacts of white-tailed deer overabundance in forest ecosystems: An overview. USDA Forest Service Miscellaneous Publication. 8 pp.
- Rolley, R.E. and D. M. MacFarland. 2012. Black Bear Population Analyses 2011. Wisconsin Department of Natural Resources website: <http://dnr.wi.gov/org/land/wildlife/harvest/reports/bearpop2.pdf> accessed 6/20/12.
- Rooney, T. P. and D. M. Waller. 2003. Direct and indirect effects of deer in forest ecosystems. *Forest Ecology and Management*. 168:267-277.
- Sawcer SJ, Yuill GM, Esmonde TFG, Estibeiro P, Ironside JW, Bell JE, Will RG. 1993. Creutzfeldt-Jakob disease in an individual occupationally exposed to BSE. *Lancet* 1993; 341:642.
- Staples Marketing. 2011a. Chronic wasting disease management focus group research findings. Report to WDNR, 6 pp.
- \_\_\_\_\_. 2011b. WI-DNR CWD research results. Report to WDNR, 26 pp.
- Terborgh, J. 1986. Keystone plant resources in the tropical forest. Pages 330-344 in M. Soule, ed. *Conservation biology: the science of scarcity and diversity*. Sinauer Assoc., Sunderland, Mass.
- Thomas, J. W.. 2011. The future of the National Forests- Who will answer an uncertain trumpet? Part II. *Fair Chase: the Official Publication of the Boone & Crockett Club*. Volume 26(4): 16-25.
- \_\_\_\_\_, and A. Sienkiewicz. 2011. The future of the National Forests- Who will answer an uncertain trumpet? Part I. *Fair Chase: the Official Publication of the Boone & Crockett Club*. Volume 26(3):16-23.
- Van Deelen, T. R., B. J. Dhuey, C. N. Jacques, K. R. McCaffery, R. E. Rolley, and K. Warnke. 2006. Effects of earn-a-buck and special antlerless-only seasons on Wisconsin's deer harvests. *Journal of Wildlife Management*. 74:1693-1700.
- \_\_\_\_\_. 2009. Growth characteristics of a recovering wolf population in the Great Lakes Region. Pages 139-154 in A. P. Wydeven, T. R. Van Deelen, and E. J. Heske, editors. *Recovery of gray wolves in the Great Lakes region of the United States*. Springer, New York, NY, USA.
- VanderZouwen, W., and K. Warnke (eds). 1995. Wisconsin deer population goals harvest management environmental assessment. Wisconsin Dept. Natural Resources. Madison.
- Vercauteren, K. C., C. W. Anderson, T. R. Van Deelen, D. Drake, W. D. Walter, S. M.

- Vantassel, and S. C. Hygnstrom. 2011. Regulated commercial harvest to manage overabundant white-tailed deer: an idea to consider? *Wildlife Society Bulletin*. 35(3):185-194.
- Virginia Department of Game and Inland Fisheries. 2007. Virginia deer Management Plan 2006-2015. Wildlife Division. No. 07-1. Richmond.
- Vreeland, J. K., D. R. Diefenbach, and B. D. Wallingford. 2004. Survival rates, mortality causes, and habitats of Pennsylvania white-tailed deer fawns. *Wildlife Society Bulletin* 32:542-553.
- Wadsworth, J. D. F., S. Joiner, J. M. Linehan, E. A. Asante, S. Brandner, and J. Collinge. 2008. The origin of the prion agent of kuru: molecular and biological strain typing. *Philos. Tran. R. Soc. London B. Biol. Sci.* November 27 363(1510):3747-3753.
- Waller, D. M. and W. S. Alverson. 1997. The white-tailed deer: a keystone herbivore. *Wildlife Society Bulletin*. 25:217-226.
- Wild, M. A., N. T. Hobbs, M. S. Graham, and M. W. Miller. 2011. The role of predation in disease control: A comparison of selective and nonselective removal on prion disease dynamics in deer. *Journal of Wildlife Diseases* 47(1): 78-93.
- Williams, E. S. 2005 Chronic Wasting Disease. *Veterinary Pathology* 42:530-549.
- Wisconsin Conservation Congress. 2000. Deer management for 2000 and beyond. Final Report.
- Wisconsin Department of Natural Resources. 1989. Wisconsin Timber Wolf Recovery Plan. Wisconsin Department of Natural Resources, Wisconsin Endangered Resources Rep. 50: 37 pp.
- \_\_\_\_\_. 1992. Deer population goals and harvest management environmental assessment. Bureaus of Wildlife Management and Integrated Sciences Services.
- \_\_\_\_\_. 1998. Wisconsin's deer management program: the issues involved in decision making. 2<sup>nd</sup> Edition. Wisconsin Department of Natural Resources. Bureau of Wildlife Management and Integrated Sciences Services.
- \_\_\_\_\_. 1999. Wisconsin Wolf Management Plan. PUBL-ER-099 99. Wisconsin Department of Natural Resources, PO Box 7921, Madison, WI 53707.
- \_\_\_\_\_. 2001. Management workbook for white-tailed deer. 2<sup>nd</sup> Edition. Wisconsin Department of Natural Resources, Bureaus of Wildlife Management and Integrated Sciences Services. Madison.
- \_\_\_\_\_. 2010. Wisconsin's chronic wasting disease response plan: 2010-2025. Wisconsin Department of Natural Resources. Publication WM-482-2010. 39pp..
- \_\_\_\_\_. 2010. Investing in Wisconsin's whitetails. Publication Number WM-528-2010.

- \_\_\_\_\_. 2011. Wisconsin big game hunting summary. PUB-WM-284 2011. Madison. Wisconsin Conservation Congress. 2000. Deer management for 2000 and beyond. Final Report .
- \_\_\_\_\_. 2012a. Gray wolf factsheet. Wisconsin Department of Natural Resources Website: <http://dnr.wi.gov/topic/wildlifehabitat/wolf/facts.html> accessed on 6/18/12.
- \_\_\_\_\_. 2012b. Black bears. Wisconsin Department of Natural Resources Website: <http://dnr.wi.gov/org/land/wildlife/pub/wlnotebook/bear.htm> accessed 6/20/12.
- \_\_\_\_\_. 2012c. Coyotes. Wisconsin Department of Natural Resources Website: <http://dnr.wi.gov/org/land/wildlife/PUB/wlnotebook/coyote.htm> accessed 6/20/12.
- \_\_\_\_\_. 2012d. WI Prehunt and Posthunt Deer Population Estimates and Goal (1969-2010). Wisconsin Department of Natural Resources Website: Source: [http://dnr.wi.gov/org/land/wildlife/images/hunt/deer/deer\\_pop.htm](http://dnr.wi.gov/org/land/wildlife/images/hunt/deer/deer_pop.htm) accessed on 6/21/12.
- Wobeser, G. 2002. Disease management strategies for wildlife. *Rev. Sci. Tech.*
- Wydeven, A. P. 1995. Wolf carrying capacity. Pages 43-47 in W. J. Vander Zouwen and D. K. Warnke, editors. Wisconsin deer population goals and harvest management: environmental assessment. Wisconsin Department of Natural Resources, Madison, WI, USA.
- \_\_\_\_\_, J. E. Wiedenhoft, R. N. Schultz, R. P. Thiel, R. L. Jurewicz, B. E. Kohn, and T. R. Van Delen. 2009. History, population growth, and management of wolves in Wisconsin. Pages 87-117 in A. P. Wydeven, T. R. Van Deelen, and E. J. Heske, editors. *Recovery of gray wolves in the Great Lakes Region of the United States*. Springer, New York, New York, USA.
- Zimmer, G. 2011. National forest management- A cause for concern. *Ruffed Grouse Society Magazine*, Fall 2011.
- \_\_\_\_\_. 2012. Impacts to wildlife populations of reduced management on our national forests. Testimony before the U.S. House of Representatives, Subcommittee on Conservation, Energy & Forestry, March 27, 2012. 4pp.



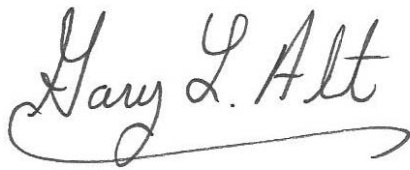
Submitted by:

A handwritten signature in purple ink that reads "James C. Kroll". The signature is enclosed in a thin black rectangular border.

Dr. James C. Kroll, White-tailed Deer Trustee

A handwritten signature in black ink that reads "David Guynn". The signature is enclosed in a thin black rectangular border.

Dr. David C. Guynn, Jr. altTrustee Team Member

A handwritten signature in black ink that reads "Gary L. Alt". The signature is enclosed in a thin black rectangular border.

Dr. Gary L. Alt, Trustee Team Member

26 June, 2012

## **APPENDIX I**

## Topics for DNR Review Meeting

Submitted by:

Drs. James C. Kroll, Gary Alt and David Guynn

**Note: We will bring storage devices for this information if you wish to provide in digital form, as well.**

1. What incentive programs are available to private landowners for deer management; viz., habitat improvement, forestry and herd management?
2. Detailed information on all state wildlife management areas in which deer hunting is allowed, along with the following:
  - a. Acreages and locations.
  - b. Goals.
  - c. Hunting process and access.
3. Administrative structure in regard to white-tailed deer programs. This would include both state administration and field personnel.
4. How is research organized, prioritized and administered?
5. What projects have you funded with outside parties on deer, habitat and disease issues?
6. Where do funds originate for research projects?
7. What is your process for public input and participation?
8. What programs do you have in place for determining the health of Wisconsin deer herds?
9. How do you work with other agencies such as extension, NRCS, etc.?
10. Detailed presentation on the decision-making process in arriving at regulations, bag limits, etc. Please present flow of activities and decision authority assignments.
11. What are the goals for the Wisconsin deer management program? What we are interested in would include harvest goals, population goals, demographics, etc.
12. Can you provide us with a copy of the Whitetails 2000 and Beyond Project Report, and which goals have been completed, adopted, etc.?
13. What is the Deer Committee, who belongs to it and how are they selected?
14. What data are collected related to your goals?
15. Copies of data typically collected by DNR for the last 5 years.
16. How do you assess progress in achieving goals?
17. Do you census your deer and by what means?
18. How much emphasis do you place on population density estimates?
19. How much time/effort is expended annually by staff in public appearances, meetings, etc.
20. Please provide us with a working copy of the SAK model, including the equations that are in it. How was this model developed and has it been validated? How?
21. Copies of all white-tailed deer data bases by management unit and county.
22. Copies or links to all materials produced for public education.
23. Are there any result demonstration areas for any aspect of deer population/habitat management?

- 24.** Do you have any data or results on your “Earn-a-Buck” program, in regard to effectiveness in achieving population and demographic goals?
- 25.** What is the relationship between the DNR and the following:
  - a.** Agricultural Extension.
  - b.** Federal and State forestry agencies.
  - c.** Environmental departments (state and federal).
  - d.** Universities.
- 26.** How does the DNR Division of Forestry policies relate to the U.S. Forest Service National Forest management policies?
- 27.** Discuss how Pittman-Robertson funds are used, including accounting for them.
- 28.** Income-expense breakdown for deer hunting and management.
- 29.** Have you completed projects on the following:
  - a.** Studies related to antler restrictions.
  - b.** Impacts of wolves, bears, etc. on your deer population.
  - c.** Impacts of hound training on deer and other animals.
  - d.** Forest impacts of deer herds.
  - e.** Baiting relationships to disease and harvest.
  - f.** Antler development affected by age, nutrition, etc.
  - g.** Productivity of deer in the CWD Core and Zone.
- 30.** Do you have data on the number of dead deer found in the CWD Core area and Zones and the cause of death?
- 31.** Copies of all CWD reports produced to date, public and in-house.
- 32.** Can you provide us with a copy of the Staples Marketing Report.
- 33.** Do you have a cover type map or spatial distribution study on habitats in Wisconsin?
- 34.** How does the department define “deer habitat?”
- 35.** We would appreciate a list of stakeholders and contact information for our next meeting.
- 36.** We would like to obtain and review the minutes, notes, meeting summaries, and reports by the Health & Science Team.
- 37.** We request a list and contact information for past professional employees whose work related to deer or wildlife diseases. This extends as far as reasonable to request.

## APPENDIX II

**INVENTORY OF MATERIALS PROVIDED INITIALLY BY,  
THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES**

**IN RESPONSE TO,**

**LIST OF 37 REQUESTS (APPENDIX 1) ABOUT DEER MANAGEMENT IN WISCONSIN**

Q1- Private Land Management

1. Links to State Programs for Landowners
2. Captive Deer
3. Deer Shooting Permit Summary, 2010
4. Wildlife Damage Program Brief
5. Wildlife Damage Program Summary 2010
6. Federal Programs with Implications for Deer in Wisconsin
7. Link to VPA Program.
8. Chapter 77 Subchapter VI- MFL
9. Link to Forest Crop Law
10. WFLGP Fact Sheet 03\_07

Q2- Public Land Management

1. Acreage of Public Land Open for Hunting
2. Goals for Wildlife Areas
3. Hunting Process and Access Wildlife Areas
4. Link to County Forest Lands
5. Links to FS and FWS Properties for Hunting
6. Topic 26- USFS & DNR Interaction
7. Chapter 28 WI Statistics
8. Link to State Land Mapping
9. Links to State Properties
10. Public Conservation Lands & DNR Facilities Map
11. Public Hunting- Cover Types 10-11
12. Public Hunting- Long term Harvest Goals 10-31-11
13. Public Hunting- TS Establishment 10-31-11
14. State Lands- All Long term Harvest Goals 10-31-11
15. State Lands- All TS Establishment 10-31-11
16. State Lands- All Cover Types 10-11
17. Topics for DNR Review Meeting Loomans

Qs3,7,10,11,12,13,14,16,17,18,19,22,23,24,27,28,33,34,35,37

1. Administrative Structure
2. 2010 WI DNR FWHMP Update Final
3. CMS Narrative July 2011
4. PR Apportionments FY10-12

5. PR Deer Expenditures SFY10-12
6. PR-All Est Expen SFY12
7. PR-All SFY10
8. PR-All SFY11
9. Answer to Q27
10. SS Activity Codes
11. WM Activity Code Descriptions
12. Past Professional Employees
13. Rule Promulgation Loomans
14. WI DNR Fiscal Years 2006-10 Report- Car Killed Deer
15. Deerfacts
16. CM Summary
17. Deer Forest Impacts
18. Forester\_AmMidNat\_2008
19. Tolerable Damage Indicators (01-07)
20. Tolerable Levels of Deer Damage
21. Agricultural Deer Damage Shooting Pemits (2006-2010)
22. Wildlife Damage Abatement and Claims Program (2006-2010)
23. Deer 2000 Recommendations
24. Administrative Structure
25. Est-DeerRange (1-82) Green
26. Estimated Deer Range (1,10,11,12) Green
27. Deer Range Landcover (1-82)
28. Deer Range- Landcover\_ MCC
29. Deer Range
30. Item 26 Landcover\_deerrange readme
31. Wiscland Powerpoint
32. 2008-10 Harvests by Type
33. Deer Harvest Reports, 2006-2010
34. Trophy Record Book Powerpoint
35. US Records
36. 1960-2010 harvest
37. 1966-2010 Harvest
38. Buck harvest Age Composition, Eastern Farmland
39. State Compare
40. Farm
41. Final 2007 Nine Deer Gun Season Report
42. Final 2008 Deer Season Report
43. Final 2009 Law Enforcement Deer Season Report
44. Final 2010 Law Enforcement Deer Season Report
45. Final Nine Deer Gun Season Report
46. 2001-2010 License Sales
47. Male Hunters

48. Participation
49. Demonstration Areas- Bayfield C. Deer Fence
50. Deer and Alternative Management in Northern Hardwood Stands
51. Deer Exclosure Powerpoint
52. Deer Impacts Literature from a Bowsite Blogger
53. Item 23- Deer Demonstration Areas
54. WI\_Exclosures
55. Buckfawn
56. Deer News Releases
57. Deer Notebook
58. Deerexsign
59. Forecast
60. Herd Story
61. Kovach Deer Impacts 0306
62. Randall Walters\_Deer Density Vegetation Effects Aspen MI-FEM 2010 in press
63. Sakcd
64. WDD10 TransTeamInfo
65. WDD11\_11x17poster
66. Wolvesdeer2009
67. Public Input
68. Public Participant, Loomans
69. Timeline 2011 Deer Season
70. Deer Habitat, Red Book
71. DeerBook
72. DeerRedBook.zip
73. Deer Management Goals, Loomans
74. Program Goals
75. Item 24 Earn-a-buck effectiveness
76. Van Deelen et al JWM 2010 Earn a buck in WI
77. 2010 Buck Harvest sq mile of DR
78. 2010 Buck Harvest sq mile total
79. 2010 Deer Range
80. 2010 Fall Pop sq mile DR
81. 2010 Fall pop
82. 2010 Overwinter pop
83. 2010 Overwinter sq mile DR
84. 2010 \_Season\_Structure (final)
85. DMU Regions
86. Abungoals
87. Chapter 4
88. Post\_Hunt\_Goal
89. 2011 SAK estimates
90. Prehunt, posthunt, goal



91. SAK Explanation for Secretary
92. SAK Report
93. 2011 Large Block Landowner Contact List
94. Deer Hunting Stakeholders
95. Deer Population Stakeholders
96. External\_Liaisons- Contacts\_Div Forestry
97. Interagency Health and Science Team Distribution List
98. Stakeholder Groups Invited\_Deer
99. Stakeholders to DNR 10\_27\_11\_Div Forestry
100. WDD10 Trans Team Info
101. WDD11\_11x17 poster
102. Summer Deer Observations (2006-2010)
103. APL\_Hunter\_Brief\_Final
104. APL\_Hunters2011-print
105. Archery Deer Questionnaire, 2005
106. Archery Deer Questionnaire, 2009
107. Deer Hunter Wildlife Survey Summary 2009
108. Deer Hunter Wildlife Survey Summary 2010
109. Gun Deer Hunting Questionnaire (2006-2010)
110. Summary Wildlife Inquiry (2006-2010)
111. Hunter Days
112. AllKillsCty (2006-2010)
113. Buck Harvest Density 2009 Midwest Powerpoint
114. Chronic Wasting Disease in Wisconsin Deer (2005-2010)
115. Hunter\_Days\_9\_Day\_November\_Firearm\_Season.ppt
116. Item 15- Data Collected
117. QDMA Record Book Buck Harvest Map and 2009 Chart
118. Regional Antlered and Antlerless Harvests (1990-2010)
119. Regional Buck Harvest Age Composition 1960-2010ppt
120. Buck Faawn\_Doe\_Ratios\_1990-2010ppt
121. Regional Yearling Antler Development Powerpoint
122. Winter Severity Indices (2006-2011)
123. DeerStubOpeningDayWeatherdeerSeen2009vs2010
124. History2010

Qs5,8,9,11,14,15,21,22,25,30,31,32,36

1. 2011 Ectoparasite manuscript (Piette) Final
2. CWD Tissue Sharing
3. Health Section for Question 5
4. Near Final CERANR RFP for 2011
5. External Review
6. SAG Report
7. WCC Brochure (trifold) 09-11
8. WCC

9. Agency Partnerships Health Section
10. Escaped Captive Deer Policy Revised 6-15-10
11. Final Signed MOU
12. IAHST
13. IAHST\_WHAC
14. MAFWA 2010 Report
15. MAFWA Letter for CWD Funding
16. MAFWA Report
17. MAFWA Report 10
18. Partnership with WVDL
19. CWD Code References
20. CWD Response Plan Goal
21. 2008\_CWD\_Brochure
22. CWD Web Pages Links
23. CWD Report
24. CWD Book
25. Wildlife Health Section Relationships
26. Number of Dead Deer Found in CWD Core Area and Cause of Death
27. Sick Deer Calls Guidance Flow Chart
28. Bishop 2004 Economic Impacts of CWD in WI
29. Blanchong et al 2007- Landscape Genetics
30. Blanchong et al. WSB 2006\_Deer Removal Effect
31. Cooney and Holsman 2010\_Hunter Support
32. CWD Publications Item 31
33. Grear et al. 2010 Linking process to pattern CWD
34. Grear et al. 2006 Demographic patterns
35. Heisey et al 2010 Linking process to pattern CWD
36. Holsman and Patchenik 2006 Hunter Behavior in DEZ
37. Holsman et al 2010 After the Fire
38. Jennelle et al 2009 JWM Deer Carcass Decomposition
39. Johnson et al 2006 prion protein polymorphs
40. Joly et al 2009 Wisconsin Surveillance
41. Joly et al 2003 Emerging Infection Disease CWD in WI
42. Keane et al 2008 J Vet Diagn Invest Hall Farm
43. Keane et al 2008 J Vet Diagn Invest Lymph node v obex
44. Keane et al 2009 J Clinical Microbiology\_RAMALT
45. Osnas et al 2009 Mapping CWD prevalence in WI Ecol Applications
46. Oyer et al 2007 Long distance movement
47. Petchenik 2006 Landowner Response to Incentives
48. Skultdt elt al 2008 Deer Movements in CWD area\_JWM
49. Vaske et al 2006 information sources and knowledge
50. Wasserberg et al 2009 Host Culling Adaptive Management
51. CWD Reports-Annual PR reports Item 31

52. PR Annual Report SSEH 9.15.08
53. PR.Annual.Report.Study SSEH.9.1.10
54. PR.annual.Report.StudySSEH.09.09
55. CWDREP 1.Doc
56. MIDWGP Status Reports (2002-5)
57. Wisconsin Deer Status Reports (2006-11)
58. USDA Grant Report 9655-020CA
59. USDA Grant Report 9655-0381-CA
60. USDA Grant Report 9655-0224-CA
61. USDA Grant Report 9655-0381-CA
62. USDA Grant Report 9655-0224-CA
63. USDA Grant Report 9655-0381-CA
64. USDA Grant Report 9655-0224-CA
65. Assembly Natural Resources committee
66. Bimonthly report April 11
67. Bimonthly report August 2011
68. Bimonthly report Jan 11
69. Bimonthly report June 2011
70. Bimonthly report October 2011 Final
71. MAFWA Report 2011
72. MAFWAReport10
73. October 2010 bi-monthly
74. Chronic Wasting Disease in Wisconsin Deer (2005-10)
75. Staples Marketing Reports, CWD- Billboards, brochure, bumper sticker, Focus Group Research, HHH Logo Images, HHH Talking Points, Media Aids, Post-Implementation Testing, Presentations & Timelines, Videos, Web Visits Reports
76. Health Data
77. 2300280 (2008-10)
78. Deer Harvest Reports (2006-10)
79. Program Summary
80. Shooting Permit Summary 2010
81. CWD Data Model 20070912
82. WDACP Main1.1
83. WHDB CORE
84. WHDB PEOPLE
85. WHDB STORAGE
86. WHDB SUPPORT
87. Deer Vehicle Accident Issue Brief
88. DNR Deer Vehicle Accident Data 1951-2011
89. Dot Accidents and Traffic 1987-2010
90. DVC memo June 14 Final
91. Item 21 Deer Data Bases, DVCs
92. Summer

93. Variable list for summer data set
94. County
95. Forest
96. History 2010
97. Variable list for county data set
98. Variable list for forest data set
99. Item 21 Deer Data Bases WSI
100. WSI by Station 1960
101. WSI1960-2011
102. CWD Test Results
103. AFWA CWD Working Group
104. CWD Samples by County
105. EHD report April 2005 No. 2
106. Health Section for Question 8
107. Herd Health Monitoring
108. Sick Deer Calls Guidance Flow Chart
109. WSI by Station 1960-2010
110. Science and Health Team notes (2002-2011)
111. CWD Rule Memo 06
112. IHST Statement of Concern
113. CWD White Paper KJM 2 27 09
114. Health and Science Team Discussion of Refuges
115. Interagency Comments on SAG Recommendations
116. Rules Team Question, Response
117. Testing For CWD
118. The Role and Function of the CWD Interagency Health and Science Team

#### Tribal Relations Q10

1. Voight Stipulations for Tech. Man. and other Updates
2. Chip Thresholds 2011

#### Presentations

1. 2011 Deer Review Powerpoint (ppt)
2. 2011 Bill V Trustee Meeting ppt
3. Aminrulesdeertrustee ppt
4. Deer in WI Present 11-07 Forestry ppt
5. Deer Trustee CWD 2010 Surveillance ppt
6. Deer Trustee Deer Health ppt
7. Deer Trustee meeting Nov 8, 2011 ppt
8. Deer Trustee Petchenik ppt
9. Deer Trustee Research update ppt
10. Deer Survey and Data ppt

#### Research Q29

1. Item 29 Completed projects, Baiting
2. Thompson et al. JWM 2008
3. VanDeelen et al 2006 bait
4. Walrath et al WSB 2011
5. Walrath, Ryan Masters Thesis
6. Completed projects Item 29
7. Deer Repellent Study material list
8. Predation white paper
9. Sedgek ppt
10. Repellent trial
11. Sciences Services Answers to Deer Trustee
12. Deer Population Status Rep (2006-10)
13. Final 2010 Deer Population estimates
14. Item 20 SAK Model
15. SAK Audit Final Report
16. Dissertation Summary

## **APPENDIX III**



State of Wisconsin  
Governor Scott Walker

**Department of Agriculture, Trade and Consumer Protection**  
Ben Brancel, Secretary

May 17, 2012

Dr. James Kroll  
Whitetail Deer Trustee  
PO Box 6109  
SFA Station  
Nacogdoches, TX 75962

Dear Dr. Kroll;

We've met a couple of time already this year concerning Whitetail Deer (WTD) management in Wisconsin. Wisconsin has a viable deer farming industry and one of the largest number of deer farms in the US. As you are well aware, our agency has responsibility for deer management "inside the fence" while the DNR has responsibility for the wild herd. In addition to the fence-line interface between the wild and domestic deer herd there is at least one other area of concern between the two herds that I would like to bring to your attention. That issue is orphan deer and more specifically, the illegal "adoption" of orphan deer by well-intentioned but unknowledgeable private citizens.

There are provisions in administrative rules and statutes that prohibit the adoption of orphan deer. These prohibitions are soundly based in animal disease concerns. Chronic Wasting Disease and its control is a major effort in Wisconsin and many other states. CWD exists in Wisconsin's wild deer herd and in the wild deer and elk herds in fifteen other states. In Michigan the primary disease of concern is tuberculosis (TB) which is endemic in NE Michigan's wild deer herd. Brucellosis is endemic in wild elk in and around Yellowstone National Park. Axis deer in Hawaii are a reservoir of tuberculosis.

CWD has been found on eight WTD farms and one elk farm. Every infected WTD farm but one had either historically started with captured wild WTD or adopted orphan fawns. In one case the only infected animal was an illegally adopted wild fawn. The farm that did not adopt orphan fawns was also a taxidermy operation located near the CWD zone. There is a plausible link that the source of infection on Wisconsin deer farms is the wild herd and that CWD can be spread via adopted fawns. Deer less than six months of age have been confirmed as CWD positive which also means they were infected at a very young age. Adopting (moving) orphan deer is a risk factor in spreading CWD and could provide a means of amplifying the disease.

Tuberculosis is a zoonotic disease and has significant impact on cattle health, movement and trade restrictions. Over fifty Michigan cattle herds have been infected with the WTD strain of TB since 1998. WTD are the reservoir of TB in Michigan and have infected numerous other

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wild and domestic mammalian species. There is one reported human case of this strain of TB. TB has been confirmed in animals less than one month old.

Currently there are six cattle and bison herds infected with Brucellosis in the three states contiguous to Yellowstone Park. All six herds have an elk strain of brucellosis. There is a known syndrome (latent heifer syndrome) in calves born to infected dams where the calves remain negative on a blood test but shed the brucellosis organism and serve as a source of infection years later.

These are known examples of diseases that can be spread by very young animals. Other diseases could include Q fever, salmonella and rabies. Fawns present a potential disease risk to deer, other animals and humans. Adopted wild animals tend to become too big, too aggressive, too expensive to maintain. They get released back to the wild, sometimes miles distance from their original location. This can move a disease much greater distances over a shorter period of time than in a normal outbreak situation.

Not all "orphan" fawns are truly orphans. The doe may be nearby and out of sight. Even in the case of doe killed by a vehicle there is the possibility that the doe was hit because she had a neurologic problem (CWD) or a respiratory problem (TB) and the fawn with her is already infected. Research in Rocky Mountain National Park has shown that car killed deer have a much higher infection rate for CWD.

While adopting supposedly orphan deer is already illegal, every year adopted deer are reported. The DNR is left with the unenviable task of removing the deer usually by killing them. These cases tend to become media events and in some cases special legislative provisions are enacted to allow people to keep these illegal animals. Perhaps if you can highlight this issue, along with the associated disease risks in your report on Wisconsin deer management, the public will better understand why it's best to leave these fawns in the wild.

Sincerely,

  
Robert G. Ehlenfeldt, DVM  
Administrator-State Veterinarian  
Division of Animal Health  
608-224-4872  
[Robert.ehlenfeldt@wisconsin.gov](mailto:Robert.ehlenfeldt@wisconsin.gov)





June 4, 2012

Dr. James Kroll  
Stephen F. Austin State University  
605 Horseshoe Drive  
Nacogdoches, TX 75962

Subject: Preliminary Deer Trustee Findings

Dear Dr. Kroll:

On behalf of DNR, I want to thank you, Dr. Alt, Dr. Guynn, and all your staff for the effort and energy you have put into the review of Wisconsin's deer management program. We understand that it's a difficult task to come into our state and try to fully understand the history and complexities of deer management programs and hunting cultures in the short time since you started. We appreciate your effort to do so.

We wholeheartedly agree with your team's conclusion that Wisconsin must recognize that white-tailed deer are a keystone species. Deer are indeed a species that can have a profound impact on its habitat, other species of plants and animals, as well as, playing a large role in Wisconsin's economy and culture. You've correctly observed that as we celebrate the white-tailed deer conservation restoration success story of the 20<sup>th</sup> Century, the challenge we now face is building effective management programs for the 21<sup>st</sup> Century. The *Deer Management for 2000 and Beyond* Project was a start, but clearly more is needed.. We share your desire to do so.

We share your view that a successful 21<sup>st</sup> Century program will need to effectively address the three key components of deer management; people, habitat and populations. You've suggested that our agency must increase our attention to the people component. We agree and we are doing so. As you've reported, our agency initiated the human dimensions research that can help guide our efforts to improve. This research highlighted the importance that hunters see that DNR shares their values and that we involve them. A few small steps we've taken are to create ways hunters can contribute to monitoring the herd by recording their observations both on on-line and when registering a deer. Last fall, we launched DNR's first-ever venture into the social media world during the deer seasons and continued it to publicize the deer meetings this spring. This is a great way for hunter's to post messages on the hunt and share their pictures. We will continue to use technology and face-to-face channels to strengthen our people emphasis.

Dr. Alt explained well his experiences as a both hunter and deer program manager for Pennsylvania. He cherishes the hunt and time with family. He indicated his hunting experiences are some of the best times of his life. As the deer program manager, his experiences were very different and often frustrating. He had to be concerned not only with the hunt, but with the health of the woods, deer-car collisions, and other impacts.

In my role within DNR, I have seen these two worlds become a source of frustration and disagreement between Wisconsin's hunters and my staff. I look forward to your suggestions to forge a more collaborative approach. I see the passion that department wildlife staff bring to their jobs everyday. I know that they are terribly frustrated by the view that "DNR doesn't listen". Our job is to be Wisconsin's deer managers and balance the many desires that Wisconsinites have for herds and management. We do hear what people say, but our job can require us to take actions that disappoint people.

I also see the passion Wisconsin's hunters have for deer and their time in the woods. They want their hunt to remain fun and exciting. They want to pass their deer hunting heritage onto future generations. They

acknowledge, but struggle with their key role in using the hunt for managing to keep the herds and habitat healthy. They want us to remember that they are more than mere management tools for conservation.

Both the deer manager and deer hunter want our deer management system to be using the best available habitat and deer population information when making decisions. We support your finding that we are in need of improved and up-to-date land cover information. Our department will be a very willing partner working with others to gain access to current satellite imagery.

Likewise, we will be a very willing partner in reassessing our deer population monitoring programs. You've pointed to difficulty of building precise population estimates. The SAK Audit Panel concluded that Wisconsin should consider consolidating deer management units for purposes of population estimation. Population tracking on larger geographic landscape will help reduce sampling error problems. This coupled with efforts to increase landowner participation in herd monitoring will help build everyone's confidence going forward.

You told forum attendees that the easy work of the deer trustee review is completed, that being the identification of the issues. The heavy lifting will be the formulation of suggestions that will effectively address those issues. I want to pledge our department's continued and full cooperation in this next phase of your work. As you near project completion, we wanted to share some thoughts and feedback. We hope our feedback, along with the many other comments you've received will help aid your progress in developing suggestions.

Sincerely,

A handwritten signature in black ink, appearing to read "Kurt Thiede". The signature is fluid and cursive, with a large initial "K" and a stylized "T".

Kurt Thiede, Administrator  
Division of Lands

Ed Eberle – DOA  
Secretary Stepp – AD/8  
Natural Resources Board



## Wisconsin Chapter of The Wildlife Society

P.O. Box 863, Madison, WI 53701-0863  
www.witws.org

*Approved: 25 April 2012 by  
WCTWS Executive Board*

25 April 2012

Dr. James Kroll, Deer Trustee

Dear Dr. Kroll,

I am writing on behalf of the Wisconsin Chapter of the Wildlife Society (WCTWS) regarding your interim report on Wisconsin's whitetail deer management program. The Wildlife Society is an international organization of wildlife biologists that has chapters in every state and many countries. It is the largest organization of professional wildlife biologists in the world and exists to promote excellence in wildlife stewardship through science and education. The Wisconsin chapter is one of the oldest and most active of the state chapters with over 250 professional members statewide. We appreciate the opportunity to comment on your report. In short, we have the following comments and recommendations with additional detail to follow:

- The SAK model of deer population estimation is performing well and should be retained with improvements as needed.
- WDNR staff and the deer management program are actually responsive to the hunting communities' (should this have an apostrophe?) interests as evidenced by the numerous changes in the deer hunting season framework on an almost annual basis.
- The deer population and management programs should be managed from an ecosystem perspective where deer population goals consider a balance of perspective and needs.
- Chronic Wasting Disease is a serious threat to the deer population and the WDNR should work with its partners to aggressively respond to this threat to protect the long-term future of deer and deer hunting in Wisconsin.
- We agree with you that WDNR should have a larger presence (in or with) private-lands management, not just for deer, but for all wildlife habitats.
- The WCTWS stands ready to assist you with completion of the final report.

The Wisconsin Department of Natural Resources (WDNR) deer management program is a science-based program that has responsibly managed Wisconsin's deer population for well over 50 years. The deer management program, and specifically the "SAK" method of population estimation, has undergone frequent outside reviews (including a 2007 review conducted by a panel including four of the wildlife profession's most respected big-game population scientists and two well-respected state-agency managers) and is known for both its transparency and rigor. WDNR deer biologists are and have been involved with international, national, and regional meetings of deer biologists in the Northeast, Southeast, and Midwest to actively seek better methods for managing deer in Wisconsin. As new scientific methods become proven they are adapted for use in Wisconsin as appropriate. For example, the WDNR and numerous

partners are engaging in a massive deer research project to address buck recovery rates and cause specific mortality of fawns, two issues that arose directly from the SAK audit in 2007.


While science guides Wisconsin's deer management program, the WDNR is charged with balancing the interests of all constituencies in keeping with the Roosevelt Doctrine and the Public Trust Doctrine while maintaining deer herds within ecological and sociological sideboards. As a result, constituents are involved at virtually every step of the deer management process through informational meetings and public hearings. As evidence of WDNR's receptiveness to the public's comments, deer hunting regulations are often revised annually based on feedback and desires from the Wisconsin Conservation Congress and the hunting community. This demonstrates that the WDNR does in fact listen to its constituents.

Deer populations in many regions of the state have been chronically above scientifically guided goals for many years. There continues to be real concerns about the long-term ecological sustainability of maintaining deer populations above estimated goals [and its impact on native plant and animal communities]. WCTWS supports and recommends that Wisconsin's deer management program continue to strive for balancing the many needs and interests of Wisconsin's citizens so that we can maintain a healthy deer herd, healthy ecosystem and ample recreational opportunities. We are concerned that your interim report and many of your findings are based on a narrow-segment of Wisconsin citizens who may not be representing the views of the majority of landowners, farmers, foresters and other interested parties.

The Wildlife Society recognizes the important role of wildlife diseases in natural ecosystems, their potential adverse effects on populations and ecosystems, and their implications for human and domestic animal health. Because of the seriousness and relatively unknown impacts from chronic wasting disease (CWD), WCTWS recommends continued investigation into CWD in Wisconsin's white-tailed deer population and requests your support for state natural resource professionals to continue their work to manage this disease.

In an effort to represent the broader constituency and wildlife concerns statewide, WCTWS stands ready to assist you in any way with your on-going review of Wisconsin's deer management program. As such, we request an opportunity to meet with you and your committee to discuss your recommendations prior to the finalization of your report. We believe that we can offer constructive suggestions for improvement so that your final report will be acceptable to all of Wisconsin's citizens.

Sincerely,

  
David Drake, Ph.D.  
Past-President

Cc: Dr. Gary Alt  
Dr. Dave Gwynn  
DNR Secretary  
DNR Board

## **APPENDIX IV**

DMAP REPORT NAME : 2011 RAAP Dublin

DATE: 04-May-12

Table 1. 2011 DMAP Cooperator and Data Information

County	Cooperator	New	Objective	QDM	Acres	Tags
Pulaski	155 1 0000 2011 RAAP	0	decrease	yes	2400	100
					Totals	2400 100
					Square miles	3.8

% Data 98% ( 56 / 57 )  
 % HD 0% ( 0 / 57 )

Table 2. DMAP Cooperator History

Cooperator	Objective	QDM	Acres	(mi2)	Tags	% Data	% HD
1985						100% ( 61 / 61 )	0%
1986						99% ( 74 / 75 )	0%
1987						100% ( 97 / 97 )	0%
1988						100% ( 67 / 67 )	0%
1989						100% ( 97 / 97 )	0%
1990						100% ( 95 / 95 )	0%
1991						92% ( 109 / 119 )	0%
1992						100% ( 86 / 86 )	0%
155 1 0000 1993 RAAP			2800	4.4	100	100% ( 44 / 44 )	0%
155 1 0000 1994 RAAP			2800	4.4	130	100% ( 42 / 42 )	0%
155 1 0000 1995 RAAP			2800	4.4	100	100% ( 61 / 61 )	0%
155 1 0000 1996 RAAP			2800	4.4	60	100% ( 28 / 28 )	0%
155 1 0000 1997 RAAP			2800	4.4	60	98% ( 41 / 42 )	2%
155 1 0000 1998 RAAP			2800	4.4	65	100% ( 44 / 44 )	0%
155 1 0000 1999 RAAP	stabilize	yes	2800	4.4	65	100% ( 63 / 63 )	0%
155 1 0000 2000 RAAP	stabilize	yes	2800	4.4	65	97% ( 69 / 71 )	0%
155 1 0000 2002 RAAP	stabilize	yes	2800	4.4	100	100% ( 100 / 100 )	0%
155 1 0000 2003 RAAP	stabilize	yes	2420	3.8	100	100% ( 86 / 86 )	0%
155 1 0000 2004 RAAP	stabilize	yes	2420	3.8	100	99% ( 67 / 68 )	0%
155 1 0000 2005 RAAP	stabilize	yes	2420	3.8	100	100% ( 67 / 67 )	0%
155 1 0000 2006 RAAP	stabilize	yes	2420	3.8	100	100% ( 66 / 66 )	0%
155 1 0000 2007 RAAP	stabilize	yes	2420	3.8	100	99% ( 93 / 94 )	0%
155 1 0000 2008 RAAP	stabilize	yes	2420	3.8	100	99% ( 101 / 102 )	0%
155 1 0000 2009 RAAP	decrease	yes	2400	3.8	100	97% ( 62 / 64 )	0%
155 1 0000 2010 RAAP	decrease	yes	2400	3.8	100	100% ( 51 / 51 )	0%
155 1 0000 2011 RAAP	decrease	yes	2400	3.8	100	98% ( 56 / 57 )	0%

DMAP REPORT NAME : 2011 RAAP Dublin

DATE: 04-May-12

Table 3. 2011 Deer Kill Summary

	ANTLERED MALES (with ages)	ANTLERED MALES (without ages)	TOTAL ANTLERED MALES	MALE FAWNS	MALES (no age or antlers)	FEMALES	UNKNOWN SEX	TOTAL KILL
Total	24	1	25	8	0	24 (42%)	0	57
Kill/Square Mile			6.7			6.4		15.2

Table 4. Deer Kill History

SEASON	SQ MI	TOTAL ANTLERED MALES	MALE FAWNS	FEMALES	(%)	UNKNOWN SEX	TOTAL KILL
1985		48 ( )	5	9 ( )	15%	0	61 ( )
1986		39 ( )	14	22 ( )	29%	0	75 ( )
1987		45 ( )	14	38 ( )	39%	0	97 ( )
1988		29 ( )	19	19 ( )	28%	0	67 ( )
1989		7 ( )	22	68 ( )	70%	0	97 ( )
1990		31 ( )	16	48 ( )	51%	0	95 ( )
1991		25 ( )	28	66 ( )	55%	0	119 ( )
1992		28 ( )	15	43 ( )	50%	0	86 ( )
1993	4.4	15( 3.4)	9	20( 4.6)	45%	0	44 ( 10.1)
1994	4.4	12( 2.7)	6	24( 5.5)	57%	0	42 ( 9.6)
1995	4.4	30( 6.9)	6	26( 5.9)	43%	0	61 ( 13.9)
1996	4.4	10( 2.3)	6	12( 2.7)	43%	0	28 ( 6.4)
1997	4.4	14( 3.2)	7	21( 4.8)	50%	0	42 ( 9.6)
1998	4.4	18( 4.1)	3	23( 5.3)	52%	0	44 ( 10.1)
1999	4.4	21( 4.8)	5	37( 8.5)	59%	0	63 ( 14.4)
2000	4.4	25( 5.7)	6	40( 9.1)	56%	0	71 ( 16.2)
2002	4.4	40( 9.1)	9	51( 11.7)	51%	0	100 ( 22.9)
2003	3.8	34( 9.0)	18	34( 9.0)	40%	0	86 ( 22.7)
2004	3.8	32( 8.5)	9	27( 7.1)	40%	0	68 ( 18.0)
2005	3.8	31( 8.2)	6	30( 7.9)	45%	0	67 ( 17.7)
2006	3.8	37( 9.8)	4	24( 6.3)	36%	1	66 ( 17.5)
2007	3.8	34( 9.0)	10	50( 13.2)	53%	0	94 ( 24.9)
2008	3.8	27( 7.1)	10	65( 17.2)	64%	0	102 ( 27.0)
2009	3.8	27( 7.2)	6	30( 8.0)	47%	0	64 ( 17.1)
2010	3.8	15( 4.0)	1	35( 9.3)	69%	0	51 ( 13.6)
2011	3.8	25( 6.7)	8	24( 6.4)	42%	0	57 ( 15.2)

Figure 1. Deer Kill History

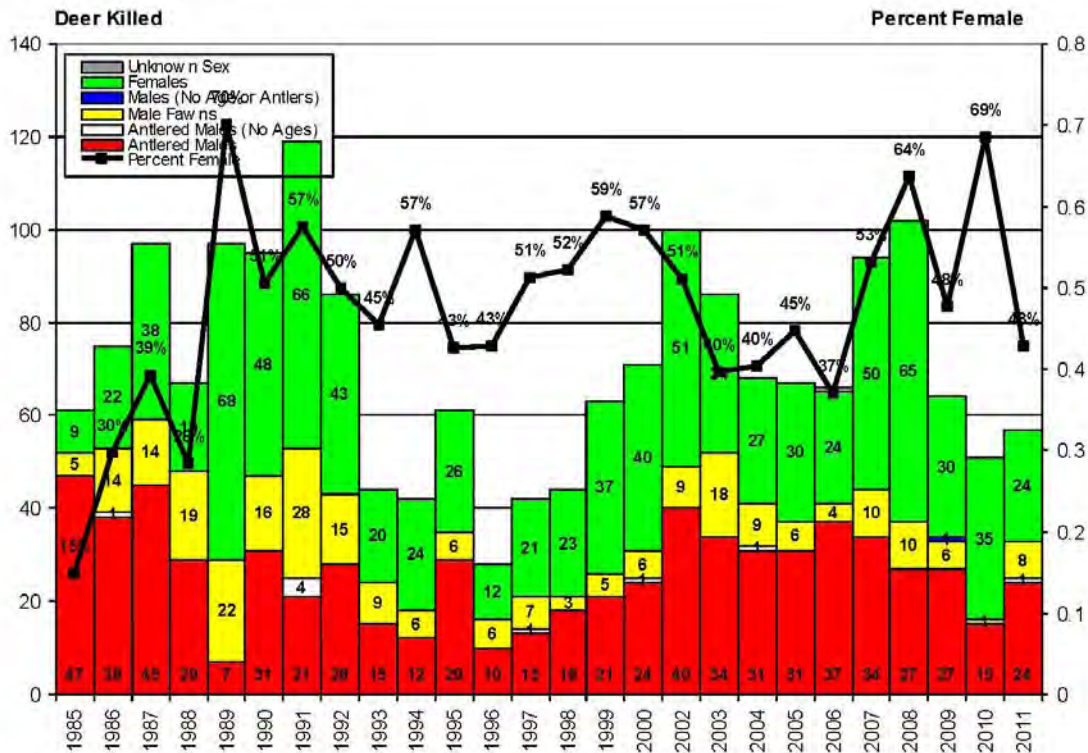




Table 5. 2011 Deer Kill Age Distribution

AGE	MALE		FEMALE		TOTAL	
	No.	(%)	No.	(%)	No.	(%)
0 = Fawns	8	25%	5	21%	13	23%
1 = Yearlings	5	16%	3	13%	8	14%
2 = 2-1/2 Year-olds	3	9%	4	17%	7	13%
3 = 3-1/2 Year-olds	6	19%	6	25%	12	21%
4 = 4-1/2 Year-olds	4	13%	2	8%	6	11%
5 = 5-1/2 Year-olds	2	6%	3	13%	5	9%
6 = 6-1/2 Year-olds	3	9%	0	0%	3	5%
7 = 7-1/2 Year-olds	0	0%	0	0%	0	0%
8 = >=8-1/2 Year-olds	1	3%	1	4%	2	4%
Totals	32	100%	24	100%	56	100%

Note: The fawn per yearling and adult female ratio (FDR) is 0.68 ( 13 / 19 )

Figure 2. Female Deer Kill by Age Class By Year (including female fawns)

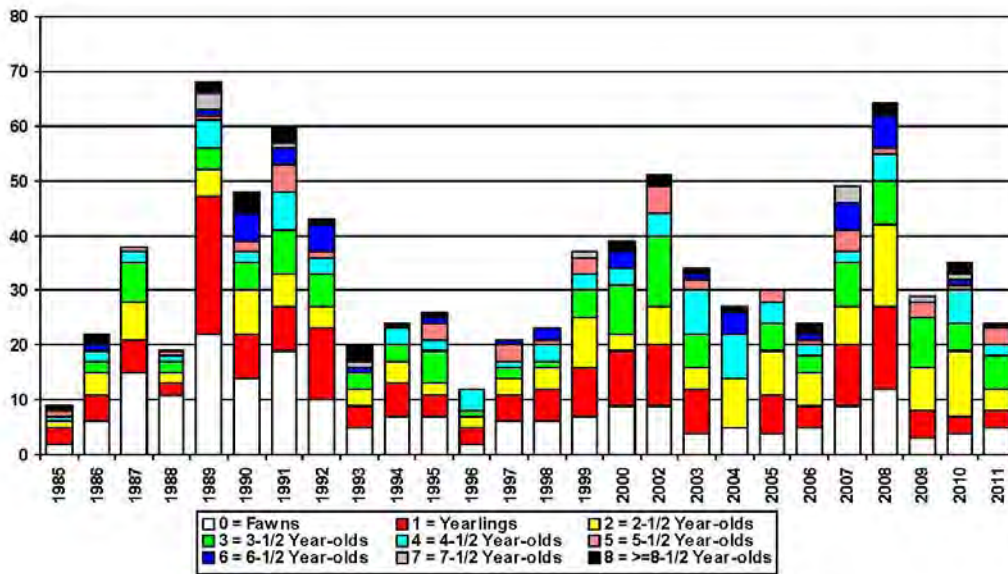
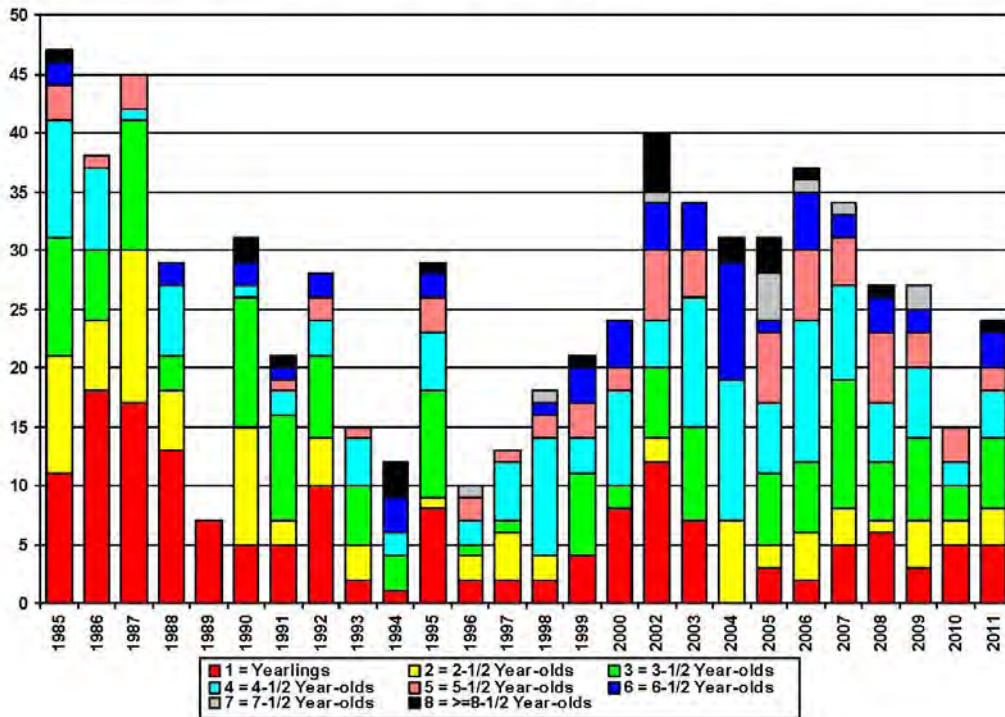


Figure 3. Yearling and Adult Male Deer Kill by Age Class by Year (male fawns not included)



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Table 6. 2011 Statistics for Females

AGE	DRESSED WEIGHTS		LACTATION RATES	
	Avg.	No.	Percent	No.
0 = Fawns	38	5		
1 = Yearlings	62	3	33% (	1 / 3 )
2 = 2-1/2 Year-olds	72	4	75% (	3 / 4 )
3 = >=3-1/2 Year-olds	73	12	83% (	10 / 12 )

Table 7. Statistics for Females History

SEASON	***AVERAGE DRESSED CARCASS WEIGHT***			*****LACTATION RATES*****			FAWN PER DOE RATIO
	FEMALE FAWNS	YEARLING FEMALES	ADULT FEMALES	YEARLING FEMALES	2-1/2 FEMALES	>=3-1/2 FEMALES	
1985	37 ( 2 )	61 ( 3 )	84 ( 4 )	33%( 1 / 3 )	100%( 1 / 1 )	67% ( 2 / 3 )	1.00 ( 7 / 7 )
1986	46 ( 6 )	73 ( 5 )	78 ( 11 )	20%( 1 / 5 )	50%( 2 / 4 )	29% ( 2 / 7 )	1.25 ( 20 / 16 )
1987	40 ( 15 )	67 ( 6 )	80 ( 17 )	33%( 2 / 6 )	86%( 6 / 7 )	100% ( 10 / 10 )	1.26 ( 29 / 23 )
1988	41 ( 11 )	76 ( 2 )	80 ( 6 )	( / 2 )	( / 2 )	75% ( 3 / 4 )	3.75 ( 30 / 8 )
1989	29 ( 22 )	60 ( 25 )	65 ( 21 )	4%( 1 / 25 )	100%( 5 / 5 )	69% ( 11 / 16 )	0.96 ( 44 / 46 )
1990	35 ( 14 )	60 ( 8 )	72 ( 26 )	13%( 1 / 8 )	100%( 8 / 8 )	89% ( 16 / 18 )	0.88 ( 30 / 34 )
1991	34 ( 19 )	56 ( 8 )	70 ( 33 )	( / 8 )	67%( 4 / 6 )	81% ( 22 / 27 )	1.15 ( 47 / 41 )
1992	40 ( 10 )	55 ( 13 )	68 ( 20 )	( / 13 )	25%( 1 / 4 )	94% ( 15 / 16 )	0.76 ( 25 / 33 )
1993	43 ( 5 )	68 ( 4 )	71 ( 11 )	( / 4 )	67%( 2 / 3 )	75% ( 6 / 8 )	0.93 ( 14 / 15 )
1994	41 ( 7 )	65 ( 6 )	65 ( 11 )	( / 6 )	75%( 3 / 4 )	67% ( 4 / 6 )	0.76 ( 13 / 17 )
1995	46 ( 7 )	66 ( 4 )	68 ( 15 )	( / 4 )	100%( 2 / 2 )	69% ( 9 / 13 )	0.68 ( 13 / 19 )
1996	35 ( 2 )	70 ( 3 )	72 ( 7 )	( / 3 )	100%( 2 / 2 )	40% ( 2 / 5 )	0.80 ( 8 / 10 )
1997	41 ( 6 )	71 ( 5 )	69 ( 10 )	( / 5 )	100%( 3 / 3 )	57% ( 4 / 7 )	0.87 ( 13 / 15 )
1998	44 ( 6 )	63 ( 6 )	76 ( 11 )	( / 6 )	75%( 3 / 4 )	86% ( 6 / 7 )	0.53 ( 9 / 17 )
1999	42 ( 7 )	72 ( 9 )	77 ( 21 )	( / 9 )	44%( 4 / 9 )	67% ( 8 / 12 )	0.40 ( 12 / 30 )
2000	36 ( 9 )	63 ( 10 )	73 ( 20 )	( / 10 )	( / 3 )	47% ( 8 / 17 )	0.50 ( 15 / 30 )
2002	33 ( 9 )	59 ( 11 )	66 ( 31 )	( / 11 )	43%( 3 / 7 )	75% ( 18 / 24 )	0.43 ( 18 / 42 )
2003	36 ( 4 )	68 ( 8 )	76 ( 22 )	13%( 1 / 8 )	25%( 1 / 4 )	39% ( 7 / 18 )	0.73 ( 22 / 30 )
2004	38 ( 5 )	( )	71 ( 22 )	( / )	33%( 3 / 9 )	46% ( 6 / 13 )	0.64 ( 14 / 22 )
2005	43 ( 4 )	69 ( 7 )	81 ( 19 )	14%( 1 / 7 )	50%( 4 / 8 )	91% ( 10 / 11 )	0.38 ( 10 / 26 )
2006	45 ( 5 )	72 ( 4 )	73 ( 15 )	( / 4 )	83%( 5 / 6 )	67% ( 6 / 9 )	0.53 ( 10 / 19 )
2007	38 ( 9 )	64 ( 11 )	69 ( 29 )	9%( 1 / 11 )	29%( 2 / 7 )	50% ( 11 / 22 )	0.48 ( 19 / 40 )
2008	40 ( 12 )	64 ( 15 )	70 ( 37 )	( / 15 )	47%( 7 / 15 )	55% ( 12 / 22 )	0.42 ( 22 / 52 )
2009	40 ( 3 )	51 ( 5 )	67 ( 21 )	( / 5 )	50%( 4 / 8 )	46% ( 6 / 13 )	0.35 ( 9 / 26 )
2010	41 ( 4 )	59 ( 3 )	70 ( 28 )	( / 3 )	50%( 6 / 12 )	56% ( 9 / 16 )	0.16 ( 5 / 31 )
2011	38 ( 5 )	62 ( 3 )	73 ( 16 )	33%( 1 / 3 )	75%( 3 / 4 )	83% ( 10 / 12 )	0.68 ( 13 / 19 )

Figure 4. Female Average Dressed Carcass Weights

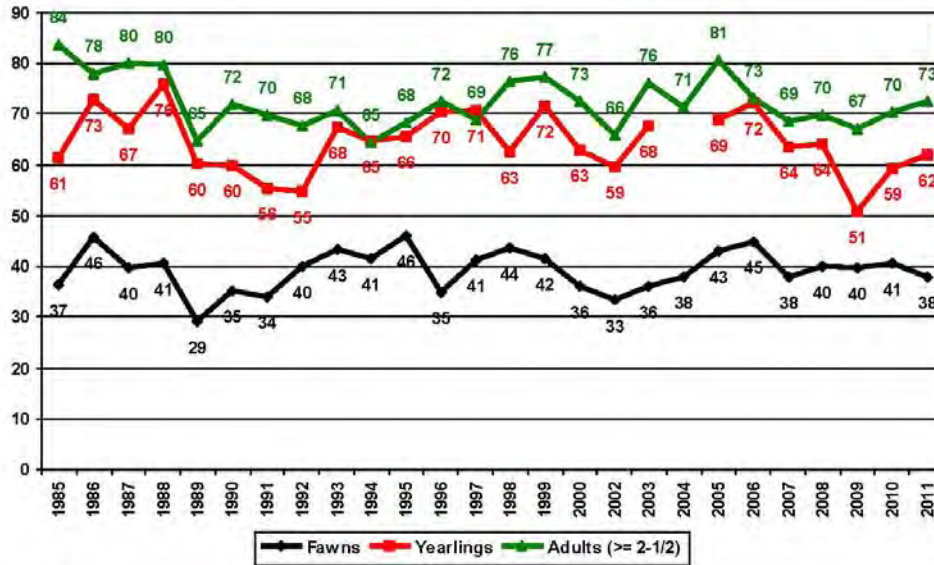
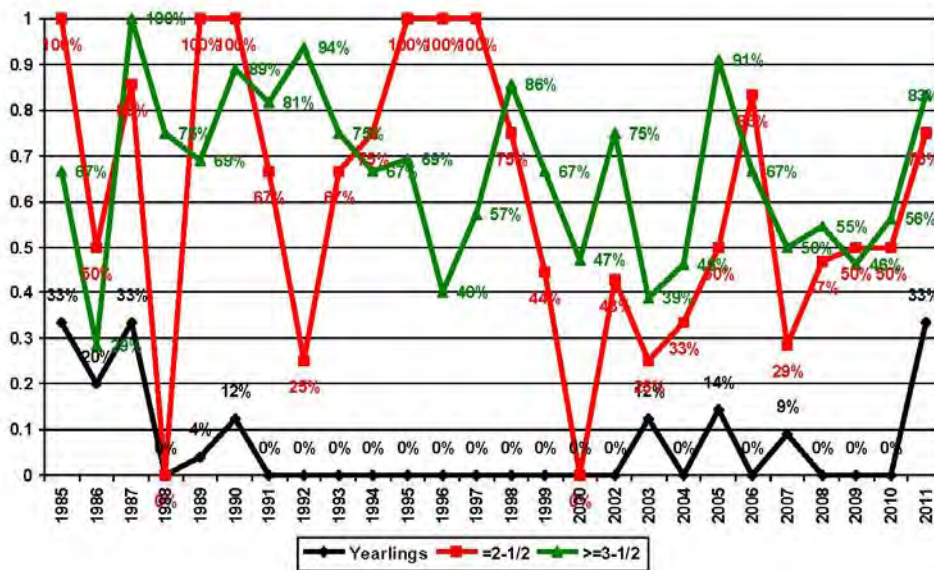


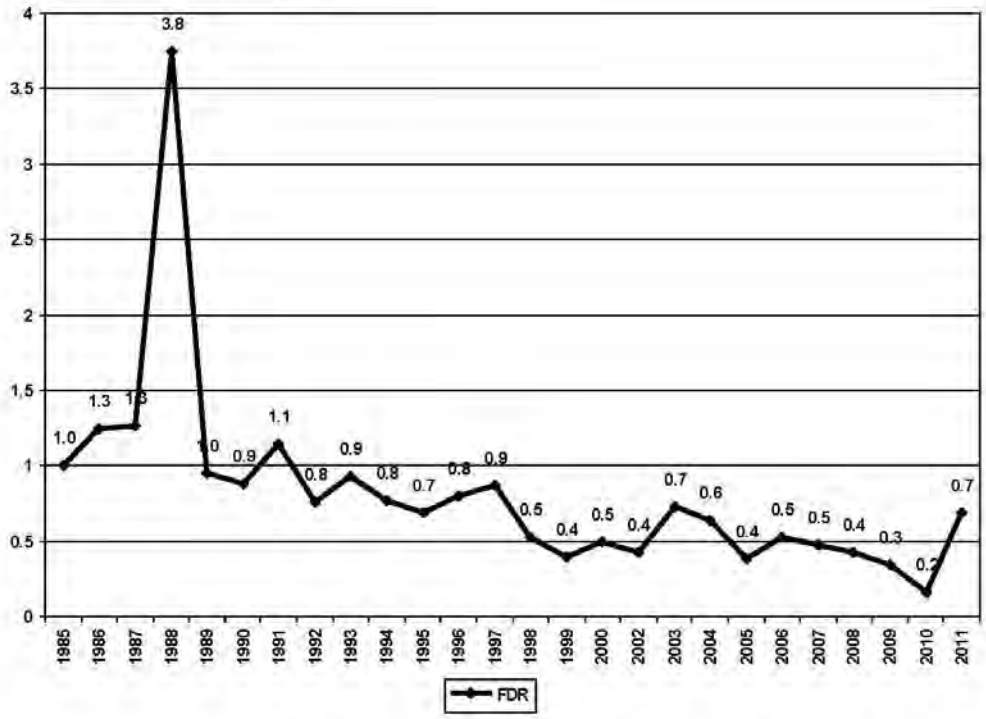
Figure 5. Female Lactation Rates



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Figure 6. Fawn Per Doe Ratio (FDR)



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Table 8. 2011 Statistics for Males

AGE	DRESSED WEIGHT		ANTLER POINTS		BEAM DIAMETER		OUTSIDE SPREAD	
	Avg.	No.	Avg.	No.	Avg.	No.	Avg.	No.
0 = Fawns	42	8						
1 = Yearlings	67	5	2.0	4	9.0	4		0
2 = 2-1/2 Year-olds	98	3	7.3	3	24.7	3	13.4	3
3 = >=3-1/2 Year-olds	115	16	8.5	16	28.8	16	15.8	16

Note: The percent yearling males in the adult antlered buck kill was 21% ( 5 / 24 )

Table 9. Statistics for Males History

	*****AVERAGE DRESSED CARCASS WEIGHT*****				
	MALE FAWNS	YEARLING MALES	2 YEAR-OLD MALES	>=3 YEAR-OLD MALES	% YEARLING MALES
1985	54 ( 5 )	91 ( 11 )	113 ( 10 )	143 ( 26 )	23% ( 11 / 47 )
1986	50 ( 14 )	90 ( 18 )	112 ( 6 )	128 ( 14 )	47% ( 18 / 38 )
1987	46 ( 14 )	81 ( 17 )	107 ( 13 )	129 ( 15 )	38% ( 17 / 45 )
1988	44 ( 19 )	80 ( 13 )	105 ( 5 )	134 ( 11 )	45% ( 13 / 29 )
1989	31 ( 22 )	59 ( 7 )	( )	( )	100% ( 7 / 7 )
1990	40 ( 16 )	58 ( 5 )	98 ( 10 )	109 ( 16 )	16% ( 5 / 31 )
1991	33 ( 28 )	61 ( 5 )	72 ( 2 )	102 ( 14 )	24% ( 5 / 21 )
1992	37 ( 15 )	61 ( 10 )	91 ( 4 )	108 ( 14 )	36% ( 10 / 28 )
1993	41 ( 9 )	77 ( 2 )	85 ( 3 )	111 ( 10 )	13% ( 2 / 15 )
1994	36 ( 6 )	61 ( 1 )	( )	106 ( 11 )	8% ( 1 / 12 )
1995	45 ( 6 )	66 ( 8 )	100 ( 1 )	102 ( 20 )	28% ( 8 / 29 )
1996	42 ( 6 )	64 ( 2 )	97 ( 2 )	103 ( 6 )	20% ( 2 / 10 )
1997	41 ( 7 )	70 ( 2 )	105 ( 4 )	123 ( 7 )	15% ( 2 / 13 )
1998	45 ( 3 )	78 ( 2 )	104 ( 2 )	122 ( 14 )	11% ( 2 / 18 )
1999	43 ( 5 )	68 ( 4 )	( )	120 ( 17 )	19% ( 4 / 21 )
2000	37 ( 6 )	65 ( 8 )	( )	107 ( 15 )	33% ( 8 / 24 )
2002	40 ( 9 )	66 ( 12 )	88 ( 2 )	105 ( 26 )	30% ( 12 / 40 )
2003	42 ( 18 )	68 ( 7 )	( )	119 ( 27 )	21% ( 7 / 34 )
2004	36 ( 9 )	( )	81 ( 7 )	130 ( 24 )	0% ( 0 / 31 )
2005	46 ( 6 )	79 ( 3 )	114 ( 2 )	129 ( 26 )	10% ( 3 / 31 )
2006	49 ( 4 )	83 ( 2 )	121 ( 4 )	131 ( 31 )	5% ( 2 / 37 )
2007	36 ( 10 )	65 ( 5 )	100 ( 3 )	119 ( 26 )	15% ( 5 / 34 )
2008	38 ( 10 )	70 ( 6 )	90 ( 1 )	123 ( 19 )	22% ( 6 / 27 )
2009	38 ( 6 )	56 ( 3 )	90 ( 4 )	109 ( 20 )	11% ( 3 / 27 )
2010	43 ( 1 )	69 ( 5 )	110 ( 2 )	118 ( 8 )	33% ( 5 / 15 )
2011	42 ( 8 )	67 ( 5 )	98 ( 3 )	115 ( 16 )	21% ( 5 / 24 )

Figure 7. Male Average Dressed Carcass Weights

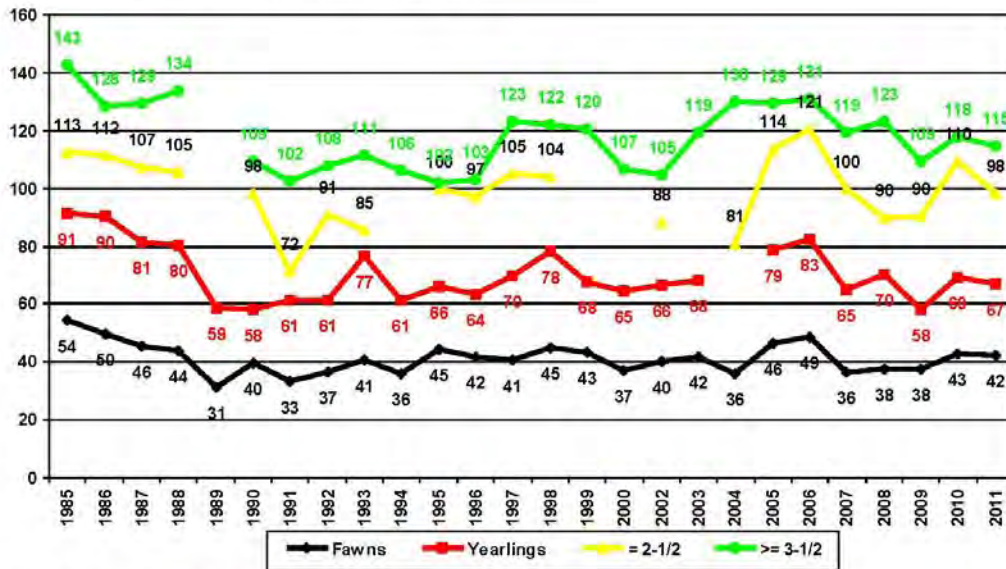


Figure 8. Adult Male Age Structure

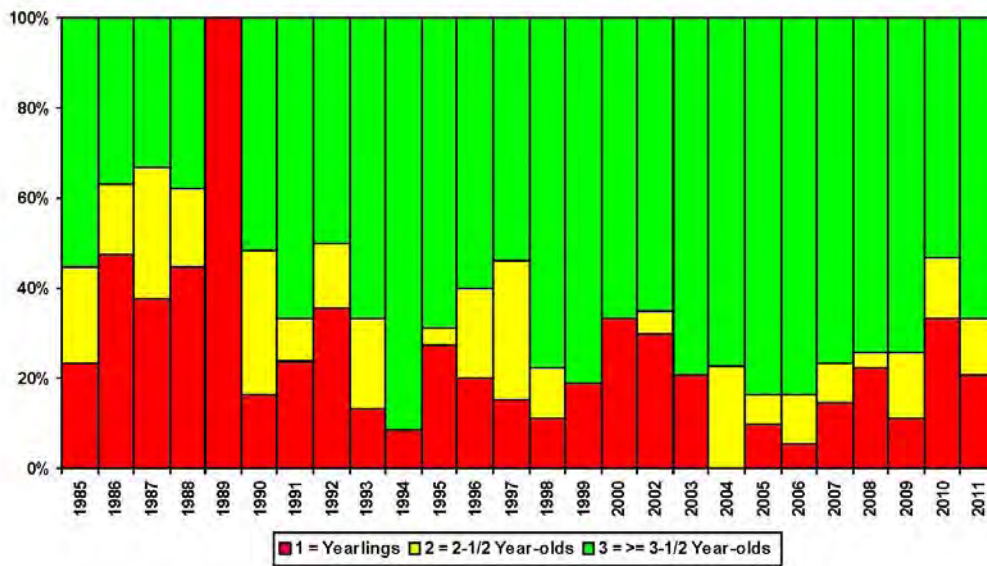


Table 10. Average Antler Characteristics For 1-1/2 Year-old Males (Yearlings).

Season	Number of Antler Points	Antler Beam Diameter (mm)	Outside Antler Spread (in)
1985	6.4 ( 11 )	22.4 ( 10 )	( 0 )
1986	4.9 ( 18 )	18.7 ( 18 )	( 0 )
1987	3.8 ( 17 )	15.5 ( 17 )	( 0 )
1988	4.7 ( 13 )	17.8 ( 13 )	( 0 )
1989	2.0 ( 4 )	10.8 ( 4 )	( 0 )
1990	2.0 ( 1 )	12.0 ( 1 )	( 0 )
1991	2.3 ( 4 )	14.8 ( 4 )	( 0 )
1992	2.0 ( 6 )	12.0 ( 6 )	( 0 )
1993	2.0 ( 2 )	11.0 ( 1 )	( 0 )
1994	( 0 )	( 0 )	( 0 )
1995	2.2 ( 5 )	12.3 ( 4 )	( 0 )
1996	2.0 ( 2 )	25.5 ( 2 )	( 0 )
1997	3.0 ( 2 )	16.0 ( 1 )	( 0 )
1998	( 0 )	10.0 ( 1 )	( 0 )
1999	2.0 ( 4 )	12.0 ( 3 )	( 0 )
2000	2.0 ( 8 )	11.8 ( 5 )	( 0 )
2002	2.6 ( 8 )	14.2 ( 5 )	14.1 ( 1 )
2003	2.0 ( 5 )	12.0 ( 3 )	( 0 )
2004	( )	( )	( )
2005	2.0 ( 2 )	11.0 ( 1 )	4.9 ( 1 )
2006	2.5 ( 2 )	15.0 ( 1 )	4.5 ( 1 )
2007	2.0 ( 4 )	9.8 ( 4 )	( 0 )
2008	2.0 ( 4 )	11.8 ( 4 )	3.9 ( 2 )
2009	2.0 ( 1 )	10.0 ( 1 )	3.6 ( 1 )
2010	2.0 ( 4 )	9.3 ( 3 )	( 0 )
2011	2.0 ( 4 )	9.0 ( 4 )	( 0 )

Figure 9. Average Antler Characteristics For 1-1/2 Year-old Males (Yearlings).

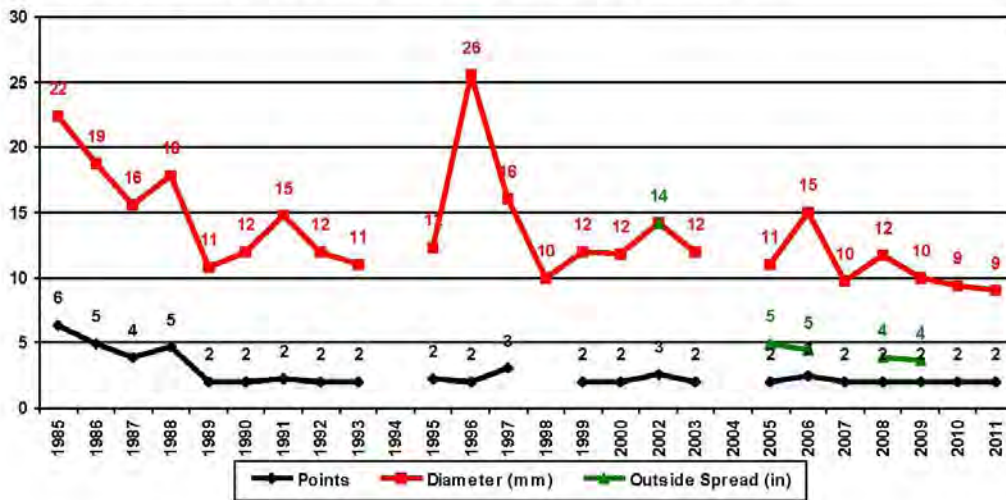




Table 11. Average Antler Characteristics For 2-1/2 Year-old Males.

Season	Number of Antler Points	Antler Beam Diameter (mm)	Outside Antler Spread (in)
1985	8.2 ( 10 )	26.9 ( 10 )	( 0 )
1986	8.0 ( 6 )	25.5 ( 6 )	( 0 )
1987	7.1 ( 11 )	23.1 ( 11 )	( 0 )
1988	7.4 ( 5 )	22.8 ( 5 )	( 0 )
1989	( )	( )	( )
1990	8.0 ( 7 )	23.1 ( 7 )	( 0 )
1991	5.5 ( 2 )	21.0 ( 2 )	( 0 )
1992	7.0 ( 4 )	23.3 ( 4 )	( 0 )
1993	6.7 ( 3 )	20.7 ( 3 )	( 0 )
1994	( )	( )	( )
1995	9.0 ( 1 )	25.0 ( 1 )	( 0 )
1996	5.5 ( 2 )	21.0 ( 1 )	( 0 )
1997	7.0 ( 4 )	29.0 ( 4 )	( 0 )
1998	8.0 ( 2 )	24.5 ( 2 )	14.8 ( 2 )
1999	( )	( )	( )
2000	( )	( )	( )
2002	7.0 ( 2 )	23.5 ( 2 )	13.0 ( 2 )
2003	( )	( )	( )
2004	3.0 ( 6 )	15.5 ( 4 )	11.4 ( 2 )
2005	8.0 ( 2 )	25.0 ( 2 )	13.7 ( 2 )
2006	6.5 ( 4 )	26.5 ( 4 )	16.1 ( 3 )
2007	8.0 ( 3 )	22.7 ( 3 )	13.7 ( 3 )
2008	7.0 ( 1 )	20.0 ( 1 )	11.0 ( 1 )
2009	6.8 ( 4 )	23.0 ( 4 )	13.0 ( 4 )
2010	8.0 ( 2 )	21.5 ( 2 )	10.9 ( 2 )
2011	7.3 ( 3 )	24.7 ( 3 )	13.4 ( 3 )

Figure 10. Average Antler Characteristics For 2-1/2 Year-old Males.

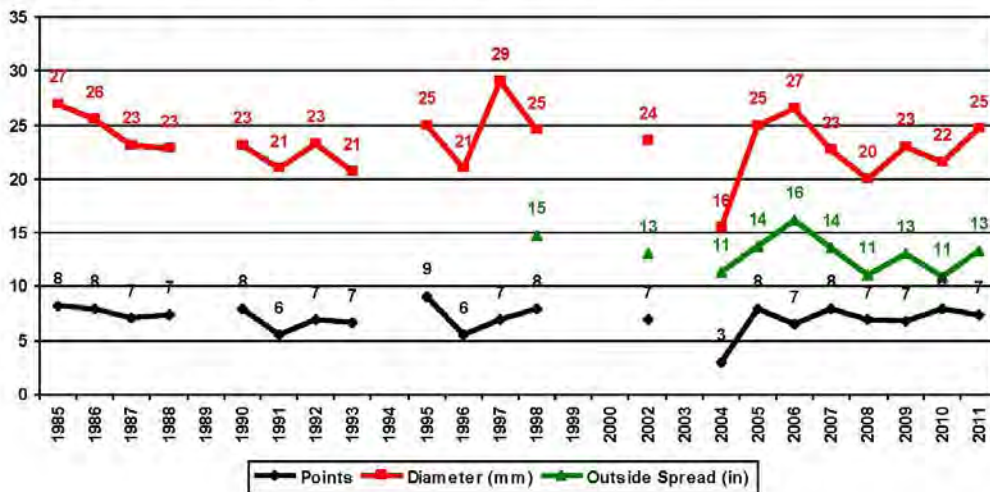
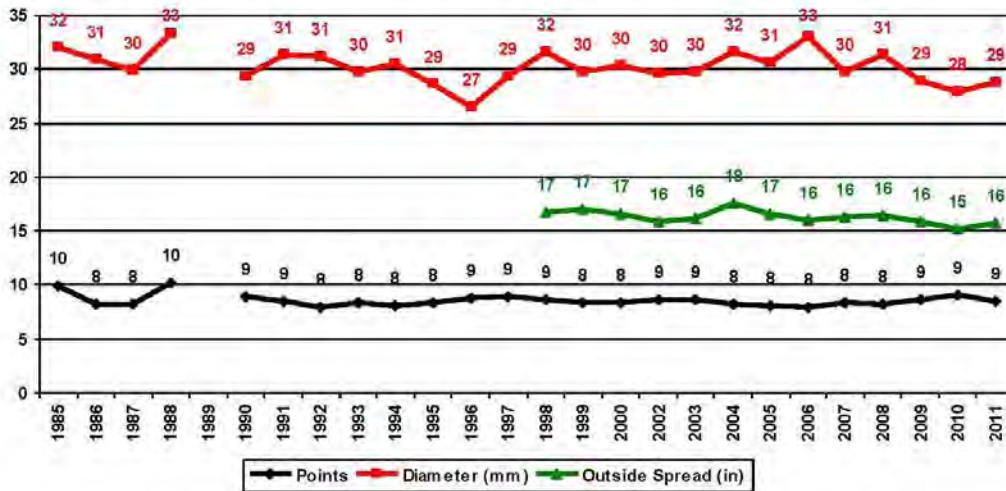


Table 12. Average Antler Characteristics For Males Greater Than Or Equal to 3-1/2 Years Of Age.

Season	Number of Antler Points	Antler Beam Diameter (mm)	Outside Antler Spread (in)
1985	9.9 ( 26 )	32.0 ( 25 )	( 0 )
1986	8.2 ( 14 )	30.9 ( 14 )	( 0 )
1987	8.2 ( 14 )	29.9 ( 14 )	( 0 )
1988	10.2 ( 11 )	33.3 ( 11 )	( 0 )
1989	( )	( )	( )
1990	8.9 ( 15 )	29.3 ( 15 )	( 0 )
1991	8.5 ( 14 )	31.4 ( 14 )	( 0 )
1992	7.9 ( 14 )	31.1 ( 14 )	( 0 )
1993	8.3 ( 9 )	29.8 ( 9 )	( 0 )
1994	8.1 ( 11 )	30.5 ( 10 )	( 0 )
1995	8.4 ( 19 )	28.7 ( 19 )	( 0 )
1996	8.8 ( 6 )	26.5 ( 4 )	( 0 )
1997	8.9 ( 7 )	29.3 ( 7 )	( 0 )
1998	8.6 ( 14 )	31.6 ( 14 )	16.8 ( 14 )
1999	8.4 ( 17 )	29.8 ( 17 )	17.0 ( 16 )
2000	8.3 ( 16 )	30.3 ( 15 )	16.6 ( 16 )
2002	8.6 ( 26 )	29.7 ( 26 )	15.9 ( 26 )
2003	8.6 ( 27 )	29.8 ( 27 )	16.2 ( 26 )
2004	8.3 ( 24 )	31.5 ( 24 )	17.6 ( 24 )
2005	8.1 ( 26 )	30.6 ( 26 )	16.6 ( 26 )
2006	7.9 ( 30 )	33.0 ( 30 )	16.0 ( 30 )
2007	8.4 ( 26 )	29.7 ( 26 )	16.3 ( 26 )
2008	8.3 ( 19 )	31.4 ( 19 )	16.5 ( 19 )
2009	8.7 ( 20 )	29.0 ( 20 )	15.9 ( 20 )
2010	9.0 ( 8 )	27.9 ( 8 )	15.2 ( 8 )
2011	8.5 ( 16 )	28.8 ( 16 )	15.8 ( 16 )

Figure 11. Average Antler Characteristics For Males Greater Than Or Equal to 3-1/2 Years Of Age.



## APPENDIX V

## Deer Related Publications<sup>1</sup>

- \*Blanchong, J.A., D.A. Grear, B.V. Weckworth, D.P. Keane, K.T. Scribner, and M.D. Samuel. Effect of chronic wasting disease on reproduction and fawn harvest vulnerability in Wisconsin white-tailed deer. *Journal of Wildlife Diseases*. In Press.
- \*Blanchong, J.A., D.M., Heisey, S. Libants, K.T. Scribner, C. Johnson, J.M. Aiken, J.A. Langenberg, and M.D. Samuel. 2009. Genetic susceptibility to chronic wasting disease in free-ranging white-tailed deer: Complement component C1q and Prnp polymorphisms. *Infection, Genetics, and Evolution* 9:1329-1335.
- \*Blanchong, J.A., D.O. Joly, M.D. Samuel, J.A. Langenberg, R.E. Rolley, and J.F. Sausen. 2006. White-tailed deer harvest from the chronic wasting disease eradication zone in south-central Wisconsin. *Wildlife Society Bulletin* 34(3):725-731.
- \*Blanchong, J.A., M.D. Samuel, K.T. Scribner, B.V. Weckworth, J.A. Langenberg, and K. Filcek. 2008. Landscape genetics and the spatial distribution of chronic wasting disease. *Biology Letters* 4:130-133.
- Bollinger, T., P. Caley, E. Merrill, F. Messier, M.W. Miller, M.D. Samuel, and E. Vanopdenbosch. 2004. Chronic wasting disease in Canadian wildlife: An expert opinion on the epidemiology and risks to wild deer. Final report to the Canadian Cooperative Wildlife Health Centre. July 2004.
- Conner, M.M., J.E. Gross, P.C. Cross, M.R. Ebinger, R.R. Gillies, M.D. Samuel, and M.M. Miller. 2007. Scale-dependent approaches to modeling spatial epidemiology of chronic wasting disease. Utah Division of Wildlife, United States Geologic Survey, and Association of Fish & Wildlife Agencies Report, Salt Lake City, Utah, USA. 68pp.
- Cross, P.C., J. Drewe, V. Patrek, G. Pearce, M.D. Samuel, and R.J. Delahay. 2009. Host population structure and implications for disease management. Pages 9-29 in R. J. Delahay, G. C. Smith, and M. R. Hutchings (eds.) *Management of Disease in Wild Mammals*. Springer-Verlag Tokyo, Inc. Tokyo.
- \*Grear, D.A., M.D. Samuel, J.A. Langenberg, and D. Keane. 2006. Demographic patterns and harvest vulnerability of chronic wasting disease infected white-tailed deer in Wisconsin. *Journal of Wildlife Management* 70:546-553.
- \*Grear, D.A., M.D. Samuel, K.T. Scribner, B.V. Weckworth, and J.A. Langenberg. 2010. Influence of genetic relatedness and spatial proximity on chronic wasting disease infection among female white-tailed deer. *Journal of Applied Ecology* 47:532-540.
- \*Holsman, R. H., Petchenik, J., & Cooney, E. E. (2010). CWD after "the fire": Six reasons why hunters resisted Wisconsin's eradication effort. *Human Dimensions of Wildlife* 15(3): 180-193.
- \*Holsman, R. H., & Petchenik, J. (2006). Predicting deer hunter harvest behavior in Wisconsin's chronic wasting disease eradication zone. *Human Dimensions of Wildlife* 11(3): 177-189.

- Walter, W.D.**, K.C. Vercauteren, H. Campa III, W.R. Clark, J.W. Fischer, S.E. Hygnstrom, N.E. Mathews, C.K. Nielson, E.M. Schaubert, T.R. Van Deelen, and S.R. Winterstein. 2009. Regional assessment on influence of landscape configuration and connectivity on range size of white-tailed deer. *Landscape Ecology* 24:1405-1420.
- \***Jennelle, C.S.**, M.D. Samuel, C.A. Nolden, D.P. Keane, D.J. Barr, C. Johnson, J.P. Vanderloo, and J.M. Aiken. 2009. Surveillance for transmissible spongiform encephalopathy in scavengers of white-tailed deer carcasses in the chronic wasting disease area of Wisconsin. *Journal of Toxicology and Environmental Health* 72:1018-1024.
- \***Jennelle, C.S.**, M.D. Samuel, C.A. Nolden, and E.A. Berkley. 2009. White-tailed deer carcass decomposition and potential exposure of scavengers to chronic wasting disease. *Journal of Wildlife Management* 73:655-662.
- Johnson, C.J.**, J.M. Aiken, D. McKenzie, M.D. Samuel, and J.A. Pedersen. Highly efficient amplification of chronic wasting disease agent by protein misfolding cyclic amplification with beads (PMCAb). *PLoS ONE*. In Press.
- \***Joly, D.O.**, C.A. Ribic, J.A. Langenberg, K. Beheler, C.A. Batha, B.J. Dhuey, R.E. Rolley, G. Bartelt, T.R. Van Deelen, and M.D. Samuel. 2003. Chronic wasting disease in free-ranging Wisconsin white-tailed deer. *Emerging Infectious Diseases* 9(5):599-601.
- \***Joly, D.O.**, M.D. Samuel, J.A. Langenberg, J.A. Blanchong, C.A. Batha, R.E. Rolley, D.P. Keane, and C.A. Ribic. 2006. Spatial epidemiology of chronic wasting disease in Wisconsin white-tailed deer. *Journal of Wildlife Diseases* 42(3):578-588.
- \***Joly, D.O.**, M.D. Samuel, J.A. Langenberg, R.E. Rolley, and D.P. Keane. 2009. Surveillance to detect chronic wasting disease in Wisconsin white-tailed deer. *Journal of Wildlife Diseases* 45:989-997.
- \***Keane, D.**, [D.J. Barr](#), [J.E. Keller](#), [S.M. Hall](#), [J.A. Langenberg](#), and [P.N. Bochslers](#). 2008. Comparison of retropharyngeal lymph node and obex region of the brainstem in detection of chronic wasting disease in white-tailed deer (*Odocoileus virginianus*). *Journal of Veterinary Diagnostic Investigation* 20(1):58-60.
- \***Keane, D.P.**, D.J. Barr, P.N. Bochslers, S.M. Hall, T. Gidlewski, K.I. O'Rourke, T.R. Spraker, and M.D. Samuel. 2008. Chronic wasting disease in a Wisconsin white-tailed deer farm. *Journal of Veterinary Diagnostic Investigation* 20:698-703.
- \***Keane, D.**, [D. Barr](#), [R. Osborn](#), [J. Langenberg](#), [K. O'Rourke](#), [D. Schneider](#), and [P. Bochslers](#). 2009. Validation of recto-anal mucosa associated lymphoid tissue (RAMALT) for immunohistochemical diagnosis of chronic wasting disease in white-tailed deer (*Odocoileus virginianus*). *Journal of Clinical Microbiology* 47(5):1412-1417.
- \***Osnas, E., D.** Heisey, R. Rolley, and M. Samuel. 2009. Spatial and temporal patterns of an emerging wildlife epidemic: fine scale mapping of chronic wasting disease in Wisconsin. *Ecological Applications* 19:1311-1322.
- \***Oyer, A.M.**, N.E. Mathews, and L.H. Skuldt. 2007. Long-distance movement of a white-tailed

deer away from a chronic wasting disease area. *Journal of Wildlife Management* 71(5):1635-1638.

- \*Petchenik, J. & Watermolen, D. J. (2011). A cautionary note on using the Internet to survey recent hunter education graduates. *Human Dimensions of Wildlife*, 16(3): 216-218.
- \*Petchenik, J. (2010). The human dimensions of chronic wasting disease: Introduction to the special issue. Guest Editor of *Human Dimensions of Wildlife*, 15(3), 161-164.
- \*Petchenik, J. (2006). Landowner responses to harvest incentives in Wisconsin's southwest chronic wasting disease eradication zone. *Human Dimensions of Wildlife*, 11(3), 225-226.
- \*Robinson, S.J., M.D. Samuel, C.J. Johnson, M. Adams, and D.I. McKenzie. Emerging prion disease drives host selection in a wildlife population. *Ecological Applications*. In Press.
- \*Robinson S.J., M.D. Samuel, K.I. O'Rourke, and C.J. Johnson. The role of genetics in chronic wasting disease of North American cervids. *Prion*. In Press.
- \*Rogers, K.G., S.J. Robinson, and M.D. Samuel. 2011. Diversity and distribution of white-tailed deer mtDNA lineages in CWD outbreak areas in southern Wisconsin, USA. *Journal of Toxicology and Environmental Health* 74:1521-1535.
- Samuel, M.D., and B.J. Richards. 2006. Chronic wasting disease in free-ranging North American cervids. Page 324-328 in *Proceedings 22<sup>nd</sup> Vertebrate Pest Conference*. R. M. Timm and J. M. O'Brien (eds). University of California, Davis, CA.
- \*Skuldt, L.H., N.E. Mathews, and A.M. Oyer. 2008. White-tailed deer movements in a chronic wasting disease area in south-central Wisconsin. *Journal of Wildlife Management* 72(5):1156-1160.
- \*Stafford, N. T., Needham, M. D., Vaske, J. J., & Petchenik, J. (2007). Hunter and nonhunter beliefs about chronic wasting disease in Wisconsin. *Journal of Wildlife Management*, 75(5), 1739-1744.
- Thompson, A.K., and M.D. Samuel. 2007. Alternative bait marker systems for white-tailed deer. Pages 223-231 in *Proceedings of the 12<sup>th</sup> Wildlife Damage Management Conference*. D. L. Nolte, W. M. Arjo, and D. H. Stalman, eds.
- \*Thompson, A.K., M.D. Samuel, and T.R. Van Deelen. 2008. Alternative feeding strategies and potential disease transmission in Wisconsin white-tailed deer. *Journal of Wildlife Management* 72:416-421.
- Van Deelen, T.R. and K.R. McCaffery. 2004. Baiting and feeding deer in the face of chronic wasting disease: Lessons from Wisconsin. *The Wildlife Society. Annual Meeting Symposium: Implications of baiting and feeding game wildlife species*.
- \*Vaske, J. J., Needham, M. D., Newman, P., Manfredo, M. J., & Petchenik, J. (2006). Potential for conflict index: Hunters' responses to chronic wasting disease. *Wildlife Society Bulletin*, 34(1), 44-50.

\*Vaske, J. J., Needham, M. D., Stafford, N. T., Green, K. & Petchenik, J. (2006). Information sources and knowledge about chronic wasting disease in Colorado and Wisconsin. *Human Dimensions of Wildlife*, 11(3), 191-202.

\*Vaske, J. J., Timmons, N. R., Beaman, J., & Petchenik, J. (2004). Chronic wasting disease in Wisconsin: Hunter behavior, perceived risk, and agency trust. *Human Dimensions of Wildlife*, 9(3), 193-209.

\*Wasserberg, G., E.E. Osnas, R.E. Rolley, and M.D. Samuel. 2009. Host culling as an adaptive management tool for chronic wasting disease in white-tailed deer: a modeling study. *Journal of Applied Ecology* 46:457-466.

\*Xie, Z., K.I. O'Rourke, Z. Dong, A.L. Jenny, J.A. Langenberg, E.D. Belay, L.B. Schonberger, R.B. Petersen, W. Zou, Q. Kong, P. Gambetti, S.G. Chen. 2006. Chronic wasting disease of elk and deer and Creutzfeldt-Jakob disease: comparative analysis of the scrapie prion protein. 2006 *The Journal of Biological Chemistry* 281(7):4199-206.

### **White-tailed Deer Biology or Management**

\*Jacques, C.N., K.R. McCaffery, J.A. Jenks, and J.T. Baccus. 2009. Semi-melanistic white-tailed deer in northern Wisconsin. *The Prairie Naturalist* 40(3/4):125-128.

\*Jacques, C.N., T.R. Van Deelen, W.H. Hall, Jr., K.J. Martin, and K.C. VerCauteren. 2011. Evaluating how hunters see and react to telemetry collars on white-tailed deer. *Journal of Wildlife Management* 75:221-231.

\*Jacques, C.N., W.E. Ishmael, T.R. Van Deelen, and R.E. Rolley. 2007. A late-born white-tailed deer, *Odocoileus virginianus*, fawn in southcentral Wisconsin. *Canadian Field-Naturalist* 121(3): 333-335.

Kubisiak, J.F., K.R. McCaffery, W.A. Creed, T.A. Heberlein, R.C. Bishop and R.E. Rolley. 2001. Sandhill Whitetails: providing new perspective for deer management. Wisconsin Department of Natural Resources Madison 53707. 282pp.

\*Larkin, R.P., T.R. Van Deelen, R.M. Sabick, T.E. Gosselink, and R.E. Warner. 2003. Electronic signaling for prompt removal of an animal from a trap. *Wildlife Society Bulletin* 31:392-398.

\*Storm, D.J., M.D. Samuel, T.R. Van Deelen, K.D. Malcolm, R.E. Rolley, N.A. Frost, D.P. Bates, and B.J. Richards. 2011. Comparison of visual-based helicopter and fixed-wing forward-looking infrared surveys for counting white-tailed deer *Odocoileus virginianus*. *Wildlife Biology* 17(4):431-440.

\*Van Deelen, T.R., B.J. Dhuey, C.N. Jacques, K.R. McCaffery, R.E. Rolley, and K. Warnke. 2010. Effects of earn-a-buck and special antlerless-only seasons on Wisconsin's deer harvest. *Journal of Wildlife Management* 74(8):1693-1700.

\*Van Deelen, T.R., B. Dhuey, K.R. McCaffery, and R.E. Rolley. 2006. Relative effects of baiting

and supplemental antlerless seasons on Wisconsin's deer harvest. *Wildlife Society Bulletin* 34(2):322-328.

\*Van Deelen, T.R., and D.R. Etter. 2003. Effort and the functional response of deer hunters. *Human Dimensions of Wildlife* 8:97-109.

\*Van Deelen, T.R., P. Kaiser, M.A. Watt, and S. R. Craven. 2007. Quintuplet fetuses from a white-tailed deer in Wisconsin. *American Midland Naturalist* 157:398-400.

\*VerCauteren, K.C., T.R. Van Deelen, M.J. Lavelle, and W. Hall. 2010. Assessment of the abilities of white-tailed deer to jump fences. *Journal of Wildlife Management* 74:1378-1381.

\*Walrath, R., T.R. Van Deelen, and K.C. VerCauteren. 2011. Efficacy of proximity loggers for detection of contacts between maternal pairs of white-tailed deer. *The Wildlife Society Bulletin* 35:452 - 460.

\*Walter, W.D., K.C. Vercauteren, H. Campa III, W.R. Clark, J.W. Fischer, S.E. Hygnstrom, N.E. Mathews, C.K. Nielson, E.M. Schauber, T.R. Van Deelen, and S.R. Winterstein. 2009. Regional assessment on influence of landscape configuration and connectivity on range size of white-tailed deer. *Landscape Ecology* 24:1405-1420.

### **Habitat Management**

\*McCaffery, K.R. 2005. Book review: *Wildlife & Woodlot Management*. *Journal of Wildlife Management* 69(4):1753.

### **Predators**

Del Giudice, G.D., K.R. McCaffery, D.E. Beyer, Jr., and M.E. Nelson. 2009. Prey of wolves in the Great Lakes Region. Pages 155-173 *In* Wydeven, A.P., T.R. Van Deelen, and E.J. Heske (editors). *Recovery of Gray Wolves in the Great Lakes Region of the United States: An Endangered Species Success Story*. Springer, New York, NY, USA. 350pp.

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<sup>1</sup>\*= Peer-reviewed.

University of Wisconsin affiliated senior author.

DNR senior author.

Other agency senior author.

Other university senior author.



## **APPENDIX VI**

## **Wisconsin Department of Natural Resources**

### **Wildlife Management Sub-Program**

**Title:** Wildlife Biologist

**Classification:** Wildlife Biologist – Senior

#### **Role the Position Plays in the Organization:**

This position is responsible for the planning, coordination and implementation of the wildlife management program within the assigned area of the state. This program's mission is to encourage, enable and enhance sound management of the region's wildlife populations and ecosystems to provide the environmental, economic and social benefits of healthy wildlife communities. This position performs a wide variety of highly technical tasks, using a high degree of scientific knowledge and skill to represent Wildlife Management in providing service to the public and developing working relationships with other wildlife management organizations.

#### **Position's Geographic Scope, and Travel Requirements:**

This position is responsible for implementing the wildlife program in assigned counties. Travel within the assigned area will be frequent, with occasional travel to other locations of the state for meetings/conferences.

#### **Scope of Authority:**

This position reports to the Area Wildlife Supervisor and may direct the work of wildlife technicians, equipment operators and limited term employees performing wildlife management and habitat development activities.

#### **Responsibilities and Accountabilities**

##### **10 % Development, monitoring and evaluation of the wildlife management program in assigned area.**

Prepare and submit biennial wildlife project proposals and budget requests in accordance with area and Regional guidelines. Organize, implement, and monitor work plans and budgets for approved projects to ensure satisfactory completion, on time and within budget. Keep the Area Wildlife Supervisor informed of project status and overall program progress through written and oral communications. Conduct an ongoing evaluation of the program progress and take steps to improve performance where needed. Plan and direct the daily work activities of technicians, assistants, limited term employees (LTE's), and volunteers conducting the field phase of operations. Communicate and cooperate with other wildlife biologists and other land managers for enhanced teamwork wherever possible. Prepare needed law and administrative rule change recommendations. Attend training and keep current with advances in wildlife management.

##### **15% Development of public and approved private lands for wildlife, wildlife based public recreation, and planned integrated management.**

Write property master plans and periodically update existing plans for department wildlife management areas and natural areas. Develop and maintain wildlife habitat and public use facilities in accordance with approved plans and all appropriate environmental and safety standards. Consult on timber sales and forest development projects. Implement habitat management initiatives for assigned area. Implement facilities management initiatives for assigned area. Negotiate and issue land use agreements in accordance

with property management objectives (i.e. dog trial and training permits, wood cutting permits, hay cutting, partition fence agreements, etc.). Direct the installation and maintenance of property identification signs and boundary markers as needed. Write environmental assessments and secure all other approvals/permits for land management projects as required. Plan for small projects and obtain engineering plans and approvals for projects as needed. Write project specifications and initiate the purchase orders, sealed bids, news releases and other paperwork for the acquisition of materials and labor needed to complete projects.

**15% Enhancement of wildlife populations and their uses, and development of regulations.**

Conduct approved wildlife population and habitat surveys and user surveys. Identify needs and forward through channels to the Bureau of Research. Prepare annual harvest quota recommendations consistent with established population goals, particularly deer, turkey, geese, and harvest quotas. Evaluate and update hunting, trapping and property management regulations, develop new regulation proposals, initiate and process the approval of new or modified rules and regulations. Establish and maintain a network of Department and cooperative registration stations for deer, turkey, and bear. Monitor the performance of registration stations to ensure proper record keeping, reporting and billings. Direct the stocking of pheasants on selected Department owned and/or leased public hunting grounds. Advise, monitor, and assist clubs participating in the Department's day-old pheasant chick rearing program. Prepare and submit quarterly narrative reports and annual deer season and waterfowl season reports. Coordinate and implement range expansion and reintroduction of turkey, quail, hungarian partridge, trumpeter swan, osprey, pheasants of Iowa and Chinese genetic strains, and other species.

**15% Provision of technical expertise to private landowners and private organizations in the management of wildlife resources.**

Provide technical assistance to conservation clubs, local rod and gun clubs, and other private conservation organizations in the development and implementation of wildlife enhancement projects. Provide technical assistance to private landowners upon request. Investigate, process and administer permits for captive wildlife. Participate in the establishment and implementation of Habitat Restoration Areas, under the Stewardship Fund, and Pheasant Restoration Areas under the Wisconsin pheasant management plan. Coordinate protection and enhancement of riparian habitat in priority watersheds. Assist landowners practicing elements of the Wisconsin Managed Forest Law program.

**2% Provision of lead worker activities.**

Assist in the interviewing and hiring of technician and LTE positions. Plan and schedule work and set job site performance standards. Monitor on the job performance of LTE's. Complete required administrative reports including vehicle, time and travel vouchers. Review LTE time sheets, travel vouchers and vehicle documents for project costs.

**8% Performance of public relations, information and education, outdoor skills and partnership – team interactions using CQI skills and techniques.**

Represent wildlife management, as needed, to Conservation Congress delegates, at public hearings, meetings of local and regional conservation/environmental organizations, service clubs, etc. Represent wildlife management at selected events such as state and county fairs, Farm Progress Days, sport shows, etc. Give news media interviews, deliver talks, conduct tours, write articles, popularized annual reports and news releases to promote understanding of Department wildlife programs. Coordinate and conduct hunter safety and trapper education, Learn to Hunt events, and turkey hunter clinics.

**15% Acquisition of lands, leases, and easements within assigned area.**

Solicit acquisitions, negotiate with landowners, process and implement options for the acquisition of lands needed to meet approved acquisition goals for state lands and federal Waterfowl Production Area Lands. Solicit, contact landowners, negotiate and implement public hunting ground leases and habitat easements.

**5% Implementation of wildlife damage law and nuisance wildlife programs for deer, geese, beaver, and urban wildlife.**

Investigate complaints to determine nature of damage or nuisance and responsibility of DNR. Prescribe and/or administer abatement measures to alleviate damage or nuisance. Issue shooting or other permits to control animals as necessary.

**5% Provision of wildlife health and disease expertise within assigned area.**

Coordinate and conduct wildlife disease surveillance, monitoring and control of disease outbreaks, and checking and monitoring for disease in wildlife reintroductions. Coordinate monitoring and controlling of environmental contaminants and toxics.

**5% Assist the Bureaus of Endangered Resources, Fisheries Management and Habitat, Forestry, Law Enforcement, and Research.**

Protect and manage habitat of endangered, threatened, and nongame species. Conduct surveys as required. Provide Wildlife Management input into Fisheries property master plans and implement approved wildlife management projects on fisheries areas. Provide Wildlife Management input into priority watershed, basin plans, remedial action plan, and critical areas designations. Assist with field investigations of wetland and other land alteration permit applications as needed. Assist in the development of project mitigation plans. Collaborate in the preparation of Managed Forest Law plans for enrollees who have Wildlife Management objectives. Provide Wildlife Management input into Forestry master plans and review timber sale prospectus. Implement approved Wildlife Management projects on state forests. Assist with emergency fire control activities as required. Assist with enforcement of natural resource laws on state properties and work with local law enforcement personnel in the area. Monitor and patrol state land to deter, detect, and rectify problems of trespass, theft, encroachment and safety hazards. Advise Research of management information needs. Conduct special surveys as required and cooperate with various wildlife habitat and population studies.

**5% Assist the U.S. Fish and Wildlife and Forest Service, U. S. Department of Agriculture, Natural Resources Conservation Service, University of Wisconsin System, the Department of Public Instruction and County Government.**

Provide advice and counsel involving management of federal properties. Assist in wetland and grassland restorations. Conduct approved cooperative surveys. Promote Conservation Reserve, Water Bank, Farm Bill, WHIP, EQUIP and other programs with wildlife benefits and provide technical assistance to enrollees. Assist A.P.H.I.S. with their execution of animal damage control efforts. Employ and help train wildlife students through the student intern and work study programs. Serve as in instructor or resource person at teacher workshops in environmental education. Provide technical and expertise in the management of county park lands.

**Competencies: Skills, Abilities and Knowledges**

**Skills and Abilities**

**Innovator**

Taps natural resources trends and market developments to anticipate and respond to current and future

business needs and market opportunities. Understands and communicates innovative strategies to others. Commits to new approaches at the beginning of emerging opportunities. Has ability to demonstrate entrepreneurial risk taking as necessary. Takes chances and embraces challenges, seeing them as opportunities for personal and DNR improvement. Takes independent action to meet critical business objectives, while balancing the uncertainty of a situation with common sense. Is creative in bringing forward new ideas or improves existing ideas, products and services by challenging assumptions and thinking outside the box.

### **Effective Communicator**

Drives free flow of timely and accurate information and communication throughout the agency. Effectively communicates and relates to a broad range of people internally and externally. Articulate. Presents ideas in a clear, persuasive manner.

### **Builds Trusting Relationships & Partnerships**

Builds and effectively utilizes relationships and influences informal networks to achieve goals. Shares knowledge and builds trust with colleagues, superiors and employees. Can be discreet when situation demands. Uses tact when dealing with sensitive issues and personalities. Recognizes sensitive information and keeps it confidential.

### **Confident Presenter**

Conveys poise, clarity and self control in stressful, ambiguous, and emotionally demanding situations. Builds credibility and rapport through honest and direct communication. Gives concise presentations that capture the interests and addresses the needs of the audience. Presents a good professional image through dress, speech, and actions with a demeanor that inspires confidence in the individual and the DNR program he/she represents. Has ability to be self confident. Has faith in and relies on own knowledge and skills. Exudes self-assurance, poise and a clarity of conviction that is compelling, convincing and reassuring.

### **Organized & Focused**

Uses well-reasoned judgment in effectively planning and setting of appropriate work priorities and managing over-all workload responsibilities. Prioritizes tasks, sets milestones, sequences activities, divides tasks among others as needed and sets a reasonable pace. Sustains focus and is persistent and tenacious in the face of any difficulties or resistance encountered. Coordinates realistic time frames and delivers products and services in a timely manner.

### **Takes Action & Shows Initiative**

Reacts quickly and decisively to changing business conditions, while at the same time paying attention to thoroughness and quality. Independently motivated to takes action to meet critical agency/program/unit goals. Sets and monitors own objectives and standards. Is a self-starter that is driven to succeed. Initiates appropriate actions and follows thorough without prompting or close supervision. Demonstrates strong work ethic. When needed, puts in the hours necessary to complete the tasks at the highest level of quality possible. Displays the stamina necessary to work an irregular, demanding schedule.

### **Technical Competencies**

#### *Upon Appointment:*

Wildlife conservation principles and methodologies  
Wildlife population and harvest survey methodologies  
Wildlife habitat management practices  
Research methodologies for wildlife management  
Word processing, spreadsheet, and communication software programs

Other governmental conservation programs

**Full Performance:**

Priorities, fund-raising strategies, and organization of conservation organizations.

Principles of strategic planning

Statute and rule promulgation procedures

Land acquisition processes

**Physical Requirements and Environmental Factors**

Sedentary work: Exerting up to 10 pounds of force occasionally and/or a negligible amount of force between 50-75% in a year's time.

Light work: Exerting up to 20 pounds of force occasionally and/or up to 10 pounds of force frequently, about 25-49% in a year's time.

Medium Work: Exerting up to 20-50 pounds of force occasionally and/or up to 25-50 pounds of force frequently, less than 25% in a year's time.

Heavy Work: Exerting up to 50-100 pounds of force occasionally and/or up to 25-50 pounds of force frequently, less than 25% in a year's time.

Very Heavy Work: Exerting in excess of 100 pounds occasionally and/or in excess of 50 pounds frequently, less than 25% of the time.

**Physical activity Requirements**

The position requires bending at the waist, kneeling, crouching, crawling, climbing, balancing, lifting, carrying, pushing, pulling, reaching, handling, fingering, sitting, standing, talking, hearing, seeing (clarity of vision at 20 feet or more, clarity of vision at 20 inches or less, and the ability to distinguish colors), and walking on foot.

**Physical surroundings and Hazards**

Depending on the time of year, activities occur indoors and outdoors in varying amounts, meaning the incumbent could be exposed to extreme cold (temperatures below 32 degrees for periods of an hour or more), and possibly extreme heat (temperatures above 100 degrees for periods of more than one hour). There may be situations involving sufficient noise to cause the incumbent to shout in order to be heard, may be exposed to vibrating movements of the extremities or whole body. There may be exposure to hazards such as bodily injury (proximity to mechanical parts, electrical current, etc.) and/or exposure to conditions that affect the respiratory system or the skin, such as fumes or odors.

**Equipment Used**

In the performance of their duties, incumbents typically use hand tools, office equipment, fire suppression equipment, motorized equipment, farm equipment/implements, GPS/navigation equipment, power tools, boats/boating equipment, electronic equipment/radios, firearms, and monitoring and sampling devices.

