

40th Midwest Deer and Wild Turkey Study Group Meeting
General Butler State Resort Park
Carrollton, KY August 22–25, 2016

Welcome to Kentucky. We were welcomed by Steve Beam of the Kentucky Department of Fish & Wildlife Resources.

Field to Fork. Brian Clark. Kentucky Department of Fish & Wildlife Resources. Kentucky sales of decreased since the 1980's. In 1987, senior/disabled licenses caused a small spike. The purpose of field to fork is to reach new audiences which is vital for sustaining funding and provide way for private lands biologists to advance the agency's mission by aiming efforts at prospective hunters. The program format consists of focusing on the metro area using deer hunting as the primary tool. Classroom setting provide history, biology, habitat use, hunting techniques, safety, regulations, and a venison sampler. All hunts are mentored with participation typically around 20-30 annually. Results include a high satisfactory rates in which most participants continue to hunt afterward.

Deer Health. Dr. Iga Stasiak. Deer health is affected by many factors: climate change, chemical use, ag land/urban use, human disturbance, invasive species, etc. It is important to manage disease because it can minimize health risks to humans, decrease health risks to livestock, and can conserve populations. Disease management consists of prevention, control, and eradication. Important diseases of wild turkey include avian pox, lymphoproliferate disease virus, and blackhead. Important diseases of WTD include CWD, EHD/blue tongue virus, Bovine and TB.

Deer Breakout Session

Midwest Deer Metrics. Dan Storm. Wisconsin Department of Natural Resources. The responsibilities of the agencies are to monitor population, estimate harvest, and establish harvest regulations. Methods will vary, but an understanding is needed among states to see how they monitor. Midwest Deer Survey conducted that included a 9-page questionnaire which included questions regarding how we survey. Results included spatial framework for harvest, compliance with regulations, sex/age estimates, nutrition, population trends, reproduction, hunter effort, performance goals, and stakeholder input.

Deer Vulnerability. Rebecca Cain. Antler size of record book bucks have been declining for the past 100 years. This analysis looks at broad-scale trends, but management happens on a local scale. Fuzzy Cognitive Mapping is a special kind of concept map in which the components and relationships between components are defined in specific ways.

NDA Update. Nick Pinizzotto. National Deer Association. The NDA's mission statement is "To serve as a guardian for wild deer conservation and our hunting heritage". The 2014 and 2015 Whitetail Summit was reviewed. The key focus areas would be wild deer conservation, diseases, hunter access, marketing and communications, predators and competitors, state and federal land management.

QDMA Update. Kip Adams. Quality Deer Management Association. The QDMA's mission statement is "To ensure the future of White-tailed deer, wildlife habitat and our hunting heritage". The REACH program was discussed, where QDMA would promote research, educate, advocate, certify, and hunt.

County Deer Advisory Councils. Kevin Wallenfang. Wisconsin DNR. The county deer advisory councils require more local involvement, increased communication, and population objectives rather than numeric goals. The CDAC membership consisted of the conservation congress, forestry, agriculture, tourism, local hunting clubs, and at least three members must be deer hunters. The CDAC changed the DMU's from 134 units to 73 counties that were aligned with political boundaries. CDAC members were generally satisfied because they got what they wanted and were very happy with the support from the department. The CDAC is now involved in the new CWD plan.

SW Wisconsin Deer-Predator Project. Dan Storm. Wisconsin DNR. This was a comprehensive study of deer population dynamics in CWD endemic areas. CWD was spreading spatially at about 1-2 km per year and

the prevalence was also on the rise. The purpose was to look at predator number and analyze their effects on populations. Data collection consisted of capture and fitting 200 adults, 100 fawn, 30 coyote and bobcats with GPS collars. The collared animals were monitored for mortality and habitat use. Trail camera grids were set up to monitor deer and predation. There were 2 study area that were 6 miles apart with similar deer densities and habitat but one with a high prevalence of CWD.

Midwest Deer Metrics: What, How and Why We Measure

Robert E. Rolley¹, Daniel J. Storm¹, Kevin B. Wallenfang¹ and Michael J. Tonkovich²

¹ Wisconsin Department of Natural Resources, ² Ohio Department of Natural Resources

INTRODUCTION

Among the core principles of the North American Model of Wildlife Conservation are that wildlife resources are a public trust and science is the proper tool to discharge wildlife policy (Organ et al. 2012). The Public Trust Doctrine holds that certain natural resources, such as water, fish, and wildlife, are held in trust by the government for the benefit of the people (Batcheller et al. 2010, Smith 2011). As managers of the public trust, state wildlife agency professionals are responsible for monitoring populations and harvests; biological and human dimensions research; and public communication, education, and engagement (Smith 2011). Sound management of public trust resources requires decision-makers having access to the best available information about the size of the resource and the potential to grow the resource (Jacobson et al. 2010, Smith 2011). Equitable distribution of the proceeds of the trust to the beneficiaries while maintaining the corpus requires population surveys and research into population dynamics and human dimensions (Organ et al. 2012, Smith 2011).

While state wildlife agencies have common responsibilities for population and harvest monitoring, the methods used vary among states. An understanding of the survey methods used by states is needed to determine whether data can be compared among states (Rupp et al. 2000).

In 1979 the Midwest Deer and Wild Turkey Study Group in cooperation with the North Central Section of The Wildlife Society sponsored a symposium at the Midwest Fish and Wildlife Conference on white-tailed deer population management (Hine and Nehls 1980). The symposium included presentations on deer population estimation, reproduction, harvest estimation, estimation of illegal harvest and non-harvest mortality, and deer impacts on society. These presentations highlighted the various methods used by states in the region to monitor deer demography.

Nearly 20 years after the Midwest symposium, Rolley and McCaffery (1998) resurveyed states in the Midwest about deer monitoring methods. Their focus was on methods used to estimate harvest, population size, and trend; the spatial scale of population monitoring; and assessments of accuracy and precision of monitoring methods.

Our objectives were to update previous assessments of deer monitoring methods to better understand what data Midwest states collect, the methods used to collect these data, and how states use the data to inform management decisions. We broaden our assessment beyond population metrics to include impact metrics in recognition that population size is an incomplete measure of the myriad of public benefits associated with deer resources (Decker et al. 2014).

METHODS

We developed a 9 page questionnaire that asked about what population parameters states measured and methods used to measure those parameters. Parameters assessed included deer harvest size, sex and age composition of the harvest, nutritional condition, population size and trend, reproduction and recruitment, non-harvest mortality, hunter effort and satisfaction, and deer impacts. We inquired as to the spatial scale used to make deer harvest management decisions and the scale used to monitor deer population trends. We also

asked whether states had specific performance goals for their deer management programs, how those goals were expressed, who was involved in setting goals, and what data was used in goal setting.

We e-mailed the questionnaire to deer program managers in the 13 states within the Midwest Deer and Wild Turkey Study Group. Multiple follow-up e-mails were sent to deer program managers to ensure a complete response. Additional follow-up e-mails were sent to clarify answers to several questions.

RESULTS

Completed questionnaires were received from deer program managers in all 13 states within the Midwest Deer and Wild Turkey Study Group.

The spatial framework for deer harvest management decisions varies among states in the Midwest. Seven of 13 states use counties as the basis of deer harvest management and 6 states use deer management units (Table 1). The number of management units per state varies from 18 to 128 with a mean of 82 (median = 88). The average size of management units varies from 337 to 4,300 mi² and averages 1,237 mi² (median = 613). States with fewer, larger units (Kansas, Nebraska, and North Dakota) tend to be western states with lower deer populations and hunter densities.

All states estimate deer harvest size annually. Nine of 13 use electronic mandatory registration (telephone or internet) and 4 (Kansas, Michigan, North Dakota, and South Dakota) use hunter surveys to estimate harvest. Of those states using electronic registration, 5 still maintain some in-person registration stations to facilitate collection of biological samples (including CWD surveillance samples) or for hunter convenience.

In the 4 states that use hunter surveys, the number of questionnaires sent to hunters ranges from 12,800 to 59,000, which represents from 10% to 50% of the hunter population. Response rates vary from 38 to >70%, resulting in sample sizes of 8,100 to approximately 30,000 returned surveys. States with smaller hunter populations sample a higher proportion of hunters in order to estimate harvest with a desired level of precision.

Of the 9 states that estimate harvest with mandatory registration, only 3 reported efforts to estimate compliance (Iowa, Kentucky, and Wisconsin). Iowa reported cross referencing deer that were sampled for CWD against their registration data base. Kentucky has used periodic telephone surveys of hunters conducted by Responsive Management to estimate compliance. Wisconsin used both warden field checks and questions on mail questionnaires to estimate compliance with registration.

Only 8 of 13 states attempt to estimate the sex and age composition of harvested deer beyond categories of adult male, adult female, and fawn (Table 2). In those 8 states, the most widely used method was aging at meat lockers (5 states). Two states reported using mandatory registration stations in some locations or seasons to facilitate classification of harvested deer, 2 used taxidermists, and 2 used hunter-supplied measurements of deer eye-nostril length and/or antler characteristics (beam circumference or inside spread). Missouri indicated they were planning to add hunter submitted measurements in 2016. Michigan reported using voluntary check stations and jaw aging events to age deer. The number of deer annually classified by trained agency personnel varied from fewer than 1,000 to approximately 29,000. Hunter-submitted measurements allowed classification of approximately 150,000 deer into a subset of age classes in Illinois. Most deer aged were associated with firearm season harvests but some bow season harvested deer were aged in a few states.

Approximately half of states responded that they attempt to monitor changes in the nutritional condition of deer populations (Table 3). Parameters measured included pregnancy rates (5 states), yearling antler development (3 states), fat deposits (3 states), lactation rates (1 state), body weight (1 state), serology and parasite load (1 state) and thyroxine levels (1 state). Mandatory and voluntary registration stations and meat lockers facilitated access to hunter harvested yearling bucks for assessment of antler development. Fat deposits and pregnancy rates were mainly assessed in vehicle-killed does in late winter. South Dakota used ultrasound and blood samples to estimate pregnancy rates of does captured for research studies. Kansas reported occasionally using herd condition protocols developed by the Southeast Cooperative Wildlife Disease Study in association with culling operations. Most states assessed nutritional condition on an annual basis, but Ohio only checked

pregnancy of vehicle-killed deer periodically. Sample sizes varied widely among states and methods. Larger samples were associated with antler development of hunter harvested yearling bucks.

All states reported using a harvest index to monitor trends in deer population size (Table 4). Eight states also incorporate a measure of hunter effort into a trend index. Deer-vehicle collision data were used by 8 states. Six states reported using aerial surveys in some applications to index deer abundance. The scale of aerial surveys ranged from limited use in a few selected situations to selected management unit surveys to regional surveys. Six states indicated they used hunter, landowner, or staff observation surveys to monitor deer population changes. Hunter surveys usually relied on diaries of bowhunters, but included gun hunter observations in some states. Roadside surveys were used by 4 states, usually using a distance sampling framework. In Illinois, deer were recorded in conjunction with a furbearer survey. South Dakota was evaluating the utility of spotlight-distance sampling surveys in the Black Hills. Other indices of deer abundance used by Midwestern states included agricultural damage complaints and opinion surveys of agency staff, hunters, and production landowners. Kansas reported experimenting with trail cameras to monitor changes in deer abundance. All states reported using more than one index, with a mean of 3.3 methods/state (range 2-5).

Approximately one-half of Midwestern deer program managers indicated that they attempted to estimate deer population size (Table 5). Three states reported currently using accounting models and 2 reported using herd reconstruction techniques (sex-age-kill or Downing methods). Three states responded that they were developing integrated population models. Three states were using or evaluating roadside-distance sampling to estimate deer density and 2 states were estimating density with aerial surveys.

Most states in the Midwest attempt to monitor changes in deer population at the same spatial scale that they use to regulate harvest (e.g., county or deer management unit). The 2 exceptions were Iowa and South Dakota. Iowa reported monitoring deer abundance for 16 multi-county deer management units versus 99 counties and South Dakota had 11 data analysis areas that were aggregates of 81 deer management units.

Eight of 13 Midwestern states monitor changes in deer reproduction or recruitment (Table 6). The most commonly used methods were harvest fawn:doe ratios and winter fetal counts. Three states reported using observation surveys to estimate late summer or fall fawn:doe ratios. In two instances these were opportunistic surveys while in the third case fawn:doe ratios were calculated from data collected during roadside-distance sampling surveys. Additionally, South Dakota reported estimating neonatal survival from radio-collared fawns.

Most states reported some form of monitoring of non-harvest mortality. Ten states indicated recording reported cases of disease mortality, either EHD, CWD or meningeal worm. Five northern states (Michigan, Minnesota, North Dakota, South Dakota, and Wisconsin) reported using a winter-severity index (WSI) to estimate over-winter mortality. Most WSIs incorporated data on temperature and snowfall but the details of each state's WSI varied (e.g., different thresholds or time periods).

Virtually all states in the region monitor parameters associated with hunter participation, effort, and satisfaction (Table 7). Most monitor the number of licenses and/or permits sold, days hunted, and areas hunted, number of deer seen and ratings of hunt quality of hunter satisfaction. Approximately two-thirds of states track hunter's preferences for deer population trends. Mail surveys with or without internet supplementation were the primary method of collecting deer hunter data (Table 8). Frequency of hunter surveys varied from annual to every 5 years. Many states conduct multiple hunter surveys with different frequencies to address different questions. Sample sizes varied widely among states (range 3,000 - 59,000), with larger samples generally associated with states that rely on hunter surveys for estimation of harvest. States with smaller hunter populations generally contact a larger percentage of their hunters to obtain sufficient number of respondents.

All states reported monitoring agricultural damage caused by deer and most monitored deer-vehicle collisions (Table 9). Eight states indicated they conduct annual or periodic surveys of agricultural producers to assess deer damage. Three states indicated they have programs to appraise deer damage, while others indicated they monitor damage reports or permits issued to control damage. Most states (10) that monitor deer-vehicle collisions utilize crash data provided by their departments of transportation or highway safety. Three states reported that they use carcass removal data either in addition to or in place of accident reports. Kansas and South Dakota replied that they have conducted human dimension surveys of citizens to assess the impacts of

deer-vehicle collisions. North Dakota previously tracked deer-vehicle collisions but their Department of Transportation discontinued providing these data.

Only 2 states responded that they were monitoring environmental impacts of deer. Illinois replied that some nature preserves were conducting browse surveys and Minnesota indicated using consultations with local biologists and foresters. Wisconsin responded that they were trying to develop an environmental impact metric.

Eleven of 13 Midwestern states responded that they had quantifiable performance goals that guide deer management decisions at the local level (Table 10). Indiana responded that they have a management plan that sets general directions for the program but did not have unit-specific goals. Michigan reported that they do not currently have unit-specific goals because hunters rejected proposed goals approximately 10 years ago.

The ways goals are expressed varies substantially among states (Table 10). Four states expressed goals in terms of desired population trend (increase, decrease, maintain). Minnesota responded that their goals were expressed in terms of population size and trend and Kentucky indicated their goals were expressed as desired population size. Performance goals in Illinois were expressed as a tolerable level of deer-vehicle collisions (accidents per billion miles travelled) and Iowa expressed their goals as a population size similar to that in 1995-1999. Goals in Kansas were expressed in terms of public desires. North Dakota expressed their goals as license sales and hunter success rates. Ohio recently moved from goals expressed in terms of population size to managing deer based on social tolerances of production landowners and hunters.

The frequency that performance goals are updated varies widely among states (Table 10). Iowa has not updated their goals since they were set over 15 years ago and Kentucky has not updated goals since 2005. Wisconsin regularly updates its goals every 3 years, North Dakota every 5 years, and Minnesota every 10 years. Four states reported updating their goals annually as part of their annual antlerless quota setting process.

The goal setting process varied substantially among states (Table 11). In Illinois and Iowa, initial goal proposals were developed by statewide advisory committees. Minnesota has used 15-20 multi-unit advisory committees to develop goal proposals. Wisconsin used 72 county advisory committees. In other states, initial goal proposals were developed by agency staff, usually the deer program staff. North Dakota indicated that initial goal proposals were developed by deer program staff in consultation with field biologists and 8 regional advisory committees. South Dakota reported that goal proposals were developed by regional managers together with local biologists and conservation officers. In most Midwestern states with goals, initial goal proposals received administrative review before being approved by the agency board or commission.

All states with goals reported obtaining input from various stakeholder groups to inform their goal setting process (Table 11). Most states indicated receiving input from hunters and farmers. Other stakeholder groups listed by some states included businesses, conservation organizations, transportation, tourism, Native American tribes, local biologists, foresters, and the general public. Various methods were used to solicit input from stakeholder groups. Eight states reported using human dimension surveys and 5 states received input from advisory committees. Many received input during public meetings, open houses or during public comment periods. South Dakota reported developing a phone app that their managers use to document opinions of the public they contact.

All states that set performance goals reported considering either hunter and farmer attitude data or data on crop damage complaints and hunter demand or success (Table 12). Six states reported that data on deer population trends were considered and six states indicated that disease data were given consideration. Deer-vehicle crash data was reportedly considered by 4 states. Public input was noted by 4 states and local biologist input was listed by 3 states. Only two states reported considering data on habitat availability, 2 listed reproduction, and 2 states mentioned buck quality.

DISCUSSION

Big game harvest management strategies start with an inventory of the resource (Strickland et al. 1994). Inventory includes identification of spatial management units and estimation of population status within management units. With the exception of 3 states on the western edge of the Midwest region, deer managers are tasked with managing deer populations in 80 to approximately 130 management units. Monitoring deer populations at this scale presents significant challenges (Hanson 2011). Defining management units is always a compromise between the desires for local control of harvests with being large enough to facilitate the long-term collection of data with the needed precision for management decision making (Strickland et al. 1994).

There is no accepted industry standard for deer population monitoring; data collected among states vary widely (Wildlife Management Institute 2016). Our objective was simply to update our understanding what data Midwest states collect, the methods used to collect these data, and how states use the data to inform management decisions. A detailed discussion of the strengths and weaknesses of particular survey methods was beyond the scope of this manuscript, but see Keegan et al (2011) for a review of many of the methods.

All states in the Midwest use multiple indices to monitor trends in deer populations. Reliance on indices has been criticized because the relationship between the index and true population size is often unknown (Anderson 2001). By using multiple indices managers can have greater confidence of detecting true population change if multiple indices are positively correlated. A harvest index was used by all states. Trends in antlered buck harvest are commonly used to index population trends (Hanson 2011, Strickland et al. 1994). In Williamson's (2003) review of deer harvest management in the Northeast, he cautioned that variation associated with buck harvest rates complicates interpretation of a buck harvest index and encouraged managers to incorporate information about effort into their index or, better yet, to seek independent measures of population size.

Deer-vehicle collision data was widely used by states in the Midwest as an index of population trend. Likely, this is due to these data being inexpensive to obtain as they are often provided by other state agencies (e.g., departments of transportation or highway safety). However, because collection of these data are outside of the control of agency biologists, care is needed in interpreting them as variation in collision data may be unrelated to changes in deer population size.

Virtually all states in the Midwest monitor hunter participation, effort and satisfaction and many track number of deer seen and hunter desired population trend. Sample sizes in some states were sufficiently small to preclude estimation at spatial scales used for harvest management (e.g., county or DMU). Some state only measure hunter effort periodically which limits the utility of harvest/effort indices for anything other than long-term monitoring.

Riley et al. (2002) suggested that the essence of wildlife management is the management of wildlife-related impacts, i. e., the significant effects of interactions among humans and wildlife. In addition to monitoring hunter's ratings of hunt quality and satisfaction, all Midwestern states are monitoring negative impacts of agricultural damage and nearly all are tracking deer-vehicle collisions. More than half the states use annual or periodic surveys of agricultural producers to monitor deer damage to crops while the rest rely on tracking damage complaints and/or permits. With a few exceptions, monitoring of deer-vehicle collisions was largely dependent on information received from other state agencies. While this may be convenient for most managers, this leaves them vulnerable to administrative decisions outside of their control, as in the case of North Dakota. Although deer impacts to forests and the environment has received considerable research focus in recent years (e.g., Côté et al. 2004, Frerker et al. 2014, Rawinski 2014, Webster et al. 2005), there is currently limited data on environmental impacts available for deer management decision making at local scales. In the recent review of Minnesota's deer management program, it was recommended that better documentation of deer impacts on habitat be provided for setting population goals (Minnesota Office of the Legislative Auditor 2016).

There was relatively little consistency among Midwestern states in other parameters related to deer population status. About half of states attempt to estimate deer abundance, sex and age of harvest, nutritional condition, and reproduction or recruitment. There was considerable variation in the methods used to monitor these parameters. The number of deer examined for condition assessments were often too low to permit reliable inference at local scales.

The biggest change in Midwestern deer metrics since Rolley and McCaffery (1998) has been the transition from in-person mandatory check stations to mandatory electronic registration of harvested deer. This transition has been driven by concerns over agency expense and inconvenience for hunters (Hansen 2011, Rupp et al. 2000), despite the fact that check stations were recognized for their ability to collect accurate harvest data within short time frames along with facilitating the collection of useful biological data and public relations values (Rupp et al. 2000).

Most deer program managers in Midwestern states who used check stations in 1998 felt that hunter compliance with regulations that mandated registration was high ($\geq 90\%$, Rolley and McCaffery 1998). The transition to electronic registration raises questions about whether compliance rates will be similar between techniques (Hansen et al. 2006). Three states indicated that they have recently attempted to estimate hunter compliance. While the reporting method differed (mandatory report cards), Rosenberry et al. (2004) observed that harvest reporting rates in Pennsylvania varied by type of deer, season segment, year and DMU. They cautioned that reporting rates estimated at the statewide scale may not accurately reflect local reporting rates. The Minnesota Office of Legislative Audit (2016) questioned the assumptions of constant compliance rates across DMUs and years in Minnesota.

Since 1998, the number of Midwestern states reporting use of harvest trends as an index of abundance increased (+3) while the number using population models or population reconstruction to estimate abundance decreased (-4) (Rolley and McCaffery 1998). No state reported using pellet group counts to index deer abundance in 2016 (-2 from 1998).

The greater emphasis on harvest trends and reduced emphasis on accounting models or population reconstructions may be driven by a desire for greater transparency with stakeholder groups. In contrast, recent advances in the computer-intensive modeling have led to several states developing integrated population models (IPM). The Wildlife Management Institute (2016) considered Bayesian IPMs to be the state-of-the-art in population modeling. The Minnesota Office of Legislative Audit (2016) noted the challenge associated with the unique expertise required for deer population modeling and the need for clear communication of technical aspects of population estimation with citizens involved in goal setting processes.

Most Midwestern states have quantifiable performance goals for specific DMUs to help guide harvest management decisions. Many of these goals are expressed as desired population trends or size but a few are expressed in terms of impacts (e.g., tolerable levels of deer-vehicle crashes, hunter success rates, hunter/farmer desires). However, there is wide variation in the processes used in setting goals, how often the goals are updated, who provides input to the goal setting process and how input is provided and the types of information considered in the process. About half of states utilize quantitative human dimension surveys to collect stakeholder input while the remainder rely on less rigorous methods that may be less reliable and representative. Opinions of hunters and farmers are widely considered by Midwestern states when setting deer management goals but interests of other stakeholders may not be as well reflected. The Minnesota Office of Legislative Audit (2016) suggested the DNR consider expanding the range of interest groups surveyed as part of its goal setting process to include motor-vehicle drivers. Common types of data considered in goal setting processes include recent deer population trends, hunter and farmer attitudes, crop damage complaints, hunter demand and/or success, and disease concerns. Habitat quality, reproduction, and buck quality were listed as categories of data considered by only 2 states each.

Is there a need for greater consistency in deer metrics among Midwestern states? Deer management is a state responsibility and information needs vary among states. There is a wide variety of terrain, habitat and weather patterns across the Midwest. Winter severity is a concern for northern states in the region but not states farther south. Stakeholders in different states may have different expectations. Managers need to be cost-effective and design monitoring programs for state-specific needs. However, the lack of consistency does create challenges for regional analysis.

Widespread mule deer population declines starting in the late 1980s generated interest for greater interstate cooperation and coordination among western states (Heffelfinger and Messmer 2003). The Western Association of Fish and Wildlife Agencies chartered the Mule Deer Working Group to develop solutions to

common mule deer management challenges. Among the many issues this group addressed was the collection and analysis of data. Carpenter et al. (2003) concluded that many questions about drivers of mule deer population change in the West could be better answered if data gathering approaches were more statistically sound, consistent, standardized, and continuous. Mason et al. (2006) argued that enhanced regional collaboration was critical for better understanding of management of western deer and elk populations. They believed there were substantial needs and opportunities to improve interagency coordination and collaboration in data-collection, data-sharing and analysis. They also believed there was a need to improve the rigor of data-collection and analysis strategies. Mason et al. (2006) stressed that states should strive to use common standards for obtaining population data; but they explained that “*by standardization we do not imply that all states use the same survey system but, rather, that all states should at least employ fundamental statistical aspects of random sampling and bias corrections when developing new or applying previously published survey techniques.*”

In response to these demands for greater standardization in data collection, the Mule Deer Working Group produced a handbook titled *Methods for Monitoring Mule Deer Populations* (Keegan et al. 2011). The objective of the handbook was to thoroughly describe various monitoring methods and their advantages and disadvantages. Keegan et al. (2011) recognized that dramatic changes to state’s ongoing monitoring programs were constrained by practical, political and economic factors. They acknowledged that different population management objectives influenced population monitoring needs; some management strategies require more intensive population monitoring than others.

While the 4 western states in the Midwest have populations of mule deer, white-tailed deer is the dominant species in the region. In contrast to mule deer, overabundance is a greater concern of many white-tailed deer managers (McShea et al. 1997, Warren 1997). While deer management is a state responsibility there are shared management challenges. Perhaps chief among them is conflict among stakeholders, appointed administrators, and elected representatives over goals for management (Woolf and Roseberry 1998). Diefenbach and Palmer (1997) recommended “marketing” the need for scientific deer management as an approach to overcome the political conflict associated with deer management. Will greater interstate cooperation, coordination, and data sharing help Midwestern deer managers address these challenges?

ACKNOWLEDGEMENTS

We thank Robert Holsman who reviewed a draft of the survey and offered numerous suggestions for improvement. We also thank the Midwestern deer program managers who took the time to respond to this survey.

LITERATURE CITED

- Anderson, D. R. 2001. The need to get the basics right in wildlife field studies. *Wildlife Society Bulletin*. 29(4):1294-1297.
- Batcheller, G. R., M. C. Bamberg, L. Bies, T. Decker, S. Dyke, D. Gwynn, M. McEnroe, M. O’Brien, J. F. Organ, S. J. Riley, and G. Roehm. 2010. The public trust doctrine: implications for wildlife management and conservation in the United States and Canada. *The Wildlife Society Technical Review* 10-1, Bethesda, Maryland, USA.
- Carpenter, L. H., D. Lutz, and D. Weybright. 2003. Mule deer data types, uses, analyses, and summaries. Pages 163–176 in J. C. deVos, M. R. Conover, and N. E. Headrick, editors. *Mule deer conservation: issues and management strategies*. Jack H. Berryman Institute, Utah State University, Logan, USA.
- Côté, S. D., T. P. Rooney, J.-P. Tremblay, C. Dussault, and D. M. Waller. 2004. ecological impacts of deer overabundance. *Annual Review of Ecology, Evolution, and Systematics* 35:113-147.
- Decker, D. J., A. B. Forstchen, J. F. Organ, C. A. Smith, S. J. Riley, C. A. Jacobson, G. R. Batcheller, and W. F. Siemer. 2014. Impacts management: An approach to fulfilling public trust responsibilities of wildlife agencies. *Wildlife Society Bulletin* 38:2-8.

- Diefenbach, D. R., and W. L. Palmer. 1997. Deer management: marketing the science. *Wildlife Society Bulletin* 25:378-381.
- Frerker, K., A. Sabo, and D. Waller. 2014. Long- Term Regional Shifts in Plant Community Composition Are Largely Explained by Local Deer Impact Experiments. *PLoS ONE* 9(12): e115843. doi:10.1371/journal.pone.0115843
- Hansen, L. 2011. Extensive management. Pages 409-452 in D. G. Hewitt, editor. *Biology and management of white-tailed deer*. CRC Press, Boca Raton, FL.
- 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: 1356-1361.
- Heffelfinger, J. R., and T. A. Messmer. 2003. Introduction. Pages 1–13 in J. C. deVos, M. R. Conover, and N. E. Headrick, editors. *Mule deer conservation: issues and management strategies*. Jack H. Berryman Institute, Utah State University, Logan, USA.
- Hine, R. L., and S. Nehls. 1980. White-tailed deer population management in the North Central states. *Proceedings of a symposium 41st Midwest Fish and Wildlife Conference*. North Central Section of The Wildlife Society.
- Jacobson, C. A., J. F. Organ, D. J. Decker, G. R. Batcheller, and L. E. N. Carpenter. 2010. A conservation institution for the 21st century: implications for state wildlife agencies. *The Journal of Wildlife Management* 74:203-209.
- Keegan T. W., B. B. Ackerman, A. N. Aoude, L. C. Bender, T. Boudreau, L. H. Carpenter, B. B. Compton, M. Elmer, J. R. Heffelfinger, D. W. Lutz, B. D. Trindle, B. F. Wakeling, and B. E. Watkins. 2011. *Methods for monitoring mule deer populations*. Mule Deer Working Group, Western Association of Fish and Wildlife Agencies, USA.
- Mason, R., L. H. Carpenter, M. Cox, J. C. deVos, Jr., J. Fairchild, D. J. Freddy, J. R. Heffelfinger, R. H. Kahn, S. M. McCorquodale, D. F. Pac, D. Summers, G. C. White, and B. K. Williams. 2006. A case for standardized ungulate surveys and data management in the western United States. *Wildlife Society Bulletin* 34:1238–1242.
- McShea, W. J., H. B. Underwood, and J. H. Rappole, editors. 1997. *The science of overabundance: deer ecology and population management*. Smithsonian Institution Press. Washington, D.C.
- Minnesota Office of the Legislative Auditor. 2016. Department of Natural Resources: Deer population management. Evaluation Report. Program Evaluation Division. Office of the Legislative Auditor, St. Paul, MN. <http://www.auditor.leg.state.mn.us/ped/2016/deermanagement.htm> assessed Sep. 8, 2016
- Organ, J. F., V. Geist, S. P. Mahoney, S. Williams, P. R. Krausman, G. R. Batcheller, T. A. Decker, R. Carmichael, P. Nanjappa, R. Regan, R. A. Medellin, R. Cantu, R. E. McCabe, S. Craven, G. M. Vecellio, and D. J. Decker. 2012. *The North American model of wildlife conservation*. The Wildlife Society Technical Review 12-04, Bethesda, Maryland, USA.
- Rawinski, T. J. 2014. *White-tailed Deer in Northeastern Forests: Understanding and Assessing Impacts*. U.S. Department of Agriculture Forest Service Northeastern Area NA-IN-02-14.
- Rolley, R. E. and K. McCaffery. 1998. Status of deer population monitoring in the Midwest. *Proceedings of the 22nd Midwest Deer and Turkey Group*. http://mdwtsg.org/docs/proceedings/1998_mdwtg_proceedings-camp_grafton_devils_lake_nd.pdf assessed Sep. 8, 2016.
- Rosenberry, C. S., D. R. Diefenbach, and B. D. Wallingford. 2004. Reporting-rate variability and precision of

- white-tailed deer harvest estimates in Pennsylvania. *The Journal of Wildlife Management* 68:860-869.
- Rupp, S. P., and W. B. Ballard. 2000. A nationwide evaluation of deer hunter harvest survey techniques. *Wildlife Society Bulletin* 28:570-578.
- Smith, C. A. 2011. The role of state wildlife professionals under the public trust doctrine. *Journal of Wildlife Management* 75:1539-1543.
- Strickland, M. D., H. J. Harju, K. R. McCaffery, H. W. Miller, L. M. Smith, and R. J. Stoll. 1994. Harvest management. Pages 445-473 in T. A. Bookout, editor. *Research and management techniques for wildlife and habitats*. The Wildlife Society, Bethesda, Maryland, USA.
- Warren, R. J. 1997. The challenge of deer overabundance in the 21st century. *Wildlife Society Bulletin* 25:213-214.
- Webster, C. R., M. A. Jenkins, and J. H. Rock. 2005. Long-term response of spring flora to chronic herbivory and deer exclusion in Great Smoky Mountains National Park, USA. *Biological Conservation* 125:297-307.
- Williamson, S. J. 2003. *White-tailed deer harvest management and goal setting in the Northeast*. The Wildlife Management Institute. Washington DC. 164 pages.
- Wildlife Management Institute. 2016. Technical review of Department of Natural Resources' deer population modeling and survey methods. Appendix A in Minnesota Office of the Legislative Auditor. *Department of Natural Resources: Deer population management. Evaluation Report*. Program Evaluation Division. Office of the Legislative Auditor, St. Paul, MN.
<http://www.auditor.leg.state.mn.us/ped/2016/deermanagement.htm> assessed Sep. 8, 2016
- Woolf, A., and J. L. Roseberry. 1998. Deer management: our profession's symbol of success or failure? *Wildlife Society Bulletin* 26:515-521.

Table 1. Spatial framework for deer harvest management.

	Type of area	N areas	Mean size (mi ²)
Illinois	County	102	349
Indiana	County	92	400
Iowa	County	99	566
Kansas	DMU	19	4,285
Kentucky	County	120	337
Michigan	DMU	80	700
Minnesota	DMU	128	613
Missouri	County ^a	115	561
Nebraska	DMU	18	4,300
North Dakota	DMU	37	1,910
Ohio	County	88	465
South Dakota	DMU	81	917
Wisconsin	County ^b	82	680
Mean		82	1,237

^a Plus 1 independent city.

^b Nine counties are split into forest and farmland parts.

Table 2. Methods used by Midwestern states to estimate sex and age composition of harvest, approximate number of deer examined annually, number of locations sampled, and timing of data collection.

State	Methods used ^a	Approx. N. deer examined	N. locations	Timing of collection
Illinois	MR, HM	5,000 (MR), 150,000 (HM)	10	firearm season (MR)
Kansas ^b	ML, TX	700		entire season
Kentucky	ML, TX	3,000	25	major firearm weekends
Michigan	VC, JA	29,000	80(VC) ,120 (JA)	entire season
Missouri ^c	ML, CWD	4,500	50	opening weekend (55%), entire season (30%), CWD (15%)
Nebraska	MR, HM	16,000	112	firearm season
Ohio	ML	7,000	73	firearm season
Wisconsin	ML	15,000	130	firearm season (82%), bow season (18%)

^a CWD = CWD culling, HM = hunter submitted measurements, JA = Jaw aging events, ML = meat lockers, MR = mandatory registration stations, TX = taxidermists, VC = voluntary checkstations.

^b Minor effort with occasional sampling.

^c Planning to add hunter submitted measurements in 2016.

Table 3. Parameters measured and methods used to assess nutritional condition of deer populations by Midwestern states.

State	Parameter	Method	Frequency	N. deer
Illinois	Lactation	Mandatory registration	Annual	
Iowa	Fat deposits	vehicle-killed deer	Annual	100
	Pregnancy	"		
Kansas	Body weight	SCWDS ^a herd check	5-10 yrs	5-300
	Fat deposits	"		
	Lactation	"		
	Pregnancy	"		
	Serology	"		
	Parasites	"		
Michigan	Yrlg ^b antlers	Voluntary check Meat lockers		
Ohio	Yrlg antlers	Meat lockers	Annual	1,200
	Pregnancy	vehicle-killed deer	10 yrs	
South Dakota	Pregnancy	vehicle-killed deer	Annual	200
	"	ultrasound research captures	Annual	550
	"	blood hormones fawn captures		
	Thyroxine	blood from research captures	Annual	600
Wisconsin	Yrlg antlers	Meat lockers	Annual	7,000
	Fat deposits	vehicle-killed deer	Annual	500
	Pregnancy	"		

^a Southeast Cooperative Wildlife Disease Study

^b Yearling (1.5 years old)

Table 4. Methods used by Midwestern states to monitor trends in deer populations.

State	Harvest index	Deer-vehicle collisions	Harvest/effort	Aerial surveys	Roadside counts	Observation surveys	Other
Illinois	X	X		X	X		
Indiana	X	X	X				
Iowa	X	X			X	X	
Kansas	X	X	X		X	X	X ^a
Kentucky	X	X					X ^b
Michigan	X		X				
Minnesota	X		X	X			
Missouri	X		X			X	X ^c
Nebraska	X	X					
North Dakota	X			X		X	
Ohio	X	X	X	X			
South Dakota	X			X	X	X	
Wisconsin	X	X		X		X	

^a Experimenting with trail cameras.

^b Agricultural damage complaints.

^c Opinion surveys of agency staff, hunters, and production landowners.

Table 5. Methods used by Midwestern states to estimate deer population size.

State	Accounting model	Sex-age-kill/Downing	Integrated population model	Aerial surveys	Roadside distance sampling
Iowa	X		X ^a		X
Kansas					X
Kentucky		X			
Minnesota	X			X	
Missouri	X		X ^a		
South Dakota			X ^a	X	X ^b
Wisconsin		X			

^a Integrated population models under development.

^b Evaluating distance sampling for white-tailed deer in Black Hills.

Table 6. Methods used by Midwestern states to monitor deer reproduction or recruitment.

State	Harvest fawn:doe ratios	Winter fetal counts	Observation surveys	Other
Illinois	X	X		
Iowa	X	X		
Kansas	X		X	
Kentucky		X		
Missouri	X			
Ohio	X	X ^a		
South Dakota	X	X	X	X ^b
Wisconsin		X	X	

^a frequency of approximately every 10 years.

^b radio-collared neonates to estimate survival.

Table 7. Hunter participation, effort, and satisfaction parameters monitored by Midwestern states.

State	Licenses/permits sold	Days hunted	Units hunted	Deer seen	Rating of quality/ satisfaction	Desired population trend
Illinois	X	X	X		X	X
Indiana	X	X	X	X	X	X
Iowa	X	X	X	X	X	X
Kansas	X	X	X	X	X	X
Michigan	X	X	X	X	X	X
Minnesota	X	X	X	X	X	X
Missouri	X	X	X	X	X	X
Nebraska	X				X	
North Dakota	X	X	X	X		
Ohio	X	X	X	X	X	X
South Dakota	X	X	X		X	
Wisconsin	X	X	X	X	X	

Table 8. Methods used by Midwestern state to monitor hunter participation, effort, and satisfaction.

State	Survey contact method	Temporal scale	Sample size ^a	Comments
Illinois	Mail	Annual	3,000	Habitat stamp buyers, multiple species.
		3-5 years	3,000	Deer hunter surveys
Indiana	Mail	3 years	15,000	~8-10% of hunters
Iowa	Mail	Periodic	4,000	2% of hunters
Kansas	Mail & internet	Annual	10-15%	Hunter satisfaction
		Periodic		Special issues
Michigan	Mail	Annual	59,000	10% of hunters
		Periodic		As needed
Minnesota	Mail & internet	3-5 years	> 900 hunters/ permit area	Rotate among permit areas
Missouri	Mail	Annual	18,000	4% of hunters
Nebraska	Internet	5 years		
North Dakota	Mail	Annual	13,000	27% of hunters
		Periodic		
Ohio	Mail, phone & internet	Annual 2 years	20,000	8-10% of hunters
South Dakota	Mail & internet	Annual	33,500	~50% of hunters occasionally ask number of deer seen and desired population trend
		Periodic		
Wisconsin	Mail	Annual	10,000	2% of hunters # of deer seen estimated from successful hunters and web based hunter records

^a number of surveys sent to hunters.

Table 9. Methods used to monitor deer-vehicle collisions and agricultural damage caused by deer in Midwestern states and the temporal scale of monitoring.

State	Deer-vehicle collisions	Agricultural damage	Temporal scale	Comments
Illinois	Accidents ^a	Farmer survey	Ann./periodic	
Indiana	Carcasses ^b	Appraised damage Farmer survey	Ann./periodic	
Iowa	Accidents Carcasses	Appraised damage Farmer survey	Ann./periodic	Ag. producers surveyed every 5 yrs.
Kansas	Accidents Citizen ^c	Damage permits Farmer survey	Ann./periodic	Ag. producers surveyed every 5 yrs.
Kentucky	Accidents	Damage permits	Annual	
Michigan	Accidents	Damage permits	Annual	
Minnesota	Accidents Carcasses	Farmer survey	Ann./periodic	Ag. producers surveyed every 3-5 yrs.
Missouri	Accidents	Farmer survey	Annual	
Nebraska	Accidents	Damage reports		
North Dakota ^d	Accidents	Damage reports	Annual	
Ohio		Farmer survey	2 years	
South Dakota	Citizen	Damage reports Farmer survey	Ann./periodic	
Wisconsin	Accidents	Appraised damage	Annual	

^a Reported accidents from Department of Transportation/Highway Safety

^b Deer carcass removal data.

^c Human dimension surveys of citizens.

^d North Dakota Department of Transportation formerly provided data on reported deer-vehicle crashes but no longer does.

Table 10. Responses from Midwestern deer program managers to questions of whether their management program has quantifiable performance goals, how those goals are expressed, and frequency that goals are updated.

State	Have performance goals	Expression of goals	Update frequency	Comments
Illinois	Yes	Tolerable level of deer-vehicle crashes	2014	CWD takes precedence over other impacts
Indiana	No			Mgmt plan sets general directions
Iowa	Yes	Population level similar to late 1990s	> 15 years	
Kansas	Yes	Public desires	Annually	Deer committee and agency staff set general direction
Kentucky	Yes	Population size	Not since ~2005	
Michigan	No			No goals for ~10 yrs, hunters rejected proposed goals
Minnesota	Yes	Pop. Size & Trend	Every 10 yrs	
Missouri	Yes	Population Trend	Annually	
Nebraska	Yes	Population Trend	Annually	Informal process
North Dakota	Yes	License sales & hunter success	Every 5 yrs	
Ohio	Yes	Farmer and hunter desires	Periodically	Changing goal process
South Dakota	Yes	Population Trend	Annually	
Wisconsin	Yes	Population Trend	Every 3 yrs	

Table 11. Responses from Midwestern deer program managers to questions about the process of establishing performance goals, the role of agency staff, which stakeholder groups provide input to the process and how that input is provided.

State	Goal setting process	Stakeholder groups providing input	How is input provided
Illinois	Statewide advisory committee	Hunters, farmers, landowners	HD surveys
Indiana	No goals		
Iowa	Statewide advisory committee	Business, hunters, ag. producers conservation, public	Advisory committee, HD surveys, public input at meetings
Kansas	Agency driven	Hunters, landowners, general public	HD surveys, public meetings, individual comments
Kentucky	Agency driven	Hunters, farmers, landowners, biologists	"A blend of input"

Michigan	No goals		
Minnesota	15-20 multi-unit advisory comm.	Hunters, ag. producers, public	Advisory committees, HD public input at meetings
Missouri	Agency driven Deer program staff	Hunters, farmers, general public	HD surveys, public comm periods, stakeholder group
Nebraska	Agency driven Deer program staff	Hunters, landowners	HD surveys, public comm
North Dakota	Agency driven Deer program staff + field input + 8 advisory comm.	Field staff, general public	Regional staff/advisory co meetings
Ohio	Agency driven	Hunters, farmers	HD surveys
South Dakota	Agency driven Regional managers + field biologists and COs	Hunters, farmers, ranchers	HD surveys, advisory group public meetings, phone ap
Wisconsin	72 county advisory committees	Hunters, farmers, foresters, transportation, tourism, tribal	County advisory councils, public meeting input

Table 12. Types of data considered during performance goal setting processes in Midwestern states.

State	Hunter & farmer attitudes	Deer population trends	Disease	Crop damage complaints	Public input	Deer-vehicle crashes	Hunter demand/success	Local biologist opinion	Reproduction
Illinois	X		X			X			
Iowa	X	X	X	X		X			X
Kansas	X	X	X	X	X	X	X	X	
Kentucky	X			X				X	
Minnesota	X	X			X			X	
Missouri	X	X	X						
Nebraska	X	X	X	X	X	X	X		
North Dakota	X	X	X				X	X	
Ohio	X								
South Dakota	X			X	X				
Wisconsin		X	X	X	X	X	X		X

Deer Status Report

Wisconsin. Total harvest was 311,000 with an even split between antlered and antlerless. Crossbow season is under attack with new regulations coming. There were 110,000 deer harvested in the first 2 days. Went all electronic in 2015, 2/3 use internet and 1/3 use phone. New regulations are to decrease buck only units, make junior antlerless tags not valid in some counties, hunters are no longer required to put tag on animal immediately, introduced blaze pink. 19 counties with wild deer CWD, just over 40 counties affected by CWD. Deer age 2.5+ are around 40% prevalence. 3 CWD positive bucks escaped in May and were killed around 10 miles away. Trying to develop systematic fawn/doe ratio estimates from roadways.

South Dakota. Total harvest was 53,000 animals (47,000 white-tailed deer). There was an increase in tags and deer numbers on the rise. Fawn/doe ratios for white-tailed deer are where they need to be and mule deer are doing well. Fawn pregnancy rates ranging from 0% to 50% across study areas.

Ohio. Total harvest was 188,000 which is up by 7.1% (archers accounted for 44%). In the process of writing a deer management plan. Conducted a survey where landowners felt there were too many deer and hunters felt there were too few. Hunters were very dissatisfied with all facets of hunting but happy with hunting experience.

North Dakota. Total harvest was 32,000 white-tailed deer, 4,000 mule deer. Numbers seem to be rebounding (traditionally declining since 1980's). Current research is on evaluating deer survey methods and life history, insecticides in deer livers, and a deer hunter survey.

Nebraska. Total harvest was 48,000 white-tailed deer, 10,640 mule deer. Permit sales have increased 146% in non-residents and 12% in residents. Harvest is down substantially from 2012.

Missouri. Total harvest was 275,000 deer which was a 7% increase. Population recovering from 2012. The buck harvest was higher the doe harvest for first time in many years. The antlerless firearms season was reduced to 3 days. There were 7,680 deer tested for CWD with 7 positives. Sampling statewide but rotate northern and southern portion of state annually.

Minnesota. Hunters have raised concerns over lower harvest numbers. As a result, legislative auditor audited the DNR to see how DNR uses data, tools, and techniques to manage. Looking at ways to manage for moose, as well as deer to provide opportunities for both. Management plan by 2018. Altered carcass importation regulations (extra precautions).

Michigan. Total harvest was 325,000. There were 4,600 deer tested for CWD with 7 positives. Tuberculosis prevalence increased from 1% to 1.5%. Currently revising deer plan which was originally completed in 2010.

Kansas. Total harvest was 95,000, an increase of 2%. Only 2,000 mule deer were harvested. The price of deer permits and licenses increased. It was reported that 23% of hunters are non-resident. Currently surveying deer using spotlight and road surveys (distance sampling).

Iowa. Total harvest was 105,000. Currently shifting focus from a number to a trend and looking at numerous factors to make sense of populations. Current research is looking at changes in fecundities and distance sampling. Current discussion on changes to rules on baiting and feeding.

Indiana. Deer management by legislation reviles new rifle regulations in March 2016. The new regulation states that one can use either a .243 and/or .308 caliber, nothing in between. Bovine TB was found in 2009 at a deer farm, found at a cattle farm in 2011, then found in wild deer in 2016. Check stations will be mandatory in Deerborn county.

Illinois. 37% of harvest from archers. Current regulation changes consist of 2 tier antlerless only permits, youth minimum age changed from 16 to 18, archery equipment will be legal during gun season, adding 3 more check stations during firearms season. 8,500 deer tested for CWD in 2015.

Turkey Breakout Session

National Wild Turkey Federation Update. Jason Lupardus.

- 3 part initiative (save the habitat. Save the hunt – end of 4th year)
 - Conserve or enhance 4 million acres
 - Recruit 1.5 million hunters
- Created new position with help from partners – new R3 position (Steve Sharp)
- 2016 national focus on forever workshop
 - Partnership with pheasants forever (MO)
 - can work together to tackle conservation issues
- Mentored dove hunts (volunteer-run)
- America's big six
 - Thinking big
 - Regions (America's mid-south re-birth – includes KY)
 - Midwest – "America's crossroads"
 - Created focal landscapes (87)
 - Seen a change in behavior in organization and partners
 - Driving work for next 6-8 years – create consistency
 - Collecting data – spatial data for every project (2nd year)
- Focal landscapes (mid-west)
 - Driftless area focal landscape
 - Habitat work,
 - \$8 million total (plan)
 - Broke cost/projects down into small chunks
 - Characteristics: karst topography, oaks disappearing
 - Attempting to develop position of support (provide landowners with equipment and guidance)
 - Development staff – help with funding (restricted \$ to this area, then applied for grant to help fund a 5-6 yr position – forestry, biologist mix)

- Lands Program (NEW)
 - Goals
 - Ensure that current future generations have quality places to hunt
 - Conservation easements (permanent)
 - 1 in KY – Paddy’s Bluff (911 acres)
 - On Cumberland river – high bluff on river
 - Divided into 5 individual easements
 - Multi-million-dollar conservation value
 - Iowa Acquisitions 1988-present (IA does a lot of acquisition work)
- National leadership conference (Oct)
- Access
 - Open access to 500,000 acres by 2022
 - 2015 (MW 7,918 acres, national 72, 955 acres)
 - Good growth/potential
- Habitat work
 - Restoration work
 - District stewardship projects (does not include participation grants)
 - 79-80 stewardship agreement in 24 states
- Conserve or enhance 4 million acres or critical upland wildlife habitat by 2022
- Media
 - Need to take opportunities to grow media coverage
 - Tell people about the work we are doing
 - Social media is a powerful tool
 - Helpful when developing a license plate (coming out on Sept 6)
 - Need to talk more about the work we do
- Research
 - Moving back into this
 - Assemble all ideas and thoughts and brainstorm areas, concepts, etc. that need to be researched
 - Want to continue to fund/assist with research
- Property acquisitions
 - Needs to be a focal landscape
 - Is it close to public land?
 - People can will property to NWTF
 - Work with state partners or land organizations

National Wild Turkey Federation. National Updates (Ryan Boyer, NWTF MI). MI and IN Conservation Programs

- Habitat objectives (within focal landscapes – MI and IN)
 - Openings creation and management
 - **Young forest creation** – overlaps with grouse, etc.
 - Hard and soft mast production
 - Native warm season grass restoration
 - Oak savanna/barrens restoration
 - Riparian buffers filter strips
 - Create food sources during winter
 - Focal landscape work is not tied to state boundaries
- Indiana
 - State board – how funds are spent
 - Annual RFP process
 - Process with state agencies
 - Funding opportunities - outside of fund collect through banquets

- Grants: \$100,000 to \$1 million
 - Equipment purchase
 - Conservation seed program
 - Offer discounted seed to members to create food plots/maintain habitat
 - Sometimes ~ 25% of original cost
 - Great marketing opportunity
 - Energy for wildlife
 - Work with energy companies to develop management plans/recommendations
 - “green credits”
 - Opportunity for non-traditional partnerships
 - Private lands programs
 - ~3% of IN is public land (mostly in Hoosier landscape)
 - Opportunity
 - Internship positions
- Indiana’s Access Program
 - 97% private land
 - Indiana license plate revenue
 - 2,615 acres acquired since 2014
 - Cost share partners – DNR wildlife, forestry, USFWS, DU
 - Help with access to portions of wildlife refuges
 - \$ comes from larger grants and NGOs
- 2015 Indiana accomplishment report
- Michigan’s program
 - More public land
 - State grant programs
 - Hunter access programs
 - Incentivized
 - Huron-manistee & Hiawatha NF’s (stewardship)
 - Future opportunities
- MI State Wildlife Habitat Grant Program
 - Hunter license dollars
 - Min 10:1 match
 - Awarded 3 grants, proposals submitted
- 2015-2016 Focal Landscape Projects
 - 200 acres of oak savannah restoration (~ \$50, 000)
 - N MI mast, openings, and trail enhancement project (~110,000 – project match 10:1)
 - Work with army national guard -
 - Enhance some of the wildlife openings (habitat connectivity)
 - Mechanical/herbicide treatments
- Manistee National Forest
 - Karner blue butterfly
 - \$520,000 agreement (2 modifications)
 - \$260 timber value (non-commercial)
 - 550+ acres

Learn to Hunt Program/Turkey Tracts. Al Stewart. Michigan DNR.

- Program Background
 - Licensed hunter declines
 - Recruitment of new groups
 - New hunters from non-traditional backgrounds
 - Each program consists of informational & experiential learning
 - Species-specific information – biology, scouting, management

- Clothing and equipment
 - License purchasing
 - Optional range days offered for new shooters
 - Mentored hunt opportunities
 - Game dish tastings and recipes
 - Food aspect is mainly what draws people to hunt
- LTH Deer 2015
 - Pilot program: 9 participants
 - 3 day, weekend format
- LTH Turkey, Spring 2016
 - Pilot program – 17 participants
 - Patterned after “field to fork”
 - Barry county conservation club, Barry state game area
 - 4 session format – hunter safety certification, optional scouting, optional range day, and mentored hunt weekend
 - History of hunting and conservation
 - Firearm safety and range safety/practice
 - Turkey license purchasing
 - Hands-on practice scouting with mentors
 - Hunter ethics & responsibility
 - History of the wild turkey in MI
 - Turkey butchering demo
 - Mentored hunts
 - 1 on 1 interactions
 - Have to pay to come
 - Many people were from local food co-ops
- LTH Turkey, Fall 2016
 - Offered to LTH program graduates (deer & turkey) as a shorter clinic
 - How fall and spring turkey hunting differ
 - North American model & PR dollars
 - Basic equipment & clothing
 - Turkey biology
 - Conservation
 - Barry state game area field office
- LTH Deer 2016
- Partners and Future Info
 - LTH waterfowl program being planned for Fall 2017 – partnering with DU and MDNR
- Johanna Dart (Learn to hunt Program Coordinator – learntohunt@gmail.com)
 - Glassman Scholar

Turkey Tracts

- How it got started
 - Part of it
 - Want to protect natural resources
 - Want to be relevant
 - Want to ensure sustainable recreational use
 - Want to improve/build strong relationships and partnerships
 - License restructuring
 - Governor Snyder proposed a 599-mile recreational trail (Iron Bell Trail)
- Number 1 partner – NWTF
- Patterning this off of GEMS (grouse enhancement management sites)
- First tract created this spring (April 12, 2016)

- Allegen County
- To create a destination point for turkey hunting
- To provide unique hunting opportunities
- Michigan has 10 million acres open to public hunting
 - GEMS in northern portions of state
- MI-Hunt
 - Computer mapping program to find land open to public hunting
 - Interactive layers allow user to view:
 - All state game and wildlife areas
 - Hunt-able areas
- Turkey Tracts
 - Includes informational signage
 - Includes info about restoration, oaks, turkey bio, other wildlife in the area, project maps, local sponsors, etc. (a little different than GEMS)
 - Great way to tell the public about the work that the state and other organizations in doing
 - Can scan QR codes to learn how to become a member, etc.
 - Local sponsors are part of the program – provide coupons/discounts
- Next: 3 turkey tracts for 2016 – in southern lower peninsula
 - 3 state land (10 businesses to date)
- Don't see too much hunting pressure because it is really only meant to get people started

Population Ecology of Wild Turkeys in Northern Missouri. Jason Isabelle. Missouri Dept. of Conservation

- Shift in focus to providing sustained harvest
- Extensive knowledge about wild turkey population demographics
 - Studies throughout range of eastern subspecies
- Relatively little harvest management refinement during post-restoration phase
- Turkey populations stabilizing or declining in many areas
 - Efforts to monitor and regulate harvest will become increasingly important
 - Population estimates are essential component of evaluating wildlife management programs (difficult to obtain)
 - Need robust quantitative means of understanding population status & trends
- Statistical population reconstruction (SPR)
 - Alt to traditional reconstruction methods, offering several advantages
 - Uses readily-available age-at-harvest /hunter effort data
 - Single comprehensive analysis that simultaneously
 - Provides managers with a more credible look at turkey population and info needed to make management decisions/regs
 - SPR
 - Works best with 5+ yrs age-at-harvest data
 - Harvest rates of 0.2-0.5 (precise abundance estimates)
 - Radio telemetry or other auxiliary data necessary to calibrate models
 - Ongoing process
- Application to turkeys in MO
 - Objective – apply SPR models to male wild turkey pop in E MO Ozarks
 - Available data
 - Spring/fall age-at-harvest data
 - Spring hunter effort
 - Auxiliary radio-telemetry study
 - Production index (to validate models)
 - Abundance index (to validate models)
 - Scaled bow hunter observation index
 - Recruitment

- Estimated # of juveniles
 - Scaled poult-to-hen ratio
 - SPR Benefits – provides harvest probabilities, recruitment estimates,
- Justification
 - Updated demographic data (important given declines in abundance)
 - Harvest rate estimates to evaluate hunting regs
 - SPR – more credible and defensible means
- Objectives:
 - Develop region SPR for turkeys in N MO
 - Develop SPR modeling software for future analysis
 - Estimate season/annual survival rates, cause-specific mortality
 - Est harvest rates during spring and fall seasons
 - Est reproductive parameters
- Study area – 4 counties (2 study areas)
 - Dominated by ag
- Capture/monitoring
 - Turkey capture (rocket-nets) Dec-Mar
 - Determine age and sex
 - Annual sample size goals:
 - 60 radio-tagged adult males
 - 60 radio-tagged juvenile males
 - 50 radio-tagged females
- Monitoring - hunting seasons
 - Monitored male turkeys 5x/wk throughout hunting season
- Monitoring – reproductive period
- Methods – productivity and poult survival
 - Nesting rate, re-nesting rate, initial success rate, etc.
- Data analysis – survival
 - Known fate models in program MARK
- Results
 - Captured 909 turkeys during 1st 3 winters
 - Male survival – year 1: 0.69, year 2: 0.69 (spring)
 - Generally, pretty high survival for juvenile males
 - Hen survival lowest in summer
 - Juvenile hens...
- Human-caused mort (spring season) (adult male-juvenile male)
 - Yr 1: 18-6
 - Yr 2: 16-3
 - Yr 3: 31-7
- Cause-specific mort
 - Largest cause – predation (42% for males), unknown then predation (females)
- Fall harvest est
 - Yr 1: largest – juvenile males
 - Yr 2: largest – male/females (adults)
- Reproduction parameters
 - No re-nesting by juvenile hens
 - 50% in adult hens
 - Avg initial clutch size – 10.3 and 11.2
 - Hatching rates – 94% and 82%
- Discussion
 - 69-78% juvenile male annual survival
 - Seasonal /cause-specific

- Predation leading cause of male mort
 - Adult male survival lowest in spring
 - Harvest rates
 - Spring male harvest rates lowest reported (22%)
 - Mean juvenile harvest rates (4%)
 - Fall harvest rates (female – 0 and 3%)
 - Repro parameters
 - Adult female nesting rates (86% and 88%)
 - Juvenile female nesting rates (40% and 50%)
 - Adult female re-nesting rates (47 and 54%)
 - No re-nesting from juvenile hens
 - Very little productivity in juvenile hens
 - Initial adult success (20 and 15%)
 - Less productivity out of turkey population now than in 1980's
 - 1980's – mean PHR 3.1
 - Now – mean PHR ~2
 - Density-dependence regulates population demographics
 - Increasing population of some nest predators
 - Loss of nesting and brood-rearing habitats (i.e. CRP to row crops)
- Management implications
 - Greater survival and lower harvest rates of males
 - 1st 2 years of data indicate relatively low female harvest rates
 - Lower repro potential than previous studies
 - Little contribution from juvenile females
 - Increasing populations of some nest predators coupled with habitat loss
 - Programs aimed at creating nesting and brood-rearing habitats are important
- 2 more years of trapping (field work done in March 2019)
 - Will have results summary, etc. after that (models, etc.)
- Habitat co-variants – last 3 years of project will have nest habitat selection data (micro-scale)
- Nest predators – coyotes are primary predator (not more pressure than expect/predicted), need focus on nesting success
 - Depends on how the message is delivered
 - Talk about loss of habitat and grasslands – promote the need for habitat work
- Not able to determine greatest nest predator – not enough certainty to pin it down to species
- No trail cams

Changing Turkey Management Zones. Mark Wiley. Ohio DNR.

- Spring season opened state wide on 4th mon in April
- Study in SE OH
 - Mean nest initiation date – Apr 17th
- Spring opener changed to Monday closest to Apr 21st statewide
 - Sometimes 3rd wk or 4th wk
- Hunter complaints from NE OH (that the season is too early)
 - Justification – lake-effect snow so breeding season is delayed in most years
- Changing turkey zones
 - Nesting study (2014-15)
 - 2014: 8 hens collared (2 GPS, 6 satellite (PTT))
 - 2015: 8 PTT in Ashtabula Co, 5 PTT in Lake Co, 7 PTT in Geauga Co
 - 3-4 points per day
 - Mating
 - When activity started to suggest nesting, give initiation day then count backwards
 - Results:

- 6 of 8 nested in 2014 (out of 6 alive)
 - 15 of 20 nested in 2015 (out of 18 alive)
 - They were nesting later than statewide season
- Hunter opinion survey (2015)
 - 10,000 randomly selected turkey permit buyers
 - Asked it started too early, right time, too late
 - Majority thought season started too late
 - NE OH – too early
 - If hunters would prefer if season started in Monday closest to May 1, 4th mon in April, 3 mon in April
 - Season started on 3rd Monday that year
 - most wanted closest to May 1st
- Held a wild turkey summit meeting (2015)
 - 50 invited
 - Biologists, administrators, media, etc. went well
- Invited comments at open house (2015)
 - No major issues
- Proposal to wildlife council
 - NE zone – 4 weeks (start in May)
 - South Zone – (start in April – 3rd or 4th week)
- Ashtabula county – almost always highest harvest county
 - Harvest patterns in NE county – harvesting birds in first week (pattern similar to rest of the state)

Direction following the 11th Turkey Symposium in Arizona. Chad Parent. MSU

A Review of Recent Turkey Research: Insights for the future of turkey harvest management

- Lots of important discussions:
 - NAMWC
 - Policy
 - Ecology across small scales
 - Fine-scale movement ecology
 - NOT THE MOST IMPORTANT PAPERS
- Going to be citing a lot in the next 10 years
- Turkey pops have stabilized at or near carrying capacity
 - Across the US
- Context for management has changed (restoration → management)
- Turkey pop trends are stabilizing across the Midwest (1st paper)
 - Used harvest data – need to account for variation in harvest data, account in raw harvest through time (changes in hunter effort)
 - CPUE = harvest/effort = catchability*abundance
 - Constant throughout time and space (assumption)
 - Problem – when don't collect info on hunter effort
 - Applied regression to pop data across Midwest
 - Depends on break point that you look at
 - “ns” – not significant
 - Hunter effort/raw harvest – similar trends
 - Raw harvest (KS, WI – stable/ IN, MN – increase/ IA, OH – decline)
 - Pop trends are stable
 - Useful – provided way to compare all data, but not all data is collected in the same way
 - Need to collect data that would allow for large-scale comparisons
- Byrne paper
 - Density dependence
 - Pop growth affected b/c of pop size

- When change per-capita productivity, would expect K to change... but there are times when it will not
 - Data trends depended on which data set you were looking at
 - Breeding bird survey data – increasing
 - Long-term decline – mean brood size, % females w/o broods, poult-hen ratio
 - Byrne plotted each scenario
 - Decrease in productivity as abundance increases – density dependence
- Stevens paper
 - Trying to incorporate uncertainty into management decisions
 - Uncertainty – we don't often incorporate these factors into management decisions
 - Key forms of uncertainty:
 - Environmental
 - Observation
 - Structural
 - Implementation
 - Specifically looked at structural uncertainty
 - Vulnerability
 - If we use different models will we still reach carrying capacity in the same way?
 - If want to max harvest, look at 4 potential harvest objectives
 - Harvest rates that max harvest change depending on the form of density dependence (especially in fall)
 - Spring – 100% (doesn't matter b/c have already fertilized eggs)
 - Considerable variability
 - b/c don't know which model is best, might focus models
 - need to have clear population harvest objectives when going into management decisions
- Casalena paper
 - Shifting harvest management objectives – due to a desire to expand opportunities
 - Expansion due to increase in hunting popularity
 - Current goals – center around having a large population, don't have a definition of “large” population
 - Shift in 1990s/2000s – IMPORTANT
 - Population models will be changing b/c population was still reaching carrying capacity (high repro output) – now, lower repro output
 - 2nd excerpt – things learned with previous turkey research may not apply because population parameters are changing
- 2 papers that suggested stabilization of pop, 1 paper suggesting density dependence, 1 paper saying type of density dependence matters for harvest objectives
- Stevens paper (2016)
 - Population dynamics for turkeys are sensitive to harvest
 - Have harvest rates that are thought to be sustainable harvest rates
 - But heterogeneous landscapes affect harvest, population characteristics
 - Continuum of survival may change across landscape
 - What happens to robustness or generalizability if we look at the full range of possible demographic scenarios?
 - Simulation scenarios (3 levels of productivity, 3 levels of spring harvest, 2 poaching of hens)
 - Judged if fall harvest was risky – does it provide a large population?
 - Need to define – he defined as $\frac{1}{2}$ carrying capacity**
 - Basing 9% because of \
 - Robustness of 9% fall harvest:
 - Stochastic variation
 - Columns correspond to harvest (low, med, high)

- Asterisk – same scenario tested in McGhee paper (only one where can reliable harvest turkeys under these assumptions)
 - 9% - targeted harvest rate
 - With high poaching, 9% harvest rate is not robust in any scenario
 - Simple rules are not broadly applicable
- Recap
 - Stable pop
 - Density dependence – going to affect objectives and evaluation of them
 - Harvest objectives centered on fall harvest rates are not robust
- Insights
 - Need develop objectives (clear and specific) – need consistency
 - Difficult to evaluate with data that we collect
 - Need to think about more long-term data collection methods
 - Better collection of info on harvest – becoming more useful
 - Many model structures to take advantage of hierarchical modeling
 - Hierarchical frameworks were not developed 5 years ago
 - Will become common place to analyze harvest data (more accessible)
 - **should think about the data we collect now so it can be used for these models in the future
 - Productivity info
 - Many states collect data
 - Will be important auxiliary info used to inform population models (can help in the long term)
- Most states are collecting exactly what they need to
- Collect your data well, with design in mind (on appropriate scale for management goals)
 - County would be a smallest scale, but doesn't have to be county if there is something smaller and more representative for management goals
 - Want to use information to be able to compare all states in the Midwest – help identify where populations are at risk
 - Hunter harvest – easily standardized, would be a good parameter to synchronize
 - But it could also be productivity – but it's harder to standardize
 - MI – hunter effort expressed in “days of harvest”
 - Total number of permits in county – standard for harvest (suitable if can't collect data on hunter days)

Turkey Status Report

Iowa.

- Population has stabilized
- Hunting is consistent
- 58-60,000 licenses this year
- Harvest ~11,000 (reported by hunters)
- Est 74% compliance (do not report any other numbers)
 - Issues with telecheck – easier to get away with not reporting
 - Want to do a hunter satisfaction survey
- Deer – 92 down to 85% of people report with telecheck
- Fall – turkey numbers are high
 - Approx. 7,000 people out hunting (many have tag while deer hunting)
 - ½ are
 - 3-4% success rate
- Bow hunters – approx. 5%
- No non-residents in fall
- Zone management in the fall
- Dropped quota of birds available to number of licenses sold in past couple of years

- May be time to increase this to promote fall hunting
- Good production 2 years ago (visual observations) – no survey
- Saw influx of 2-year-old birds
- Spring harvest – approx. 11-12,000
- Age structure of hunters is shifting to old age classes
- 5500-5600 youth hunters
 - Hopefully see more young adult hunters in the coming years
- 10 years of electronic data this year – hopefully will analyze this year
- Youth hunters have highest success rate of any age class
- Recently changed from 3-9 day youth season (2nd mon to closest mon to the 15th)
 - Talk (couple of years ago) – youth tag to be valid until filled
 - Thought is to reduced 9-day youth season back to 3 days (since they have the rest of the season)
- No crossbows yet
- No active research
- Brood survey – July to August
- Road surveys – use mail people
- Sample from 9 ag regions
- Mail/electronic surveys – harvest (utilize both systems)
- TX requested some birds – sent problem birds (first in 12 years) – sent 125 (males and females)
 - Procedure has changed with AI hotspot in Iowa
- Reproduction – warm spring
 - Birds went down early
 - 6-7 poults per hen reported (observations) – now not seeing any poults now
 - Doesn't think that 2nd and 3rd nests were successful
 - Probably not due to rainfall
 - May just not be seeing them, but they are there
- Down to bare bones when it comes to surveys
- Not over-pressuring birds
- Print a log book every year – full report (with charts and graphs)

Ohio

- Can send out report via e-mail
- 17,800 birds harvest spring 2016 (same trend)
 - 17-18,000 birds last spring
 - 1500 harvest during youth season (similar to 2015 fall)
- Best harvests in western OH – ag lands
- Issue 66,000 spring permits
- Approx. 11,000 fall permits
- Fall harvest – good number of jakes probably – so spike in population/harvest will probably be in 2 years
- Reproduction is parallel with cicada emergence
- 2 poults per hen – avg (western OH)
- 6 poults per hen – avg (eastern OH – cicadas)
- State avg is 3.5 poults/hen
- Recently switched to zone harvest management – spring 2017

Michigan

- Fall

- Some declines in participation (last 8 years)
 - Seems widespread, not regional
 - Turkey numbers in northern MI were probably artificially high (due to baiting for deer), but are down now because baiting was banned due to a TB outbreak
- Least number of people participating (17,000 of 31,000 licenses purchased)
- Harvested ~5,400 birds (**not sure if I recorded this correctly**)
- Some areas open, some not
- 11 management units open
- Spring
 - Decline in number of turkey hunters (108,000 eight years ago)
 - 71,000 hunters, avg ~30,000 turkeys (~ 42% hunter success)
 - 58, 000 sq mi – 13 management units open
- 95% compliance rate – mail surveys
 - Look at harvest methods
- Youth
 - 10,000 licenses purchased
- Avg license buyer age – 42 yrs
 - Seen a bump in older and young adults
 - Primary group is 26-58
 - 7% of hunters are women (~ 5,000 licenses)
- Avg person hunts approx. 4 days/yr
 - People spend a lot of time out if the woods
- High hunter satisfaction rates
- Spring – focus on maintaining high quality hunts and creating more opportunities
- Mail carrier survey for poults
 - Not sure as ha lot of value for turkeys
 - Concerns over ID or consistency in reporting
- Reproduction is pretty good
 - Lots of reports of large/more broods
 - Won't know just have good until fall and next spring
- 6% use compound bows
- 5% use crossbows
- Do both mail and online surveys – trying to move to solely an electronic system
 - Survey in fall and spring (hunter satisfaction side)

Kansas

- Adaptive harvest strategy for management recommendations
 - Commission may or may not continue to use
- 6 management units
- Highest harvest was spring 2016
- Increase in permit prices (2016)
- Steady declines in fall harvest (parentheses are number of hunters)
- Spring harvest – slight decline
 - Bad drought in 2012-13
 - Increase in non-resident hunters, but slight decrease in resident hunters
- Production
 - Summer – mail surveys (hens and poults)
 - Brood surveys
 - 5-10 year avg relatively low
- Spring Indices
- Unit 1

- General pattern is slight decrease in production, prevalence, hunter numbers, and hunter success
- SW (Unit 4)
 - Limited draw – no fall season
- SE (Unit 6)
 - Potential increase in production
 - Slight decrease in second graph
- Harvest strategy
 - Different packages available (sign up for specific units)
 - Liberal → conservative (unit specific)
 - Triggers (allows state recommendation to go up or down)
 - Active resident hunter success must be > or equal to 60% each of the previous 2 years and the % of the harvest composed of jakes must avg <25% over the same period before upward movement recommendation
 - Active resident hunter success must be < or equal to 55%
- Spring surveys – would prefer 2 in spring, none in fall (birds total)
- Fall surveys – would prefer 1 in spring, 1 in fall (birds total)
- 2017 spring/fall recommendations
- No telecheck – post-season survey (can get confidence intervals, eliminates some of the reporting issues that come up with telecheck)
 - Concerns of response rates with telecheck
 - Surveys are emailed – could be missing some people
 - Hunter satisfaction – hasn't changed much (no major declines even within different units)

North Dakota

- Population status – steady decline since 2007
- New population survey completed soon
- Brood numbers are down – 1 poult/hen
- Spring – good weather during season
 - 2300 licenses (48% success rate)
- Fall – 2500 licenses (70% success rate – 1 turkey per license)
 - Decrease in participation (competition with pheasants)
- Hunter participation – variable
- Good youth interest, could boost numbers

Nebraska

- Fall season increased popularity (decreased by 4.2%)
- 25% were youth permits
- Harvest for fall 10% lower than last year (64.6% success rate)
- Determined by email survey, with reminder e-mail 1 week later (access on website)
- Spring
 - Permits down <1%
 - 15% were youth permits
 - Large declines in number of youth permits purchased (9%)
 - 1 turkey/permit (limit 3) – but most hunters are only buying 1 permit
 - Harvest was 11% higher (65% success rate)
- Population – rural mail carrier survey (3x a year – best is spring (April))
 - Declining slightly in past 5 years
 - Not concerned yet
 - Sometimes high enough in certain parts of state – nuisance
- Regulations

- When harvesting turkey and hunter can NOT be within 200 yards of bait pile
- Research
 - Functional genomics (upcoming project)
 - Map out various subspecies throughout population – released 3-4 types through reintroductions
 - Think most birds are hybrids
 - Look at what percentage of total pop belong to each subspecies
 - Genetic information will go to marketing people – so that they give out accurate information
 - State chapter of NWTF wants to know – want to promote if there is large number of Mirriams

Missouri

- Population
 - Peaked in early 2000s
 - Declined by ~25% in mid-late 2000's
 - N MO saw larges declines (40-50%)
 - Saw similar trends in AR, S IA, E KS, E Ok
 - Poulth/hen ratio – poor 2007-2010
 - Starting to see numbers bounce back – increasing or stable in most counties
 - Still below state peak (~20 below)
 - Concerned numbers are starting to dip again
- Spring harvest is indicative of abundance
 - Peak in 2004, slight decline, now slight increases
- Wild turkey productivity regions
 - Grouped based on generalized forest cover
 - NW/W – last regions to be stocked with birds (mid 70's, young compared to pops in Ozarks)
 - Seen numbers drop since 2004
 - Numbers haven't stabilized completely yet
 - NE – saw pop decline, now stable\
 - Sharp drop-off in mid/late 2000's
 - Ozarks – increasing trends
 - Not much habitat in boot-heel
 - Strong numbers in Ozark border region
 - Most counties in state are stable
- New turkey management plan in next couple of years
 - New plan – 9 → 13 productivity units
- Brood surveys
 - Statewide poulth/hen ratio – declining productivity through time (highest in 70/80's)
 - High productivity in late 1990's – corresponds with population peak
- Reproduction
 - Trends are generally similar
 - Decline, then slight increase in productivity
- Spring Harvest and permit
 - Spring harvest/permits have continued to increase
 - Peaked in 2003
 - Most harvest in south central and west central parts of the state
 - Hunting incidents
 - Decreased sharply since the 1987, stabilized around 5-10 recently
- Fall harvest and permits
 - Not as popular as spring
 - Peaked in 1980's
 - Sharp drop in 2000's
 - More harvest in south east/ozarks

- Archery harvest (fall)
 - Get two with deer tag
 - Combined in 1978
 - Starting to stabilize in 2008, generally seen more archery hunting in the fall (greater percentage of archery kills over all in fall)
 - Most harvest in central part of the state, north central
 - Continues to be popular, even though fall season has become less popular
 - Substantial increase since 2000's
 - Continue to increase with use of crossbow without exemptions
- Research
 - Stat pop reconstruction to estimate demographics
 - Survival and repro ecology in N MO
 - Characteristics, and preferences of spring hunters
- Summary
 - Increasing trend in spring harvest
 - Stable to increasing turkey numbers in most counties
 - Declining numbers in several NW and SE counties
 - Poor production $\frac{3}{4}$ years
 - Declining interest in fall firearms season
 - Increasing participation in fall archery season
 - Allocation of fall harvest
 - Population demographics research in N MO
 - Develop regional SPR models
 - Conduct additional auxiliary studies
 - Incorporate into revised turkey management

Discussion

Is anyone specifically measuring habitat factors that will affect turkey numbers/harvest? – IA

- Forest management needs to be better
- Habitat is changing, maybe turkeys are just adjusting to changing surroundings
- Seems to be common issue across the eastern US
 - Forests are maturing, very few seedlings and saplings (oaks are not easy to regenerate)
 - Need forest inventory work
 - May be burning, may be selective cutting, may be creating shelters
 - Can have conflicting management perspectives for deer and turkeys
 - Productivity of forest has changed
- Iowa doesn't have a forest culture, plus lots of ag
- Going to take multiple individuals/agencies to make a difference
- Get landowners involved
- Need more oak regeneration – for mast and for cover
- Need to get things back to a landscape scale – more relevant
- MI hunter retention
 - Advertise certain people to be at state parks (with Pheasants Forever and Ruffed Grouse Society)
 - Turkey Thursdays, Woodcock Wednesdays
 - Also include articles and hunting stories in state travel literature (which is then distributed nationally) – hadn't been done previously
 - Campfire programs – Steve talks about turkeys and hunting
 - Helps get attention from/educate any non-hunters that may be staying at state parks
- Need to let people know what you are doing to the habitat and why
 - Need to let the public know what's going on
 - Attitude changes if you let the public know that the habitat work is helping a wildlife species

- Need appropriate funding for social media sources – need utilize more ways to connect with the public and let them know what we are doing and what resources are available to them
 - Try to make these programs and agencies relevant to lots of people, not just hunters

Can look up Michigan Fish and Wildlife Council – marketing

- Need to relate policy and funding back to quality of life and importance to commissioners and legislatures to get their attention and spark action
- New technology
 - Interesting to find out how many males contribute to one nest
 - Could have impacts on season starting dates
- Is there a threshold to success rates correlating to hunter satisfaction? – KS
 - Hunter satisfaction is on a sliding scale, so it's hard to establish a state-wide scale
 - Maybe should tie it to permit sales instead of hunter success
 - If there's too many hunters (even if hunter success has gone up), hunter satisfaction could go down because they may lose the peace and satisfaction of hunting
 - Also, think about catch-per-effort
 - Set goals or parameters and then evaluate whether you've reached that target
 - Can make adjustments when there are fluctuations in participation
 - These goals and decisions should not be annual, should be based on short-term or long-term trends
 - Hunter satisfaction as a value has changed over time (with people's expectations)
- Why do we care about hunter success?
 - Index to hunter satisfaction or index to abundance?
 - Could be just arbitrary
 - Have spent large amount of time to convince hunters that fall harvest affects spring harvest... maybe that is affecting it
- Without a population abundance estimate through fall harvest, thresholds will decrease (and have)
- Michigan has regulation changes every three years (three-year stabilizer)
 - Different species are staggered to prevent all of these changes from being reviewed at once
- How do we apply density-dependence to the top research questions in this field?
 - If had funding, what would be focused on?
 - Monitor changes in productivity, etc. in different/changing habitats
 - Now adds time and special components
 - More modeling – potentially up to the entire state (large scale predictor models)
- SE Study Group
 - Interest in regional cooperation project
 - i.e. Cooperative NE project – gobbler survival (PA, OH, NY); WV/VA -
 - issue of opening seasons earlier
 - concerns of killing gobblers before getting to hens
 - interest in monitoring reproductive parameters
 - impact of habitat availability and usage
 - more disease reports annually than ever – how does that affect management
 - centered around density dependence, spring harvest timing, and hunter satisfaction
 - productivity – some states are nervous about opening early, liberal bag limits, lots of hunters, and habitat fragmentation (effects on population)
- Concern over best management for turkeys – KS
 - Are we too aggressive in some cases?
- Time is right for GPS transmitters – see how birds respond to habitat changes
 - Southern states are doing lots of work with prescribed burns – how do the birds respond to fires and the new habitat they create
 - GPS transmitters seem to be getting more reliable, but there are still lots of problems
 - Can get large amounts of data for a small sample size – different

- Can also look at hunter movements (given GPS when hunting, look at movements while pursuing gobblers, etc.
- No changes seen in clutch size, just in nest success and poult survival
- How do we count turkeys?
 - Everybody does it differently because everybody just wants a number
- Jason Isabelle interests
 - Mark birds, see habitat preference/movements
 - Try to give managers better info to improve nest selection information – make better decisions
- Now trying to shift gears and re-evaluate harvest management now that the population is shift back towards stable
- Having abundance efforts will be important moving forward – can help with population estimate
- Winter flock counts in Midwest??
 - In ND – but don't know if its valid any more, too many variables
 - Problems with accuracy in reporting
 - Could it become another index?
 - Would drones help?
 - Fly at night to do brood surveys with thermal imaging
 - Could be the future
- Northeast uses track counts
- Need to have consistent messages

Round Table Discussion

Hunter survey – 2/5 of hunters thought legal regulated hunting could cause extinction

- Michigan
 - Annual division meeting – presentation from marketing group
 - Surveyed MI residents
 - 20% of MI hunters think legal regulated hunting could potentially lead to extinction of a species (14% others were unsure)
 - Thinks department needs to do more public education/outreach, information
 - Define regulations, highlight reasoning behind regulations, talk about methods, monitoring
 - Want to see what other agencies are doing
 - Is there a metric for monitoring success in informing hunters on regulations?
 - Hunter response, hunter thoughts on regulations, disease
 - Can put lots of effort into this, but still see lots of gaps in results
 - Want to get more hunters on board with what the agency is trying to accomplish
 - Survey submitted to both hunters and resident non-hunters
 - Might expect this from non-hunters, but numbers might be similar between 2 groups
 - Doesn't think responses were all that different for hunters
- MSU
 - How soon after wolf hunt was survey completed? What population do they feel would go extinct?
 - Probably at least a year
 - Public referendum – overwhelmingly against wolf management/lethal control in UP
 - More people in Detroit than UP
- WI
 - Is it general ignorance or mistrust of the agency?
 - Thinks its general ignorance
 - Hunting itself was generally favorable (80-85% support)
 - Recognize its value
 - 55-60% of non-hunters were favorable (not quite as may support it, but still high)

- Where do we go from an educational stand point? How big a wall of distrust?
 - NOT message from agency biologist, maybe needs to be carried by stakeholders to reach the public
 - Work closely with partners
 - If it comes straight from the agency, there is a chance it will get blown out of proportion
- IN
 - Similar in IN
 - Potential try to get materials online (classes, etc.) – educate people about basic wildlife biology topics
 - Many hunters don't know where funding comes from (Pittman-Robertson Act)
 - If landowner in IN, don't have to have hunting license to hunt on property (then call to complain about not having enough resources)
 - Lack of education
 - Many times didn't know that was true (change view/inform 1 person) – need to reach more people
 - Maybe do YouTube series, etc.
 - Master naturalist program (similar)
 - If complete classes, can earn title and it might mean more
- KY (David)
 - Outlook is grim
 - Late 70's/80's – show pictures of common wildlife and the avg person couldn't correctly id species (except WTD)
 - Ignorance about common species is overwhelming (then – may have gotten better now)
- IA
 - Many people/kids know the unique stuff, but may not know the common species
 - A lot of concepts are not state-specific, so if it came from a trustworthy non-state agency source it might be better
- KY (Gabe)
 - Could it be confusion with the past wildlife management “strategies”
 - Extinctions due to unregulated hunting
 - Could be, but would need to follow up
 - Want to make sure that we weren't missing anything or that others were having some success with
 - Social media, town halls, press releases, speaking with partners
- OH
 - Given MI benefit of the doubt
 - Don't know how these hunters/people define themselves
 - How recently did they hunt last, etc.
 - Need some way to define that, worth following up
 - Room for more questions to clarify the responses to the questions that were asked
 - There have been species extirpated due to hunting
 - Want to know more about design of the survey
 - Where did these people get their information (to make this decisions)
- IN
 - Also asked which species were endangered and many couldn't correctly identify them
 - Seen this in college students and seen it in children taking an environmental education class
 - Seems to be a pattern that persists
- OH
 - Underlying problem – people don't know what we do
 - Think about social marketing – how to market message?

- Focal groups, words that resonate
 - Put landowners into different categories where they could measure the effectiveness of the message
 - Don't know what would resonate with wildlife problems
 - Random approach won't get us closer to a solution
 - Let people know how passionate we are about maintaining/protecting this resource
- MI
 - Other part of survey – MI wildlife council (working with marketing council)
 - Need to get final message out
 - People in the metro areas don't understand because it is not something they think about, hunting most likely not on their radar
 - Rest of it is patterned off of the "CO public hunter"
 - Need to try to duplicate those efforts
 - Restructuring of licenses creates money to move this program/education forward
 - \$1 of every license sale goes into education/advertisement
 - Lots of programs in metro areas to try to expose people to wildlife and the natural resources
 - Soft entry – don't know how it is going to work out
- IL
 - Survey with very negative views (similar)
 - Put out video about trapping to help people understand (may not like it still, but understand it)
 - Try to head it off before becomes unmanageable
- MI
 - USFWS – tried to put out information (film strip)
 - The Un-endangered Species

Ways to encourage hunters to harvest antlerless (or not) in the name of disease

- Issues with culling or problems with getting hunters to take more deer than normal
- WI
 - Free doe tags, earn buck for next year (could earn multiple bucks)
 - Actually turned deer numbers down
 - Not popular
 - Been taken away by state legislature – no authority to take it back
 - Movement by county deer advisory councils to take it back
 - 4 or 72 counties had resolutions
 - Advance it at spring hearings
 - Since earn a buck has gone away - lowest numbers in years
 - Best trophy deer management program in the state
 - Are we saving the animals that we should be taking out?
- NE
 - Earn a buck for 2 years – worked
 - Local movements (process of meat, cooking) – need to support this program
 - Deer exchange program (successful)
 - Sign up for people who wanted a deer, could connect with hunters
 - Worked great, people were willing to take deer for various reasons
- OH
 - Like WI, have favored antlerless tool
 - Most success with \$15 antlerless permit
 - More isn't always better – make seasons longer, etc.
 - Lower permit by \$9, only a 2 week window (first 8 days of season)
 - Got people to buy permit (savings), then realized that they had to use it
 - But then they also bought the either sex tag too so they didn't pass up opportunities
 - Already going out with intent to kill 2 animals

- Removed program
- 65% → just under 60% harvest
- Not really an education standpoint, but were able to
- Didn't get everybody
- Saw a tremendous increase in harvest (many people killed 2 deer then, instead of 1)
- May or may not work – saw novelty wearing off
- Worked well for 5/6 years
- IN
 - Trying to get more samples brought in
 - In favor of paying (incentive) for hunters to bring in samples (for disease management)
 - b/c if don't have enough hunters come forward, will have to pay Wildlife Services anyways
 - cost-benefit ratio (pay up front, 10x cheaper, makes hunter happy)
 - has potential to work
 - goes against how we operate (people pay up for opportunities)
 - may take something extreme to get people to participate
 - may need to partner with someone outside the agency to make it work
 - not enough time to implement something like this this year
 - antlerless increase 5-10%, then need to pay agency
- WI
 - Don't want to leave out supplemental hunters
 - Better if there are more hunts (1 early, 1 late)
- MI
 - Could use elk tag as incentive
 - Have points for landowner – could you use that similarly for deer with elk tag for incentive
 - KY – that was where that discussion went
 - If landowner just allowed someone to come in, even if unsuccessful, they should get points
 - But just wanted to try it with the elk first to prove it works
 - So it might go that way
 - Want to continue as is (or expand the KY program)?
 - Yes, make sure this program is successful first for the next few years
 - Steve beam came up with idea, morphed into program today...maybe could grow to incorporate deer
 - Could do it in other states too with other game species (i.e. deer(another buck), turkey)
- MN
 - In a disease management, want to drastically lower deer herd
 - Is this going to affect access, how affect their interests?
 - Provide other opportunities assures people that you are not affecting their way of life
- IL
 - To MI – do you have wildlife services sample animals?
 - Could tell hunters that every deer they bring in is less than wildlife services has to take
 - Helped sample size
 - Got public to participate – either through reporting, etc.
- IN
 - Hunters are being more proactive about getting deer in for samples
 - But could go either way – hunters may just refuse

Urban management tactics that were successful and how it plays into killing deer for disease purposes

- WI
 - Still have urban sharpshooting
 - This year urban hunting tags – don't know success yet
 - E WI – trapping deer (donating to food pantries – 100 some deer in 2015)

- Enrolled urban areas – open up urban parks for hunting
- Don't have to do a drawing, etc. – associated with state hunting license systems
- NE
 - Omaha – deer and turkeys in wooded areas – not open to hunting
 - Use staff to kill turkeys, finally contacted wildlife services
 - Small towns it works
- MI
 - Urban deer plan
 - When community approaches, lay out a plan
 - Should talk about it at the community level – decide which methods will be pursued
 - Not immunocontraception, not trap & removal
 - Allow flexibility & lay out framework
 - Make sure agency/state is protected (more consulting)
 - Community has ultimate decision
- IL
 - Urban deer program – project manager (work w/ communities to implement
 - Marty Jones (retired, matryjones@illinois.gov)
 - Use state-wide season dates, follow regulations and season dates
 - Get access to properties within the community
 - Sister-cities – one won't consider hunting program, but one has it
- WI
 - Legislation passed that municipalities couldn't prevent bow hunting
 - Cities used to be able to regulate it
 - Don't know impact
- IA
 - Special management hunts that groups can form in areas
 - Get group of stakeholders, propose a management zone
 - Weapons restrictions, antlerless
 - Pretty effective
 - Agency takes advisory standpoint – group has to go to city councils
 - IA City did opposite – hired sharpshooters
 - Advisory standpoint has been more effective
 - A lot more receptive to management because it is a local group
 - UNI – police chief
 - Are people more satisfied and seeing more results at the population level
 - Local partners – city council
 - Urban stakeholder groups could do it, neighborhoods wanted to do it too (needs to be within the whole neighborhood) –
 - Agency does helicopter surveys and telemetry to determine the number of deer, etc. and they sat back and became mediator
 - Worked for them, cost them money
 - Agency original was doing surveys there, now don't have money for it, so now they come to the agency essentially for consulting (agency not spending any resources)
 - First antlerless deer, then points system
 - Selling point for urban system – put benefit back on hunters (learn more about deer biology when going after a doe in urban area)
 - Saw a positive response to this strategy
 - Not we're helping the agency
 - Never had bad experience with urban hunt – b/c hunters had to take courses in ethics, etc.
 - Program is still going on, moved back and forth
 - Waterworks (15000 acres) – new director didn't want hunting, so they've stopped it there
 - Biggest complaint – from wildlife viewers (tally number of deer seen)

- Eventually got on board
- OH
 - Working local municipalities to get them on board
 - Mayor says deer are fish and wildlife's responsibility
 - Do have success
 - More of advisory role in communities – give them options, they have to decide what they want to do
 - 6 communities that had it on their ballot – overwhelmingly in favor
 - Working to bring hunting into those cities
 - Those that don't – sharpshooting
 - 1 city did a trap and bolt system
- IA
 - Had a locker in the city so that people could drop them off if they didn't want it or couldn't use it
 - Could help out local food banks
- OH
 - Small incentive – some have option to
 - Key to success – make it look and feel attractive to hunters
 - Its convenience, they just need to see the benefits to it
- MN
 - Similar program, advisory role
 - Minneapolis/ST. Paul – success with bow hunters
 - Self-regulated proficiency test
 - Have to pass a proficiency test in order to participate – set up by municipalities (similar thing in IA – bow hunters cert and pass a test, some uncertainty removed)
 - Fill out form annually, get bonus permits (hold tight on bags limits, but give them latitude)

Business Meeting

Iowa volunteered to host the meeting in 2017. Proceedings, meeting notes and information about upcoming meetings are available on the web at: <http://mdwtsq.org/>. South Dakota has been maintaining the web site and is willing to continue to do so but is happy to hand it off if anyone is interested. There is a need to update the current contact list. There was Discussion about this group speaking on behalf of other cervids, such as moose and elk. In which we decided that it would be best to speak for WTD, Mule Deer, and Wild Turkey only. The study group approved a resolution related to federal funding for CWD management. Discussed the releasing of captive cervids into the wild for restocking or restoration purposes.