Independent Review
of the
South Dakota Department of Game, Fish, and Parks
Division of Wildlife
Big Game Management Program (RFP – 2018)

Final Report - 9/26/2013

Wildlife Management Institute, Inc.
2013

Executive Summary

The South Dakota Office of the Governor, through the South Dakota Department of Game, Fish, and Parks (Department), contracted with the Wildlife Management Institute (WMI) to conduct a review of the big game (deer, elk, antelope, and mountain lion) management programs conducted by the Department and the Game Fish and Parks Commission (Commission). WMI completed the review by analyzing over 2,500 documents provided by the Department; holding a series of public "listening sessions" across the state; gathering public input via a dedicated email address; conducting personal interviews with individuals identified by the Governor's Office, current and former Commissioners, current and former Department staff, and circulating an on-line survey administered to Division of Wildlife staff who were not personally interviewed.

WMI's review was designed to identify the strengths, weaknesses, and areas of improvement for the South Dakota big game management program. Our goal was to provide valuable information that will improve each of the big game management programs and to assist the Department in its role as public steward of the wildlife resources that grace South Dakota.

WMI concluded that the South Dakota Department of Game, Fish, and Park's Wildlife Division is comprised of knowledgeable and dedicated wildlife professionals. WMI identified the following strengths of the big game management programs. 1) Staff understand the importance of combining biological information with stakeholder desires to manage big game. 2) The Department has been actively engaged in scientific research to help answer questions that would improve the science behind population management. 3) The Department has openly embraced public participation and communication in order to engage the public in their decisions. 4) Hunter satisfaction rates and response to landowner tolerance demonstrated that the Department staff has been working to meet public demands as public stewards. 5) The big game management program has rapidly evolved to adopt more sophisticated management planning, survey methodology and population modeling. These efforts, although time-consuming and laborious, will be essential for continued big game management improvement.

WMI identified the following weaknesses that we believe must be addressed in order to improve the big game management process. 1) Biological surveys should be reassessed based on time and expense, use of data, established protocol, training, and accuracy and precision of data. 2) Management plans should be developed in concert with the public and Commission and should contain measurable and time specific population objectives. 3) Population modeling should continue to be improved and used to reduce costly and/or ineffective surveys. These models should form the basis of population projections that should be compared with population objectives. 4) Harvest management and license/tag allocations should be based on algorithms that allow adaptive management and provide a learning experience for managers.

5) Department staff should improve internal communication and participatory management. 6) Staff at all levels in the chain of command must understand leadership priorities, policies, goals, and objectives. Staff must also understand their role in a participatory management approach. 7) All relevant staff should have input to the decision making process at appropriate levels but they must understand the decision making matrix and be provided feedback on decisions that lead to changes in their personal recommendations. 8) The Commission and Department leadership should establish a roles and responsibilities agreement that provides transparency to the public, staff, and Commission. This agreement should conform with existing law and define the expectations, authorities, and jurisdictions of the Commission and Secretary.

WMI finally concludes that the Department has a strong and well established big game management program that appears to meet the current needs of the Department, hunters, and landowners of South Dakota. Notable improvements in that program are underway. The Department should consider providing key staff members appropriate reprieves from their daily activities to focus a concentrated effort on improvements recommended by WMI to address the weaknesses that both Department staff and WMI have identified.

QUESTIONS POSED BY THE GOVERNOR'S OFFICE

The Governor's Office posed nine specific questions to be answered by the review. Brief answers to each question and **recommendations** for areas of improvement include:

1. *Does the current structure of big game hunting seasons in South Dakota lend itself to proper big game management?*

The current structure of the antelope, elk, and mountain lion seasons provide a sound basis for proper management of these species' populations. The season structure for deer is adequate, but could be improved. The current deer season structure is more complex than necessary to meet all management needs for this species, but is overly simplified in other ways. The myriad of license types issued at the unit level (i.e. county or smaller area) enables managers to distribute hunting pressure with precision, but allocation of multiple license types through multiple drawings may confuse some hunters and reduce overall participation. In contrast to the variety of license types employed at the unit level, the Department has adopted a policy that dictates substantial statewide consistency for season length and structure which may limit managers' ability to address variable deer population status at a regional or sub-regional level. In addition, the issuance of unlimited archery, muzzle-loader and youth licenses that are valid over broad areas (e.g. East River, West River, or statewide) limits managers' ability to control harvest in some locales. **WMI recommends the Department and the Commission review the structure of deer seasons and evaluate ways to reduce complexity of license types and allocation and provide managers greater flexibility to adapt season structure at the regional or sub-regional level. This process should be completed as an element of developing a**

current deer management plan (see next question for additional discussion of this issue)**.**

2. *Does the Department give sufficient effort to development of big game management plans and specifically, to sections of these plans that guide the setting of population objectives and strategies to meet objectives?*

Historically, the Department did not give sufficient effort to the development of management plans for antelope, deer, elk or mountain lions, and the few plans that were developed did not include meaningful population objectives. The absence of plans with clear objectives created uncertainty for Department staff, the Commission, and the public and contributed to past and present controversies regarding management of big game. The Department recently developed management plans for antelope and mountain lions that do include specific population objectives and strategies to achieve those objectives. The Department is currently initiating the development of an elk management plan and indicated its intent to develop a deer management plan as soon as resources permit.

WMI's review revealed that the Department, rather than the Commission, makes final decisions regarding approval of management plans. Although the Commission is informed throughout the planning process, the lack of a formal role for the Commission in approving management plans creates a potential "disconnect" that can affect implementation of plans and achievement of the plan's goals and objectives. Management actions implemented by the Department, management plans, and in particular the objectives in those plans, constitute a "contract with the public" with respect to the management of the public's resources. As such, management plans should be developed through an open, inclusive process that employs effective strategies to engage the public in setting goals and the Commission should formally adopt objectives and final plans. **WMI recommends that the Department and Commission review the ongoing process being conducted to develop the elk management plan to improve public involvement. Given the ecological relationships between elk, deer, mountain lions, and habitat in the Black Hills, the Department and Commission should consider developing an integrated management plan for these species in the Black Hills, rather than a stand-alone elk plan. The planning process used for the Black Hills should include evaluation of the relationship between grazing management on the National Forest and forage availability for elk and deer as well as predator-prey relationships. Effectively engaging all major stakeholders in a comprehensive planning process would enable the Department and Commission to resolve a number of chronic issues that contribute to controversy surrounding big game management in the Black Hills. Finally, when the Department and Commission begin development of a current deer management plan for portions of the state outside the Black Hills, they should evaluate options that allow greater management flexibility with reduced complexity of license types as well as ways to reduce the frequency with which the Commission deals with deer management issues.**

3. *Do the management and harvest surveys conducted and contracted by the Department provide sufficient foundation for proper big game management?*

Harvest surveys conducted by the Department provide a sufficient foundation for proper management of antelope, deer, elk and mountain lions. Ongoing efforts of the Department to enhance both the efficiency and quality of harvest surveys have been effective and should be continued. Some management surveys conducted and contracted by the Department provide valid data that are useful for the management of antelope, deer, elk and mountain lions. The quality and utility of data from other management surveys has not been adequately evaluated, and some management surveys appear to be conducted on the basis of historic precedent, with no apparent role in current management decision-making. For instance, WMI is not confident that current deer and elk teeth collection to determine age structure provides additional information that drives deer and elk management decisions. Fall deer, elk, and pronghorn classification surveys would be improved if survey protocols were more statistically valid and if they were a primary job responsibility rather than an opportunistic and secondary job responsibility. The current aerial surveys for elk and pronghorn provide meaningful information necessary for population management. **WMI recommends that the Department seek additional biometric/statistical expertise to assist with this activity. Periodic reviews of survey protocol, use, and validity should be conducted.**

4. *Are sufficient financial and staff resources allocated for proper big game management?*

Every state's big game management system has a limited amount of funding and staff, and every state could improve its management system if additional resources were available; South Dakota is no exception. At the same time, every state must balance its use of resources for big game management against other program needs.

Financial and staff resources employed by the Department for big game management appear sufficient to manage big game in a traditional reactive framework, but as the Department continues to implement rigorous population estimation, monitoring, and management to objective approaches, it is very likely that additional staff and financial resources will be needed. In addition to seeking added biometric support as previously mentioned, further resources will be needed to interact with stakeholders in management plan development and data collection to support population models. As models are developed, there will be an opportunity to reallocate funding and, to some extent, staff time currently used to estimate population sizes of mountain lion, pronghorn and elk to other surveys such as classification counts for deer and elk.

WMI's review identified that the Department commits significantly more staff time and funding to wildlife damage management than most other states. The wildlife damage program is deeply embedded in the wildlife management culture of the state. The program influences the attitude of landowners toward the Department and may contribute to public access for hunting on private land. Wildlife Damage Specialists

contribute to the big game management program by collecting some management data in some regions. However, the wildlife damage management program, particularly as it relates to resident geese in areas along and east of the Missouri river, has grown to the point where it is significantly impacting the regional wildlife managers' ability to focus on big game management. WMI recognizes that this issue is complex and involves legislative action beyond the scope of the Department's authority and WMI's review.

WMI understands that the Department has the necessary flexibility within its budget and spending plans to address prioritized needs. **Recognizing that funding is finite, the Department should review the recommendations within this report and assign priorities to the actions identified and accepted by the Department. Staff and funding should then be assigned to address the priority actions within reasonable timeframes.**

5. *Are financial resources for scientific research prudently allocated, and does the scientific research conducted and contracted by the Department contribute to proper big game management?*

Research conducted and contracted by the Department is well designed and is directed at appropriate management questions which provide results that contribute to proper management of antelope, deer, elk and mountain lions. The Department makes effective use of the limited resources it has for research. However, the Department's historic reliance on a single research institution (South Dakota State University) has limited the Department's ability to identify and employ a broader range of knowledge and skills. **WMI recommends that the Department continue to support in-house research at a level that addresses the highest priority management issues identified through the existing objective process. WMI further recommends that the Department engage additional research institutions and a broader range of expertise, including biometrics and statistical analysis when contracting research outside the agency. In particular, the Department should seek additional expertise in the field of population modeling and adaptive harvest management.**

6. *Does the Department properly utilize available survey and research data to formulate big game hunting season recommendations that are consistent with established management plans and population objectives?*

The Department does use available survey and research data to help inform recommendations consistent with established management plans for pronghorn antelope and mountain lions. The lack of current deer and elk management plans and population objectives precludes the ability of the Department or Commission to make decisions based on objectives. The Department's surveys provide statistically useful estimates of harvest levels for all species, but the current "bottom up" approach to deer and elk hunting recommendations appears to WMI to rely heavily on anecdotal landowner and hunter input collected in an opportunistic manner rather than by any formal, structured approach that is transparent to the public and that lends itself to scientific analysis. The lack of a structured approach with a well-documented and

quantifiable decision-making process impairs the Department's ability to practice adaptive management and to learn what works and what does not work when it comes to effective harvest recommendations necessary to affect population management. WMI recommends that **the Department provide adequate time and resources to key staff to develop management plans, robust population models, and adaptive harvest management recommendations that will achieve population objectives.**

7. *Is there sufficient opportunity for appropriate staff input at all levels of the Division during the season setting process? Do Department administrators provide an appropriate level of oversight and review in big game management decisions and the development of hunting season recommendations?*

The Department's current season setting process for antelope, deer, elk and mountain lions provides extensive opportunities for staff participation. The process begins with recommendations developed by Conservation Officers, resource biologists and Wildlife Damage Specialists at the field level and progresses through review at the regional level, then at the central office staff level, and finally by upper-level management including the Wildlife Division Director and Department Secretary. Department administrators provide an appropriate level of oversight and review of management recommendations. However, the lack of management plans and inconsistent guidance from upper-level staff (i.e. Regional Supervisors and above) at the front end of the process can result in field staff developing recommendations that are outside the bounds of established policy. This results in inefficiency and frustration when recommendations are modified or rejected. Feedback to regional and field-level staff from discussions at Commission Recommendation Development (CRD) meetings was very good, but communication from upper-level staff to the field regarding the rationale for changes or rejection of recommendations was inadequate, which leaves an information gap that may erode trust and, ultimately, reduce staff willingness to participate in the process. To a substantial degree, the problems WMI identified with the season setting process are a function of inadequate management plans, lack of appropriate delegation of staff-level and commission-level decisions and the frequency with which all aspects of the big game regulations are considered by the Commission. These factors lead to excessive time committed to bureaucratic process focused on minor details and inadequate attention to higher-level policy decisions and communication by senior management within the Department and by the Commission. **WMI recommends that the Department integrate management plans more effectively and upper-level staff provide additional direction at the beginning of the season setting process to establish appropriate expectations and understanding of policy guidance by field staff. In addition, upper-level staff and the Commission need to improve both the frequency and content of communication to field staff and the public with respect to how their input is considered and factored into final decisions. To enable the Department and Commission to implement these recommendations, they should restructure the way changes to big game regulations are considered. Higher-level policy issues such as season structure, when and if multiple tags per license should be used, preference systems, manner of take restrictions, etc., should be addressed on a**

multi-year (e.g. 3 or 5 year) cycle rather than annually. To the extent allowed by law, the Commission should delegate additional authority to the Department to make minor changes in license numbers, at least for antelope and deer, on a year-to-year basis, within a framework defined by the Commission. These changes would allow both the Department and Commission to focus additional time and effort on public and staff engagement and communication.

8. *Does the Department provide the Commission with a sufficient amount of biological justification and information on social impacts to make informed decisions on hunting season regulations?*

Our interviews with Department staff and Commission members indicated that Commission members are provided sufficient biological and social information prior to making regulatory decisions. Results of the Commission Recommendation Development process were provided to the Commission in advance of their meetings and staff were available to answer questions before and during Commission meetings. However, we questioned the validity and inclusive nature of some of the social information because it was anecdotal and collected opportunistically rather than through a human dimension research approach that would provide scientifically valid information. Valid human dimension research would inform decisions more effectively than the tendency to respond to individuals expressing their personal opinions in public. Further, it was apparent that the Commission has occasionally placed unrealistic and questionable demands on the staff (e.g. asking for antelope population estimates in the spring rather than waiting for survey and analysis to be completed in the fall). **WMI recommends that the Department employ human dimension research to improve the social information used in decision-making. WMI recommends that management plans developed pursuant to recommendations in questions 2,3,6 and 7 contain quantifiable objectives relating to social impacts, including hunter satisfaction and landowner tolerance, and the means to quantifiably evaluate progress against these objectives be developed and implemented.**

9. *Is there sufficient opportunity for public input in the development of management plans, population objectives, and big game hunting season regulations?*

The approach used by the Department to develop management plans typically begins with the Department preparing a draft management plan internally before submitting draft plans for public comment. This approach is adequate for some plans but does not employ public engagement strategies that would allow the Department to better understand the diverse interests of stakeholders and, importantly, allow the stakeholders to better understand the management options and recognize the desires of other stakeholders for controversial species such as mountain lions and elk. Further, the lack of quantifiable population objectives in some plans and the limited role of the Commission in management planning may reduce public acceptance of plans and makes implementation of plans more difficult. **WMI recommends that the Department and Commission develop and employ more open and inclusive planning processes to**

reduce the controversy associated with, and improve the efficiency and effectiveness of, management of big game, especially elk and mountain lion.

The process used for setting big game hunting season regulations provides substantial opportunity for public input. However, the Department-public-Commission dialog regarding regulations is hampered by the lack of recognized management plans with measurable population objectives, which would provide a better context for making decisions regarding license allocations and other hunting regulations. The lack of clear plans and objectives also contributes to the perception that the Department and/or Commission are simultaneously non-responsive to the interests or input of some citizen interests or to field-level staff and overly sensitive to the demands of some special interests. Finally, as explained in response to question 7, the manner in which the Department and Commission address changes to big game hunting regulations leads to excessive attention to minutia and inadequate consideration of broader policy issues. **WMI recommends that the Department and Commission modify their approach to developing big game hunting regulations (**see response to Question 7**).**

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Introduction

The Wildlife Management Institute (WMI) was established in 1911 with a mission to provide leadership and advocacy for the enhancement, conservation, and professional management of wildlife and its habitat. Our mission remains unchanged today. WMI has a 102-year tradition of science-based wildlife management which values wildlife as a public trust resource, hunting as a legitimate and necessary management tool and recreational pursuit, habitat as necessary for wildlife, and conservation education. During our history, WMI has conducted more than 70 independent reviews of state and federal fish and wildlife programs.

In October 2012, WMI received the announcement by the Office of the Governor of the State of South Dakota for a request for proposals (RFP – 2018) to conduct an independent review of the Department of Game, Fish, and Parks (Department) big game (deer, elk, antelope, and mountain lion) management programs. WMI submitted our proposal (Appendix A) on December 26, 2012. On February 22, 2013, WMI received a request for a best and final offer (BAFO) for our proposal. Our BAFO was submitted to the Office of Procurement Management on February 25, 2013. On March 18, 2013, WMI signed a consulting contract between the State of South Dakota, Department of Game, Fish, and Parks and WMI to conduct the independent review.

On April 16, 2013, WMI's President and Vice President met in Pierre, SD with officials from the Office of the Governor and Department to discuss details of the proposal and logistics for conducting our review. Prior to this meeting, WMI requested Department documents concerning big game management planning, surveys and analyses, recommendations, and budgetary and staffing information. At that meeting, the Department provided more than 2,500 documents (Appendix B) on USB flash drives for our review and analyses.

WMI approached this independent review with the understanding that effective management of big game populations is a critical factor in the success of state fish and wildlife agencies. Big game species are a public trust resource in the United States, and the people of each state hold state government accountable for the management of their resources.

WMI understands that effective management depends on successful integration of biological and social elements. The biological elements must be accurately measured, monitored, and analyzed using scientifically sound techniques. The social elements must provide meaningful ways for people to gain knowledge about big game resources and participate in decision-making. Citizens have a range of values from naturalistic to utilitarian. For these reasons and others, big game management systems must consist of processes that are well defined, transparent, and understood by both the managers and the constituents they serve. The North American Model of Wildlife Conservation, built on such principles as managing wildlife as a public trust, using science as the basis for decision-making, providing all citizens a voice in the process, allocation of wildlife

harvest by law – not the market or privilege – and equal opportunity for all citizens to participate in hunting is the overarching framework by which state agencies seek to meld the biological and social elements to achieve desired outcomes for game species.

WMI understands that big game species are highly visible, economically important and charismatically attractive to hunters and non-hunters alike, and potentially damaging to natural and altered habitats. Each year approximately 96,000 resident and non-resident hunters take to the field in South Dakota in pursuit of these species. Managing big game populations that include large predators presents unique biological and social challenges to management agencies. Effective management of deer, elk, antelope and mountain lion populations is equally important to agricultural producers and ranchers whose private lands provide habitat for these species. Managing big game populations at levels where crop damage, competition for forage, and livestock depredation is tolerated by landowners is important not only for the state economy, but also for maintaining constructive relationships between landowners, hunters and wildlife managers.

Our independent review consisted, in part, of document reviews and analyses. We employed public listening sessions, informal public surveys, and electronic mail and standard mail collection of public comments to gauge public perception. We conducted one-on-one interviews with Commissioners, interested individuals, and selected Department staff directly involved in the big game management process. WMI also developed and distributed questionnaires for Department field staff that directly or indirectly provided input to the big game management process.

WMI's independent review team consisted of six academically trained and experienced wildlife professionals with a combined working experience in state and federal agencies in excess of 100 years. The team's expertise included field surveys and research, data analysis, population modeling, and agency administrative experience for big game management programs in the states of Montana, Colorado, Alaska, Texas, Kansas, Pennsylvania, Ohio, New Hampshire and Massachusetts. Recently, WMI team members conducted similar reviews of big game programs in Pennsylvania, Montana, and Texas.

Methodology

Document Review

In April 2013, the Department provided a set of over 2,500 documents to WMI to convey perspective to the review team of agency operations, procedures, budgets, planning, laws and administrative rules. Not all of these documents were germane to the project. For example, it appeared that complete sets of Commission Action Sheets for the years 2005 through early 2013 were sent. Many of these addressed species other than big game. Hence, only documents pertinent to the project (Appendix B) were selected and reviewed to help formulate questions for subsequent surveys and interviews. In addition, some of these documents were useful for data analysis and provided a foundation for our findings and recommendations.

Early Public Input

In addition to the agency documents, WMI received approximately 150 written comments that were sent to Mr. Jason Glodt in response to his request for input to assist in development of the Request for Proposals for this project. These were also sent to WMI in April, 2013 and were valuable in helping the review team formulate an understanding of the current public perception and wildlife-related issues in South Dakota.

Public Listening Sessions

In May, 2013, the WMI conducted three public listening sessions with the intent to gather the opinions and views of South Dakota residents regarding the state's management programs for antelope, deer, elk and mountain lions. These listening sessions were held in the cities of Brookings, Pierre, and Rapid City. Each session was three hours in length (beginning at 6:00 p.m.), and included introductory remarks, a 15-minute period for participants to complete a 16-question survey, and ended with a facilitated open comment period in which participants were asked to express their opinions and views of the Department's big game management process and programs. The listening sessions were publically advertised through a press release issued by the Governor's office on May 3, 2013 (Appendix C).

For each listening session, comments were recorded via 3 different methods. First, the facilitator summarized and wrote each comment on an adhesive flipchart sheet so that the participant could see and approve how the comment was documented. Second, the entire comment period was recorded using a digital audio recorder. Third, each attending WMI staff (3) drafted individual notes to capture relevant discussion points. Following each session, each of the three redundant comment records were compiled and synthesized topically.

Listening session questionnaires (Appendix D) were distributed to all participants at each session. Questions were developed based upon elements of the nine questions within the Request for Proposals for this review that were pertinent to public interest and comment. Open comments included in the questionnaires were cataloged along with all other submitted comments and synthesized per the above.

Commissioner and Stakeholder Interviews

Preceding each of the aforementioned public listening sessions, WMI staff individually interviewed a series of Commissioners and stakeholder representatives from the region of the state represented by the city in which each session took place. Information from these interviews was recorded individually by each of the WMI staff (4) that attended the interview, and the resulting records were compiled and synthesized topically.

Open Public Comment

General public comments were received through a non-response email address (SDcomments@wildlifemgt.org) that was specifically created for this review process. The email address was publically advertised through a press release issued by the Governor's office on May 3, 2013 (Appendix C).

Department Staff Interviews

During the week of June 24, 2013, WMI conducted 24 interviews with Department staff, each interview lasting approximately one hour. Interviewees included top-level administrators, headquarters program staff, regional supervisors, regional wildlife management staff and regional conservation officer supervisors. Each interview consisted of a few standard questions regarding the Department and were followed up by more focused questions relevant to the interviewee's current position and their role in big game management programs.

Department Staff Questionnaires

Following the completion of the public listening sessions, Commissioner and stakeholder interviews, and Department staff interviews, WMI developed a separate questionnaire (Appendix E) to collect the opinions and perspectives of Wildlife Division staff that could not be interviewed individually. Staff members surveyed included all Wildlife Conservation Officers, Wildlife Damage Specialists and Regional Biologists. Specific questions were developed based upon elements of the nine questions within the Request for Proposals for this review that were pertinent to internal agency insight

and opinion. Additionally, questions were designed to capture much of the same information requested from staff members who were personally interviewed.

The questionnaire was formatted into a SurveyMonkey™ online survey format. Participants were emailed a link to the survey where their responses could be collected anonymously. During the 23-day period the survey was available (July 10 – August 2, 2013), non-respondents were sent two reminder emails, and the Office of the Governor also distributed an electronic solicitation for response to the target participants. A summary of the results of this survey is included in the following results section sans any open-ended comments. These comments were complied and synthesized topically to aid in the reviewers' development of the specific recommendations found within this document.

The review team used information gleaned from the documents provided, comments for the development of the Request for Proposals, interviews with Commissioners and other interested stakeholders, listening sessions with both oral and written input, the website, the staff survey and staff interviews to develop a set of overarching issues which formed the basis for review findings and recommendations.

Results

Document Review

Review of the documents made available early in the process provided insight into laws, administrative rules, agency policies, agency budgets, staffing, plans, programs, the science used to manage big game, management plans, the regulations development process, public outreach, license sales and public opinion surveys. Review of these documents indicates that operations and activities undertaken by Department are quite similar to the procedures in place at many other state wildlife agencies throughout the country. The science used to manage big game is addressed in subsequent sections of this report. It should also be noted here that management plans are in place for Gregory County Elk (2000), mountain lions (2010-2015), pronghorns (prepared in 2012) and deer in the Black Hills (2008-2017).

Early Public Input

Written comments in response to a request prepared by Jason Glodt for input to help identify issues for development of the Request for Proposals for this project were received from five Commissioners, twenty-nine Department staff, twenty-seven members of the general public, twelve landowner/rancher/farmers and thirty-seven sportsmen. Several individuals submitted multiple sets of comments. Not surprisingly, since the request was prepared to solicit comments to help identify the scope of the project, a wide variety of topics was covered including, but not limited to: goose

management, personnel issues, furbearers, employee compensation, Custer State Park, the Public Trust Doctrine, compensatory time, communications issues, employee qualifications, training, regulations development, Department organization and structure and wildlife damage management. In addition, there were a number of comments related to the Department's big game programs.

Comments from the above sources related to the Department's deer, antelope, elk and/or mountain lion programs could be grouped and summarized as follows: there are credibility issues with Department's big game population estimates; communications between the Commission, Department headquarters staff, Department field staff and sportsmen on big game programs need to be improved; management on the Black Hills National Forest has a significant impact on deer and elk numbers in the region; too many mountain lions are being harvested; there's dissatisfaction with the preference system for big game tags; mountain lion depredation on deer and elk is the primary factor for their decline; mountain lions are not the cause of the decline in deer and elk numbers; deer and elk numbers in the Black Hills are down because of excessive hunting pressure; elk eat too many crops; Department's big game crop/livestock depredation programs aren't adequate; mountain lions will soon be attacking people; big game management should be totally science-based; deer and elk numbers are far too low. Interestingly, there were very few comments pertaining to antelope.

Public Listening Sessions

Questionnaires

Of the approximately 45 individuals who attended a public listening session during the week of May 14, 2013, 37 participants completed and returned a questionnaire (nine from Brookings, six from Pierre, 22 from Rapid City). The data from these questionnaires reflects a sample of opinions from those who elected to attend a listening session, and should not be viewed as representative of all South Dakota residents. Open-ended comments were compiled and synthesized topically.

A large majority of participants were male (78%). The average participant age and residency in South Dakota was 63 years (range, 35 - 79 years) and 48.1 years (range, 3 - 70 years), respectively. Fifty seven percent of the participants reside in rural areas (Fig. 1). Only three participants farmed land, eight were ranchers, six reported leasing their land for agriculture and/or hunting, and 22 indicated that they did none of the above (Fig. 2). Seventeen percent of respondents reported working in the past or present for the Department or Commission.

Figure 1. Respondent residence type.

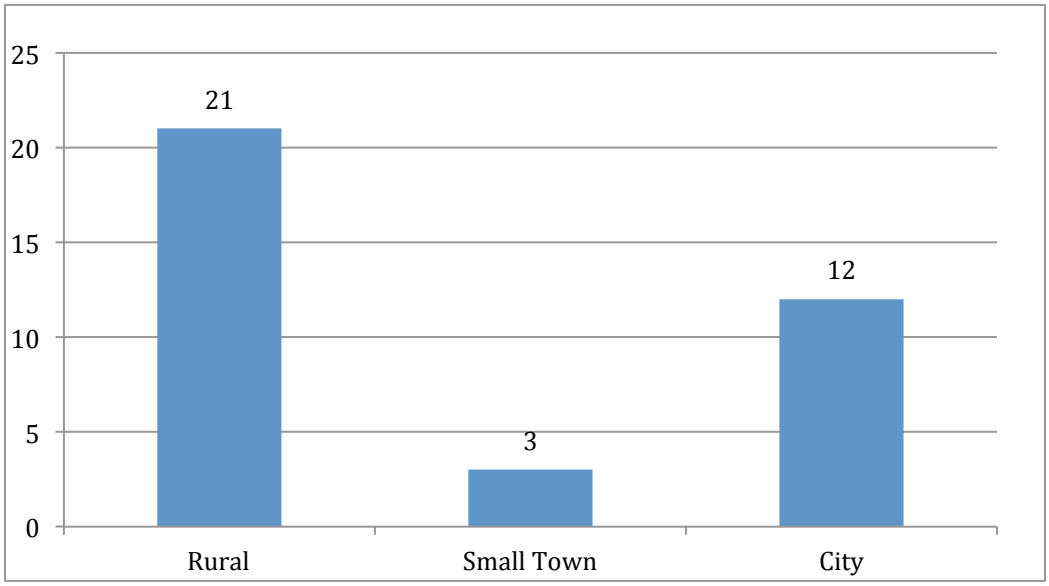
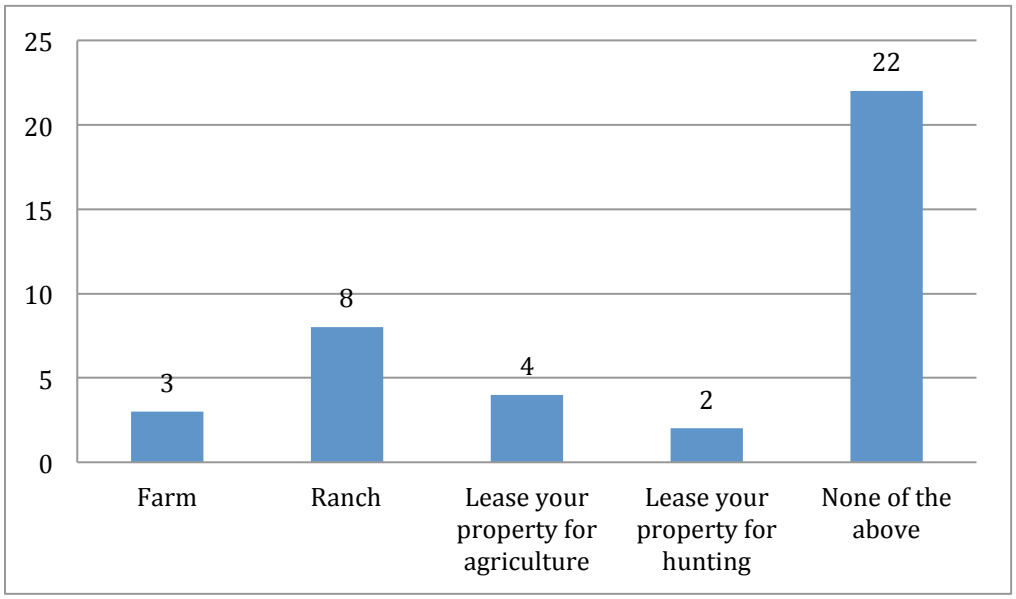


Figure 2. Respondent land use.



Section 1. Knowledge of big game data and information use by the Department and Commission.

Question 1. How knowledgeable are you in regards to the following: (Please circle only one for each item)

Fig 3. The process used by the Department and Commission to set big game management rules and regulations.

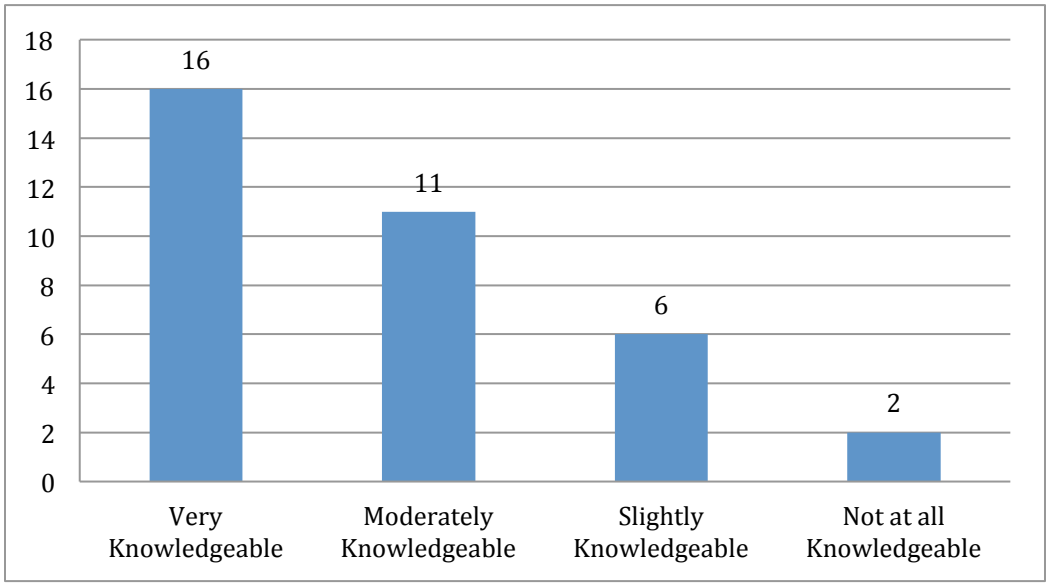


Fig 4. How the Department uses harvest data and population surveys to set hunting seasons and the number and type (bull/cow, buck/doe) of big game licenses available.

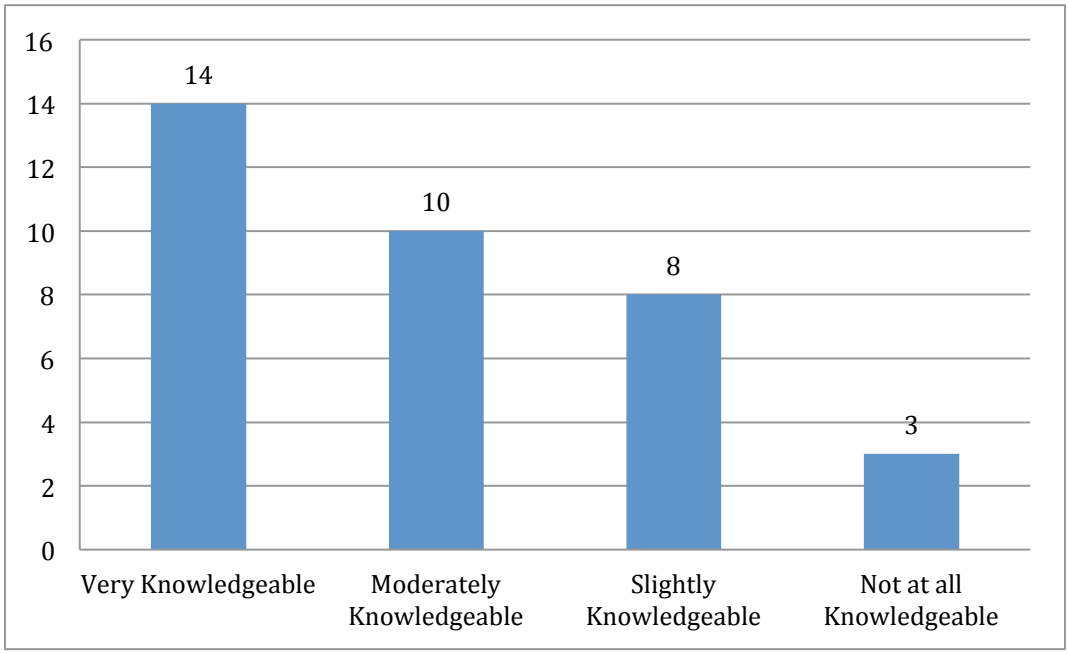
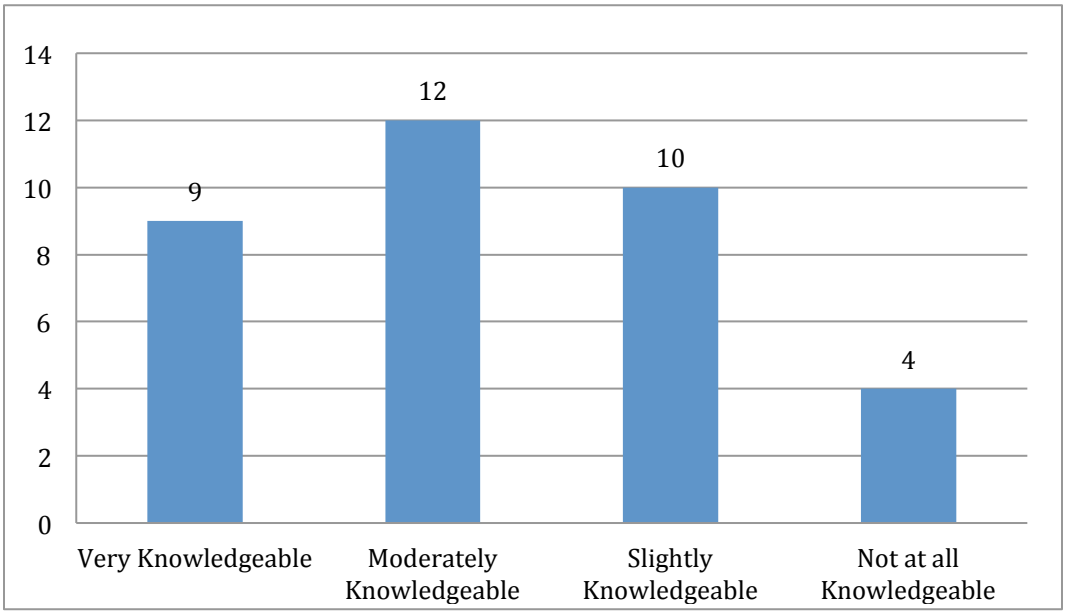


Fig 5. The process used by the Department to develop and update management plans for big game species, including the setting of population and sex ratio objectives.



Section 2. Stakeholder involvement in the Department and Commission rule-making process.

Question 2. Please indicate which, if any, of the following meetings you have attended in the past <u>three</u> years?

Table 1.

Commission meeting	**Response**	**Percent**
Yes	21	58%
No	15	42%
How many times?	Average = 3.12 (8 responses)	
Department meeting		
Yes	19	53%
No	17	47%
How many times?	Average = 3 (6 responses)	
Regional Advisory Panel meeting		
Yes	16	44%
No	20	56%
How many times?	Average = 2 (5 responses)	

Question 3. Have you personally contacted a Commissioner (either in person, by phone, letter or e-mail) concerning a big game management issue in the past three years?

Table 2.

	Response	Percent
Yes	22	61%
No	14	39%
How many times?	3.8 (13 responses)	

Question 4. Have you personally contacted a Department employee (either in person, by phone, letter or e-mail) concerning a big game management issue in the past three years?

Table 3.

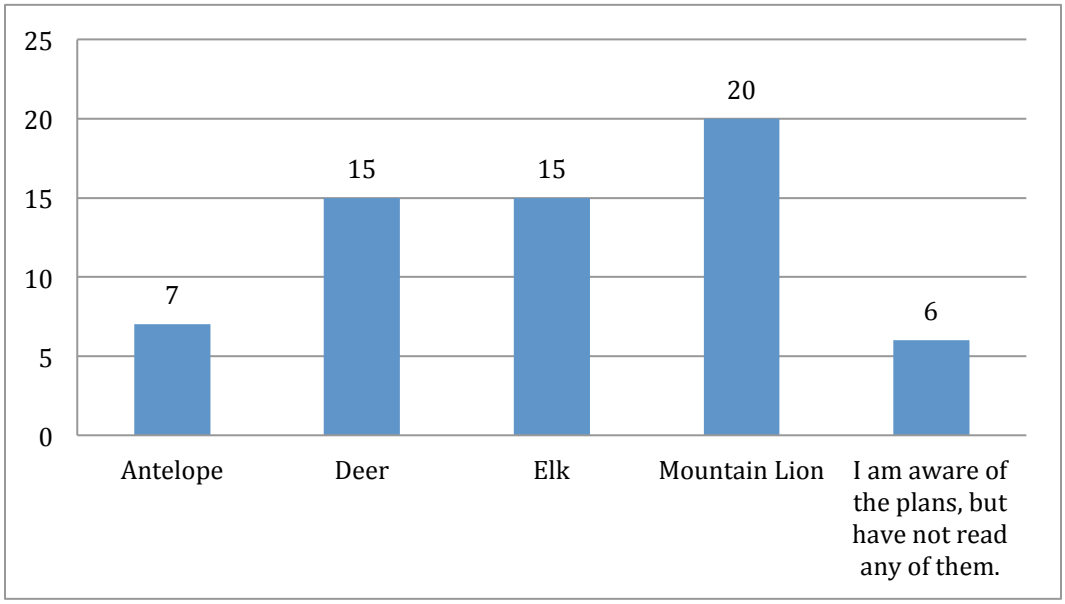
	Response	Percent
Yes	31	86%
No	5	14%
How many times?	6.05 (20 responses)	

Question 5. Are you aware of the management plans the Department has developed and published for South Dakota's big game species?

Table 4.

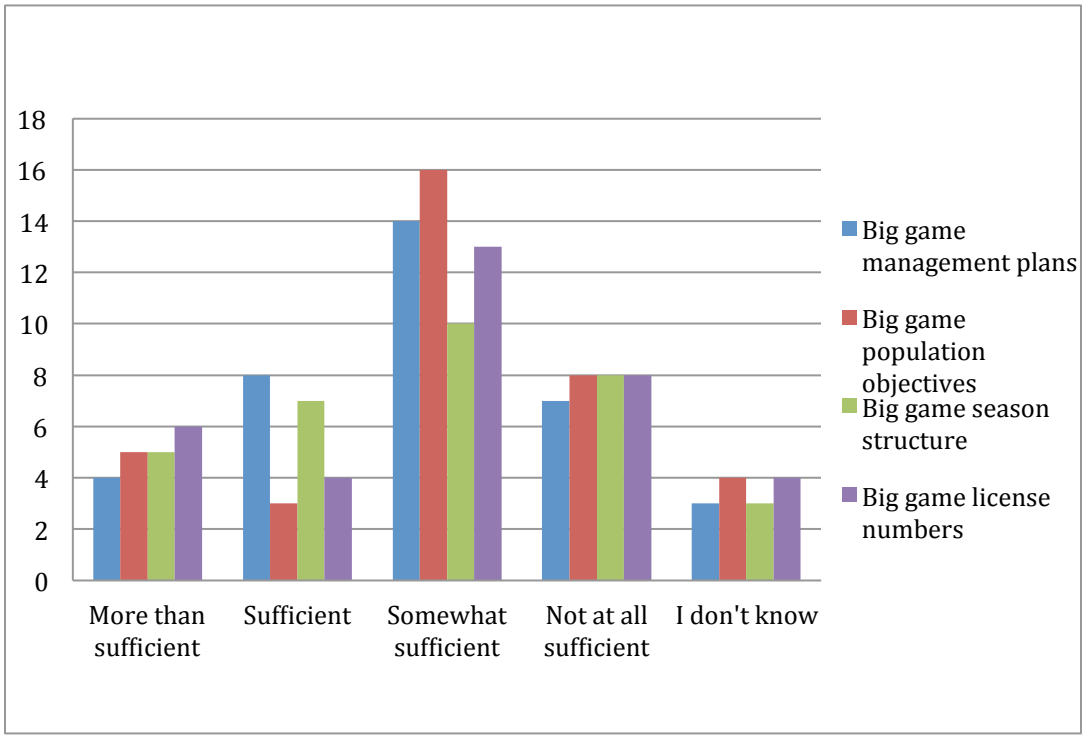
	Response	Percent
Yes	28	78%
No	8	22%

Figure 6. If yes, which of the following big game management plans have you read? (Select all that apply).



Question 6. How sufficient are the opportunities provided by the Department and Commission for public input during the development of the following categories of big game (antelope, deer, elk, mountain lion) management? (Please select an answer for each category)

Figure 7. Comparison of the responses to the categories within Question 6 (big game management plans, big game population objectives, big game season structure, big game license numbers).



Question 7. Are there ways the Department could improve the process for receiving public input during the development of big game management plans, population objectives, season structure and license numbers?

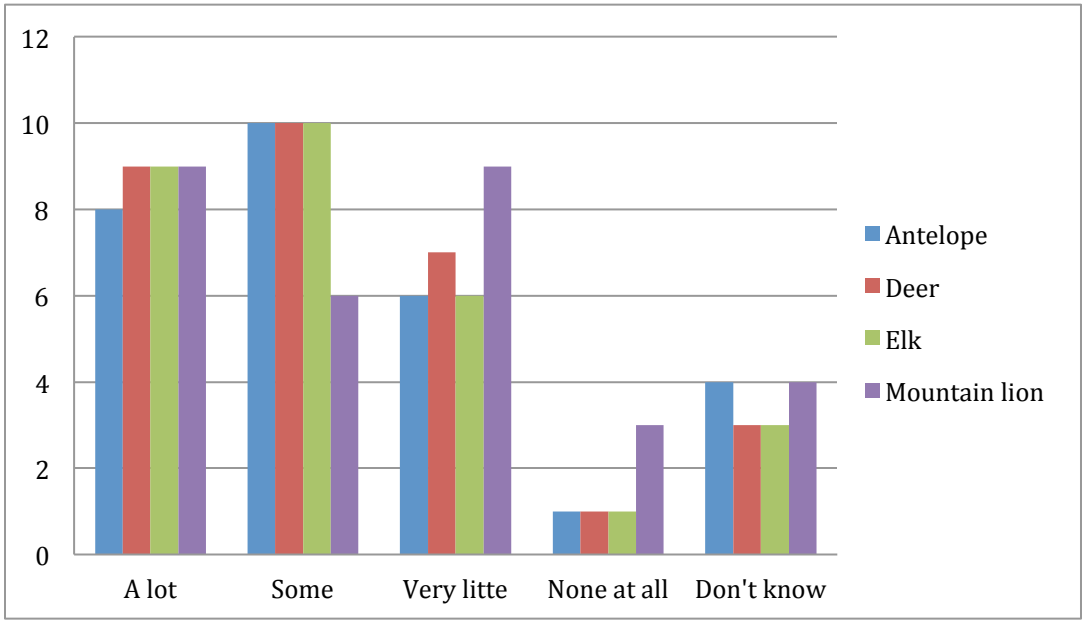
Table 5.

Yes, ask us in a public forum or give us (landowners) a viable way to have input that is considered. Also, GFP needs to listen to their field people.
Public meetings.
Correct process is more than sufficient. These guys are the professionals. Most public outcry is not bases on scientific facts, but personal opinions and agenda.
More involvement with private landowners and ranchers. Better announcing of meetings and time of meetings.
Just tell us the truth.
Listen to what we have to say.
The department allows input, but the Commission chooses to completely ignore GF&P input as well as public comment to do what special interests of the Commission want to do.
Detailed hunter surveys.
Department has forgotten who they work for.
More use of paid advertising on the above subjects. Reliance on regular news is too spotty and not often presented as GF&P wants.
More input sessions. More landowner/sportsman input.
At this time they call landowners during the development, but I've never known the department to use the advice they are given.
Getting written feedback for conservation clubs and groups and independent citizens as to issues that need to be changed or discussed.
Increase public meetings - more diverse locations across the state. Personal response from the department.
Incorporate their information into public information sessions. Publicize regional advisory meetings to discuss these topics.

Section 3. The use of data and information by the Department and Commission in the rule-making process.

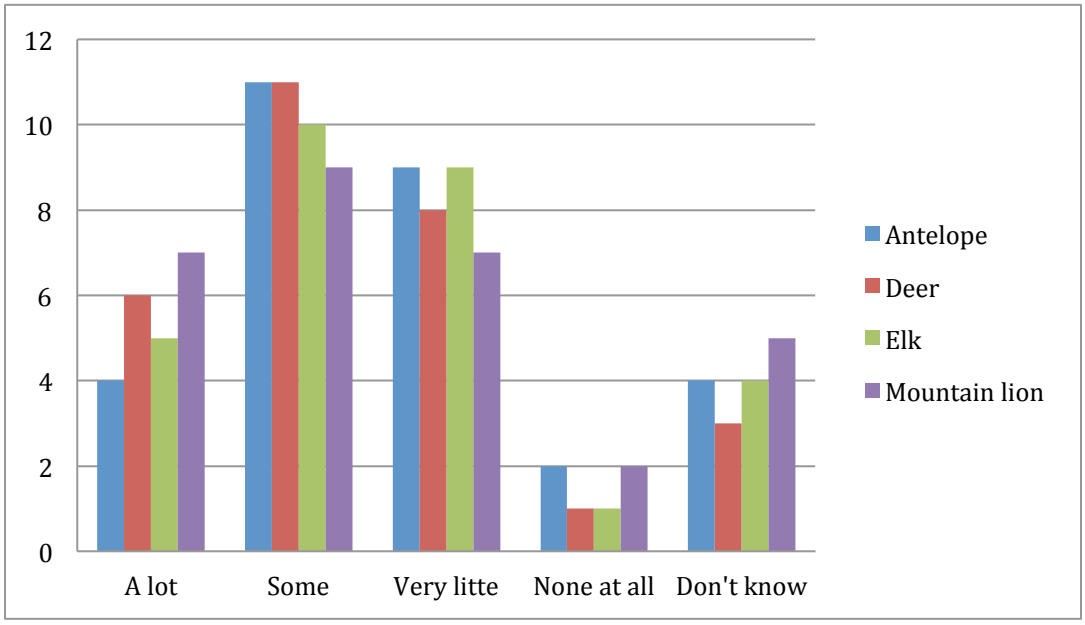
Question 8. In your opinion, how much does the Department utilize biological, harvest, and research data in the development of season structures and license quota's for the following big game species? (Please select an answer for each game species)

Figure 8. Comparison of the responses to each big game species listed within Question 8 (antelope, deer, elk, and mountain lion).



Question 9. In your opinion, how much does the department incorporate public opinion and other social information in the management of the following big game species? (Please select an answer for each game species)

Figure 9. Comparison of the responses to each big game species listed within Question 9 (antelope, deer, elk, and mountain lion).



Question 10. How strongly do you agree or disagree with the following statements? (Please circle only one)

Figure 10. Public opinion is adequately considered in the Commission's big game management decisions.

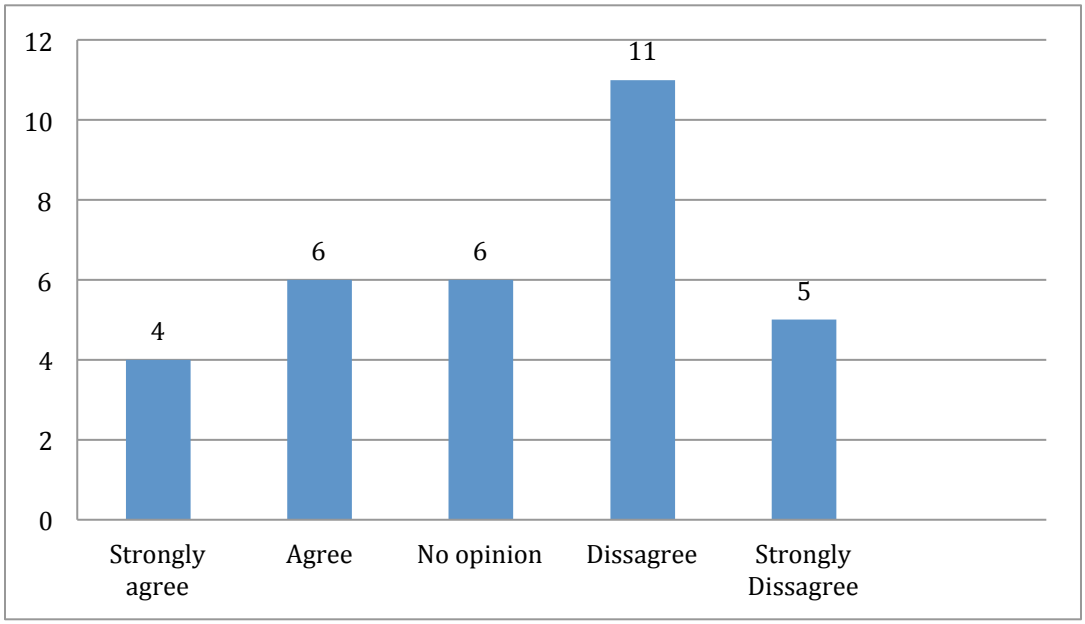


Figure 11. The Commission adequately balances the interests of landowners, hunters and the general public in their big game management decisions.

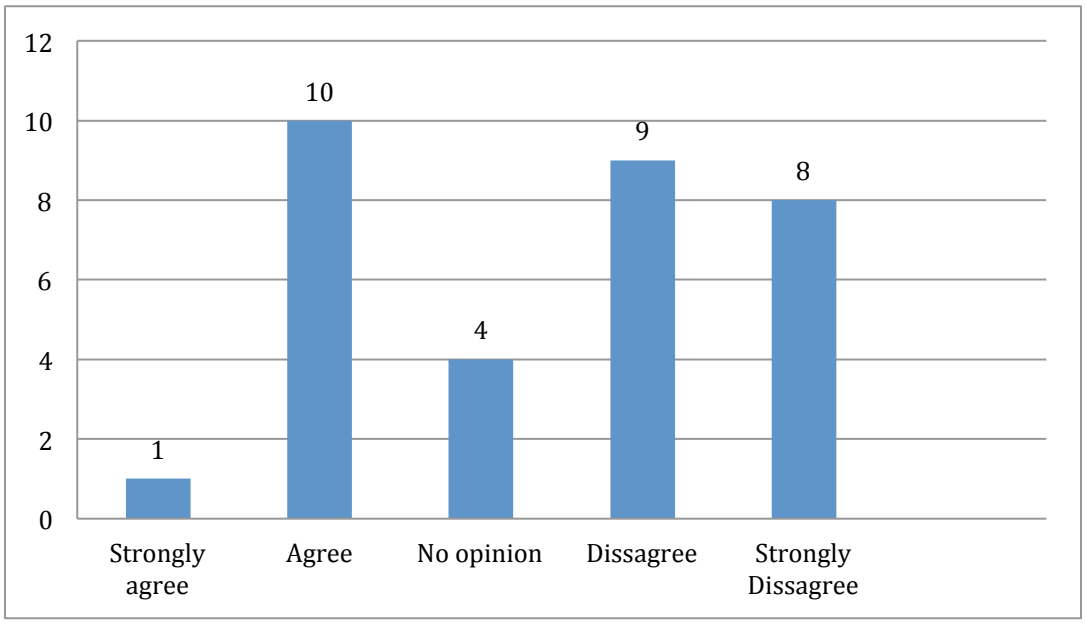


Figure 12. The Department uses adequate, scientifically- based harvest surveys, big game population surveys, and models to provide a sufficient foundation for proper big game management.

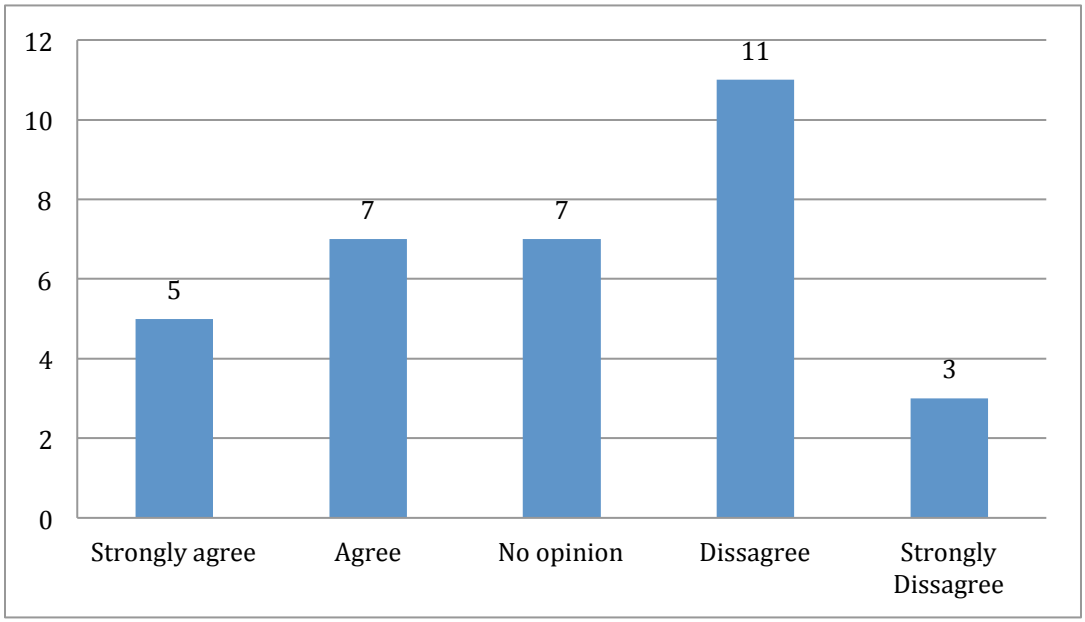


Figure 13. The Department has developed sufficient guidelines for setting big game population objectives.

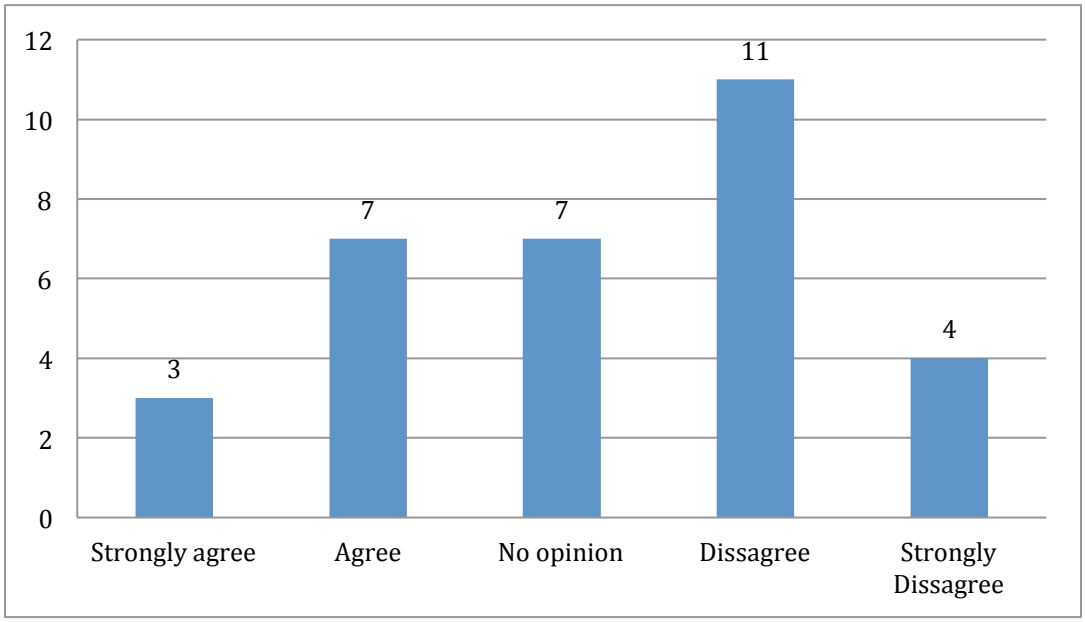
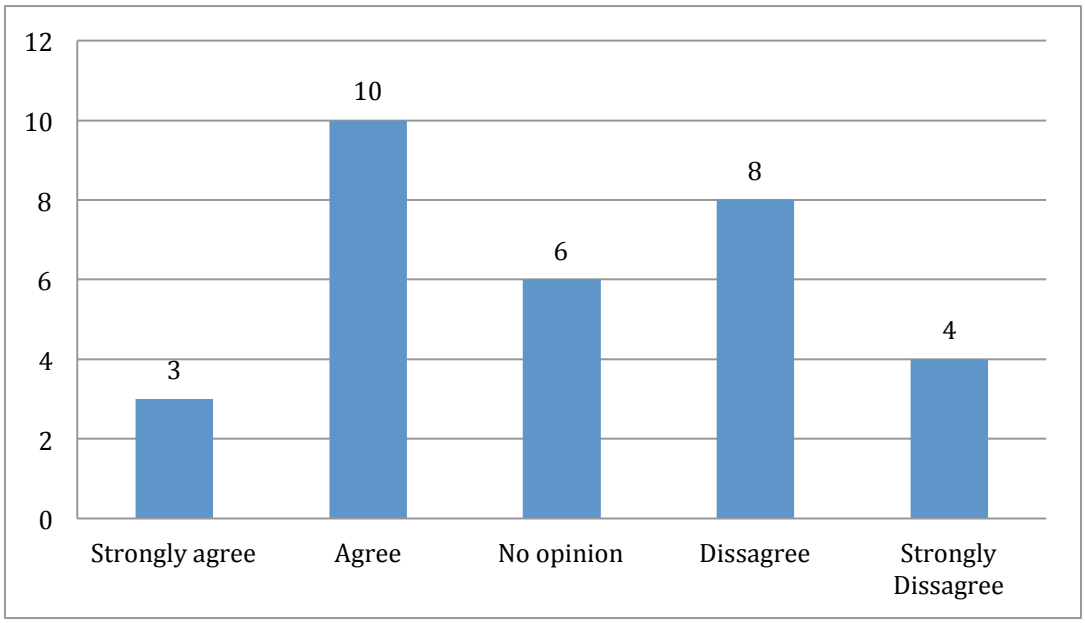


Figure 14. The Department makes sufficient effort to inform the public on how harvest data and management surveys are used to develop big game management plans.



Public Listening Sessions and Commissioner/Stakeholder Interviews

Several of the individuals who were interviewed requested that their input be provided anonymously. Hence, the following represents a generalized list of issues that were identified during the public listening sessions and Commissioner/stakeholder interviews:

- People are generally confident that the Department technical staff is well qualified, does a good job and generates solid scientific data.
- There are no current statewide management plans for deer or elk. In addition, there are no quantified population objectives for deer or elk. There is a population objective for mountain lions.
- Wildlife management at Custer State Park was conducted independently from the statewide Department management program until recently which was causing some issues.
- The Department may not be using the RAP's as effectively as they could.
- The Department has a population objective for mountain lions but it doesn't seem to be driving regulations.
- Although there were a few complaints relative to public outreach efforts, there was a general feeling that the Department does an adequate job of holding public meetings to keep people informed and provide opportunities for public input.
- Deer and elk populations and harvests have been fluctuating widely. The Department needs to work on making them more consistent.

- Grazing on the Black Hills National Forest could be constraining Department big game management efforts.
- There was some consternation about the elk tag preference system for landowners and that bowhunters and muzzleloader hunters can get multiple tags when rifle hunters can't.
- Most people expressed confidence that the recent aerial elk survey was accurate.
- The Department made a conscious decision that it was best not to have quantified big game population objectives.
- Black Hills National Forest is allowing higher grazing rates than what is prescribed in their long-term forest plan.
- Wyoming tries to create a "sink" for lions on their portion of the Black Hills.
- With the exception of deer, big game hunting in South Dakota is primarily reserved for South Dakota residents.
- The Department manages big game at farmer/rancher tolerance levels, which is a moving target.
- There's a need for better maps for hunting on and near Indian reservations.
- The Department should attempt to coordinate with tribes on big game management.
- There seems to be much more public dissatisfaction West River than East River.
- With the exceptions of making adjustments to the elk and deer drawing points preference system and the practice of issuing multiple tags for big game to individual hunters instead of spreading single tags around to more hunters, hunters seemed satisfied with the current big game regulations framework.
- South Dakota and Wyoming coordinate big game management efforts along their border.
- There's a need to make big game data collection, submission and analysis more transparent to stakeholders and field staff.

Open Public Comment

During the three-month open period for the SDcomments@wildlifmgt.org email, WMI received eighteen emails regarding the Department's big game management programs. Numerous emails submitted were in no way related to the scope of this review, and were not included in the summary of relevant comments. As with staff comments and comments collected during the public listening sessions, email comments were synthesized topically to aid in the reviewers' development of the specific recommendations found within this document.

Department Staff Interviews

Staff interview responses were kept confidential in order to encourage honest and frank discussions. WMI carefully considered staff comments as we developed our

findings, recommendations, and conclusions. General topics discussed by Department staff included:

- Working relationships between staff members and staff and leadership
- Staff duties, expectations, budgets, and workloads
- Agency's public perception
- Strengths, weaknesses, and areas of improvement in the big game management programs
- Roles and responsibilities of staff, agency leadership, and the Commission
- Methods and techniques used in big game management programs

Department Staff Questionnaires

At WMI's request, a list of 82 questionnaire recipients was submitted to WMI by the Department. This list included 50 Wildlife Conservation Officers (36 responded), 24 Wildlife Damage Management Specialists (13 responded), and eight Regional Biologists (all responded). Total questionnaire response rate was 69.5% (57 responses). Of the total respondents, 30.8% (16) were located in Region 1, 17.3% (9) in Region 2, 25% (13) in Region 3, and 26.9% (14) in Region 4.
A summary of this survey's results is listed below.

Note: The resulting data from these questionnaires is not necessarily representative of the views and opinions of all employees of the Department. The following summary simply reflects a sample of opinions from those who elected to respond to the survey request and include geographic variation in species responsibility.

Question 1. How strongly do you agree or disagree with the following statement? (Check one answer for each species) "I receive adequate guidance and direction from the Pierre senior management staff to conduct successful management programs for antelope, deer, elk and mountain lion populations?"

Table 6.

Answer Options	Strongly agree	Agree	No opinion	Disagree	Strongly Disagree	Response Count
Antelope	6	12	25	10	1	54
Deer	10	19	3	19	3	54
Elk	4	8	28	9	4	53
Lions	3	10	26	8	4	51
Additional comments						19
					answered question	55
					skipped question	2

Question 2. Please indicate your level of confidence in the guidance or direction provided to you by the Pierre senior management staff regarding the management of antelope, deer, elk and mountain lions? (Check one answer for each species)

Table 7.

Answer Options	Very confident	Confident	Somewhat confident	Not at all confident	Not applicable to my area	Response Count
Antelope	6	5	19	5	18	53
Deer	9	12	21	12	0	54
Elk	3	7	12	6	25	53
Lions	3	8	13	8	21	53
Additional comments:						11
					answered question	54
					skipped question	3

Question 3. How often do you reference and use species management plans when developing recommendations for hunting seasons and license/tag allocations for antelope, deer, elk and mountain lions? (Check one answer for each species)

Table 8.

Answer Options	Very often	Occasionally	Not often	Never	Not applicable to my area	Response Count
Antelope	8	11	4	7	23	53
Deer	11	18	9	14	2	54
Elk	7	5	5	5	31	53
Lions	7	4	4	5	33	53
Additional comments:						15
					answered question	54
					skipped question	3

Question 4. In your opinion, how necessary or unnecessary are quantified and measurable population objectives to the implementation of successful management programs for antelope, deer, elk and mountain lions? (Check one answer for each species)

Table 9.

Answer Options	Very necessary	Necessary	Somewhat necessary	Not at all necessary	Response Count
Antelope	22	24	8	1	55
Deer	23	23	9	0	55
Elk	25	24	3	3	55
Lions	22	25	5	3	55
Additional comments:					12
				answered question	**55**
				skipped question	**2**

Question 5. Within each administrative level of the SDGFP listed below, how much do your license quota recommendations influence the development of final license quotas and other big game harvest regulations?

Table 10.

Answer Options	A lot	Some	Very little	None at all	I don't know	Response Count
Regional level	28	20	2	2	3	55
Commission Recommendation Development committee	7	21	17	5	4	54
Senior management staff level in Pierre	6	22	16	7	3	54
If you answered “very little” or “none at all,” please explain.						19
					answered question	**55**
					skipped question	**2**

Question 6. Within each administrative level of the SDGFP listed below, how often do you receive feedback on your recommendations for annual license quotas and other big game harvest regulations?

Table 11.

Answer Options	Very often	Often	Not very often	Never	Response Count
Regional level	19	21	10	3	53
Commission Recommendation Development committee	1	9	21	22	53
Senior management staff level in Pierre	2	10	20	21	53
				answered question	53
				skipped question	4

Question 7. How strongly do you agree or disagree with the following statement? (Check one answer for each species) "The data collection and analysis methodology currently used within the SDGFP allow me to make license quota and other recommendations/decisions that are scientifically based and defensible."

Table 12.

Answer Options	Strongly agree	Agree	No opinion	Disagree	Strongly disagree	Response Count
Antelope	8	18	23	4	0	53
Deer	6	30	7	7	5	55
Elk	5	13	27	4	4	53
Lions	5	15	27	4	2	53
Additional comments:						17
					answered question	55
					skipped question	2

Question 8. How strongly do you agree or disagree with the following statement? (Check one answer for each species)"The process used by the SDGFP to collect and use landowner, sportsmen, and public opinion allows me to adequately address stakeholder interests in my big game management recommendations."

Table 13.

Answer Options	Strongly agree	Agree	No opinion	Disagree	Strongly disagree	Response Count
Antelope	6	15	27	5	0	53
Deer	9	22	9	8	6	54
Elk	5	12	31	3	2	53
Lions	5	11	31	5	1	53
Additional comments:						11
					answered question	55
					skipped question	2

Question 9. How strongly do you agree or disagree with the following statement? (Check one answer for each species) "The current design of big game management units allow for effective and efficient data collection, analysis and decision making in the management of antelope, deer, elk and mountain lion populations."

Table 14.

Answer Options	Strongly agree	Agree	No opinion	Disagree	Strongly disagree	Response Count
Antelope	11	19	20	3	0	53
Deer	9	29	5	10	2	55
Elk	8	15	26	4	0	53
Lions	6	19	26	2	0	53
Additional comments:						15
					answered question	55
					skipped question	2

Findings and Recommendations

Staff Opinions of Big Game Management

The employee questionnaire and interviews were an important source of information for this review. Based on that information, WMI found that Department staff consisted of knowledgeable and dedicated professionals who worked well together in a team environment and demonstrated respect for one another (especially the Conservation Officers and Wildlife Biologists). Some Department staff have had inadequate time in their work schedules to plan for the future and develop dynamic species management plans with measurable population and habitat objectives. However, efforts were underway to complete comprehensive management plans and appropriate population models to assist big game management. WMI believes that the harvest survey methodology was robust and reliable. Staff indicated that deer management decisions were largely driven by landowner tolerance and hunter satisfaction. Department staff have the knowledge, skills, and abilities to continue and to complete their efforts to modernize the big game management programs. Staff capabilities would benefit from additional biometric and population modeling expertise.

The Department has made good use of communication tools – website, social media, magazines, press releases, public information sessions, open houses. Information received at public listening sessions was consistent with that opinion. Although WMI heard frequent allegations from individuals outside the Department that "the numbers change between the field and Pierre", based on our interviews and research, we concluded that those changes did not apply to survey or research results; rather, the changes concerned license numbers, tag allocations, or season setting. In WMI's experience with other wildlife agencies, these decisions (that involve biological, sociological, economic, and political input) are routinely reviewed and, on occasion, amended by agency leadership. WMI concluded that there were mixed opinions on whether agency leadership (defined as Pierre headquarters' staff) provided adequate guidance to staff with respect to big game management. In addition, we heard some concern expressed about whether the agency leadership and/or the Commission valued staff input to the decision-making process. Internal communication could be improved especially with respect to feedback from decision-makers to field staff concerning the regulation development process, agency policy decisions, and Commission actions. In WMI's long experience with conducting agency reviews, we have frequently identified internal communication issues as a shortcoming in agency communication plans.

Recommendations

- Continue efforts that are underway to complete comprehensive management plans and appropriate population models to assist big game management.
- Employ adaptive management and standardized protocols with respect to deer management decisions concerning season setting and tag allocation.

- Strengthen survey and research protocols and provide annual training.
- Provide staff with additional time and support to improve the management programs for which they are responsible.
- Future outreach and communication would be improved by incorporating human dimensions research and methods (not just public surveys).
- Department leaders must explain the appropriate role of participatory management to all staff and adhere to its principles.
- The roles and responsibilities of Department staff, administration, leadership, and the Commission should be formally defined and provided to the public.

Big Game Management Planning

Management plans are a critical element of a comprehensive wildlife management system, and the process used to develop a plan is as important as the plan itself (Guynn 2012). Plans developed through a transparent process that involves all key stakeholders can help identify important values and trade-offs that must be considered in balancing the biological, social and economic aspects of wildlife management and can reduce the controversy surrounding management direction by providing a context for management decisions (Chase et al. 2000). Management plans can insulate decision-makers from reactionary pressures. Adherence to a management plan also supports "learning" which can enhance future management.

Management plans represent a "contract" between the agency, the Commission and the public with respect to how public trust wildlife resources will be managed and how the benefits of management will be allocated (Smith 2011). Given the nature of the decisions that fall within the Commission's authority such as seasons, bag limits, and license allocations that affect implementation of management plans, it is imperative that Commissions be engaged in the planning process and formally endorse or adopt management plans. If the Commission is not involved in the development of the plan and does not endorse or adopt the plan, the Commission may perceive no obligation to implement the plan and the probability that the plan will have any impact on Commission decisions – and hence actual management of species on the ground – declines dramatically.

The amount of public involvement necessary in the planning process is directly proportional to the number of competing interests or complexity of the management environment (Chase et al 2000; Jacobson and Decker 2006, 2008, Decker et al. 2013, Nie 2004). While some simple management plans can be developed by agency staff working internally and rely on public feedback in response to draft plans to make final adjustments, most big game management scenarios involve too many stakeholders with divergent interests and values for application of the traditional "agency expert" approach to planning (Gill 1996). More inclusive and transparent processes that allow direct interaction and negotiation among competing interests are generally required to

develop sustainable big game management plans, especially those related to carnivores (Todd 2001). In these cases, the agency expertise is best applied to facilitating the dialog among stakeholders, defining the biological, technical, and economic trade-offs associated with alternatives, quantifying risks and benefits of alternatives and developing the management techniques that would be used to implement and monitor alternatives. This approach can resolve many inherent user conflicts and more clearly frames key decisions for the Commission (Decker et al. 2013).

Management plans should include general goals that describe the desired outcomes from management of a species or system, but such goals are not sufficient. To be useful, management plans must also include measureable, time-bound objectives that managers, the public, and decision-makers can use to gauge progress toward the goal. Plans must also identify the strategies or actions that will be taken to achieve the objectives, the methods that will be used to monitor the results of management actions, and the mechanisms that will be used to adapt or adjust management to improve alignment of future outcomes with the stated goals and objectives.

The dynamic and stochastic nature of systems that are the target of wildlife management and the limits on managers' ability to measure parameters with precision and affect change requires management plans that balance specific prescriptions with flexibility. Plans must provide managers clear direction, yet also grant sufficient discretion to allow managers to exercise appropriate professional judgment. For this reason, many wildlife management plans include population objectives expressed as a range, with strategies identified that will guide the system toward or keep it within that range. The 2010 Mountain Lion Management Plan and 2012 South Dakota Pronghorn Management Plan come closest to this model among all the plans the Department shared with WMI.

While some management plans can be focused on a single species, in areas where multiple species interact, management plans must take a systems approach to be effective. For example, while it may be reasonable for South Dakota to develop and implement a "deer" management plan for the East River and West River areas, management of deer, elk and mountain lions in the Black Hills should be guided by an integrated plan that addresses all three species, as well as relevant habitat and public and private land use management collectively.

WMI examined the existing Department management plans and discussed the management planning process used by the Department with Commissioners and staff during interviews. The Department provided WMI copies of five management plans that pertain to big game species covered by this review. These included a 1994 Big Game Management Plan that provided broad guidance for all big game management programs, draft Gregory County Elk Management Plan that was prepared in 2000, a 2008 – 2017 Black Hills Deer Management Plan, a 2010 Mountain Lion Plan and a 2012 Pronghorn plan. Our analysis identified a number of issues and opportunities to improve management planning processes and plans. WMI does believe that the

Department is on the right trajectory, recent management plans are improvements over older plans.

South Dakota's management planning process, as described by Department staff, typically began with agency staff compiling biological and human dimensions information and developing a draft plan. In a few instances, the Department has supplemented the human dimensions information gathered and used in the planning process by forming informal working groups to provide input in support of plan development. The draft plan was initially reviewed by the Commission, then subject to a period of public comment, after which it was finalized by staff and approved by the Division Director or the Department Secretary. The final plan was then presented to the Commission, but the Commission did not appear to have a formal role in adopting the plan. During interviews, several Commissioners expressed uncertainty about their role in the management planning process and indicated management plans had limited impact on their decisions. Staff did not consistently believe that planning should involve the Commission nor seek Commission approval.

The planning process used by the Department places too much responsibility on staff to serve as arbitrators for competing interests and excludes the Commission from their full role as trustees of the public's wildlife (Smith 2011). This causes unnecessary stress on staff, undermines public confidence in the Department and Commission and results in management plans that do not substantially guide Department or Commission decisions. It leaves conflicts between competing interests unresolved and leads to ongoing controversy, political pressure, and reactive management responses.

The Department and Commission did not historically place a high enough priority on development and implementation of management plans. This may have been due to a lack of recognition of the value of plans to resolve some of the chronic conflicts that plague the Department and Commission, a lack of staff resources to develop plans, the reliance on an outdated "agency expert" model for developing plans, the limited involvement of the Commission in the planning process, and/or an agency culture accustomed to reactive management responses. Department staff acknowledged the importance of management plans in theory (Tables 8 and 9), but indicated that current staffing and workload do not allow sufficient time to focus on planning. Further, while the Department identified the need for an elk management plan as a "high priority" in 2012, initial efforts to develop that plan were side-tracked by a Commission decision to develop a sheep management plan, respond to the impacts of an EHD outbreak and other issues deemed more urgent at the time.

The strengths and weaknesses of the species management plans are discussed in more depth in the sections of the report dealing with the deer, elk, pronghorn, and mountain lion programs. Prior to the recent development of plans for mountain lions in 2010 and pronghorn in 2012, the Department did not develop species or population specific management plans with the exception of a draft plan for a small population of elk in Gregory County. A Big Game Strategic Plan was developed in 1994, but it contained no measurable objectives and few of its directives have been implemented. Almost half of

the Department staff that responded to the staff survey reported that management plans were "never" or "not often" referred to in the process of developing hunting season or license allocation recommendations (Table 8).

Recommendations:

1. The Department and Commission should place greater emphasis on the development and implementation of effective management plans. All management plans should incorporate quantitative, time-bound objectives, as well as mechanisms that can be used to monitor outcomes relative to the objectives. Plans should include pre-determined responses when outcomes do not align with the objectives. Management plans should have a defined temporal duration and the Department and Commission should commit to following the plan throughout that period, baring truly extraordinary and unanticipated circumstances.

2. The Department and Commission should adopt a planning process that is more inclusive of the public at the outset and places decision-making authority for all but the most technical aspects of the management plans in the hands of the Commission. The planning process should take fuller advantage of the Human Dimensions capability of the Department and employ neutral, third party facilitation for highly complex and controversial planning processes. For example, to address issues in the Black Hills, the Department and Commission should begin by convening a broadly representative stakeholder's group charged with identifying issues, defining problems, seeking mutually beneficial outcomes and framing questions for managers. With that background, Department staff could work with the stakeholders to develop viable alternatives, clearly communicating management capabilities and limitations and the risks and trade-offs associated with each approach. In the end, the Commission should make the final decision on which alternative to adopt, after a thorough and transparent public review process.

3. Agency leadership should provide clear direction to staff regarding their expectations that approved management plans would guide staff decisions, actions and recommendations for regulation changes. The Commission Recommendation Development committee and process should include explicit steps that link recommendations to objectives in management plans and any deviation from the direction laid out in a management plan – at any level in the decision-making process – must be fully justified in a transparent manner.

Public Participation in Big Game Management

Communication with citizens and public participation in decision-making is increasingly important to effective big game management programs (Jacobson and Decker 2006, Decker et al. in press). Effective state wildlife agencies use a variety of

communication strategies and media to convey information to the public (McMullin 1993). Mechanisms to gather information from and about constituents are equally important (Decker et al. 2013), as are ways to effectively engage the public in making the complex decisions associated with big game management (Nie 2004, Jacobson and Decker 2008, Smith 2011).

WMI found that the Department used a host of means and media to provide information to the public about big game management. In addition to such traditional avenues as news releases, public service announcements, open houses and meetings, the Department is increasingly using electronic media. The Department's website is up to date and includes a broad range of information. The website is being used as a means to inform the public about upcoming Commission actions related to big game and to report on actions taken by the Commission. One potential outreach channel the Department has not fully exploited to date is its list of email addresses compiled from interactions with customers and constituents. Department staff indicated they are exploring options to use emails lists, within the constraints of broader state policy related to this issue. There has also been some discussion about using live streaming as a way to make Commission meetings accessible to more people, although Commissioners expressed the caution that this should not be used as justification to discontinue holding meetings at locations around the state.

Department staff, Commissioners and citizens at the public listening sessions all commented on the large number of opportunities citizens have to provide input to the Department. Each region held a number of open houses around its portion of the state to listen to concerns or gather input on proposed agency decisions. The Department held public meetings to gather input on proposed changes to big game hunting regulations. The staff questionnaire results (Table 13) indicated that the current process was not overwhelmingly useful to staff making decisions on big game management. Each region has a Regional Advisory Panel (RAP) with citizens nominated by the Regional Supervisor and appointed by the Division Director to serve as a sounding board and liaison with the region's citizens on matters of interest.

There does not appear to be any shortage of opportunities for the public to express their views to the Department and Commission on big game management. However, it appears that the emphasis on providing opportunities for public input may be at the expense of effectiveness in gathering and integrating public input into decisions in meaningful ways. For example, although public meetings were commonly used by the Department and considered vitally important, public attendance was often poor and input at public meetings generally represents the views of only those individuals or interests that most oppose, or support, a proposed action (Peterson and Messmer 2010). Department staff expressed difficulty in determining how much weight to give input received through this channel, in contrast to other sources.

Similarly, Conservation Officers make numerous landowner contacts each year to gather input on landowners' tolerance for deer, elk or pronghorn as well as hunter numbers. As valuable as these contacts are for maintaining agency credibility, the

information gathered is entirely anecdotal and difficult to quantitatively assess in relation to other types of citizen input and integrate into management decision-making. This may contribute to some of the sentiment WMI heard from field staff that their input – representing the views of their local constituents – was "ignored" by the central office.

Another consequence of the multitude of mechanisms for public input, without clear means of integrating that input into decisions and communicating back how public input was used in decision making was one of the common themes WMI found in the public listening sessions and the written input. A number of people said they have stopped providing input because they did not perceive that the Department or Commission listen or respond to public input. This erodes public trust in the big game management programs.

The Department has a long history of gathering human dimensions data, and provided WMI with numerous reports on topics ranging from hunter satisfaction to wildlife-related values of South Dakota citizens (see Appendix D). This represents a wealth of information that many other state agencies lack.

WMI determined through staff interviews that following the retirement of the previous human dimensions specialist there was a gap in filling this position and the role of human dimensions in agency planning and management appeared to have been diminished. WMI believes that the recently hired human dimensions specialists has an excellent background and skill set that does not appear to be fully utilized at this time.

WMI asked staff and Commissioners to describe their view of the role and effectiveness of the RAP's. The responses indicated general support for the concept of the RAPs, but the range of answers reveal the purpose of the RAPs was not widely understood and they were typically viewed as not as effective as they could be. Commissioner's responses indicated a varying degree of involvement with the RAPs.

Recommendations

1. The Department should continue to explore and expand its use of electronic media, including social media, which are increasingly important for reaching younger audiences. The Department should determine the extent to which it can use email addresses captured through online services to its customers as a means to communicate with constituents.

2. The Department should provide its human dimensions specialist with the time and support necessary to review and enhance the myriad mechanisms used to gather public input and incorporate input into management plans and other agency decisions. By investing in fewer, but more meaningful, ways of gathering input and placing additional importance on relaying back to the public how their values and desires are considered

and incorporated into decisions, the Department and Commission will increase both the effectiveness and credibility of their big game programs. Examples of human dimensions projects include: evaluating public outreach and conservation education programs, managing human-wildlife conflicts, understanding the public's perception of predator-prey relationships, and evaluating stakeholder satisfaction.

3. The Department and Commission should consider developing and using a comprehensive management planning system to engage the public in setting long-range goals and quantitative management objectives for big game populations. By engaging the public in meaningful dialog regarding the desired outcomes of management, the Department and Commission will not have to spend as much time or effort annually debating changes in license numbers at Commission or other public meetings.

Commission Recommendation Development Process

The Department uses a standardized process to develop, document and inform Commission regulatory actions. WMI found that the "Commission Recommendation Development" (CRD) process consumed a significant portion of agency time devoted to big game management (in actuality all management programs) and was the source of both appreciation and consternation from agency staff. Because the CRD process serves multiple functions, WMI divided our analysis of the process into its component parts.

The CRD process originates at the field level and serves as a forum to organize field-level big game recommendations. WMI found general consistency between regions on the common course of action to develop and advance field proposals. The regional wildlife manager meets either individually or as a group with regional biologists, conservation officers and wildlife damage specialists (WDS). The manager provides whatever data are available, including outputs from harvest surveys and various surveys and population models. Each conservation officer makes recommendations regarding license numbers or season changes for his/her area of responsibility and generally works collaboratively with fellow officers, regional biologists, WDS staff and the wildlife manager to develop regional proposals. Inputs from conservation officers include their interpretation of field conditions, inputs on tolerance or preferences of landowners within their patrol area, and occasionally interpretations of data collected. WDS provide input on tolerance of landowners to potential damage levels expected from current or projected big game populations.

At the field level, the CRD serves as a forum for regional staff to discuss and coalesce around a set of regional recommendations. The regional wildlife manager leads a discussion of all regional staff regarding proposals received from the field. Following discussion, proposals are vetted with the Regional Supervisor and approved for advancement to the CRD committee. Because the process is an open discussion among regional staff, no feedback is necessary at this step.

The next level in the CRD process involves a CRD Committee that consists of all the regional wildlife managers, central office program staff and agency leadership below the level of the Division Director. The CRD Committee serves as a forum for regional recommendations to be vetted by headquarters' program staff and by other regions. Approved regional proposals are presented by the regional wildlife manager and are reviewed and discussed within the CRD Committee. The outcome of discussions may result in approval, change or disapproval of a regional proposal. If a proposal is changed or modified at this level in the CRD process, regional managers generally document discussions and report back to regional staff (usually individually) on reasons why a proposal was changed or not approved.

The CRD Committee product is submitted to the Division Director and Department Secretary for their review before being transmitted to the Commission as the Department's recommendations. The Director and Secretary generally discuss the recommendations with senior staff and consider their input in the course of making the final decisions on the Department's recommendations. WMI did not find evidence of the Division Director or Secretary making arbitrary or unilateral changes to CRD recommendations. In some cases, however, the Director or Secretary did request or require senior staff to reconsider or modify recommendations based on higher policy-level considerations. WMI does not consider such actions inappropriate or inconsistent with practices in other states.

WMI determined that the perception among some members of the public, some agency staff and some Commissioners that proposals were routinely changed in this CRD step was much greater than we were able to document. However, contrary to the field level in the CRD process, when proposals were changed at higher-level steps in the process, there was insufficient feedback through the CRD process to the field regarding the rationale for the change. This lack of feedback added to concerns that regional staff input was not valued by upper-level staff, suggested by the results presented in Tables 10 and 11.

The Departmental proposal alerts and informs the Commission and the public on the agency's desired course of action. The departmental proposal begins a 30-day period where the public is encouraged to comment to either the Commission or the Department on the merits of an agency proposed action. Public hearings are also held to solicit and document public opinion.

The finalization of an agency proposal by Commission action represents the end point whereby the agency sets into policy and/or regulation those proposals developed beginning at the field level. If the Commission changes the departmental proposal, there apparently is little communication back to the field on the reason for the change.

The CRD process is time consuming, but WMI understands it may be necessary for some programs and over-kill for others. Staff expressed an interest in separating the annual license and season setting process from larger policy issues with a regulatory

component which would be considered every 3 to 5 years. WMI would expect such a change and other options to reduce the time and workload associated with the regulatory process to be an important element in the continual balancing act between regulatory responsiveness and expense.

Recommendations:

1. The CRD process should originate with an evaluation of current versus desired conditions as documented in a species management plan. Agency management should communicate policy sideboards relative to season structure to staff in advance of regional meetings, ideally as a season structure framework that outlines circumstances when multiple tags, additional seasons, or other alternatives should be employed.

2. The CRD process allows continued tweaking to regulations and season structure, but that doesn't necessarily represent the best course of action for the agency. The CRD process should be changed to include a minimum threshold a recommended management action must exceed in order to advance in the CRD process.

3. Communication apparently breaks down during the CRD process when changes are made above the field level. The reasons why proposals are changed should be communicated to all staff through a standardized feedback format. One possible protocol could be to have regional supervisors involved in all substantive discussions of proposals at the CRD, departmental and Commission level and tasked with communication back to the region from any decisions made at any of the aforementioned levels.

Role of Department Conservation Officers in Big Game Management Programs

The Department Conservation Officer serves to "manage wildlife, fisheries, water, and land resources; implement department programs; and enforce laws in an assigned district to conserve and protect fish and wildlife, represent the department to the public, and provide recreational opportunities and public safety" (http://gfp.sd.gov/agency/employment/position-conservation-officer.aspx). One component of that mission - "to evaluate habitat, wildlife, and fisheries needs and project long- and short-term management goals and objectives" - is of great significance to big game management.

By assigning that responsibility to conservation officers, the Department joins 18 other states that either assign big game management data collection responsibilities to conservation officers or share conservation law authority with wildlife biologists (Wildlife Management Institute, 1997). In the states without shared responsibility, wildlife biologists are responsible for population and habitat management planning, goal setting, implementation, and evaluation while conservation officers are responsible for enforcement of conservation laws and regulations that are largely

designed to prevent wanton waste and to protect equitable access to wildlife resources by the license-buying public.

Conservation law enforcement is a specialized career designed to protect wildlife resources by blending criminal justice and law enforcement duties with wildlife conservation, education, and public relations. Similarly, wildlife management is a specialized profession focusing on population management through an interconnected system of habitat management, population management through regulated harvest, and scientific research. Just as law enforcement relies upon defensible evidence, wildlife biology relies upon the scientific method to produce estimates that are deemed reliable through quantified measures of confidence and repeatable through rigorous selection and implementation of data collection methodology and interpretation.

Both fields require specialized training but all wildlife management positions require a 4-year wildlife or natural resource college degree; twenty-seven of 51 agencies require a 4-year degree for law enforcement personnel (Wildlife Management Institute, 1997). The Department does not require a 4-year college degree, but staff indicated in interviews that most officers recently hired had obtained a 4-year college degree.

There are advantages to the agency from employing the "general purpose" conservation officer model. Because a corps of biologists are not required at the regional or district level, personnel and equipment costs are lower. Having "one face" in the community associated with all aspects of agency programs means for less confusion in the public about who represents the agency. Because conservation officers are in the field for a variety of purposes including law enforcement, they are able to make additional observations of big game populations and/or conditions, which can be invaluable inputs to season setting.

The liability in the "general purpose" conservation officer model is that biological data collection can be a low priority when stacked against law enforcement or other aspects of a multi-faceted job. Employees hired to do primarily law enforcement may or may not have the inclination or the training to collect biological data. To conform to scientific standards of data collection for biological resources, conservation officers must be effectively trained, and consistently and conscientiously comply with data collection protocols that have been established by program managers.

For the generalist conservation officer model to work, biological data collection cannot always be a lower priority than other activities. WMI learned that several regions had shifted biological data collection away from conservation officers in favor of more landowner outreach. Data collection responsibilities were shifted to wildlife damage specialists and/or biologist staff within the region. While such staffing decisions are frequently necessary within agency management, a thorough understanding of the impact of such changes on the utility of biological data must be made. Deviation from protocols reduces the ability of agency decision-makers to act on the public's or resource's behalf.

A viable data collection protocol includes regular protocol review sessions, training, testing, and quality control. While WMI was aware that law enforcement personnel must successfully complete the "South Dakota Law Enforcement Officers Standards Training Course and the Game, Fish, and Parks Conservation Officer Field Training Program; participate in semi-annual qualification and training with department-issued firearms and semi-annual qualification in defensive tactics and other required law enforcement training" (http://gfp.sd.gov/agency/employment/position-conservation-officer.aspx), WMI was not made aware of a similar set of training protocols for biological data collection.

Another responsibility assigned to conservation officers is "to establish and maintain effective working relationships with landowners" (http://gfp.sd.gov/agency/employment/position-conservation-officer.aspx). In a rural state like South Dakota, WMI appreciates the importance of this activity to the agency. WMI cautions however that a frequent description of season setting heard during our interviews involved an officer "talking to his landowners" about their preferences for season structure. Assessing landowner preferences is a valid approach to big game season setting, but the decision-making protocol must rely on a foundation of statistical survey sampling design and interpretation of responses, rather than anecdotes heard in the course of a casual conversation. The human dimensions unit should be empowered to design landowner surveys if the agency expects to rely upon landowner preferences to guide big game management. There is much to be gained by having conservation officers conducting landowner interviews that allow for collection and analysis of standardized sampling data while at the same time satisfying the landowning-public's interest in Department programs.

Recommendations:

1. Establish data collection protocols that conform to baseline sampling minimums. Discard any data collected in a manner not prescribed in the protocol.

2. Schedule annual review and training workshops where protocols and methods are established and the reasons for using them are explained.

3. Utilize human dimension staff to develop standardized survey protocols for landowner interviews and include analysis of both spatial and temporal data.

Roles and Responsibilities of Senior-Level Leadership

In a comprehensive analysis of state wildlife agencies, McMullin (1993) found that agency leadership was critical to agency effectiveness. For purposes of this finding, "leaders" refer to senior-level managers found throughout the Department including Regional Supervisors and program managers in Pierre. McMullin found the most effective state agencies were led by experienced, enlightened wildlife professionals who know how to manage, have participatory styles, emphasize teamwork, and delegate

decision making out to the "grass roots." Effective leaders provide clear, firm policy guidance, make the tough decisions that rise to them and back their employees when they make decisions.

Effective leaders, especially in decentralized organizations, do not attempt to "micro-manage" or employ a "command and control" approach to decision-making. This is particularly important in wildlife agencies where the majority of staff are highly trained professionals who are passionate about the resources they are entrusted to manage. This environment demands visionary leaders who can inspire their staff. WMI found that Department leadership reflects many of the attributes cited by McMullin (1993). Most senior staff in the Department have formal education and years of experience "in the trenches" managing wildlife, which provide a solid foundation for the technical aspects of managing the state's big game. However, there are areas where agency leadership could be enhanced.

WMI learned through staff interviews and the employee questionnaire, that some staff did not believe they receive clear guidance on policy issues, such as regulation recommendations (Tables 6 and 7). This lack of up-front guidance could lead to staff making recommendations that fall outside the bounds acceptable to Department senior-level leadership. When leaders amend such recommendations, especially without providing adequate follow-up explanation, staff could become frustrated, angry and distrustful of leaders. Common outcomes of this pattern are withdrawal from the process as well as active or passive aggressive behavior toward leadership.

WMI also heard that some department staff perceives agency upper-level leadership, as well as the Commission, to be too sensitive or reactionary to "politics" or special interest groups. These individuals opined that this results in agency leaders and Commissioners exerting undue pressure on staff to make decisions contrary to the best interests of wildlife or other constituencies, or otherwise interfere with their professional responsibilities. These beliefs were not unique to the Department and in WMI's experience are common among wildlife agencies. Whether these feelings were justified or simply reflected the different realities of staff in remote field stations and agency leaders in Pierre's political environment, they could contribute to internal mistrust that detracts from the Department's ability to fulfill its mission.

Recommendations

1. Agency leaders need to place a greater emphasis on communication within the agency, especially between central staff in Pierre and the field. This communication has to be two-way, with agency managers providing clearer and more consistent policy guidance, while at the same time demonstrating genuine openness to and interest in input from the field. Developing and implementing clearly documented management plans through a participatory process is one mechanism agency leaders could use to facilitate this communication. In addition to the immediate benefit of increasing communication, the plans derived through this approach would document the policy guidance that is

essential to effective operations. With more such plans in place, agency leaders and the Commission can focus on "big picture" issues related to what the desired outcomes of big game management are and more effectively delegate to staff the role of determining how to achieve those outcomes and implementing management strategies.

2. Agency leaders should find ways to spend more time in the field, ideally in informal, small group or one-on-one settings, to build relationships, communication and trust within the agency. At the same time, leaders should look for opportunities to bring field staff into the headquarters office for meaningful involvement in higher-level policy issues. This would not only give field staff a better understanding of the demands and constraints imposed on the agency by the political environment, it would also help prepare field staff for the type of challenges they will face if they move up the ranks and exchange their seat in a pickup for a seat in a legislative hearing.

3. Agency leaders should model a commitment to "continual learning" by seeking and sharing leadership training themselves. Every mid-level manager should be offered the opportunity and/or required to participate in leadership training to enhance their skills and prepare them for higher-level positions.

Roles and Responsibilities of the Commission

In South Dakota, as in all other states, wildlife is considered a public resource, held in trust by government, and managed for the benefit of the state's citizens and visitors. Like most other states, South Dakota has a citizen Commission, charged with providing policy guidance to the South Dakota Game, Fish and Parks Department and setting rules related to hunting, fishing, trapping and certain other topics as delegated by the state legislature (Wildlife Management Institute 1997; Title 41, South Dakota Codified Statutes).

The Commission form of governance for fish and wildlife was adopted across the United States during the first half of the last century as a way to insulate decisions affecting the public's wildlife from the vagaries of partisan politics in the legislative arena and/or governor's office (Management Assistance Team 2007). Commissioners are appointed by the Governor and confirmed by the legislature to serve as "trustees" of the public's wildlife (Smith 2011). In this capacity, Commissioners are expected to exercise their judgment and fiduciary responsibility to maintain the health and wellbeing of the state's wildlife resources, as well as allocating the benefits, or offsetting the impacts, of wildlife in the best interest of current and future generations (Riley, et al. 2002, 2003; Decker et al. in press).

Commissioners are typically appointed based on their ability to represent the public as "laymen" rather than as experts in wildlife management. While Commissioners are expected to be knowledgeable about the wildlife resources in the state and the public's

interests in wildlife, they rarely have formal training in wildlife management. As such, they must rely on the expertise of the professional staff in the state agency for guidance on technical matters. Conversely, it is critical that agency professionals recognize and respect the role of Commissioners as trustees of the public's wildlife and defer policy level decisions to the Commission (Smith 2011). Among the policy level decisions that appropriately rest with the Commission are such things as the goals and objectives of management, whether documented in plans or not.

To fulfill their role as trustees, Commissioners must have time to focus on policy-level issues. This can be challenging, given the statutory responsibility Commissions have to set rules for hunting, fishing and trapping combined with the high level of public interest in Commission decisions. A common problem WMI observes in examining state management systems is that Commissioners spend too much time dwelling on relatively less important issues, such as the number of licenses issued for a certain season or hunting unit, and not enough time focusing on higher-level policy matters such as the desired outcome of the harvest authorized by those licenses. This can create a downward spiral, where the lack of attention to broader policy issues, such as management planning, leads to inadequate guidance for staff and context for management decisions, which requires the Commission to spend more time debating minutia of annual license allocations.

One other challenge that can arise under the Commission form of government is tension between a governing body of lay citizens and the highly trained experts within the agency staff. If properly managed, this tension can bring out the best in both parties. If not addressed, however, this tension can lead to misunderstandings and erode trust.

WMI interviewed all seven of the current South Dakota Commissioners and two former Commissioners. Each of these individuals reflected the qualities that make good Commissioners – passion for the state's wildlife resources, a genuine interest in the public's views and desires for benefits from wildlife, respect for private landowners who provide the vast majority of habitat and access for hunting the South Dakota and willingness to both listen to others' opinions and make hard decisions.

WMI found that not all Commissioners, especially those appointed within the past year or so, fully understood their role and responsibilities. Several Commissioners reported that it had been over a year since their last "governance" or orientation session. Several Commissioners indicated they were unfamiliar with the Department's management plans or how those plans related to their decision-making.

The Commissioners voiced universal confidence in the capabilities and commitment of the Department staff, particularly at the field level. The Commissioners respected the staff's professional expertise. At the same time, a few Commissioners expressed concerns about the degree to which staff input was – or was perceived to be – considered in the formulation of agency recommendations. In WMI's view, these concerns were based on a lack of communication and transparency rather than on disregard for or manipulation of staff input at higher levels in the Department.

WMI found that the boundaries between Commission and Department staff responsibilities were not always clear and respected by either Commissioners or staff. For example, some staff indicated they thought it was their responsibility to decide what the goals and objectives of management plans should be, and WMI heard of an apparent attempt to politicize programs or policy.

Several Commissioners expressed frustration that their monthly meeting agendas were so full of "urgent" matters that they did not have time to discuss higher-level policy issues. As a result, the Commission did not have time to address some of the "big picture" issues, such as management plans, and was constantly reacting to the most recent crisis or the demands of the schedule to set annual license quotas. One example of how this pattern has impacted the Department and Commission was the history of elk management in the Black Hills.

In the absence of a meaningful management plan to guide Department and Commission actions in the 1900's and early 2000's, elk numbers grew to levels that exceeded landowner tolerance, particularly when drought conditions occurred. In response to pressure from landowners, the Department and Commission reacted by greatly increasing antlerless elk harvests to reduce the population. The dramatic reduction in elk numbers through hunting coincided with the period of rapid growth in the recently re-established mountain lion population, leading to disagreement and controversy over the degree to which lions were responsible for the decline in elk. Subsequent issues surrounding management of both elk and lions in the Black Hills have eroded public confidence in the Department and Commission.

Recommendations

1. The Department and Commission should seek assistance with training for both Commissioners and staff on their respective roles and responsibilities. Once these roles and responsibilities are clearly understood, the Commission Chair and Department leadership need to ensure that both Commissioners and staff operate consistent with their roles.

2. The Commission and Department should review the current regulation-setting process and schedule to find and implement changes that will reduce the amount of detail work for the Commission. For example, the Commission should explore the potential of setting multi-year license quota levels, or establish a range of license numbers within which the Department can operate for several years, to free up time for the Commission to focus on more important issues. Several states and provinces have taken the approach of setting multi-year license quotas that only require Commission review if the Department believes licenses need to be reduced or expanded beyond the limits set by the Commission in the "off" years due to unforeseen circumstances.

3. Department leadership should engage the Commission to a greater degree in policy level decisions, such as setting management goals and objectives, including integrating formal Commission approval of management plans into the planning process. This will increase the degree to which the Department and Commission are on "the same page" with respect to desired outcomes of management and insulate both the Commission and Department from reactionary pressures. This will ultimately support the actions in Recommendation 2, above, and allow the Commission and Department leadership to focus more on "what" the desired outcomes of management are and leave it to the staff to determine "how" to accomplish those outcomes.

Deer Management

Deer and deer hunting are an integral part of the fabric of South Dakota, contributing $56 million in economic impact to the state economy, and supporting 637 jobs (Department data). Over 15% of South Dakota residents over the age of 15 purchased a license to hunt deer in 2012, among the highest participation rates in the country. The Department manages both white-tailed and mule deer at the county level, but deer are aggregated into three groupings for management purposes: Black Hills Deer, East River and West River deer herds.

Deer Management Plans

Management is loosely guided by a 1994 Big Game Management Plan, and for the Black Hills deer population, a 2008-2017 Black Hills Deer Management Plan. This plan estimated deer populations in the Black Hills at 12,000 mule deer and 50,000 white-tailed deer, but acknowledged methods to census deer in pine forested areas with 70% canopy had yet to be developed. The plan also described strategies to address depredation, disease and habitat issues, and evaluate and improve population survey methodologies. There are no quantifiable objectives in the plan relative to population levels or buck doe ratios, although the plan described a goal of 80% of hunters satisfied with their hunt or no more than 10% dissatisfied. Hunter satisfaction data is collected in the annual harvest survey, but is reported as a mean value on a 7 point scale as opposed to proportion satisfied or dissatisfied. There are no current management plans for East River or West River deer herds, although there is an intent to develop these within the next few years as time and resources permit.

Ideally, evaluating the success of a deer management program would compare performance against benchmarks established in management plans. Management goals for deer, as for other big game species, are described as: "maximize user opportunity while maintaining populations consistent with ecological, social, aesthetic, and economic values of the people of South Dakota and its visitors." While no doubt an accurate reflection of a high level management philosophy, such a subjective goal is unlikely to inform the public or direct management strategies at any particular point in time, both because of the general nature of the goal and because South Dakota residents and visitors have diverse ecological, social, aesthetic and economic values relative to deer management. Since there are no specific objectives related to deer population size or quality that fulfills this objective, success will be evaluated through several less direct means; by comparing measures of user (hunter) opportunity and success to those in nearby states, by evaluating the degree to which key stakeholders, namely landowners and hunters, are satisfied with current deer management, and finally by comparing approaches used in South Dakota to those recommended or encouraged by the Mule Deer Working Group of the Western Association of Fish and Wildlife Agencies and other professionals.

Deer Hunting and Harvest Management

Statewide, in recent years (2005-2012), about 122,000 deer hunting licenses have been issued representing about 184,000 tags (Table D-1). Double, or triple-tag (last four years) licenses have been issued for many years for both east and west river deer, but not for the Black Hills. Deer harvest over this interval has averaged about 86,000 deer, with white-tailed deer comprising about 83% of the harvest. Hunter success as measured by harvest per license issued has varied from 62 to 79%, and averaged 71%. White-tailed buck harvest has ranged from 29,286 to 36,377 and averaged 32,635.

Table D-1. Licenses and tags issued, harvest, percent white-tails in harvest, and success rate for South Dakota hunters combined across all seasons and manner of take, 2005-2012.

Year	Licenses	Tags	Harvest	Success rate by license (%)	Success rate by tag (%)	Hunter Satisfaction
2012	112,008	162,338	69,351	62	43	4.9
2011	126,728	200,406	85,160	67	43	4.8
2010	130,352	203,375	94,726	73	47	5.1
2009	128,789	203,344	87,350	68	43	4.9
2008	128,713	189,159	91,562	71	48	5.0
2007	119,212	180,803	87,181	73	48	5.0
2006	118,732	174,476	86,806	73	50	4.8
2005	108,315	159,070	85,329	79	54	-
Average	**121,606**	**184,121**	**85,933**	**71**	**47**	**4.9**

Success of the South Dakota deer management program can be viewed in the context of how satisfied constituents are; both the license buying public and the landowners who maintain habitat that supports deer herds. South Dakota has taken a proactive approach to assessing hunter satisfaction and landowner tolerance. Informal conversations between conservation officers and landowners and sportsmen influence license quotas, and these conversations have been made a priority in recent years. Two types of quantitative surveys have also been conducted.

Each hunter surveyed as part of the annual harvest questionnaire from 2006 through 2012 was asked to gauge their satisfaction with their hunt on a Likert scale where 1 is completely dissatisfied, 2 is mostly dissatisfied, 3 is somewhat dissatisfied, 4 is neither satisfied or dissatisfied, 5 is somewhat satisfied, 6 is mostly satisfied, and 7 is completely satisfied. The Harvest Survey Report reports out satisfaction averaged across all hunters by method of take season or special hunt, such as archery, youth antlerless, muzzleloader, etc. A more useful measure of satisfaction would be the proportion of hunters who are satisfied or at least not dissatisfied (i.e., scores of 4 and above), however a single, weighted estimate was derived for each year by multiplying the satisfaction score for each category by the proportion of licenses in that category (Table D-1). This weighted estimate of hunter satisfaction varied slightly during this

period from 4.8 to 5.1, and averaged 4.9 (Table D-1), which indicated most hunters were pleased with their hunts. Across years, weighted hunter satisfaction was not strongly correlated with success as measured as harvest per license or harvest per tag.

Comparisons across states are difficult because deer herds respond to varying environmental and habitat conditions, and because states have different licensing systems that can complicate comparisons in success rates, such as presence or absence of unlimited licenses for archery, multiple licenses per individual, and multiple tags per license. Most states in this table report success as harvest per hunter afield, correcting for hunters who purchased a license and did not hunt. South Dakota does not make this correction, although human dimensions surveys (Gigliotti 2011) suggest about 96% of license buyers actually hunt in South Dakota, so this is likely to be a minor bias for reporting hunter success (success will be about 2 points higher than reported), and the harvest estimate itself is unbiased. Recognizing the limitations, comparisons across states can be informative.

Compared to nearby western and midwestern states containing extensive crop and rangeland, South Dakota harvest success rates for deer hunters, averaged across all seasons and manners of take, are very good (Table D-2). The South Dakota success rate is no doubt influenced by the ability of hunters to purchase multiple tags per license, but that can also be viewed as a strategy to make hunters more likely to be successful. Total harvest is nearly identical to North Dakota, but exceeds all other states compared except Montana, which is a substantially larger state (Table D-2). While not proof that the Department is meeting its stated objective to "maximize user opportunity while maintaining populations consistent with ecological, social, aesthetic, and economic values of the people of South Dakota and its visitors," it is highly indicative that opportunity, as measured by harvest and success, is being maintained to a degree at or above neighboring states.

Table D-2. Comparison of average number (2005-2012) of South Dakota deer hunters, harvest, success rate, and proportion of white-tails in the harvest to nearby western and Midwestern states.

State	Size (sq. mi.)	# Hunters or licenses (SD)	Harvest	Success Rate[1]	Percent white-tails	Percent Private land
South Dakota	**77,184**	**121,606**	**85,933**	**71/47**	**82**	**91**
North Dakota	70,672	136,892	85,811	62	91	91
Montana	147,164	153,587	107,793	40	51	63
Wyoming	97,809	72,577	49,666	68	29	44
Nebraska	77,421	122,008	63,471	52	85	97
Colorado	104,185	81,893	35,888	44	-	57
Idaho[2]	83,642	149,516	46,948	31	44	30
Utah[3]	84,899	86,229	26,994	31	~0	25

[1]Success rate calculated as harvest/hunters in the field, except SD, where success was calculated as harvest/licenses issued (higher number), and harvest/tag issued (lower number).
[2]Includes both general and controlled hunts.
[3]2005-2011.

Some interesting patterns emerged when looking at hunter satisfaction scores for individual seasons or methods of take across years. Archery and muzzleloader hunter satisfaction generally tracked the average across years, but West River and Black Hills deer hunters were consistently more satisfied than average, while East River deer hunters were consistently less satisfied than the statewide average, perhaps because of perceptions of crowding. Not surprisingly, youth antlerless hunters and mentored youth hunters were consistently more satisfied than the average hunter. Satisfaction in both East and West River Special Buck Hunts was highly variable across years, with some of the highest and lowest satisfaction scores recorded. Hunter success was relatively constant across years, suggesting hunter satisfaction is perhaps reflecting higher hunter expectations for these limited hunts relative to animal quality, crowding or some other factor other than whether a deer is killed. Although involving small numbers of hunters, hunts on Sand Lake, Waubay, and to a lesser extent LaCreek National Wildlife Refuges consistently received the lowest, and most variable across years, satisfaction scores. Although satisfaction in this instance was loosely correlated to success ($R^2 = 0.44$), there would appear to be other factors influencing the degree to which hunter expectations are being met, or not being met on these hunts.

Other western and midwestern states either do not collect, or report hunter satisfaction statistics from annual harvest surveys, so direct comparisons of South Dakota satisfaction data is not possible. Gigliotti (2011a) surveyed 2010 East and West River deer hunters, and found 65% and 68% of East and West River deer hunters, respectively, were satisfied with their 2010 deer hunting experiences, while 23% of both groups were dissatisfied. Black Hills deer hunters in 2010 had identical levels of satisfaction as West River hunters, 68% satisfied, 23% dissatisfied, and a declining trend in satisfaction since 2004 had been reversed (Gigliotti 2011b). This degree of satisfaction is consistent with deer hunting satisfaction summarized by Duda et al. (2006:94-96) in their national review of overall satisfaction with the hunting experience. They noted 69% of resident Colorado deer hunters were somewhat or very satisfied with their deer hunting experience. Sixty eight percent of resident New York deer hunters were satisfied with their experiences while 18% had some level of dissatisfaction. In Florida, 61% were satisfied or very satisfied and 38% were dissatisfied or very dissatisfied. McCullough and Carmen (1982) in a study of deer hunter satisfaction in California concluded that many aspects of hunter satisfaction are beyond the wildlife manager's control. In their study, the perceived quality of the hunting experience was most influenced by the number of animals observed and secondarily by kill. Only 28% of hunter satisfaction was accounted for by the controllable variables tested. To the degree hunter satisfaction was influenced by agency actions, it would appear the Department was doing as good of, or better job of managing hunter opportunity than other states.

Landowner satisfaction with deer population levels are assessed informally on an annual basis as described previously, but a more formal, albeit non-scientific, survey was conducted in 2010 through a mail-back questionnaire inserted in the *Landowners Matters* newsletter (Gigliotti 2011c). Landowners were asked to rate whitetail deer numbers on their land, and results were compared to a statistically valid sample of East and West River deer hunters. About 22% of landowners who were mailed the survey completed the survey (n = 3,372), suggesting considerable potential for non-response bias (landowners satisfied with current deer numbers may be less likely to respond than those who perceive there are too many).

Responding landowners perceived higher relative deer numbers than hunters did in 61 of 66 counties. Landowners felt there were too many deer (slightly too many, moderately too many, or too many) in 45 of 66 counties, while hunters felt there were too many deer in only 11 counties. Although the relative number of landowners who rated deer abundance as too high is likely to be inflated because of non-response bias, these results are still suggestive that at least in 2010 the current informal system of assessing landowner tolerance and adjusting license quotas accordingly could be improved.

Deer Population Monitoring and Modeling

Approaches to deer management differ between western, more mountainous states with a significant portion of public land and Midwestern, more agricultural states with mostly privately owned lands. Midwestern states, such as South Dakota, North Dakota, Nebraska, and Iowa where private ownership exceeds 90%, manage on an annual basis to increase, decrease or maintain populations based on landowner tolerance, last year's harvest of deer, and weather patterns. Deer population status and performance is assessed based on indirect measures of deer abundance such as hunter success rates, number of deer observed by hunters, roadside or aerial index counts, number and condition of road-kills, etc. Because management goals are primarily to manage deer populations within landowner tolerance based on annual changes in deer numbers and conditions, specific population objectives and accurate population estimates or models are usually not employed. A specific number is deemed not as important as a good sense of whether there is tolerance for more deer, less deer, or the same number of deer.

Western states, such as Idaho, Montana, Utah, New Mexico, Oregon and Colorado, manage to specific population objectives and estimate populations using aerial surveys with sightability corrections (New Mexico and Idaho) or model populations based on aerial classification counts, direct measures of mortality in representative habitats, and precise harvest estimates (Montana, Utah and Colorado). Rabe et al. (2002), reviewed monitoring methods employed by western states for big game and found that the statistical rigor of population size estimation varied greatly. Some states used ground-based classification counts obtained from roads and derived population size estimates by reconstructing population scenarios that could have generated observed sex and age ratios. Ground-based surveys, particularly those conducted along roads, are likely to be biased because roadsides are not representative of overall habitat and different sex and

age classes of deer may either avoid roadsides or use them disproportionately to other habitats (Rabe et al. 2002). This may not be a problem, or may be a minor problem East River where roads transect habitats to a great degree, but may be a larger problem in the Black Hills and West River in areas where roads are less common.

Other states directly estimated deer populations from aerial quadrat surveys, used sightability methods that corrected for visibility bias, or used aerial distance sampling, all of which directly estimated population size in the area sampled. Rabe et al. (2002) emphasize the importance of using aerial surveys, not combining disparate methods (such as aerial, roadside and horseback counts), randomization of transects or quadrats surveyed, and measurement of survival of females of breeding age as essential components for statistically rigorous population estimates. They point out that annual surveys in all units is not necessary, or cost-effective.

South Dakota understandably has taken a more midwestern approach to deer management in the past, but is moving towards more rigorous approaches for big game management. The Department has moved to an aerial census and modeling approach for pronghorn and established a specific population objective, used DNA mark-recapture methodology to estimate lion populations, has initiated research to evaluate aerial census and sightability approaches to estimate deer numbers in the Black Hills and East River, and has begun to develop models to estimate the Black Hills elk population and deer populations regionally.

Both midwestern and western approaches to deer management can work, although in our opinion managing to specific population objectives established in management plans created through a highly participatory process involving all stakeholders and directly estimating or modeling population size against that objective is the best way to meet stakeholder expectations, learn from past experiences and adaptively manage public resources in a transparent manner. Managing to a specific population objective or target, as opposed to reacting to landowner complaints about too many (or too few deer), should not be viewed as any reduction in concern about impacts of public deer on private land, rather, the population objective serves as a proxy for landowner and sportsmen interests that allows for a more transparent and open discussion about population levels.

As noted earlier, the Department currently does not manage deer populations to specific population objectives, rather evaluates annually whether to maintain, increase or decrease deer populations based on landowner tolerance for current levels of deer as assessed through informal contacts and deer population trends (assessed by doe:fawn ratios, past harvest, perceptions of winter mortality, and recently simple models). Fawn:doe and buck:doe ratios are collected to evaluate productivity and herd composition, and influence the relative degree to which licenses and tags are decreased or increased each year. Fawn:doe ratios are collected each September or October by biologists, wildlife conservation officers, and some game damage specialists, who are instructed to obtain a minimum sample of 30 per observer per unit (typically county), although the statistical basis for this minimum is not described or clear. Deer

population estimates are not routinely used to inform decision making, although simplistic models to estimate deer population size in each region by assuming a fixed harvest rate and back-calculating from prior-year harvest, adjusting for subsequent mortality, and allocating deer to sex and age classes based on classification counts have recently been developed. Terrall et al. (2005) as a class exercise at SDSU also developed models for white-tailed deer in the Black Hills, establishing an initial population by back calculating from harvest estimates, incorporating demographic rates from the literature and imposing various density dependent impacts on recruitment. Although models where harvest is the only parameter directly measured can generate crude population estimates that may be suitable for "seeding" demographically explicit models that require a starting population size, using a harvest-based model with a fixed harvest rate should not be used to determine future harvest quotas.

Harvest estimates are generated by post-card surveys of a random sample of license buyers, stratified by license and unit. Two follow-up surveys are sent at 12-14 day intervals in an attempt to reach an 85% response rate, expected to provide harvest estimates to plus or minus 15%. Hunters can return the post-card, or fill out the survey on-line. Estimating harvest through surveys of a sample of hunters has been found to be more cost-effective and reliable than mandatory reporting or animal checks (Lukacs et al. 2011).

Rabe et al. (2002), in a review of western states big game survey methodologies, point out that agencies are increasingly being challenged by special interest groups on the scientific validity of data and methods used to manage natural resources. The Mule Deer Working Group of the Western Association of Fish and Wildlife Agencies published "Methods for Monitoring Mule Deer Populations" (Keegan et al. 2011) which is also generally applicable for monitoring white-tailed populations. While recognizing (page 4) "that practical, political, and economic factors constrain the ability of wildlife agencies to make dramatic changes in their ongoing monitoring activities," these authors asserted (page 5) that "modern mule deer management must be based on monitoring methods that are statistically sound and designed to produce data necessary for decision makers." Keegan et al. (2011) point out that because of expense intensive monitoring of most hunted species is not feasible, and they describe situations where intensive monitoring of deer populations is important; namely when management strategies maximize buck harvest rates (> 50% of bucks harvested annually) and when doe harvest levels are high and designed to control populations. Arguably both situations apply in South Dakota, where harvest of doe white-tailed and mule deer equal or exceed buck harvest in most years, and where hunting was responsible for 65% (Robling 2011) and 37% (Haffley 2013) of doe mortality, and 68% of a predominately female group of whitetails (Burris 2005).

Keegan et al. (2011) summarize advantages and disadvantages of a variety of approaches to estimate deer population abundance or density (abundance/unit area) when intensive monitoring is warranted, including distance sampling along line transects, strip transects, quadrat surveys, mark-resight or mark-recapture, and thermal imaging approaches. These methods vary in utility and assumptions, but all

suffer from a need for many hours of expensive helicopter time, radio-collared deer to estimate detection rates, or both. Even if sufficient resources are deployed the area of inference is often small (less than a county) and confidence intervals are generally prohibitively large. The Department has sponsored research on several of these methodologies that validates they are expensive and produce estimates with large confidence intervals, even at small scales (Naugle 1994, Grassei 2000, Jarding 2010, Phillips 2011, Robling 2011, Haffley 2013).

Consequently modeling approaches are often used to "provide biologically realistic, mathematical simulations of mule deer populations based on demographic parameters that can be estimated using routinely collected field data" (Keegan et al. 2011, page 43). Modeling (sensu White and Lubow 2002) allows populations to regularly be estimated in an unbiased manner at a scale that would seldom be feasible with sample-based population methods. Models of this nature typically incorporate as data inputs harvest estimates, estimated wounding loss, post-hunt sex and age-ratios, and natural survival rates, all of which South Dakota has, or could obtain information on with survey modifications. The strongest models are optimally fitted cumulative models that incorporate and align data over a period of years. Typically spreadsheet software incorporating complex mathematical algorithms is used to align modeled to observed (from classification surveys) post-hunt buck:doe ratios. Competing models are evaluated and compared using Akaike's information criteria (AIC).

Models can be improved by incorporating prior probabilities using Bayesian statistical methods (Lukacs et al. 2009), and by periodic alignment with sample-based population estimates. The latter is particularly important to seed models with an initial population estimate, and perhaps after significant mortality events such as EHD outbreaks or extreme winters. Models can also be improved by incorporating field data on parameters that most heavily influence model outputs, such as doe and fawn survival, something South Dakota is already collecting information on.

Collecting enough data to estimate or model the size of deer populations to a reasonable degree of accuracy and precision on an annual basis is a very expensive undertaking, both in dollars and staff time. Rabe et al. (2002) summarized costs of big game surveys in western states, many of which were deemed inadequate, as between $400,000 and $1.7 million dollars in 1998 dollars. The degree to which each state can, or should, achieve highly accurate and precise estimates of deer population size, or even rely on indirect measures of abundance, will vary across states based on their budgets, staffing, and competing demands for dollars and staff.

The Department, while moving its big game management program towards monitoring methodologies that are statistically sound and that are designed to produce data necessary for decision makers, is not yet at that point for deer. The Department has recognized the limitations of current methodologies (1994 Big Game Management Plan, others), completed or has on-going research projects evaluating aerial transects with sightability corrections and spotlight distance sampling approaches for deer and elk (Grassei 2000, Jarding 2010, Phillips 2011, Robling 2011, Haffley 2013, W-75-R-54

Federal Aid Progress Report July 1, 2011 – 30 June 2012), and staff have submitted a proposal for bio-statistical support for model development. These findings are designed to encourage and speed ongoing improvement efforts.

Deer Management Findings and Recommendations:

1. The absence of a defined population objective and reliance on informal discussions with landowners about their tolerance for current deer population levels does not provide transparency to the public about deer management objectives or annual quotas. The Department should move to development of deer management plans that contain population objectives defined as a range of values, address at a minimum or preferably quantify tolerable levels of game damage, and which may include measures of quality relative to buck:doe ratios, proportion of mature bucks, hunter density, etc. These plans should be prepared by game management staff, with public input relative to objectives, and formally adopted by the Commission through a multi-step process.

2. Management of deer at the County level will not be economically feasible if and when the Department moves to managing towards specific population objectives and estimating or modeling deer population size relative to those objectives. The Department should consolidate counties into larger aggregate data analysis units (DAUs) that approximate deer populations or reflect geographic or political boundaries that make sense. Managing hunter distribution through county-level licenses would still be possible and desirable both because the public is comfortable with this approach through years of experience, and to manage crowding.

3. The Department does not currently have inventory systems or methodologies in place to estimate or model the size of deer populations, evaluate the impacts of management decisions, or acquire additional knowledge over time. Lack of statistically defensible population estimates can lead to public challenges, erode public confidence, and may lead to periodic under or over harvest of deer. The Department should seek additional bio-statistical support to develop deer population models that have the characteristics below, and that incorporate data within budgetary and staffing constraints of the Department. Model development should:
    a. Incorporate an optimally fitted, cumulative modeling approach.
    b. Incorporate harvest, wounding loss, post-hunt sex and age ratios and natural survival rates.
    c. Align modeled to observed post-hunt buck:doe ratios.
    d. Use a maximum likelihood estimator; evaluates and compare competing models using Akaike Information Criterion (AIC)..
    e. Incorporate Bayesian prior probabilities to improve model performance when suitable information is available.
    f. Align with sample-based population estimates when and where available or needed.
    g. Utilize a cloud-based data storage and retrieval system where models run on individual PC's but data are called from, and stored on, a central server.

4. Current data collection methods, principally the fall classification counts and harvest survey, will support, but are not sufficient to develop models developed in finding 3. Specifically:
    a. Current Harvest Survey methodology provides accurate and reliable results, but response rates typically fall somewhat short of the 85% response rate thought necessary to meet the stated +/- 15% of the test statistic (statewide harvest estimate) goal. Mail surveys can be influenced by non-response bias, likely to be negligible if the 85% response rate is achieved. Because harvest estimates are a critical component of population modeling, the Department should increase sample size, possibly by the addition of e-mail notifications, phone surveys, or both to the standard mail survey, with appropriate corrections for differential responses (Lukacs 2007) to increase response rates, decrease non-response bias, and potentially decrease costs. Ultimately sample sizes should be adjusted to meet levels of precision deemed appropriate for each deer management unit/population, as opposed to those adequate for a statewide estimate.
    b. Classification counts as currently designed and conducted are not adequate as input to rigorous modeling approaches. Classification counts should be improved by: 1) formal training and testing of staff in classifying fawns, 2) evaluate degree of bias of road-based counts, and moving, if needed and economically feasible, away from road-side transects to randomly derived aerial transects, 3) determining sample sizes needed to meet a pre-determined level of precision, and 4) conduct classification counts post-hunt during late winter when overwinter mortality, particularly on fawns, will be reflected in fawn:doe ratios.
    c. Additional data on doe survival should be collected routinely (now being collected as part of a research project) in representative Black Hills, East River, and West River habitats because outside of harvest, annual doe survival is the parameter that most influences deer population dynamics. Monitoring survival of radio-collared does will allow for accurate assessment of over-winter mortality and impacts of rare events such as EHD outbreaks.
    d. Collection and analysis of deer incisors as a means of estimating age structure has recently been dropped because of Postal Service regulations pertaining to mailing biological samples. The 2011 deer management report suggests staff is exploring alternative ways to collect incisor data, but age-structure data from hunter kills, and other "comfort" data such as pregnancy rates or body condition of road kills, does not meaningfully support rigorous modeling, and takes staff time and other resources away from more meaningful data collection and should not be reinstated.

Elk Management

Elk, once widespread throughout South Dakota prior to settlement, now occur in three discrete populations established through reintroductions. The Black Hills herd, which occurs in the Black Hills National Forest, Wind Cave National Park, Custer State Park, nearby private lands, and is contiguous with populations in Wyoming, is the largest herd at about 6,000 animals. Several smaller populations of elk, collectively referred to and managed as Prairie Elk, occur in Lawrence and Butte Counties, Bennett and Todd Counties and a small portion of Mellette County, and in Gregory Counties in south central South Dakota, which extends into adjacent Boyd County, Nebraska. A small herd is also hunted that occurs in extreme southwest South Dakota, west of Angostura Reservoir along the Cheyenne River bottom.

Black Hills Elk Management

Elk in the Black Hills occur over a checkerboard of public and private ownership, all of which have differing management goals and perspectives on elk. Publicly owned lands include the Black Hills National Forest (BHNF), which extends into Wyoming, Wind Cave National Park (WCNP), and Custer State Park (CSP), each of which has management prescriptions and plans for elk. The bi-state nature of this elk herd, as well as this complicated land ownership patterns makes for an extremely challenging elk management environment.

Elk Management Plans

The BHNF has about 1.5 million acres within its boundary, which includes about 300,000 acres of non-federal private and public land. Disturbance on the Forest include fire suppression, grazing, mining and logging. Fire suppression has increased the density and canopy cover of ponderosa pine, and reduced understory grass, shrub and forb components and hence available forage for elk (reviewed in SAIC 2003). The Land and Resource Management Plan of 1997 set an objective of 3,800 elk on the BHNF, and discussed the impact that elk may have been having on aspen regeneration and riparian areas.

Custer State Park is 71,000 acres in size, and lies immediately east of the BHNF in the southern Black Hills. In addition to a variety of recreational amenities, the Park since 1914 has hosted a herd of bison, which is now managed to a spring population of about 1,300. Elk hunting is allowed within the Park, under separate park-specific licenses. In 2012, 3 rifle any-elk licenses and 3 archery any-elk licenses were issued, with no antlerless rifle season or late archery elk season. There is no specific management plan for elk within CSP.

WCNP lies immediately south of CSP. It is 28,295 acres in size, and as a National Park it has management authority over elk within its boundaries. It is surrounded by 37 miles of 4-7-foot-high woven wire fence built to contain a resident bison herd. This boundary fence inhibits movement of elk and deer as well. Historically elk populations within WCNP were managed to an objective of 350-400, established by the Elk Surplus

Disposal Program / Environmental Assessment (NPS 1980), and reaffirmed by the Elk Management Strategy developed in 1994 (NPS 1994). Hunting is not permitted within the Park, and from 1980 to 1994 (prior to discovery of chronic wasting disease) translocations of animals out of the Park were the primary tool used to manage populations. Somewhat over a third of elk wintering within WCNP leave through a lowered fence in the southwest corner in the spring but generally return in the fall. In the absence of culling, translocations or other strategies to reduce elk, it was estimated elk populations inside the park increased by 10-12% annually. An EIS was completed in 2009, the need for which was described as the elk "population is not regulated by natural ecosystem processes." The preferred alternative within the EIS was to utilize drop-down fences and "gates" permeable to elk but not bison, and hazing to move elk in the spring, but raise fence heights in the fall to prevent return of some elk and expose them to hunting off the Park. These strategies would continue until elk were reduced from an estimated 800 to within a range of 232-475. The Department would facilitate harvest of elk off the Park by working with landowners to obtain access for hunters. In addition, an MOU was signed in 2012 between superintendents of WCNP and CSP to cooperate in dropping fences along their common border to facilitate movement out of WCNP and onto CSP. In March of 2013, helicopter crews hired by the Department using Rocky Mountain Elk Foundation funding hazed 391 elk out of WCNP onto CSP.

Aside from the 1994 Big Game Strategic Plan, intended primarily to guide staff efforts, there is no current Department plan for Black Hills elk, although Department staff is in the initial phases of developing elk management plans. The Big Game Strategic Plan had no specific population objective, but described an objective to develop clearly defined management goals for population size, hunter satisfaction and landowner tolerance by January, 1996. These objectives have not yet been met. The Department has managed to population objectives for Black Hills elk established internally and in cooperation with Wyoming, of around 4,600, but this goal was established before reliable population estimates were available.

Elk Damage and Damage Programs

While elk in the Black Hills provide a highly sought after hunting opportunity, they also compete with livestock for forage on public and private rangelands and can damage fences, haystacks and other private property. This dynamic tension between a dispersed public benefits versus individual private impact can create conflict when elk populations are perceived as too high or too low by one group or another. For instance, the Fair Deal Coalition was formed in 2003 by a group of landowners concerned about increasing elk depredation. As a result of the Coalition's request, the Department increased the number of cow elk tags and increased funding for elk depredation-related projects and hunter access within the elk emphasis area. A common theme heard during the public listening session was that elk populations were now too low, whether thought caused by over-aggressive issuance of antlerless licenses or lion predation, or both.

The Department has been innovative in attempting to address landowner complaints about elk damage. While the Department does not pay for forage or livestock losses

directly, as mentioned previously, they have a very well-funded (~ $3 million/year) and well-staffed (24 Wildlife Damage Specialists) Wildlife Damage Management Program to respond to complaints and aggressively attempt to mitigate losses. This program includes control of depredating or nuisance animals as well as fencing, stack yard protection, food plot contracts that contain a hunter access component, paying for hunter access to private lands, and depredation hunts to disperse elk. While all western and mid-western state wildlife agencies respond to landowner complaints relative to game damage, we are not aware of any state which offers this degree of customer service to landowners or commits this level of staff and financial resources.

Black Hills Elk Hunting and Harvest Management

The Black Hills herd provides a limited but significant opportunity for residents of South Dakota to hunt elk. In 2013, 620 licenses were issued, 445 any elk and 175 antlerless. By administrative (Commission) rule, 50% of licenses are set aside for those with landowner preference, 30% of licenses are set aside for those with 10 or more preference points, and the remaining 20% are set aside for those with 2 or more preference points. The order of the draw is landowner preference first, followed by 10 or more preference points, two or more preference points and finally the general draw, with licenses not drawn cascading down to the next lower preference group until all applications are satisfied or licenses are gone. Leftover licenses are available to those requesting it as a second choice, although this occurs rarely and only with antlerless elk. Consequently, almost all those applying with landowner preference in the Black Hills have a 100% chance of drawing either type of elk license, because there are relatively few of them and because only one application is permitted per property per year. Demand among non-landowner hunters is high; odds of drawing an any elk license without preference points ranged from 0 to 1.4%, with two preference points 0.6 to 1.6% of hunters drew, and with ten or more preference points 10.3 to 100% of applicants drew an any elk tag.

The perceived inequity that landowners can draw an elk tag every year while the general public have very low odds in any given year and can't even apply for nine years after drawing, was raised as an issue in several public meetings. A set-aside of 50% of limited licenses is high compared to other western states (e.g., ND – 15%, CO -15%, MT - ≤10%, ID - 10-25%), although landowner preference programs are complex and aspects such as transferability or sale of vouchers/licenses complicate comparisons. However, in 2013, landowners used their preference to take only 81 any elk licenses (19% of those available), and 2 antlerless licenses (1%) in Black Hills seasons. There is no right or wrong allocation of high demand or other licenses to landowners, but this is exactly the kind of contentious resource allocation issues that should be supported by policy and periodically reviewed and debated by the Commission.

The number of elk hunting licenses issued and elk harvest, particularly of cows has varied tremendously over the last ten years (Table E-1). Total licenses have varied from a low of 667 in 2012 to a high of almost 3,000 in 2005, a 4-fold difference. Cow harvest has varied even more dramatically, from a low of 129 in 2012 to a high of almost 900 in 2005, a 7-fold increase. Bull harvest on an annual basis has varied from

29% below the 10-year average in 2011 and 2012, to 32% above the 10-year average in 2007, while cow harvest has varied from 74% below average in 2012 to 78% above average in 2005. Because elk are long-lived animals where hunting is the primary cause of mortality for most adult elk, generally elk population abundance can be regulated reasonably well by adjusting cow harvest, unless there are large refuge areas not subject to hunting, unusual levels of predation on calves, or both.

Table E-1. Rifle and archery licenses issued and bull and cow harvest for Black Hills elk seasons, 2003-2012.

Year	Rifle licenses	Archery licenses	Total licenses	Bull harvest	% dev. from average	Cow harvest	% dev. from average	Total harvest
2003	1579	192	1771	451	-1	663	32	1114
2004	1798	192	1990	426	-6	734	46	1160
2005	2670	267	2937	553	22	898	78	1451
2006	2470	247	2717	555	22	850	69	1405
2007	2075	237	2312	600	32	527	5	1127
2008	1675	202	1877	520	14	399	-21	919
2009	1366	185	1551	456	0	388	-23	844
2010	1059	144	1203	334	-26	266	-47	600
2011	866	126	992	323	-29	181	-64	504
2012	570	97	667	324	-29	129	-74	453
Average	**1613**	**189**	**1802**	**454**		**504**		**958**

Large swings in harvest, caused by large swings in the number of licenses issued, undermines public confidence that the agency is managing elk populations in an objective fashion and can cause the public to question agency competence. However it is symptomatic of reactive management constructs where agencies evaluate landowner tolerance in informal ways and adjust accordingly as opposed to managing to a publicly accepted, or at least publicly debated population objective established by the Commission. Reactive, as opposed to objective-based management approaches can allow elk to build to intolerable levels when conditions are good. However when either or both habitat and economic impacts are great enough during periods of drought, during bad winters or other tough conditions, managers are compelled to drive populations well below what might otherwise be desired. An established population objective (range), when supported by effective population inventory and modeling methodologies, results in relatively fine scale adjustments to license numbers to keep elk populations within a fairly narrow range.

Black Hills Elk Population Monitoring and Modeling

Considerable effort has gone into development of aerial census methodologies for elk in the Black Hills with South Dakota State (Jarding 2010, Phillips 2011) since at least the early 1990s. Detection of groups containing radio-collared elk was 64% (Jarding 2010),

and 59% (Phillips 2011), with group size, vegetation cover and snow cover parameters most influencing sightability. A population estimate of 6,067 elk (95% confidence interval 5,794-7,115) was derived from sightability surveys in winter, 2013. Confidence limits within 5% of the mean are outstanding, and more than adequate for management purposes.

Elk spreadsheet population models have been developed for the Black Hills population and for Custer State Park, although they are point estimate (rather than cumulative over years) and deterministic (rather than stochastic models that incorporate variance). Given the precision of the winter survey, a simple spreadsheet model approach would be adequate if surveys of that precision were conducted every year. Given the considerable expense, and risk to staff of intensive annual helicopter flights, a more prudent approach would be to develop optimally fitted, cumulative population models and periodically align those models with aerial censuses adjusted for detection probability. Classification counts are conducted for elk in the Black Hills each fall. If these counts were moved to the post-hunt period they could support this type of model development.

At listening sessions the public expressed concern that mountain lion predation on elk, particularly elk calves, was driving down elk populations and reducing hunter opportunity significantly. The Department has initiated several research projects internally or with SDSU to evaluate adult cow and calf mortality rates and mountain lion food habits in the Black Hills (W-75-R-54 Federal Aid Progress Report July 1, 2011 – 30 June 2012). Results indicate generally high pregnancy rates (85-95%), and high cow survival rates which are consistent with these rates for other populations of elk in the west. Survival of calf elk has varied between years and study areas fairly dramatically. In the Custer State Park and adjoining portions of elk units 4 and 9, calf elk survival to 31 July was only 7% in 2011 and 41% in 2012, while in another study conducted during 2012 in elk unit 2 on the BHNF 89% of calves survived to 4 September. Almost all calf mortalities in both studies were attributed to mountain lion predation. It is difficult and dangerous to draw conclusions from 1-2 years of data. Additional years of data collection will shed more light on whether the very high calf mortality in the Custer State Park study area is representative or anomalous, perhaps representing the impact of a single lion or group of lions that became adept at hunting calves. A companion study evaluating the impact of lion predation on bighorn sheep and other prey species reported that between June of 2009 and September of 2012, 1,398 carcasses of lion kills were examined, and while deer represented about 82% of kills, elk represented only 6.6%. Brodie et al. (2013), in a review of population dynamics of 45 elk populations across the west, found that adult cow elk mortality was unrelated to presence or absence of mountain lions, but did not evaluate impact of lions on calf mortality.

The Department has done an exemplary job of responding to public concerns and initiating scientific studies of a high caliber to quantify lion predation rates and assess the impacts on big game species. Ultimately these data can contribute to a systems

modeling and potentially planning approach where these predator-prey relationships can be quantified and tradeoffs evaluated.

Prairie Elk Management
A management plan was developed for the Gregory County population in 2000 (McCrea and Lengkeek 2000), which called for maintaining this population at around 70 animals. This was based on conversations with area landowners, 19 of 21 who wanted elk on their property, 15 of which felt current (2000) population levels were about right. Hunters who drew licenses to hunt this herd were surveyed in 1996, and they reported strong satisfaction with the hunt, and an ability to access private lands for that purpose. Management Plans have not yet been developed for other prairie elk populations.

Prairie Elk Hunting and Harvest Management
In recent years (2003-2012), the Prairie Elk rifle season has averaged about 100 licenses per year, with a harvest of about 20 bulls and 20 cows each year. Hunter success rates over this period have ranged from 27 to 54% per year, and averaged 43%. Demand for prairie elk rifle licenses is even greater than for Black Hills elk rifle licenses. Any elk licenses were allocated 50% to landowners, 30% to those with 10 or more points, and 20% to those with two or more points, with no licenses rolling over to lower preference groups or the general draw. Elk are also hunted in Boyd County, Nebraska, and prior to 2013 a reciprocal agreement allowed hunters in each state to hunt across state lines.

Prairie Elk Population Monitoring and Modeling
Elk populations are not monitored in any systematic fashion, nor are that likely necessary given the small size of these herds, and their strong reliance on private or tribal property. Knowing how many elk there are is less important than knowing how many are causing depredation issues, and local COs appear to be in touch with relative elk population size and landowner tolerance for numbers of elk.

Black Hills and Prairie Elk Management Findings and Recommendations:

1. The absence of current management plans containing defined and broadly communicated population objectives do not provide transparency to the public about elk management objectives or annual quotas. The Department should move to development of elk management plans for the Black Hills herd that contain population objectives defined as a range of values, address tolerable levels of game damage, and which may include measures of quality relative to bull:cow ratios, proportion of 4-point or better bulls, hunter density, etc. These plans should be prepared by game management staff, with public input relative to objectives, and formally adopted (and periodically reviewed) by the Commission through a multi-step process.

2. Because of the inter-relatedness of many of the complex issues within the Black Hills, such as predator prey dynamics, competition for forage, and damage to livestock and agricultural operations from both lions and deer and elk, the Department in the future

should consider establishing a stakeholder process to develop a systems plan for the Black Hills, which considers the interactions between available forage, livestock, deer, elk, and mountain lions, allocates forage between livestock and native ungulates, and establishes measurable and quantifiable objectives for range condition, and population levels of deer, elk and lion. Although such an approach is clearly the best way to objectively evaluate tradeoffs in a system where predators and prey interact, and where domestic and wild ungulates compete, it will be a difficult and time consuming process that will benefit from the completion of several ongoing studies. We view this as a longer term goal, the planning output of which would supplant the Black Hills elk, deer and lion plans which should be viewed as interim plans.

3. The Department has developed elk inventory methodologies that can accurately and precisely estimate the size of elk populations, but lacks elk population models which can be used to evaluate the impacts of management decisions, population responses, and acquire additional knowledge over time. The Department should seek additional bio-statistical support to develop elk population models for the Black Hills that have the characteristics below, and that incorporate data within budgetary and staffing constraints of the Department. Model development should:
    a. Incorporate an optimally fitted, cumulative modeling approach.
    b. Include harvest, wounding loss, post-hunt sex and age ratios and natural survival rates.
    c. Align modeled to observed post-hunt bull:cow ratios.
    d. Use a maximum likelihood estimator; evaluates and compare competing models using Akaike Information Criterion (AIC).
    e. Incorporate Bayesian prior probabilities to improve model performance when suitable information is available.
    f. Align with population estimates derived from helicopter surveys with sightability corrections when and where available or needed.
    g. Utilize a cloud-based data storage and retrieval system where models run on individual PC's but data are called from, and stored on a central server.

4. Current data collection methods, principally the fall classification counts and harvest survey, will support, but are not sufficient to develop models developed in finding 3. Specifically:
    a. Current Harvest Survey methodology provides accurate and reliable results, but response rates typically fall somewhat short of the 85% response rate thought necessary to meet the stated +/- 15% of the test statistic (statewide harvest estimate) goal. Mail surveys can be influenced by non-response bias, likely to be negligible if the 85% response rate is achieved. Because harvest estimates are a critical component of population modeling, the Department should increase sample size, possibly by the addition of e-mail notifications, phone surveys, or both to the standard mail survey, with appropriate corrections for differential responses (Lukacs 2007) to increase response rates, decrease non-response bias, and potentially decrease costs. Ultimately sample sizes should be adjusted to meet levels of precision deemed appropriate for each elk management unit/population, as opposed to those adequate for a statewide estimate.

b. Classification counts as currently designed and conducted are not adequate as input to rigorous modeling approaches. Classification counts should be improved by: 1) formal training and testing of staff in classifying calves, 2) moving, if economically feasible, away from road-side transects to randomly derived aerial transects, 3) determining sample sizes needed to meet a pre-determined level of precision, and 4) conduct classification counts post-hunt during late winter when overwinter mortality, particularly on calves, will be reflected in calf:cow ratios.
c. Additional data on calf survival may be valuable (now being collected as part of two research projects) in the Black Hills if research determines that lion predation rates are high enough and variable enough to impact population modeling.

Pronghorn Antelope Management

Pronghorn historically occurred in high numbers across all of South Dakota. Unregulated subsistence and market hunting in the late 1800's and early 1900's reduced the population to less than 1,000 pronghorn by 1924. Under management by the Department over the past 90 years, the population increased steadily in western South Dakota reaching a peak of more than 81,000 pronghorn in 2008. Agricultural development is a limiting factor for pronghorn from both a habitat quality and landowner tolerance perspective east of the Missouri river and few pronghorn occur in that half of the state. Nevertheless, only two other states have larger pronghorn populations (SDGFP 2012).

Pronghorn hunting is not as popular as deer hunting in South Dakota, but the Department issued between 8,000 and 15,000 licenses with a total of 14,000 to 36,000 tags through a lottery system for the period 2005 – 2011 (SDGFP 2012). Demand for licenses is high and one complaint voiced by some people at the WMI listening sessions is that issuing licenses with two or three tags, as opposed to issuing more single tag licenses when populations are high curtails hunting opportunity. Department staff and Commissioners indicated during interviews that multiple-tag licenses are used as a way to balance hunter opportunity with landowner tolerance for hunters, while achieving higher harvest levels. However, as discussed in the harvest monitoring and management section, below, issuance of multiple tag licenses may not be as effective as desired or anticipated.

The Pronghorn Management Plan

Pronghorn management in South Dakota is guided by a management plan completed in 2012. The goal of the plan is to, "manage pronghorn populations and habitats consistent with ecological, social, aesthetic, and economic values of South Dakota citizens while addressing the concerns and issues of both residents and visitors of South Dakota" (SDGFP 2012). Importantly, the plan includes quantitative population objectives.

When the plan was published in 2012, it set an initial statewide objective of 55,000 $\pm$ 5,000 prior to the fall hunting season. While a statewide objective is informative in a general sense, to provide meaningful guidance for management decisions, objectives must be set at the management unit level. The Department recognized this need and developed unit specific objectives earlier this year (Table A-1). These unit specific objectives, combined with the harvest management options adopted in the management plan provide a sound framework for pronghorn management. It is not clear, however, that the Commission has adopted these objectives and committed to using them as the basis for decision-making.

WMI did note that the unit specific objectives are stated as single point values, without a range surrounding them. Given the limited precision of population estimates and the realities of population management, it is likely that pronghorn numbers will always be

either above or below the single value stated in the unit specific objective. Objectives expressed as a range or bounded by an interval (e.g. ± 10%, like the initial statewide goal) would provide a more realistic frame of reference for management.

Table A-1. Unit specific population estimates and management objectives for pronghorn in South Dakota.

		2013	**Unit Specific**
GMU Name	**Unit#**	**Population Estimate**	**Population Objective**
Pennington	02A	1,733	2,000
Bennett/Shannon	11A	1,886	2,000
NW Butte	15A	1,123	2,500
Butte	15B	3,431	8,000
Corson	20A	986	2,250
Custer	21A	2,438	2,000
Dewey	24A	660	1,200
Fall River	27A	3,935	4,000
Haakon	31A	1,275	2,000
West Harding	35A	2,861	8,000
East Harding	35B	2,135	6,000
Hughes	36A	251	225
Jackson	39A	1,300	1,500
Jones	41A	489	950
Lyman	45A	89	550
FPNG	45B	110	450
North Meade	49A	3,706	6,000
South Meade	49B	1,667	2,000
Mellette	50A	556	800
North Perkins	53A	1,052	4,000
South Perkins	53B	2,210	5,000
Stanley	58A	770	850
Sully	59A	163	210
Tripp	60A	166	375
Walworth/Potter	63A	130	210
Ziebach	64A	2,146	3,000
Total		**37,268**	**66,070**

One concern with the language in the management plan is the statement that objectives "may fluctuate due to landowner tolerances, which are often influenced by winter severity, crop rotation, and changing habitat conditions due to drought and/or livestock grazing." An objective that is subject to change based on year-to-year variation provides no guidance to scientific management. Stable objectives need to be maintained for a defined period of time (e.g. 5 or more years) to guide the harvest

management system described in the management plan. Without that, the management plan will be meaningless.

Several other objectives in the management plan could be improved by making relatively minor, but important changes. For example, Objective 1, "Maintain rangelands (native grasslands, CRP, shrub steppe, pasture) acreages at the highest level possible." is entirely subjective. What constitutes the "highest possible level" for one person may be much higher – or lower – than for another. There is no way to know whether or not this objective is being met. If the Department used existing land-cover maps or other sources to estimate the current amount of rangeland, then set a quantitative objective related to that acreage (e.g. maintain 90% of the 2013 acreage or increase acreage by 15% over the next 5 years), future assessment of rangeland acreage would enable the Department to determine whether the strategies identified for this objective are succeeding and adjust accordingly.

Objective 2, "Advocate management of rangelands to enhance quantity and quality of pronghorn habitats on private and public lands," is an activity or strategy related to habitat management, not an objective. If there are specific attributes of rangeland that enhance the quantity and quality of pronghorn habitat, those should be incorporated in measureable terms into an objective.

Objective 4, "Manage for a biologically and socially acceptable statewide pronghorn population," simply restates the goal and is not a useful objective. All the strategies listed under this objective apply to Objective 3. Eliminating Objective 4 would streamline the plan and provide greater focus on management directed at quantifiable objectives.

Objective 5, "Manage and abate pronghorn depredation to agricultural crops and other private property," and Objective 6., "Provide the public with access to private and public land for quality hunting opportunities," both relate to important elements of the pronghorn management program, but neither provides any basis to measure success. These objectives should be rephrased in quantitative terms similar to the 1994 Big Game Strategic Plan objective related to pronghorn depredation which read, "Address pronghorn depredation on private land in a manner that will reasonably satisfy 95% of annual complaints." Objectives stated in this manner provide the basis for allocation of resources, establish clear public expectations, and give both the Department and public a basis for evaluating whether or not management strategies were working satisfactorily. Quantitative objectives also provide a frame of reference for future program improvement, based on experience gained through management or changes in such factors as landowner tolerance.

The strategies outlined under the objectives are comprehensive and appropriate to the desired outcomes of the management plan. With the modifications to the objectives discussed above, and consistent implementation, the pronghorn management plan would provide the Department, Commission and public an effective foundation for pronghorn management.

Population Monitoring and Modeling

Annual aerial surveys are conducted using fixed wing aircraft to estimate the number of adult pronghorn in May and June in all management units. Conducting the surveys in May and early June is driven by manager's desire for a population estimate prior to submitting license allocation recommendations in June for the upcoming fall season and a desire to continue a long-term dataset.

Ground-based counts are conducted in all units in August and September to estimate productivity. The surveys are conducted by multiple staff, from vehicles on roads, who gather data opportunistically, classifying observed groups of pronghorn and recording the number of does and fawns. Desired sample sizes for each unit are based on the adult doe population estimate the preceding spring.

Results from the aerial and ground surveys are used in a spreadsheet model to estimate population size, status and trend. Each element of this approach to population monitoring has strengths and limitations.

The spring aerial strip transects surveys follow a standard protocol that has been in place for many years. The survey design reasonably complies with the underlying assumptions of the method (e.g. random distribution of pronghorn relative to transect location; 100% sightability of pronghorn) and these surveys provide one of the best pieces of information available for pronghorn management.

The recent modification to the analysis of results, using variation in observations along individual transects to generate statistically bounded estimates of density and population size (A. Lindbloom, pers. comm.), is a major improvement over the previous approach of simply multiplying the observed number of animals by three to adjust for areas not covered between transects. Applying confidence intervals to the population estimate provides managers with a scientifically sound estimate. It also informs managers about the precision of the estimate from which they can better judge the risks associated with decisions based on the estimate.

One important limitation of the current aerial surveys is a consequence of conducting the surveys prior to parturition. Surveys conducted in May and early June provide no measure of initial productivity that can be used to estimate the total fall, pre-hunt population as part of the season setting process. Managers could make reasonable recommendations for license allocations based solely on the adult population estimate derived from the aerial survey using the harvest management system outlined in the pronghorn management plan, but staff indicated in interviews that both the public and Commission insist on having a total population estimate for the pre-hunt population as part of the season setting process.

To accommodate the demand for a total population estimate, the Department uses the doe:fawn ratio obtained from late-summer/fall composition counts conducted the preceding year with the estimated number of does from the current year's aerial survey to generate a projected number of fawns that will be added to the population. However,

using just the prior year's doe:fawn ratio fails to take into account the documented variability in doe:fawn ratios over time (SDGFP 2012). As a result, the total population estimate may be significantly higher, or lower, than what will actually be present in the fall. This source of error is not factored into current decision-making. If the Department continues to generate pre-hunt population estimates, it should modify the model used to incorporate variability in doe:fawn ratios as discussed below in Recommendations.

The Department uses ground-based surveys of pronghorn groups consisting of does and fawns as the basis for estimating "recruitment" to the pronghorn population in South Dakota. Estimating recruitment is an important element of managing any hunted ungulate population. Knowing the number of animals "recruited" into the population allows managers to set harvest levels consistent with management objectives. However, the survey protocol currently used by the Department does not provide an estimate of recruitment.

The Department's Wildlife Survey Manual 2009 – 2015 (SDGFP 2009) indicates that data sheets for the late summer doe:fawn surveys are distributed to field personnel, who are directed to record observations of does and fawns seen, with guidance to record only groups for which all animals in the group can be observed. The desired sample size is 10% of the estimated doe population from the spring aerial survey, but no direction is provided regarding the distribution of effort to ensure random or representative sampling of the population or avoid duplicate counting.

Through staff interviews, WMI determined there is variation in the degree to which Conservation Officers, Wildlife Damage Specialists and Resource Biologists are trained and assigned to gather doe:fawn data. In addition, the increased emphasis for Conservation Officers to make landowner contacts in some regions has affected their participation in the surveys. This has shifted more responsibility to biologists, which has increased their workload and the cost of gathering the data. One positive aspect of this shift is that it may improve the quality of data by reducing the number of different individuals collecting it.

The major advantage of the ground-based composition surveys is the relative cost. Collecting pronghorn classification data through ground counts, especially when conducted incidental to other activities such as landowner contacts, is highly cost-effective. Also, as with aerial surveys, the Department has a long term dataset based on a consistent protocol. However, the recent shift in workload from Conservation Officers to biologists described above, combined with the current protocol that calls for sampling in all management units each year, was reported to be taxing on staff.
The current approach to estimating productivity involves inherent biases associated with ground counts surveys. The magnitude of these biases may be multiplied by the inconsistency in training and limited survey direction provided to the relatively large number of staff collecting the data. While the impact of these biases may be offset to some degree by the long duration of the dataset, this is an important issue to address. Department staff reported during interviews that a research project is currently

underway to evaluate the reliability of ground-based composition counts to determine accurate doe:fawn ratios. This is an important project that should receive continued support from the Department and the results should be used to guide future estimation of productivity.

Another limitation of the current approach to estimating productivity is that a significant portion of the mortality of pronghorn in their first year of life occurs during the fall and winter, after the surveys are conducted. Thus, while the Department refers to their late summer doe:fawn ratio as a measure of "recruitment," it is more accurate to refer to the late summer surveys as a measure of potential recruitment. The actual recruitment to the population is a function of mortality in the months following the survey. Depending on the severity of the winter, the difference between potential recruitment in the late summer and actual recruitment the following year, may be substantial.

Watts (1990) identified aerial surveys conducted in late winter as the optimal method to estimate recruitment. Surveys conducted in late winter, after most natural mortality has occurred, but while yearling pronghorn can still be distinguished from older animals enables managers to determine the relative proportion of actual recruits to the population. However, even the most accurate classification of age ratios can be misleading (Caughley, 1974).

Importantly, the spring aerial surveys conducted in May and June are a direct measure of net recruitment of young born the previous year and mortality of all age classes. This is the single most valuable statistic for management of this species available to managers.

Harvest Monitoring and Management

Pronghorn harvest estimates are generated from mail surveys of a random sample of license holders. Hunt report post cards are sent to hunters shortly after the end of the season and two follow-up surveys are sent at 12-14 day intervals to non-respondents in an attempt to reach an 85% response rate. That response rate is expected to provide harvest estimates with confidence intervals of $\pm$ 15%. Hunters can return the post-card, or fill out the survey on-line. Estimating harvest through surveys of a sample of hunters has been found to be more cost-effective and reliable than mandatory reporting or animal checks (Lukacs et al. 2011).

The Department reported that response rates are not currently meeting the objective of 85%. Consequently, harvest estimates are not as precise as desired. The Department should continue to evaluate ways to increase the precision of harvest surveys and consistently display confidence intervals surrounding estimates so managers and decision-makers understand the limitations of the estimates.

The Department's 2012 Pronghorn Management Plan provides a scientifically sound framework for setting license and tag numbers (SDGFP 2012). Table 3 in the plan identifies "Restrictive", "Moderate" and "Liberal" management options that relate measured population status to management objectives. This approach provides clear

guidance to managers and the Commission and a basis for public expectations related to season structures and license numbers. Consistent application of this management framework, in conjunction with the unit specific population objectives developed this year, would reduce the complexity and controversy associated with pronghorn management. It would also allow the Department and Commission to "learn" from experience.

Under the management options in the pronghorn plan, the Department issues pronghorn licenses that may include one, two or three tags, allowing an individual hunter to take one, two or three pronghorn. The plan provides for issuance of only single tag licenses under "Restrictive" conditions. Single or double tag licenses can be issued under the "Moderate" option and single, double or triple tag licenses under the "Liberal" option. Department staff and Commissioners stated in interviews that the triple tag licenses were issued during the peak in pronghorn numbers in the mid-2000's in an effort to increase total harvest while maintaining hunter numbers at levels that reduce crowding on public lands and are consistent with landowner permission for hunting on private land. However, results of harvest during the most recent peak in pronghorn numbers indicate a potential limit to the effectiveness of issuing triple tag licenses to increase total harvest.

Table 1 and Figure 5 in the 2012 Pronghorn Management Plan indicate that during the years when pronghorn numbers reached a peak of over 67,000 in the mid-1980's and a peak of over 81,000 in the mid-2000's similar numbers of licenses were issued (15,338 in 1984; 15,046 in 2008), but the number of tags associated with those licenses differed significantly (22,456 in 1984; 36,816 in 2008). In spite of issuing 14,360 more tags, and with a population of nearly 15,000 more pronghorn, the total harvest increased by only 871 (SDGFP 2012). These data indicate that issuing triple tag licenses may not result in the higher harvests anticipated or desired.

Issuing triple tag licenses was a creative attempt to increase harvest when pronghorn numbers had exceeded landowner tolerance in an environment where simply increasing the number of licensed hunters was not feasible given the difficulty hunters have gaining access to private land (A. Lindbloom, pers. comm.). In view of the apparent limitation of triple tag licenses, unless landowners allow more hunters on their property, the Department may have difficulty achieving desired harvest levels and limiting population when pronghorn populations reach high levels.

Pronghorn Antelope Management Findings and Recommendations

1. The unit specific population objectives in the Pronghorn Management Plan would be more useful if they were expressed as a range, rather than a single point value. More importantly, if the Commission has not formally adopted the unit specific objectives and committed to applying them in the management options outlined in the plan, the Department should work with the Commission to secure that commitment. If the Commission and public were not adequately involved in setting the current unit specific objectives to be willing to adopt them, the Department should seek direction from the Commission on how they can reach agreement on objectives to provide a meaningful basis for decisions for the life of the plan.

2. The Department should review and revise the other objectives in the Pronghorn Management Plan to ensure that each objective is measureable and time-bounded. This would require minor changes in the phrasing of the objectives, without modifying their intent, but is necessary to enable the Department to assess whether or not management is achieving the desired outcomes. The Department should also commit to gathering the information needed to monitor progress toward the objectives and build annual review of progress into its management system.

3. The rapid increase in pronghorn numbers in the early 1980's, early 1990's and early 2000's demonstrate the potential growth rate for this species during periods of favorable conditions. The limited effectiveness of triple tag licenses makes it difficult for the Department to constrain pronghorn numbers during such times. The dramatic declines associated with harsh winters in 1984-85, 1986-87, 1995-96, 1996-97, 2008-09, and 2009-10 reveal the limitations of the Department to sustain pronghorn numbers when winters are severe. Given the "boom and bust" nature of pronghorn populations in South Dakota which appear to be driven mainly by weather conditions, the Department should explore the potential to develop a model that estimates population trend from weather data. The extensive historic data sets the Department has from aerial and ground counts provide an excellent basis for exploring this relationship. With such a tool, the Department could reduce its dependence on annual surveys which provide excellent data, but are expensive, time consuming and involve the inherent risks associated with low-level flight. Reducing the frequency of surveys would not compromise the quality of management, but would free up staff time and funding that could be redirected to other priorities and reduce the risks associated with aerial surveys.

4. The Department should reevaluate the protocol, timing and frequency of their pronghorn composition counts. As currently conducted, the counts contain inherent and unmeasured bias. The ongoing research project examining the accuracy of ground-based counts should be completed and its results applied to future surveys. In addition, composition counts conducted in August and September do not provide a measure of

recruitment to the population. If a measure of recruitment is deemed necessary, apart from the direct measure obtained from the spring aerial surveys, the composition surveys should be shifted to late winter.

5. If the Department continues to generate pre-hunt population estimates for the upcoming fall as part of the season setting process, it should modify its model to provide more scientifically sound results. Rather than using the arbitrary point value of the doe:fawn ratio from the prior year, the Department should develop and use a statistically derived doe:fawn ratio, with a confidence interval, in its population projection model. While this would undoubtedly result in broader confidence intervals surrounding the total population estimate, it would provide managers, the Commission and public a more realistic understanding of the limitations of the data and risks associated with decisions based on the estimate of fall population size. An alternative approach to modifying the current model that would also alleviate the problem of using an arbitrary ratio, would be to make season setting decisions based solely on the estimated number of adults in spring. Although this approach may initially be difficult for the public and Commission to accept, it would make management decisions more scientifically defensible by basing recommendations on the most accurate and precise statistic available to the Department. If adopted, this approach would require population objectives to be based on the number of adults.

Mountain Lion Management

Mountain lions historically occurred throughout South Dakota and were numerous in the Black Hills (SDGFP Mountain Lion Management Plan 2010). Lion numbers were dramatically reduced across the west, including South Dakota, through unregulated hunting, trapping and bounty programs intended to reduce the threat of depredation on livestock and address human safety concerns following settlement of the state by Euro-Americans in the late 1800's (Whittaker 2011). From the early 1900's through the 1950's mountain lions were exceedingly rare in South Dakota.

As public attitudes and legal status of mountain lions changed across the west in the 1960 and 1970's, the species began to recolonize its historic range (Fecske et al. 2011). During the 1970's, sightings of lions in the Black Hills became more common. In 1978, lions were classified as a state threatened species and provided protection from unregulated killing (SDGFP 2010). The population continued to grow through the 1980's and 1990's and the Department estimated the number of lions in the Black Hills to be 40 – 50 lions in 1997 (SDGFP 2010).

The Department initiated research on lion ecology in the Black Hills in 1998 in conjunction with South Dakota State University (SDSU). Since that time, the Department and SDSU have maintained an active research program that has provided an excellent source of data to inform management decisions (Fescke 2003, Thompson 2009). Results of this research, as well as routine population monitoring and the number of conflicts between lions and people demonstrated that the population grew rapidly from the late 1990's through the mid-2000's (SDGFP unpubl. data). The Department and Commission began active management of lion numbers with the introduction of an experimental lion hunting season in late 2005.
Lion hunting has continued each year since then (Table L-1).

Table L-1. Mountain lion harvest in South Dakota, 2005 - 2013 (SDGFP unpubl. data).

	Calendar Year									
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**Total**
Hunter Harvest	14	16	19	1	30	43	50	90	51	314

Mountain lion management is a complex and controversial undertaking in South Dakota, as it is across the range of the species (Whittaker 2011). During the public listening session in Rapid City, WMI heard from a large number of people with divergent views regarding lions and lion management. Among the opinions expressed were:

- Differing views on the proper classification of lions. At least one landowner argued that lions should be returned to "predator" status with no limit on take, while others at the meeting advocated greater – or even full – protection for lions.

- Differing views on how many lions there were in the Black Hills as well as how many there should be. Some people thought there were far too many lions and that the number should be reduced to lower the impact of lions on prey species, increase hunting opportunity or address public safety concerns. Others thought the population had been decimated by recent hunting and wanted numbers increased to provide a more "natural" environment or to create a "source" population of dispersing lions to recolonize additional portions of the species' historic range.
- Differing views on the impact of hunting. Some people expressed concern that hunting was disruptive of lion social behavior, leading to biological problems and increasing lion-human conflicts or reducing the genetic viability of the population. Others did not believe hunting was having any effect on either the number or behavior of lions.
- Differing views on the Department's management of lions. Some people expressed full confidence in the agency, its surveys, methods, harvest management approach and staff. Others said they did not believe the Department knew what it was doing with respect to lions.

The views expressed at the listening session were similar to those raised during development of the 2012 South Dakota Mountain Lion Management Plan (SDGFP 2010) and illustrate the challenge the Department and Commission face in managing a high profile species for which many people have strongly held and often conflicting values. WMI chose to evaluate the effectiveness of South Dakota's lion management program by comparing how it aligns with published guidelines developed by professionals working on lions across the species' range (Jenks 2011) and the degree to which the Department's program is consistent with the Department's management plan for lions (SDGFP 2010).

Population Monitoring

Mountain lions are difficult to monitor due to their relatively low density and secretive behavior (Whittaker and Wolfe 2011). In many western states, monitoring is further complicated by the difficulty in defining the boundaries of a population for management purposes. In this regard, South Dakota has an advantage in that suitable habitat to support a breeding population of lions is limited to approximately 8,400 square kilometers in the Black Hills (SDGFP 2010). The discrete nature of this area and population have made it possible for the Department to apply methods that would not be as effective in other areas and to generate population size and composition estimates with greater precision than most other western states.

Other western states use a range of population monitoring techniques designed to provide an index or general estimate of density or to assess the trend in lion numbers in relation to harvest levels. Actual population estimates, especially with any statistical precision, are typically limited to small areas, conducted as part of a research project,

and used to validate population indices or models that are applied over broader areas (Whittaker and Wolfe 2011).

Over the past 15 years, the Department developed a rigorous approach to estimating the size of the Black Hills using two independent methods (SDGFP 2010). One means of estimating the population employs data on reproduction and survival rates derived from research projects along with harvest data to "reconstruct" the lion population through a mathematical model. The other method employs a "mark-recapture" formula, based on the known fate of a large sample of radio-collared individuals. In the last year, the Department obtained an independent statistical review of its mark-recapture procedure that resulted in changes to the analysis and improved precision of the estimate (A. Lindlboom, pers. comm.). Independently and in combinations, these methods provide scientifically sound estimates of population size, and are as good or better than methodology employed by other western states.

Maintaining an adequate sample of radio-marked individuals distributed throughout the population to support the mark-recapture estimate is expensive and consumes substantial staff resources. Most of the radio-collaring effort in past years was associated with major research projects designed to gather baseline information on the lion population and the impacts of hunting (Fescke 2003, Thompson 2009). Now that these projects are concluded, the high cost of maintaining an adequate sample of radio-marked lions is a factor the Department must balance against the level of information needed to manage the lion population. A recently initiated research project designed to assess the utility of DNA to support population estimates (PR Proj. W-75-R-54) may provide the Department with a more cost-effective tool to monitor lion numbers.

Mountain Lion Management Plan

The importance of comprehensive management plans to guide Department and Commission decisions are discussed in depth in other sections of this report. In addition to providing support to the Department and Commission, a management plan with explicit goals and objectives informs the public about the basis for decisions. This is especially valuable for management of species like lions where there are such divergent and strongly held views. Given that management cannot begin to satisfy all interests, by documenting direction in a management plan that is periodically subject to public review and revision based on increased knowledge and experience, the Department and Commission can reduce the level of controversy surrounding lion management.

The 2010 South Dakota Mountain Lion Management Plan (SGDFP 2010) is one of the best management plans the Department shared with WMI. The plan includes a comprehensive summary of the history of mountain lion ecology and management in the state, documents the Department's extensive research investment in lions and identifies a broad range of issues and challenges associated with managing the species. The plan includes guiding principles of the Department and a general goal for lion management which is, "to monitor and maintain mountain lion populations and habitats consistent with ecological, social, aesthetics and economic values of South

Dakota citizens while addressing the concerns and issues of both residents and visitors of South Dakota."

To achieve this goal, the plan identifies three different management areas: the Black Hills Fire Protection District exclusive of Custer State Park, Custer State Park and the prairie portions of the state. The Department does not believe that suitable habitat exists to support a breeding population of lions outside the Black Hills. WMI found no evidence to refute that conclusion. Outside the Black Hills lion seasons are liberal to allow landowners and hunters the opportunity to take lions that are dispersing across the prairie. Some individuals at the public listening session objected to this management strategy because it reduces the potential for lions from the Black Hills to serve as a source for vacant suitable habitat within the species' historic range beyond the South Dakota borders (Thompson and Jenks 2010).

Significantly, the plan includes a quantitative objective of 175 $\pm$ 25 lions within the Black Hills, including Custer State Park, as the key benchmark for lion management. While some may believe this objective is too low, and others may think it is too high, the Department has at least made its intentions clear and its performance can be judged against a solid metric.

One minor issue WMI identified with the population objective is that it is not clear from the plan whether the 175 $\pm$ 25 lions refers to the pre-hunt or post-hunt population, and whether it is total lions or just independent (i.e. adult and subadult) animals. Department personnel reported the objective referred to the total number of lions in the pre-hunt population, but removing any source of uncertainty in the written plan will increase public confidence in the Department.

WMI examined progress the Department has made in achieving the population objective through harvest management in the 3 years since the plan was adopted. The Black Hills lion population was estimated at 255 lions in 2009 (Table L-2; SDGFP unpubl. Data). Harvest quotas for the 2005 – 2010 seasons ranged from 25 to 40, with female sub-quotas from 5 to 25 (SDGFP 2010). Mountain lion research at the time suggested these harvest levels were sustainable by the population and that density-dependent factors such as intraspecific strife, emigration and infanticide were more important than harvest in regulating lion numbers (Thompson 2009).

Following adoption of the management plan and its objective of 175 $\pm$ 25 lions in 2010, the Commission increased harvest quotas in the 2011, 2012 and 2013 seasons to 45, 70 and 100, with female sub-quotas of 30, 50 and 70, respectively, to reduce lion numbers. Harvests increased concurrently with the increased quotas in the 2011 and 2012 seasons, but declined in 2013 (Table L-2). Females represented over 50% of the harvest in each year from 2009 – 2013, except 2011. This level of females in the harvest is typically associated with total harvest levels that will reduce a lion population (Cooley et al. 2011).

Table L-2. Mountain lion quotas/female sub-quotas and total/female lion harvest for the Black Hills Fire Protection District in South Dakota, 2019 -2014.

	Quota**		Harvest		Pre-hunt
Season*	**Total**	**Female**	**Total**	**Female**	**Population Estimate*** **
2009	35	15	26	15	255
2010	40	25	40	24	132
2011	45	30	47	21	224
2012	70	50	73	46	200
2013	100	70	61	35	223
2014	75	50			

*The 2009 and 2010 seasons preceded adoption of the management plan. In 2009 – 2011 the season ran from January 1 to March 31. Beginning in 2012, the season started on December 26 of the preceding year and ran through March of the stated year.

** 2014 quota is proposed; Commission will final in October, 2013.

** Lincoln-Peterson estimate of population size in December of the year preceding the season based on marked lions in the population and harvested during the year of the season.

The Department's population estimates declined over the 2009 – 2013 period, reflecting that the higher harvests were achieving the goal of reducing lion numbers. Based on projections that the population is currently within the range of the management objective, and that further reductions are not necessary, the Department recommended that the quota for the upcoming 2013-14 season be reduced to a total of 75 lions with a female sub-quota of 50. Model predictions indicate this level of harvest would leave the post-season population at the end of the 2014 season at 150. The Commission approved this recommendation as a proposal at its August 2013 meeting and will take final action in October. The Department's recommendation and Commission's actions to reduce the population, to date, are consistent with the management plan.

Implementation of the management plan appears to be achieving the stated population objective. The Department identified five expected benefits of managing for a population of 175 $\pm$ 25 lions including reduced human-lion conflicts and lion removals and reduced vehicle collisions (SDGFP 2010). The Department should continue to monitor the effects of the current management regime and be prepared to report to the Commission and public whether or not the expectations have been met at the end of the current plan's tenure in 2015. This will enable all parties to evaluate the outcome of the current lion management program and make adjustments as appropriate.

Other objectives in the lion management plan relate to managing lions in Custer State Park in consideration of other park values and needs, annually developing and prioritizing lion research needs, developing a comprehensive education strategy for informing the public about mountain lions and safety in lion country, and developing a public involvement plan for implementing the objectives and strategies of the plan.

WMI found that lion hunting rules in Custer State Park differ from those in the remainder of the Black Hills in ways that are consistent with the park's character.

WMI found that the department has continued to reassess research needs and funded essential projects. One observation WMI does have regarding the Department's lion research is that the Department is entirely dependent on a single researcher at SDSU to provide outside support. While this has the advantage of building on a long history and experience with lion research, it also leaves the Department vulnerable to criticism about the breadth of its research capacity and without other researchers to draw on in the event the current research partner at SDSU retires or leaves his position.

The Department has taken steps to provide information, education and outreach regarding lions and human safety. The plan calls for, and the Department has in place detailed protocols for response to lion incidents. The latter are important, given the potential for lions to depredate livestock or pets and injure or kill people. WMI found the protocols to be comprehensive and consistent with those of other western states.

Overall, WMI found that the Department has an effective lion management plan, and that the plan is being implemented and achieving its stated objectives. The continued controversy surrounding lion management that surfaced in the Rapid City public listening session and some staff and Commissioner interviews reflects that some people disagree with the direction established in the plan. It also reflects that some either question, or do not understand, how lion management integrates with other big game management or the Department's dealings with private landowners and livestock producers.

Harvest Management

South Dakota initiated lion hunting with seasons in 2005, 2006 and 2007 set to coincide with the deer and elk season. This timing was chosen in anticipation that most lion hunting would occur incidentally to other big game hunting. The number of licenses was not limited, but harvest quotas and female sub-quotas were used as necessary to ensure the total or female take did not exceed desired levels and hunting in Custer State Park was restricted through an access permit system. A number of western states use this same approach to maximize hunting opportunity while preventing over-harvest.

Following successful early winter seasons in 2005, 2006 and 2007, the Commission moved the lion season to late winter in 2009, 2010 and 2011 to allow hunters to focus on lion hunting (SDGFP 2010). During these years the season ran from January 1 to March 31. The Commission added the period from December 26 – 31 to the season beginning at the end of 2011, so the 2012 and 2013 seasons were slightly longer than preceding years.

The Commission did not allow the use of dogs to hunt lions anywhere in the state for the 2005 through 2012 seasons. Limited use of dogs was initiated in Custer State Park during the 2013 season and is proposed again for the upcoming 2014 season. The only other western states that do not allow use of dogs for lion hunting are Washington and

Oregon where use of dogs was prohibited through ballot initiatives and California which does not allow any lion hunting. Other Commission rules prohibit the taking of cubs (lions with spotted coats) or lions accompanied by cubs. To increase the effectiveness of this prohibition, the hunting rules also prohibit the pursuit of any lion traveling in the company of another lion(s).

WMI did not hear significant concerns from lion hunters regarding the current hunting rules. A few hunters and some Department staff did question the effectiveness and enforceability of the prohibition on pursuing a lion traveling with other lions. Some members of the public expressed concern that any hunting is disruptive of lion social behavior and could be creating, rather than alleviating, human-lion conflicts. The role of hunting on social behavior of lions and implications for management are part of the Department's research portfolio (Thompson 2009).

The restrictions on use of dogs for hunting lions provides substantial hunter opportunity, with a low risk of jeopardizing the lion population because hunting without dogs is less effective. The current restriction on use of dogs outside of Custer State Park also increases the probability that hunters are taking lions non-selectively from the population. This results in a lion harvest that more closely represents "random" recaptures, which is an important assumption of the model the Department uses to estimate lion numbers using the Lincoln-Peterson index.

Mountain Lion Management Findings and Recommendations

1. The Department should clarify and document that the population objective in the Mountain Lion Management Plan refers to total number of lions pre-hunt to ensure a common frame of reference for the Department, Commission and public. Based on the Department's projections, the Commission should finalize the reduced quotas proposed in August 2013 for the 2014 season. The Department should continue to monitor the population, as well as gathering data that will enable it to determine the extent to which the expected benefits of managing for a population of 175 $\pm$ 25 lions is met over the remaining duration of the 2010 – 2015 management plan. This information will be invaluable for informing the next iteration of management planning.

2. The Department is commended for its public participation and outreach efforts in the design of the current Lion Management Plan. WMI discovered that their efforts resulted in an award by the Association of Fish and Wildlife Agencies. For the future, WMI recommends that the development of its next Lion Management Plan include the engagement of competing stakeholders in direct negotiations to address the ongoing controversy over lion management. In view of the complexity of the issues and deeply held values, the Department should appoint a representative group of stakeholders, supported by Department staff, but facilitated by a neutral, third party as part of the planning process. This approach to conflict resolution was successful with wolf management in Montana (Montana Wolf Advisory Council 2000, Smith and Sime 2007).

Given the length of time such an approach can take, the Department should consider initiating this process in 2014, before the current lion plan expires. It should also consider integrating the next iteration of its lion plan into an overall systems plan for lions and other big game in the Black Hills.

3. The Department should continue to explore more cost-effective alternatives to using radio-marked animals in a Lincoln-Peterson index model to estimate lion numbers. Given the extensive information base developed by the Department through its research and field programs, the Department is well positioned to develop population models that may be adequate for making management decisions, depending on the level of precision and degree of risk deemed appropriate in the years ahead. To the degree the Department and Commission are able to reduce public controversy regarding management through the planning process recommended above, they should be able to gain increased public confidence in the agency and greater flexibility to employ lower cost management techniques.

Conclusions

The Request for Proposals (RFP) identified nine specific questions that this review must address and answer. In addition, and in a more general sense, the RFP also directed WMI to identify the strengths, weaknesses, and areas of improvement for the South Dakota big game management program. It was in that spirit that WMI conducted our review. WMI recognized that there is no one best, big game management program in the nation. Each has its strengths and weaknesses; each has been tailored through time based on geography, traditions, politics, and demographics. In this review, WMI used our education and experience, the work of other wildlife professionals, and our best professional judgment to provide the State of South Dakota with our objective and unbiased opinions. We believe our findings and recommendations to be true; however, we recognize that some may disagree with portions of our work. Our goal was and is to provide valuable information that will improve each of the big game management programs and to assist the Department in its role as public steward of the wildlife resources that grace South Dakota.

Every interaction WMI had with the Office of the Governor and the Department of Game, Fish, and Parks was conducted with the highest degree of respect and professionalism. WMI would like to offer special thanks to the Department's leadership and each of the individuals to whom we personally interviewed, participated in our questionnaires or public listening sessions, and/or provided their comments to us. It was apparent that Department staff desired to improve their current big game management programs and were hard at work doing so. In addition, WMI thanks the Office of the Governor, which provided logistical support throughout the review process and directed us to conduct this review independently and objectively.

WMI concluded that the South Dakota Department of Game, Fish, and Park's Wildlife Division was comprised of knowledgeable and dedicated wildlife professionals. We were impressed at the high degree of respect and teamwork that occurred among administrative, program, and regional staff. We arrived at this conclusion following our review of Department reports, individual staff interviews, public listening sessions, and the expressed and demonstrated desire to improve upon the strengths and weaknesses of the big game management program.

WMI identified the following strengths of the big game management programs. Staff understood the importance of combining biological information with landowner and hunter desires to manage big game. The Department has been actively engaged in scientific research to help answer questions that would improve the science behind population management. The Department has openly embraced public participation and communication in order to engage the public in their decisions. Hunter satisfaction rates and response to landowner tolerance demonstrated that the Department staff has been doing their best to meet public demands as public stewards. The big game management program has rapidly evolved (and is currently evolving) to adopt more sophisticated management planning, survey methodology and population modeling.

These efforts, although time-consuming and laborious, will be essential for continued big game management improvement.

WMI identified the following weaknesses that we believe must be addressed in order to improve the big game management process. Biological surveys should be reassessed based on time and expense, use of data, established protocol, training, and accuracy and precision of data. Management plans should be developed in concert with the public and Commission and should contain measurable and time specific population objectives. Population modeling should continue to be improved and used as a surrogate for costly and/or ineffective surveys (but should be verified with intermittent surveys). These models should form the basis of population projections which should be compared with population objectives. Harvest management and license/tag allocations should be based on algorithms that allow adaptive management and provide a learning experience.

Department staff should improve internal communication and participatory management. Staff at all levels in the chain of command must understand leadership priorities, policies, goals, and objectives. Staff must also understand their role in a participatory management approach. All relevant staff should have input to the decision making process at appropriate levels but they must understand the decision making matrix and be provided feedback on decisions that lead to changes in their individual recommendations.

The Commission and Department leadership should establish a roles and responsibilities agreement that provides transparency to the public, staff, and Commission. This agreement should conform with existing law and spell out the expectations, authorities, and jurisdictions of the Commission and Secretary.

WMI finally concluded that the Department has a well established big game management program that appeared to meet the current needs of the Department, hunters, and landowners of South Dakota. Notable improvements in that program are underway. The Department should consider providing key staff members appropriate reprieves from their daily activities to focus concentrated efforts on improvements recommended by WMI that will address the weaknesses that both Department staff and WMI have identified. Landscape scale land use changes in South Dakota, increased public interest in wildlife programs, and increased complexity in meeting the demands of the public dictate a more sophisticated big game management system.

Questions Posed by the Governor's Office - Answers and Recommendations

QUESTIONS POSED BY THE GOVERNOR'S OFFICE

The Governor's Office posed nine specific questions to be answered by the review. Brief answers to each question and **recommendations** for areas of improvement include:

1. *Does the current structure of big game hunting seasons in South Dakota lend itself to proper big game management?*

The current structure of the antelope, elk, and mountain lion seasons provide a sound basis for proper management of these species' populations. The season structure for deer is adequate, but could be improved. The current deer season structure is more complex than necessary to meet all management needs for this species, but is overly simplified in other ways. The myriad of license types issued at the unit level (i.e. county or smaller area) enables managers to distribute hunting pressure with precision, but allocation of multiple license types through multiple drawings may confuse some hunters and reduce overall participation. In contrast to the variety of license types employed at the unit level, the Department has adopted a policy that dictates substantial statewide consistency for season length and structure which may limit managers' ability to address variable deer population status at a regional or sub-regional level. In addition, the issuance of unlimited archery, muzzle-loader and youth licenses that are valid over broad areas (e.g. East River, West River, or statewide) limits managers' ability to control harvest in some locales. **WMI recommends the Department and the Commission review the structure of deer seasons and evaluate ways to reduce complexity of license types and allocation and provide managers greater flexibility to adapt season structure at the regional or sub-regional level. This process should be completed as an element of developing a current deer management plan** (see next question for additional discussion of this issue)**.**

2. *Does the Department give sufficient effort to development of big game management plans and specifically, to sections of these plans that guide the setting of population objectives and strategies to meet objectives?*

Historically, the Department did not give sufficient effort to the development of management plans for antelope, deer, elk or mountain lions, and the few plans that were developed did not include meaningful population objectives. The absence of plans with clear objectives created uncertainty for Department staff, the Commission, and the public and contributed to past and present controversies regarding management of big game. The Department recently developed management plans for antelope and mountain lions that do include specific population objectives and strategies to achieve those objectives. The Department is currently initiating the development of an elk management plan and indicated its intent to develop a deer management plan as soon as resources permit.

WMI's review revealed that the Department, rather than the Commission, makes final decisions regarding approval of management plans. Although the Commission is informed throughout the planning process, the lack of a formal role for the Commission in approving management plans creates a potential "disconnect" that can affect implementation of plans and achievement of the plan's goals and objectives. Management actions implemented by the Department, management plans, and in particular the objectives in those plans, constitute a "contract with the public" with

respect to the management of the public's resources. As such, management plans should be developed through an open, inclusive process that employs effective strategies to engage the public in setting goals and the Commission should formally adopt objectives and final plans. **WMI recommends that the Department and Commission review the ongoing process being conducted to develop the elk management plan to improve public involvement. Given the ecological relationships between elk, deer, mountain lions, and habitat in the Black Hills, the Department and Commission should consider developing an integrated management plan for these species in the Black Hills, rather than a stand-alone elk plan. The planning process used for the Black Hills should include evaluation of the relationship between grazing management on the National Forest and forage availability for elk and deer as well as predator-prey relationships. Effectively engaging all major stakeholders in a comprehensive planning process would enable the Department and Commission to resolve a number of chronic issues that contribute to controversy surrounding big game management in the Black Hills. Finally, when the Department and Commission begin development of a current deer management plan for portions of the state outside the Black Hills, they should evaluate options that allow greater management flexibility with reduced complexity of license types as well as ways to reduce the frequency with which the Commission deals with deer management issues.**

3. *Do the management and harvest surveys conducted and contracted by the Department provide sufficient foundation for proper big game management?*

Harvest surveys conducted by the Department provide a sufficient foundation for proper management of antelope, deer, elk and mountain lions. Ongoing efforts of the Department to enhance both the efficiency and quality of harvest surveys have been effective and should be continued. Some management surveys conducted and contracted by the Department provide valid data that are useful for the management of antelope, deer, elk and mountain lions. The quality and utility of data from other management surveys has not been adequately evaluated, and some management surveys appear to be conducted on the basis of historic precedent, with no apparent role in current management decision-making. For instance, WMI is not confident that current deer and elk teeth collection to determine age structure provides additional information that drives deer and elk management decisions. Fall deer, elk, and pronghorn classification surveys would be improved if survey protocols were more statistically valid and if they were a primary job responsibility rather than an opportunistic and secondary job responsibility. The current aerial surveys for elk and pronghorn provide meaningful information necessary for population management. **WMI recommends that the Department seek additional biometric/statistical expertise to assist with this activity. Periodic reviews of survey protocol, use, and validity should be conducted.**

4. *Are sufficient financial and staff resources allocated for proper big game management?*

Every state's big game management system has a limited amount of funding and staff, and every state could improve its management system if additional resources were available; South Dakota is no exception. At the same time, every state must balance its use of resources for big game management against other program needs.

Financial and staff resources employed by the Department for big game management appear sufficient to manage big game in a traditional reactive framework, but as the Department continues to implement rigorous population estimation, monitoring, and management to objective approaches, it is very likely that additional staff and financial resources will be needed. In addition to seeking added biometric support as previously mentioned, further resources will be needed to interact with stakeholders in management plan development and data collection to support population models. As models are developed, there will be an opportunity to reallocate funding and, to some extent, staff time currently used to estimate population sizes of mountain lion, pronghorn and elk to other surveys such as classification counts for deer and elk.

WMI's review identified that the Department commits significantly more staff time and funding to wildlife damage management than most other states. The wildlife damage program is deeply embedded in the wildlife management culture of the state. The program influences the attitude of landowners toward the Department and may contribute to public access for hunting on private land. Wildlife Damage Specialists contribute to the big game management program by collecting some management data in some regions. However, the wildlife damage management program, particularly as it relates to resident geese in areas along and east of the Missouri river, has grown to the point where it is significantly impacting the regional wildlife managers' ability to focus on big game management. WMI recognizes that this issue is complex and involves legislative action beyond the scope of the Department's authority and WMI's review.

WMI understands that the Department has the necessary flexibility within its budget and spending plans to address prioritized needs. **Recognizing that funding is finite, the Department should review the recommendations within this report and assign priorities to the actions identified and accepted by the Department. Staff and funding should then be assigned to address the priority actions within reasonable timeframes.**

5. *Are financial resources for scientific research prudently allocated, and does the scientific research conducted and contracted by the Department contribute to proper big game management?*

Research conducted and contracted by the Department is well designed and is directed at appropriate management questions which provide results that contribute to proper management of antelope, deer, elk and mountain lions. The Department makes effective use of the limited resources it has for research. However, the Department's historic reliance on a single research institution (South Dakota State University) has limited the Department's ability to identify and employ a broader range of knowledge and skills. **WMI recommends that the Department continue to support in-house**

research at a level that addresses the highest priority management issues identified through the existing objective process. WMI further recommends that the Department engage additional research institutions and a broader range of expertise, including biometrics and statistical analysis when contracting research outside the agency. In particular, the Department should seek additional expertise in the field of population modeling and adaptive harvest management.

6. *Does the Department properly utilize available survey and research data to formulate big game hunting season recommendations that are consistent with established management plans and population objectives?*

The Department does use available survey and research data to help inform recommendations consistent with established management plans for pronghorn antelope and mountain lions. The lack of current deer and elk management plans and population objectives precludes the ability of the Department or Commission to make decisions based on objectives. The Department's surveys provide statistically useful estimates of harvest levels for all species, but the current "bottom up" approach to deer and elk hunting recommendations appears to WMI to rely heavily on anecdotal landowner and hunter input collected in an opportunistic manner rather than by any formal, structured approach that is transparent to the public and that lends itself to scientific analysis. The lack of a structured approach with a well-documented and quantifiable decision-making process impairs the Department's ability to practice adaptive management and to learn what works and what does not work when it comes to effective harvest recommendations necessary to affect population management. WMI recommends that **the Department provide adequate time and resources to key staff to develop management plans, robust population models, and adaptive harvest management recommendations that will achieve population objectives.**

7. *Is there sufficient opportunity for appropriate staff input at all levels of the Division during the season setting process? Do Department administrators provide an appropriate level of oversight and review in big game management decisions and the development of hunting season recommendations?*

The Department's current season setting process for antelope, deer, elk and mountain lions provides extensive opportunities for staff participation. The process begins with recommendations developed by Conservation Officers, resource biologists and Wildlife Damage Specialists at the field level and progresses through review at the regional level, then at the central office staff level, and finally by upper-level management including the Wildlife Division Director and Department Secretary. Department administrators provide an appropriate level of oversight and review of management recommendations. However, the lack of management plans and inconsistent guidance from upper-level staff (i.e. Regional Supervisors and above) at the front end of the process can result in field staff developing recommendations that are outside the bounds of established policy. This results in inefficiency and frustration when recommendations are modified or rejected. Feedback to regional and field-level staff from discussions at Commission Recommendation Development (CRD) meetings was

very good, but communication from upper-level staff to the field regarding the rationale for changes or rejection of recommendations was inadequate, which leaves an information gap that may erode trust and, ultimately, reduce staff willingness to participate in the process. To a substantial degree, the problems WMI identified with the season setting process are a function of inadequate management plans, lack of appropriate delegation of staff-level and commission-level decisions and the frequency with which all aspects of the big game regulations are considered by the Commission. These factors lead to excessive time committed to bureaucratic process focused on minor details and inadequate attention to higher-level policy decisions and communication by senior management within the Department and by the Commission. **WMI recommends that the Department integrate management plans more effectively and upper-level staff provide additional direction at the beginning of the season setting process to establish appropriate expectations and understanding of policy guidance by field staff. In addition, upper-level staff and the Commission need to improve both the frequency and content of communication to field staff and the public with respect to how their input is considered and factored into final decisions. To enable the Department and Commission to implement these recommendations, they should restructure the way changes to big game regulations are considered. Higher-level policy issues such as season structure, when and if multiple tags per license should be used, preference systems, manner of take restrictions, etc., should be addressed on a multi-year (e.g. 3 or 5 year) cycle rather than annually. To the extent allowed by law, the Commission should delegate additional authority to the Department to make minor changes in license numbers, at least for antelope and deer, on a year-to-year basis, within a framework defined by the Commission. These changes would allow both the Department and Commission to focus additional time and effort on public and staff engagement and communication.**

8. *Does the Department provide the Commission with a sufficient amount of biological justification and information on social impacts to make informed decisions on hunting season regulations?*

Our interviews with Department staff and Commission members indicated that Commission members are provided sufficient biological and social information prior to making regulatory decisions. Results of the Commission Recommendation Development process were provided to the Commission in advance of their meetings and staff were available to answer questions before and during Commission meetings. However, we questioned the validity and inclusive nature of some of the social information because it was anecdotal and collected opportunistically rather than through a human dimension research approach that would provide scientifically valid information. Valid human dimension research would inform decisions more effectively than the tendency to respond to individuals expressing their personal opinions in public. Further, it was apparent that the Commission has occasionally placed unrealistic and questionable demands on the staff (e.g. asking for antelope population estimates in the spring rather than waiting for survey and analysis to be completed in the fall). **WMI recommends that the Department employ human dimension**

research to improve the social information used in decision-making. WMI recommends that management plans developed pursuant to recommendations in questions 2,3,6 and 7 contain quantifiable objectives relating to social impacts, including hunter satisfaction and landowner tolerance, and the means to quantifiably evaluate progress against these objectives be developed and implemented.

9. *Is there sufficient opportunity for public input in the development of management plans, population objectives, and big game hunting season regulations?*

The approach used by the Department to develop management plans typically begins with the Department preparing a draft management plan internally before submitting draft plans for public comment. This approach is adequate for some plans but does not employ public engagement strategies that would allow the Department to better understand the diverse interests of stakeholders and, importantly, allow the stakeholders to better understand the management options and recognize the desires of other stakeholders for controversial species such as mountain lions and elk. Further, the lack of quantifiable population objectives in some plans and the limited role of the Commission in management planning may reduce public acceptance of plans and makes implementation of plans more difficult. **WMI recommends that the Department and Commission develop and employ more open and inclusive planning processes to reduce the controversy associated with, and improve the efficiency and effectiveness of, management of big game, especially elk and mountain lion.**

The process used for setting big game hunting season regulations provides substantial opportunity for public input. However, the Department-public-Commission dialog regarding regulations is hampered by the lack of recognized management plans with measurable population objectives, which would provide a better context for making decisions regarding license allocations and other hunting regulations. The lack of clear plans and objectives also contributes to the perception that the Department and/or Commission are simultaneously non-responsive to the interests or input of some citizen interests or to field-level staff and overly sensitive to the demands of some special interests. Finally, as explained in response to question 7, the manner in which the Department and Commission address changes to big game hunting regulations leads to excessive attention to minutia and inadequate consideration of broader policy issues. **WMI recommends that the Department and Commission modify their approach to developing big game hunting regulations (**see response to Question 7**).**

Summary of Additional Recommendations

In addition to the recommendations directed specifically at the nine questions in the Request for Proposals, WMI recommends the following. This is summary provided in one location for ease of consideration. These recommendations are incorporated in the main body of the report with additional discussion that, in many cases, will provide additional insight.

Surveys

- Strengthen survey and research protocols and provide annual training.
- The Department should establish data collection protocols that incorporate baseline sampling minimums. Discard any data collected in a manner not prescribed in the protocol.
- The Department should provide its human dimensions specialist with the time and support necessary to review and enhance the myriad mechanisms used to gather public input and incorporate input into management plans and other agency decisions.
- The Department should schedule annual review and training workshops for Conservation Officers where protocols and methods are established for data collection and the reasons for using them are explained.
- The Department should utilize human dimension staff to develop standardized survey protocols for landowner interviews and include analysis of both spatial and temporal data during regulations development.
- The Department should reevaluate the protocol, timing and frequency of their pronghorn composition counts.

Management Plans

- Provide staff with additional time and support to improve the management programs for which they are responsible.
- The Department and Commission should adopt a planning process that is more inclusive of the public at the outset and places decision-making authority for all but the most technical aspects of the management plans in the hands of the Commission.
- The planning process should take fuller advantage of the Human Dimensions capability of the Department and employ neutral, third party facilitation for highly complex and controversial planning processes.
- The Commission should make final decisions on alternatives to adopt, after a thorough and transparent public review process.
- Agency leadership should provide clear direction to staff regarding their expectations that approved management plans would guide staff decisions, actions and recommendations for regulation changes.
- The Department and Commission should consider developing and using a comprehensive management planning system to engage the public in setting long-range goals and quantitative management objectives for big game populations.
- The Department should develop deer management plans that contain population objectives defined as a range of values and preferably quantify tolerable levels of game damage.

- The Department should include Commission approved ranges, rather than point values, for unit-specific population objectives in the Pronghorn Management Plan.
- The Department should review and revise the other objectives in the Pronghorn Management Plan to ensure that each objective is measureable and time-bounded.
- The Department should commit to gathering the information needed to monitor progress toward the objectives in the Pronghorn Management Plan and build annual review of that progress into its management system.
- Department leadership and the Commission should clearly define their roles in policy level decisions, such as setting management goals and objectives. WMI believes that formal Commission approval of management plans should be included in the planning process.
- The Department should clarify and document that the population objective in the Mountain Lion Management Plan refers to the total number of lions pre-hunt.
- The Department should employ a more inclusive and transparent approach to development of its next Mountain Lion Management Plan and consider initiating this process in 2014.

Population Modeling

- Continue efforts that are underway to complete comprehensive management plans and appropriate population models to assist big game management.
- The Department should explore the potential to develop a model that estimates pronghorn population trends from weather data.
- The Department should develop and use a statistically derived doe:fawn ratio, with a confidence interval, in its pronghorn population projection model.
- The Department should continue to explore more cost-effective alternatives to using radio-marked animals in a Lincoln-Peterson index model to estimate mountain lion numbers.

Season Setting and Harvest Management

- The Department should consolidate counties into larger aggregate data analysis units that approximate deer populations or reflect geographic or political boundaries.
- Employ adaptive management and standardized protocols with respect to deer management decisions concerning season setting and tag allocation.
- The Commission and Department should review the current regulation-setting process and schedule to find and implement changes that will reduce the amount of detail work for the Commission.

Commission Recommendation Development Process

- The Commission Recommendation Development (CRD) committee and process should include explicit steps that link recommendations to objectives in management plans and any deviation from the direction laid out in a management plan – at any level in the decision-making process – must be fully justified in a transparent manner.
- The CRD process should originate with an evaluation of current versus desired conditions as documented in species management plans.

- Agency management should communicate policy sideboards relative to season structure to staff in advance of the regional meetings that initiate the CRD process.
- The CRD process should be changed to include a minimum threshold that a recommended management action must exceed in order to advance in the CRD process.
- The reasons for changes in proposals as they advance through the CRD process should be communicated to staff through a standardized feedback format.

Communication/Outreach

- Future outreach and communication would be improved by incorporating human dimensions research and methods (not just public surveys).
- Department leaders must explain the appropriate role of participatory management to all staff and adhere to its principles.
- The roles and responsibilities of Department staff, administration, leadership, and the Commission should be formally defined and provided to the public.
- The Department should continue to explore and expand its use of electronic media, including social media.
- The Department should determine the extent to which it can use email addresses captured through online services to its customers as a means to communicate with constituents.
- Agency leaders need to place a greater emphasis on two-way communication within the agency, especially between central staff in Pierre and the field.
- Agency leaders should find ways to spend more time in the field, ideally in informal, small group or one-on-one settings, to build relationships, communication and trust within the agency.
- Agency leaders should look for opportunities to bring field staff into the headquarters office for meaningful involvement in higher-level policy issues.
- Agency leaders should model a commitment to "continual learning" by seeking and sharing leadership training.
- Mid-level managers should be offered the opportunity and/or required to participate in leadership training to enhance their skills and prepare them for higher-level positions.
- The Department and Commission should seek assistance with training for both Commissioners and staff on their respective roles and responsibilities. Once these roles and responsibilities are clearly understood, the Commission Chair and Department leadership need to ensure that both Commissioners and staff operate consistent with their roles.

Literature Cited

Brodie, J., H. Johnson, M. Mitchell, P. Zager, K. Proffitt, M. Hebblewhite, M. Kauffman, B. Johnson, J. Bissonette, C. Bishop, J. Gude, J. Herbert, K. Hersey, M. Hurley, P. M. Lukacs, S. McCorquodale, E. McIntire, J. Nowak, H. Sawyer, D. Smith, and P. J. White. 2013. Relative influence of human harvest, carnivores, and weather on adult female elk survival across western North America. Journal of Applied Ecology 50:295-305.

Burris, B. M. 2005. Seasonal movements of white-tailed deer in eastern South Dakota and southwestern Minnesota relative to traditional ranges and management unit boundaries. Thesis, South Dakota State University, Brookings.

Caughley, G. 1974. Interpretation of age ratios. J. Wildlife Manage. 38(3):557-562.

Chase, L.C., T.M. Schuster, and D.J. Decker. 2000. Innovations in stakeholder involvement: what's the next step? Wildlife Society Bulletin 28:208-217.

Cooley, H. S., K.C. Bunnell, D.C. Stoner, and M.L. Wolfe. 2011. Population Management: Cougar Hunting. Pages 111 – 133 *in* J.A. Jenks, editor. Managing cougars in North America. Jack H. Berryman Institute, Utah State University, Logan Utah, USA.

Decker, D.J, S.J. Riley and W.F. Siemer eds. Human Dimensions of Wildlife Management, 2nd Ed. University of Chicago Press. Chicago, IL.

Decker, D.J., A.B. Forstchen, J.F. Organ, C.A. Smith, S.J. Riley, C.A. Jacobson, G.R. Barcheller and W.F. Siemer. In press. Impact Management: An Approach to Fulfilling Public Trust Responsibilities of Wildlife Agencies. Wildlife Society Bulletin. 23 pp.

Duda, M.D., P. E. De Michele, M. Jones, A. Criscione, C. Craun, T. Winegord, A. Lanier, S. J. Bissell, and J. B. Herrick. 2006. The Future of Hunting and the Shooting Sports. Phase I. Accessed at www.responsivemanagement.com/download/reports/NSSF_Hunt_Shoot_Lit_Review.pdf

Fecske, D. M. 2003. Distribution and abundance of American martens and cougars in the Black Hills of South Dakota and Wyoming. Dissertation, South Dakota State University, Brookings, South Dakota, USA.

Fecske, D.M., D.J. Thopmson, and J.A. Jenks. 2011. Cougar Ecology and Natural History. Pages 15 – 40 *in* J.A. Jenks, editor. Managing cougars in North America. Jack H. Berryman Institute, Utah State University, Logan Utah, USA.

Gigliotti, L.M. 2011a. East & West River Deer Hunter Survey – 2010. Supplemental Report HD-8a-11.AMS. South Dakota Game, Fish and Parks. Pierre, S.D.

Gigliotti, L.M. 2011b. Black Hills Deer Hunter Survey 2010. Supplemental Report HD-7a-11.AMS. South Dakota Game, Fish and Parks. Pierre, S.D.

Gigliotti, L.M. 2011c. Wildlife on private lands status report 2010. Supplemental Report HD-6a-11.AMS. South Dakota Game, Fish and Parks. Pierre, S.D.

Gill, R.B. 1996. The wildlife professional subculture: the case of the crazy aunt. Human Dimensions of Wildlife 1:60-69.

Grassel, S. M. 2000. Evaluation of methodology used to estimate population size, sex and age ratios, and mortality of white-tailed and mule deer in the Missouri River Breaks region of South Dakota. Thesis, South Dakota State University, Brookings.

Guynn, S. 2012. Rethinking strategic planning. White Paper of the Management Assistance Team, available at www.matteam.org

Haffley, T. J. 2013. Movements, survival, and sightability of white-tailed deer in southeastern South Dakota. Thesis, South Dakota State University, Brookings.

Jarding, A. R. 2010. Population estimation procedures for elk and deer in the Black Hills, South Dakota: development of a sightability model and spotlight survey. Thesis, South Dakota State University, Brookings.

Jenks, J.A., editor. 2011. Managing cougars in North America. Jack H. Berryman Institute, Utah State University, Logan Utah, USA.

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.

Jacobsen, C.A. and D.J. Decker. 2006. Ensuring the future of state wildlife management: understanding challenges for institutional change.

Jacobsen, C.A. and D.J. Decker. 2008. Governance of state wildlife management: reform and revive or resist and retrench? Society and Natural Resources 21:441-448.

Lukacs, P. M. 2007. Development and analysis of joint internet-telephone hunter surveys. Human Dimensions of Wildlife 12:263–273.

Lukacs, P. M., G. C. White, B. E. Watkins, R. H. Kahn, B. A. Banulis, D. J. Finely, A. A. Holland, J. A. Martens, and J. Vayhinger. 2009. Separating components of variation in survival of mule deer in Colorado. Journal of Wildlife Management 73:817–826.

Lukacs, P. M., J. A. Gude, R. E. Russell, and B. B. Ackerman. 2011. Evaluating cost-efficiency and accuracy of hunter harvest survey designs. Wildlife Society Bulletin 39:1-8.

Management Assistance Team. 2007. Commission guidebook: understanding the fish and wildlife commission's role in strategic partnership with the agency, director and stakeholders. Association of Fish and Wildlife Agencies. http://www.matteam.org/joomla/content/blogcategory/106/371/ Accessed 5 Oct 2010.

McCrea, D., and D. Lengkeek. 2000. Gregory County Elk Management Plan. South Dakota Department of Game, Fish and Parks, Pierre. 34 pp.

McCullough, D. R., and W. J. Carmen. 1982. Management goals for deer hunter satisfaction. Wildlife Society Bulletin 10:49-52.

McMullin, S.L. 1993. Characteristics and Strategies of Effective State Fish and Wildlife Agencies. Trans. 58th N.A. Wildl. & Natur. Resour. Conf. pp 206-210.

Montana Wolf Management Advisory Council, 2000. Report to the governor: Appendix 1. In Montana Fish, Wildlife and Parks wolf conservation and management plan final environmental impact statement, ed. C.A. Sime, 259–67. Montana Fish, Wildlife and Parks, Helena, Montana.

National Park Service. 1980. Environmental assessment and review, elk surplus disposal program. Wind Cave National Park, Hot Springs, South Dakota. 11 pp. plus appendices.

National Park Service. 1994. Elk Management Strategy. Wind Cave National Park, Hot Springs, South Dakota.

National Park Service. 2009. Final Elk Management Plan and Environmental Impact Statement. Wind Cave National Park, Hot Springs, South Dakota. 320 pp.

Naugle, D. E. 1994. Density, movements, and habitat use of white-tailed deer at Sand Lake National Wildlife Refuge, South Dakota. Thesis, South Dakota State University, Brookings.

Nie, M. 2004. State wildlife policy and management: the scope and bias of political conflict. Public Administration Review 64:221-233.

Peterson, C. C., and T. A. Messmer. 2010. Can public meetings accurately reflect public attitudes toward wildlife management? J. Wildlife Manage. 74:1588–1594.

Phillips, E. C. 2011. Development of an elk sightability model for the Black Hills of South Dakota. Thesis, South Dakota State University, Brookings.

Rabe, M. J., S. S. Rosenstock, and J. C. deVos, Jr. 2002. Review of big-game survey methods used by wildlife agencies of the western United States. Wildlife Society Bulletin 30:46–52.

Riley, S. J., D. J. Decker, L. H. Carpenter, J. F. Organ, W. F. Siemer, G. F. Mattfeld, and G. Parsons. 2002. The essence of wildlife management. Wildlife Society Bulletin 30(2):585-593.

Riley, S. J., W. F. Siemer, D. J. Decker, L. H. Carpenter, J. F. Organ, and L. T. Berchielli. 2003. Adaptive impact management: an integrative approach to wildlife management. Human Dimensions of Wildlife 8:81-95.

Robling, K. 2011. Movement patterns, survival, and sightability of white-tailed deer in eastern South Dakota. Thesis, South Dakota State University, Brookings.

SAIC 2003. Framework for revising deer and elk strategic management direction. Black Hills National Forest Phase II Amendment. 26 pp. Accessed at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsm9_012190.pdf

Smith, C.A. and C.A. Sime. 2007. Policy Issues Related to Wolves in the Northern Rocky Mountains. Pages 391-402 *in* Transactions of the 72nd North American Wildlife and Natural Resources Conference. Portland, OR.

Smith, C.A. 2011. The role of state wildlife agency professionals under the public trust doctrine. J. Wildlife Manage. 75(7):1539-1543.

South Dakota Game, Fish and Parks. 2010. South Dakota Mountain Lion Management Plan 2010 – 2015. South Dakota Department of Game, Fish and Parks, Pierre, South Dakota, USA.

South Dakota Department of Game, Fish and Parks. 2012. Pronghorn Management Plan for South Dakota. Version 12-01. South Dakota Department of Game, Fish and Parks, Pierre, South Dakota, USA.

Terrall, D. F., K. L. Monteith, T. W. Grovenburg, B. M. Burris, B. M. Hien, C. C. Swanson, A. D. Steinke and J. A. Jenks. 2005. Population models for white-tailed deer in the Black Hills of South Dakota. Proceedings of the South Dakota Academy of Science 84:119-127.

Thompson, D.J. 2009. Population demographics of cougars in the Black Hills: survival, density, morphometry, genetic structure and interactions with density dependence. Dissertation, South Dakota State University, Brookings, South Dakota, USA.

Thompson, D.J. and J.A. Jenks. 2010. Dispersal movements of subadult cougars from the Black Hills: the notions of range expansion and recolonization. Ecosphere 1(4)(8). 11 pp.

Todd, S. 2001. Building consensus on divisive issues: a case study of the Yukon wolf management team. Environmental Impact Assessment Review. 22 (2002) 655-684.

U.S. Department of the Interior, U.S. Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2011. National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

U.S. Forest Service. 1997. Black Hills National Forest Plan of Land and Resource Management. Accessed at www.fs.usda.gov/detail/blackhills/landmanagement/planning/?cid=STELPRDB5112303

Watts, C.R. 1990. Pronghorn antelope survey efficiency in Montana. 14th Pronghorn Antelope Workshop, Silver Creek, Co. 13 pp.

White, G. C., and B. C. Lubow. 2002. Fitting population models to multiple sources of observed data. Journal of Wildlife Management 66:300–309.

Whittaker, D. 2011. Introduction. Pages 9 – 14 *in* J.A. Jenks, editor. Managing cougars in North America. Jack H. Berryman Institute, Utah State University, Logan Utah, USA.

Whittaker, D. and M.L. Wolfe. 2011. Assessing and Monitoring Cougar Populations. Pages 71 – 90 *in* J.A. Jenks, editor. Managing cougars in North America. Jack H. Berryman Institute, Utah State University, Logan Utah, USA.

Wildlife Management Institute. 1997. Organization, Authority and Programs of State Fish and Wildlife Agencies. Wildlife Management Institute, Washington, DC.

Appendix A. Wildlife Management Institute's response to the Request for Proposals (RFP – 2018)

Wildlife Management Institute, Inc.

Proposal in response to the

State of South Dakota

Office of the Governor's Request for Proposals

For an Independent Review of the South Dakota Department of Game, Fish, and Parks'

Division of Wildlife's Big Game Management Program

RFP – 2018

Submitted

December 27, 2012

STATEMENT OF UNDERSTANDING OF THE PROJECT

The Wildlife Management Institute (WMI) understands that effective management of big game populations is a critical factor in the success of state fish and wildlife agencies. Big game species are a public trust resource in the United States, and the people of each state hold state government accountable for the management of their resources.

WMI understands that effective management depends on successful integration of biological and social elements. The biological elements must be accurately measured, monitored, and analyzed using scientifically sound techniques. The social elements must provide meaningful ways for people to gain knowledge about big game resources and participate in decision-making. Citizens have a range of values from naturalistic to utilitarian. For these reasons and others, big game management systems must consist of processes that are well defined, transparent, and understood by both the managers and the constituents they serve. The North American Model of Wildlife Conservation, built on such principles as managing wildlife as a public trust, using science as the basis for decision-making, providing all citizens a voice in the process, allocation of wildlife harvest by law – not the market or privilege – and equal opportunity for all citizens to participate in hunting is the overarching framework by which state agencies seek to meld the biological and social elements to achieve desired outcomes.

WMI understands that big game species are highly visible, economically important and charismatically attractive to hunters and non-hunters alike, and potentially damaging to natural and altered habitats. Each year approximately 96,000 resident and non-resident hunters take to the field in South Dakota in pursuit of these species. Managing big game populations that include large predators presents unique biological and social challenges to management agencies. Effective management of deer, elk, antelope and lion populations is equally important to agricultural producers whose private lands provide habitat for these species. Managing big game populations at levels where crop damage, competition for forage, and livestock depredation is tolerated by landowners is important not only for the state economy, but also for maintaining constructive relationships between landowners, hunters and wildlife managers.

WMI understands that the Governor's office requests an independent review of the deer, elk, antelope and lion management systems to resolve nine questions related to both the scientific foundations and decision-making processes used by the South Dakota Game, Fish and Parks Department (Department) and the South Dakota Game, Fish and Parks Commission (Commission) for managing these species. The independent review is also intended to identify strengths and weaknesses of current management systems and provide recommendations for improving those systems.

WMI proposes to conduct the review, resolve the questions regarding deer, elk, antelope and lion management and make recommendations using a generalized big game management systems logic model that includes *inputs, activities, outputs, outcomes* and *impacts*. WMI will use the past eight years as the period to be reviewed. WMI will evaluate the adequacy and accuracy of *inputs* such as staff and funding;

population and habitat survey methods and results; goals, objectives and strategies; season structure; public opinion reports; and laws, rules and policies in comparison with scientific principles and established norms and practices for other big game management systems in North America.

WMI will assess the effectiveness of Department and Commission *activities* including priority setting, resource allocation, data analysis, public outreach and involvement, decision-making and program evaluation in achieving stated goals and objectives for big game management. WMI will assess *outputs* such as work plans and research reports, license allocations, big game harvest levels, hunter access and public information; *outcomes* such as the efficiency and effectiveness of management, funding levels from license sales, recreational opportunity and economic activity; and *impacts* such as wildlife conservation, desired population levels and economic stimulus in relation to other big game management systems in North America and public satisfaction levels in South Dakota.

One challenge WMI will face in completing this project is compiling and analyzing the substantial volume of information related to the big game management systems used by the Department and Commission. WMI will address this challenge by meeting with Department staff and Commissioners to gain a thorough understanding of resources available such as management plans, research reports, survey protocols and results, laws, rules and policies that document the management systems. WMI will conduct interviews with select management staff to gain additional insights into current management systems. WMI's ability to conduct the review will depend on the Office of the Governor and the Department's ability to provide the requested material and to make staff available to WMI in a timely manner.

Another challenge WMI will face is accurately assessing public opinion regarding the management systems. WMI will address this by holding a series of listening sessions and focus groups with invited participants who will be asked for input on specific aspects of the management systems. Participants will include sportsmen and women, farmers and ranchers, outfitters, tourism interests, business and industry interests, private landowners, and the general public. Questions posed to the participants will focus on their perception of the accessibility and inclusivity of decision-makers and decision-making processes, the degree to which they believe the management systems incorporate and accommodate public input and their satisfaction with the outcomes and impacts of big game management in South Dakota.

WMI understands that the primary deliverable for this project will be a comprehensive report that addresses each of the nine questions in the Request for Proposals and provides recommendations for improvement in the current deer, elk, antelope and lion management systems, in conformation with South Dakota law and within reasonable allocation of future budgets and staff resources. WMI will prepare and submit a draft report for review by the Office of the Governor, Commission, and Department prior to finalizing the report.

The success of the project will depend on the degree to which the process utilized and products produced by the vendor are perceived by the public as thorough, science-based and independent of influence by the Office of the Governor, Department, and Commission.

CORPORATE QUALIFICATIONS

In response to the questions posed in Section 6.2 of the RFP, WMI provides the following information:

a) Not applicable
b) Not applicable
c) Not applicable
d) Not applicable
e) Not applicable
f) Not applicable
g) The precursor to the Wildlife Management Institute was established in 1911 and was then known as the American Game Propagation and Protective Association. Subsequently, WMI operated as the American Game Protective Association and the American Wildlife Institute. In 1946 our organization was renamed the Wildlife Management Institute.
h) Please see response to g) above.
i) WMI currently employs five full-time staff with a combined experience spanning more than 120 years in service to wildlife conservation at the state and federal levels of government. We manage approximately 20 contractors to deliver conservation projects on a state, regional, and national scale.
j) All employees of WMI have been involved in specific tasks associated with this type of project.
k) All employees of WMI have been involved in these types of on-site projects.
l) Not applicable, although for your information, in fiscal year 2011-12, WMI operated on total revenues and support of $2,569,000.
m) WMI has worked with numerous state and federal agencies. Contact information and brief descriptions of services are provided on pages 6-13.
n) WMI has not conducted business with the State of South Dakota.
o) WMI has conducted numerous projects similar to this project. Contact information and brief descriptions of services are provided on pages 6-13.
p) WMI's website address is: www.wildlifemanagementinstitute.org

HISTORY OF WMI PROGRAM AND PROJECT REVIEWS

At the request of federal and state fish and wildlife agencies, WMI has successfully completed over 70 reviews of fish and wildlife programs in more than 40 states and 4 provinces. WMI has also compiled and published national summaries of the organization, authority and programs of state fish and wildlife agencies in 1948, 1968, 1977, 1987 and 1997.

In recent years, WMI has been especially effective in helping fish and wildlife agencies determine the scientific adequacy of their data gathering and analysis processes. In today's world of increased scrutiny of wildlife and natural resource agency programs and decisions, it is important that scientific information be accurate, reliable, and defensible when challenged. WMI reviews are structured to assist agencies in delivering these outcomes.

WMI reviews assess decision-making within the agency and classify the scientific foundations needed for each type of agency decision. WMI then assesses the scientific rigor of biological and social data gathering activities to insure that decisions are based on good science and defensible if challenged. WMI also assesses the training, attitudes and application of science activities by agency staff.

WMI has been an independent, non-profit advocate for professional wildlife management for over 100 years. Our experience, our team of professional wildlife managers with extensive agency and academic experience, and our non-profit status will produce a report that will be, and will be perceived to be thorough, science-based, and objective, with a high probability that recommendations will in fact be implemented.

The costs for each review vary and depend upon the nature and extent of the review. WMI works closely with each agency in developing appropriate objectives and parameters for the work. WMI guarantees confidentiality and releases review information only to the contracting agency or with express permission of the contracting agency.

Examples of recent scientific reviews are listed below. A statement relative to impact of the review on agency operations is included where such information was made public.

Title: **AN EXAMINATION OF THE PENNSYLVANIA GAME COMMISSION'S DEER MANAGEMENT PROGRAM**

Contact: Carl Roe
Executive Director
Pennsylvania Game Commission
2001 Elmerton Avenue
Harrisburg, PA 17110

(717) 787-3633

Description: The Pennsylvania Legislative Finance and Budget Committee contracted with WMI in 2010 to conduct an evaluation and study of the Pennsylvania Game Commission's (PGC) current deer management program and practices.

Services: WMI analyzed the scientific basis of deer management in the Commonwealth, including the scientific foundation of deer management goals, deer population and habitat measurements and citizen input procedures. The analysis was designed to judge the adequacy of the methods employed by the PGC to provide the agency and the public with an independent evaluation of how the deer management goals were chosen and measured, and how they affected deer management.

Impact: Following the conclusion of the PGC/PCFWRU and WMI evaluations, the PASAK (Pennsylvania sex-age kill) model was updated. All of the WMI's short-term recommendations were incorporated into the PASAK model and field research continues to address WMI's long-term recommendations.

Title: **A COMPREHENSIVE REVIEW AND EVALUATION OF THE TENNESSEE WILDLIFE RESOURCES AGENCY**

Contact: Ed Carter
Executive Director
Tennessee Wildlife Resources Agency
440 Hogan Road
Nashville, TN 37220
(615) 781-6500

Description: The Executive Director of the Tennessee Wildlife Resources Agency (TWRA) contracted with WMI in 2008 to provide an evaluation of the agency. Effective fish and wildlife agencies operate under five principles: agencies must be structured appropriately to achieve efficiency and effectiveness, agencies must represent a balance between natural resource management and service to the public, natural resource management must be grounded in good science, agencies must have effective human resource administration, and agencies must establish priorities and fund accordingly. In an effort to assess the TWRA compliance with these principles, the leadership of TWRA asked the WMI to conduct a comprehensive review and evaluation of the TWRA.

Services: WMI reviewed pertinent literature and documents; conducted Commissioner, employee, and stakeholder interviews and surveys;

analyzed scientific methodology and survey efforts; and consulted leadership from other state fish and wildlife agencies to evaluate the current status of the agency. Based on our evaluation, WMI found that the majority of TWRA employees were hard-working, dedicated resource professionals who wanted TWRA to continuously improve its ability to serve the fish and wildlife resources of Tennessee and its citizens. For decades, the Director of TWRA provided national leadership on several of the most important fish and wildlife conservation initiatives including the: North American Waterfowl Management Plan, Teaming with Wildlife and State Wildlife Action Plans, North American Bird Conservation Initiative, and National Fish Habitat Plan. TWRA Commissioners valued quality management of the state's fish and wildlife resources as their first priority and sincerely wanted the TWRA to be the best state fish and wildlife agency in the country.

Impact: Ed Carter, Executive Director of the Tennessee Wildlife Resources Agency, presented an overview of a restructure plan of the agency to members of the Tennessee Wildlife Resources Board. The Wildlife Management Institute (WMI) recently completed a comprehensive review and evaluation of the TWRA. Among the goals of the restructure plan are to improve communication, coordination, and cooperation between the agency's four regions, and the Nashville headquarters and the regions. The plans call for the establishment of clear channels and accountability for program managers and uniformity and implementation of statewide programs. The restructure calls for the creation of open communication and dialogue between all employees and disciplines and where possible, reduce the number of employees directly reporting to individual supervisors. The plan should increase cooperation across established administrative boundaries, and offer expanded avenues of advancement for employees.

Title: **A REVIEW OF MONTANA FISH, WILDLIFE AND PARKS DEPARTMENT HUNTING AND HARVEST SURVEYS AND STATEWIDE ANGLING PRESSURE SURVEY**

Contact: Mr. Mike Volesky
Acting Director
Montana Department of Fish, Wildlife, and Parks
1420 East Sixth Avenue
PO Box 2300701
Helena, Mt 59620
(406) 444-9089

Description: Montana Fish, Wildlife and Parks Department (MFWP) contracted with WMI in March of 2006 to provide an evaluation of agency hunting and

angling surveys. The scope of the evaluation was described as performing the necessary tasks to: 1) Evaluate the current Angling and Hunter Harvest Survey systems for information gathering, analysis and reporting. 2) Explore alternative systems for information gathering, analysis and reporting for more efficient, cost effective and defensible methods. 3) Develop recommendations and provide a report on the most appropriate, effective, efficient and timely Angling and Hunter Harvest Survey system for MFWP.

Services: WMI reviewed methodology and use of surveys for hunter harvest of black bear, deer, elk, antelope, moose, bighorn sheep, mountain goat, mountain lion harvest, mountain lion sightings, upland game birds, furbearers, turkey and for angling pressure and satisfaction.

WMI explored alternative systems to the MFWP system for harvest information gathering, analysis, and reporting for more efficient, cost effective, and defensible methods. Alternatives were structured with information gleaned from WMI's analysis of current MFWP survey methodologies, examination of other state fish and wildlife agency survey systems, and conversations with private vendors offering survey products. The final report was delivered in November 2006 and included responses to clarifications made by agency staff.

Title: **A COMPREHENSIVE REVIEW OF SCIENCE-BASED METHODS AND PROCESSES OF THE WILDLIFE AND PARKS DIVISIONS OF THE TEXAS PARKS AND WILDLIFE DEPARTMENT**

Contact: Carter Smith
Executive Director
Texas Parks and Wildlife Agency
4200 Smith School Road
Austin, TX
(512) 389-4800

Description: Texas Parks and Wildlife Department (TPWD) contracted with WMI to provide a broad review of science-based activities of the Wildlife Division and State Parks Division. The review was intended to answer the following questions: 1) Why are we doing what we are doing? 2) Is what we are doing being done well (i.e., are we using the best science available)? 3) Are there critical data gaps that will improve our ability to manage wildlife resources?

Services: Over the course of six months, WMI completed extensive document and method review, field interviews of field and program biologists and

analysis of employee opinions to obtain an understanding of use of scientific data to guide management programs for wildlife in Texas. The WMI analysis, findings and recommendations were delivered orally in November 2004. The final report included responses to clarifications made by program staff.

Impact: Texas made extensive revisions to survey methodology for deer, small game, and other species based on the WMI review.

Title: **AN EVALUATION OF THE DECISION MAKING PROCESSES OF THE CENTRAL ARIZONA PROJECT FUND TRANSFER PROGRAM**

Description: The 1994 and 2001 Fish and Wildlife Service biological opinions on transfers of non-native fishes from the Central Arizona Project aqueduct to the Gila River basin called for the Bureau of Reclamation to transfer funds to the Service to fulfill two major purposes: 1) achieve conservation actions (recovery and protection) for federally listed or candidate fish species by implementing existing and future recovery plans, and 2) accomplish research on, and control of, non-native aquatic species. The resultant CAP Fund Transfer Program produced a document entitled Long-term Direction, Project Allocation Guidance, and Rationale (guidance document) that describes in detail the program's purposes, goals, priorities, and project selection processes. A 5-year strategic plan also was produced that provides specific objectives to assist with the near-term implementation of the program. Policy and technical committees established to oversee the program determined that an external review of these documents should be conducted to gain additional independent input into the program's processes, goals, assumptions, and objectives.

Services: In 2005, WMI completed extensive document review, field interviews of current and past committee members and analysis of contracts let under the program. The WMI analysis, findings and recommendations were delivered orally in October 2005. The final report included responses to clarifications made by program staff.

Impact: Not available

Title: **FEASIBILITY OF RESTORING WILD POPULATIONS OF RING-NECKED PHEASANT IN PENNSYLVANIA**

Description: Ring-necked pheasant abundance in Pennsylvania has declined despite the Pennsylvania Game Commission's management of wild pheasant populations and provision of an extensive stocking program. WMI was asked to review the efforts completed to date, assess current and future

habitat conditions and threats, and advise the agency on whether stocking programs were an adequate replacement for, or supplement to, wild populations.

Services: In 1999, WMI completed extensive assessment of field conditions, including interviews of Commissioners, agency staff and land managers. The WMI analysis, findings and recommendations were delivered to the Executive Director of the Pennsylvania Game Commission in 1999.

Impact: Pennsylvania established a Wild Pheasant Recovery Area Program and reduced production of game farm pheasants, consistent with recommendations made in the WMI report.

Title: **AN EVALUATION OF BIG GAME MANAGEMENT IN WYOMING**

Description: The Wyoming Game and Fish Department requested a WMI review of the scientific foundations of their big game management techniques. Included in the WMI assessment were harvest and population surveys, hunter preference surveys, environmental management models, and use, reporting and administration of big game data. WMI conducted extensive interviews at different locations in WY. Both agency staff and members of the public were interviewed.

Services: In 1995, WMI completed extensive document and method review, field interviews of field and program biologists and analysis of employee opinions to obtain an understanding of use of scientific data to guide management programs for big game in Wyoming. The WMI analysis, findings and recommendations were delivered orally in November 1995 to the Wyoming Board of Commissioners. The final report included responses to clarifications made by program staff.

Impact: Not available

COMPLETE LIST OF WMI REVIEWS:

STATE/FEDERAL AGENCY	YEAR	REVIEW TYPE
Pennsylvania	2010	Deer Management
Tennessee	2008	Agency Review
Montana	2007	Big Game Harvest Survey
US Fish and Wildlife Service	2006	Migratory Bird Management Program
Bureau of Reclamation	2005	Central Arizona Project
Texas	2004	Wildlife Division Use of Science
Pennsylvania	2000	Restoration of Pheasant
All States	1997	Organization, Authority and Programs of State Fish and Wildlife Agencies
Wyoming	1995	Big Game Management Program
Oklahoma	1991	Complete -- Game and Fish
US Fish and Wildlife Service	1991	Patuxent Wildlife Research Center
USDA Forest Service	1990	Fish and Wildlife Program
USDA Forest Service	1990	Special -- Wildlife and Livestock
Colorado	1988	Complete -- Game and Fish
New Mexico	1988	Complete -- Game and Fish
USFS	1988	Quachita National Forest
Texas	1988	Complete -- Game and Fish
Wyoming	1988	Complete -- Game and Fish
Hawaii	1988	Forestry and Wildlife
All States	1987	Organization, Authority and Programs of State Fish and Wildlife Agencies
Delaware	1986	Complete -- Game and Fish
Indiana	1986	Complete -- Game and Fish
Minnesota	1986	Complete -- Game and Fish
Louisiana	1985	Complete -- Game and Fish
Illinois	1984	Complete -- Game and Fish
Arkansas	1983	Complete -- Game and Fish
Minnesota	1983	Complete -- Game and Fish
South Carolina	1983	Complete -- Game and Fish
Virginia	1982	Complete -- Game and Fish
Bureau of Land Management	1981	Fish and Wildlife Program
Washington	1980	Complete -- Game and Fish
USDA Forest Service	1979	Fish and Wildlife Program
Arizona	1977	Complete -- Game and Fish
All States	1977	Organization, Authority and Programs of State Fish and Wildlife Agencies
Maryland	1976	Special Study
New Jersey	1975	Complete -- Game and Fish
Oklahoma	1975	Complete -- Game and Fish

New Mexico	1974	Resurvey -- Game and Fish
New Brunswick	1973	Complete -- Game and Fish
Massachusetts	1972	Special Study
Ohio	1972	Partial Wildlife Division Only
Utah	1971	Finances Only -- Game and Fish
WAFA	1971	Non-resident Hunting and Angling
Illinois	1970	Technical Assistance -- Game and Fish
Michigan	1970	Resurvey -- Game and Fish
Minnesota	1969	Technical Assistance -- Game and Fish
Washington	1969	Complete -- Game and Fish
All States	1968	Organization, Authority and Programs of State Fish and Wildlife Agencies
Kansas	1967	Complete -- Game and Fish
Maryland	1966	Complete -- Game and Fish
Georgia	1964	Partial -- Game and Fish
Delaware	1963	Resurvey -- Game and Fish
Michigan	1963	Complete -- Game and Fish
Pennsylvania	1962	Complete -- Game and Fish
Wyoming	1962	Laws Only -- Game and Fish
Utah	1961	Technical Assistance -- Game and Fish
Manitoba	1959	Complete -- Game and Fish
Colorado	1958	Complete -- Game and Fish
Iowa	1958	Ten - Year Conservation Program
Arizona	1957	Resurvey -- Game and Fish
Colorado	1957	Policies Only -- Game and Fish
Kentucky	1957	Complete -- Game and Fish
New Mexico	1957	Resurvey -- Game and Fish
Maine	1956	Complete -- Game and Fish
South Dakota	1956	Complete -- Game and Fish
Oregon	1955	Resurvey -- Game Only
Delaware	1954	Complete -- Game and Fish
Iowa	1954	Resurvey -- Game and Fish
Louisiana	1954	Complete -- Game and Fish
Wisconsin	1954	Special -- Eau Pleine Reservoir Report
Newfoundland	1954	Complete -- Game and Fish
Missouri	1953	Complete -- Game and Fish
North Dakota	1953	Complete -- Game and Fish
Rhode Island	1953	Complete -- Game and Fish
Connecticut	1952	Technical Assistance -- Game and Fish
Idaho	1952	Complete -- Game and Fish
South Carolina	1952	Complete -- Game and Fish
Arizona	1951	Complete -- Game and Fish
New York	1951	Complete -- Game and Fish

Texas	1951	Complete -- Game and Fish
Wyoming	1951	Complete -- Game and Fish
New Brunswick	1951	Technical Assistance -- Game and Fish
Florida	1950	Complete -- Game and Fish
Illinois	1950	Complete -- Game and Fish
Nevada	1950	Complete -- Game and Fish
North Carolina	1950	Technical Assistance -- Game and Fish
Tennessee	1950	Complete -- Game and Fish
Nova Scotia	1950	Technical Assistance -- Game and Fish
New Mexico	1949	Complete -- Game and Fish
Oklahoma	1949	Complete -- Game and Fish
Montana	1948	Complete -- Game and Fish
New Mexico	1948	Laws Only -- Game and Fish
Oregon	1948	Partial -- Game Only
All States	1948	Organization, Authority and Programs of State Fish and Wildlife Agencies
Iowa	1947	Complete -- Game and Fish
Massachusetts	1947	Complete -- Game and Fish
Wisconsin	1940	Technical Assistance -- Game and Fish

PROJECT PLAN NARRATIVE

The RFP lists 9 questions the contractor shall answer relative to deer, elk, antelope, and mountain lion management programs, and describes documents to be reviewed as well as parties to be interviewed in the process of answering those questions. Too a large extent this describes the work to be performed by the contractor, and won't be repeated here; rather we will focus on the specific means we will employ to answer these questions.

Immediately after the contract is awarded and signed, WMI will attend "kick off" meetings in South Dakota with the Office of the Governor, Commissioners, and Department leadership to determine clarity of purpose and scope for the review. At that meeting, WMI would appreciate a presentation that provides an overview of the four management programs and copies of, or links to, the source documents described in the RFP. WMI will then review its approach, identify specific additional information needs, reach agreement on clear benchmarks to be employed, discuss issues of concern and interest, and confirm logistical support and appropriate protocol needed for the independent review. As soon as WMI receives information from South Dakota, we will review documents and files to assess the adequacy and comprehensiveness of the information and to develop questions regarding the public's perception of and confidence in the big game management programs.

Programmatic reviews initiated outside wildlife agencies are usually symptomatic that stakeholders are dis enfranchised with decision-making processes, the outcomes of those processes or both. For this review to be successful, it is imperative that the cause of stakeholder disenfranchisement is thoroughly explored and understood. For this purpose we intend to hold focus group sessions with stakeholders identified as significant by South Dakota officials. In these scoping sessions, we would focus through targeted questions, discussions on the level of public knowledge of, confidence in, and transparency of the Department's efforts to manage big game species and populations. We will specifically determine the extent to which they are knowledgeable of, and participate in, opportunities for public input to theses processes, as well as, reasons for lack of participation, if any.

WMI proposes two venues for participation in this review by the broader public. WMI will conduct listening sessions and focus group sessions as opportunities for the broader public to offer comments and suggestions. We will also have a website available for public comment. Public comments, however obtained, will be summarized and presented in the report. WMI will confer with South Dakota officials about appropriate dates, locations, venues, and other discussion topics for these meetings. In our proposal we have allocated one week for these sessions. We would request that the Office of the Governor and/or the Department provide logistical support for the meeting and the meeting venue. While in South Dakota, WMI will avail itself of opportunities to meet with Department staff with direct or indirect responsibilities for big game management program execution.

Following review of information provided by the Department and synthesis of this public input, WMI will develop questions and lines of inquiries for Department staff and Commissioners related to the big game management systems. WMI will employ a big game management systems logic model to structure our program analysis and evaluation. The logic model consists of *inputs, activities, outputs, outcomes, and impacts*. Some examples of information that WMI will review and analyze are found in the following table:

Inputs	Activities	Outputs	Outcomes	Impact
Available staff and funding	Priority setting	Work plans	Effective management	Desired population levels
Survey methods	Resource allocation	Reports	Funding	Wildlife conservation
Strategic plan	Monitoring	Season setting	Population status	Enhanced economy
Harvest reports	Data analysis	License allocation	Recreational activity	Satisfied constituents
Social surveys	Recommendations	Information	Economic activity	Informed constituents
Legal documents	Legal review	Legal opinions	Habitat condition	Healthy habitat

WMI proposes a second in-state trip to interview selected Department staff and Commissioners with direct or indirect responsibilities for big game management program execution. These discussions will be focused on information *input* and Department *activities.* Preliminary questions will be submitted prior to our arrival in South Dakota and will be based on our review of documents provided by the Department and comments from the public listening session.

The nine questions posed in the RFP speak to both biological and social aspects of proper big game management. For biological elements relative to questions 3 and 4 we will evaluate the adequacy and accuracy of inputs by examining harvest and population sampling methods and protocols, sample size, statistical variability within estimates, robustness, and predictive power of population and predation models. In addition to questioning whether biological sampling, analysis, and modeling approaches are within accepted scientific standards, we will also look at whether sampling is intensive and frequent enough to assess timely compliance with management plans and respond to environmental perturbations. Approaches will be compared and contrasted to those of other western states where informative.

To answer questions 5 and 6 we will assess the extent that research priorities and activities lead to the overall enhancement of big game management programs by answering questions such as: is there an adequate process to ensure research projects selected/funded answer important management questions? Is there adequate peer review of study proposals to ensure methodology proposed will lead to credible and

publishable results? Are projects adequately staffed and funded so as to provide credible and publishable results? Is there a process to ensure that research results are published, or otherwise made available to managers?

To answer questions 6 and 7, WMI will evaluate the flow and integrity of information from surveys, monitoring and research projects through data analyses, conclusions, season setting recommendations, and the decision-making process. In addition, we will evaluate whether Department goals and objectives contained within strategic, implementation, and management plans track budget requests, appropriations, and resource allocation.

We will confer with the Department and Commission's legal counsels to identify legal issues or concerns with respect to public involvement, desired population level goals or harvest strategies, and current and emerging issues that may impact the South Dakota big game management system.

Outputs such as license allocations, season setting, and harvest goals and levels will be measured by comparing levels established in strategic or implementation plans (predicted or desired results) with actual results over the 8-year time span of review. During this evaluation process, WMI will examine the use of adaptive management techniques within the program. We will determine if prior year *outputs* influenced subsequent year *inputs* and *activities* to a reasonable degree. *Outcomes* and *impacts* will be evaluated using our professional judgment and the comparison with the performance of other North American big game management programs with respect to the efficiency and effectiveness of management funding levels from license sales, recreational opportunity, and economic activity.

Several questions relate specifically to societal aspects of wildlife management. While habitat and other environmental conditions set outside limits on wildlife populations, "proper" wildlife management can only be evaluated in the context of public expectations relative to the state's management of a public trust resource. Are outcomes and impacts consistent with public expectations and plans? Answers to questions 1, 2, 7, 8, and 9 will be based on information obtained from focus groups, public listening sessions, comments obtained through the website, and interviews of staff and commissioners. WMI will compare SDGFP processes against the big game systems logic model, and specifically look for consistency with outcomes stipulated in a hierarchy of planning or guidance including legislative mandates, Commission policies, strategic plans, and species-specific regional and area implementation plans. Additional questions that will be addressed are: are plans at all levels clear and internally consistent? Are plans for species management at scales appropriate to manage populations and hunter pressure? Are plans and underlying biological assumptions available to the Commission and the public in formats understandable to the lay audience? Are season structures periodically reviewed in a public process in a manner that ensures public expectations are identified, quantified and brought before the Commission along with data relating effectiveness of previous structures? Do management plans have specific and quantifiable objectives relative to population size,

sex ratio, hunter success, degree of game damage and other relevant biological and social parameters? Do stakeholders feel they have opportunities to impact decisions? Do stakeholders participate in processes available to them, and if not, why not?

Based on WMI's review and analysis, we will prepare findings of the management systems' strengths and weaknesses, our conclusions based on these findings, and recommendations for consideration by the Office of the Governor, the Commission, and the Department. This draft report will be shared with South Dakota for their review and comment. WMI will request a response to each finding, conclusion, and recommendation. Upon receipt of those comments, WMI will finalize the independent review report. WMI understands that the primary deliverable for this project will be a comprehensive report that addresses each of the nine questions in the Request for Proposals and provides recommendations for improvement in the current deer, elk, antelope and lion management systems, in conformation with SD law and reasonable allocation of future budgets and staff resources. Upon invitation, WMI will make an oral presentation of findings to the Office of the Governor, Department, and Commission and public at a mutually agreed upon time and location.