Idaho Elk Management Plan

2014-2024

Idaho Department of Fish and Game
January 2014

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

Rocky Mountain elk are Idaho's premier big game animal. Idaho's diversity of big game species is a hunter's dream. Ten species of big game can be hunted in Idaho, but for most hunters elk are the king of them all. An incredible mixture of elk hunting opportunity is available to the hunter, thanks to Idaho's diverse habitats and a population of about 107,000 elk. The Idaho elk hunter can pursue bulls that vanish like ghosts in the sagebrush deserts, bugle for bulls in aspen draws above dry farms in eastern Idaho, chase herds in the lung-busting climbs of the central Idaho mountains, or stalk the thick-timbered ridges of northern Idaho.

The Idaho Fish and Game Commission and the Idaho Department of Fish and Game (IDFG) have a legal responsibility for conserving, protecting, perpetuating, and managing all of Idaho's wildlife. To fulfill that obligation, IDFG is guided by a strategic plan, The Compass. Adopted in 2005, The Compass broadly describes objectives for 4 major goals: 1) sustain Idaho's fish and wildlife and the habitats upon which they depend; 2) meet the demand for fish and wildlife recreation; 3) improve public understanding of and involvement in fish and wildlife management; and 4) enhance the capability of IDFG to manage fish and wildlife and serve the public.

The Compass, by design, contains no details; it is broad in scope. This elk management plan functions as an "action plan" referenced in The Compass and provides the specific goals, strategies, and performance objectives for elk management. A key criterion to the planning process is that the current status of hunter preferences and wildlife populations is used to determine goals, strategies, and performance objectives that will drive future management direction.

Idaho's prior elk management plan (1999) addressed the need to manage hunter density and distribution, as well as managing growing elk populations in some parts of the state. One notable change included in that plan was the dual-tag zone management concept (A and B tags) that was implemented to better manage hunter distribution and choice of weapons across the state, largely because of concerns about pressure on adult bulls. This management concept included the creation of 28 Elk Management Zones (later 29 zones). Although wolves were reintroduced into Idaho in 1995 and 1996, the 1999 Elk Management Plan was relatively silent on the issue.

Ultimately, the plan's A-B tag system led to redistribution of hunters out of congested areas and greater management flexibility, providing a diversity of hunting and harvest opportunities. Since that elk plan was adopted 15 years ago, several new issues have emerged relative to Idaho's elk management. These issues include declining elk populations in Idaho's backcountry, well documented impacts of wolves and other predators on elk, increased numbers of elk in agricultural settings, continued degradation of elk habitat continues because of lack of disturbance and regeneration in conifer dominated landscapes, expansion of noxious weeds, and other habitat issues.

This revised plan (2013) is not designed to prescribe specific hunting seasons; rather it is designed to establish goals that IDFG staff, working with elk enthusiasts, will achieve over the

next 10 years. Overall, the plan directs IDFG to maintain or increase current elk populations across most of the state. To accomplish the goal, IDFG has identified in the plan:

- Zone-level elk population objectives for each zone
- Specific factor(s) limiting elk numbers in each management zone
- Strategies and performance objectives to address limiting factors

The plan is purposeful and will require public support and additional financial resources for full implementation. The IDFG will work to engage additional partners in elk management, including the governor's office, other elected officials, federal and state agencies, conservation organizations, private landowners, and hunters. Partnerships, combined with a common desire to improve elk management, will go a long way toward achieving the basic intent of the plan revision: "To be responsive to elk hunter desires and expectations, and maintain biologically sustainable elk populations."

Elk Populations Past and Present

Understanding what drives elk populations is important. Ultimately, female survival is the key to elk population trajectory. Of course, cow elk pregnancy and calving rates, and calf survival to reproductive age, are also critical to determining population performance. In a nutshell, elk population trends depend on survival rates of cow elk and calves. In Idaho, elk survival depends primarily on 4 factors: nutrition (habitat), hunter harvest, predation, and weather.

Historically, elk numbers in Idaho were lower than they are today. Accounts from the Lewis and Clark expedition and trappers during the height of the fur trade generally suggest that elk populations were scattered and only locally abundant in the northern portions of the state. Eastern Idaho elk populations appeared robust in the mid-1800s. Statewide, populations were most likely reduced during the unregulated hunting of the late 1800s and early 1900s. Ungulates, including elk, were heavily utilized for food by miners, trappers, loggers, and other settlers.

Early 1900s.— European settlement brought changes to the landscape. Millions of sheep, cattle, and horses were brought into southern Idaho. Black bear, grizzly bear, and mountain lion populations generally received little or no protection, and wolves were functionally extirpated by the early 1900s. Extreme overgrazing combined with fire suppression efforts turned what was primarily perennial grass ranges into shrub fields. Unregulated harvest and conversion of grass dominated ranges to shrub fields likely resulted in fewer elk in southern Idaho.

Similarly, landscape-level changes occurred in northern Idaho during the early 1900s. However, the impact was likely more positive for elk habitat and populations. Extensive wildfires created a mosaic of grass, shrub fields, and forested habitats. Nearly extirpated local elk populations were augmented with elk from Yellowstone National Park following the large wildfires. Timber harvest also contributed to moving large portions of the forested landscape back towards a more early seral condition. Under these conditions elk flourished in northern Idaho.

Mid 1900s.— In north-central Idaho, elk populations probably peaked in the 1960s. As the newly created seral habitats aged and succession continued to move towards a climax state, habitat

potential declined. Timber management and fire suppression efforts encouraged conifer reestablishment, and reduced shrub quality and grass quantity.

By the 1970s, hunter numbers and access had increased to the point that restrictive seasons were implemented to reduce elk vulnerability to harvest. Either-sex elk hunting seasons throughout most of Idaho were replaced by antlered-only hunts in 1976. Elk populations responded, and by the late 1980s elk were once again abundant enough to support more liberal antlerless opportunity. Predator populations were likely reduced or suppressed during the mid-1900s, but had some localized effects in remote areas.

Late 1900s.— In portions of northern Idaho, the mid-1990s witnessed another downturn in elk numbers. Declining habitat potential in forested habitat, black bear and mountain lion predation, and localized impacts of hard winters (1996 and 1997) all played a role. With protection and harvest restrictions implemented during the 1970-1990s, black bear and mountain lion populations likely stabilized and began to flourish, particularly in backcountry units where hunting access is difficult. Wolves were reintroduced by the U.S. Fish and Wildlife Service (USFWS) into Idaho in 1995; at the same time expanding wolf populations in southern British Columbia and northwestern Montana were pioneering habitat in Idaho. Wolf predation further accelerated elk declines.

In other portions of the state, including much of southern Idaho, elk numbers actually increased during this same timeframe. A change in grazing practices that promoted grass production, farming practices that favored resting farmland, and continued timber cuts that favored early seral habitat stages all enabled southern Idaho elk populations to grow to all-time record highs during the latter half of the 1900s. Currently, elk populations in the southern part of the state are limited more by sociological constraints than by habitat suitability. In total, Idaho's elk population is estimated at approximately 107,000 animals.

Meeting Hunter Expectations

Elk are managed for the benefit of Idahoans, many of them hunters who eagerly look forward to the annual elk hunt. In 2012, IDFG contracted with the University of Idaho to conduct a survey of Idaho elk hunters to better understand their motivation for elk hunting and their elk management preferences. Almost 2,800 elk hunters, representing all 29 Elk Zones, participated in the survey.

Survey answers were evaluated both at statewide and zone levels. For most elk hunters, the social experience of gathering with friends and family was cited as the most important reason for elk hunting. For others, putting meat on the table or harvesting a mature bull was important. Regardless of the reason for hunting, the common attribute that defined a quality elk hunting experience centered on being able to hunt elk every year and seeing harvestable elk.

As a follow-up to the 2012 survey, IDFG sought further input and interaction with the public and organizations to refine overall management direction, gather input on zone objectives and strategies, and further explore interest in hunting multiple zones. Various communication tools

used during 2013 included 2 on-line chats, 2 on-line surveys (website), a second mailed survey, public meetings, and open house events.

This revised plan builds on the successes of the previous plan and the current Idaho model: to offer over-the-counter elk tags that provide annual opportunity for family and friends to hunt together, while also providing enhanced opportunity to hunt mature bulls in controlled hunts. This model is well-supported by Idaho residents. The plan also adds some new ideas to increase elk hunter satisfaction by looking into ways to expand hunter opportunity to include hunting in more than 1 general season (over-the-counter) hunt area, and a tool to help hunters identify the type of hunt they are looking for by identifying the type of hunt (friends and family, antlerless, or quality bull opportunities).

Statewide Elk Management Direction

The IDFG has developed statewide objectives based on elk hunter survey results, recent aerial surveys, current elk population status, and the potential for herd growth in some areas.

Proposed statewide elk management objectives include:

- Continue to offer general-season elk hunting opportunities by managing elk and predator populations, and improving elk habitat
- Enhance mature bull hunting opportunity
- Aid elk hunters in selecting hunting areas that align with their desired hunting experience
- Maintain the A-B elk tag structure, with adjustments to meet the needs and interests of today's hunters
- Implement measures to reduce elk-caused crop and property damage
- Improve public involvement in elk management decision-making
- Reduce the potential for disease to impact elk or livestock
- Increase public knowledge and understanding of elk biology, management, and hunting

Elk Zone Management Direction

The IDFG will continue to manage elk using the zone management system. The zone system allows herd management based on local habitat, weather, and herd movements, while providing a variety of hunting opportunities.

The number of elk that can be supported in any given management zone is influenced by many factors, including weather, habitat quality, predation, hunter harvest, and the need to minimize elk-based crop and property damage (agricultural impacts). One or more of these "limiting" factors can often prevent an elk herd from growing further or limit the ability of wildlife managers to maintain current elk herd numbers.

For each proposed elk zone, IDFG staff identified the limiting factors using flight surveys, elk population trends over 10 or more years, changes to available habitat, reported agricultural impacts (crop and property damage), known or suspected causes of elk mortality, assessments of predator populations and predation impacts, and other data and elk management experience. The severity of each identified limiting factor was classified as low, moderate, or high. Limiting

factors common to most Idaho elk populations are agricultural impacts (crop and property damage), predation, and habitat. Severity of these limiting factors varies across Idaho, and even within zones.

IDFG staff proposed 10-year management direction and population objectives for each elk zone, and objectives and strategies to maintain or improve elk herd performance and provide greater hunter satisfaction. Finally, using public input, IDFG staff further refined the management direction, objectives, and strategies for each zone.

Backcountry zones in north and central Idaho— Backcountry zones have experienced precipitous declines in elk numbers over the last 20 years. In many cases, these zones are limited by both predation and habitat quality, and the ability to improve elk populations in these zones can be severely affected and limited by access, remoteness, and federal land-use restrictions. To recover these populations, a long-term commitment to habitat improvement is required, as is a clear link between this revised elk plan and predation management plans. In most instances, the 10-year management direction established for backcountry zones involves stabilizing an elk population then beginning the slow process of rebuilding the herd. The IDFG will continue to commit resources and personnel to support habitat projects and reduce predator numbers in these zones, and will continue to work with land managers, hunters, and other interested groups to accomplish the long-term goal of increased elk populations in these backcountry areas.

Predation Management

Managing predators to increase elk populations is a complex issue, in part because different segments of society value predators differently, and because previous efforts have met with mixed results. Nonetheless, predator management is desired by many hunters and serves as an important IDFG elk management tool.

Determining whether predation management will benefit elk populations requires a complex analysis of predator and prey population status, nutritional status of prey, cause-specific mortality, logistical considerations, scale of predation management efforts, and social and economic considerations. As a general rule, predation management can result in more elk when the following conditions are met:

- An elk population is not nutritionally limited (i.e., below habitat carrying capacity)
- Predators are a primary source of elk mortality
- Significant numbers of predators can be removed economically
- Predator removal efforts are conducted in the winter and spring, just prior to predator or elk reproductive periods
- Predation management efforts are focused at the appropriate geographic scale

Wolves, mountain lions, and black bears are the primary predators of elk in Idaho. Current predation management efforts emphasize hunting to manage black bears, mountain lions, and wolves. Idaho has some of the most liberal hunting seasons and methods for predators in the lower 48 states. Use of bait and pursuit by hounds is allowed during spring and fall seasons for black bears. Mountain lion may be hunted with hounds, and wolves may be harvested during

long hunting seasons and trapping seasons in some areas. Harvest strategies available to impact predator populations include:

- General seasons with harvest quotas
- General seasons without quotas
- Decreased tag prices
- Multiple tags
- Trapping (for wolves only)
- Baiting (for black bears)
- Use of hounds (black bears and mountain lions)

These harvest strategies, alone or in combination, provide tools for wildlife managers to better manage predators in a manner consistent with achieving elk population management objectives. Additionally, predators are removed by U.S. Department of Agriculture Wildlife Services when human safety or livestock depredations are issues.

In some cases when predators are negatively impacting ungulate populations, managers may recommend tools in addition to regulated harvest strategies. In 2000 the Idaho Fish and Game Commission (Commission) approved the Policy for Avian and Mammalian Predation to guide IDFG's implementation of predator management activities. The policy states "*The Director may implement a Predation Management Plan in those circumstances where wildlife management objectives for prey species cannot be accomplished within two years by habitat manipulation, sportsman harvest, or interagency action designed to benefit the prey species, and where there is evidence that action affecting predators may aid in meeting management objective*." The Management Plan's policy and season frameworks will be used aggressively to reduce the impact of predators on elk where policy criteria are met and predators are limiting elk.

The IDFG staff acknowledged and incorporated zone-specific predation management plans into zone level goals and strategies. Predation management plans are available at: http://fishandgame.idaho.gov/public/wildlife/?getPage=325.

The Future

Elk populations and IDFG are facing new and ever changing opportunities and challenges, including: 1) the return of wolves to the landscape; 2) continued declines or instability of elk herds in the backcountry; 3) elk population expansion in southern Idaho, limited by the amount of crop and property damage that can be sustained; 4) habitat loss and modification; 5) declining elk hunter numbers; and 6) increased importance of the social aspects of elk hunting to elk hunters. This revised elk plan is a continued effort by IDFG to address these challenges at the state and elk management zone level, and to provide direction and specific elk management objectives for the next 10 years.

This revised elk management plan is aligned with The Compass, which is an important administrative step to maintain accountability and responsiveness to Idaho's citizens and elk hunters alike. Many of the strategies outlined in this plan will result in changes in how IDFG staff communicates elk information to hunters, while potentially aligning hunter desires with hunter experiences at the zone level.

Other strategies will bring functional changes as IDFG utilizes new and emerging technology and know-how to track and monitor elk populations. The IDFG will persist in its efforts to stabilize and increase elk populations in backcountry zones, re-affirming a long-term commitment to these zones. The IDFG will cooperatively look for ways to increase hunter satisfaction, while maintaining current hunting opportunities, and work with all Idahoans to manage elk populations for the benefit of all.

The IDFG is committed to establishing collaborative working relationships with all stakeholders. Without this support and commitment, IDFG will likely not be able to maintain the model of providing annual hunting opportunity for friends and family through general hunting seasons. Ultimately, IDFG has a legal obligation to ensure elk thrive and the needs of elk enthusiasts are met, as well as addressing elk-caused damage to private property. We look forward to actively implementing on-the-ground actions to maintain elk as a premier big game gem on Idaho's landscape.

INTRODUCTION

Idaho's diversity and abundance of big game species is rarely rivaled, and Rocky Mountain elk (*Cervus elaphus canadensis*) are considered by many hunters to be the state's premier big game animal. Elk provide an incredible mixture of recreational, aesthetic, social, cultural, economic, and scientific value to people who work or live in, or visit Idaho. Thanks to Idaho's diverse habitats and a population of approximately 107,000 elk, Idaho elk hunters can pursue their quarry in sagebrush (*Artemisia* spp.)-covered deserts, aspen (*Populus* spp.) draws above farm fields, high mountain meadows, or thick timbered ridges. In fact, elk are found in all of the 99 Game Management Units (GMU) within the state, and elk hunting is provided in 98 GMUs. Because elk are so widespread and abundant, Idaho elk hunters are fortunate to have a diversity of hunting experiences and opportunities available to them. The average hunter density in the majority of Idaho's elk management zones is $\leq$1.5 hunters/mi^2 (Fig. 1).

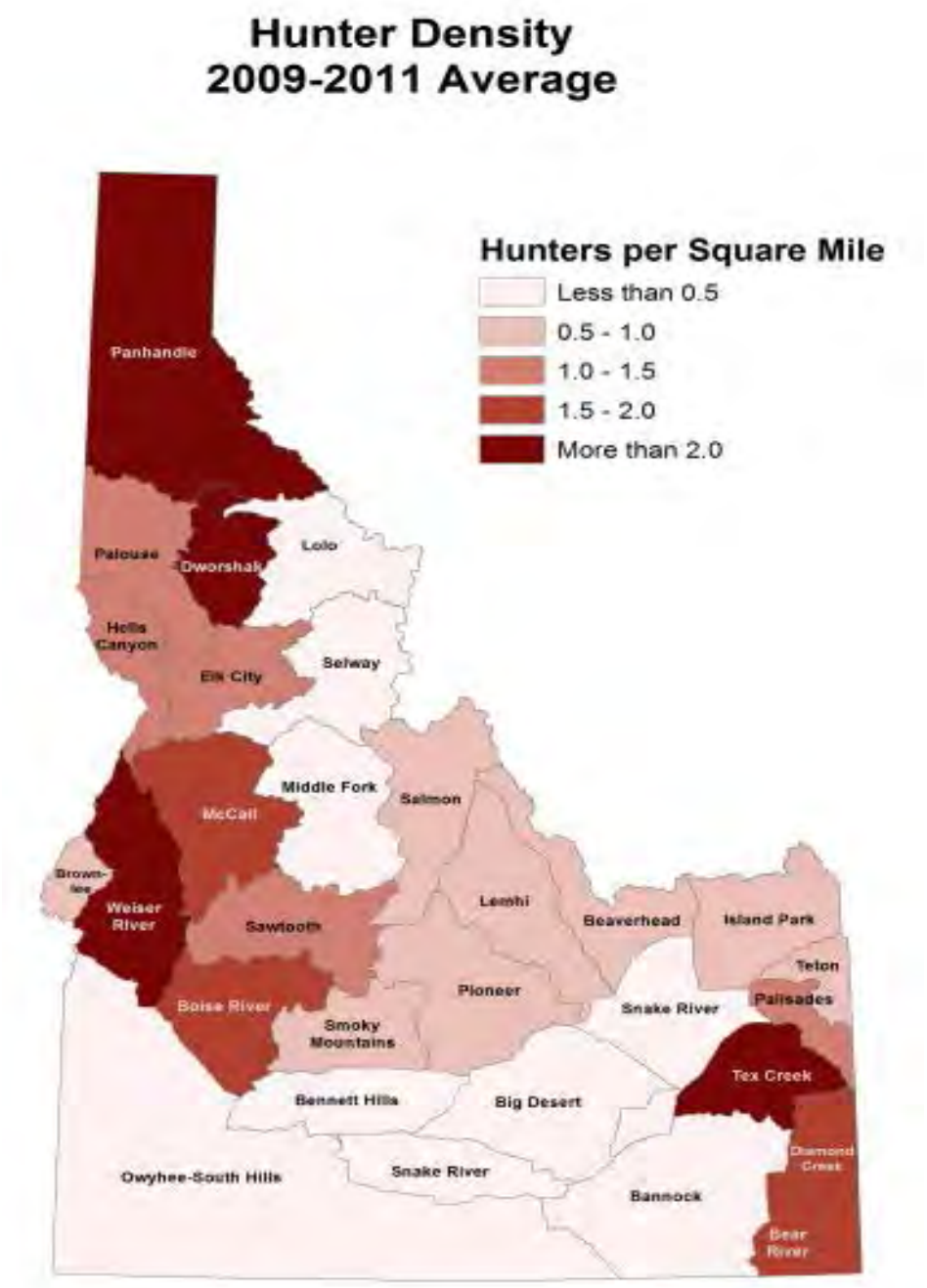

Figure 1. Average hunter density by elk management zone in Idaho, 2009-2011.

Historical Perspective

Historically, elk numbers in Idaho were likely lower than they are today. Accounts from the Lewis and Clark expedition and trappers during the height of the fur trade generally suggest elk populations were scattered and only locally abundant in northern Idaho. Eastern Idaho elk populations appeared robust in the mid-1800s (Evans 1939). Statewide, populations were most

likely reduced during the unregulated hunting of the late 1800s and early 1900s. Ungulates, including elk, were heavily utilized for food by miners, trappers, loggers, and other settlers.

Early 1900s.— European settlement brought changes to the landscape. Millions of sheep, cattle, and horses were brought into southern Idaho. Black bear (*Ursus americanus*) and mountain lion (*Puma concolor*) populations generally received little or no protection and gray wolves (*Canis lupus*) were functionally extirpated by the early 1900s. In southern and parts of central Idaho, extreme overgrazing combined with fire suppression efforts turned what was primarily perennial grass ranges into shrubfields. Unregulated harvest and conversion of grass dominated ranges to shrubfields likely resulted in fewer elk in southern Idaho.

Similarly, landscape-level changes occurred in northern Idaho during the early 1900s. However, the impact was likely more positive for elk habitat and populations. Extensive wildfires created a mosaic of grass, shrubfields, and forested habitats. Nearly extirpated local elk populations were augmented with elk from Yellowstone National Park (YNP) following the large wildfires. Timber harvest also contributed to moving large portions of the forested landscape back towards a more early seral condition. Under these conditions elk flourished in northern Idaho.

Mid 1900s.— In north-central Idaho, elk populations probably peaked in the 1960s. As the newly created seral habitats aged and succession continued to move towards a climax state, habitat potential declined. Fire suppression efforts resulted in forest habitat advancing to later seral stages and preventing natural regeneration of early seral stages more favorable to elk.

By the 1970s, hunter numbers and access had increased to the point where restrictive seasons were necessary to reduce elk vulnerability to harvest. Either-sex bag limits throughout most of Idaho were replaced by antlered-only bag limits in 1976. Elk populations responded, and by the late 1980s elk were once again abundant enough to support more liberal antlerless opportunity. Predator populations were likely reduced or suppressed during the mid-1900s, but had some localized effects on elk in remote areas.

Late 1900s.— In portions of northern Idaho, the mid-1990s witnessed another downward cycle in elk numbers. Declining habitat potential in forested habitat, black bear and mountain lion predation, and the localized impacts of hard winters (1996 and 1997) all played a role. With protection and harvest restrictions implemented during the 1970-1990s, black bear and mountain lion populations likely stabilized and began to flourish, particularly in central mountain areas (commonly referred to as backcountry) where hunting access is difficult. Wolves became re-established in Idaho during the 1990s through USFWS reintroduction, and through wolves from southern Canada and northwest Montana naturally re-occupying historic wolf habitat. Wolf predation on elk has further accelerated declines in elk herds in many parts of northern Idaho.

In other portions of the state, including much of southern Idaho, elk numbers actually increased during this same timeframe. A change in grazing practices that promoted grass production, farming practices that favored resting farmland, and continued timber cuts that favored early seral habitat stages all enabled southern Idaho elk populations to grow to all-time record highs during the latter half of the 1900s.

Today.— Elk herds in the southern part of the state are mostly robust and limited more by sociological constraints, such as damage to agricultural crops and property, than by habitat suitability. Elk herds in the central and northern mountains continue to be suppressed by predators and habitat declines. Elk herds in the prairies and agricultural areas of northern Idaho are mostly robust and population levels are constrained by crop and property damage. In total, Idaho's elk population in early 2013 was estimated at approximately 107,000 animals.

Elk will always be a high priority species relative to their impact on hunting and other recreational opportunity, cultural heritage, and rural economies, and elk management is a priority program for IDFG.

Purpose

Idaho Code 36-103 establishes statewide policy for wildlife, and can be paraphrased as all wildlife will be preserved, protected, and perpetuated; and that wildlife will be managed to provide continuous supplies for hunting, fishing, and trapping. The Commission is charged with administering state wildlife policy through the Director of IDFG.

Idaho Code 67-1903 requires state agencies to develop strategic plans expressing how they will meet core mission requirements. Plans must identify outcome-based goals and performance measures. The current IDFG strategic plan, entitled "The Compass," was implemented in 2005 (IDFG 2005*b*). The Compass calls for the development of "action plans" that describe programs, projects, and activities necessary to meet strategic plan goals.

The prior Elk Management Plan (IDFG 1999) was adopted in 1999 and preceded The Compass. This Elk Management Plan (2013) tiers off of the IDFG strategic plan and functions as the action plan for elk management in the state. Major issues affecting elk management are identified, setting overall direction for elk management during the next 10 years and providing performance objectives and management strategies for management actions. Although the plan is not regulatory (e.g., statute or rule), it does incorporate Commission policy and provide management direction to IDFG. This plan will guide IDFG in annual work plan development and program priority, and provide guidance on development of regulatory recommendations. Finally, it will be used in development of IDFG's annual budget request to the legislature.

Public Involvement in Plan Development

Several phases of public outreach have been conducted during the development of the draft Elk Management Plan.

Elk Hunter Opinion Survey, Phase 1, April-June 2012.— A comprehensive opinion survey about elk hunting in Idaho was conducted in 2012 under contract to the University of Idaho, by Drs. Nick Sanyal and Ed Krumpe, and Alexandria Middleton at the University of Idaho, Conservation and Social Sciences Department. The survey was mailed to a random sample of 6,200 Idaho elk hunters who purchased general elk tags in 2011. The sample was stratified by elk hunting zones which meant 220 elk hunters were randomly selected in each of 28 elk zones to receive the survey (200 with Idaho addresses, and 20 who live in other states). Hunters could respond to the

survey by hardcopy or on-line. A total of 2,786 useable questionnaires were returned and used in the analyses, which was a 48.5% response rate after accounting for undeliverable instruments and refusals. This response was judged to be adequate to produce a statistically representative sample of the population of Idaho elk hunters at ±10% level of accuracy. Results of the survey were presented at the IDFG Commission meeting at Bonners Ferry, Idaho in July 2012. Summary of results and the questionnaire are available on the elk planning website (http://fishandgame.idaho.gov/elkplanning) and Appendix A.

The lengthy questionnaire asked many questions to gather information about Idaho elk hunters, such as:

- Current demographics of Idaho elk hunters (who they are)
- Idaho elk hunters' preferences and experiences (what type of experience are they looking for, how they would define a quality hunt, what are the top reasons they hunt in Idaho)
- How do they view different types of management options (general seasons, controlled hunts, choose a weapon)
- Satisfaction level with various factors such as season lengths, amount of access, and timing of elk seasons
- How predators impact their elk hunting experience

This study was the first comprehensive investigation of Idaho elk hunters since a similar study was conducted by the University of Idaho almost 25 years ago (1987), and provided an important update to knowledge about elk hunters. This comprehensive survey of elk hunters allowed IDFG staff to quantify current hunter demographics, desires, expectations, and hunting experiences. The following attributes were identified as defining a quality elk hunting experience for most Idaho hunters:

- Being able to hunt every year, and seeing a harvestable elk
- Closely followed by being able to hunt elk with family and friends, harvesting an elk, being able to hunt for mature bulls, and low elk hunter densities

The survey validated that the Idaho model of being able to purchase over-the-counter (OTC) tags that provide yearly opportunity for family and friends to hunt together, in combination with mature bull opportunity in controlled hunt areas, is well supported by Idaho residents. The fact that hunters would like to see more elk while hunting was also noted.

A few of the questions from 2012 survey could be compared to the survey conducted in 1987. When comparing the 2 surveys, a few differences stood out:

- In 2012 77% of people surveyed said they would miss elk hunting in Idaho a great deal if they could not do it, compared to 54% in 1987
- Of respondents in 2012, 43% said hunting elk with family was extremely important, compared to 28% in 1987
- In 2012 the general trend was that harvesting any elk and putting meat on the table was more important, and harvesting a mature bull (6 points on a side) had the same desirability as in 1987; but harvesting a raghorn, spike, or antlerless elk was less desirable than in 1987

Responding to requests for more opportunity for hunters to hunt in more than 1 general zone, we also asked hunters in this survey if they would like to be able to hunt in multiple zones in a year for a single elk. Almost 83% of hunters responded that they were interested in the opportunity to hunt elk in more than 1 general zone. Of these hunters, 60% agreed that they were willing to pay more to do so ($30 for resident, $100 for nonresident). This result led to further development of the concept to expand elk hunter opportunity to multiple zones.

Elk Hunter Opinion Survey and Public Outreach, Phase 2, April-May 2013.— Based on hunter preferences from the 2012 hunter survey and current elk population status and potential for elk herd growth, IDFG staff developed statewide elk management objectives for the next 10 years. Staff also developed objectives and strategies for each of the elk management zones in Idaho.

During April through May 2013, the IDFG obtained public input on:

- Draft statewide management direction and objectives
- Draft zone objectives, strategies, and limiting factors
- Interest in expanding hunter opportunities (2-zone, C-tag, no change)

Input was sought from individuals as well as notifying sporting groups, agricultural groups and private landowners, and federal land management agencies.

The IDFG sought input and interaction with the public through a variety of communication tools, including:

- On-line chat
- On-line survey (website)
- Second elk hunter survey (mailed)
- Public meetings and open houses

On-line chat was designed to inform and answer questions about the proposed statewide management directions and objectives, as well as specific questions about zone level population objectives, limiting factors, and strategies. The chat served primarily as a tool to kick-off the public comment period and was very successful, with the following highlights:

- Over 1,400 people participated in the two 2-hour sessions
- The first night alone IDFG staff answered almost 500 questions
- Hunters from almost all states were represented, along with a few foreign countries

On-line survey (website) had 3 separate sections for public input: statewide management directions; zone-specific objectives and strategies; and expanding hunter opportunities to include being able to hunt in 2 or more zones (2-zone or C-tag).

Input on statewide and zone management included:

- Over 75% of the respondents favored the proposed statewide elk management objectives as presented
- Most respondents found zone-specific 10-year management direction and proposed strategies favorable or acceptable

There were 1,801 respondents to the zone-specific management direction and proposed strategies and 579 respondents to the statewide management objectives.

The second elk hunter survey (mailed) was a random sample of hunters to determine specific interest in expanding or not expanding hunting opportunity into 2 or more zones. The second elk hunter survey was sent out to 3,187 people and 1,487 responded (47% response rate). The sample was stratified by elk hunting zones which meant 110 elk hunters were randomly selected in each of 27 elk zones to receive the survey (100 with Idaho addresses, and 10 who live in other states); and also included a sample of those who drew controlled hunts in the Hells Canyon and Owyhee-South Hills zones. Hunters could respond to the survey by hardcopy (Appendix B). The survey was also available to interested people on the IDFG website; this self-selected sample consisted of 1,064 responses.

Key responses of the mailed survey and on-line survey include:

- Sixty-five percent of the mailed survey respondents and 70% of the on-line respondents favored the 2-zone option to expand elk hunter opportunity
- Forty-nine percent of the mailed survey respondents and 54% of the on-line respondents favored the C-tag option to expand elk hunter opportunity
- Only 27% of the mailed survey respondents and 29% of the on-line respondents were in favor of expanding hunting opportunity into 2 or more zones if it might cause these zones to become more restrictive in the future (e.g., tag quotas, shortened seasons)
- Based on the descriptions of the 2 options, 2-zone and C-tag, mailed survey respondents and on-line respondents were more likely to participate in the 2-zone option versus the C-tag or neither option (mailed survey - 57% 2-zone, 17% C-tag, 27% neither option; on-line survey – 60% 2-zone, 21% C-tag, 20% neither option)
- Fifty-seven percent of each survey group indicated we should move forward with these options to hunt in multiple zones; 30% of the mailed survey respondents and 38% of the on-line respondents were not in favor of moving forward with these options to hunt in multiple zones

Public meetings and open houses provided an opportunity for the public to meet one-on-one with IDFG staff and discuss draft plan statewide direction, zone objectives, and expanding hunter opportunity alternatives. Input was collected using the same questions and format that was provided with the on-line website survey.

Highlights included:

- Fourteen open houses or public meetings held statewide
- Two hundred forty-three people attended the meetings

Public Outreach, Phase 3, August – September 2013.— During August and September 2013, IDFG solicited public comment on the draft plan. Comments were collected using the website, hard copy, and by email. The draft elk plan was viewed by 1,203 individuals on the website during the comment period, and 401 of these individuals left comments. Additionally, IDFG received 19 written comments separate from the website; 8 were from governmental agencies and Non-Governmental Organizations (NGOs), 10 from citizens, and one additional citizen letter

that was signed by 27 individuals. The general tone of the written comments was support for the plan. Each group stressed the importance of elk management and several mentioned the importance of managing predation to benefit elk in some areas. A few written comments were not in favor of predation management.

Written and on-line comments were categorized into topic categories for more in-depth analysis. Each comment was given multiple topics (if necessary) in order capture the extent of each comment. There were 43 different topics that were assigned to 554 total comments by topic. Of those 43 topics, 19 topics had 5 or more individuals address that specific topic.

The most frequently-mentioned topic in the comments was predation (171 of the comments). The comments were split with 152 supportive of predation management and 19 comments against any predator harvest or control. Primarily, discussion of predation management centered on wolves, but also addressed black bears, mountain lions, and grizzly bears.

The multiple zone tag ("C-tag" or 2-zone) concept was mentioned by 77 of the respondents. The comments were 2 to 1 against the multiple zone tag option. The general apprehensions were that it would increase hunter crowding, increase statewide elk harvest, and that the multiple zone tag concept was just about raising revenue.

An on-line chat was conducted to kick-off the public comment period and inform and answer questions about the draft plan. There were 186 viewers during the live event with 88 people participating.

After considering all public comments, the draft plan was modified and prepared for consideration by the Commission. The Commission held a public hearing on 15 January 2014 to solicit testimony on the final proposed plan. Minutes of the public hearing can be found at https://fishandgame.idaho.gov/public/about/commission/selectYear.cfm. The plan was adopted by the Commission on 16 January 2014.

Public involvement was a critical component in developing this plan, and will continue to be a necessary aspect of elk management throughout implementation.

RELEVANT IDFG PLANNING DOCUMENTS

- Black bear management plan 1999-2010 (IDFG 1998)
- Elk management plan (IDFG 1999)
- Policy for avian and mammalian predation management (IDFG 2000)
- Mountain lion management plan 2002-2010 (IDFG 2002)
- Idaho wolf conservation and management plan (Idaho Legislative Wolf Oversight Committee 2002)
- White-tailed deer management plan 2004-2015 (IDFG 2004)
- Idaho comprehensive wildlife conservation strategy (IDFG 2005*a*)
- The Compass, IDFG strategic plan (IDFG 2005*b*)
- Memorandum of Understanding between IDFG and Idaho State Animal Damage Control Board (IDFG and Idaho State Animal Damage Control Board 2005)
- Mule deer management plan 2008-2017 (IDFG 2008)
- Mule Deer Initiative Action Plan 2010 (IDFG 2010)
- The Communications Bureau strategic plan 2011-2015

RESULTS FROM PREVIOUS PLANNING PERIODS

Management of elk has been a priority since the inception of IDFG. Since the 1980s, IDFG has had 4 formal statewide elk management plans. A key feature of the 1986-1990 plan was establishing a minimum post-season bull:cow ratio of 25:100 for backcountry units and 15:100 for all other units. The elk "sightability" helicopter survey method was implemented as a statewide plan for inventorying elk in most units. This inventory method was state of the art and the envy of management agencies in the West. The IDFG also advocated for logging guidelines that maintained adequate cover for elk and minimized open road densities on the landscape. A comprehensive Elk Rifle Hunting study was initiated that quantified and qualified elk hunting experiences in Idaho.

Emphasis during the 1991-1995 planning period was focused on maintaining or increasing bull elk numbers. General any-weapon seasons were moved out of the breeding season in the majority of GMUs. Spike-only general seasons and branch-antlered permit-only hunts were implemented in eastern Idaho. Hunters were forced to choose between hunting the 14 central Idaho GMUs with the Mountain zone tag or hunt front country GMUs with the regular elk tag. By the mid-1990s, the number of elk tags sold eclipsed the 100,000 mark.

The impending social conflict and declining bull:cow ratios drove the 1996-2010 Elk Management Plan process (referred to as the 1999 Plan). A new minimum bull:cow ratio of 20:100 was adopted, along with graduated higher bull:cow ratios for "quality" and "high quality" hunting areas. The dual-tag zone management concept was implemented to manage hunter distribution across the state, by incentivizing certain zones and seasons. Although wolves were reintroduced into Idaho in 1995, the 1999 Plan was relatively silent on the issue.

A 20% decline in hunter numbers and significant declines in north-central and central Idaho elk herds precipitated the current elk plan review process.

ELK MANAGEMENT ISSUES

Hunting Opportunities and Experiences

Idaho elk hunters have various motivations for hunting, including spending time with family and friends, seeing elk in a natural setting, being close to nature, just being outdoors, harvesting an elk, putting meat in the freezer, harvesting a mature bull, and others. In comparison to elk hunters in 1987, today's hunters are older, the social aspects of the hunt are more important, and they are more likely to miss Idaho elk hunting a great deal if they could not participate (Sanyal et al. 2012*a*).

Elk hunting has strong ties to Idaho's history and culture and today's hunters highly value the opportunity to hunt every year. Hunters also reported that harvesting a mature bull (6 points on a side) or a large bull (>350 Boone & Crockett points) was most desirable of all bull and antlerless opportunity. However, when hunters primary reasons for hunting elk were revealed through a series of questions, a clear majority of hunters found it unacceptable to be restricted to purchasing an elk tag only every other year, or having more controlled hunts that provide larger animals but not being able to hunt elk every year. The current Idaho model is to offer OTC tags that provide yearly opportunity for family and friends to hunt together, in combination with mature bull opportunity in controlled hunt areas. This model is well supported by Idaho residents. The IDFG staff will continue to work with hunters to increase elk hunter satisfaction by looking into ways to expand hunter opportunity to hunt in more than 1 general season zone per hunting season. Further, IDFG staff will better help hunters match the type of hunt they are looking for with available opportunities (OTC with friends and family, antlerless, or quality bull opportunities) and weapon type.

Annual opportunity.— Idaho currently offers liberal general-season hunting opportunities. In 2012, 27 of the state's 29 elk management zones provided some form (i.e., weapon type) of OTC general-season hunting opportunity. The dual-tag zone management concept (A and B tags) was implemented in 1999 to address concerns for numbers of adult bulls and bull age structure and to better manage hunter numbers among GMUs. This A-B tag system has enabled IDFG to provide ample and diverse hunting opportunities while minimizing hunter crowding and managing hunter distribution. For instance, in 2012 there were 43 total OTC general seasons available among the 27 elk zones that offered OTC opportunity. A-tag hunts typically provide more opportunity for archery or muzzleloader hunters, and may include harvest opportunities for antlerless, either-sex, or antlered animals. B-tag hunts tend to provide more any-weapon opportunities, often for antlered elk only. These hunts have become a staple for maintaining Idaho's hunting tradition and continue to provide an opportunity for family and friends to get together for the "annual hunt," while still providing opportunities to hunt with a variety of weapon types and for either antlered or antlerless elk.

Backcountry opportunity.— Idaho's north and central backcountry zones were once the epitome of all elk hunting experiences for many residents and nonresidents of Idaho. These zones are characterized as remote, with limited access and comprised mostly of wilderness. Hunters sought out these zones for not only the backcountry experience, but also because of relatively high abundance of elk. Over the last 20 years, some backcountry elk populations declined 34% - 80%

based on elk survey data. Since the mid-1990s, cumulative elk populations in the Lolo, Middle Fork, Sawtooth, and Selway zones have declined from over 30,500 elk to just over 14,500 (52% decline), and are still fluctuating. Subsequently, available elk tags have been reduced by as much as 52%. While all of these zones still offer OTC tags, quotas have been established and tags are sold on a first-come, first-served basis.

In many cases, these zones are limited by both predation and habitat quality, and IDFG's ability to improve elk populations in these zones can be severely affected by limited access, landownership, and federal wilderness restrictions. Recovery of these elk populations hinges on long-term commitment to habitat improvement and a clear link between this elk plan and predation management plans. In most instances, the 10-year management direction for backcountry zones directs first stabilizing elk populations, then beginning the process of growing herds. The IDFG will continue to commit resources and personnel to reduce predator numbers and work with federal land managers to improve habitat in these zones, and will continue to work with land managers, hunters, and other interested groups to accomplish the long-term goal of increased elk populations in these backcountry areas.

Other hunting opportunity.— Hunter surveys indicate that Idaho hunters strongly value opportunities to harvest mature bulls as well as opportunities to hunt elk annually. The majority of Idaho elk hunters prefer to harvest a mature bull rather than other types of elk. But when presented with the choice of annual antlerless opportunity, every third year raghorn opportunity, or every tenth year mature bull opportunity, the majority of hunters chose to hunt every year. Idaho currently offers over 252 different controlled hunt opportunities of which 50 are antlered or either-sex any-weapon hunts, 5 are antlered archery hunts, and 8 are antlered or either-sex muzzleloader hunts. Depending on variations in herd characteristics, most of these hunts are considered "quality" or "high quality" hunts. In addition, many high-harvest potential opportunities (primarily cow and youth hunts) exist as other controlled hunt "special opportunities." These hunts are provided annually where populations are meeting overall population objectives or to minimize damage to agricultural crops. The challenge Idaho elk hunters have, especially new participants, is wading through the diversity of opportunities that the A-B tag system and controlled hunts have to offer. To better meet the diversity of hunting experiences desired by Idaho elk hunters while maintaining desirable OTC tags in general seasons, IDFG has adopted the following statewide goals:

- Annually maintain 10 "quality" and 10 "high quality" hunting opportunities throughout the state
- Improve efforts to inform hunters about the diversity of hunting opportunities available throughout Idaho

These opportunities are broadly characterized in Table 1 and are based on individual hunts, not by zones.

Table 1. Characteristics of elk hunting opportunity types in Idaho.

	Type of hunting opportunity		
Characteristic	General	Quality	High quality
Hunter success (%)	≈15	≈35	≈50
6-point bulls (%)	>20	>40	>60
Hunter density (no./mi^2)	1.0 – 7.0	0.18 – 0.99	< 0.18
Opportunity to hunt every year (%)	100	10-20	<10
Bull:100 cows ratio	18-24	25-29	30-35

Expanding elk hunter opportunity to multiple zones.— Hunters surveyed in the 2012 survey responded positively to the general concept of expanding hunter opportunity to multiple zones. The concept is that hunters would still only have 1 tag and be able to harvest only 1 elk, but it would provide them more flexibility in zones they hunt, with the intent to make it easier to hunt with family and friends. Based on the positive response from hunters in the 2012 survey, IDFG staff developed 2 options for further consideration by hunters. In each option, only OTC, general-season hunts would be eligible for consideration. The 2-zone option allowed a hunter to purchase an elk tag for a single zone and also purchase the opportunity to hunt with that tag in 1 additional zone. For example, a person could choose to hunt in the Panhandle Zone near home, but could also choose to hunt the Brownlee Zone. The idea is to extend an individual's hunting season and add some diversity to where that person hunts. The second option, the "C-tag" option, would create a third type of tag in addition to the current A- and B-tag system. A tentative list of GMUs that were meeting elk management objectives was selected to be part of the C-tag. The C-tag option allowed a person to purchase the C-tag and hunt in any or all of the GMUs on the list during the open season for those areas. The tentative list would include approximately 28 GMUs in 6-8 zones.

A second survey was used to gather information from hunters in 2013 about the 2 options and associated proposals and details. The majority of the respondents favored the 2-zone option over the C-tag option. A majority of hunters did express concern of moving forward with any option to expand hunter opportunity to multiple zones if it would result in more restrictions to the zone they currently hunt in. Six of 10 hunters did still express interest in moving forward, while 3 of 10 hunters were opposed. Because of uncertainty and concerns expressed by some hunters, IDFG will further evaluate the effects either option may have on current hunting opportunities before making any recommendations to the Commission. Over the first few years of this plan, IDFG staff will continue to work with hunters to develop ways to expand hunter opportunity to hunt in >1 area.

Potential impact of technology on opportunity.— Technological advances create unique challenges for both wildlife managers and conservation officers. Technology such as global positioning units (GPS) and advanced communication devices are common field tools used to obtain and store data, and maintain personal safety. On the other hand, using the aid of technology while hunting often results in questions of what constitutes "fair chase."

Some examples of technological advances and the impacts include:

- **Trail cameras** - are being put up on water holes and feeding areas making it more effective for hunters to scout an area before and during a hunt as opposed to physically scouting an area themselves. The Montana Fish, Wildlife and Parks Commission was concerned enough about impacts of trail cameras that they made them illegal during hunting seasons.
- **Range finders** and **high-tech scopes** help hunters judge distance, which, in part, led to the growing popularity of long-range shooting of big game animals. Whereas these tools have enabled practiced shooters to take long-range shots with higher accuracy, they have also encouraged less practiced shooters to take long-range shots that may be unethical. This technology likely also increases success rates in some habitats, which can lead to reduced opportunity.
- **Two-way radio** communication has made hunting in pairs or groups much easier. A spotter can now put a stalker in the path of the big game animal they are pursuing. This form of communication was a concern for the Montana Fish, Wildlife and Parks Commission and is now prohibited in Montana.
- Technology has made **bows** and **muzzleloaders** shoot faster, farther, and with greater accuracy. Increasing success rates in archery and muzzleloader hunts to nearly equal the rifle harvest success rates in some elk zones of Idaho (Fig. 2), raises the question, "What constitutes a 'primitive' weapon?"

Ultimately, decisions on what and how technology should be used in hunting as "fair chase" is a social issue. However, technology can play a role in harvest success. Managing elk harvest by adjusting the technology used to hunt will be important to help manage harvest in order to maintain populations within objective as well as hunting opportunity. This process will be through the Commission and integrate public input, Commission approval, and legislative action.

Population Monitoring

Population monitoring is the backbone of IDFG's elk management program. Monitoring provides wildlife managers with information to evaluate management goals and allows informed decision making. Monitoring should include an estimate of population size, as well demographic information such as age and sex ratios. Aerial surveys should be conducted frequently enough to establish population trends and timely enough to enable managers to influence these trends.

Prior to the 1980s, key drainages in a winter range were flown periodically using helicopters to establish a minimum population size and herd composition, and this data was used to infer trend. Because not all animals are observed during aerial surveys (Caughley 1974), IDFG developed a "sightability model" that corrects for animals missed (Unsworth et al. 1994) during aerial surveys. Since the late 1980s, this sightability technique has been used to monitor elk populations. Using this technique has enabled IDFG to generate population estimates with confidence intervals, collect composition information, establish population trend, and statistically compare surveys.

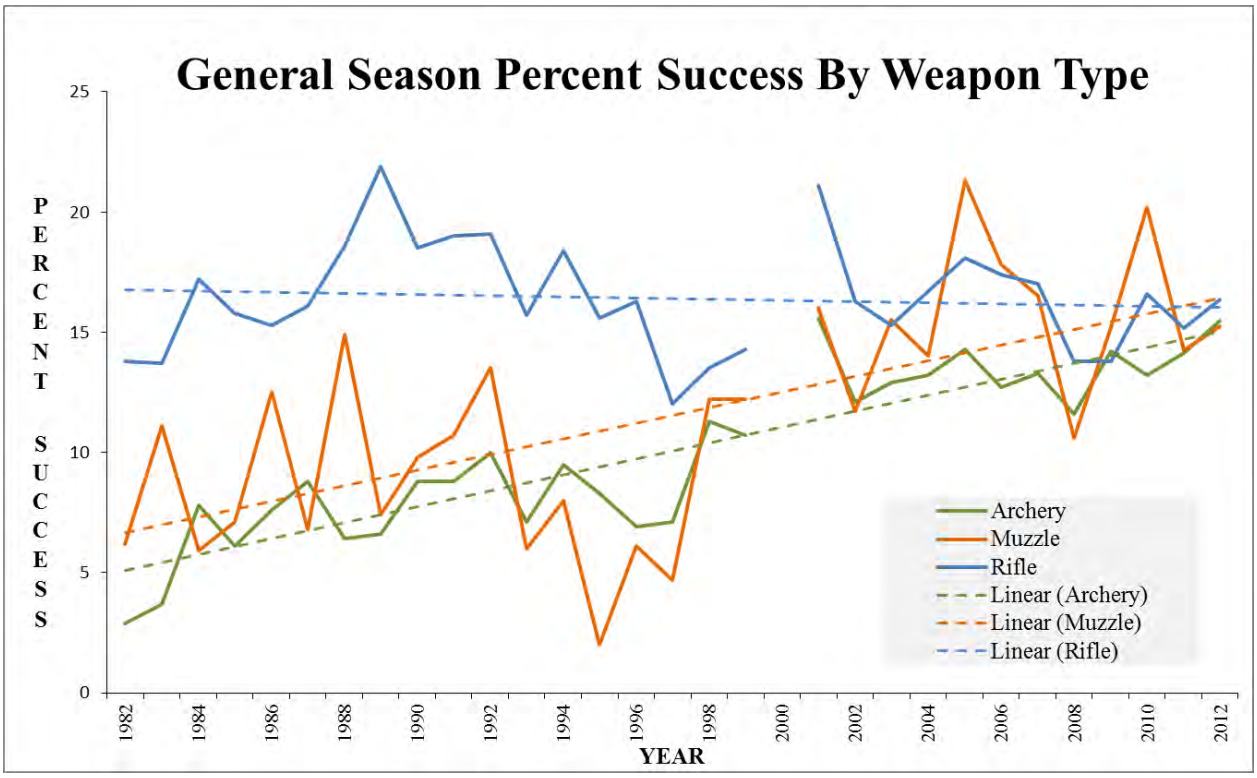

Figure 2. Statewide elk general season percent success by weapon type, 1982-2012.

In 2006, IDFG assembled an elk monitoring team to evaluate the Department's implementation of the aerial sightability protocol (Berkley and Short 2006). Although the team felt elk monitoring was robust, improvements were suggested. The following recommendations came out of that effort and have since been implemented:

- Create minimum standards for observer experience and refine training
- Restructure elk survey schedules to reflect statewide and regional management priorities and establish a 3-5 year rotation for most zones
- Reallocate aerial survey budgets to reflect annual regional flight needs
- Survey elk on the scale of elk management zone rather than the scale of GMUs
- Survey at high enough intensity to detect a 15% change in population (zone level)

The IDFG currently faces several challenges in its elk monitoring program. The first is increased variability in adult and calf survival in some zones. Historically, most adults and a large percentage of calves observed during aerial surveys in mid- to late-winter survived until June. In the case of calves, these individuals were recruited into the population unless an extreme winter event occurred. Annual adult cow survival rates observed in the Lolo and Sawtooth zones varied between 79% and 96%, and 84% and 92%, from 2009 to 2012. Survival of 6-month-old calves from January to June varied from 9% to 60% in the Lolo Zone, and 30% to 78% in the Sawtooth Zone. The assumption that a large proportion of individuals counted in winter will survive until June is no longer true, due to wolf predation in some zones, and this has caused some populations to become less stable.

The second issue is maintaining a robust elk monitoring program on a limited budget. To date IDFG staff have been relatively successful in balancing increasing helicopter costs, statewide and regional data needs, and employee safety. Since 2008, declining tag sales (particularly nonresident tag sales) have meant declining revenue. Over the past 10 years, helicopter costs have increased 5-6% annually. This situation, in combination with greater instability in some populations, has increased the desire for more frequent data collection and exacerbated the funding issue. Additionally, some concerns have been expressed over decreased helicopter availability.

Another objective of the elk monitoring team is to promote development of alternatives to intensive aerial survey techniques. The IDFG is in the early stages of exploring a technique that is currently being implemented for mule deer (*Odocoileus hemionus*) monitoring in Idaho: an integrated population model (IPM). An IPM combines data from population surveys (population estimate as well as demographic information), harvest surveys, survival monitoring, and other sources into a comprehensive analysis. An IPM can provide estimates of vital rates as well as population estimates on an annual basis. If fully implemented, this approach will likely reduce aerial survey flight time, but may ultimately cost more due to the relatively high expense of survival data.

Predation Management

Predators of elk.— Gray wolves, mountain lions, black bears, grizzly bears (*U. arctos horribilis*), coyotes (*Canis latrans*), bobcats (*Lynx rufus*), and occasionally golden eagles (*Aquila chrysaetos*) prey on elk. Wolves, mountain lions, and black bears occur across most of Idaho, and are the primary predators of elk. Coyotes, bobcats, grizzly bears, and potentially eagles prey on elk calves in the early spring, but current research indicates that these losses are minimal or restricted in distribution in Idaho (Zager et al. 2007*b*, White et al. 2010, Griffin et al. 2011). An ecological system with multiple large predators likely has more impact on elk populations and harvestable surplus than more simple systems (Griffin et al. 2011).

Wolf predation occurs on all age classes of elk and can be a limiting factor on elk populations (Zager et al. 2009, Brodie et al. 2013). Wolf predation rates vary depending upon time of year, weather conditions, prey densities, and other factors. Elk are vulnerable and suffer higher predation rates in late winter due to deep snows and weakened condition (Husseman et al. 2003, Smith et al. 2004, Brodie et al. 2013). Wolves have the greatest impact on elk calves between 6 and 12 months (Zager et al. 2007*b*, White et al. 2010, Griffin et al. 2011, Pauley and Zager 2010).

Mountain lion predation occurs on all age classes of elk (Zager et al. 2007*a*, *b*; White et al. 2010; Griffin et al. 2011). Husseman et al. (2003) determined that mountain lions preyed disproportionately on elk calves and old individuals in Idaho. The type of impact (additive or compensatory) on elk calves by mountain lion predation has been unclear (White et al. 2010) or likely at least partially compensatory (Griffin et al. 2011). Mountain lion predation does not appear to significantly influence adult female survival in most instances (Brodie et al. 2013). Predation on cow elk by mountain lions when combined with wolves can have an additive effect on elk mortality, but total impact to elk survival across large geographic areas appears to be low

(<2%, Brodie et al. 2013). As an obligate predator, mountain lions in a single-prey system are not believed to trigger declines or depress prey populations for extended time periods (Ballard and Van Ballenberghe 1997, Ballard et al. 2001).

Black bears are predators on elk calves <90 days old, and are most effective during the first 2 weeks of an elk's life, when calves are most vulnerable (Schlegel 1986, White et al. 2010, Griffin et al. 2011). Black bear predation on elk calves is additive mortality in some instances (White et al. 2010, Griffin et al. 2011), but other factors can also play a role (e.g., habitat condition which would pre-dispose elk calves to black bear predation [Zager and Beecham 2006, White et al. 2010]). Management actions that reduce black bear densities before elk calving can have a strong positive impact on elk calf survival (White et al. 2010). Where grizzly bear populations and elk overlap in YNP, bear-caused mortality can be additive (Griffin et al. 2011). Grizzly bears are geographically restricted to eastern and northern Idaho and occur at low densities.

What variables should be monitored to determine if elk are limited by predation?— Several variables are important for evaluating predation impacts: how much predation is occurring and whether it is limiting the elk population, what segment of the elk population is being impacted, and what predator(s) are the primary causes of elk mortality. Cow elk pregnancy rates and calving rates, and calf survival to reproductive age is critical to determining population performance. Changes in cow and calf survival, in concert with elk productivity can result in different elk population trajectories (Table 2).

Table 2. Predicted elk population trends (decrease [↓], maintain [■], or increase [↑]) based on adult female (>1 year) survival and over-winter (January-May) calf survival in relation to January-February calf:cow ratios.

	25 Calves: 100 Cows			35 Calves: 100 Cows			45 Calves: 100 Cows		
Over-Winter Calf Survival	0.2	0.5	0.8	0.2	0.5	0.8	0.2	0.5	0.8
Annual Adult Female Survival (3-yr average)									
0.85	↓↓↓	↓↓	↓	↓↓	↓	■	↓↓	■	↑
0.90	↓↓	↓	■	↓	■	↑	↓	↑	↑↑
0.95	↓	■	↑	■	↑	↑↑	■	↑↑	↑↑↑

Predation is a limiting factor on calf survival, and potentially cow survival, in some zones. During 2005-2008, IDFG assessed cow elk survival and causes of mortality in 11 elk management zones. The 11 zones represented a range of habitats, weather regimes, harvest levels, and predator densities found across Idaho. Adult female elk survival ranged from 63% to 97% and the role of predation, and the primary predator(s), varied across the management zones and between years. Predation by wolves had a greater impact on ungulates in northern and some south-central zones, whereas predation by mountain lions was more important in other south-central and southeast zones. Primary causes of mortality included harvest, wolf, mountain lion, unknown predation, and other causes; and rates varied by zone. Mortality of radiocollared cow

elk was attributed to human harvest (0-8%), wolf predation (0-14%), mountain lion predation (0-5%), and other causes (2-7%) (Fig. 3; Zager et al. 2009; IDFG, unpublished data).

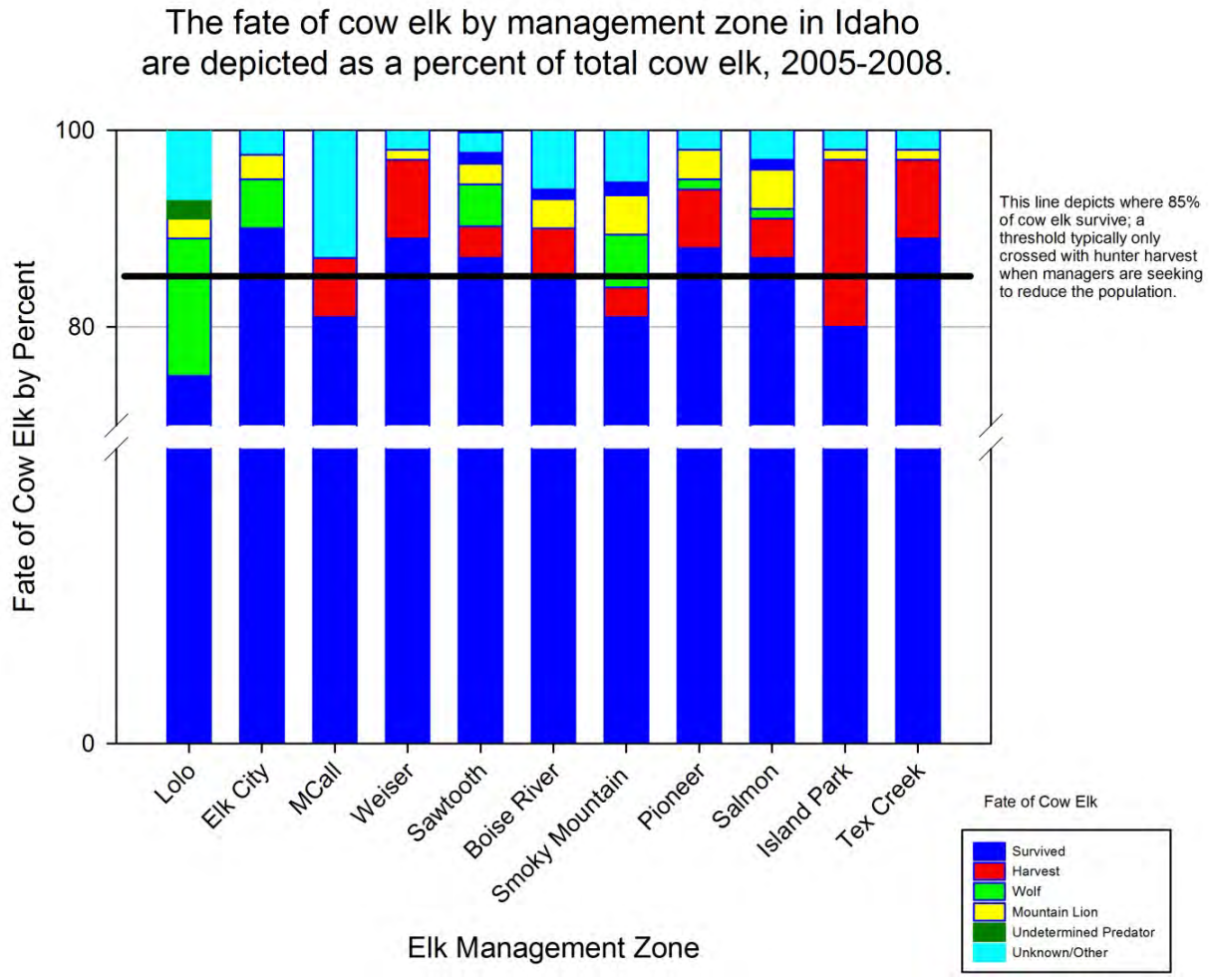

Figure 3. Fate of cow elk (%) in 11 elk management zones, 2005-2008.

The IDFG has investigated neonate (birth through 90 days) and 6-month-old elk calf survival and cause-specific mortality in a few elk management zones over the last 30 years. Survival of neonates and 6-month-old calves (Jan-Jun) ranged from 19% to 100% and 9% to 78%. Predation was the primary proximate cause of mortality among neonates and 6-month-olds, though the suite of predators and the relative importance of each species varied with study area and year (Schlegel 1986; Zager et al. 2009; Pauley and Zager 2010; White et al. 2010; Griffin et al. 2011; IDFG, unpublished data).

The IDFG is currently investigating wolf predation on elk population dynamics in the Lolo and Sawtooth zones. One goal is to produce models that allow us to predict impacts of wolf predation on elk populations using a set of known factors such as topography, habitat, and alternate prey availability. Such models will reduce the need to capture, radiocollar, and monitor elk and

wolves in GMUs before we can make management decisions. Preliminary data indicate that wolves have a significant impact on 6-month-old calves, adult females, and adult males. However, the relative impact varies with wolf density, season, and winter severity (Pauley and Zager 2010; IDFG, unpublished data).

Trends in seasonal or annual composition data (young:adult ratios) for ungulate populations are useful, but not definitive, in identifying impacts of predation (Ballard et al. 2001). However, herd composition can help identify the timing and likely source of offspring mortality. Deaths of healthy neonates relatively soon after birth, revealed by surveys that occur early in the biological year, suggest that predation accounts for low recruitment (Ballard et al. 2001). Combined composition and population estimates also indicate how female reproductive output (additions) compares in magnitude to total mortality (losses). For example, poor nutrition may account for lower birth rate, lower birth weights, and subsequently lower growth rates of prey populations rather than high levels of mortality caused strictly by predation. Likewise, knowledge that a specific predator is "the greatest source of mortality" among all sources (or among all predators) in a particular area, or that mountain lion, wolf, or bear predation is "high" relative to other locations is insufficient by itself to assess the magnitude of predation as a limiting factor.

Annual reproduction or recruitment may still out-pace total mortality, resulting in an increasing prey population, and further compounded by situations where most losses to predators may be compensatory with other mortality factors. However, just the opposite may also be true in that combined effects of predation by multiple predators, including humans, or even a single predator under certain conditions, may be a long-term additive cause of a prey population decline (Barber-Meyer et al. 2008, White et al. 2010, Brodie et al. 2013). Given that the literature provides examples of both, managers responding to declining prey populations should carefully consider all available data and insight to develop strategies to achieve positive outcomes. Focusing solely on predation by 1 species may have very little impact on most declining prey situations unless predation by that species is additive. Predator reductions must be maintained over the long term to be effective in increasing prey populations (National Research Council 1997, White et al. 2010).

Predation management.— Predation management is an important tool to aid in management of prey populations. The Commission approved the Policy for Avian and Mammalian Predation to guide IDFG's implementation of predator management activities (http://fishandgame.idaho.gov/public/wildlife/?getPage=331). The policy directs managers to "recognize the role of predators in an ecological and conservation context. The actions by the IDFG must be based on the best available scientific information, and will be evaluated in terms of risk management to all affected wildlife species and habitats."

Current statewide predation management for predators of elk (wolves, black bears, and mountain lions) emphasizes hunting or trapping seasons for those species. Existing rules and laws provide a regulatory framework to manage big game species, including black bears, mountain lions, and wolves, through hunting. Idaho currently has some of the most liberal hunting seasons and methods in the lower 48 states. Spring and fall seasons for black bears include the use of bait and hounds in most areas. Mountain lion seasons allow the use of hounds, and wolf harvest consists of a long hunting season statewide and a trapping season over a portion of the state. Harvest

strategies available to impact predator populations (from least impacting to most aggressive) include:

- Controlled hunts
- General seasons with harvest quotas
- General seasons without quotas
- Decreased tag prices
- Multiple tags
- Trapping (for wolves)

The harvest strategies above, alone or in combination, may allow wildlife managers to achieve desired predator population levels in some areas. Additional predators can be removed by the U.S. Department of Agriculture, Animal Plant Health Inspection Service, Wildlife Services in situations where human safety or depredation on livestock are a concern. Harvest strategies and the removal of predators for human safety or livestock concern are guided by the species plans for black bears (IDFG 1998), mountain lions (IDFG 2002), and wolves (Idaho Legislative Wolf Oversight Committee 2002).

Managers will implement different tools in addition to regulated harvest strategies to reduce predator populations determined to be negatively impacting elk populations. The IDFG Policy for Avian and Mammalian Predation Management states, "The Director may implement a Predation Management Plan in those circumstances where wildlife management objectives for prey species cannot be accomplished within two years by habitat manipulation, sportsman harvest, or interagency action designed to benefit the prey species, and where there is evidence that action affecting predators may aid in meeting management objectives."

Predation management plans have been or are currently being developed for the Lolo, Selway, Middle Fork, Panhandle, and Sawtooth zones where elk populations are below management objectives. In addition to the harvest strategies listed above for wolves, black bears, and mountain lions, agency control actions were initiated in 2011 with the purpose of reducing wolf abundance in the Lolo zone. The IDFG staff incorporated existing and the potential development of zone-specific predation management plans into zone level goals and strategies. Predation management plans are available at: http://fishandgame.idaho.gov/public/wildlife/?getPage=325.

There are numerous examples of predation management programs initiated to increase prey species (National Research Council 1997). Idaho has conducted several noteworthy studies which have demonstrated increased ungulate survival after predator removal (Schlegel 1986, White et al. 2010, Hurley et al. 2011). Long-term benefits are dependent on continued predator removal and habitat improvement, or on weather events that could not be controlled.

Predator control is often expensive, logistically difficult, requires lots of staff time, and is controversial with some of the public. Therefore, managers must consider the potential benefits, the costs, and the potential effectiveness of the proposed actions on prey populations. It is important that the IDFG develop, test, and utilize appropriate tools to manage for a balance of predators and prey. We also must strive to use the most cost effective methods by using hunters and trappers to the full extent when possible and adaptively and incrementally increasing the number of tools to achieve that balance. Table 3 gives us guidelines on how effective predator

management activities will be in relationship to the population parameters for elk. This information should be considered as part of the predation management plans to gauge the potential for effective change and to help determine the suite of tools and information needed to benefit elk populations showing signs of decline.

Table 3. Guidelines for determining whether predator management activities can be expected to increase elk numbers (adapted from Ballard et al. 2003).

Increased elk numbers likely	Increased elk numbers unlikely
Elk population below carrying capacity	Elk population near carrying capacity
Predation identified as a major cause of mortality	Predation not identified as a major cause of mortality; or elk in poor or substandard body condition
Predator management efforts can result in a significant decline in predator numbers	Predator management efforts unlikely to achieve a significant reduction in predator numbers
Predator management efforts timed just prior to predator or prey reproductive periods	Predator management efforts haphazardly scheduled throughout the year
Predator management efforts focused (e.g., generally <400 mi^2)	Predator management efforts scattered over a relatively large area or no clear goals and objectives

Information needs.— Predator-prey dynamics are complex situations, and using adaptive strategies is a key to developing solutions that make a difference. Adaptive management concepts should be the framework used in any attempt to manage predators and prey so that we can learn and adjust as we manage. Therefore, predation management programs should be designed with control and treatment areas, applied at sufficient spatial and temporal scales, and monitored effectively.

Agriculture and Elk

Preventing crop and property damage (depredation) is a priority management objective for IDFG, and our response to depredation complaints is directed by Idaho Code 36-1108. Each region's Landowner-Sportsmen Coordinator has the responsibility to assist landowners in minimizing or eliminating depredations. Typical strategies to reduce depredations include hazing, permanent fencing, depredation hunts, kill permits, continued use agreements, targeted general or controlled hunts, and perpetual easements. However, depredation problems and their solutions are an increasingly complex matter involving not just the ecology and management of the species, but socio-economic problems and human population dynamics as well. Decades of effort to provide permanent solutions to depredation problems have proven successful and, in many areas, chronic problems have been successfully resolved.

Although elk populations have declined in some management zones over the last decade, other zones have been experiencing an influx of animals into the urban-rural interface and agriculture-

sagebrush-steppe interface where conflicts occur, and appear to be increasing. Multiple factors may be influencing these conflicts, including, but not limited to, increased growth in agriculture, increasing human populations, habitat suitability, wild fires, changes in landowner support, and predator-prey relationships.

As prices continue to increase for agricultural crops like corn, alfalfa, wheat, and rapeseed, so does the cost of damage caused by elk. These high prices also influence the amount of acres planted into these more profitable crops. Further exacerbating the likelihood of conflict is the fact that many of these crops are highly attractive to elk. All of these factors; increased presence of elk in high conflict areas, increasing crop prices, and the planting of palatable crops; are evident in the history of damage claim payments.

Depredation claim payments for elk-related damage since Fiscal Year (FY) 1993 have ranged from a low of $31,003 for 13 approved claims in FY1994 to a high of 36 approved claims totaling $475,946 in FY2008 (median = 16 elk-related claims per year, $109,698) (Table 4). In FY2008, 44 claims for damages caused by all species combined (deer, pronghorn [*Antilocapra americana*], mountain lions, and black bears, in addition to elk) totaled $587,186 and exceeded the available budget, and payments to claimants had to be prorated based on available funds. We are committed to working aggressively to reduce elk damage, but in light of these costs, it is worth exploring mitigating measures aimed at increasing landowners' support for elk. These programs might include payments, tags, or an expanded use of depredation release agreements.

Idaho's human population has increased 21% since 2000 (Mackun and Wilson 2011). While much of this population growth has occurred around metropolitan areas, the associated outward expansion of development continues to impact elk habitat. This expansion is, perhaps, most prevalent on elk winter ranges. Human population growth also resulted in subdividing larger ranches into 5-100 acre ranchettes, contributing to increasing elk conflicts and hindering the ability of IDFG to effectively handle depredations. In addition to increases in the number of buildings and human activity in these subdivisions, problems also occur when some landowners provide refuge for elk that may cause damage to property on adjacent lands. This complexity of ownership across an area narrows the range and effectiveness of options available to assist landowners experiencing damage.

Table 4. Elk-related depredation claims in Idaho by Region, FY1993-FY2013.

	Panhandle		Clearwater		Southwest		Magic Valley		Southeast		Upper Snake		Salmon		Statewide Total	
Fiscal Year	**# Claims**	**$ Final Claim**	**# Claims**	**$ Final Claim**	**# Claims**	**$ Final Claim**	**# Claims**	**$ Final Claim**	**# Claims**	**$ Final Claim**	**# Claims**	**$ Final Claim**	**# Claims**	**$ Final Claim**	**# Claims**	**$ Final Claim**
1993	0	$0	5	$11,033	10	$72,887	1	$681	4	$6,726	4	$8,400	1	$4,150	25	$103,876
1994	0	$0	9	$22,668	2	$2,947	0	$0	1	$5,113	1	$275	0	$0	13	$31,003
1995	0	$0	4	$5,449	9	$50,035	0	$0	0	$0	1	$2,150	1	$106	15	$57,740
1996	0	$0	4	$16,653	7	$16,978	0	$0	1	$919	0	$0	0	$0	12	$34,550
1997	1	$1,890	2	$4,847	8	$52,894	0	$0	7	$19,266	3	$9,515	1	$5,090	22	$93,502
1998	0	$0	8	$50,402	7	$29,729	0	$0	1	$1,126	0	$0	4	$5,627	20	$86,884
1999	0	$0	1	$4,151	4	$31,922	0	$0	1	$3,375	3	$7,363	0	$0	9	$46,810
2000	0	$0	5	$15,617	9	$75,103	0	$0	0	$0	1	$2,125	1	$3,470	16	$96,315
2001	0	$0	6	$56,342	5	$10,175	0	$0	2	$530	0	$0	3	$6,788	16	$73,835
2002	1	$3,000	3	$11,136	9	$45,503	0	$0	2	$4,285	1	$7,582	0	$0	16	$71,507
2003	0	$0	2	$5,288	5	$25,233	0	$0	1	$2,699	2	$5,923	1	$816	11	$39,958
2004	1	$275	6	$19,715	6	$26,337	0	$0	0	$0	2	$4,439	1	$1,610	16	$52,376
2005	1	$5,107	4	$5,762	7	$27,737	0	$0	2	$12,111	1	$1,400	1	$1,390	16	$53,506
2006	0	$0	9	$40,742	5	$32,634	0	$0	0	$0	2	$7,000	0	$0	16	$80,376
2007	0	$0	19	$126,118	4	$35,874	1	$2,983	2	$20,793	1	$1,750	2	$6,145	29	$193,663
2008	1	$8,009	22	$400,729	6	$23,042	1	$19,314	4	$19,114	2	$5,739	0	$0	36	$475,946
2009	3	$8,054	9	$62,510	10	$89,114	2	$35,399	0	$0	4	$17,765	1	$2,106	29	$214,949
2010	1	$1,500	13	$96,265	6	$33,210	1	$3,845	1	$7,276	1	$4,000	1	$3,250	24	$149,347
2011	0	$0	5	$30,176	5	$70,441	4	$54,213	7	$27,077	3	$38,336	1	$1,868	25	$222,110
2012	1	$1,400	1	$4,483	4	$18,000	3	$31,068	4	$11,210	1	$4,000	1	$20,014	15	$90,174
2013	3	$4,018	4	$41,758	5	$32,886	2	$93,401	3	$13,080	2	$4,815	2	$18,088	21	$208,045
Median	-	$0	5	$19,715	6	$32,634	-	$0	1	$4,285	1	$4,439	1	$1,868	16	$86,884

Elk Habitat

No single factor impacts wildlife, including elk, more than habitat. As with all wildlife species, elk need adequate amounts of food, water, cover, and space throughout their life to survive. These fundamental requirements change throughout the year as elk use winter, summer, and transitional ranges. Positive or negative impacts to these seasonal habitats impact distribution and abundance of elk, ultimately affecting associated recreational opportunities. Inherently, elk zones sharing the same fundamental habitat type may potentially provide similar benefits to wildlife populations across a large area, while zones with fundamentally different habitat types may display differences in elk productivity. For example, while not proven to be a cause-and-effect relationship, calf:cow ratios vary among ecological sections (Fig. 4).

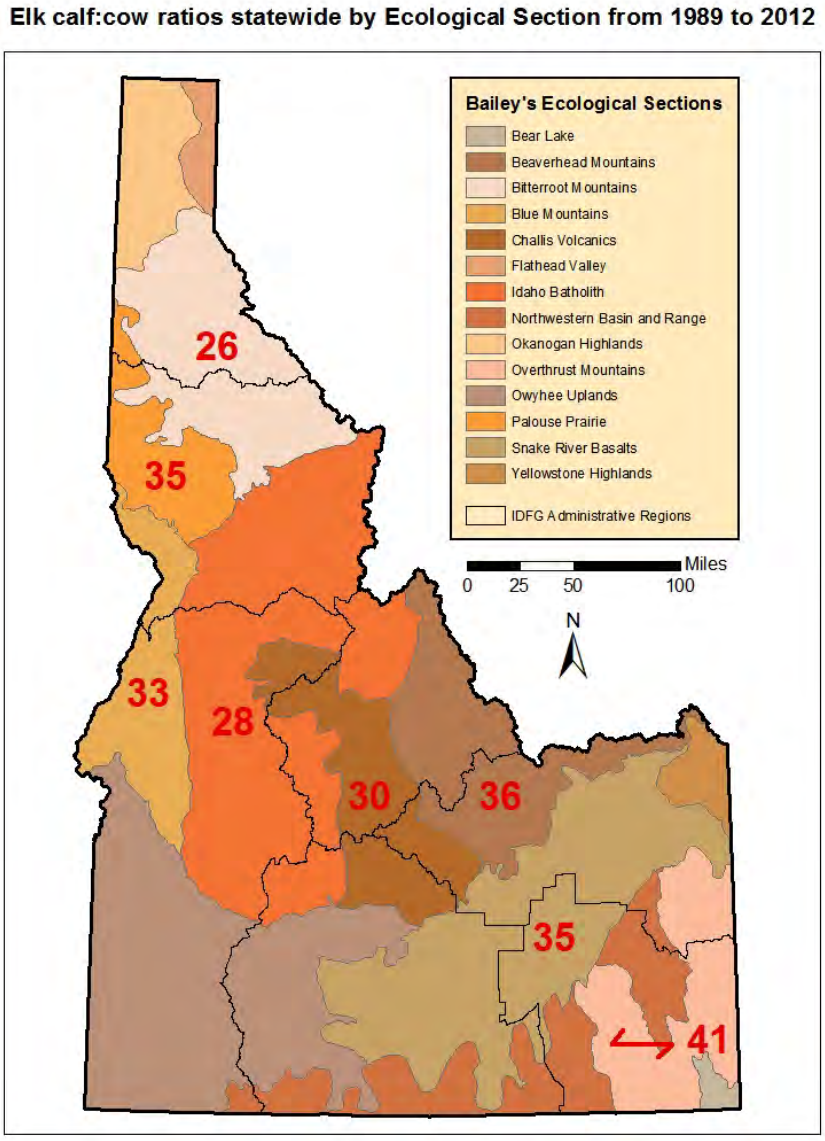

Figure 4. Elk calf:100 cows ratios (number in red is the number of calves per 100 cows) by ecological section, 1989-2012.

Natural phenomena that alter elk habitat, such as wildfire and drought, are common throughout the western states and impact a suite of wildlife across the landscape. Human-caused impacts to elk habitats can also influence the ability of a habitat to sustain elk populations throughout the year. In Idaho, 6 primary habitat issues affecting elk are invasive plants, wildland fires, timber and rangeland management, ecological succession, human development, and energy development.

Invasive plants and noxious weeds.— Infestations of invasive plants and noxious weeds have major impacts on ecological conditions that support wildlife. For example, invasive plants and noxious weeds reduce and even replace native or desirable non-native plants and ultimately reduce wildlife forage, alter thermal and escape cover, change water flow and availability to wildlife, and may reduce territorial space necessary for wildlife survival. This disruptive process ultimately affects the quantity and quality of available habitat and will reduce elk populations. The Bureau of Land Management (BLM) estimates 4,600 acres of native habitats on federal land in the West are lost each day to weed infestation (BLM 2011).

Invasive plants and noxious weeds are plants that are not native to Idaho and cause harm to people or our environment. Most have come from Europe or Asia either accidentally or as ornamentals that have escaped. These plants have an advantage because the insects, diseases, and animals that would normally control them are not found locally. Because these plants have developed specialized mechanisms to survive and have no natural controls in Idaho, they can spread at alarming rates.

To combat invasive plant species, strategies have been developed from information gathered by agency personnel, private landowners, surveys, interviews, and from analyses of existing information. General management priorities on critical elk ranges include: 1) prevent establishment of potential invaders; 2) characterize and eradicate new invaders; 3) reduce spread of weeds by treating transportation corridors and areas of concentrated human activities, such as roads, trails, campgrounds, trailheads, parking lots, gravel pits, and satellite infestations of established invaders; 4) contain locally established invaders; 5) reduce the density or slow the spread of widespread established invaders; 6) require the use of weed-free hay on public lands; 7) inventory and map current noxious weed infestations; 8) monitor sites for effectiveness of control actions; and 9) restore areas to prevent re-establishment of noxious weeds and improve habitat quality of areas currently infested with weeds.

The State of Idaho has adopted Integrated Weed Management (IWM) practices (Idaho Weed Coordinating Committee 2005). The program is “a holistic systems approach to weed management involving the best management techniques available to limit the impact and spread of targeted plant species.” This strategy regarding invasive plants and noxious weeds leads to the most effective and efficient tools and methods for management.

Wildland fire.— Wildfire is a major ecological force that helps maintain historical plant communities. Today, few factors play as critical a role in elk habitat condition and health as wildfire. Historically, wildfires helped maintain a mosaic of plant communities across the landscape. Succession of vegetation post-fire provided excellent forage and cover for elk. However, current wildfire frequencies have departed significantly from historical regimes

throughout many of the plant communities occupied by elk (Miller and Rose 1999). In general, current wildfire return intervals are too frequent in low elevation shrub-steppe communities and too infrequent in mid- to upper elevation shrub and aspen-conifer communities to create optimal elk habitat.

For several years following a fire, many preferred elk forage species are enhanced by an increase in available nutrients (Asherin 1973, Leege 1979, DeByle et al. 1989). Fire improves the quality of forage under aspen stands (Gruell and Loope 1974, Canon 1985). Prescribed burning of shrubs in grand fir (*Abies grandis*) and Douglas-fir (*Pseudotsuga menziesii*) forests increased forage by reducing the height of tall shrubs and promoting growth of preferred forage species (Lyon 1971, Leege 1979).

Aspen-conifer communities provide important seasonal cover (security, calving, and thermal) and forage resources for elk in Idaho. Under normal circumstances, aspen-dominated patches are often scattered throughout or on the edge of larger conifer-dominated stands, and conifer encroachment is a natural process within aspen stands. However, aspen is well adapted to fire and other disturbances and aspen-dominated stands were historically maintained through these processes (Jones and DeByle 1985). Historical fire frequencies in aspen-conifer communities ranged from 25 to 100 years (midrange 63 years) with a mixed pattern of severity (USDI 2004). Fires are currently much less frequent (≥100 years), increasing the potential for landscape-scale events (Tausch et al. 1981, Miller and Rose 1999, USDI 2004). The use of targeted mechanical and prescribed fire treatments in aspen communities subject to conifer encroachment can help improve stand conditions and increase the extent of aspen-dominated communities throughout the range of elk in Idaho.

Shrub-steppe communities are a crucial component of elk winter range in central and southern Idaho. Historically, wildfires in low elevation sagebrush-steppe were small and patchy, resulting in a mosaic of burned, recovering, and unburned lands (Howard 1999). By the mid-1900s, the combination of wildfire suppression and land use resulted in a trend toward monotypic stands of woody plants (such as sagebrush and rabbitbrush [*Chrysothamnus* spp., *Ericameria* spp.]) and the loss of important herbaceous understory vegetation. These factors, combined with the introduction and invasion of exotic annual grasses, have resulted in a current trend toward larger and more frequent wildfires in low elevation sagebrush-steppe communities (USDI 2004). After fires in shrub-steppe communities, annual grasses can out-compete native shrubs for water, thus preventing re-establishment of the shrub component. The increase in fire frequency has decreased availability of quality forage, negatively altered structure of the plant community, increased patch size, and decreased patch diversity. These changes relate to how elk use these areas for foraging, bedding, security, and breeding. In general, decreased diversity and structure results in fewer areas that can inclusively meet the needs required during the annual cycle of healthy elk herds. Large scale wildfires can also result in vast areas that are unusable to elk and currently cannot be effectively restored.

Timber and rangeland management.— Timber harvest can have both positive and negative impacts on elk. Timber harvest and roads associated with logging cause surface disturbance to soils and ground litter, and alter the amount of coarse woody debris on the forest floor. Disturbed soils along roads and in logged areas are prime spots for invasive weeds to colonize. The

increase in the number of roads amplifies elk vulnerability due to the increase in human activity. Loss of security cover due to timber harvest causes elk to become more vulnerable to predators and hunters (Christensen et al. 1993). On the other hand, timber harvest can increase nutritional quantity and quality of forage (Collins and Urness 1983). Changes in forage relate to the inverse relationships between forest cover and understory vegetation production (McConnell and Smith 1970). Timber harvest has the greatest potential to benefit elk when few new roads are built or roads are closed once harvest is complete, adequate security cover is preserved, and size of openings are considered (Lyon and Christensen 2002).

Idaho rangelands, especially those of the sagebrush-steppe, provide forage and cover resources for elk. Historically, management of sagebrush-steppe often involved the removal of sagebrush under the premise of increasing grass and forb production. More recent evaluations of this paradigm are concluding that intact sagebrush-steppe maintains higher levels of forage production than areas treated to remove sagebrush (Welch 2005).

Livestock grazing is ubiquitous to Idaho rangelands. Livestock grazing systems are designed to benefit livestock, and if designed and managed properly, can benefit wildlife habitat. Improper grazing management negatively affects wildlife production, plant vigor, water quality, and soil erosion and productivity. Timing of livestock grazing, especially cattle, can impact elk use of rangelands as elk distribution changes in response to cattle presence (Stewart et al. 2002), and elk and cattle are selecting some of the same resources during late summer (Coe et al. 2001). Some studies suggested livestock grazing can have a positive effect on forage conditions (crude protein, digestibility) for elk when timing, intensity, and duration of livestock grazing are controlled, while other studies do not show improvements.

Ecological succession.— Elk tend to be most productive in habitats that are in a mosaic of plant successional stages. Evidence suggests this is due to associated vegetation diversity and availability of high quality forage. The challenge is that nature is dynamic and communities do not remain in a single successional state. Thus, ability of a landscape to support elk varies with these changes in habitat.

Elk diets vary seasonally and annually due to nutritional demands, plant phenology, and weather patterns. Elk are considered to be mixed feeders consuming both herbaceous and woody plants (Cook 2002). Elk prefer grass and forbs during the summer because of their digestibility and nutrient content, but may consume a large proportion of shrubs (Cook 2002). High elevation meadows and riparian areas are preferred summer habitats (Adams 1982). Good summer nutrition is important for survival of cow and calf elk over-winter (Cook et al. 2004). When nutrition during summer and autumn is poor, cow elk are likely to breed later than cows in good condition, or not at all (Cook et al. 2001). Woody shrubs are eaten by elk throughout winter. However, if summer habitat conditions do not allow elk to obtain good body condition by autumn, elk on high quality winter range may not survive through winter (Cook 2011). Body condition of elk in autumn is dependent on quality of summer habitat, not on body condition of the individual in the prior spring (Cook 2011).

Typically, most of the edible biomass in late successional or climax forest systems is out of reach of terrestrial herbivores. In mature coniferous forests of the Rocky Mountains, more than 99% of

total above ground vegetation biomass may be tied up in trees (Wallmo 1981). Shrubs and herbaceous plants make up <1% of the total vegetation biomass in these late-seral systems (Gary 1974, Landis and Mogren 1975). Forage supply is inversely related to the amount of tree overstory in forested habitats (Folliott and Clary 1972). However, some xeric forest habitat types maintain forage availability with overstory canopies. Mature forests can also be beneficial to elk when mature stands are associated with mid-seral stands in areas that elk frequent during late summer and early autumn prior to and during early breeding season.

In general, managing habitats in a mosaic of plant successional stages will prove most beneficial to elk. Overall plant diversity and forage is higher in recently disturbed areas. Exceptions to this might be on certain winter ranges where shrubs can take much longer to regenerate. Disturbance is crucial to maintaining high quality elk habitat. Traditionally, different fire cycles and human disturbance, such as logging, resulted in higher elk densities than occur in many areas today. In the short-term, weather patterns can affect elk populations, but landscape-scale habitat changes will impact long-term trends.

Human development.— The main issues with human development are habitat loss and habitat fragmentation. Development includes construction associated with residential, commercial, agricultural, energy, infrastructure, and other human activities.

The U.S. Census Bureau reported that Idaho is the fourth fastest growing state in the union. The total human population of Idaho increased 21.1 % between 2000 and 2010. A Geographic Information System-based analysis of human population growth in Idaho was recently completed using census data and a projected housing density model was developed by D. Theobald of Colorado State University. This analysis indicated recent human population growth (2000 to 2004) has not been uniformly distributed across the state. Instead, recent growth has occurred primarily in distinct portions of Idaho: greater Boise area, Teton Valley, greater Coeur d'Alene area, Magic Valley-Blaine County, and Bear Lake area. Similarly, projections through 2030 indicate most future human settlement will be clustered in several general areas of the state: greater Coeur d'Alene area, Palouse area, greater Boise area, Magic Valley-Blaine County, and eastern Snake River Plain-Teton Valley areas (Fig. 5).

Several of the growth "hot spots" identified above are also areas where important elk summer and winter habitats occur. As a result, elk populations that have already been adversely affected by past and current development are further threatened by predicted rapid human population expansion and associated development.

Concomitant with human population growth, Idaho has experienced increases in road construction and elk-vehicle collisions. Approximately 640 elk-vehicle collisions were reported in Idaho from 2000-2010 (G. Burak, IDFG, unpublished data). Roads also fragment habitats and migration corridors and can alter elk seasonal migrations, reducing the potential of habitats to support healthy elk populations.

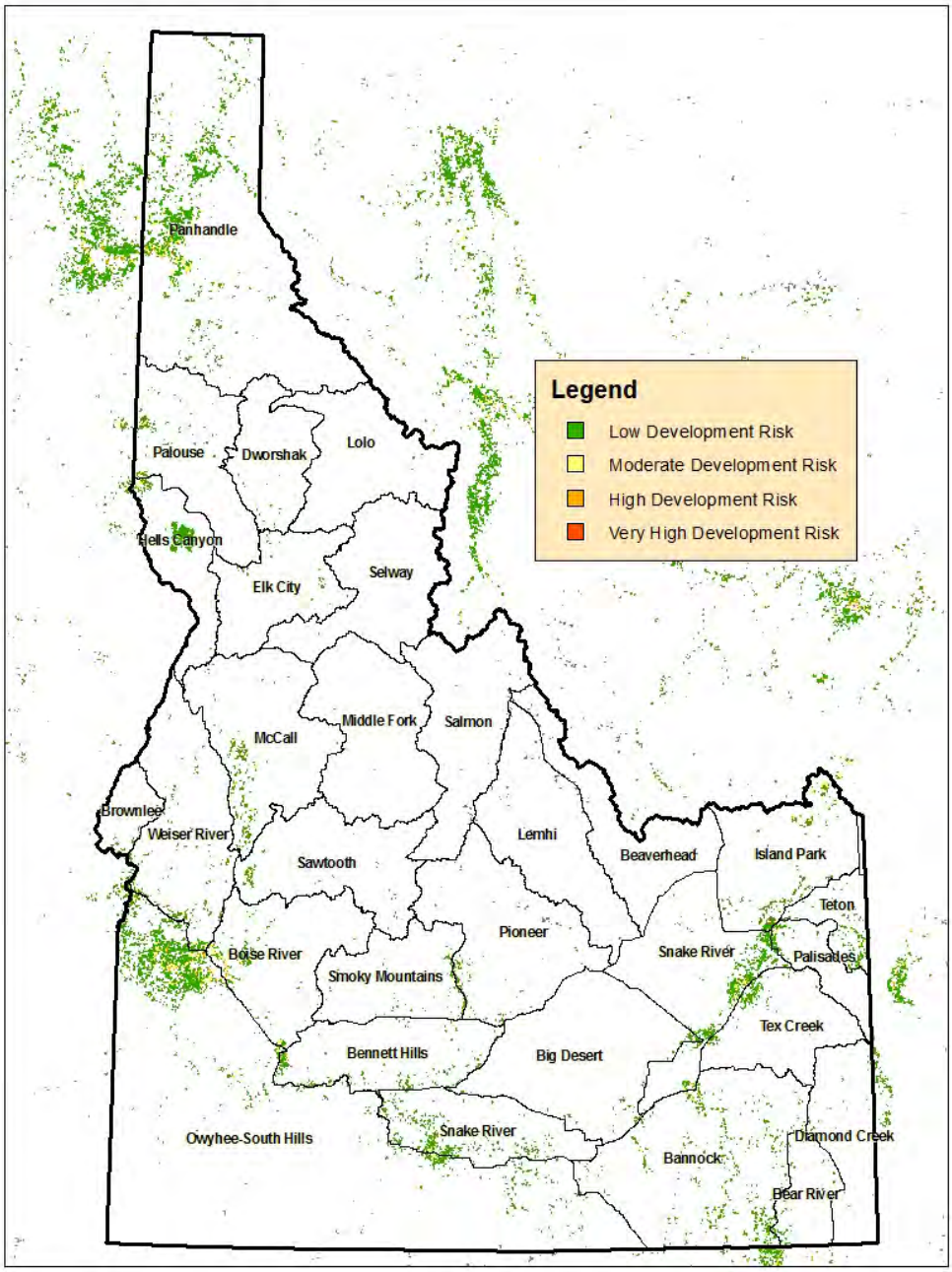

Figure 5. Projected risk of human development through 2030 by elk management zone in Idaho.

Energy development and mining.— Increasing human populations create more demand for energy development and raw materials from mineral extractions. Energy developments common to Idaho include hydro power, wind power, oil and gas development, and their associated transmission lines. Impacts of energy development and mining on elk habitat are expected to increase as development continues into the future.

Exploration, construction, and production phases of energy development and mineral extraction can cause direct loss of habitat (USDI 1999). Wind turbine bases, oil and gas platforms, transmission line corridors, and the roads associated with development replace what was once wildlife habitat. Open pit mining causes habitat loss which may be reclaimed, but these reclaimed sites can have reduced habitat diversity and quality.

Energy development and its infrastructure can lead to disturbance that impedes key habitat functionality by altering wildlife access to or use of habitat and by causing avoidance and stress (Cox et al. 2009). Increased vehicle and human traffic, equipment noise, and noises related to the mining or drilling operation can lead to elk avoiding preferred habitat. The increase in human activity along roads built for energy development and mining can lower elk survival through injury or death due to a vehicle collision, poaching, and harassment from a variety of increasing recreational activities, such as off-highway vehicle (OHV) use (Cox et al. 2009, Dzialak et al. 2011, Webb et al. 2011). Large scale wind-energy projects have potential to displace elk from important seasonal habitats (USFWS 2011). Transmission corridors and associated roads can cause direct mortality and reduce available habitat due to fragmentation (Cox et al. 2009).

Habitat descriptions.— Habitat conditions for elk in Idaho can be described in numerous ways and at a variety of scales. We chose to use the Ecological Systems Classifications. This classification system consists of recurring groups of vegetative communities with similar physical environments and influenced by comparable ecological processes (e.g., fire) to describe environments (IDFG 2005*a*). This system is used throughout the U.S., Canada, and Mexico for describing plant communities within landscapes and is an accepted standard for many land management agencies. The system can be used to describe habitats and for mapping terrestrial communities and ecosystems at multiple scales.

This same classification system, along with finer scale "habitat" descriptions within Idaho, were developed and described within the Idaho Comprehensive Wildlife Conservation Strategy (IDFG 2005*a*). Idaho is currently developing new habitat descriptions that will be available within the new Idaho State Wildlife Action Plan by 1 October 2015.

Idaho is comprised of 5 ecoregions: the Canadian Rocky Mountains in the northern part of the state, the Middle Rockies–Blue Mountains across the central part of the state, the Columbia Plateau that follows the Snake River across the state, the Utah–Wyoming Rocky Mountains along the southeastern boundary of the state, and the smaller Wyoming Basins in the southeastern corner of the state. These ecoregions are subdivided into 14 ecological sections (Fig. 6): the Okanogan Highlands, Flathead Valley, Bitterroot Mountains, Blue Mountains, Idaho Batholith, Challis Volcanics, Beaverhead Mountains, Palouse Prairie, Owyhee Uplands, Snake River Basalts, Northwestern Basin and Range, Yellowstone Highlands, Overthrust Mountains, and Bear Lake (IDFG 2005*a*). For a full description of each ecological section and percentage of ecological section in each elk zone, see Appendix 3.

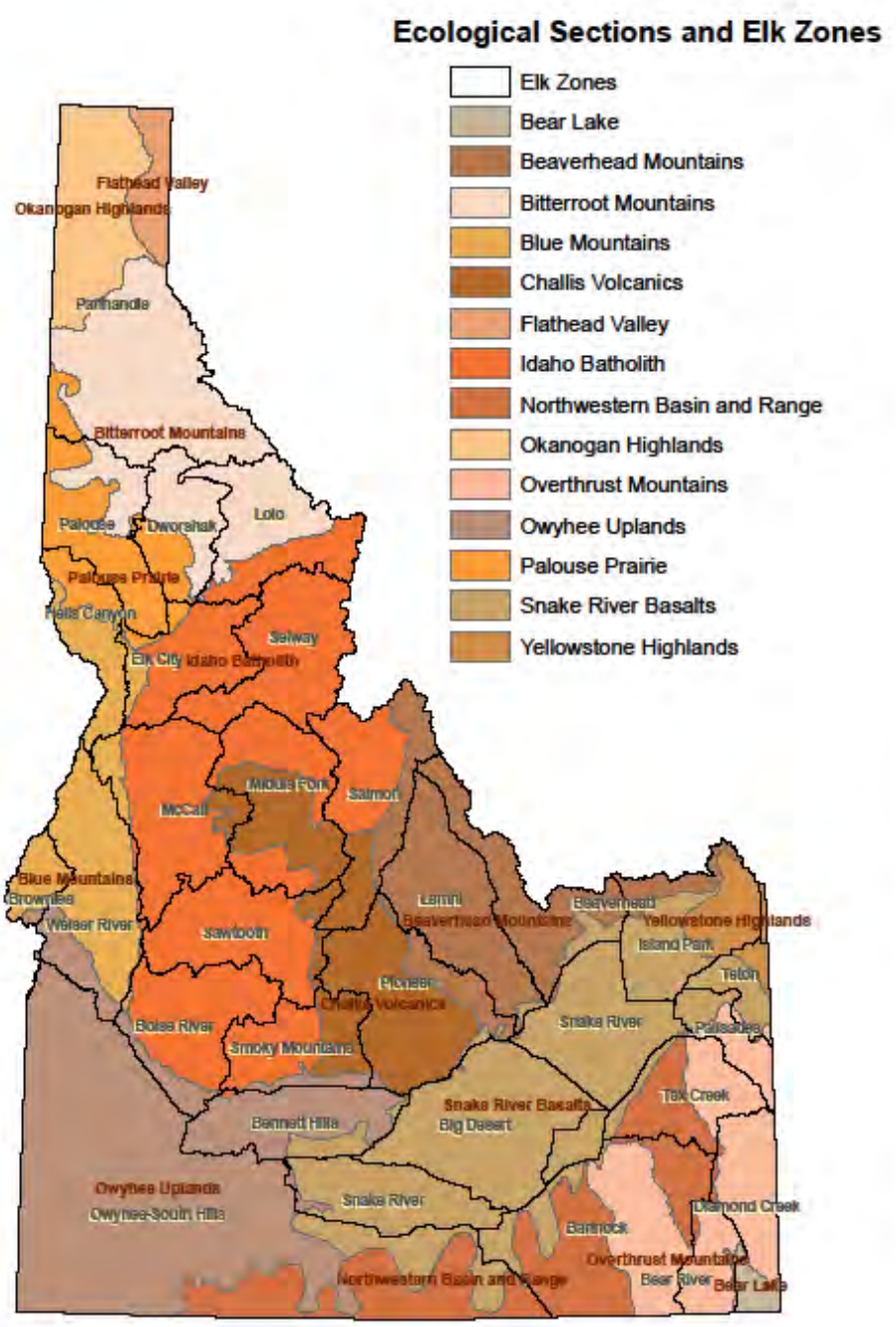

Figure 6. Underlying ecological sections for each elk zone in Idaho.

Access and Travel Management

Access and travel management in elk habitat has long been an opportunity and challenge facing wildlife managers. Historically, motorized access into elk habitat was created as roads were built into forested habitats for timber removal. New roads allowed more hunters access into elk habitat and subsequent declining bull:cow ratios in many elk herds led to discussions and research regarding elk vulnerability and habitat security. Conversely, having access to elk

hunting areas is an important issue for many elk hunters and wildlife managers. Today, managers are still concerned about access, striving to achieve a balance between having access for hunting opportunity and adequate security to maintain bull:cow ratios.

The IDFG manages a very small portion of elk habitat in the state. Approximately 67% of the state is land managed by county, state, or federal agencies, of which 38% is managed by the U.S. Forest Service (USFS) and 22% is managed by the BLM (Fig. 7). Land management agencies have primary responsibility to manage roads, trails, and travel on public land. The IDFG acts in an advisory role to state and federal managers and does not have authority to close roads or trails to recreationists. The IDFG hopes to influence land management decisions to balance the need for providing access for hunting and recreational opportunities, without negatively impacting elk populations or elk habitat.

Figure 7. Land ownership patterns in Idaho.

Access into elk habitat, which was largely an issue with hunters during hunting season, now occurs year-round as an increasing population seeks motorized and non-motorized outdoor recreation. New OHVs allow recreationists and hunters to access elk habitats that were once secure. Registration of OHVs in Idaho increased substantially from 1991 through 2011 to >134,000 (Fig. 8). Whereas human access into elk habitat has potential to displace and disturb elk, motorized access (whether on roads or trails) generally has the greatest negative effect on elk movements, vulnerability, habitat security, habitat effectiveness, and therefore, elk population levels (Naylor et al. 2009). The issue of roads and motorized travel and effects on elk behavior and management has been widely studied for decades.

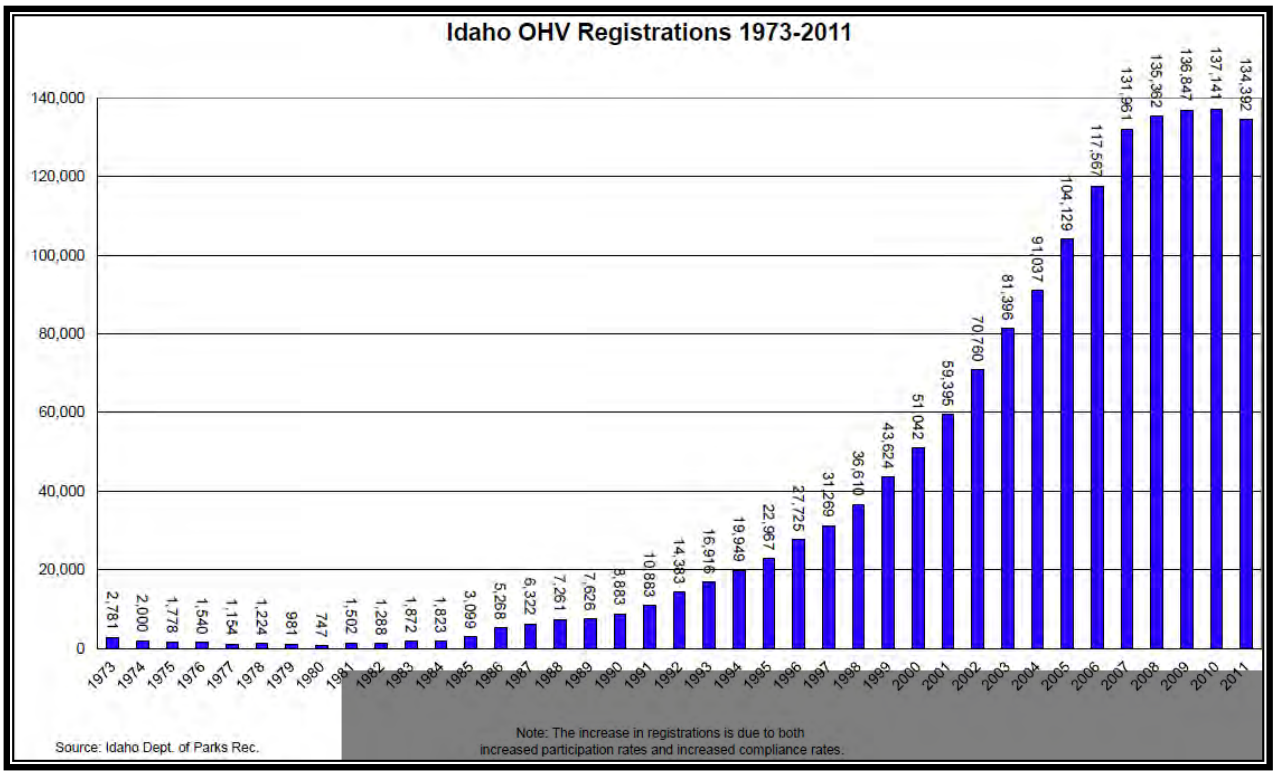

Figure 8. Registration of OHVs in Idaho, 1973-2011.

Harvest vulnerability.— There are several key management considerations regarding access and travel management. Roads open to motorized travel increase hunter access and subsequently increase elk vulnerability to harvest (Leptich and Zager 1991, Unsworth and Kuck 1991). Leptich and Zager (1991) documented higher bull mortality rates (62% mortality) in highly roaded areas compared to areas with few roads (31% mortality) in Idaho. In the highly roaded area, no bull lived past 5 years, whereas bulls lived to >10 years in the area with few roads. In highly roaded areas, there were <10 bulls per 100 cows. Closing roads boosted sex ratios to nearly 20 bulls per 100 cows and ratios in unroaded areas were almost 35 bulls per 100 cows. Unsworth and Kuck (1991) concluded bull elk in roaded habitats were more than twice as likely to be killed during hunting seasons as those in areas with few roads.

Adequate numbers of older age-class bulls are required for elk populations to function properly. Squibb et al. (1986) documented that heavy hunting pressure interfered with normal breeding by delaying conception dates of elk. Additionally, breeding age of bulls also affects elk productivity in a similar fashion. When older bulls are present in a population, conception dates in cow elk are earlier and more synchronous, resulting in calves being born earlier and over a shorter time period each spring (Noyes et al. 1996). A synchronous birth pulse results in fewer calves taken by predators in the spring. Calves born later in the year will subsequently be smaller entering winter and more susceptible to predation and starvation. Access management is a tool that wildlife managers can use to maintain robust elk populations and maintain public hunting opportunities without restricting seasons (e.g., controlled hunts, weapon restrictions, shorter seasons, or seasons during a less desirable time of year).

Seasonal issues.— Road and trail closures during critical times of the year, such as during winter or calving seasons, can be beneficial to elk populations. There are issues to consider from recreational use of motorized vehicles by non-hunters or during times of the year outside of hunting seasons. In areas with high road densities, elk exhibit higher levels of stress and increased movement rates (Rowland et al. 2005, Naylor et al. 2009). Naylor et al. (2009) exposed elk to different types of recreational activity. Exposure to all-terrain vehicles (ATV) caused the largest reduction in elk feeding and resting time, and increases in elk movement, followed by mountain biking, hiking, and horseback riding. Limiting human disturbance can eliminate unnecessary energy expenditures of elk during winter when forage quality and quantity is reduced (Parker et al. 1984). To ensure healthy development of an elk fetus, cow elk must minimize energy costs that exceed those required for maintenance (Geist 1978). Calving season closures have been recommended when reduced productivity of elk during calving season was documented after human disturbance (Shively et al. 2005). The energetic cost of moving away from disturbance associated with roads and trails may be substantial (Cole et al. 1997) and could limit population productivity or reduce an elk's ability to withstand winter by depleting fat reserves (Cook et al. 2004).

Habitat use.— Displacement of elk away from roads and trails may cause substantial reductions in habitat utilization and habitat effectiveness. Human disturbance associated with roads and trails negatively influences elk behavior because elk vacate otherwise suitable habitat to avoid human activity (Lyon 1979, 1983; Naylor et al. 2009). Displacement of elk into poorer habitat might be equally or more detrimental than increased energetic costs caused by movements (Hobbs 1989). When elk are displaced into poor-quality habitats, they may be forced to use poorer quality forage and expend more energy on thermoregulation (Cassirer et al. 1992). Water and riparian areas are important to lactating elk (McCorquodale et al. 1989), but in Idaho many roads and trails follow drainages, thus making these important habitats less available to elk. Research has shown quality of summer and autumn ranges largely determines condition of an elk heading into winter, and thus whether that elk can survive winter (Cook et al. 2004). A relatively small difference in forage quality consumed by elk in summer and autumn can have very strong effects on fat accretion, timing of conception, pregnancy rates of lactating cows, calf growth, yearling growth, yearling pregnancy rates, and winter survival rates.

Another issue related to motorized access to roads and trails is displacement of elk onto adjacent private land where hunting is restricted (Wertz et al. 2004, Proffitt et al. 2010). Damage to crops, haystacks, and fences often result, at significant cost. Additionally, agricultural damage and reduction of rangeland forage meant for domestic livestock reduce landowner support toward elk. Reduced support generally leads to more liberal elk harvest as IDFG reduces the local elk population to address agricultural depredations. By simply limiting motorized access in these areas, elk may remain on public land longer and public hunting opportunities can be maintained or increased (Rowland et al. 2005).

Tools and strategies.— Elk hunters generally support road closures as a management tool. However, there are many hunters and user groups who use OHVs and oppose road or trail access restrictions. Over 60% of hunters reported managing access (i.e., closing roads) was easily acceptable or tolerable as an elk management tool (Gratson and Whitman 2000*b*). Similarly, in a statewide survey of Idaho rifle hunters, only 10% of elk hunters reported closed roads were never acceptable, whereas 67% reported closed roads were always or usually acceptable (McLaughlin et al. 1989). Sanyal et al. (2012*a*) reported almost 73% of elk hunters found restricting use of OHVs an acceptable method to improve elk hunting in Idaho. Further, Sanyal et al. (2012*a*) found most elk hunters travel on foot when hunting, about one-third use OHVs or pack animals, and very few hunters use a mountain bike. In a separate survey of southern Idaho resident hunters (survey included mule deer, elk, and upland game hunters), Sanyal et al. (2012*b*) reported individuals who identified themselves as "primarily a hunter" strongly supported restricting motorized vehicles to established roadways (61%), whereas those who identified themselves as a "hunter and OHV enthusiast" strongly opposed (41%) restricting motorized vehicles to established roadways. Both groups, hunters and hunters-OHV enthusiasts, agreed they were likely to use OHVs to retrieve game, access a hunting area, and to some extent as a social mechanism (Sanyal et al. 2012*b*).

Reduced disturbance by motorized vehicles, reduced hunter densities in non-motorized areas, and potential for greater success rates provide a greater "quality" hunting experience for many hunters (McLaughlin et al. 1989). In Montana, hunters spent more time walking, saw more elk, and actually had greater success when vehicle travel was restricted (Basile and Lonner 1979). Gratson and Whitman (2000*a*) saw elk hunter success improve from 14% in heavily roaded areas to 24% in an area with managed access (i.e., closed roads) in north-central Idaho. Closed roads likely increase elk habitat use in those areas and provide quiet access, leading to increased encounter rates between hunters and elk. However, overall harvest in travel-restricted areas tends to be lower because fewer hunters access such areas (hunter densities are lower).

In response to concerns expressed by hunters about increasing deer and elk harvest vulnerability, declining buck and bull ratios, hunter complaints about hunt quality, and to resolve hunter concerns about off-road travel, IDFG implemented a motorized hunting rule (MHR) in 2002 that restricts all motorized vehicle use by hunters to roads capable of travel by full-sized vehicles. The MHR has allowed IDFG to maintain longer seasons with more tags or permits available to hunters. Currently (2013), the MHR is in effect in 30 GMUs.

Hunters do need a reasonable amount of access to reach hunting areas. Access into the backcountry is a need for hunters, recreationists, livestock producers, and land and wildlife

managers. Other desired access for hunters includes public access onto private land for hunting, often through hunter access programs such as *Access Yes!* But "access" does mean different things to different people. Managing expectations and balancing the needs of hunters, other recreationists, and elk populations is paramount for wildlife managers.

Access management will continue to be a challenge for elk management because it involves trade-offs between benefits of increased access versus ecological and economic costs associated with roads (Gucinski et al. 2001). Most hunters want long seasons into easily accessible areas with little hunting pressure and lots of mature animals, but motorized access into elk habitat comes at a cost. When access management is not effective or utilized, IDFG must take other management measures. Without management of hunter numbers through access management (e.g., road and trail closures), elk populations generally have undesirable sex and age structures, increasingly complex and restrictive hunting regulations, and loss of hunting and viewing opportunities for both hunters and non-consumptive users (Leptich and Zager 1991).

Access management for the benefit of elk populations applies to all recreationists, especially motorized-vehicle users, not just elk hunters. The IDFG encourages state and federal land managers to continue to develop comprehensive access management programs that include multiple tools such as timing of use, limitations on use, appropriate density of roads and trails, and complete or seasonal closures of roads and trails to create large blocks of habitat with non-motorized access to benefit elk populations.

Competition Between Elk and Deer

Elk populations have increased in western North America over the last few decades, and many resource managers have questioned the influence of this species on their environment in general and mule deer specifically. Because mule deer (hereafter, deer) populations have generally declined concurrent with elk population increases, resource managers have further questioned the likelihood of a cause-and-effect relationship between these 2 trends, particularly as a result of competition.

Deer and elk undoubtedly interact with each other and components of their environment. However, competition can be difficult to demonstrate in free-ranging wildlife. Impacts must take the form of decreased survival or productivity leading to decreased population growth to be important in population dynamics (Lindzey et al. 1997). Simply observing that elk and deer eat the same forage does not constitute proof of competition.

Energetics.— Deer and elk generally select habitats and behave in a manner that allows them to conserve energy. Under some conditions, energetic costs for deer can be higher than those for elk. Elk tend to have a wider "comfort zone" (Beall 1976) than do deer, in part because elk sweat extensively in warm weather, whereas deer primarily pant to dissipate heat (Parker and Robbins 1984). Elk also tend to have an advantage during winter when snow accumulates because the energy cost of moving in deep snow is less than that for deer (Wickstrom et al. 1984). Further, the larger body mass of elk reduces heat loss in winter, allowing elk to conserve energy more efficiently than deer. Because elk are taller than deer, they have a greater reach and can obtain

forage from taller plants than deer. Thus, elk can often occupy and use more diverse areas and resources than deer in both summer and winter (Lindzey et al. 1997).

Digestion.— Although deer and elk can and do eat the same forages at times, there are physiological differences that provide elk with apparent advantages over deer. The relatively larger stomachs of elk allow them to digest grass diets of lower nutritive quality and greater lignification more effectively than deer. Therefore elk fare better in grass-dominated systems. Conversely, elk need to forage in areas of relatively high forage production and move more often because of their large size, total energy demands, and tendency to form larger herds.

In general, elk are able to take advantage of preferred deer foods, but rarely do deer extensively use common elk forages. Coupled with higher consumption rates for elk, elk foraging is more likely to influence deer than deer foraging is to influence elk (Lindzey et al. 1997).

Many plants contain secondary compounds that retard digestion by herbivores. Because deer rely on more rapid digestion than do elk, plant compounds that slow digestion may be more detrimental to deer. Tannin levels in shrubs are lower in winter than in other seasons, so elk can compete for shrubs more effectively if deer and elk share restricted winter ranges (Lindzey et al. 1997).

Habitat and diet.— Historic ranges of elk and mule deer overlapped in large parts of western North America, and current elk distribution is almost entirely overlapped by mule deer. However, within areas of overlap, deer and elk tend to separate by habitat features. Theoretically, diets of species occupying the same range should differ most during periods of low food availability to minimize interspecific competition (Hardin 1960, Zaret and Rand 1971). Evidence from studies on Starkey Experimental Forest and Range suggests mule deer avoid microhabitats occupied by elk, indicating interference competition occurs between elk and deer (Johnson et al. 2000, Coe et al. 2001). Interference completion may have negative impacts on mule deer if elk exclude deer from limited fawning habitats (e.g., aspen habitats preferred by both species). This exclusion may force maternal females to use high-risk fawning range, thereby increasing neonatal fawn mortality.

Atwood (2009) reported elk shifted their spatial distributions to winter ranges occupied by mule deer and selected resources similar to mule deer during severe winters in southeast Idaho. In addition, dietary overlap of these species increased during severe winters. Elk density, however, did not result in changes in diet composition or quality in deer. Body condition and survival of deer were also unaffected by elk density. Conversely, year effect was significantly related to body condition and survival of deer; indicating environmental conditions were more important than elk density.

Habitat changes, brought on primarily by humans, affect deer and elk differently. Forested habitat maturation and conversion to grassland vegetation types has favored elk over deer. Loss of habitat for both species often means the 2 species are forced into smaller areas, which likely increases potential for competition. Other human-induced influences on habitat probably place greater pressures on mule deer than elk simply because overlap of these developments with deer habitat is greater (e.g., highways and housing developments in deer winter range).

Parasites.— Biting flies, particularly horseflies, may cause greater harassment for elk than deer in some areas. In fact, some have speculated that some elk migrations to higher elevation may be as much related to avoiding horseflies as for searching out higher quality forage. Beyond simple harassment, flies can spread the roundworm Elaeophora, which causes elaeophorosis, which can limit elk populations (Kistner et al. 1982). Mule deer are unaffected by the disease and can act as a host for the roundworm. In this situation, mule deer may exclude elk from some areas (Lindzey et al. 1997).

Population dynamics.— In both species, survival of young to breeding age (recruitment) is affected by an interaction of summer forage condition and winter severity affecting energy expenditure. In general, deer are more susceptible to impacts of adverse weather than elk. These differences are borne out in more pronounced mule deer population fluctuations compared to elk. However, deer exhibit higher reproductive potential than elk, breeding more frequently as yearlings and often producing twins. Therefore, deer populations can rebound more quickly after declines if habitat conditions and other factors are favorable.

Elk impacts on other species.— Like any herbivore, if elk occur at high densities, they can influence vegetation growth and recruitment, and thus occurrence and density of other wildlife species. In national parks, high density elk populations have been linked to reduced or failed recruitment of aspen (Singer 1996, Baker et al. 1997). Hebblewhite et al. (2005), in an area with >9 elk/km^2, documented negative impacts on willow (*Salix* spp.) growth, and songbird abundance and diversity, compared to an area with approximately 1 elk/km^2. In their work, Hebblewhite et al. (2005) attributed changes in biodiversity to a trophic cascade induced by gray wolf predation on elk leading to reduced elk density.

However, managed elk populations outside of parks and other protected areas are unlikely to reach the high densities noted in the unmanaged areas where elk have negatively impacted vegetation. For example, if elk in east-central Idaho were maintained near the upper limit of current objective ranges, overall density would be approximately 1.2 elk/km^2 (based on total land area). Densities on winter ranges would of course be higher (perhaps 3-4 elk/km^2), but still well below levels of un-hunted or lightly hunted populations.

Diseases and Parasites, Game Farms and Commercialization of Elk, and Winter Feeding

Elk are subject to a number of diseases and pathogens. While numerous papers and reports identify pathogens from individual animals or herds from numerous states, no summary of such data for Idaho is known. This document will serve to present known information about diseases that are considered to pose a risk to elk populations if they are currently present in or introduced to Idaho.

Brucellosis.— Brucellosis is a transmissible bacterial disease caused by *Brucella abortus*. In most ruminants, the disease results in abortion or birth of weak calves and arthritis. Brucellosis is a zoonotic disease that can infect humans. The disease was introduced into the U.S. by infected cattle from Europe at the time of settlement. Brucellosis was introduced into the greater Yellowstone area when bison (*Bison bison*) that were being reintroduced into the park were exposed to infected cattle, and from bison it spread to elk (Thorne et al. 1997). The primary

concern with brucellosis is transmission of the organism from elk to cattle (Thorne and Morton 1976), and the economic and logistical consequences to domestic livestock producers.

Detection of brucellosis is done by either detection of antibodies in blood samples or culture of the organism from appropriate tissue samples. When animals are infected with brucellosis, antibodies are produced that can be detected using a number of test procedures. Animals with antibodies are called seropositive and classified as either reactors or suspects. Animals from which brucellosis has been cultured are considered infected. Presence of antibodies does not imply infection as animals can recover from infection.

Surveillance by IDFG found the first evidence of infection in elk in Idaho in 1998 in eastern Idaho. A task force was assembled to formulate a plan to deal with the disease in elk and minimize risk of transmission to cattle. Based on epidemiology and DNA, elk appear to have spread the disease to cattle in Idaho on ≥2 occasions, resulting in the loss of Idaho's Cattle Brucellosis-Free Status in 2005. In addition, elk are suspected of spreading the disease to 2 other cattle herds in eastern Idaho in 2009 and 2012. Currently, the proportion of seropositive elk is approximately 2.5% in eastern Idaho, but varies across GMUs. In general, the known area with antibody positive elk includes GMUs 59, 60, 60A, 61, 62, 62A, 64, 65, 66A, 67, and the northern portion of 76.

Management of brucellosis in free-ranging elk is challenging. Although infection with brucellosis can negatively affect reproductive performance in cows through abortions and stillborn calves, and possibly bulls through orchitis (swelling of the testicles), the population impact in Idaho is relatively low given the low seroprevalence (Gross et al. 1998). There is no effective vaccine for elk, and no way to easily vaccinate elk even if an effective vaccine were available. Where possible, IDFG traps, tests, and removes seropositive elk in eastern Idaho, especially at feed sites that are used repeatedly or if elk interact with cattle during the risk period (January-June).

A cooperative brucellosis plan between IDFG and Idaho State Department of Agriculture (ISDA) was developed in 2006 and serves as the basis for management of elk in the brucellosis-affected area. Most of the joint effort between IDFG and ISDA is to minimize likelihood for potentially infected elk to intermingle with cattle in winter by fencing haystacks, hazing elk away from cattle feedlines, fencing cattle feeding areas, and development of alternative wintering areas. In some areas, elk populations and objectives may be at levels where some reduction in elk numbers is needed to reduce elk-cattle interactions in winter. The cooperative brucellosis plan has 4 primary objectives:

1. Manage elk populations within carrying capacity of available winter habitat and provide for a harvestable surplus.
2. Monitor elk and livestock for exposure to and infection with brucellosis and reduce brucellosis prevalence in elk.
3. Improve habitat to ensure adequate areas of high quality winter and spring range necessary to support a stable and harvestable elk population.
4. Maintain separation between elk and cattle during high risk periods.

The IDFG recommends harvest season frameworks consistent with population objectives. Obtaining adequate harvest of elk in brucellosis-affected zones can be a difficult challenge due to seasonal elk movements that may not correspond to established elk harvest seasons. Some elk that winter in Region 6 spend the summer in YNP and Grand Teton National Park or in Montana or Wyoming. Some elk do not return to Idaho until late fall or early winter, after or late in the hunting season, which may limit access to these animals by Idaho hunters. Implementing harvest season frameworks that will target these elk herds is a dynamic and adaptive process. The IDFG adjusts season length, season timing, tag numbers, and other variables to modify hunter distribution to address concerns for cattle-elk interactions.

Chronic Wasting Disease (CWD).— This disease is known to occur in wild mule deer, white-tailed deer (*O. virginianus*), elk, and moose (*Alces americanus*) only in North America (U.S. and Canada; Williams 2005). The original endemic area was confined to a small portion of Wyoming, Colorado, and Nebraska. But over time, CWD has been found in free-ranging mule deer, white-tailed deer, elk, and moose in an expanding number of states and Canadian provinces which now includes Illinois, Kansas, Maryland, Minnesota, Missouri, Nebraska, New Mexico, North Dakota, New York, South Dakota, Utah, Texas, Virginia, Wisconsin, West Virginia, Alberta, and Saskatchewan. Further, CWD has been found in captive white-tailed deer and elk in a similar area, including Colorado, Iowa, Michigan, Minnesota, Missouri, Montana, Nebraska, New York, Oklahoma, South Dakota, Wisconsin, Alberta, and Saskatchewan. In addition, CWD has been documented in captive red deer (*Cervus elaphus*) in Minnesota. In the endemic area, approximately 5-15% of mule deer and 1% of elk are infected with CWD (Miller and Williams 2003, Miller and Green 2007). Only New York has been successful in eliminating CWD in wild and captive cervids after the disease was recognized (Major et al. 2007).

CWD is uniformly fatal in all species of cervids in which it has been found (Williams 2005). Clinical signs in affected individuals include chronic progressive emaciation with neurological signs that range from tremors to periods of stupor and abnormal gait (Williams 2005). Population-level impacts of CWD are unclear (Almberg et al. 2011, Sargeant et al. 2011). While the disease is fatal to affected individuals and prevalence of the disease increases over time, especially in high density cervid populations, the actual morbidity and mortality rate for CWD-affected herds and populations is unclear. Modeling efforts clearly indicate populations of CWD-affected wild cervids decline to near extinction (Cary 2007), but long-term monitoring has not indicated such population trends. However, most states respond to the presence of CWD with intensive culling efforts to reduce wild cervid density and populations, which may affect model predictions for population performance.

The IDFG has conducted CWD surveillance since 1997 using a combination of targeted and general surveillance. Over 9,000 wild deer and elk have been sampled and to date, no free-ranging cervids have been found with CWD. At least 3 wild deer and elk harvested in Wyoming by Idaho hunters have been positive for CWD. After notification from Wyoming Game and Fish, IDFG notified the hunters to locate all carcass remains. In 2 cases, no carcass was found and in 1 case, the carcass was dumped at a landfill.

In captive domestic elk in Idaho, 3 tracebacks or potential connections to CWD cases or farms in other states have occurred. In 1998, 34 elk were brought to Hamer, Idaho from an elk farm in

Montana. They were then moved to Oklahoma and mingled with other elk from Oklahoma, and CWD was diagnosed in the herd in Oklahoma. None of the CWD-positive animals came through Idaho, but the Idaho farm was quarantined for several months. In 2000, an elk raised in Menan, Idaho and sold to an elk farm in Nebraska was found to be CWD positive. On investigation, the elk was likely infected in Nebraska. In 2001, 37 elk were imported from Colorado to a farm near Salmon, Idaho. The Colorado farm was found to have CWD and the animals imported into Idaho had been in contact with infected animals in Colorado prior to importation. All 37 elk were euthanized, sampled, and the owners compensated for their loss. None of the elk were positive for CWD.

Management of CWD in wild cervids is very challenging (Decker et al. 2007, Langenberg 2007, Wolfe 2007). A number of tactics have been tried in other states, but none were very successful in eradicating the disease once it was found in wild populations. The IDFG adopted a CWD Response Plan in 2002 which was revised in 2010 (http://fishandgame.idaho.gov/public/wildlife/diseaseChronicWasteActionPlan.pdf). Response to the initial finding of a CWD-positive cervid is to define a 5-mile zone around the location of the positive animal for further testing of as many wild cervids as possible, as soon as possible, given local conditions. If additional CWD-positive animals are found, the plan calls for a 50% reduction of wild cervids within 5 miles of the positive site. The plan can be expanded in area and could include a total population reduction if needed. In captive domestic cervids, the ISDA CWD response plan is to quarantine and slaughter all clinical and exposed captive animals.

Giant liver fluke (Fascioloides magna).— Flukes are trematode parasites found in the liver of white-tailed deer and elk in a patchy distribution in North America (Pybus 2001). The parasite is normally found in white-tailed deer, in which it is well tolerated. In elk, the parasite is tolerated, but can cause morbidity or mortality. In abnormal hosts like moose, other cervid species, and domestic livestock, the parasite usually causes extensive liver damage, resulting in morbidity or mortality. Population-level impacts are unknown, but high infection rates may reduce individual animal fitness and extensive mortality may negatively impact wild cervid populations (Pybus 2001).

The parasite has been documented in deer, elk, and bison in British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, Labrador, and Newfoundland, most states in the southeastern U.S., New York, Minnesota, Wisconsin, Michigan, and small areas of Montana, Washington, and Oregon (Pybus 2001). The parasite requires an aquatic snail as an intermediate host. By moving white-tailed deer and elk around the globe, this parasite has been translocated to Europe and New Zealand (Pybus 2001).

To date, giant liver flukes have been documented in 1 wild elk from the Lochsa area, and in 2 deer from the Clearwater Basin. There are some anecdotal reports of liver flukes in elk and moose from other areas in the state. The parasite is present on several captive cervid farms in Idaho in Regions 4 and 6. Movement of the parasite to wild cervids could happen through contamination of aquatic systems with eggs passed in the feces of infected domestic elk.

There are large numbers of susceptible wild cervid hosts in Idaho, as well as suitable aquatic snails. If an introduction did occur, the parasite would be very difficult to manage without severe damage to aquatic ecosystems.

Meningeal worm (Parelaphostronglylus tenuis).— Meningeal worm is a nematode parasite of the meninges of white-tailed deer and occurs over much of the central and eastern parts of North America. To date, meningeal worm has not been documented in Idaho. The parasite causes mortality in most cervid and bovid species that it infects, largely with the exception of white-tailed deer, cattle, and sheep. The parasite is transmitted by a variety of terrestrial snails and slugs, some of which are present in Idaho. The IDFG conducted surveys for meningeal worm in white-tailed deer in Region 1 in 1992 (Foreyt and Compton 1991) and Region 2 in 2002 (M. Drew, IDFG, unpublished data). No evidence of the parasite was found in over 300 animals examined.

Researchers have determined that some elk infected with meningeal worms can tolerate the infection and produce larval worms which can transmit the infection to other animals (Welch et al. 1991, Samuel et al. 1992). Presence of meningeal worm is the primary reason ISDA and IDFG have a prohibition on import of domestic or captive cervids from east of the 100th meridian.

There are 6 species of susceptible cervid and bovid hosts in Idaho (white-tailed deer, mule deer, elk, moose, bighorn sheep [*Ovis canadensis*], and mountain goat [*Oreamnos americanus*]) and if the parasite were introduced, it could have very severe consequences for wild cervids. In addition, control of the parasite would be very difficult as the intermediate hosts are difficult to control in the environment, and there is no viable treatment for infected cervid hosts.

Bovine Tuberculosis (TB).— Bovine TB is a bacterial disease (*Mycobacterium bovis*) distributed worldwide (Thoen et al. 1992). In most infected animals, the disease causes enlargement of lymph nodes and respiratory infections. Chronic cases can develop that lead to pneumonia or systemic illness. Morbidity and mortality are generally low. The disease has a broad host range, including humans. The disease is transmitted by aerosolization, direct inhalation, or ingestion of contaminated materials. Infected animals can shed *M. bovis* through saliva, nasal secretions, urine, and feces (Whipple and Palmer 2000). Bovine TB can be spread by infectious materials in aerosol form or by contamination of feed or water that may be used by other animals.

In North America, bovine TB was introduced to wild deer and elk from infected cattle (Hunter 1996). In wild cervids in North America, only scattered reports of bovine TB are known (Belli 1962, Friend et al. 1963, Dodd 1984, Clifton-Hadley and Wilesmith 1991). However, in 1994, wild white-tailed deer in Michigan were found to be infected with bovine TB (Schmitt et al. 1997, Kaneene et al. 2002). White-tailed deer in Michigan are the only known wildlife reservoir in the U.S., although bovine TB is also found in elk in Riding Mountain National Park in Manitoba, Canada. Maintenance of the disease in white-tailed deer in Michigan is a function of high deer densities and the accepted practices of winter feeding and baiting deer (Schmitt et al. 1997). There is a 2-4% infection rate in deer, but the disease has also been seen in coyotes, black bear, raccoons (*Procyon lotor*), domestic elk, and cattle (Schmitt et al. 1997). Michigan lost its cattle TB-accredited status because of the disease in white-tailed deer. Bovine TB was a major

problem in captive cervids in North America (Miller et al. 1991, Thoen et al. 1992) and spread from captive elk to free-ranging mule deer (Rhyan et al. 1995, Whipple et al. 1997).

Among challenges for dealing with bovine TB in wildlife is that there is no vaccine or treatment. The only management options are to reduce deer populations, ban winter feeding and baiting, and enforce temporal and spatial separation of deer and livestock. The presence of bovine TB in wild cervids in Idaho would have severe impacts on domestic livestock. The introduction of this disease would require extensive testing and culling of wild cervids in conjunction with testing and culling of domestic livestock.

In Idaho, bovine TB occurred on a fallow deer (*Dama dama*) farm near Hammett in 1992. In 1991-1992, a fallow deer farm in Montana was found to be infected with bovine TB, and 15 fallow deer were imported into Idaho from the infected facility. One of the 15 fallow deer was culture positive for bovine TB and all 15 animals were destroyed.

Epizootic Hemorrhagic Disease (EHD).— The disease is a viral disease of white-tailed deer that is spread by *Culicoides* spp. gnats. This disease is related to bluetongue (BT), a viral disease of domestic sheep which can be carried by cattle.

In Idaho, EHD is known to occur in deer, generally as small outbreaks on an irregular basis. The disease is rare in elk, although, based on serology, elk are exposed to EHD. In the last EHD outbreak in Idaho (2003), no wild elk were found with EHD, but 1 elk farm near Riggins had several mortalities associated with EHD.

In white-tailed deer, EHD is maintained by animals that survive the infection. Gnats spread the virus between deer, especially when deer numbers and density are high and summer temperatures create sufficient gnat breeding habitat around the edges of ponds and seeps.

Management of EHD is generally not feasible; there is no vaccine and no treatment. The only way to stop the disease is to either remove all susceptible hosts or wait for a killing frost to significantly reduce gnats.

Game farms.— In Idaho, IDFG generally regulates private possession of wildlife, excluding domestic cervids. In 1999, jurisdiction of domestic cervidae, defined as elk, reindeer (*Rangifer tarandus*), and fallow deer, was transferred to ISDA. The ISDA developed rules for fencing, identification, licensing, fees, and disease testing for importation, all of which have been updated or modified over time. Currently, ISDA and IDFG collaborate on inspection of domestic cervidae farms and facilities with regard to presence of wild cervids. A herd management plan is to be developed for removal of entrapped wild cervids on existing farms and facilities. The Commission is opposed to spending sportsmen's funds on management of domestic cervidae.

The number and distribution of domestic cervidae farms and facilities in Idaho have changed little since 1999 (Fig. 9). The total number of domestic cervidae farms in Idaho has remained relatively constant over 10 years with approximately 70 elk and 9 fallow deer and reindeer farms. Total numbers of animals on domestic cervidae farms declined from >6,500 animals in 2005 to

4,900 in 2012. Annual imports of domestic cervidae for 2005 to 2011 ranged from a low of 222 to a high of 606, with no apparent trend over the past 10 years.

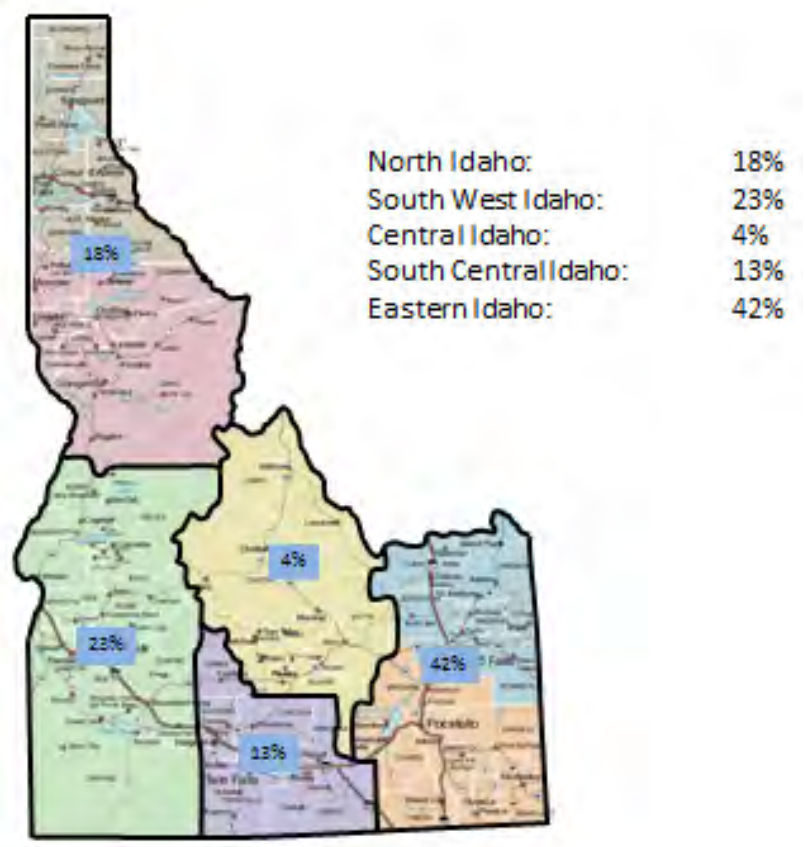

Figure 9. Geographic distribution of domestic cervidae farms in Idaho, 2000-2012.

Contact between wild and domestic elk.— Disease transmission between domestic elk and wild elk is of concern (IDFG Policy, 2007). Several diseases are known to occur in domestic elk, both in Idaho and other locations, but not in free-ranging elk in Idaho. These include giant liver fluke, which has been found on 1 elk farm in both Regions 4 and 6. However, only a few scattered reports of giant liver fluke are known for free-ranging elk or deer in Idaho. Captive elk with CWD have been found in numerous states and ISDA maintains stringent rules for importation and health certification for imported animals. All elk that die on elk farms in Idaho are to be tested for CWD. Typically, 1,500 domestic elk are tested annually. No domestic cervids have tested positive for CWD to date. Meningeal worm is present in small numbers of captive elk in eastern and midwestern states and import of domestic elk from east of the 100th meridian is prohibited to minimize potential of introduction of the parasite into Idaho. Domestic elk do escape from and wild elk do ingress onto elk farms, especially "shooter bull" operations. Hunters in Idaho have harvested elk with ear tags indicating a domestic origin. Not all domestic elk from a large escape in 2006 in eastern Idaho were recovered. In general, wild elk that ingress onto a domestic elk farm are lethally removed, but response depends on a risk assessment jointly conducted by the State Wildlife Veterinarian and the State Veterinarian. Risk assessment

includes evaluating number of animals involved, extent and time of contact, record keeping, and previous presence or absence of disease.

Commercialization.— The possibility of commercialization of wild elk exists on several levels. Given ingress of wild cervids into domestic elk facilities and the difficulty of removing these animals, it is possible that some wild elk could be incorporated into breeding situations on domestic elk farms or harvested by clients on shooting operations. The possibility exists for harvest of viable semen from wild bull elk and subsequent use in domestic elk breeding operations. In addition, commercializing an iconic and wild animal such as elk could lead to a public perception towards lower value of wild elk. Idaho currently does not prohibit sale of parts, except edible meat, from wildlife harvested or legally recovered in the state, so potential exists for commercial exploitation of elk from the state.

Winter feeding.— Winter feeding of big game animals conducted by IDFG follows Commission rules and policy. In general, regional winter feeding advisory committees make recommendations to IDFG about the need to feed wintering deer or elk based on temperature, snow depth, and assessment of animal condition. If feeding is recommended, IDFG will feed animals a diet that is appropriate to the stage of winter, amount of native browse in the diet, and observed body condition of animals to be fed. In general, there are few long-term feeding sites in Idaho. The IDFG maintains a nearly-annual elk feeding operation in the Warm Springs Creek area, west of Ketchum. The intent of this site is to prevent elk from attempting to overwinter within Ketchum, which historically was winter habitat. From the 1930s through early 2000s, IDFG maintained 4 additional long-term feed sites along the South Fork Boise River. These sites were initiated shortly after elk were translocated to the area in the 1930s, and elk were typically fed there 2 of every 3 winters. However, changing elk migration patterns in the area have eliminated the need for the South Fork Boise River sites.

Economics of Elk and Elk Hunting in Idaho

Elk have substantial consumptive (hunting) and non-consumptive (wildlife viewing) values. Of the two, hunting related revenue is easier to quantify: dollars spent on hunting licenses, elk tags, and hunting-related travel expenses are both definable and quantifiable. Elk are considered one of IDFG's flagship species, with >80,000 hunters spending >$6.1 million annually on tags (20% of IDFG's annual license and tag revenue). While nonresident elk tags represent only 10% of total elk tags, they provide 60% of elk-tag revenue. Additionally, direct hunting expenditures (e.g., fuel, meals, lodging, etc.), based on Cooper et al. (2002), indicate elk hunters contribute >$70 million annually; much of it in small, rural economies dependent on tourism dollars. Using a typical economic multiplier of 2.5 (Gordon and Mulkey 1978), total estimated economic impact of elk hunting in Idaho exceeded $175 million.

Wildlife viewing economics are a harder metric to quantify: many nonresident visitors enjoy wildlife viewing, and may even plan their trip with that in mind, but it may not be the sole or even primary focus of their travel. Further, winnowing that intent to view wildlife to dollars spent on a vacation can be even more difficult.

Every 5 years, the USFWS and the U.S. Census Bureau produce both national and state-specific summaries of hunting, fishing, and wildlife-related activities. Though these reports are not species-specific, they are the most comprehensive scientific reviews of economics associated with wildlife-viewing activities. Preliminary results from the 2011 national survey indicate >550,000 people (16 and older) participated in wildlife-viewing activities in Idaho, expending >$444 million in trip-related costs (USFWS 2012).

In 1986, IDFG worked with the USFS Rocky Mountain Forest and Range Experiment Station to assess economic value of elk hunting in Idaho. This survey assessed hunters' willingness to pay for elk hunting trips to determine a value for elk hunting that is directly comparable to the profit of commercial resource-use enterprises like logging, cattle grazing, and mining, etc. In general, hunters were willing to pay more for elk hunting trips on which they saw more elk (Sorg and Nelson 1986). There was some evidence of a "threshold" at which hunters would not be willing to pay more, despite seeing more elk, but the study was unable to determine the 1986 threshold.

A similar study was conducted at Oregon's Starkey Experimental Forest and Range facility in 1995. Fried et al. (1995) assessed hunters' willingness to pay for a "virtually guaranteed" chance at harvesting an elk. In general, willingness to pay for such a hunt followed an S-shaped curve; nearly all hunters were willing to pay a relatively small amount for an almost certain harvest, while very few were willing to pay an extremely high amount (≥$1,000). Hunters exhibited a mean willingness to pay $287/trip where harvest of an elk was virtually certain. At the time of the study, mean expenditures on a 6-day elk hunting trip in Oregon were $297 (Fried et al. 1995).

Finally, Cooper et al. (2002) used a survey to estimate hunters' expenditures on different components (e.g., transportation, food, and lodging) of their 1996 elk hunting trips in Idaho. They found resident hunters spent $65.18/day, while nonresidents spent $165.89/day. On average, resident hunting trips lasted 4.24 days, while nonresident hunting trips were 6.96 days. All told, there were 676,358 resident and 118,736 nonresident hunter days in 1996, resulting in a total of $21.8 million in labor income to the economy of Idaho (Cooper et al. 2002).

Aside from these expenditure data, elk hunting has a significant economic impact on IDFG. For the past several years, revenue from nonresident elk tag sales has declined (Table 5). These revenues represent a significant portion (20%) of IDFG's overall license and tag revenues, and serve as match for federal funding sources that comprise another significant portion.

Table 5. Summary of nonresident elk tag sales, Idaho, 2008-2012.

Year	Tags sold	Revenue
2008	14,714	$5,480,965
2009	12,080	$4,499,800
2010	10,288	$4,287,524
2011	9,395	$3,915,366
2012	8,927	$3,720,327

Finally, the outfitting industry in Idaho provides an important service to elk hunters, especially non-resident hunters, and contributes a vital economic stimulus to the state. Annually, outfitted elk hunters spend more than $1 million for hunting licenses and elk tags. The Idaho Outfitting and Guides Licensing Board is the agency responsible for regulating the outfitting and guiding industry in Idaho. Currently 128 outfitters are licensed for elk hunting in 84 of the 99 GMUs. In 2011, 2,009 elk hunters in Idaho used the services of an outfitter (S. Knapek, Idaho Outfitters and Guides Licensing Board, personal communication) and the estimated outfitter fees paid by elk hunters exceeded $10 million (Grant Simonds, Idaho Outfitters and Guides Association, personal communication). Using a typical economic multiplier of 2.5 (Gordon and Mulkey 1978), total estimated economic impact of outfitted elk hunting in Idaho in 2011 exceeded $24 million.

Compliance with Hunting Regulations

Enforcement strategies formulated to complement the statewide Elk Management Plan are necessary for IDFG to successfully manage healthy elk populations at levels supported by landowners while providing ample recreational opportunity for harvest. Developing laws and regulations easily understood by the hunting public and clearly enforceable by conservation officers is a dynamic, challenging process, not only necessary for management of the resource, but also for addressing issues of public safety, fair chase, and ethical hunting practices. Therefore, a diligent effort in enforcing hunting rules is a necessary strategy for achieving these goals (IDFG 2005*b*). Laws and regulations must also be supported by the majority of hunters.

Idaho conservation officers are often coined “the face of the IDFG” because they are often the first personnel to make contact with hunters in the field. Officers spend approximately 50% of their time enforcing fish and game rules and contact >80,000 licensed hunters and anglers per year, issuing an average of 5,000 citations and warnings (IDFG Fish Management Plan 2013-2018). During these interactions with hunters and anglers, officers often identify “problem areas” within their regions, often resulting in development of enforcement action plans. These plans detail the issue(s), test whether the problem is perceived or real, and outline goals to be achieved in a specific time frame, and identify strategies to accomplish the goals. These plans can simply involve more officer presence in an area, multi-officer saturation patrols, plain-clothes officer work, or for more complex enforcement situations, specifically directed investigations. Results of these action plans are evaluated and revisited often (usually annually) to determine if goals are being accomplished and make adjustments necessary to meet goals.

Officers throughout the state have discussed and come up with 4 statewide issues: 1) illegal OHV use; 2) unethical and illegal behavior during cow elk hunts; 3) illegal baiting; and 4) illegal outfitting. For these, enforcement action plans should be created to determine if the issues are real or perceived and which enforcement techniques will work to deter the behavior.

Use of OHVs has skyrocketed since the late 1980s, creating both biological and social consequences in management of big game. In response to biological and social issues, in 2002 IDFG began implementing the MHR in some GMUs limiting use of motorized vehicles to roads capable of travel by a full-sized automobile. This rule was implemented not only to reduce conflicts between motorized and non-motorized hunters, but also to decrease big game

vulnerability. Generally, a majority of elk hunters support restricting use of OHVs to improve hunting (Sanyal et al. 2012*a*). However the rule is confusing to some, especially when it differs from land management agency travel plans. As one of the primary contacts for hunters in the field, conservation officers will continue to participate and develop programs that help educate and share benefits of the MHR where the rule is implemented.

Cow elk hunts are an important management tool for meeting elk population objectives. However, enforcement issues can arise during these hunts. "Flock shoots," where groups of hunters repeatedly shoot at multiple animals in a herd, often leave more dead or wounded elk than there are hunters with valid tags. Another common violation is "party hunting," where an individual transfers their elk tag to another individual who shot an elk, or vice versa. This practice is legal in some states, but not in Idaho. Party hunting is especially prevalent in late season elk hunts when herds are more concentrated on or migrating to winter ranges. These hunts can also encourage "road hunting," which creates safety issues in and around vehicles. Road hunters are highly visible to the public and activities such as shooting from roads, preventing elk from moving from public land onto private land, and chasing elk with vehicles are not approved of by the public nor lawful. These behaviors are exhibited by only a small portion of hunters, but are often the activities that garner media attention. Officers often attempt to deter this behavior by using Artificially Simulated Animals in areas where problems are occurring. Trespass is another issue that occurs annually and has led to some landowners closing their property to hunting. When hunting is closed on large tracts of private land, crop and property damage from elk often increase, further reducing landowner support for elk.

Baiting to attract and concentrate big game animals to a certain area for hunting is a practice conservation officers are seeing more frequently; however, identifying perpetrators requires extensive personnel time. Baits are often hard to find, and particularly hard to detect when placed on private land. Increasing public awareness and reporting, and innovative techniques and sleuthing to identify and detect illegal baiting, are needed to improve compliance.

Monetary value of elk, especially of large bull elk has substantially increased in the last 20 years, likely leading to increased illegal outfitting. These illegal activities result in lost revenue for licensed outfitters and reduce opportunity for the hunting public. Enforcement efforts for apprehending illegal outfitters is very time intensive and sometimes requires years of investigation for successful prosecution. Detecting and investigating illegal outfitting continue to be a focus of enforcement efforts.

Solid, dynamic law enforcement techniques are critical for effective management of sustainable elk populations, now and in the future. In addition, coordination and integration of IDFG law enforcement efforts with other law enforcement agencies and land managers (i.e., USFS, BLM, city, and county officers) is vital in helping IDFG meet its goals and objectives. Finally, IDFG will continue to adopt and implement regulations to ensure that illegal harvest is minimized and opportunities for legal hunting and viewing are maintained.

Citizen Involvement and Outreach

With approximately 107,000 elk in Idaho, elk rank among the state's most prized wildlife species. Widespread fascination with this majestic animal among a variety of user groups

provides an opportunity to share with the public what IDFG is doing for Idaho's wildlife and wildlife management in general. Numerous programs implemented by IDFG on a continual basis are part of the elk management process. Programs include habitat improvement measures, predator control activities, population surveys, and formation of working groups or committees designed to address issues affecting elk in Idaho (Winter Feeding Advisory Committees, Clearwater Basin Collaborative, Western Governors' Wildlife Council, etc.).

Elk enjoy a high level of interest among Idahoans. A critical component of IDFG's elk management efforts involves ensuring all stakeholders are provided timely and accurate information, and that information is readily available through traditional and innovative communication methods. The IDFG provides a variety of opportunities for public involvement, including public meetings; mail, telephone, and web-based surveys; news media; task groups (e.g., Winter Feeding Advisory Committee); and workshops. The IDFG will continue to embrace newer communication methods such as on-line chats and Twitter. The IDFG envisions developing specific communication outputs: a user-friendly summary of the elk plan, an elk web page, elk information kiosks, elk management surveys, elk information campaigns, and "elk in the schools" programs.

Public elk plan.— Upon completion of the new elk management plan, and to better facilitate public awareness and education regarding IDFG elk management efforts, staff will distill the final plan into an easy-to-read and understand document for widespread public consumption. This document will be more than an executive summary, instead providing details regarding elk ecology, management, habitat, hunting, viewing, research efforts, policy, and rationale behind elk management decisions.

The final document should be made available on the web, at regional offices, and distributed widely at shows and other public venues. The plan should be incorporated into course materials for WILD About Elk! (Project WILD) workshops, with consideration given to making the document available (in some form) to Hunter Education participants as well.

Elk web page.— IDFG staff will also reshape the current elk planning page on the Department website to an elk management page to serve as a clearinghouse for public information regarding elk. Examples of information to be included on the site include new research, population estimates, and hunting and harvest statistics.

Elk information kiosks.— As part of the education and outreach effort, staff will develop and establish several information kiosks by 2018. Kiosks will house information regarding elk ecology, including habitat, migration, predation, and management challenges. In addition, portable information displays will be created and used at county fairs, regional offices, and gatherings of hunting and conservation groups.

Elk management survey.— By 2020, IDFG staff will develop and administer an elk management survey to determine if public awareness of elk management has increased from levels identified in the 2012 elk management survey.

Elk information campaign.— As part of the new elk management plan, staff will begin crafting and distributing materials to increase understanding and support for Idaho's free-ranging elk herds. Materials will include an annual special issue of the *Fish and Game News*, devoted specifically to elk and elk management and research, short videos for website and YouTube use, and educational materials regarding the history of hunting and wildlife conservation. In addition, a video will be developed to explain key details of the elk management plan, and will be played when Citizens Against Poaching trailers are set up for display around the state.

Elk in the schools.— To further promote understanding and appreciation of elk by Idaho's school children, IDFG staff will complete the following by the end of 2016:

1. Develop a tri-fold brochure on elk ecology for distribution to all hunter education graduates. This brochure will encourage students to visit the newly established elk management plan web page on the IDFG website.
2. Conduct "Project WILD About Elk" workshops for ≥50 teachers.
3. Devote 1 issue of the children's newspaper, *Wildlife Express*, to elk and elk management.