2014-2018

Kootenay-Boundary Mule Deer Management Plan

Ministry of Forests, Lands and Natural Resource Operations
Province of British Columbia
Cranbrook, BC
10/16/2013

Executive Summary

The Ministry of Forests, Lands and Natural Resource Operations used a structured decision making process to evaluate and make recommendations for mule deer (*Odocoileus hemionus*) hunting regulations for 2014-18 in the Kootenay-Boundary Region of British Columbia (BC). FLNRO staff also identified actions that may increase mule deer populations based on consultation and a review of the latest scientific knowledge. This management plan will be implemented in 2014 and should be revisited in 2018.

In consultation with regional and provincial stakeholder groups, First Nations, the Conservation Officer Service and the general hunting public, FLNRO staff established management objectives for mule deer, identified a range of hunting season alternatives, and assessed how different season alternatives satisfied management objectives. Hunting clubs used this information to communicate with their members and vote on a preferred hunting season option. Mail-out surveys were conducted to collect additional information from resident hunters in the Kootenay-Boundary and a web-based survey allowed for input from hunters elsewhere in the province.

The vast majority of stakeholder groups and resident hunters consulted through meetings and hunter surveys support an exclusive “4-point or greater” season across the Kootenay-Boundary. This option was identified as a means to achieve target buck ratios, while maintaining hunting opportunity, recognizing this season would not likely change mule deer population trends. An exclusive “4-point or greater” season would likely reduce mule deer hunters by 15-20% in the Kootenay-Boundary, compared to the current seasons which include any-buck opportunities.

Based on the evaluation of trade-offs among different hunting seasons and strong support for an exclusive “4-point or greater” season from most stakeholders, this plan recommends a “4-point or greater” season for 2014. Different closing dates were suggested by stakeholders and FLNRO staff recommended a closing date of November 10th to allow hunting opportunity in November when demand is highest and to align season dates with the Okanagan. There was consensus among stakeholders that increasing mule deer populations would enhance hunting opportunity and hence specific actions are recommended to increase populations. Only actions supported by provincial policy that have potential to increase mule deer survival and recruitment based on available science are recommended in this plan.

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1. Introduction

The Ministry of Forests, Lands and Natural Resource Operations (FLNRO) developed this 2014-2018 mule deer (*Odocoileus hemionus*) management plan for the Kootenay-Boundary Region (Figure 1) in British Columbia (BC) in consultation with stakeholder groups, First Nations, the Conservation Officer Service (COS) and the general hunting public. This is the first mule deer management plan for the region.

A management plan is needed to address stakeholder concerns with current hunting regulations and to establish appropriate management actions to increase mule deer abundance so hunting opportunity can be enhanced. The plan contains two components:

1. Recommended mule deer hunting seasons for the Kootenay-Boundary based on an evaluation of options and stakeholder input
2. Recommended management actions to promote growth of mule deer populations in the Kootenay-Boundary, given that hunting regulations will likely not affect population trend

The Southern Interior Mule Deer Harvest Procedure http://www.env.gov.bc.ca/fw/wildlife/policy_procedures/index.html was the starting point for hunting season options and identifies performance targets for monitoring.

1.1 History of Mule Deer Hunting Regulations in Kootenay-Boundary

From the late 1980s to 1997 the Boundary had a long 51 day any-buck season as well as an early 4-point season in Management Unit (MU) 8-15. From 1997 to 2010 the any-buck season was reduced to 20 days in October with 20 days of 4-point in September and 10 days of 4-point in late October. In 2010, as part of the changes to the mule deer seasons across the Southern Interior, the any buck season in the Boundary was extended by 10 days to the end of October replacing the former late 4-point season. In addition, limited antlerless permits have been available through LEH for a 21 day period in October.

The East and West Kootenay sub-regions had long any-buck seasons until the 1990s. Antlerless mule deer permits were also available in the 1990s with seasons starting on October 10, and running to November 30 or December 10. Antlerless seasons were closed in 1997. This change was intended to increase mule deer population size in response to concerns about declines in the 1990s. Buck seasons became more restrictive (shorter seasons and 4-point seasons) in the late 1990s and 2000s to try and increase buck numbers. In 2010, an October any-buck season was implemented across the Southern Interior of BC, along with 4-point seasons in September and November. The any-buck season was implemented with limited support from stakeholders and concerns were raised that suppressed mule deer populations could not handle additional hunting pressure.

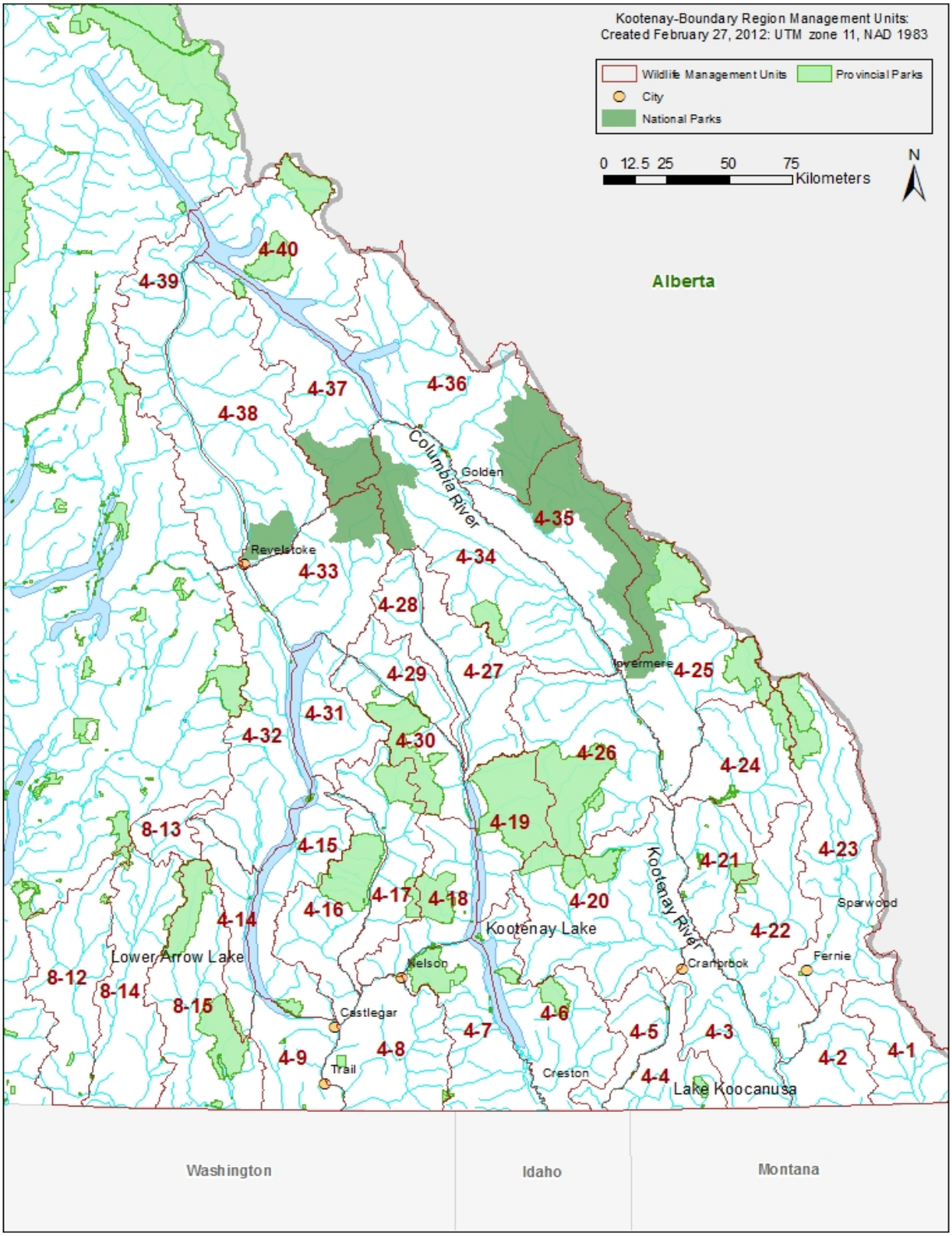

Figure 1: Management units in the Kootenay-Boundary Region.

1.2 Overview of the Management Plan Process

To develop this management plan, FLNRO staff:

1) Consulted stakeholders to establish mule deer population and hunting season objectives (Section 2.1)
2) Identified hunting season alternatives recommended by stakeholders (Section 2.2)
3) Collected input on mule deer management through a survey of hunters (Section 1.3; Stent 2013)
4) Developed a consequence table to evaluate how different hunting season options satisfied hunting season objectives (Section 2.3)
5) Identified the most supported hunting season option through evaluating the consequence table and additional input from stakeholders (Section 2.4)
6) Evaluated the impact of implementing the most supported hunting season option (Section 2.5).
7) Identified population objectives that cannot be addressed by modifying hunting seasons (Section 3.1)
8) Recommended actions to meet mule deer population objectives (Section 3.2)

1.3 Public Consultation

FLNRO staff consulted stakeholder representatives on the mule deer management plan. Stakeholders were affiliated with the following clubs: United Bowhunters of British Columbia, East Kootenay Hunters Association, Kimberley Wildlife & Wilderness Club, Southern Guides Association, East Kootenay Wildlife Association, West Kootenay Outdoorsmen, Okanagan Guides and Grand Forks Wildlife Association. The provincial British Columbia Wildlife Federation (BCWF) also provided input throughout the process.

Additional input was also collected through a mail-out hunter survey, which was distributed to a random sample of mule deer hunters in the Kootenay-Boundary Region, and through a web-based survey, which was open to anyone who hunts mule deer in the region (Stent 2013). The purpose of the web survey was to reach out-of-region hunters, who comprise approximately 20% of mule deer hunters in the Kootenay-Boundary (FLNRO, unpublished data). A link to the survey was provided to regional wildlife clubs and the BCWF requesting hunters to complete the survey and forward the link to other hunters.

The timeline for consultation was as follows:

June 2012: Started discussion on management plan with Region and Headquarters and developed draft management objectives.

June 2012: Prepared background document on management plan and limiting factors, which was posted on the FLNRO website.

July 2012: Hosted meetings in Cranbrook, Nelson and Grand Forks with representatives to introduce the management plan and discuss management objectives.

July 2012: Distributed mail-out survey to 1700 hunters in Kootenay-Boundary and set up the web survey.

December 2012: Summarized survey results and prepared a draft report on findings.

February 2013: Provided an update on the management plan at the Kootenay Wildlife Harvest Advisory Committee meeting and discussed different hunting season options.

March 2013: Held workshops in Cranbrook and Nelson to present results from the hunter survey, stakeholder consultation and hunting season options.

March 2013: Reviewed feedback from stakeholders on hunting season alternatives and identified the most supported regulation options.

March 2013: Reviewed recommendations for management actions to increase mule deer populations.

April 2013: Discussed mule deer management at the Ktunaxa hunter's meeting.

May 2013: Completed a consequence table and prepared a draft management plan.

June 2013: Presented the most supported hunting season options at the Kootenay Wildlife Harvest Advisory Committee (KWHAC) meeting and had further discussion on tradeoffs.

September 2013: Submitted a proposed mule deer hunting regulation change to the Fish and Wildlife Director for the 2014 season.

October 2013: Posted the draft plan on the web and solicited input from stakeholder groups and the general public.

November 2013: Posted the proposed hunting regulation change in the Public Engagement Website for comment.

1.4 Primer on Mule Deer Harvest Management

Background information on mule deer harvest management was provided to stakeholders at meetings and on the web (http://www.env.gov.bc.ca/fw/wildlife/management-issues/docs/kootenay_md_background&limitations.pdf). The following section describes implications of common harvest strategies for mule deer, based on a review by Erickson et al (2003).

There is little evidence to suggest buck-only hunting seasons affect population viability because bucks are able to breed all available does even at low buck:doe ratios. Buck harvest can skew sex ratios and alter the age structure of the male component of the population, with high harvest rates resulting in few bucks reaching 3.5 years of age or older (Hatter, unpublished data). Antler point restrictions, including "4-point or greater" seasons have been adopted in several jurisdictions in an attempt to increase buck:doe ratios and increase average age of bucks. In some cases, "4-point or greater" seasons increased buck:doe ratios but this was likely the result of fewer hunters participating in the season. The number of 3.5+ bucks in harvest did not increase following implementation of this season in most jurisdictions, while accidental kill (i.e., <4-point bucks) increased. Seasons that allow harvest across all age classes are generally preferred; however shortened seasons outside of the rut may be needed to achieve target buck ratios.

Limited Entry Hunting (i.e., LEH; lottery) season have been adopted in many western states to increase buck ratios and increase average age of bucks. However extreme reductions in hunting opportunity are often needed to achieve these objectives, making this management approach unpopular to managers and stakeholders. Antlerless seasons are used to manage mule deer populations relative to habitat capacity providing information on population trends,

adult survival and fawn recruitment is available to set appropriate harvest rates. Limited antlerless seasons exist in the Boundary but have been eliminated from the East Kootenay in an effort to increase abundance.

1.5 Mule Deer Hunting Season Objectives

A list of management objectives was developed following discussions with club representatives listed above, and an analysis of web and mail-out survey results. Objectives represented components of mule deer management that stakeholders and FLNRO felt should be considered in the context of this plan. Stakeholders supported similar management objectives across the region. Hence, an evaluation of hunting season alternatives was conducted at the regional level, instead of at the sub-regional level (i.e. East Kootenay, West Kootenay and Boundary) or Game Management Zone level.

The following list captures the range of objectives that relate directly to mule deer hunting seasons. Caribou and urban deer management objectives were discussed but stakeholders felt these objectives needed to be addressed through other means. Since the list is meant to be all-encompassing, some objectives are competing, and cannot be achieved simultaneously (e.g. increase proportion of 3.5 year-old bucks in population and maximize harvest). The objective to increase population size will not likely be affected by buck-only hunting seasons. However this objective was included in the consequence table to demonstrate that other tools needed to be considered to increase population size (Section 3.0).

Population Management:

- Increase mule deer in areas that have the capability to support higher numbers (increase fawn recruitment and doe survival)
- Increase post-hunt buck:doe ratios and maintain at or above 20 bucks:100 does (post season)
- Increase proportion of 3.5+ year-old bucks in populations
- Ensure First Nations harvest needs are met

Hunter Opportunity:

- Maximise harvest and hunter success within the constraints of approved population objectives
- Provide youth hunting opportunity outside of the General Open Season (GOS)
- Provide archery hunting outside the GOS
- Provide hunting opportunity during the rut (late October – mid November)
- Provide hunting opportunity without antler point restrictions
- Maximise hunter recruitment and retention

Viewing:

- Provide opportunity to view deer in natural habitat, outside of the hunting season
- Provide opportunity to view bucks during the hunting season

Management and Enforcement

- Minimise administration cost (i.e., Limited Entry Hunt [LEH] and regulation changes)
- Minimise enforcement and monitoring costs
- Minimise regulation complexity within region
- Minimise regulation complexity among regions

2.1 Hunting Season Alternatives

Eight hunting season options were brought forward by stakeholders for consideration (Table 1). These range from the most liberal to the most conservative hunting seasons. Details and rationale for each regulation option are provided in Appendix 1.

Table 1: Hunting season alternatives for mule deer in the Kootenay-Boundary brought forward by stakeholder groups for evaluation during management plan meetings.

Option No.	Youth Season	Archery Season	Any-Buck Season	4-point or Greater Season
1	Sept 1 - 9	Sept 1 -9	Oct 1 -31	Sept 10-30; Nov 1 - 10
2	Sept 1 - 9	Sept 1 -9	Oct 1 -31	Sept 10-30
3	Sept 1 - 9	Sept 1 -9	Oct 21 - 31	Sept 10 - Oct 20; Nov 1 – 15
4	Sept 1 -9	Sept 1 -9	Oct 1 - 9	Oct 10 - Nov 15
5	Sept 10 - 30	Sept 1 - 9; Dec 1 -10	None	Sept 10 - Nov 15
6	Sept 1 - 9	Sept 1 - 9	None	Sept 10 - Nov 15
7	Sept 1 - 9	Sept 1 - 9	None	Oct 1 - 31
8	Sept 1 - 9	Sept 1 - 9	LEH (Oct 1-31)	None

2.2 Evaluation of Trade-offs

Data from composition surveys, population models and hunter harvest statistics were used by FLNRO to evaluate the likely effect of each hunting season option on the established management objectives (Table 2).

Table 2: Consequence table showing the likely effect of mule deer hunting season options for the Kootenay-Boundary on each management objective (darker colour = better). Data originate from population models, composition survey data and hunter harvest statistics. Rationales for consequence table results are provided in Appendix 2.

	What's Better	Units	30 day any-buck; short Nov season	30 day any-buck; no Nov season	Late short any-buck	Early short any-buck	Increase bow hunting	Long 4-point only	Short 4-point only	Limited Entry Hunt
Population Management:										
Fawn recruitment	↑	Fawns:100 does	33	33	33	33	33	33	33	33
Doe survival	↑	Annual survival	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Buck:doe ratios post-hunt	↑	Bucks:100 does	23	27	25	26	29	30	35	40
Proportion of 3.5+ yr old bucks	↑	% of population	1.0	1.5	1.5	2.0	2.0	2.0	3.5	4.0
Ensure FN harvest needs met	↑	# of deer	50	50	50	50	50	50	50	50
Hunting Opportunity:										
Annual harvest	↑	# of deer (x100)	15	12	14	13	12	11	8	5
Hunter success	↑	Kills/100 days	2.3	1.9	2.2	2.1	2.0	1.8	1.4	30.0
Maintain/increase hunter #s	↑	# of hunters (x1000)	12	11	10	10	9	9	7	2.5
GOS hunting opportunity	↑	# of days	62	52	67	67	67	67	52	0
Hunting during rut (Oct 25-Nov)	↑	# of days	17	7	22	22	22	22	7	7
Opportunity w/o antler restriction	↑	# of GOS days	31	31	11	9	0	0	0	0
Archery hunting opportunity	↑	# of days	9	9	9	9	19	9	9	9
Youth hunting opportunity	↑	# of days	9	9	9	9	21	9	9	9
Viewing:										
Ability to view deer outside hunt	↑	5 = more deer	2	3	3	4	4	4	5	5
Ability to view bucks during hunt	↑	5 = more bucks	1	1	1	1	4	4	5	5
Management and Enforcement:										
Administration cost	↓	Annual cost	1000	1000	1000	1000	1000	1000	1000	8000
Monitoring costs	↓	Annual cost (x1000)	25	20	10	10	10	0	0	30
Enforcement costs	↓	5 = higher cost	5	5	5	5	5	3	3	2
Reg. complexity within region	↓	# of seasons	5	4	5	5	4	3	3	3
Reg. complexity among regions	↓	5 =more different	1	2	3	3	3	4	5	5

Rationale for effect values is provided in Appendix 2. The consequence table was presented to stakeholders and tradeoffs with season options were discussed. The consequence table was used to objectively evaluate trade-offs among hunting seasons, and inform decisions. However it was not used to select the recommended option. After evaluating hunting season tradeoffs using the consequence table stakeholders were asked to present the hunting season options and trade-offs to their respective clubs and vote on the most supported option.

2.3 Most Supported Hunting Seasons

Thirteen organizations voted on hunting season options presented (excluding FLNRO) (Table 2). Responses from regional clubs indicated no support for options that included an “any buck” season; however current hunting seasons were supported by several club members in the West Kootenay and by the BCWF at the provincial level.

Ten of 12 regional clubs supported an exclusive “4-point or greater” season, although preferred season dates varied (Table 3). Hunters in support of the “4-point or greater” option felt this season would increase buck ratios in most areas, while maintaining hunting opportunity. There was general agreement among stakeholders that increasing mule deer populations would allow all hunting opportunity objectives to be achieved and this should be a priority for future management.

Table 3: Most supported hunting season options voted by stakeholder groups involved in the Kootenay-Boundary Mule Deer Management Plan.

Organization	Most Supported Option	Comments/modification
Elkford Rod and Gun	4-point or greater; Sept 10th - Oct 31st	
Canal Flats Wilderness Club	4-point or greater; Sept 10th - Oct 31st	
Lake Windermere District Rod and Gun	4-point or greater; Sept 10th - Oct 31st	
Grand Forks District Rod and Gun	4-point or greater; Sept 10th - Oct 31st	Remove youth "any-buck" season
West Kootenay Outdoorsmen (representing Nelson, Creston, Kaslo, Trail, Nakusp, Edgwood and Revelstoke clubs)	4-point or greater; Sept 10th - Nov 15th	Some differences of opinion within local clubs
Fernie Rod and Gun	4-point or greater; Sept 10th - Nov 15th	
Sparwood Fish and Wildlife	4-point or greater; Sept 10th - Nov 15th	
Golden District Rod and Gun	4-point or greater; Sept 10th - Nov 15th	
Southern Guides	4-point or greater; Sept 10th - Nov 15th	Close November 10
Kimberley Wildlife	4-point or greater; no season dates specified	
United Bowhunters of British Columbia	No comment on rifle season	December 1st - 10th archery season
Okanagan Guides	Limited Entry Hunting	
Provincial BC Wildlife Federation	4-point or greater Sept 10^{th} – 30^{th}	Follow Southern Interior Mule Deer Harvest Procedure
	Any-buck; Oct 1^{st} – 31^{st}	
	4-point or greater; November 1^{st} – 15^{th}	

To evaluate trade-offs of season closing date for the two most supported options, an analysis of hunter survey data was conducted from 2006-2009, when there was a September 10th – November 15th "4-point or greater" season was in place in the East Kootenay. The results suggest 43-56% of hunter days are expended in November, thus an October 31st closing will have a substantial impact on hunting opportunity (Table 4). A closing date of November 10th is recommended to maintain some hunting opportunity in November and align season dates with Region 8.

Table 4: November mule deer harvest and hunter days as percent of annual totals for the Kootenay Region, 2006-2009. Data are from hunter survey reports. In the East Kootenay, mule deer seasons included a September 10th – November 15th "4-point or greater", while the West Kootenay had a Sept 10th – Sept 30th and October 21st-November 10th "4-point or greater" season as well as an October 1st-October 20th "any-buck" season.

Year	Percent of Annual Harvest in November	Percent of Annual Hunter Days in November
2006	41%	43%
2007	39%	43%
2008	49%	53%
2009	50%	56%

2.4 Effect of Hunting Regulation Change

A regulation change to an exclusive "4-point or greater" season will likely result in a 15-20% decline in hunter numbers from 2010-12 levels. However declining hunter numbers are expected with current seasons, considering the extremely poor success recently (82 days per kill across region in 2012; FLNRO unpublished data). Buck:doe ratios of at least 20 bucks:100 does should be achievable by 2016 in most MUs with an exclusive "4-point or greater" season although we expect buck ratios wlll remain below 20:100 does in MU 4-03 for several years based on 2012 composition survey results (Stent and Szkorupa 2013).

2.5 Additional Hunting Opportunities

Support for special mule deer hunting opportunities such as youth/archery seasons and additional motor vehicle closures were evaluated at meetings and through the hunter survey. Support for these opportunities varied among stakeholder groups; some opportunities were very important to some interest groups but unimportant to others. Overall, support was highest for maintaining/increasing youth opportunity and lowest for increasing motor vehicle closures. The Ministry recommends maintaining opportunity for each unique interest to encourage hunter retention, given the wide array of hunter interests.

2. Mule Deer Population Management

Much of the concerns around mule deer management raised by stakeholders stemmed from declining mule deer populations across the region. FLNRO wildlife staff and stakeholders discussed factors limiting mule deer population growth and recruitment at mule deer meetings to develop a set of actions that may increase populations. An overview of the latest science on factors limiting mule deer population growth was distributed to stakeholders prior to meetings and posted on the web (see http://www.env.gov.bc.ca/fw/wildlife/management-issues/docs/kootenay_mule_deer_faq.pdf, http://www.env.gov.bc.ca/fw/wildlife/management-

issues/docs/kootenay_md_background&limitations.pdf). The feasibility of each action was assessed, including potential to increase mule deer adult survival and fawn recruitment (based on available science), relative costs and staff time required, and whether or not the action would be supported by current government policy. Therefore actions presented below represent the highest priorities for the short term (1-3 year) and long term (>3 year). The delivery of these actions will depend in part on available funding and staff time. Many actions are not the primary mandate of FLNRO and will require partnerships with other departments and organizations.

Other actions that were assessed and deemed lower priority at this time are listed in Appendix 3. These will be revisited periodically as new research results are available regarding limiting factors, and as government capacity, funding and policy change over time.

An adaptive management approach will be used to implement management objectives. This will involve researching potential limiting factors to understand if they are hindering population growth and recruitment, then focusing management action on most important limiting factors and monitoring results.

2.1 Goal for Mule Deer Management

In general, stakeholders agreed that the primary goal was to increase mule deer populations within their current distribution. The Southern East Kootenay (MUs 4-01 to 4-26), Southern West Kootenay (MUs 4-07 to 4-18) and East Boundary (MU 8-15) were identified as the primary targets to increase abundance (Figure 1). These areas have had pronounced population declines and have high demand from hunters.

Goal: Increase mule deer abundance in the Southern East Kootenay, Southern West Kootenay and East Boundary within habitat capability.

Performance Measures:

- Mule deer population growth rate (λ, lambda) greater than 1.0 by 2018 (in monitored populations)
- Increasing buck harvest trend by 2018

2.2 Objectives to Address Limiting Factors

2.2.1 Predator Management

High predation rates can lead to mule deer population declines in multi-predator, multi-prey ecosystems (Robinson et al. 2002). In these systems, both fawn and doe survival may limit population growth (Forrester and Wittmer 2012). Cougar predation was the leading cause of doe mortalities (59%) in the South Selkirk Mountains when this population suffered a major decline (Fish and Wildlife Compensation Program, unpublished data). In this study, an increasing white-tailed deer population led to an increase in cougar numbers and disproportionately high predation rates on mule deer (i.e., apparent competition; Robinson et al. 2002). The authors of this study recommended white-tailed deer reductions to reduce cougar population growth and predation on mule deer; however Stent (2013) found that hunters in the region did not generally support alternate prey reductions to benefit mule deer. Analysis of white-tailed deer, mule deer and cougar harvest trend data suggest white-tailed deer populations have increased in the Southern East Kootenay, while mule deer populations have declined (Aldous 2013), which could be attributed to apparent competition.

Research in southeast Idaho has shown limited effectiveness of predator control treatments to increase mule deer population size (Hurley et al. 2010). Ballard et al. (2003) suggest predator reductions have failed to increase mule deer growth rates when populations were at or near carrying capacity as mortality from predation is typically replaced by other natural mortality factors (i.e., starvation). Low recruitment rates have been documented in several Kootenay populations (Stent and Szkorupa 2013), suggesting fawn predation could be limiting growth of the population, although further research is needed to determine if fawn recruitment is limited by predation or nutrition.

- ***Objective 1: Reduce cougar predation on mule deer, where it may be limiting mule deer population growth.***

Lead: FLNRO regional wildlife staff
Support: FLNRO, Fish, Wildlife and Habitat Management Branch., contract biologists, universities, Fish and Wildlife Compensation Program (FWCP) staff

Short Term Actions:

1) Determine whether cougar predation is a major source of mortality for mule deer populations, as per Ballard et al. (2003)
2) Estimate cougar density by MU for entire region and develop target harvest rates. Develop a regional cougar management statement to guide management decisions
3) Propose modified cougar hunting regulations for 2014-16 (e.g., bag limits, female quotas, closing dates) across the region to increase cougar harvest when abundance is high, and enable more flexible management in response to fluctuating cougar populations

Long Term Actions:

4) Monitor cougar abundance and improve estimates in priority areas (e.g., where mule deer are declining and cougar predation is thought to be significant)
5) Monitor effect of cougar management on mule deer population growth

- ***Objective 2: Reduce wolf, bear and/or coyote predation on mule deer fawns and does, where predation may be limiting mule deer population growth.***

Lead: FLNRO regional wildlife staff
Support: FLNRO, Fish, Wildlife and Habitat Management Branch, external consulting biologists

Short Term Actions:

1) Determine whether bear, wolf and/or coyote predation is affecting mule deer population growth rates
2) Identify an appropriate inventory method to monitor wolf, bear and coyote population trends

Long Term Actions:

3) Consider revising motor vehicle closures to facilitate winter predator hunting in situations where conservation values are not compromised
4) Implement trend monitoring for bears, wolves and/or coyotes, if these species are found to be limiting mule deer

- ***Objective 3: Manage alternate prey (white-tailed deer and elk) to meet mule deer objectives in priority areas.***

Lead: FLNRO regional wildlife staff
Support: FLNRO, Fish, Wildlife and Habitat Management Branch
Short Term Actions:

1) Maintain the GOS for antlerless white-tailed deer across the region for 2014-16 to limit population increases
2) Identify priority areas for future white-tailed deer management to benefit mule deer (e.g., where mule deer are declining, predation is high and alternate prey are thought to be supporting high predator populations, and where stakeholders support white-tailed deer reductions to possibly benefit mule deer)
3) Develop a regional white-tailed deer management statement to guide management decisions
4) Consider mule deer objectives during Kootenay-Boundary Elk Management Plan discussions (2015). Work with stakeholders to determine whether there are areas where elk populations should be managed to benefit mule deer
5) Monitor buck harvest as an index of white-tailed deer population trend

Long Term Actions:

6) Develop regional ungulate management statement to establish management direction for all ungulates
7) Develop a population model to monitor white-tailed deer trends
8) Consider white-tailed deer reductions in priority areas for 2016-17
9) Monitor the effectiveness of managing alternate prey to benefit mule deer

2.2.2 Habitat Management

The landscape of the Kootenay-Boundary Region has changed dramatically over the last century. Extensive forest loss occurred in the late 1800s and early 1900s due to large fires and land clearing for settlements and agriculture (MFR 2006). Since the 1950s, forest succession, changes in timber harvest practices, and aggressive fire suppression has resulted in greater forest cover. These successional changes have reduced forage availability across the northern range of the species (Hayden et al. 2008; Peek et al. 2002).

Nutritional value of forage is low in the winter and mule deer may be unable to meet energy demands during this period (Parker et al. 1984). Although improvement of winter habitat may improve survival of deer by reducing predation risk and improving overwinter survival, an equally important consideration is the quality of summer and transitional habitat as this will influence the body condition of mule deer prior to winter. Research has shown enhanced nutrition in the summer and autumn increased fawn growth and survival rates and increased pregnancy and twinning rates of does in Washington (Tollefson et al. 2010). A separate study showed enhanced nutrition during the winter increased survival of mule deer does and fawns (Bishop et al. 2008). After experimentally predator reductions in Southeast Idaho failed to increase mule deer population growth rates, Hurley et al. (2010) recommended nutrition enhancement over predator reductions to increase mule deer populations.

- ***Objective 4: Improve suitability of mule deer habitat by increasing forage quality and quantity.***

  Lead: FLNRO regional habitat staff
  Support: FLNRO regional wildlife staff, external consulting biologists, FWCP biologists

  Short Term Actions:
  1) Identify candidate mule deer habitat restoration sites through ER steering committee
  1) Carry out planned winter range habitat restoration in MU 4-02
  2) Support FWCP sheep/mule deer restoration in MU 4-21
  3) Support ongoing restoration projects in Boundary and West Kootenay winter ranges
  4) Identify other priority areas for habitat restoration and seek additional funding sources

  Long Term Actions:
  5) Identify efficient methods for conducting ER on mule deer winter ranges
  6) Develop habitat prescriptions that can be applied to winter range, summer range and transitional habitat to restore mule deer habitat
  7) Consult licensees and foresters to increase access to unproductive and inoperable stands in managed forests for ER purposes
  8) Assess mule deer population response (survival and recruitment) to large scale habitat restoration

- ***Objective 5: Support reduction of noxious weeds where they threaten mule deer habitat.***

  Lead: FLNRO regional habitat staff
  Support: Regional districts, external consulting biologists

  Short and Long Term Actions:
  1) Support habitat branch and local government in noxious weed management on mule deer winter ranges and provide input on priority areas
  2) Support access management needed to reduce noxious weed invasion

- ***Objective 6: Support fire management planning to increase fire frequency in mule deer habitat.***

  Lead: FLNRO regional habitat staff
  Support: Regional habitat branch, wildfire branch regional resource stewardship branch, FWCP biologists

  Short Term Actions:
  1) Map summer and transitional mule deer habitats that have experienced little wildfire activity recently
  2) Consult with wildlife and forestry branch to identify “let burn” areas that would benefit mule deer

  Long Term Actions:
  3) Incorporate mule deer “let burn” areas in fire management planning

- ***Objective 7: Support forest management to improve and conserve mule deer habitat.***

  Lead: FLNRO regional habitat staff
  Support: FLNRO regional habitat staff, regional resource stewardship branch

  Short Term Actions:
  1) Identify logging and post-logging treatments that could be used to improve mule deer habitat suitability
  2) Map mule deer winter observations from aerial surveys and compare to UWR polygons

  Long Term Actions:
  3) Support implementation of logging and post-logging treatments that will benefit mule deer
  4) Refine UWR boundaries to encompass winter ranges used by mule deer during periods of high snow accumulation
  5) Maintain sufficient canopy cover on winter ranges in Interior Cedar Hemlock (ICH) and Montane Spruce (MS) subzones, which receive heavy snowfall

- ***Objective 8: Assess forage quality and quantity on important winter ranges and incorporate into range management discussions.***

  Lead: FLNRO regional habitat staff
  Support: FLNRO regional wildlife staff, FLNRO regional range program, external biologists

  Short Term Actions:
  1) Document browse quality and quantity on winter ranges where cattle and mule deer overlap

  Long Term Actions:
  2) Manage ungulate use on mule deer winter ranges to maintain sufficient forage

- ***Objective 9: Maintain connectivity between summer, winter and transitional habitats.***

  Lead: FLNRO regional wildlife staff
  Support: External consulting biologists, FWCP biologists

  Short Term Actions:
  1) Map known migration routes using findings from past monitoring projects and local knowledge

  Long Term Actions:
  2) Work with relevant organizations to remove or modify barriers to facilitate migration

2.2.3 Access Management to Minimize Habitat Disturbance

Motorized vehicle closures have been used as a tool to protect valuable mule deer habitat and/or restrict access to areas where mule deer are vulnerable at certain times of the year. Research suggests roads negatively impact ungulates by reducing habitat effectiveness and altering animal behaviour (Trombulak and Frissell 2000). Access management continues to be a contentious issue in the Kootenay Region and the hunter survey report suggested little appetite for additional motor vehicle closures, although some stakeholder groups support road closures. Road densities have not been estimated in the Kootenay-Boundary and it is uncertain if current densities are impacting effectiveness of mule deer habitat.

- ***Objective 10*: Manage motorized vehicle access to minimize disturbance and ensure valuable mule deer habitats are protected.**

Lead: FLNRO regional habitat staff
Support: FLNRO regional wildlife staff

Short Term Actions:

1) Review current road densities, closures and justifications
2) Use regional wildlife advisory and access committees to identify additional closures needed to protect important habitats

Long Term Actions:

3) Implement road closures needed to protect valuable mule deer habitats
4) Increase road closure signage and enforcement

2.2.4 Improving Knowledge of Mule Deer Population Trends

Hunter harvest statistics (kill per unit effort) have been the primary method for monitoring mule deer population trends; however this method may underestimate the rate of population decline and/or overestimate rate of population increase (Hatter 2001). Interpretations of harvest data are further complicated by changes to hunting regulations. Several Stratified Random Block (SRB) mule deer inventories have been attempted in the Kootenay Region to estimate population size using a sightability model; however this model was developed in relatively open habitat and is not believed to be accurate in forested winter ranges. An alternative to conducting SRB surveys is to use female survival and juvenile recruitment data as the index of trend, given mule deer populations generally follow a pattern of stable adult doe survival and variable fawn recruitment (Forrester and Wittmer 2012).This method has successfully predicted population trends of elk in the East Kootenay Trench and may be a more cost-effective approach than repeated SRB surveys. Roadside surveys are the most affordable means to collect population data but have shown limited effectiveness in monitoring population trends for deer (Collier et al. 2012).

- ***Objective 11: Improve inventory and monitoring methods to track mule deer population trends.***

Lead: FLNRO regional wildlife staff
Support: External consulting biologists

Short Term Actions:

1) Submit funding proposal to develop a cost-effective methodology for monitoring mule deer population trends in the Kootenay-Boundary.

Long Term Actions:

2) Monitor mule deer recruitment and survival annually
3) Develop population model for reconstructing mule deer trends from recruitment, survival and harvest data
4) Support development of a Smartphone application to monitor mule deer and predator population trends
5) Develop a mule deer sightability model that can be used to accurately and precisely measure mule deer population size in forested habitat

2.2.5 Engaging Hunters in Mule Deer Management

Hunters are the main contributors to wildlife conservation (Hefflefinger et al. 2013) but often express frustrations about not being included enough in management. Consultation through the mule deer management plan has revealed distrust between many hunters and government, which the Ministry hopes to improve through implementation of this plan.

- ***Objective 12: Engage hunters and wildlife clubs in mule deer management activities.***

Lead: FLNRO regional wildlife staff
Support: FLNRO regional habitat staff

Short Term Actions:

1) Communicate proposed research and ER activities with wildlife clubs
2) Work with ER committee to identify opportunities for wildlife clubs to conduct winter ranges
3) Distribute relevant mule deer survey information and reports to interested hunters and wildlife clubs
4) Continue to provide mule deer hunting opportunities for unique interest groups

Long Term Actions:

5) Include wildlife clubs in mule deer research projects
6) Establish multi-year ER projects (i.e., slashing) for wildlife clubs to carry out
7) Conduct another hunter survey to evaluate satisfaction with mule deer management
8) Work with headquarters to identify method to monitor archery harvest

9) Maintain regular communication with all stakeholders through club meetings and regional wildlife committee

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Appendix 1: Mule deer hunting season alternatives brought forward by stakeholders in the Kootenay-Boundary that were evaluated at management plan meetings.

Option 1: Sept ≥4 pt, October any-buck season, 10-day ≥4pt November season: These are the current seasons in most of the region.

- Youth any-buck season from Sept 1 – Sept 9
- Bow any-buck season from Sept 1 – Sept 9
- Early 4≥-point season from Sept 10 – Sept 30
- Any-buck season from Oct 1 – Oct 31
- Late 4-point season from Nov 1 – Nov 10

Option 2: October any-buck season, no November season: These are the current seasons but with no November 4-point hunt. The intent of this season set is to reduce overall buck harvest while maintaining opportunities for any-buck hunting.

- Youth any-buck season from Sept 1 – Sept 9
- Bow any-buck season from Sept 1 – Sept 9
- Early 4-point season from Sept 10 – Sept 30
- Any-buck season from Oct 1 – Oct 31

Option 3: Late 11-day any-buck season: The intent of these seasons is to avoid overlap with the elk season. However a later any-buck season will likely result in higher harvest than an early any-buck season (since buck vulnerability increases closer to the rut and as bucks migrate in to more accessible areas).

- Youth any-buck season from Sept 1 – Sept 9
- Bow any-buck season from Sept 1 – Sept 9
- Early 4-point season from Sept 10 – Oct 20
- Any-buck season from Oct 21 – Oct 31
- Late 4-point season from Nov 1 – Nov 15

Option 4: Early 9-day any-buck season: The intent of these seasons is to retain a short any-buck season in early October, in order to continue to provide some opportunity for hunters to harvest smaller bucks. Our survey of hunters indicates that a segment of the hunting community in the region values the any-buck season.

- Youth any-buck season from Sept 1 – Sept 9
- Bow any-buck season from Sept 1 – Sept 9
- Early 4-point season from Sept 10 – Sept 30
- Any-buck season from Oct 1 – Oct 9
- Late 4-point season from Oct 10 – Nov 15

Option 5: Increase bow hunting: These seasons focus on increasing bow hunting opportunities. Bow hunters have expressed concern with the youth season overlapping the bow season. Hence the youth season below starts after the bow only season. Bow hunters have also requested consideration of a December any-buck season. The suggested rifle season is this option is 4-point or better only, to offset the anticipated increase in harvest associated with a December bow season.

- Bow any-buck season from Sept 1 – Sept 9
- Youth any-buck season from Sept 10 – Sept 30
- 4-point season from Sept 10 – Nov 15
- Late bow any-buck season from Dec 1 – Dec 10

Option 6: Long ≥4-point season: These seasons were in place in the East Kootenay prior to 2010, with the exception of the any-buck season for youth. The intent of these seasons is to limit harvest through a 4-point restriction, while allowing a long hunting season.

- Youth any-buck season from Sept 1 – Sept 9
- Bow any-buck season from Sept 1 – Sept 9
- 4-point season from Sept 10 – Nov 15

Option 7: Short ≥4-point season: The intent of these seasons is to reduce buck harvest substantially, while still maintaining a General Open Season.

- Youth any-buck season from Sept 1 – Sept 9
- Bow any-buck season from Sept 1 – Sept 9
- 4-point season from Oct 1 – Oct 31

Option 8: Limited Entry Hunt: This is the most conservative option. The intent of this season is to reduce buck harvest substantially through Limited Entry Hunt. This would likely result in the highest buck to doe ratios and more trophy (3.5+ year-old) bucks.

- Youth any-buck season from Sept 1 – Sept 9
- Bow any-buck season from Sept 1 – Sept 9
- Limited Entry Hunt any-buck season from Oct 1 – Oct 31

Appendix 2: Rationale for consequence table results for mule deer hunting season options.

Population Management	**What's Better**	**Units**	**Rationale**	**Source**
Fawn recruitment	↑	Fawns:100 does	There was no significant difference predicted in fawn among season options, although inventory results suggest higher fawn ratios when buck ratios are lower Research suggests fawn recruitment may increase with fewer bucks in the population if there is a density dependent increase in forage	Bishop et al. 2005
Doe survival	↑	Annual survival	There was no significant difference predicted in doe survival among season options. However there may be potential for high buck harvest to increase predation on remaining does in multi-predator ecosystems .	
Buck:doe ratios post-hunt	↑	Bucks:100 does	Buck to doe ratios increase with lower buck harvest, assuming constant doe numbers. Ratios here are based on composition surveys.	Kootenay Region composition surveys 2010-12
Proportion of 3.5+ yr old bucks	↑	% of population	Based on population model, higher harvest rate of bucks will reduce the number reaching 3.5+ years of age.	Erickson et al. 2003; Hatter, unpubl. data
Ensure FN harvest needs met	↑	# of deer	All options assume FN harvest needs will be met, since there is no harvest of females. Hunting of bucks only will likely have no or minimal impact on population trend.	Erickson et al. 2003
Hunting Opportunity				
Annual harvest	↑	# of deer (x100)	More liberal hunting seasons will result in higher harvest.	Hunter sample data
Hunter success	↑	Kills/100 days	Highest hunter success is expected with LEH option. Options with "any-buck" season will have better success than antler restriction seasons. However population trends will affect hunter success regardless of hunting season option.	Hunter sample data
Maintain/increase hunter #s	↑	# of hunters (x1000)	More liberal hunting seasons are expected to maintain and/or increase hunter numbers.	Hunter sample data
GOS hunting opportunity	↑	# of days	Longer hunting seasons provide the most General Open Season Opportunity.	

Hunting Opportunity (cont'd...)	What's Better	**Units**	**Rationale**	**Source**
Hunting during rut (Oct 25-Nov)	↑	# of days	More hunting days during the rut can be sustained with antler point restrictions as overall harvest is reduced when mule deer are most vulnerable and hunter demand is highest. Any-buck seasons in the Kootenays led to fewer hunting days during the rut (shorter season) to maintain target buck to doe ratios.	Kootenay hunting seasons with and without any-buck seasons
Opportunity w/o antler restriction	↑	# of GOS days	Number of "any-buck" season days for rifle hunters.	
Archery hunting opportunity	↑	# of days	Number of exclusive archery season days is highest for the "increase bow hunting" option.	
Youth hunting opportunity	↑	# of days	Number of youth hunting days is highest for the "increase bow hunting" option since this option expands youth seasons as well.	
Viewing:				
Ability to view deer outside hunt	↑	5 = more deer	More restrictive seasons allow for more bucks, and hence more deer overall, to survive the hunting season.	
Ability to view bucks during hunt	↑	5 = more bucks	Hunter surveys showed the number of bucks observed contributes to enjoyment of the hunt. More restrictive seasons will increase the number of bucks hunters will see in a season.	
Management and Enforcement:				
Administration cost	↓	Annual cost	Higher cost associated with administering a Limited Entry Hunt.	Estimated
Monitoring costs	↓	Annual cost (x1000)	Liberal seasons require additional monitoring to ensure buck ratios do not fall below management targets.	Kootenay composition monitoring 2009-12
Enforcement costs	↓	5 = higher cost	Enforcement costs are higher with more types of seasons, antler restrictions, and more season days.	
Regulation complexity within region	↓	# of seasons	More liberal options have more types of seasons	
Regulation complexity among regions	↓	5 =more different	Option 1 is status quo for regions 3, 5 and 8. Options 7 and 8 differ the most from other regions.	

Appendix 3: Actions brought forward from stakeholders that are not recommended in the plan because of high cost, uncertain effectiveness and/or lack of support from provincial policy.

Objective	Actions	What's Known?	Reference	What isn't Known	Support from Policy?	Cost per year	Potential to Increase Survival and Recruitment?
Reduce wolf predation on mule deer	Lengthen hunting season and remove bag limit restriction	Wolves have recolonized the Kootenay-Boundary and prey on mule deer.	Mowat 2007	Are wolves limiting mule deer population growth?	Possibly for increasing bag limit	Existing Budgets	Low
Reduce wolf predation rates on mule deer	Implement trapper subsidy across region	Need repeated high harvest (70-80%) to have any effect.	Russell 2010; Hayes et al. 2003		In Caribou Recovery Zones	$5,000	Unknown
Reduce wolf predation rates on mule deer	Initiate aerial wolf reduction	Wolf control must be done to attain 70-80% reduction repeatedly for a minimum of 4 years and must occur over 10,000 km2 to be effective. Estimated cost of $35/km^2.	Schneider et al.2010; Alaska Department of Fish and Game 2007	Are wolves limiting mule deer population growth?	NO (BC wolf mgt. plan)	$350,000	Unknown
Reduce black bear predation rates on mule deer	Lift requirement for hunters to remove edible portions of harvested bears	Neonate fawns susceptible to predation by black bears. Limited hunter interest in harvesting black bears.		Will black bear harvest be sufficient to increase mule deer population growth?	NO (wildlife act)	Existing Budgets	Low
Reduce black bear predation rates on mule deer	Legalize baiting of bears	Neonate fawns susceptible to predation by black bears. Limited hunter interest in harvesting black bears.		Will black bear harvest be sufficient to increase mule deer population growth?	NO (wildlife act)	Existing Budgets	Low
Reduce black bear predation rates on mule deer	Lengthen trapper season for black bears	Neonate fawns susceptible to predation by black bears. Not likely to increase harvest.			NO	Existing Budgets	Low
Increase coyote harvest	Lengthen hunting season	Coyotes are an important predator of mule deer in some areas.	Hurley et al. 2010	Effect of coyote predation on mule deer population growth and recruitment in Kootenay-Boundary	NO	Existing Budgets	Low
Reduce elk competition with mule deer	Reduce elk populations across region	Elk have increased over past decade and overlap with mule deer in certain areas	Szkorupa and Mowat 2010	How increasing elk populations affect mule deer survival	YES	Existing Budgets	Low

Objective	Actions	What's Known?	Reference	What isn't Known	Support by Policy?	Cost per year	Potential to Increase Survival and Recruitment?
Improve knowledge of harvest levels	Mandatory reporting of harvest and hunting effort	Switching to electronic licensing; will discuss this with data committee			Unknown	Unknown	N/A
Reduce grizzly bear predation on mule deer	Implement open season on grizzly bears in MU 4-23	Grizzly bears prey on juvenile and adult mule deer. Grizzly populations are believed to have increased in the Rocky Mountains	Mowat 2007	Effect of grizzly bear reduction on mule deer population growth	NO	Existing Budgets	Unknown
Reduce predation rates on mule deer	Institute predator bounty	Bounties have increased predator harvest in the past but have not achieved long-term reductions	Bartel and Brunson 2003		NO	$ 15,000	Unknown