EAST KOOTENAY ELK MANAGEMENT PLAN 2000-2004

MINISTRY OF ENVIRONMENT, LANDS AND PARKS
WILDLIFE BRANCH

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March 15, 2001

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INTRODUCTION

Declining elk populations in the East Kootenay characterized by distorted bull to cow ratios and low calf recruitment led to public controversy during the mid 1990's focusing on bull elk hunting regulations. In response, the Wildlife Program initiated various hunting restrictions to limit the harvest of elk. Public concern continued and in 1998, the Ministry of Environment, Lands and Parks contracted a professional wildlife biologist with extensive experience with elk, Dr. Ken Raedeke, to conduct an independent assessment of the elk harvest management in the region and province. The resulting report, *Assessment of Harvest Strategies for Rocky Mountain Elk* provided short and long-term recommendations for managing elk hunting as well as a list of recommendations to promote recovery of the Kootenay elk herds.

A high priority recommendation of the report was to develop a formal elk management plan for the East Kootenay for implementation over the period 1999-2003, updated to cover the period 2000-2004. The existing management plan had been prepared in 1985, was no longer responsive to current issues and required updating. A plan with clearly defined management objectives is required to allow evaluation of harvest management options to meet objectives, provide a greater level of certainty for hunters and commercial users of the elk resource and to direct government and public efforts in the areas of population, habitat, elk/agriculture conflict and land management.

Planning workshops were held with representatives of 47 interested stakeholder organizations during the early part of 1999 as a first step toward development of the plan. East Kootenay, West Kootenay and provincial hunting clubs, First Nations, guiding, agriculture, forest and mining industries and interested government agencies participated.

Participants were asked to express their visions and objectives for elk management in the East Kootenay. They identified the issues that stand in the way of meeting their expectations and proposed solutions to the issues. The publication "*Stakeholder Input Toward an Elk Management Plan for the East Kootenay* June, 1999" provides a summary of input from those workshops. Some stakeholders provided further comment and information following the workshops.

VISION AND GOALS

The first step in any planning initiative is to develop an ideal image of the future, or *Vision* and desired outcomes, or *Goals* to be used as beacons to guide all activities under the plan. The vision and goals should be at a high level and encompass all areas of planed activity and influence. They should be widely accepted by those who will deliver the plan and by those affected. The Vision and Goals are not meant to be measurable objectives. Those are found later in the plan.

VISION

Viable populations of elk in the East Kootenay that meet the desires and expectations of most British Columbians.

GOALS

Restore and maintain sufficient elk habitat to sustain elk populations at desired levels.

Restore and maintain appropriate sex and age ratios.

Minimize elk depredation on private agricultural lands.

Optimize resident hunter opportunity and commercial utilization.

Implement a sustainable hunter harvest regime.

MANAGEMENT PRINCIPLES AND GUIDELINES

The following elk management principles and guidelines are proposed as the scientific and policy basis for elk management in the East Kootenay. They place conservation as the highest priority while simultaneously providing continuing opportunities for harvest.

POPULATION MANAGEMENT

Elk populations are primarily limited by the quality and quantity of their wintering habitats, predation and winter severity. Some elk populations may be limited through competition for forage with domestic livestock, deer, mountain sheep or other animals co-occupying critical habitats. Road and rail kills, hunting mortality and poaching are additional factors that can periodically limit elk populations in some areas.

The provincial Wildlife Harvest Strategy (Ministry of Environment, Lands and Parks 1996) states that elk in British Columbia will be managed to optimize population viability within ecosystems while allowing for options and opportunities associated with viewing and hunting. In the East Kootenay, elk densities will be established and maintained at levels that are commensurate with the natural carrying capacity of their habitat, that meet conservation and recreation needs, and provide for viable agriculture and forestry industries within the region.

The Wildlife Harvest Strategy also states that post-season sex ratios for elk will be maintained above 20 bulls per 100 cows.

Post-season calf to cow ratios should be maintained above 25 calves per 100 cows, as this is the calf recruitment rate typically required to maintain a stable population that is lightly hunted. It is important to note that the ability to directly manage calf to cow ratios is limited, particularly where predation is an important mortality factor.

HABITAT MANAGEMENT

Habitat structure, quantity and quality ultimately dictate population size and health of wildlife populations. Elk habitat management involves maintaining the necessary habitat requirements of cover for security, thermal, and snow interception purposes; forage quantity and quality; and suitable temporal and spatial patterns of forage and cover on and between winter, spring and summer ranges.

Elk habitat management will also consider management and protection of biodiversity. The requirements of other species, particularly red and blue listed species, will not be degraded by elk habitat protection and enhancement activities.

Integrated elk habitat management solutions that consider the needs of other competing land uses will be developed consistent with the direction of the Kootenay Boundary Land Use

Plan. Several regional factors affect habitat availability and use, including competition for forage between elk and cattle, forest encroachment on natural grasslands, habitat loss due to alienation for other uses (ie. ski resorts, mines, etc.) and rural and urban expansion. Regional planning processes have identified the need for aggressive habitat enhancement programs to reverse trends of habitat loss over the past five decades. The provision of additional elk habitat is key to the successful coexistence of expanding elk populations and the regional agricultural industry.

HARVEST MANAGEMENT

Harvest options, strategies and prescriptions must be consistent with the harvest management principles and standards outlined in the provincial Wildlife Harvest Strategy. Pertaining to elk, these include:

- The level of elk harvest will be adjusted to meet hunter demand within the constraints of conservation and allowance for non-hunting uses of the elk populations.
- Harvest prescriptions will be sufficiently conservative to allow for uncertainty in determinations of population status.
- The priorities for allocation of the allowable harvest, after conservation needs have been satisfied, will normally be: 1) aboriginal use pursuant to aboriginal rights; 2) British Columbia resident use; and 3) non-resident use
- Wherever possible, hunting regulations will be kept simple, uniform within ecosystem units and consistent over time.
- The vulnerability of elk populations to over-harvest can be reduced by limiting the harvest primarily to bulls, and further reduced by limiting the harvest to an identifiable sub-group of bulls (e.g. 6 or more points), by limiting hunter numbers (e.g. Limited Entry Hunting) or by implementing hunting opportunities of documented low success (ie. special weapons seasons).
- Cow and calf elk hunting can normally be provided where required to maintain a stable, prescribed balance with habitat carrying capacity or where population reductions are required. Antlerless elk seasons provide additional recreational opportunity, can serve to relieve excessive hunting pressure on bulls, can be used to relieve agricultural depredation problems and can be used to restore distorted sex ratios. Cow hunting can be used to acquire ancillary biological information needed for management (e.g. reproductive rates, dates of conception, body condition). Where an elk population is unacceptably below potential carrying capacity due to recent occupation of new habitat or suppression by a mortality factor such as predation, cow and calf hunting opportunities are limited or not provided.
- Elk populations can sustain a greater harvest rate on calves than cows. While harvesting bulls, cows and calves typically produces the greatest harvest, it also increases the risk of population decline. Populations with below 35 calves per 100 cows should generally not have a calf harvest unless population reduction is desired.

- Elk damage control seasons may be provided in areas where elk cause moderate to severe crop damage. Harvest regulations for elk damage control are set to meet local requirements. In some circumstances, such as management of conflicts between wildlife and agriculture, a harvest exceeding a sustainable harvest level could be prescribed to reduce numbers to the desired population level.

Elk hunting cannot be considered as purely additive, nor purely compensatory mortality. Hunting mortality is mostly additive when elk are below maximum sustained yield levels and becomes increasingly compensatory as populations approach habitat carrying capacity. In systems where bears, cougars and wolves are abundant and actively prey on elk populations, predation reduces elk numbers below habitat carrying capacity. Not only are predation-affected elk densities lower, but their growth rate is less and the sustainable human harvest is greatly reduced.

Hunting pressure should be evenly distributed in time and space to avoid overcrowding and local over-harvesting. Hunter access allows for the dispersion of harvest within a management unit and is thus an important management tool for regulating hunting pressure. Where access cannot be adequately regulated, it may be desirable to define the "accessible elk population" within the area and maintain a sustainable harvest level on that population segment. Limited entry hunting is another effective tool for distributing hunting pressure by zoning wildlife management units and regulating authorization numbers. Hunter opportunities and harvest levels can also be adjusted by employing combinations of special weapons seasons.

While the control of human activities, including hunting and disturbance, is often the most practical elk management tool available to the Wildlife Program, hunting is usually only one of many mortality factors operating on elk and may account for a relatively minor component of the total mortality in some elk populations. An emphasis on the manipulation of wildlife populations through hunting suggests that wildlife managers understand fully the role of hunting in individual herd population dynamics; that hunting regulations can effectively control the size, age and sex composition of harvests; and that hunting alone can predictably influence target populations. These criteria are seldom met operationally and biological considerations are usually only one factor among many social and political factors that shape harvest regulations.

ISSUES

Stakeholders provided their views on the wide range of issues affecting elk management in the East Kootenay at planning workshops held during the early months of 1999. A detailed account of these views can be found in the companion document to this discussion paper, "*Stakeholder Input Toward an Elk Management Plan for the East Kootenay, June, 1999"*.

Any activities associated with elk population and habitat management must be consistent with trecommendations put forward by the East Kootenay Trench Agriculture/Wildlife Committee in the report "Final Report East Kootenay Trench Agriculture/Wildlife Project" (Gayton and Hansen, 1998).

Some issues were controversial in that stakeholders disagreed with each other on the nature of the problem or the methods that should be used to resolve it. On other issues, stakeholders were in general agreement, but their comments indicated that changes to management practices should be considered. In the following section, a detailed analysis is provided of those issues that were most controversial and/or are most important to elk management in the East Kootenay.

POPULATION MANAGEMENT

BACKGROUND

Elk in the East Kootenay tend to occupy relatively discrete herds with distinct seasonal migration patterns. A small percentage of the animals do not migrate out of the valley bottoms. Timing of the migration and migration routes are fairly predictable, although influenced by winter severity.

In the early 1980s the East Kootenay elk population was likely close to or exceeded 30,000 (Demarchi and Wolterson 1991). Agricultural producers were suffering serious crop losses and their cattle were competing with elk for forage on Crown ranges. As a result, government directed wildlife staff to reduce the elk population by one third.

The population objective of 20,000 to 25,000 elk was probably reached in 1992, but the population continued to decline. It is hypothesized that the continuing decline was due to a combination of continued liberal harvest strategies through 1995, sequential catastrophic winter severity in 1995/96 and 1996/97, increasing predator impacts and declining habitat condition. The habitat decline has been well documented in studies prepared for the Kootenay Boundary Land Use Plan and the East Kootenay Trench Agriculture Wildlife Committee report. While there have been no direct studies on predator population trends,

there is some evidence that cougar, bear and wolf numbers increased during the elk decline and may have been an important contributing factor. By 1997 the elk population was estimated to be 16,500 with bull to cow ratios of 12 bulls per 100 cows, and calf to cow ratios of 19 calves per 100 cows.

Inventory based population trend information in the East Kootenay Trench since 1997 suggests that overall elk numbers are improving. Anecdotal reports from the public, ranchers, conservation officers and wildlife staff also suggest elk are currently increasing. The increase can likely be attributed to a combination of reduced hunter harvest, lower predator densities and successive mild winters from 1996/97.

The key to continued recovery of the elk populations will depend on further increases in the calf to cow ratio, maintaining the current low bull elk harvest, continuing mild winters and increasing improvments to elk habitat through prescribed burning and other silvicultural techniques.

Since 1992, comparable population surveys have been carried out in the East Kootenay Trench. In 1992 and 1997 the surveys were comprehensive. The 1996, 1998 and 1999 surveys were of select winter ranges and should be interpreted to indicate population trends only. In the Elk Valley, mining companies operating in the drainage conduct winter population composition surveys each year as part of their obligation for wildlife habitat loss compensation.This information is provided to government. Until 1998 when all hunting seasons for cow elk were curtailed to assist population recovery, fertility studies using uteri from hunter kills provided information on conception dates and fecundity.

Effective population management depends on managers having access to accurate information on population parameters and the factors affecting them, and the ability to implement necessary management actions. For elk in the East Kootenay, this includes developing a comprehensive management strategy and effective monitoring of both the population and the hunter harvest.

POPULATION OBJECTIVE

Public Input

Wildlife stakeholders want East Kootenay elk populations to be increased. Farmers and ranchers are concerned that intolerable agricultural damage will result from an increase in the elk populations. Both groups agree that measures to prevent and reduce agricultural damage must be implemented.

An understanding of the amount and types of habitat required to sustain elk populations is key to setting population objectives. Stakeholders want government to undertake the needed habitat capability work to properly manage elk populations.

Issues

Habitat carrying capacity varies in time and space and is influenced by a host of biotic and abiotic factors. It is very difficult to quantify directly, requiring analysis and compilation of detailed, operational level plans.

A more strategic approach involves obtaining a measurement of habitat capability based on interpretation of biophysical maps. A 1:50,000 capability map for elk based on the ability of soil, terrain and vegetation units to support elk during winter and summer seasons exists for a portion of the East Kootenay sub-region (Demarchi 1986). Unfortunately, this product did not include seral stage of the units and therefore could not be interpreted for present habitat suitability.

More recently, the 1:250,000 broad ecosystem unit inventory that was conducted for the CORE process was interpreted for elk capability for the East Kootenay. By applying density estimates to winter range classes a population estimate was derived for the entire sub-region and individual Elk Management Zones (EMZs) within the sub-region based on habitat capability (optimal habitat condition) and suitability (present habitat condition). The elk habitat capability/suitability maps also provide strategic level direction on priorities for habitat enhancement by identifying habitats of high capability that are currently in a low suitability class due to present condition (e.g. forest ingrowth). Priorities can be further refined by looking at the proximity of these sites to private land and agriculture interests where winter/spring ranges are in poor condition. These priorities will be exploited over the next decade as resources and opportunity permit.Preliminary results from the capability/suitability mapping project indicate that the East Kootenay sub-region has the gross capability to support about 67,800 elk, assuming all habitat (public and private) is in optimal condition to provide elk winter range. Netting out, or removing all capability associated with private land reduces this figure to 40,600. **Current habitat condition on all potential winter range (gross suitability) is estimated to support 41,400 elk, while the net suitability (minus private land) has the potential to support 24,400 elk.** Net winter habitat suitability by Elk Management Zone (Appendix 1) indicates the two zones comprising most of the East Kootenay Trench could support about 16,500 elk, the Elk Valley 3,100, and Upper Columbia 4,800 elk. It is important to note that this product does not incorporate important factors such as habitat type adjacency and distribution, nor does it consider land use activities other than the exclusion of private land that may exclude elk use of the suitable habitat.

Another approach to quantify habitat potential and carrying capacity is to derive an estimate of current and projected winter forage supply. Again, a detailed, site-specific approach is preferred, but the following example based on estimates of forage production and animal stocking rates for major ecosystem types in the Natural Disturbance Type 4[1] fire-maintained ecosystem within the Invermere and Cranbrook Forest Districts of the East Kootenay Trench (EKT) (Gayton and Hansen, 1998), may indicate potential habitat carrying capacity.

[1] NDT4 - Ecosystem with frequent stand-maintaining fires. Includes grassland, shrubland and forested communities with an overstory of widely spaced Ponderosa Pine and Douglas Fir that normally experience frequent low-intensity fires. On grasslands these fires limit encroachment by most woody shrubs and trees. The varied intensity and frequency of fires across the landscape creates a natural mosaic of unevenaged forests interspersed with grassy and shrubby openings. An increase in fire activity in the late 19th and early 20th centuries likely increased the extent of these ecosystems, but fire suppression during the last six decades has had the opposite effect. Surface fire return intervals historically ranged from 4 to 50 years, stand initiating crown fires were relatively rare and occurred at intervals ranging from 150 to 250 years in the East Kootenay.

Example:

EKT/NDT4 (public land)	Area (current)	Forage prodn	Stocking rate	Total AUMs
Open range	34,200 ha	500 kg/ha	1.5ha/AUM	22,800
Open forest	79,000	250	3ha/AUM	26,330
Mnged forest	77,600	100	7ha/AUM	11,085
				60,215 AUMs
			minus	45,000 permitted
			=	15,215 AUMs

The stocking rate is assumed to be twice the forage consumption per AUM (1 AUM = 360 kg X 2 = 720 kg) to provide a safe use level of 50% forage removal. It is also assumed the 45,000 AUMs currently allocated to domestic livestock exclude elk use. At a conversion factor of 3 elk per AUM, the unallocated AUMs would support 7,600 to 9,130 elk in the NDT4 portion of the southern Rocky Mountain Trench over a 5 to 6 month winter period. This estimate is considered conservative given the exclusion of known elk winter range in areas outside the East Kootenay Trench and in the Natural Disturbance Type 3[2], and any contribution of range land associated with properties administered by the wildlife program. The Kootenay Boundary Land Use Plan targets a doubling of the Open Range category, and habitat enhancement activities are also planned in the NDT3. Restoration activities combined with proper herbivore management (elk and livestock primarily) will not only increase the area of open range, but will also increase the productivity of open range. **Based on these estimates of habitat capability, suitability, and forage production, a sub-regional elk population target of ± 25,000 appears feasible.** The challenge will be to identify and direct habitat enhancement and population management activities that minimize resource conflicts at the local level.

Studies conducted under the East Kootenay Trench Agriculture Wildlife Committee report (Gayton and Hansen 1998) have increased our knowledge of many aspects of elk ecology. Diet composition and overlap between elk, cattle and deer revealed that elk preferred grasses, especially fescues, over the fall, winter and spring periods. Winter elk diets are often similar to summer cattle diets, leading to potential indirect competition for the same forage species. This can result in declines in range condition and productivity, especially in cases where winter and early spring elk grazing is followed immediately by livestock grazing. Grazing pressure on native grasses is exacerbated by forest ingrowth which acts to concentrate grazing ungulates on remaining open grassland habitats. In addition to preference for grasses and depending on forage availability, elk and cattle also utilize shrub species, especially Saskatoon.

[2] NDT3 - Ecosystem with frequent stand initiating events. Frequent wildfires ranging in size from small spot fires to conflagrations covering tens of thousands of hectares. Usually contain unburned patches of mature forest that were missed by fire, creating a mosaic consisting of large areas of single aged forests surrounding patches of mature forest. Mostly Douglas Fir and Engelmann Spruce. Mean disturbance interval about 150 years in East Kootenay.

Telemetry studies provided information on movement behaviour and patterns. About 15% of the collared animals were non-migratory, commonly called "homesteader elk", with a high degree of overlap with wintering migratory elk. Migratory elk arrive on winter ranges from late September to mid November, peaking in late October, and initiate spring migration from March to early May. A complex of forage habitats and thermal/security habitats are critical to the exploitation of available resources by elk as daytime elk activity on winter range appeared associated with cover and security forest types, making little use of riparian, selective logging, open shrub or grassland habitats. However, these sites are exploited diurnally for forage so their importance cannot be underrated.

POPULATION STRUCTURE

Public Input

Stakeholders are cognisant of the need to maintain minimum bull to cow ratios and calf to cow ratios for population growth and maintenance.

Issues

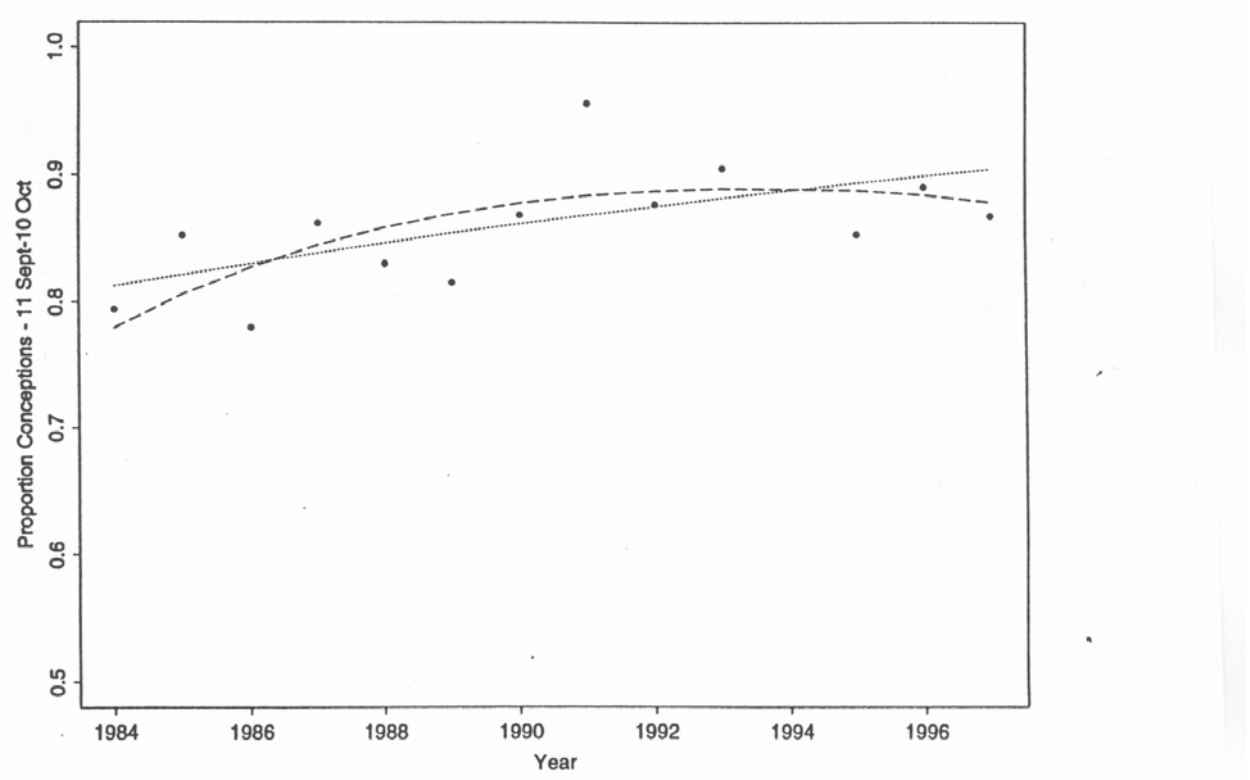
The first priority for establishing population structure objectives is to determine minimum sex ratios to satisfy the biological needs for reproduction. Bull to cow ratios above this minimum are then determined by human preferences and desires and hunters must realize that managing for higher bull ratios and older age structure comes with a cost. In order to produce more older aged bulls, more younger bulls have to live and grow older. The cost is in the form of reduced harvest on bulls, requiring regulations that decrease hunter opportunity either by restricting participation/opportunity or restricting the harvest to a segment of the bull population.

An extensive literature review of studies on elk sex ratios and subsequent affect on pregnancy rate and conception period (e.g. Raedeke et al.1998) reveals that there is no definitive answer to the question of minimum bull/cow ratios. Other than general widespread agreement that reliance on yearling bulls as primary breeders will result in declining fertility and longer conception periods, there is little evidence relating minimum mature bull numbers to calf recruitment. A number of jurisdictions, however, have established minimum post season bull/cow ratio targets in order to encourage public confidence in management strategies. Washington state has set a state-wide minimum of 12 bulls per 100 cows. The Oregon state minimum is 10 bulls per 100 cows, similar to Colorado. An observed bull to cow ratio of 5 bulls per 100 cows is the minimum criteria indicating need for corrective action in Montana. In Idaho, the state-wide minimum is 10 adult (3.5+ years) bulls per 100 cows pre-season, or about 18 total bulls per 100 cows post season. Most objectives for elk management units in these jurisdictions exceed 15 bulls per 100 cows, post-season. It must be emphasized that these ratios are based on observed numbers usually obtained in mid-winter surveys, and thus represent trends and not absolute population composition. This is because adult bulls in winter tend to be segregated from cow/calf groups and may not be encountered during routine inventory programs.

Pregnancy and conception data collected over the period 1984 to 1997 in the East Kootenay indicate an average pregnancy rate of 82.5% for adult (2+years) cows, and that 86% of cow elk are bred between September 11 and October 10 (30 days). In addition there is evidence that the proportion of cows conceiving during this period increased from 1984 to 1997 (Figure 1. Raedeke 1998). This information indicates that historic and current bull ratios have been adequate in terms of reproductive performance. A post season objective of 20+ bulls per 100 cows consistent with the provincial Wildlife Harvest Strategy (Ministry of Environment, Lands and Parks 1996), would ensure biological requirements are met and help satisfy expectations of seeing more adult bulls by hunters and non-hunters.

A recruitment rate of 30+ calves per 100 cows is desirable to provide the necessary recruitment to allow population recovery and provide a sustainable harvestable surplus. Levels below 25 calves per 100 cows persisting over three sequential years should be considered a trigger indicating corrective action.

Figure 1. (Raedeke 1998)



Plot of estimated proportion of cow elk that conceived during the period 11 Sept. – 10 Oct. for the years 1984-1993, 1995-1997. Fitted linear (…) and quadratic (---) trends plotted illustrating increasing proportions over time.

POPULATION INVENTORY

Public Input

Stakeholders want to see the East Kootenay elk population inventory program strengthened.

Issues

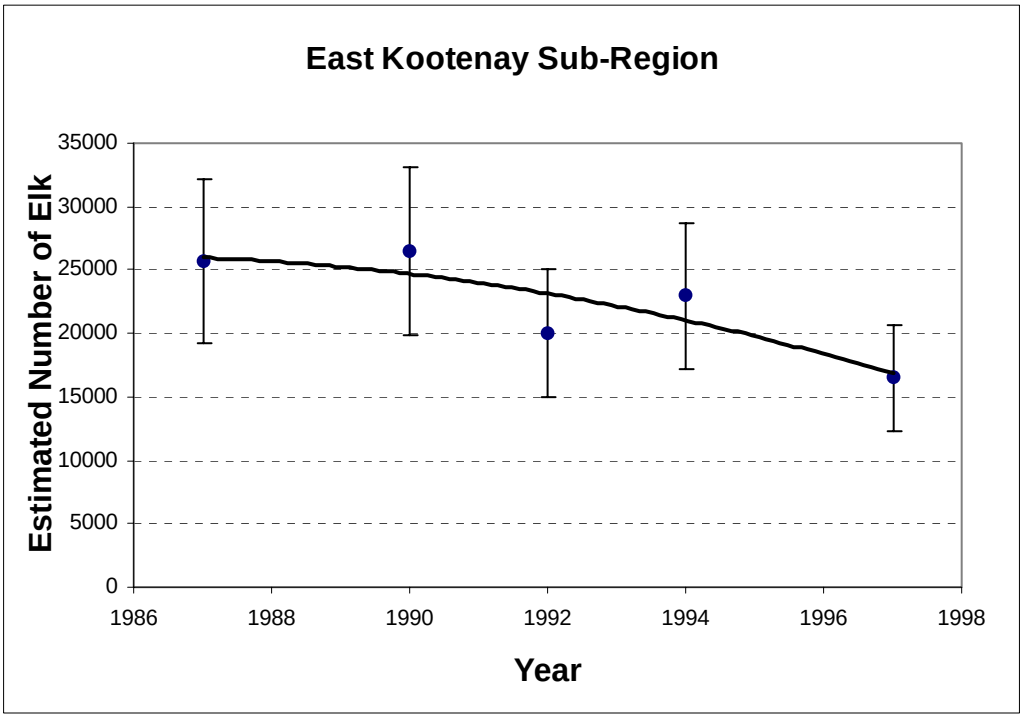
Carryover counts are conducted annually by volunteers to monitor calf overwinter survival on key elk winter and spring ranges in order to assist in identifying general population trends. The Wildlife Program currently provides two series of population estimates for elk in the East Kootenay; sub-region estimates and larger regional survey area estimates. Sub-region estimates are less accurate than survey area estimates. The costs associated with intensive aerial surveys, however, are prohibitive in terms of conducting region-wide surveys at frequent intervals and this level of detail is generally not required to make most management decisions. The sub-region estimates are always higher than regional survey area estimates because they are pre-season estimates (i.e. before hunting), while the survey area estimates are typically conducted during mid to late winter, when some animals have died from hunting or winter mortality.

East Kootenay Sub-Region Elk Population Estimates

Best estimates of the number of elk in the East Kootenay sub-region are provided every 3 to 5 years as part of a provincial review on ungulate population estimates. These estimates are for the pre-season or fall period, and are based on all available information including the most recent survey data (e.g. elk density, bull/cow and calf/cow ratios), harvest levels, age-class structure of harvest, and kill per unit effort. Reliability is variable depending on the availability of information. For elk in the East Kootenay, the actual number of animals is believed to be accurate to within $\pm$ 25% of the best estimate.

The elk population is believed to have started declining from a high of over 30,000 animals in the early 1980's. By 1992, it was apparent that the population had declined to about 20,000 to 25,000 elk. The estimate in 1994 was 23,000 animals, although this was felt to be optomistic and the actual number of elk that year was likely lower. The 1997 sub-regional population estimate of 16,500 indicates that the population continued to decline after 1994. Survey area estimates (see below), however, suggest that the elk population has increased since then. This should be assessed with a new sub-regional estimate in year 2001 based upon the most recent inventory, harvest and habitat information. SAK (sex-age-kill) modeling (see Raedeke et al. 1998) should also be undertaken to provide a second, independent check on the size and trend of the East Kootenay elk population.

Figure 2. East Kootenay Elk Population Estimates from 1986 to 1998



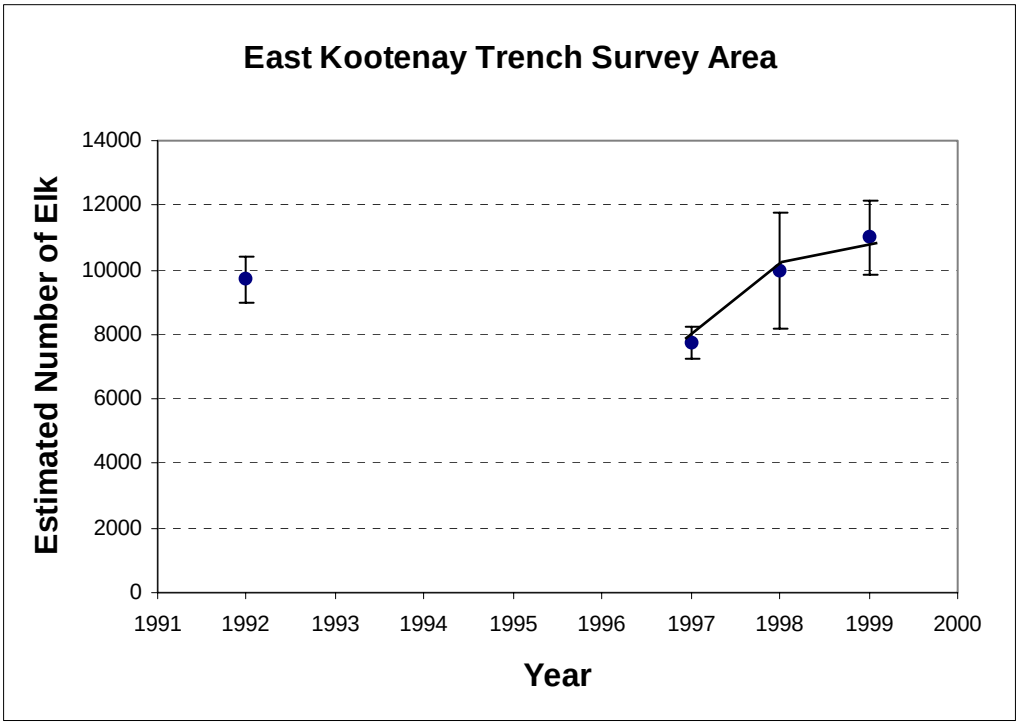
Note: the vertical lines are error bars which indicate the range of possible numbers of elk for that year. The middle values shown as dots is the best estimate for that year. The trend-line (thick solid line) is the estimated trend in the elk population.

The second series of population estimates comes from periodic intensive population inventories (surveys) conducted within the East Kootenay Trench from late January to early March. Some surveys have also been conducted in the Elk Valley. These surveys have measured elk abundance, calf to cow ratios and minimum bull to cow ratios on select winter ranges. The survey area estimates are considered to be much more reliable for estimating population trend than the sub-regional estimates, as they are based on provincial Resource Inventory Committee standards for Aerial Surveys which measure survey bias (including animals missed in more heavily forested habitats) and statistical precision (i.e. confidence intervals). The aerial survey uses a stratified random block design and includes a correction factor for animals missed on the survey blocks. Population estimates and herd composition are estimated from a computer program called *Aerial Survey* developed in Idaho (Unsworth et al. 1994).

To date, comprehensive surveys within the East Kootenay Trench have only been done in 1992 and 1997, with partial surveys in 1996, 1998 and 1999. At the very least, three winter ranges were surveyed each year (Dutch-Findlay, Premier Ridge, and Pickering Hills) which has enabled a cautious extrapolation of current population trends for this area (Halko and Hebert 1999). These trends suggest that the wintering elk population within the East Kootenay

Trench has increased since 1997. This trend, however, needs to be verified by another comprehensive survey in the year 2001. Select winter ranges within the Elk Valley should also be surveyed at this time using the standard Resource Inventory Committee Aerial Survey Protocol to complement inventory data collected for the rest of the sub-region. The sightability model being applied to estimate animals missed during the surveys with the *Aerial Survey* program should be validated for the East Kootenay.

Figure 3. East Kootenay Trench Select Winter Range Elk Population Estimates



Note: the vertical lines are errors bars indicating the range of probable numbers of elk for that year. The middle value is the 'best' estimate.

CALF RECRUITMENT

Public Input

All stakeholders agree that low calf recruitment is a significant factor influencing population recovery. Some stakeholders believe that predation is a leading cause of low calf recruitment. They agree that more information is needed about predator populations and their effects on prey populations in the East Kootenay.

Issues

The low calf recruitment rate observed in the East Kootenay since the early 1990s is largely responsible for current population status. There will be no population recovery without substantial improvement in the recruitment rate (Raedeke et al. 1998). Predation and past overharvest are two issues commonly identified as causitive factors leading to depressed

recruitment, but a number of other influencesprobably played a role as well, including elk density, habitat quality and quantity, weather, animal condition, pregnancy rate and breeding conditions and bull age structure (reviewed by Gratson and Zager 1998).

As habitat ultimately sets the limit on elk density, recruitment rates can decline as elk numbers approach or exceed habitat carrying capacity, resulting in poorer calf condition and higher rates of natural mortality. Under this scenario, one would expect a reduction in elk numbers below carrying capacity by hunting to result in improved recruitment. The East Kootenay elk population was reduced by about 1/3 from the mid 1980s to the early 1990s, but the low recruitment rates did not appear evident until the early 1990s. Poor habitat quality, however, has been shown to influence calf condition regardless of elk density. Calf birth weight and growth rate were shown to be related to weight loss by cows over the last half of gestation (Thorne et. al. 1976), implying that poor quality summer and/or winter ranges are important considerations. It is generally accepted that the quantity and quality of winter and spring ranges in the East Kootenay Trench have declined significantly since the 1950s due to fire suppression and forest ingrowth.

Pregnancy rates are also affected by habitat conditions and animal nutrition. Higher pregnancy rates in yearling cow elk have been related to reduced population density due to hunting, apparently resulting in better nutrition (Buechner and Swanson 1955). Gratson and Zager (1998) documented variable pregnancy rates in the western United States. Pregnancy rates in 2-year-olds ranged from 64% to 96%, rates in elk older than 3 years typically ranged from 69 to 95%. Some studies indicate a relationship between overall pregnancy rates and population density but cows in poor condition, regardless of population density, may have a delayed estrous or breed only in alternate years (Trainer 1971). Bull age structure is another important factor that can potentially lead to declining recruitment rates (reviewed by Raedeke et al. 1998). The average pregnancy rate for adult cows (2+ years) in the East Kootenay of 82.5% falls within the mid-range of reported values, indicating that poor calf recruitment is primarily due to survival, not production.

The situation of declining recruitment rates, increasing predator populations and declining habitat conditions are not unique to the East Kootenay. Similar trends are evident in various regions in Washington state, north-central and north Idaho and Montana. Causes for low or declining recruitment in these regions appear to be related to predation and habitat factors (refer to Appendix 2 for more detail).

Although habitat conditions are good and elk population objectives are being met in southwestern Alberta, grizzly bear numbers are increasing, wolves are becoming established at least sporadically, and cougar numbers are at recent highs (Quinlan, pers. comm.). March 1999 surveys in southern Alberta indicate recruitment at 25 (20-32) calves per 100 cows and bull to cow ratios of 9 (7-12) bulls per 100 cows.

Determining causes of poor recruitment and the role of predation in a complex system that features multiple prey species, multiple predator species, changing habitat condition and human influence on all these factors is a daunting task. Current habitat condition and available information on predator and prey population status in the East Kootenay combined with information from other jurisdictions indicates that predation is likely the short-term, proximate cause of low recruitment rates, whereas the affects of habitat structure, condition, and pattern over the longer term may be the ultimate factor. While elk pregnancy rates are

adequate at this time, habitat enhancement aimed at increasing forage abundance and quality (species composition) should increase the nutritional status of cows and improve fertility. Creating more open, forage producing habitat may also influence predator success by reducing the amount of closed canopy habitat that appears to be favoured by certain predators, especially cougar (Kunkel 1997).

Monitoring of pregnancy rates should continue. The Raedeke report indicated that a sample size of 100 uteri is required to achieve the statistical power necessary for testing whether pregnancy rates and/or conception dates have changed significantly.

Attempts to collect adequate sample sizes of uteri from road/rail killed elk have been disappointing. During the winter of 1998/99 wildlife clubs and other volunteers were asked to collect uteri from road killed cow elk. The clubs/volunteers were contacted by phone and letter and asked to collect fetal samples from road/rail kills encountered directly or reported by Ministry of Highways personnel. Permits, specimen bags and instructions were supplied to program participants. Unfortunately, the initiative was unsuccessful with only one cow elk uterus collected. There were a number of reasons for the low return, including elk carcasses being too severely damaged to recover uteri, lack of an adequate number of road-kill reports, and road-killed elk being difficult to locate.

In recognition of this difficulty it must be recognized that the collection of adequate sample sizes can only practically be obtained by a limited entry hunt in November when fetal development is sufficient to reliably determine date of conception. Local opposition to hunting seasons for cow elk during population recovery, however, may allow for only periodic sampling, such as every three to five years.

PREDATION

Public Input

Most stakeholders believe that predator populations are increasing and depressing local ungulate populations. Many feel that government is providing too much protection to predators. They want predator numbers to be managed through more liberal hunting seasons with fewer restrictions to harvest.

Issues

Grizzly bear, black bear, cougar and wolf populations have all increased in the East Kootenay over the last few decades. Previous lower population levels are directly attributable to excessive human exploitation and persecution of carnivores. Coyote populations have remained at healthy levels over the last several decades largely because of the cessation of active control programs. All of these species prey on elk to greater and lesser degrees, though coyote predation on elk is insignificant under most circumstances.

Grizzly bears and black bears are primarily predators of elk calves during their first month and particularly during their first week of life. Studies on moose and caribou in Alaska and other areas have shown that in some cases bears may be a significant limiting factor to ungulate populations. Wolves and cougars prey on elk year round and have also been shown to limit ungulate populations. The dynamism of the multi-prey/multi-predator

system in the East Kootenay is poorly understood in a North American context as this phenomenon has only recently surfaced. Therefore, traditional North American predator/prey relationships and research may not be applicable to the current East Kootenay situation.

Elk can adapt to human presence and in some cases may concentrate in areas in close proximity to human activity in order to avoid predators, which are generally more sensitive to human disturbance. Active predation can therefore have the effect of exacerbating elk/agriculture conflict levels in the absence of elk population increases.

Large carnivores are sensitive to human-caused mortality and must be carefully managed to ensure long-term sustainability. Provided that this sustainability is not jeopardized, liberalized harvest of coyotes, wolves, cougars or black bears may be considered where there is adequate supporting information that predation by one or more of these species is a significant limiting factor for elk. An example of this principle being applied was the liberalization of cougar hunting regulations in the Kootenay Region for the 1996 to 1999 period. Cougar populations are now believed to have declined due in large part to reduced prey availability and increased hunter harvest. Cougar hunting regulations are being adjusted accordingly for subsequent hunting seasons to ensure the conservation of this sensitive species.

Grizzly bears are Blue-listed[3] in British Columbia and are identified as being vulnerable nationally by the Committee on the Status of Endangered Wildlife in Canada. Due to the extreme sensitivity of grizzly bear populations to over-harvest, hunting of this species will not be liberalized in order to increase elk populations.

WINTER FEEDING

Public Input

Stakeholder views are mixed on the advisability of feeding elk during severe winters as a population maintenance strategy. Winter feeding is strongly advocated by some for humanitarian reasons and as necessary to maintaining elk populations. Some wildlife clubs carry out regular feeding programs. Agricultural stakeholders are concerned about the impact of winter feeding and its potential to increase elk/agriculture conflict.

Issues

A government sponsored elk winter feeding program was aggressively pursued in the East Kootenay during the early 1970s in order to accelerate population recovery through maximization of winter survival. While successful in terms of achieving elk population increases, the program resulted in increased agricultural depredation in the vicinity of feeding sites. Legal action was brought against government by affected members of the agricultural community and while the judgement resulting from this action absolved government of legal responsibility for depredation problems on adjacent private holdings, it

[3] Blue-listed means: those species considered to be vulnerable in British Columbia. Vulnerable species are of special management concern because of characteristics that make them particularly sensitive to human activities or natural events.

did identify a moral responsibility pertaining to the effects of winter feeding on the agricultural industry.

Short-term, small scale browse enhancement or householder feeding programs rarely result in significant beneficial results to wildlife populations as the cumulative impact of these actions is very small. It is unquestionable, however, that winter feeding is supported by the general public. The activity is gratifying to participants and is often seen as a panacea to habitat loss and other population limiting factors. These activities are not illegal and refusal to allow the general public to feed deer and elk is viewed as obstructionist and bureaucratic.

The Provinces of British Columbia, Alberta and Saskatchewan have policies to manage wildlife populations primarily on the basis of natural forage availability. British Columbia's policy allows winter feeding of selected wildlife as part of an authorized research or management program. It does not provide for feeding for humanitarian purposes. Alberta carries out winter intercept feeding to mitigate agricultural damage. Most western states have policies to not feed, except in some wildlife refuges where feeding is carried out to minimize agricultural damage, to improve opportunities for tourists to view elk or for experimental purposes.

Winter feeding is generally not considered to be a satisfactory approach to resolving winter habitat deficiencies. This is particularly true with respect to large scale operations involving the provision of agricultural products, such as hay, as a forage supplement to ungulate populations. Winter feeding

- is expensive to implement and maintain,
- does not resolve habitat shortfalls,

- can change social and migration behaviours,
- can introduce noxious weeds to natural habitats,
- creates a dependency on artificial food sources and can increase the attractiveness of agricultural products to elk, resulting in an increased likelihood of wildlife/agriculture conflict,
- leads to local destruction of natural habitats adjacent to feeding sites,
- concentrates animals in areas where they are exposed to increased predation and poaching, and
- significantly increases the incidence of disease contagion. Of particular concern in this regard is the transmission of brucellosis, contagious ecthyma, and other bacterial and viral infections.

The lack of a normal mortality factor (ie. periodic winter kill) may also weaken natural selection mechanisms and genetic viability. Feeding often has poor results as animals that are in a weakened condition often will not respond to feed provided and succumb anyway. The domestic animal feeds used in most feeding operations are not normal to ungulate diets, frequently causing digestive upsets.

Independently funded, small scale elk winter feeding operations on private or non-winter range Crown land are not discouraged or supported by the ministry. These feeding

opportunities should be described and direction provided for their implementation in the East Kootenay through information packages for public distribution.

Large scale feeding operations involving agricultural products on traditional winter ranges are generally discouraged and should not be contemplated unless local snow depths maintain critical levels for a period of 21 days or as soon as the physical condition of ungulates on these winter ranges shows a significant and dangerous decline. Standing snow depths in forested canopy components of these winter ranges should be used to assess snow depth criticality; the results of opportunistic autopsies of ungulates killed on winter ranges by collisions with vehicles can be used to assess overall ungulate population condition.

Government funded ungulate feeding programs occurred in the East Kootenay during the severe winter of 1996/97. Forest Renewal BC funding was used to hire unemployed forestry workers to cut trees and foliage on Crown land ungulate winter ranges and the resulting forage was left in the area it was cut. The focus of this program was to provide natural food sources to deer and elk in a dispersed fashion. A side benefit of the program's long term focus was to assist elk in subsequent years due to re-growth of preferred forage. Enhancement prescriptions included deciduous browse slashing, coniferous pruning and the felling of fir trees with a diameter at breast height of less than 20 cm. on identified sites. Site selection was made on the basis of animal presence and the requirement to feed as determined by local conditions, such as deep snow cover on marginal winter ranges. The program resulted in supplemental feeding and long term benefits being achieved in over thirty sites totalling approximately 260 ha. distributed across the East Kootenay. Immediate benefits to elk could not be measured but both elk and deer were observed utilizing the forage provided.

ELK /AGRICULTURE CONFLICT MANAGEMENT

Public Input

Stakeholders disagree on whether hunting should be used to reduce the number of non-migratory elk and deter them from using agricultural lands. Agricultural stakeholders want the full range of measures (including hunting) to be available to reduce elk/agriculture conflicts. They want recognition for the contribution made by farmers to the well being of elk populations. Others feel that any hunting for antlerless elk will slow population recovery. Relocation of problem elk and fencing of vulnerable crops and land were viewed as important alternatives for problem resolution.

Issues

Management of problem elk challenges managers in all areas of North America where elk and agriculture coexist. Once elk shift their feeding patterns onto agricultural lands, they are difficult to remove.

The agriculture/elk conflict in the East Kootenay has a long history and has been a factor influencing elk and agricultural management in the region since at least 1956. As Gayton and Hansen (1998:16) point out, an impressive number of studies and analyses of this issue

have been conducted, but "… there is an embarrassing contrast between the volume of words and intentions and the volume of action on the problem.".

Loss of natural elk habitat over time to forest encroachment on former grasslands has resulted in unwanted reliance by elk on agricultural crops and livestock feed. Agricultural producers tolerate some losses but fear that an increase in elk populations will result in a situation that will threaten the viability of their operations.

Most natural winter ranges are low on the mountain slopes, close to farms. Many of these natural winter ranges have been compromised for elk over the last fifty years by forest encroachment and coniferous ingrowth. In winter (particularly when snow depths are above normal) elk move to adjacent farm land to eat stored feed or feed that has been left out for livestock. Some elk no longer migrate to spring and summer ranges higher in the mountains. These non-migratory elk (sometimes referred to as "homesteader elk") feed on farmers' crops in the spring and summer. There is a level of competion between elk and cattle for forage on Crown ranges in summer.

Non-migratory elk, habituated to feeding on agricultural crops, cause most of the damage to agricultural operations. These elk calve and summer at low elevations on the winter ranges and damage agricultural crops. In winter and spring they feed on private land.

Because none of the available methods to deal with habituated elk is wholly effective on its own, it is necessary to address this issue through a combination of hunting seasons, non-hunting methods and modified agricultural practices as appropriate to the particular site. Prevention and reduction of conflicts between elk and agricultural operations require attention to improving natural elk habitats to reduce their need to use private agricultural lands, managing problem elk, and addressing agricultural damage. Actions to improve elk habitat are described in the following pages under "Habitat Management".

Increased measures to prevent and reduce agricultural damage by elk are required as elk populations increase. It is current government policy to not pay compensation to farmers for wildlife crop damage; farmers are expected to independently implement necessary preventive measures. Nonetheless, elk tend to utilize and benefit from agricultural lands, especially during the winter months when they are concentrated on low elevation winter ranges. The contribution that private land owners make to the health and viability of wild ungulate populations must be recognized in the context of any management plan for the species. Dialogue between government agencies and all stakeholders is essential to develop mitigating approaches to benefit both the agriculture community and wildlife. Examples of these include co-operative Crown range enhancement, fence maintenance, special mitigation, prevention and compensation initiatives and noxious weed control.

Hunting can reduce the number of problem elk on agricultural sites as well as create disturbance to encourage elk to leave these sites. Hunting seasons should be area-specific to address actual depredation concerns where alternative methods are ineffective. A system where individual land owners with well documented problems, agree to co-operate in the regulation of hunting pressure on the depredation sites is preferred. In order to avoid impacting migratory elk it is necessary to restrict the depredation hunt period to September

and October. Later in the season non-problem migratory elk become vulnerable to harvest on these sites.

While earlier depredation seasons in spring or summer may be effective, there would likely be strong public opposition to orphaning of young elk calves whose survival could be compromised by loss of the dam at that time. In some areas there has been public acceptance of aboriginal people hunting for sustenance during the spring to assist farmers by removing and disturbing elk consuming and trampling emerging crops. The co-operation of First Nations in implementing non-hunting season sustenance harvest of problem elk should be sought.

Hazing, driving or removing elk from identified depredation areas may be an option in some cases. This should be determined on a site-specific basis, and requires landowner cooperation. Removal is only practical during winter when elk can be drawn to bait, and therefore is less effective for targeting homesteader elk.

Another option currently being implemented is using prescribed burns to provide intercept habitat or alternate foraging sites for elk close to agricultural fields. In these areas, even a moderate amount of disturbance by shooting or hazing elk may be effective to shift elk onto the enhanced sites, reducing depredation problems. Some wildlife lands[4] are currently being managed for this purpose.

Intercept feeding using non-natural feed is being used in Alberta to keep elk away from farm lands during deep snow periods and storms in winter. The technique is also used extensively in some US states. Intercept feeding affects only migratory elk and does not address the issue of non-migratory elk on summer damage areas. Further, the high cost, limited application, health risks and risk of increasing habituation to non-natural food sources make intercept feeding in the East Kootenay an unfavorable option for conflict resolution.

Continuation and increased use of agricultural practices that reduce depredation problems are essential. Fencing clearly works on high value, intensively farmed orchards and forage storage areas but may not be economically viable on larger forage fields. Exclosure fencing may, however, also be cost effective in certain cases of forage production and should be assessed by farmers from a business perspective. Feeding cattle during the day so that little or no food is available at night for elk to feed on would reduce or eliminate elk consumption of winter cattle feed in some cases.

Issuance of kill permits to farmers has provided a degree of comfort and control in situations where damage had become intolerable and in situations where other methods have been ineffective,. A variation used in some US states is a “landowner preference” permit where the owner can kill and keep a “problem” elk or sell the opportunity to take problem elk to a hunter as a form of compensation. “Hot spot” hunts designed to allow for quick reaction to a legitimate problem, such as a freshly planted field, would allow a wildlife officer to issue a specific number of permits to hunters who are on a waiting list and direct them to a specific area. Repeated, long-term use of hot spot hunts appears to hold promise for reducing crop

[4] Wildlife lands are lands that have been acquired and are managed by the Ministry of Environment, Lands and Parks and/or non-government organizations, exclusively or primarily to benefit wildlife.

damage. Special weapons hunts (ie. bow and arrow seasons) should be explored as an alternative for increasing problem elk harvest in areas where firearms cannot be used safely.

HABITAT MANAGEMENT

BACKGROUND

Elk are primary grazers with grass and grass-like species composing up to 90% of their diets. They are particularly reliant on grasses throughout the year though they tend to shift to a mixture of grasses and shrubs in fall and winter. Historic and continuing loss of grassland habitat is the most important limiting factor to elk population growth in the East Kootenay.

Elk habitat management in the East Kootenay is tied to integrating and balancing the interests of elk (i.e. population growth) with the agriculture (primarily cattle ranching) and forest industries. Habitat management authority for most of the East Kootenay's key Crown land elk ranges rests primarily with the Ministry of Forests. One exception to this occurs in the Elk Valley where much of the available elk habitat is on land owned or leased by several mining companies and one forest industry firm. The Ministry of Environment, Lands and Parks is responsible for managing elk habitat in provincial parks and on a number of properties set aside as wildlife lands.

There is broad acceptance of the need to reverse the process of ongoing habitat loss in the East Kootenay by increasing the quantity and quality of grassland habitat, for ungulates and livestock. Planning and activities are underway toward that end. Appropriate allocation of improved Crown range forage resources and focused efforts to prevent and control noxious weed introductions are also required. Wildlife lands and Parks also contribute elk habitat benefits. Attention to access management planning is needed in light of the increasing human population and their enhanced access to elk habitats.

HABITAT ENHANCEMENT

Public Input

Most stakeholders agree that restoration and enhancement of grassland habitats are the most important actions required to maintain larger elk populations and reduce agricultural damage. They want aggressive habitat enhancement to be the highest priority elk management activity in the East Kootenay. The wildlife, forestry and agriculture communities agree that co-operative efforts are needed to enhance and maintain Crown grazing habitat for mutual benefit.

Issues

Forest management practices(particularly suppression of the natural fire regime) and various types of development have resulted in a dramatic loss of grassland elk habitat in the East Kootenay over the past 50 years. The trend continues with 3-4000 hectares of grassland being lost each year to forest encroachment and ingrowth. Of particular significance in this regard is the forestation of dry, low productivity south slope sites. Even though these sites are not conducive to commercial forest production, forest management policies have generally prevented extensive logging and burning of these sites to duplicate the effects of large fires that occurred naturally.

Dietary overlap and indirect competition between elk and cattle on key elk winter ranges have led to a weakening of the productive capacity of important grass species, deterioration of range condition and weed invasion.

The majority of sites providing the greatest opportunity for enhancement benefits have already reached a seral stage where native grass seed sources have been eradicated or seriously depleted through competition with coniferous tree species for available nutrients and light. The re-establishment of native grasses on these sites is complicated by a number of factors. Native grass and forb seed is not readily available and is not expected to become commercially available at the quantities required for several years. In addition, there is insufficient information available to successfully cultivate native grass and forbs species on native range. To date, production trials of native seeding sites have not been encouraging and it is likely that it will be some time before successful growing techniques can be found.

Current plans prescribe a reversal of these trends and creation of more grasslands over time. The Kootenay Boundary Land Use Plan, East Kootenay Trench Agriculture Wildlife Committee Report, various Ministry of Environment, Lands and Parks enhancement plans and the Ecosystem Restoration Planning process currently in progress under the KBLUP all describe these issues and propose solutions. These initiatives have broad-based stakeholder support and are partially funded from non-government sources. A commitment to full implementation is still outstanding as part of the core business of government, along with committed long term funding.

Management guidelines for Natural Disturbance Type 4 fire-maintained ecosystem restoration were developed in the Kootenay Boundary Land Use Plan. Targets for shrub lands, open range, open forest and managed forest components are set to double the amount of open range by the year 2024. The implementation of these ecosystem restoration programs will result in a significant increase in native bunch grasses on Crown range in the next 10 years, particularly on known winter ranges. Forest licencees are moving toward the creation of components of open forest and open range in their planning and implementation protocols. A target of 50% closed forest and 50% open forest is being implemented as a mosaic over large areas. The overall vegetation objective is to increase bunch grasses and shrubs in the understory.

The land use plan did not suggest fibre production and utilization be ignored on range areas. The commitment to fibre utilization on these areas was key to forest industry acceptance of the plan. Some of the trees on proposed range improvement areas are economic to harvest now, while other trees will require additional time to grow before they are logged. A consistent harvesting regime of this wood on an even-flow basis is planned. An opportunity exists in further development of guidelines under the land use plan to amend forestry policies that hinder expansion of elk habitat.

The location of habitat enhancement activities to improve elk distribution, reduce private land damage, reduce elk concentrations near highways and railroads and encourage migration to higher spring and summer ranges, is critical to the success of this program. Development of intercept ranges and ecosystem restoration efforts to enhance spring and fall ranges in the NDT 4/NDT 3 interface will take pressure off winter ranges that are currently

being used by wild ungulates in the spring, fall and winter and by cattle in the spring, summer and fall. These actions will be beneficial in reducing elk damage to crops on private land, which is usually greatest in the spring and fall.

In order to achieve enhanced forage availability for elk on traditional winter, spring and fall ranges it will be necessary to remove the coniferous overstory on enhancement sites and utilize the nutrients made available for grass and forb production. In addition to burns designed to reduce conifer ingrowth in open stands and grasslands, cool, post-logging controlled slash burns will normally be implemented to reduce the incidence of woody debris and accelerate the rate of nutrient release. The Ministry of Environment, Lands and Parks in conjunction with other government agencies and non-government organizations represented on the Rocky Mountain Trench Ecosystem Restoration Committee plans to increase its grassland restoration program to 5000 ha per year, primarily for the creation and maintenance of new ungulate habitat.

Habitat enhancement opportunities also exist in the Montane Spruce zone in Natural Disturbance Type 3. The largest fires in the province naturally occur in this disturbance type. High capability south-facing winter and spring ranges in this zone are now dominated by maturing forest stands, especially lodgepole pine, created by the extensive burns in the early part of the century. Present disturbance is limited to small cutblocks. These sites should be treated to mimic natural disturbance by logging large cutblocks (500+ ha) followed by prescribed burns of variable severity to change understory species composition and increase forage production. Incentives to implement these treatments by licencees may be required. Relaxing cutblock size and cover constraints may be an incentive, and be ecologically appropriate for this natural disturbance type. Forage enhancement projects in favor of cover retention in components of the NDT3 ecosystem will have far reaching benefits for ungulates.

Most elk habitat enhancement projects involving conversion of forest to grassland ecosystems will involve some form of grass seeding. The preferred method of improving elk forage availability after removing the coniferous overstory is to encourage recovery of native grass and forb plant communities through direct seeding of native species or by encouraging the expansion of relict seed sources[5]. Sites that have sufficient relict stock for natural regeneration of native grass and forb communities will not be manipulated further other than through applications of fertilizer as required to encourage recovery. Those sites having little or no capability for natural grass species recovery will be seeded to non-native grass species. These exotic species must be palatable to wildlife, cannot be increasers in response to grazing, cannot be aggressively expansionist and should die out within a decade. The purpose of this phase of grassland enhancement is to provide short term forage benefits to elk while simultaneously reducing erosion and the possibility of weed invasion while allowing native species to establish themselves and ultimately replace the exotic grass. (R. Forbes pers. comm.)

The implementation of these recommendations and plans requires ongoing co-operation by all interests to achieve planned goals. Ecosystem Restoration Steering and Operations Committees have been formed to serve this function.

[5] surviving native grass patches

CROWN RANGE

Public Input

Many stakeholders are concerned that Crown ranges are overgrazed. They suggest enhancement to produce more forage on Crown range and fair allocation of range resources between the various users.

Issues

Most low elevation Crown ranges are shared between livestock and wildlife. These ranges are essential to the health and viability of East Kootenay elk populations as well as the economic viability of cattle ranching operations. Forest encroachment has led to the concentration of large domestic and wild herbivores on smaller and smaller areas of open range, and forest ingrowth has filled in the open forest stands to make them far less productive for grazing. Overgrazing of Crown ranges is a symptom of this larger problem.

Any allocation system must accommodate existing and future uses as well as ensure the sustainability of the grasslands.

Management of cattle grazing on Crown ranges is by Range Use Plans under the *Forest Practices Code*. Forage removal by livestock is monitored and in selected areas and the amount of livestock grazing is reduced where forage plants have been detrimentally impacted and carrying capacity severely compromised. Rotational cattle grazing has been practiced on most of the dry grassland ranges in the East Kootenay for two to three decades.

Elk use of Crown range is harder to manage than cattle use of the same range, as elk are much more difficult to control than domestic animals. For example, elk will normally ignore fences that will effectively provide a barrier for cattle movement.

The range resources are allocated in much of the East Kootenay Trench using a formula of 25% to cattle, 25% to wildlife and 50% for plant health, soil building and protection and for watershed purposes. It is essential that range health be a factor along with a reasonable resource allocation to elk and other wildlife in allotment of grazing resources on Crown land. Allocation of additional forage produced by habitat enhancement projects must consider site-specific circumstances and objectives that includes input from local stakeholders, similar to the spirit of the earlier Co-ordinated Resource Management Planning initiative.

Ecosystem restoration of the winter, spring and fall elk ranges is a critical component of increasing the Crown range forage base for domestic and wild herbivores, as well as for range plant health and biodiversity. Winter ranges are currently used by wild ungulates during the spring, fall and winter and by cattle during the spring, summer and fall. Improvement of forage availability on existing ranges, in combination with the enhancement of adjacent higher level spring and fall ranges and development of intercept ranges will reduce the pressure on the shared winter ranges and reduce the elk use of private lands, which is usually greatest in the spring and fall. Permanent plots at representative sites for long-term monitoring of forage production and levels of use is a key component to assess restoration progress and range condition.

Communication and development of shared visions among stakeholders and concerned government agencies is essential to meeting the variety of objectives over the land base.

WILDLIFE LANDS

Public Input

Stakeholders want to see more active management and acquisition of wildlife lands to benefit elk.

Issues

A strategic plan entitled "*A Land Management Strategy for Wildlife in the East Kootenay Trench"* (Bioquest International Consulting, 1993) provides overall direction and establishes priorities for land management activities in the East Kootenay. Detailed management plans and intensive bio-physical inventories have been prepared for most of the lands managed for wildlife by the Ministry of Environment, Lands and Parks.

With shrinking resources, the ministry continues to seek alternative ways to manage wildlife lands. Management activities have over time evolved toward agreements with local ranchers for mutual benefit. Where wildlife lands are surrounded by farmland, the ministry works with neighbouring farmers and manages the lands with the objective of reducing conflicts.

Opportunities to use cattle to "condition" forage for wildlife are limited. Considerable science and expertise is required to determine how to apply this concept to the various forage plants. In the East Kootenay, typified by a high elevation, limited growing season and a dry summer, any conditioning on native species would be complete by June 20 at the latest.

Noxious weed is an issue on wildlife lands; control is carried out with government funds on wildlife lands as required.

Land acquisition for wildlife continues through private/public sector partnerships. For example, in 1998 approximately 1.5 million dollars was spent on acquisitions in the Elk Valley, the Cranbrook area and the Kimberley/Canal Flats area. Other acquisitions are planned.

Elk are a priority species for wildlife lands in the East Kootenay. Approximately 60-65% of wildlife land enhancement and protection activities are for elk. The ministry actively maintains and enhances elk habitat on Sheep Mountain (the Cutts property near Elko), Big Ranch and Grave Prairie (Elkford), Mount Broadwood (Elko), Columbia Lake West (Canal Flats), Bummers Flats/Cherry Creek (Cranbrook) and especially Premier Ridge (Skookumchuck).

When the Newgate (Earl) property near the Canada/US border east of Lake Kookanusa was purchased for wildlife in 1972 it was very unusual to see elk there. Now up to 150 elk are present during fall, winter and spring, when they calve on the property. Some of the fields were seeded to meadow foxtail, a highly succulent and palatable forage for elk. All but one of the fields are irrigated and intensively managed by local ranchers for annual hay crops.

One field is dryland managed with a fescue grass for winter and early spring range for deer. This property also supports a large population of whitetail deer, some mule deer, moose and wild turkey and contains the most productive waterfowl project in the East Kootenay. (D. Phelps pers. comm)

In some instances wildlife lands are managed primarily for other species with elk habitat management as a secondary goal. On some lands it is important to manage in such a way that elk do not compete with other, more fragile species or impact their habitats. While the Creston Valley Wildlife Management Area is managed primarily for migratory birds, it is used by elk and deer and some ungulate enhancement is possible.

Much of the provincial park land in the East Kootenay is at high elevation and therefore provides elk habitat only in summer. Winter range availability is extremely limited. The few lower elevation parks (e.g. Norbury Lake Park) are small, surrounded by private land, and for the most part have levels of human use that are too high to make elk management viable. Notable exceptions to this occur in Provincial Parks in the Purcell Wilderness Conservancy, on the East Side of Columbia Lake and in Kikomun Park, where limited opportunities for elk habitat development exist. These opportunities are currently being reviewed and will be implemented as opportunity permits.

NOXIOUS WEEDS

Public Input

Stakeholders are united on the issue of noxious weed management. Noxious weeds are considered to be a significant threat to biodiversity and the re-establishment of elk habitat in the East Kootenay and immediate action should be taken to reduce this problem.

Issues

Noxious weed invasion has had profound effects on range quality in the East Kootenay and there is every indication that native species diversity and abundance will continue to decline in response to noxious weed competition unless heroic efforts are initiated to reverse current trends. Many exotic weed species have become established in the East Kootenay. Of particular concern with respect to noxious weed invasives are Dalmatian Toadflax (*Linaria dalmatica),* Diffuse and Spotted Knapweed *(Centaurea sp.)* and Leafy Spurge *(Euphorbia esula).* These species are spread easily, are extremely aggressive colonizers of open ground, tend to vigorously compete with native vegetation and are completely unpalatable to wildlife. In addition, they are extremely difficult to control. (R. Forbes pers. comm.)

It is standard practice to ensure that effective programs are in place to combat noxious weed invasion on potential enhancement sites before enhancement programs are implemented. To ensure that appropriate floral communities are established on wildlife habitat enhancement areas before noxious weeds can invade, the short term introduction and maintenance of non-native grasses and forbs is sometimes necessary. Implementation of enhancement programs without weed control components in place is not recommended.

Noxious weed communities on Crown and private lands must be located, mapped and systematically eradicated through the use of biological, mechanical and chemical agents. The costs associated with effective control efforts are staggering and will require significant

co-operative funding contributions from government and non-government sources. Innovative fund generation programs should be encouraged, such as the dedication of funds accrued from motor vehicle licence fees.

ACCESS

Public Input

Proliferation of access for resource extraction is seen by many stakeholders as a limiting factor to elk population growth by making elk more vulnerable to disturbance and hunting pressure. There are conflicting views on road closures. A public access management planning process was seen by many to be the best way to address the issues.

Issues

Access can limit elk use of specific habitats and can increase elk vulnerability to hunting. Hunting regulations must be more restrictive in areas where access is increased through new roads or all terrain vehicle use. Lack of motor vehicle disturbance on access-restricted private lands compared to adjacent public lands with no restrictions, especially during the calving period, may also be a factor influencing development of non-migratory elk behaviour.

Off-road motor vehicle activity on grassland or alpine ecosystems can result in significant, irreparable damage. The development of technologies that have put all terrain vehicles and trail motorbikes into common use has exacerbated the problem. A significant number of off road vehicle users have shown little regard for environmental damage and the problem is increasing each year.

Public opinion on the use of off road vehicles is polarized. Many people wish to continue their use of off road vehicles for recreational purposes (including hunting) while others are genuinely offended by their use. Many wilderness users cannot reconcile the use of off road vehicles with a wilderness experience and do not accept their use in many areas. The opportunity for regulating off road vehicle use is decreasing each year as these vehicles come more and more into common useage and traditions of use are established.

The mandate for access and all terrain vehicle use management is divided among several government agencies and a number of different statutes, with significant gaps in content and implementation. Access management programs primarily designed to prevent wildlife harassment on sensitive habitat sites or to reduce hunting activity in specific areas have been implemented in the past under the *Wildlife Act* in the East Kootenay. The utility of access management by one agency for this single purpose is no longer sufficient, especially with respect to overall habitat damage and in light of the restrictive hunting season strategies already in place.

The accepted threshold ratio of road distance to area is 1.5 km. of road per square kilometre before disturbance levels reach a point that elk will avoid the area (R. Forbes pers. comm.). Disturbance level thresholds can be increased by reducing hunting vulnerability through regulations that protect the majority of the elk population, such as closing antlerless seasons, limited entry hunting or 6 point bull elk seasons. Access vulnerability issues become less relevant if hunting is not permitted. Conversely, as the elk population recovers and demand

for hunting opportunity increases, the use of access management can also be expected to increase, especially if restrictions on hunter participation (ie. limited entry hunting) are not implemented.

Development of a multi-agency co-ordinated access plan that has the benefit of full stakeholder consultation and review is required. The Ministries of Environment, Lands and Parks and Forests have embarked on an extensive access management review program to ensure that this process takes place. Full public consultation has been solicited. Specific timelines for review completion have not been established but a first draft of access management programs for parts of the East Kootenay (eg. Golden Forest District) is expected in 2001. The plan would determine public and technical access management requirements and would translate these requirements into various strategies specific to the needs brought forward. The most appropriate legislative instruments would be applied to ensure that access management goals were reached.

The Ministry of Environment, Lands and Parks will maintain existing East Kootenay access management programs until a full regional review of the program can be completed.

HARVEST MANAGEMENT

BACKGROUND

Liberal hunting seasons were implemented in the early 1980s to reduce the elk population and agricultural damage caused by elk. The result of this was increased recreational opportunities for hunters and economic benefits to local businesses.

Beginning in 1992, hunting opportunities were gradually reduced by seasons designed for population maintenance and agricultural damage prevention. The elk population continued to decline for four more years, however, necessitating further reducions in hunting opportunity and success.

Dissatisfied with reduced opportunities to hunt elk, some stakeholders developed firmly held positions which they advocated politically, in the media and the courts. The resulting controversy was heightened by concerns that decisions have been made as a result of biases within government rather than by science and sound wildlife management principles. Views on the source and nature of the perceived bias vary and in some cases are opposite.

To demonstrate its commitment to manage wildlife populations based on sound science, in 1998 government contracted professional wildlife biologist Dr. Ken Raedeke to conduct an independent assessment of the elk harvest management in the region and province. The resulting report provides short and long-term recommendations for managing elk hunting in the East Kootenay.

In 1998 government implemented the hunting season recommended in the report for population recovery. Following a short “archery only” season from September 1 to September 9 for bull elk with at least 3 points on one antler, the general open season was

September 10 to October 20 for bull elk with at least six points on one antler. All hunting seasons for antlerless elk were eliminated.

HUNTING SEASONS DURING POPULATION RECOVERY

Public Input

Wildlife stakeholders agree that hunting seasons in the short term should be conservative to allow for elk population growth and recovery. They are also unanimous that Limited Entry Hunting not be implemented for bull elk. They hold opposing views, however, on how bull elk hunting should be managed.

The majority of wildlife organizations want the bull elk hunting season that was in place during 1998 to continue. They feel it allows everyone the opportunity to hunt while simultaneously allowing for population recovery.

Some stakeholders do not want the 1998 season to be maintained. They believe that rifle, or any hunting during the rutting period and limiting hunting to older bulls disrupts herd dynamics, reduces calf survival, and impedes population recovery. They propose a general open season for "3 point or better bulls" or "any bull" in October, with a "bow hunting only" season during September.

The demand for archery only seasons has been forwarded as an alternative that allows high levels of recreational activity with little risk of overharvest.

Issues

Within the constraints of conservation, the ministry strives to provide hunting opportunities that optimize recreational use and economic benefits and meet the preferences of most hunters.

The goal of population recovery demands that the elk harvest remain conservative with no or minimal antlerless harvest and a low bull harvest. Hunters agree with the need to reduce harvest to help restore the bull component of the population, but also demand that hunter participation not be restricted. Regulation options that meet those criteria are very limited.

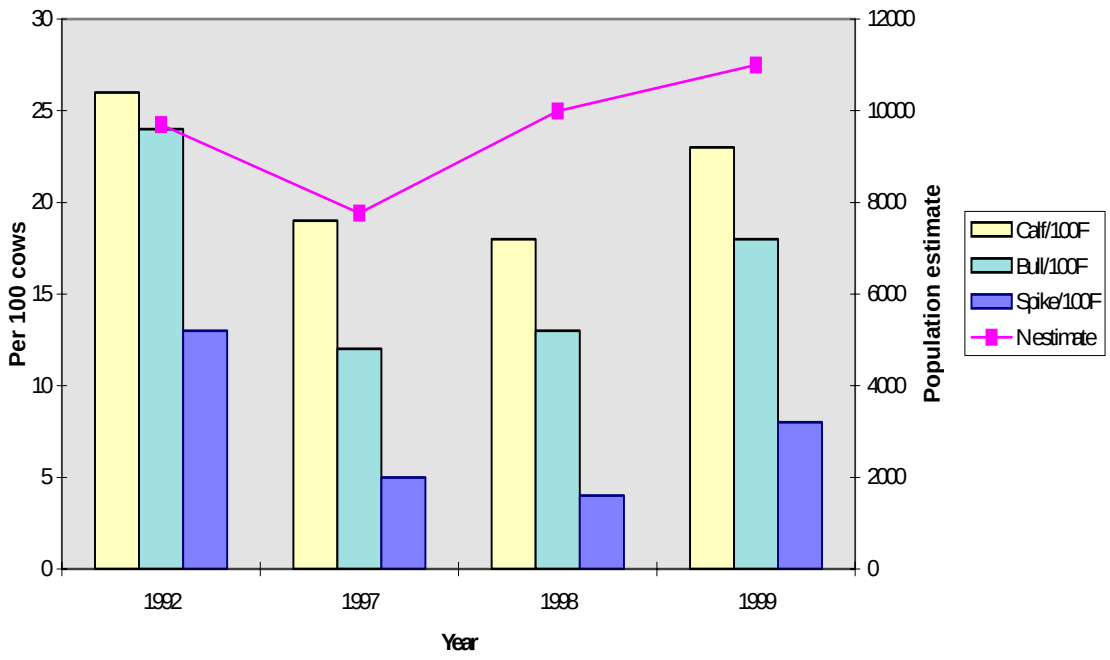
The East Kootenay has offered rifle hunting seasons during the rut for many years, an opportunity that now is somewhat unique in North America. Many stakeholders want to maintain this opportunity, while others see the rut hunt as a major cause of population decline.

Conception data collected over the period 1984 to 1997 indicate that 86% of cow elk are bred between September 11 and October 10, with evidence that the proportion of cows conceiving during this period has increased over time (Raedeke et al. 1998:33-34). The peak of the rut occurs around September 25. These data have been assessed by ministry staff and an independent reviewer who have found that the current rutting period for these herds is within normal parameters. The concern that hunting during the rut (which has been practised in the East Kootenay since before 1956) has prolonged the calving period is not supported by the available information.

The 1999 inventory of elk on select winter ranges showed an overall improvement in the bull to cow ratio (Halko and Hebert 1999). For the combined three survey areas, the ratio was 18 bulls per 100 cows, which is up from 13 bulls per 100 cows in 1998 (Fig. 4). This is now very close to the current management objective of 20+ bulls per 100 cows. The proportion of adult bulls (larger than raghorns) to total bulls has been increasing over time, from 6% in 1992 to 20% in 1997and 1998 to 25% in 1999. The number of spike bulls per 100 cows also increased from 4 in 1998 to 8 in 1999, but this number is still low due to poor calf recruitment.

Calf to cow ratios have also improved (Fig. 4). Two areas now have calf to cow ratios that should improve population growth. Overall, the calf to cow ratio was 23 calves per 100 cows, which is up from 18 calves per 100 cows in 1998.

Figure 4. Population composition ratios for the East Kootenay Trench.



Most jurisdictions in the US allow hunting during the rut, although many of these hunts are by archery, primitive weapons or limited entry rifle hunting. Current special weapon season strategies for the East Kootenay establish archery seasons for the ten days preceding the general open season. Open access, low security cover and high hunter densities are common features in many of these areas where rifle hunting during the rut would result in high hunter success and eventual depressed bull ratios. Open rifle hunting during the rut is generally

now limited to “wilderness” areas with poor access and relatively low hunter densities. The effects of hunting with any weapon during the rut on herd dynamics and movement behaviour has been identified as a possible concern by some agencies, but not to the extent that rut seasons have been terminated. There is evidence that bulls with harems are less likely than bachelor bulls to respond to a bugle, while bulls that have had exposure to bugling hunters likely learn to avoid hunters (Walsh et al. 1991). In Colorado biological data show no effect of current hunting seasons on big game reproductive rates, and their policy is to continue to allow hunting during the peak of breeding seasons for deer, elk, antelope and moose (Colorado Div.of Wildlife 1999). As a general guideline, the regular rifle season for elk in Colorado is delayed until the first Saturday after October 9 but this is done as a safety precaution to allow adequate time for livestock operators to move their stock off public lands.

The restriction of harvest to a small population segment (6 pt bulls) during the rifle season in the East Kootenay has markedly reduced the harvest in keeping with the goal of population recovery while still providing for unrestricted hunter participation. Preliminary data indicate a harvest estimate of 435 bull elk in 1998. This reduction in the bull harvest has directly contributed to the improvement of the bull to cow ratio (see also Appendix 3). The six point season serves to protect younger bulls (virtually all yearling and 2-year-olds, and most 3 and 4-year-olds), ensuring that breeding-aged bulls are available for reproduction, and that the six point bulls taken from the population are replaced each year by the next age cohort. The proportion of adult bulls in the 1999 survey also indicates increased survival of older bulls. Present habitat conditions (areas of dense forest cover) provide elk with high security from hunters, while access restrictions and the 6 pt season reduce hunting pressure, thus ensuring a portion of the mature bulls escape harvest.

Despite the strongly held views of some stakeholders, there is no scientific support for eliminating the East Kootenay elk rut hunt.

A post rut season, open to a larger component of the bull population (“3+ points” or “any bull”) would make more bull elk vulnerable to harvest and increase hunting pressure, risking an unacceptable high harvest and jeopardizing both recovery and recruitment of larger bulls into the older age classes (Appendix 3). This is especially critical under the prevailing condition of poor calf recruitment (see also Raedeke et al. 1998:41).

Allowing hunting to continue until the end of October would impose another level of risk of overharvest, as migratory elk generally start to congregate on their winter ranges in mid-October.

Maintenance of the 1998 seasons will provide recreational opportunities and economic benefits and minimize hunter crowding while allowing for population recovery. Minimal use of antlerless seasons will also aid population recovery, assuming adequate calf survival from natural mortality factors.

HUNTING SEASONS IN THE LONG TERM

Public Input

Following recovery of the elk populations, stakeholders want to see a stable, sustainable harvest regime with varied, quality hunting opportunities, including a long general open season for "3 point or better" bulls, opportunities to hunt antlerless elk and opportunities to see and hunt large 7-8 point bulls. Maximum sustainable economic benefits from the elk resource was a common theme.

Issues

Numerous options exist to provide more liberal hunting opportunities once population objectives are met and harvest targets are established. A key factor determining the type of regulation will be the response of hunters to the increased opportunity. Opportunities for general open seasons could be supplemented by archery seasons. If hunter numbers approach levels similar to the mid to late 1980s, a long general open season for 3+ point bulls would likely not be sustainable or produce larger, older bulls. Most jurisdictions now have some form of controlled hunts or require hunters to make a choice by area or license type to manage hunter effort.

The regional wildlife program will continue to consult and work with local stakeholders to develop regulation options and recommend seasons. Options will be evaluated by use of population simulations to help illustrate the effects of various harvest regimes prior to making recommendations. There is little opportunity for developing season strategies specifically for the production of 7 to 8 point bulls other than to let younger bulls live longer. Mature bull elk rarely exhibit antler point architecture greater than a six-point configuration, regardless of age. The assumption that antler point architecture is directly correlated with age is incorrect, except to say that most yearling bull elk have spike antlers and most mature bull elk have six point antlers. Post yearling and sub-mature bull elk exhibit variable antler architecture, from spike to six-point configuration.

HARVEST DATA PRODUCTION

Public Input

Most stakeholders want the Ministry to improve and streamline its processes for producing harvest information in order to make it available when it consults with the public on the next year's hunting regulations. They also provided suggestions for improving harvest data collection and estimating hunter effort.

Issues

Timely retrieval and analysis of harvest data is important information used to guide setting of hunting seasons. Consultation with stakeholders is normally conducted in late fall, during or immediately following hunting seasons. At that time, harvest data from that fall's hunting season is not available for review.

Compulsory inspection data is mostly complete and available to wildlife staff by early January. The Hunter Sample questionnaire is mailed in late December or very early January and the first mailing results are available by late March. Final results are not available until June, but the first mailing results provide useable information for regulation setting in most cases. These time frames cannot be improved without new funding but do allow wildlife staff to make necessary adjustments to hunting season recommendations before they are submitted to Cabinet for approval in June.

Although the provincial tooth return program was cancelled for the year 1999/2000, compulsory tooth returns will continue for elk taken by hunters in Kootenay Region. Compliance with the voluntary tooth return program for Kootenay elk was disappointing during the early 1990's (less than 20% for bull elk), but increased substantially with the implemention of compulsory reporting to over 50% in 1997.

Hunter effort is not constant from hunter to hunter for many reasons. For example, some hunters pass up animals they could have taken, some put much more effort into hunting than others (including the use of horses and all terrain vehicles) and some are more skilled than others. These variations have always existed but at the management unit level, the additive value of each participant's effort provides results that can be reliably used for comparative purposes between years.

The Ministry has been implementing harvest data collection with many First Nation groups around the province. As work progresses on treaty negotiations more aboriginal harvest information will become available.

ECONOMIC VALUE OF HUNTING

Public Input

Stakeholders want government to recognize the contribution of hunting to the economy and promote hunting as a legitimate, traditional use of wildlife.

Issues

It is estimated that British Columbia residents hunting in the East Kootenay spent $7,645,450 during 1997/98 on transportation, food and accommodation, equipment and supplies, etc. Of this spending, $2,737,480 or about 36% was spent by residents hunting elk. (Note - In 199/00 the amount decreased slightly to $6,503,200; $1,906,180 of which was spent hunting elk). Hunting related spending is estimated to have supported 52 person years of employment with spending on elk hunting supporting 18 person years[6]. In addition to these expenditures, it is estimated that resident hunters in the East Kootenay derived a supplementary net economic value of $7,650,080 from their hunting in 1997/98.[7] Spending by resident hunters also produced an estimated $1,621,820 in government revenue through

[6] A person year of employment is the equivalent of a person working for a full year.

taxes paid on purchases by hunters and income taxes paid by those whose employment was made possible by hunters' spending. Of this government revenue, $557,180 was accrued from elk hunters.

Non-residents hunting in the East Kootenay in 1998/99 spent an estimated $4,164,100, with $909,270 (22%) spent by elk hunters. Spending by non-resident hunters supported 45 person years of employment of which about 10 person years were due to elk hunters. Spending by non-resident hunters produced an estimated $1,303,360 in government revenue with $284,600 coming from elk hunters. (R. Reid, pers. communication)

Elk hunting has a long history in the East Kootenay and is important from both a traditional perspective and as a recreational activity. The Wildlife Harvest Strategy states: "The Wildlife Program recognizes that hunting, trapping, and falconry are legitimate uses of the wildlife resource in British Columbia providing they do not jeopardize the sustainability of individual wildlife populations." Where consistent with conservation of the elk resource, the Wildlife Program will continue to manage elk populations in the East Kootenay to provide a variety of hunting opportunities for the people of British Columbia.

Surveys on the economic value of wildlife including hunting are conducted periodically by the Wildlife Branch. The reports are provided to elected representatives and senior government officials, the press, non-government organizations and interested individuals. Updated annual values related to hunting are derived from this information using estimates of hunter effort from the Hunter Sample Questionnaire and hunting licence sales. Annual updates of the results are prepared and circulated to regional and headquarters staff and other interested groups and individuals.

The information derived from the surveys is used in other ways besides informing policy makers and the public about the values of wildlife. For example, it is used in various land use planning processes such as Land and Resource Management Planning and Timber Supply Analyses, to show the values of wildlife-related activities. Wildlife values are also considered in environmental impact assessments including wildlife values at risk and potential mitigation/compensation alternatives.

NON-CONSUMPTIVE USES

Public Input

Stakeholders report that opportunities for elk photography and viewing have diminished with the reduction in the elk population, reducing tourism and economic benefits to the area. Some are concerned that conflicts between hunters and non-hunting recreationists will arise in the future and that some commercial backcountry recreation activities (especially winter activities) can be harmful to elk.

[7] The net economic value of resident hunting refers to the amount that hunters would be willing to pay if there was a daily charge or fee for hunting as there is for privately provided forms of recreation such as lift charges at ski hills.

Issues

Non consumptive uses of East Kootenay elk include photography and wildlife viewing undertaken as either a primary activity (local viewing) or a secondary activity while visiting parks, hiking and horseback riding. Several East Kootenay wildlife viewing sites listed in the provincial Wildlife Viewing Guide focus on opportunities to observe elk. Elk are very "viewer friendly" in that they are large bodied, exhibit large antlers, are relatively non-threatening, aggregate in herds and occupy open habitats. The species is particularly important in terms of opportunities for wildlife viewing and will continue to enjoy a high profile in terms of the East Kootenay tourist industry.

Indirect, non-hunting values for wildlife have been calculated for the East Kootenay (Reid, 1996) indicating that 84% of Kootenay residents watch wildlife and value the experience. The species of most interest to residents were deer, elk and moose. It is estimated that provincial residents participating in wildlife viewing in the East Kootenay currently spend $9,800,000 on transportation, food and accommodation, equipment and supplies etc. This spending is estimated to support 105 person years of employment and $1,700,000 in government revenue.[8] (R. Reid, pers. communication)

The planned increase in the elk population will increase elk viewing and photography opportunities. Some habitat enhancement programs currently underway will encourage seasonal elk use of sites adjacent to low speed roads (ie. Bull River area) in order to provide elk viewing opportunities. Public information signage and pamphlets have been prepared to direct the public to other elk viewing opportunities.

Wildlife considerations are an important factor in adjudicating applications for new commercial recreation activities. Regional wildlife staff are asked to identify any concerns they may have with a proposed operation prior to any land use decisions being made. Regional land managers are working closely with wildlife staff to ensure that wildlife concerns are addressed prior to authorizing new commercial recreation operations.

[8] Based on a survey of activity for 1996 but is expressed in 1998 dollars.

MANAGEMENT OBJECTIVES & STRATEGIES 2000-2004

HABITAT MANAGEMENT OBJECTIVES AND STRATEGIES

1) Manage habitat suitability to sustain 25,000 (± 20%) elk excluding agricultural lands. Restore range condition and forage supply to exceed safe level of use by wildlife and livestock. Beyond the expressed target of 25,000 (+/- 20%) animals, elk populations should not be allowed to increase at a rate that exceeds forage condition and habitat recovery

2) Implement the recommendations contained in the final report of the East Kootenay Trench Agriculture Wildlife Committee.
    - Formal government endorsement and funding support to augment the non-government organizations' contributions is required.

3) Support designation of the NDT4 Ecosystem Restoration objectives of the KBLUP as a higher level plan under the Forest Practices Code. Implementation of the guidelines are well underway in the Invermere and Cranbrook Forest Districts, but this designation would provide added legal direction to lower level operational plans.
    - Modify the land use planning process on NDT4 to give parity to wildlife, livestock, timber and ecological interests.
    - Target removal of excess immature and of-site understory trees primarily in the open range and open forest ecosystem components.
    - Reduce regeneration stocking standards on open range and open forest components.
    - Provide incentives via appraisal system to encourage restoration harvesting on areas of lower site-index.
    - Establish permanent plots at representative sites to monitor forage production and levels of use.

4) Undertake habitat enhancement projects on high capability sites in NDT3 ecosystems in cooperation with forest licensees and Ministry of Forests.

5) Implement habitat management strategies designed to provide intercept habitat and attract wintering elk away from private agricultural lands.
    - Develop a working partnership among stakeholders (government agencies, the agriculture industry and wildlife interests) to develop mitigating approaches to

common issues that benefit both the ranching community and wildlife. Examples of these include co-operative Crown range enhancement, fence maintenance and noxious weed control.

- Where feasible, conduct intensive habitat management on properties managed by the regional wildlife program to encourage elk use and reduce conflicts with adjacent private landowners.

6) Continue working toward the development of a multi-agency co-ordinated access management plan for the East Kootenay.
    - Complete the access management review.
    - Establish and publish a timetable for completion of the planning process, including opportunity for public consultation and review.
    - In the interim, implement access controls under the *Wildlife Act* to protect elk populations and habitat as required.

7) Undertake a review of the current strategy and individual plans for management of Wildlife Management Areas and private lands managed by the regional Wildlife Program.

8) Protect critical private land winter ranges.
    - Secure administrative control by various means including acquisition, conservation easements, lease agreements, land exchanges, and landowner stewardship incentives.
    - Work with local governments and private landowners/developers to design development strategies and land use plans that maintain winter range capability.

9)Cooperate with a multi-agency strategy to combat the spread of noxious weeds on Crown and private land.
    - Locate, map, and eradicate noxious weed communities by use of biological and chemical techniques.
    - Habitat enhancement projects must include provisions for weed control prior to approval /implementation.
    - Increase public and private landowner awareness of the problem and their role in curtailing the spread of noxious weeds.

POPULATION MANAGEMENT OBJECTIVES AND STRATEGIES

1) Increase the sub-regional elk population to 25,000 ($\pm$ 20%). Within the constraints of habitat supply and private landowner tolerance, develop population objectives for each Elk Management Zone.

2) Manage for a post-hunting season observed bull to cow ratio of greater than 20 bulls per 100 cows.
    - A branch-antlered bull to cow ratio of 10 bulls per 100 cows is a desired component of the objective of greater than 20 bulls per 100 cows.
    - Depending on public demand for older-aged bulls, higher ratios may be desired in specific Elk Management Zones.

3) Increase and maintain post season calf to cow ratios of greater than 30 calves per 100 cows. Levels below 25 calves per 100 cows for more than 3 years is considered a minimum target warranting corrective action.
    - Monitor pregnancy rates, at a minimum of 3 year intervals, using late season antlerless hunts.
    - Periodically conduct late summer composition surveys to estimate summer calf survival.
    - Initiate a research project to investigate timing and causes of calf mortality if late summer calf recruitment is less than 30 calves per 100 cows.

4) Liberalize the harvest regulations for carnivores without jeopardizing population sustainability if it is determined (from #3) that predation by coyotes, wolves, cougars or black bears is a significant factor preventing elk population recovery.

5) Enhance the inventory program. Population inventory and analysis should be an inherent part of any review of use of the wildlife resource and should dictate the amount of harvest opportunity available.
    - Conduct comprehensive surveys in the East Kootenay Trench and select winter ranges in the Elk Valley using the standard Resource Inventory Committee Aerial Survey Protocol, beginning in the year 2001 and at 5 year intervals thereafter.
    - Validate the Idaho sightability model for the specific habitat conditions and aircraft used in the East Kootenay.
    - Conduct annual absolute abundance/composition trend surveys similar to those of 1996, 1998 and 1999 on select winter ranges in the various Elk Management Zones until the more extensive comprehensive surveys confirm population recovery.
    - Maintain and monitor approximately 50 radio-collared adult female elk to further document adult mortality, sightability, and seasonal movements.
    - Continue to use and refine population models (e.g.. Sex/Age/Kill) to provide an independent check on regional population estimates derived from habitat suitability.

6) Develop a contingency plan to direct non-government organization sponsored supplemental feeding of elk populations during very severe winters.
    - Strategically locate feeding areas to minimize conflicts with private farmlands and potential mortality associated with transportation corridors.

- Utilize natural foods.
- Avoid use of feed that might contain noxious weed seeds
- Produce a brochure to provide advice to individuals and groups that wish to conduct small scale, independently funded feeding on private land or non-winter range.

7) Reduce agricultural damage caused by elk
    - Refer to harvest and habitat management strategies.
    - Increase harvest of specific elk herds responsible for agricultural damage.
    - Capture and relocate elk from chronic damage areas where other techniques are not effective or not feasible (e.g. safety concerns, etc.).

8) Reduce vehicular and train collisions with elk.
    - Improve data collection techniques and determine critical locations of elk/vehicle and elk/train collisions.
    - In cooperation with the Ministry of Transportation and Highways and the Canadian Pacific Railway, develop strategies to reduce collisions between wildlife and vehicle or trains. Examples of these strategies are: erect signs to warn motorists of the presence of elk in the area; inform and educate the public of ways to reduce their chance of hitting wildlife; erect fencing, under/overpasses or swarflex reflectors at major wildlife collision locations; and provide input to design highways to minimize elk/vehicle collisions.

9) Maintain, enhance and promote opportunities to appreciate, study and view elk in their natural habitats.
    - Provide public information signs and pamphlets for key sites offering elk viewing opportunities.
    - Review commercial recreation applications to ensure elk habitat and elk use behaviour are not compromised.

10) Encourage investigation of competition between elk and other wild ungulates, especially mule deer and Rocky Mountain Bighorn Sheep.

HARVEST MANAGEMENT OBJECTIVES AND STRATEGIES

1) Optimize hunting opportunity within the constraints of population and demographic objectives.
    - Maintain the current 6 point bull elk harvest strategy to minimize harvest without restricting hunter participation, and to provide recovery of the bull segment.
    - Evaluate the effectiveness of the six point regulation in achieving objectives after it has been in place for four years (ie. evaluate post 2001 season; implement possible amendments in 2002 season) ;
    - If after 4 years the recovery objectives for bull escapement are not achieved, (e.g. > 20 bulls/100 cows, 10 branch-antlered bulls/100 cows) modify the bull harvest

regulation by further restricting harvest by closing the hunting season, implementing Limited Entry Hunting or a combination of season closure and LEH.

- Once population and demographic objectives are met, employ more liberal seasons designed to provide more recreational opportunity and to maintain elk numbers at desired levels (eg. short, three-point bull seasons, expanded archery seasons).
- Although a standard regulation for the entire sub-region is preferred, it may be necessary to vary harvest strategies depending on objectives established for the individual Elk Management Zones.

2) Improve effectiveness and timeliness of the provincial harvest data collection system.
    - Investigate the feasibility of using interactive voice response technology to increase the efficiency of the hunter sample.
    - Develop better public information programs to encourage greater participation in harvest data collection.

3) Implement appropriate harvest strategies to reduce elk numbers/distribution in chronic damage areas. Some considerations include:
    - early season antlerless limited entry hunts on private land;
    - options for wildlife officers to issue harvest permits at short notice, such as “hot spot hunts”;
    - landowner preference permits - allows owner to kill an antlerless elk as a form of compensation; and
    - landowner damage hunts - owner is allocated a specific number of permits, and they select the hunters. If owner does not want to administer, have an NGO group administer permit allocation based on first come-first serve, or advance bookings, or juvenile accompanied by adult, etc.

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Appendix 1
Summary Statistics by Elk Management Zone (EMZ)

A. Elk Valley

Private land and parks - area summary

Management Unit	*Total Area (km2)*	*% Private Land*	*% National Park*	*% Provincial Park*
4-1	1,558	5.3	0.0	6.7
4-2	1,237	24.3	0.0	0.0
4-23	3,315	37.6	0.0	9.8
Total	**6,110**	**26.7**	**0.0**	**7.0**

Biogeoclimatic Ecosystem Classification (BEC) zone - area summary

Management Unit	*Total Area (km2)*	*% AT*	*% ESSF*	*% ICH*	*% IDF*	*% MS*	*% PP*
4-1	1,558	7.7	72.3	0.0	0.0	19.8	0.0
4-2	1,237	4.1	54.2	7.0	8.1	13.6	12.9
4-23	3,315	22.0	57.7	7.6	0.3	12.2	0.0
Total	**6,110**	**14.7**	**60.7**	**5.5**	**1.8**	**14.4**	**2.6**

Natural Disturbance Type (NDT) - area summary

Management Unit	*Total Area (km2)*	*% NDT1*	*% NDT2*	*% NDT3*	*% NDT4*	*% NDT5*
4-1	1,558	0.0	0.1	92.0	0.0	7.8
4-2	1,237	0.0	10.5	64.3	21.0	4.1
4-23	3,315	0.0	6.4	71.1	0.3	22.2
Total	**6,110**	**0.0**	**5.6**	**75.0**	**4.4**	**14.9**

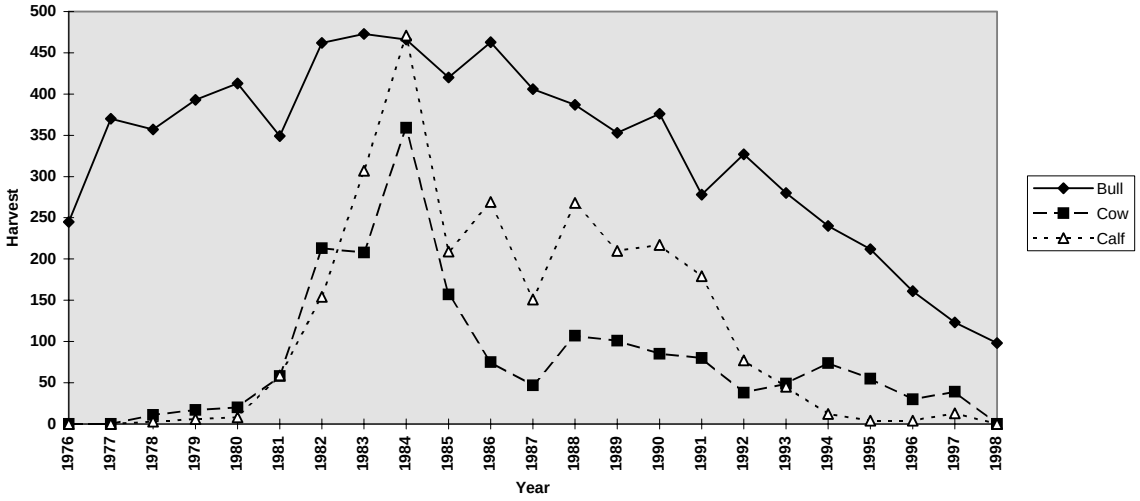
Population estimates based on winter habitat capability

Capability Class	*Gross sq km*	*Net (Public) Land Base (km2)*	*Density/km*	*Gross Number of Elk*	*Net Number of Elk*
0	81	79			
1	278	132	15.0	4,166	1,979
2	215	119	10.0	2,148	1,193
3	772	391	5.0	3,858	1,956
4	41	13	2.0	82	25
5	81	58			
6	4,724	3,725			
Total/Mgmt Zone	**6,191**	**4,517**		**10,253**	**5,153**

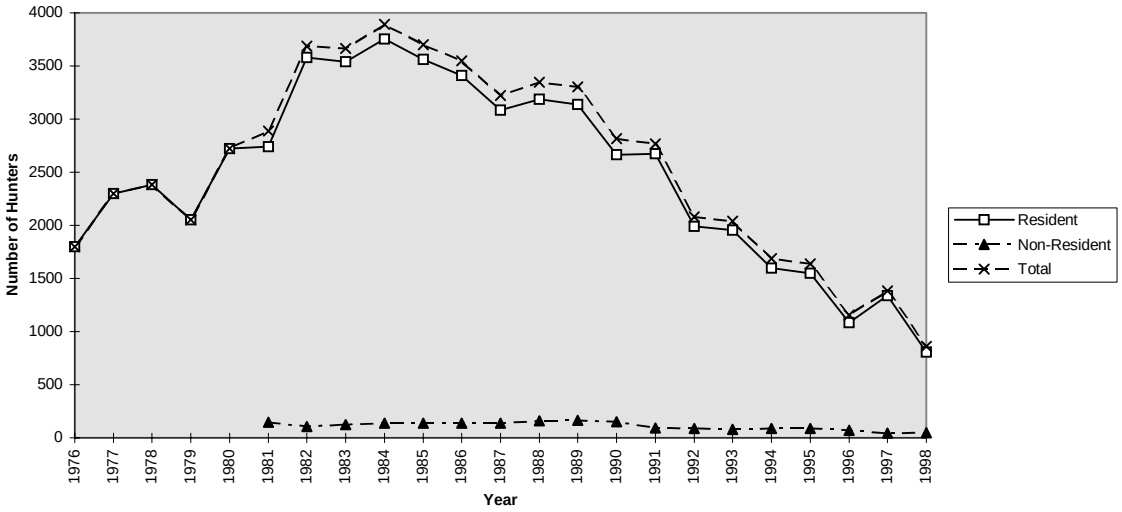
Population estimates based on winter habitat suitability

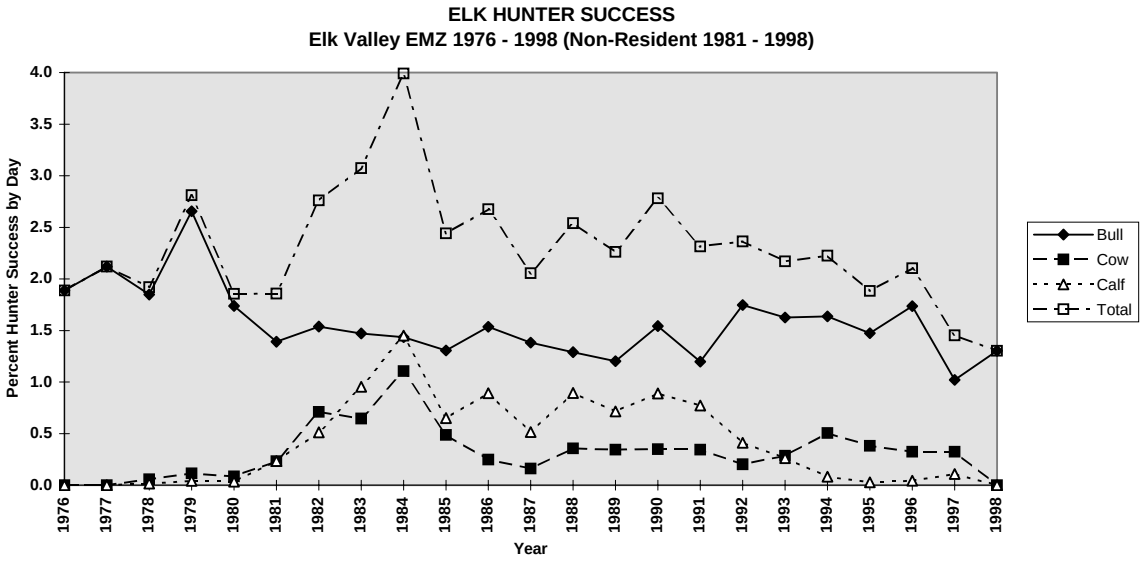
Suitability Class	*Gross sq. km.*	*Net (Public) Land Base (km2)*	*Density/km*	*Gross Number of Elk*	*Net Number of Elk*
0	81	79			
1	182	94	15.0	2,732	1,415
2	37	15	10.0	367	154
3	464	179	5.0	2,319	894
4	400	301	2.0	801	602
5	190	53			
6	4,837	3,795			
Total/Mgmt Zone	**6,191**	**4,517**		**6,219**	**3,064**

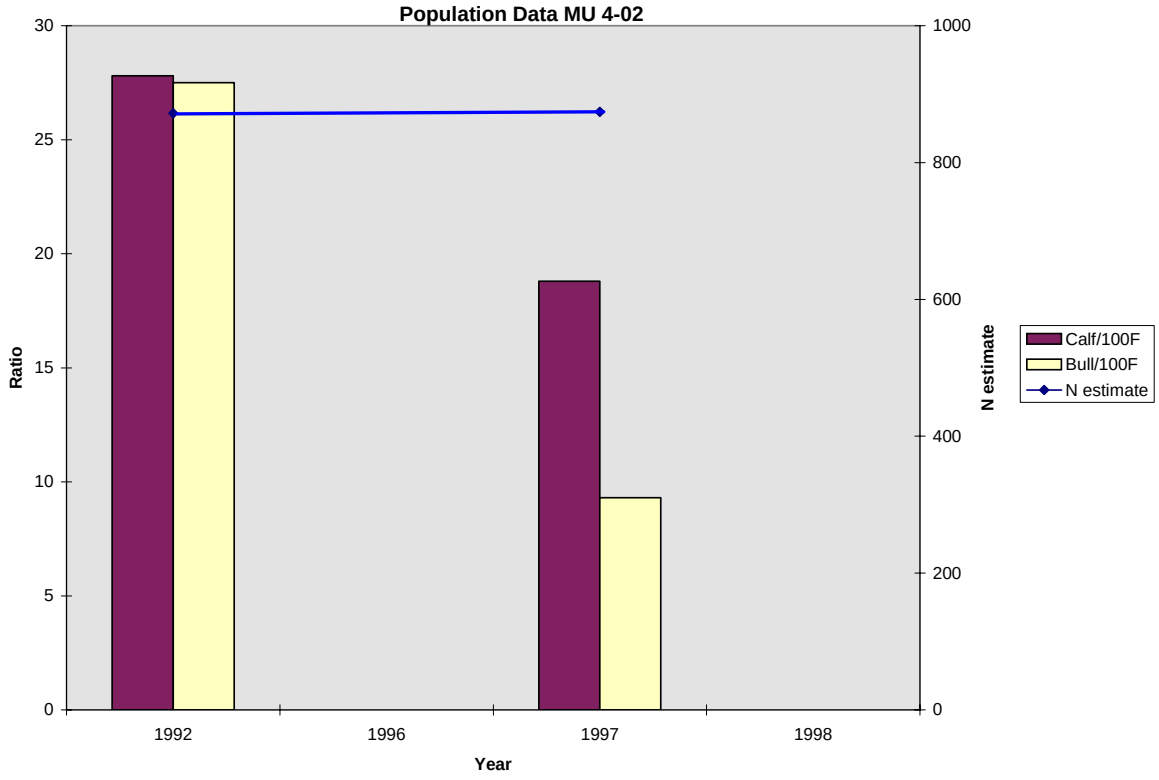
ELK HARVEST
Elk Valley EMZ - 1976 - 1998 (Non-Resident 1981 - 1998)

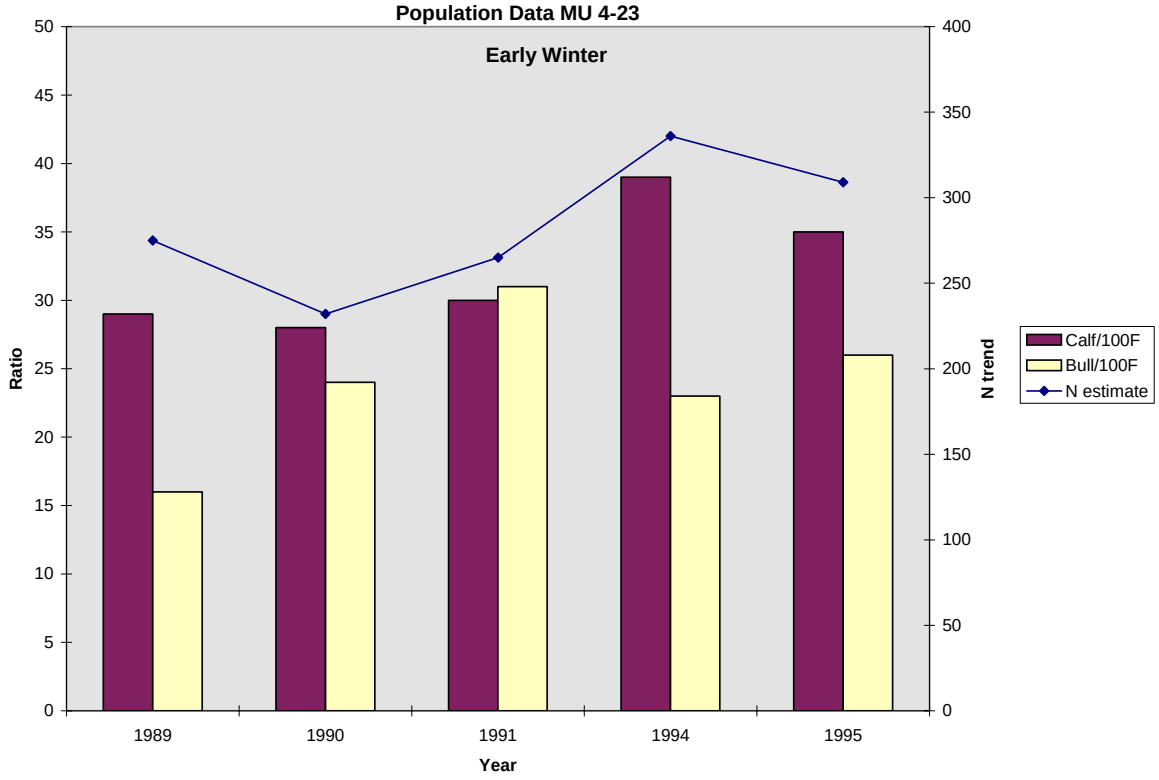


ELK HUNTERS
Elk Valley EMZ - 1976 - 1998 (Non-Resident 1981 - 1998)




ELK HUNTER SUCCESS
Elk Valley EMZ 1976 - 1998 (Non-Resident 1981 - 1998)
Percent Hunter Success by Day
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
Year
Bull
Cow
Calf
Total


Population Data MU 4-02
Ratio
N estimate
Year
1992
1996
1997
1998
Calf/100F
Bull/100F
N estimate


Population Data MU 4-23
Early Winter
Ratio
N trend
Year
1989
1990
1991
1994
1995
Calf/100F
Bull/100F
N estimate

B. East Kootenay Trench - East

Private land and parks - area summary

Management Unit	Total Area (km2)	% Private Land	% National Park	% Provincial Park
4-21	1,323	11.4	0.0	5.9
4-22	2,388	12.3	0.0	1.3
4-24	1,850	1.5	0.0	8.0
4-25	3,157	2.1	19.6	20.7
Total	**8,718**	**6.2**	**7.1**	**10.5**

Biogeoclimatic Ecosystem Classification (BEC) zone - area summary

Management Unit	Total Area (km2)	% AT	% ESSF	% ICH	% IDF	% MS	% PP
4-21	1,323	17.8	39.8	0.0	20.0	11.4	11.0
4-22	2,388	16.3	38.3	11.7	23.1	8.1	2.6
4-24	1,850	30.2	50.6	2.1	3.9	13.2	0.0
4-25	3,157	31.6	44.9	0.0	6.4	16.8	0.0
Total	**8,718**	**25.0**	**43.5**	**3.6**	**12.5**	**12.8**	**2.4**

Natural Disturbance Type (NDT) - area summary

Management Unit	Total Area (km2)	% NDT1	% NDT2	% NDT3	% NDT4	% NDT5
4-21	1,323	0.0	0.0	50.5	31.0	18.5
4-22	2,388	0.0	17.4	40.6	25.6	16.3
4-24	1,850	0.0	3.1	62.8	3.9	30.2
4-25	3,157	0.0	0.0	61.7	6.4	31.7
Total	**8,718**	**0.0**	**5.4**	**54.5**	**14.9**	**25.2**

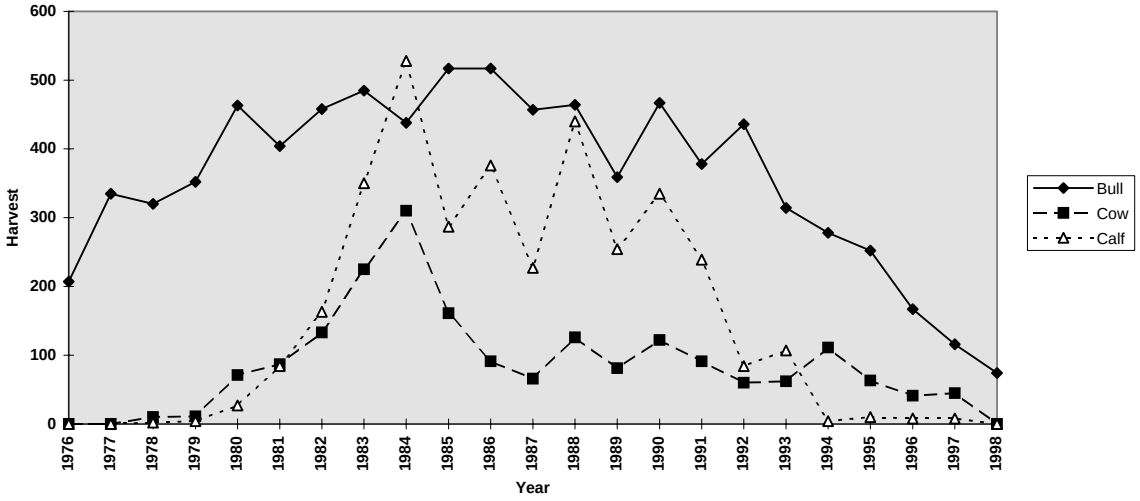
Population estimates based on winter habitat capability

Capability Class	Gross sq km	Net (Public) Land Base (km2)	Density/km	Gross Number of Elk	Net Number of Elk
0	50	50			
1	995	564	15.0	14,927	8,457
2	142	92	10.0	1,420	919
3	254	200	5.0	1,269	998
4	942	922	2.0	1,885	1,844
5	18	17			
6	6,345	6,319			
Total/Mgmt Zone	**8,747**	**8,163**		**19,501**	**12,218**

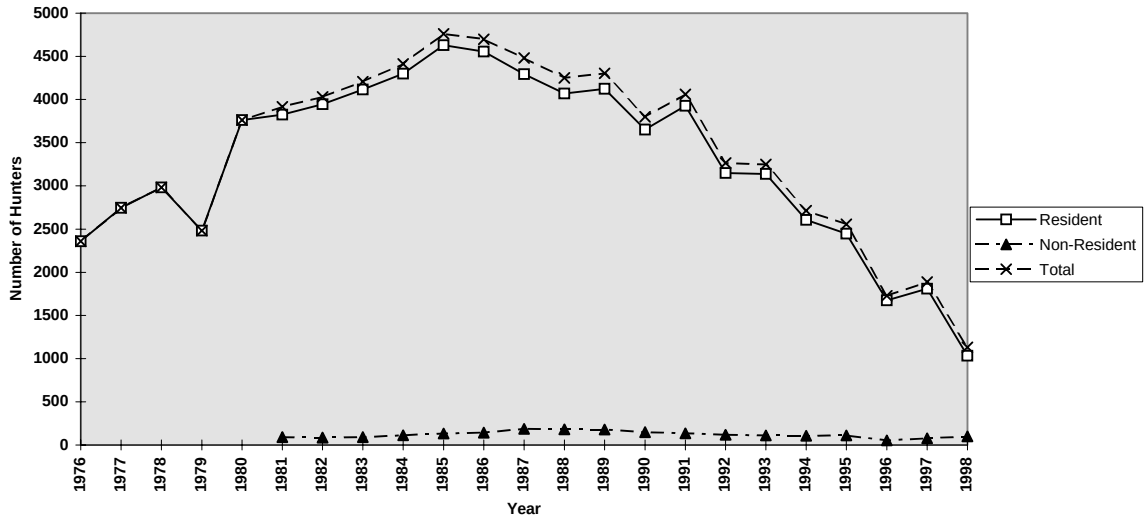
Population estimates based on winter habitat suitability

Suitability Class	Gross sq. km.	Net (Public) Land Base (km2)	Density/km	Gross Number of Elk	Net Number of Elk
0	60	60			
1	315	192	15.0	4,730	2,884
2	427	283	10.0	4,274	2,826
3	407	205	5.0	2,036	1,027
4	560	515	2.0	1,121	1,029
5	592	576			
6	6,384	6,333			
Total/Mgmt Zone	**8,747**	**8,163**		**12,161**	**7,766**

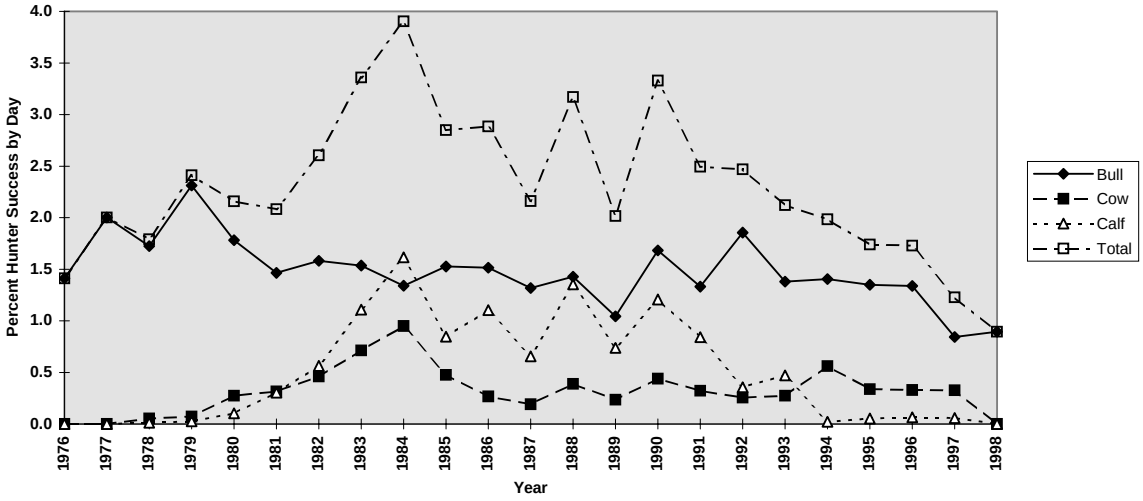
ELK HARVEST
East Kootenay Trench East EMZ 1976 - 1998 (Non-Resident 1981 - 1998)

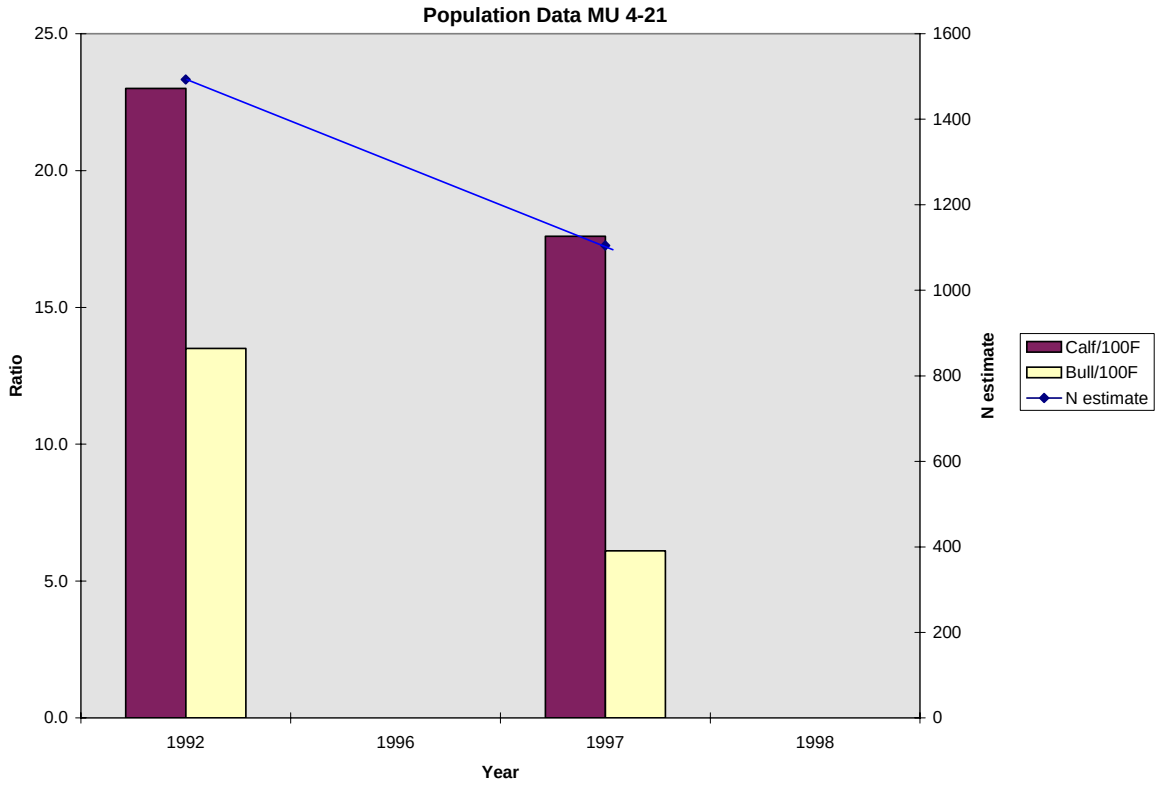


ELK HUNTERS
East Kootenay Trench East EMZ 1976 - 1998 (Non-Resident 1981 - 1998)



ELK HUNTER SUCCESS
East Kootenay Trench East (EMZ) 1976 - 1998 (Non-Resident 1981 - 1998)




Population Data MU 4-21
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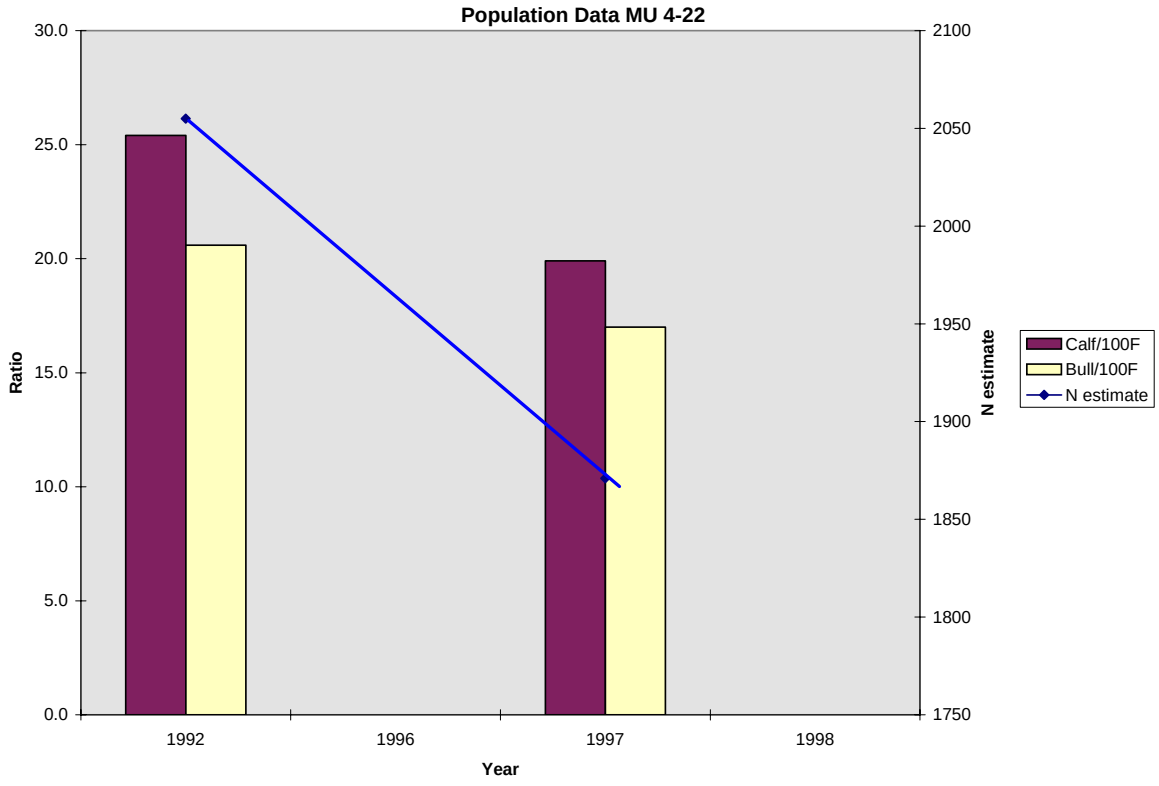
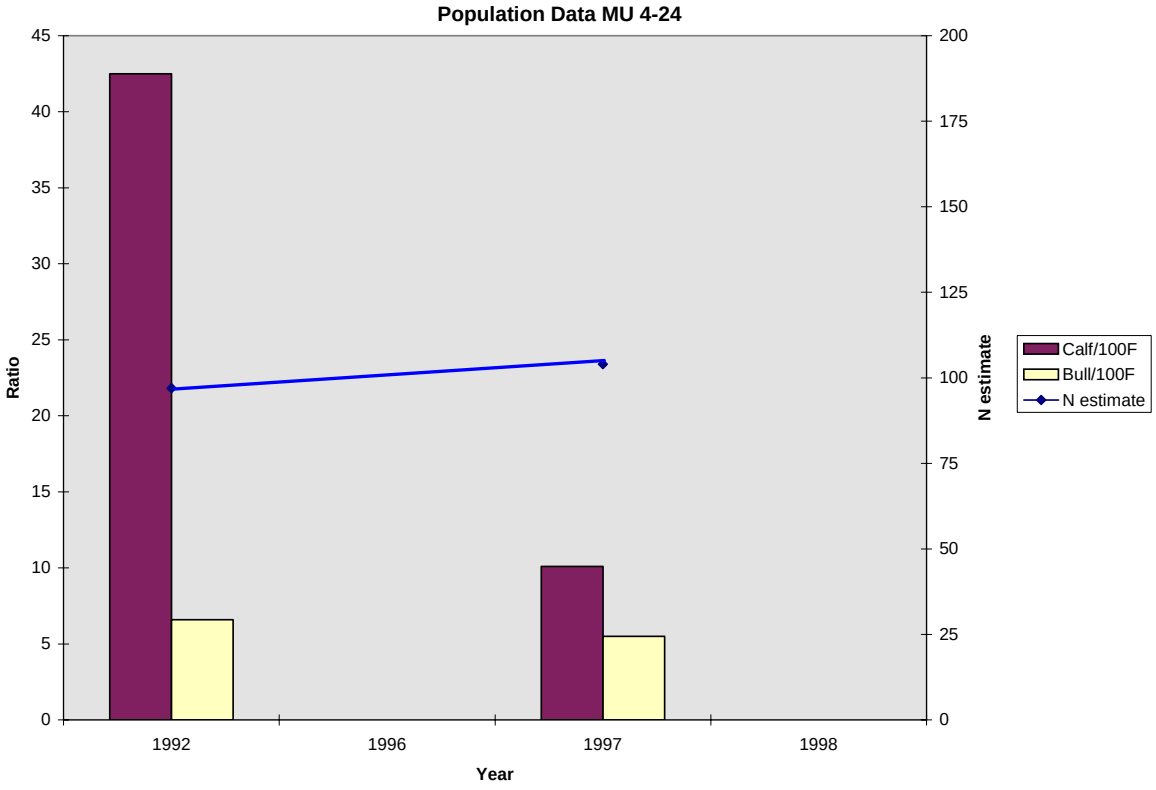
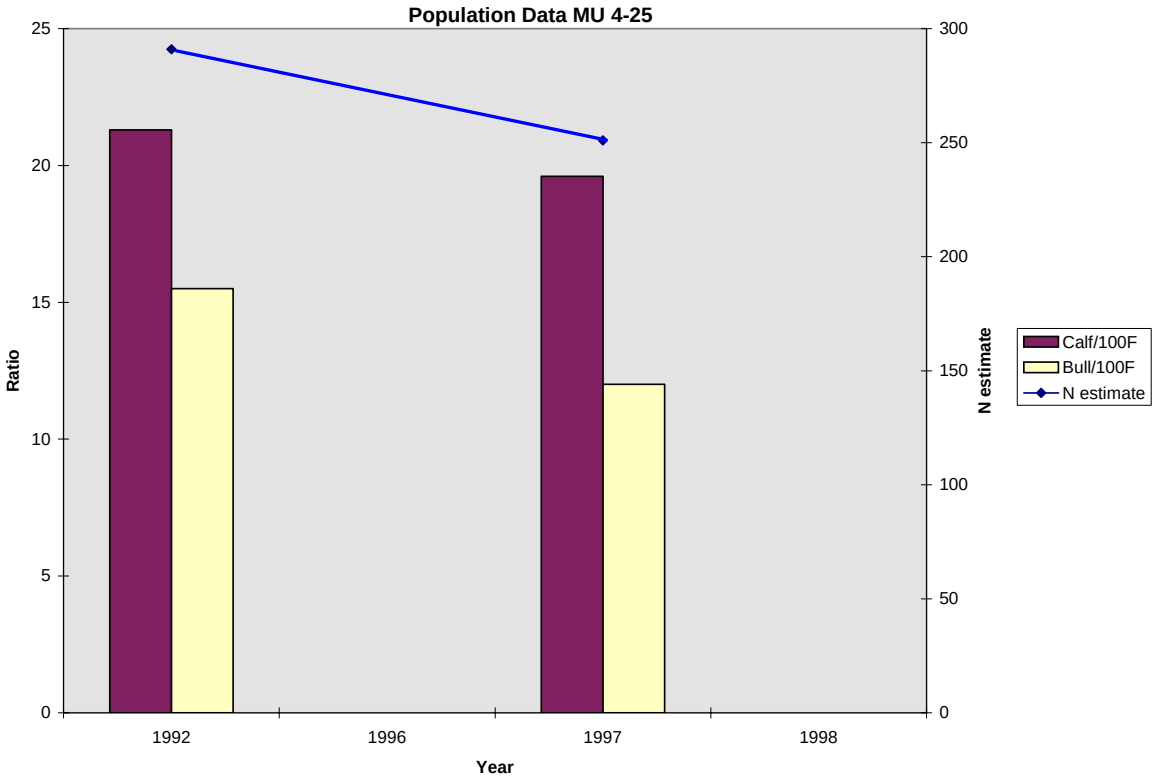
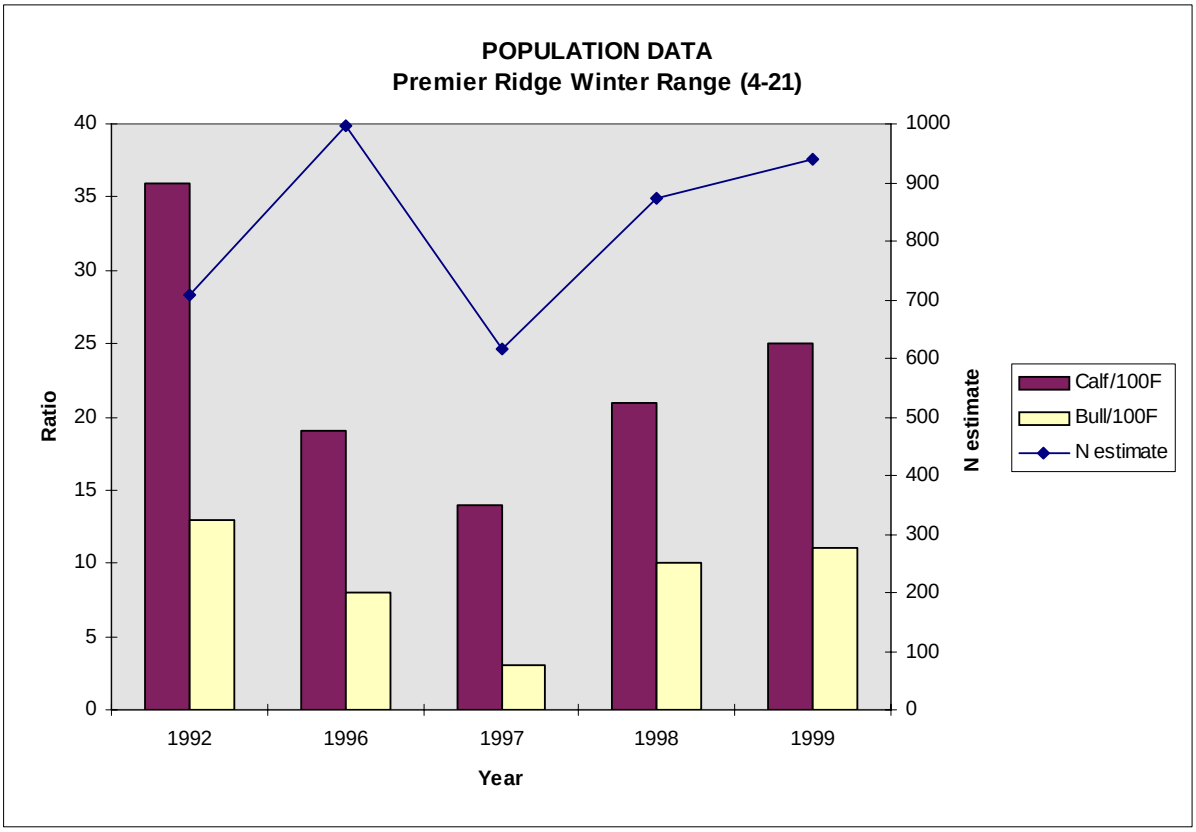
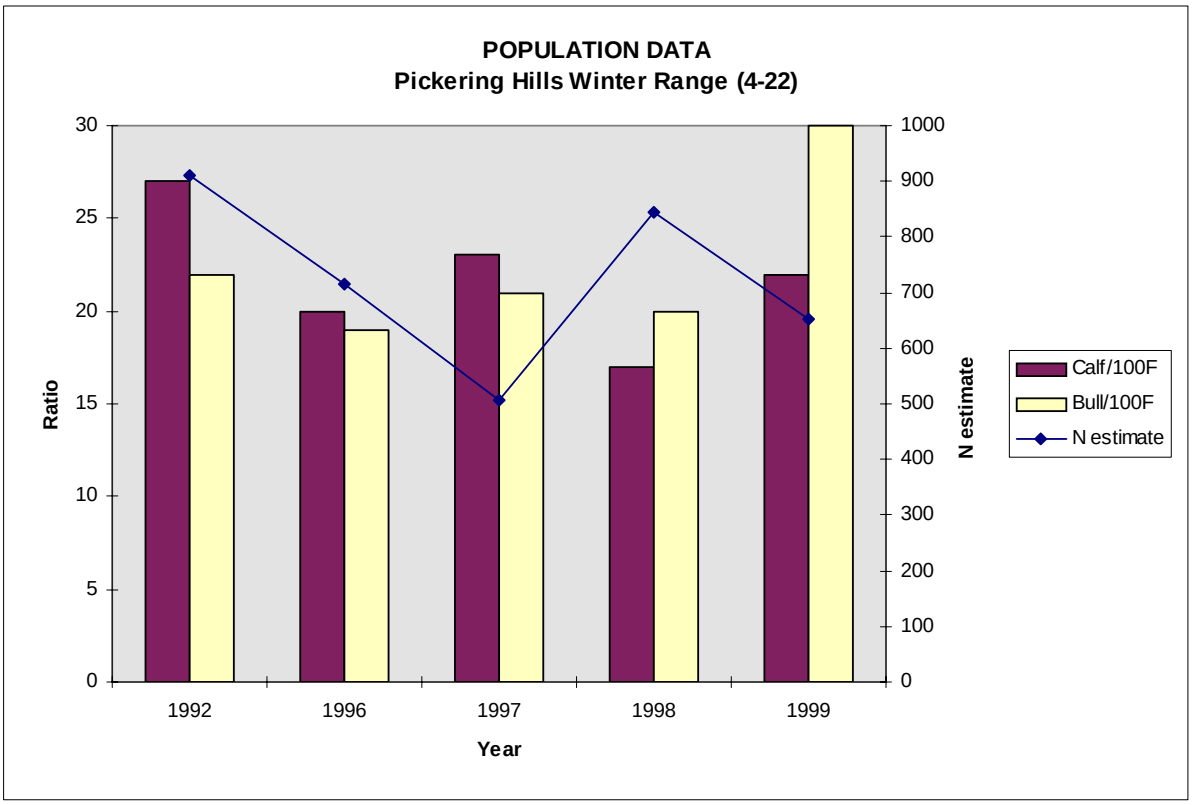
20.0
15.0
10.0
5.0
0.0
Ratio
1600
1400
1200
1000
800
600
400
200
0
N estimate
1992
1996
1997
1998
Year
Calf/100F
Bull/100F
N estimate


Population Data MU 4-22
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Ratio
2100
2050
2000
1950
1900
1850
1800
1750
N estimate
1992
1996
1997
1998
Year
Calf/100F
Bull/100F
N estimate


Population Data MU 4-24
Ratio
N estimate
Year
0
5
10
15
20
25
30
35
40
45
0
25
50
75
100
125
150
175
200
1992
1996
1997
1998
Calf/100F
Bull/100F
N estimate


Population Data MU 4-25
Ratio
N estimate
Year
0
5
10
15
20
25
0
50
100
150
200
250
300
1992
1996
1997
1998
Calf/100F
Bull/100F
N estimate


POPULATION DATA
Premier Ridge Winter Range (4-21)
Ratio
N estimate
Year
0
5
10
15
20
25
30
35
40
0
100
200
300
400
500
600
700
800
900
1000
1992
1996
1997
1998
1999
Calf/100F
Bull/100F
N estimate


POPULATION DATA
Pickering Hills Winter Range (4-22)
Ratio
N estimate
Year
0
5
10
15
20
25
30
0
100
200
300
400
500
600
700
800
900
1000
1992
1996
1997
1998
1999
Calf/100F
Bull/100F
N estimate

C. East Kootenay Trench - West

Private land and parks - area summary

Management Unit	Total Area (km2)	% Private Land	% National Park	% Provincial Park
4-3	1,654	16.7	0.0	0.0
4-4	1,105	2.9	0.0	2.6
4-5	847	4.2	0.0	0.2
4-20	3,826	8.7	0.0	9.4
4-26	3,190	10.4	0.0	26.1
Total	**10,621**	**9.5**	**0.0**	**11.5**

Biogeoclimatic Ecosystem Classification (BEC) zone - area summary

Management Unit	Total Area (km2)	% AT	% ESSF	% ICH	% IDF	% MS	% PP
4-3	1,654	0.0	30.8	0.3	34.8	29.0	5.1
4-4	1,105	0.1	37.5	26.9	3.4	31.8	0.0
4-5	847	0.4	46.6	38.7	5.0	9.2	0.0
4-20	3,826	27.7	33.7	9.5	12.2	9.3	7.5
4-26	3,190	37.5	37.5	0.0	12.9	12.1	0.0
Total	**10,621**	**21.3**	**35.8**	**9.4**	**14.4**	**15.5**	**3.5**

Natural Disturbance Type (NDT) - area summary

Management Unit	Total Area (km2)	% NDT1	% NDT2	% NDT3	% NDT4	% NDT5
4-3	1,654	0.0	1.8	58.2	39.9	0.0
4-4	1,105	0.0	46.2	50.0	3.4	0.1
4-5	847	0.0	46.6	47.9	5.0	0.4
4-20	3,826	0.0	27.0	25.6	19.7	27.7
4-26	3,190	0.0	0.5	49.1	12.9	37.5
Total	**10,621**	**0.0**	**18.7**	**42.0**	**18.0**	**21.3**

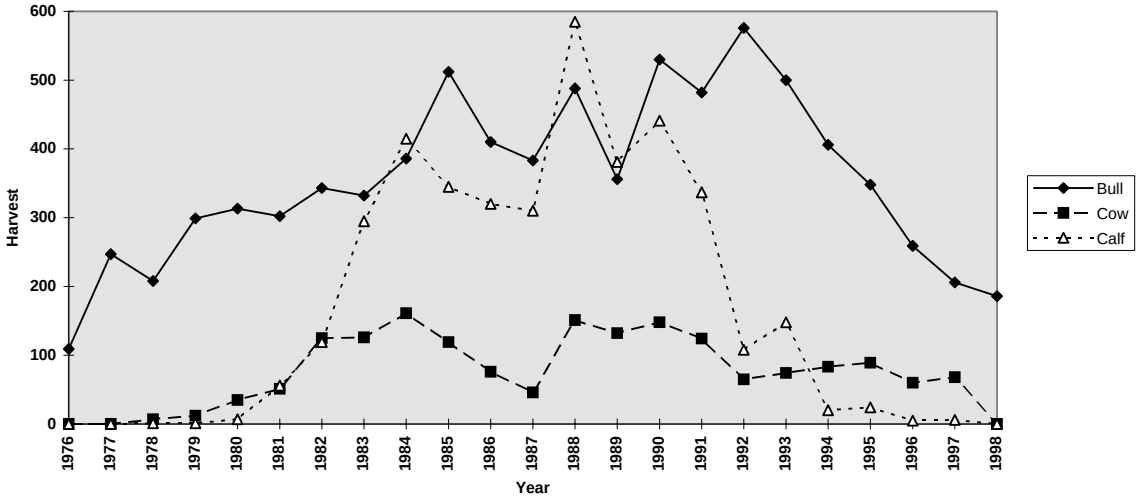
Population estimates based on winter habitat capability

Capability Class	Gross sq km	Net (Public) Land Base (km2)	Density/km	Gross Number of Elk	Net Number of Elk
0	2	1			
1	1,291	676	15.0	19,372	10,135
2	121	94	10.0	1,215	941
3	824	652	5.0	4,120	3,262
4	462	370	2.0	924	739
5	26	23			
6	7,896	7,721			
Total/Mgmt Zone	**10,624**	**9,536**		**25,631**	**15,077**

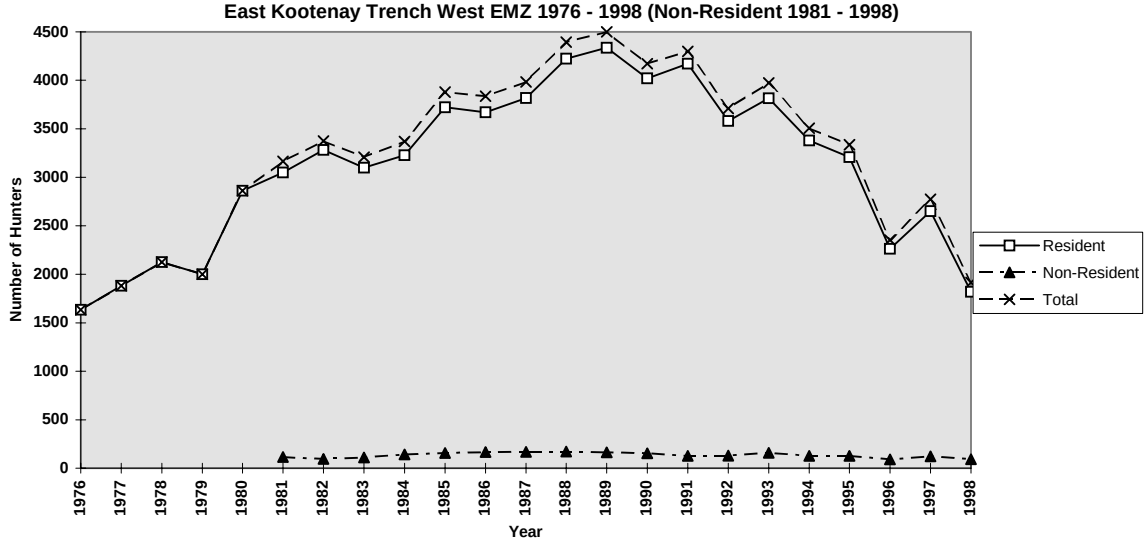
Population estimates based on winter habitat suitability

Suitability Class	Gross sq. km.	Net (Public) Land Base (km2)	Density/km	Gross Number of Elk	Net Number of Elk
0	50	41			
1	370	209	15.0	5,544	3,134
2	620	306	10.0	6,200	3,063
3	456	322	5.0	2,280	1,609
4	694	470	2.0	1,388	941
5	327	296			
6	8,108	7,892			
Total/Mgmt Zone	**10,624**	**9,536**		**15,411**	**8,746**

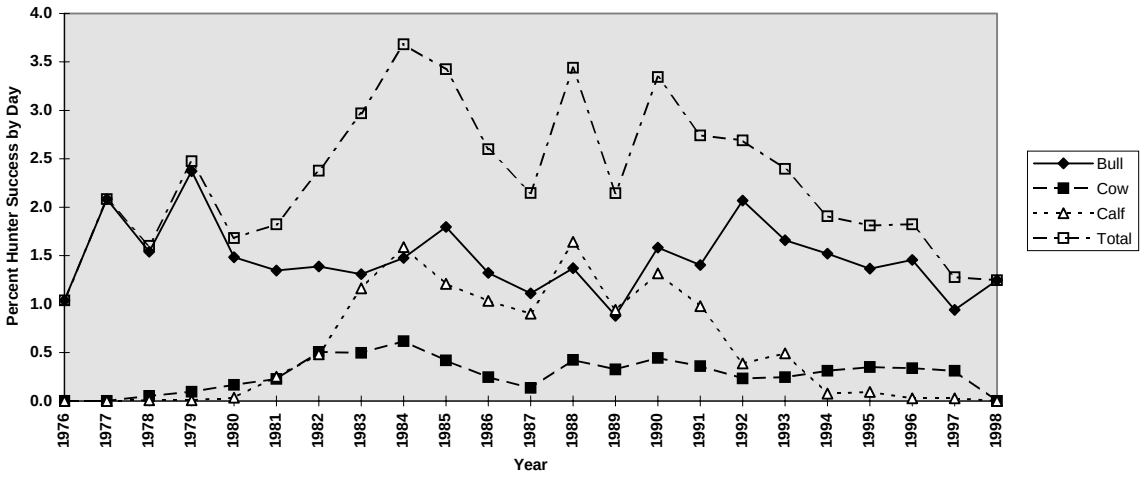
ELK HARVEST
East Kootenay Trench West EMZ 1976 - 1998 (Non-Resident 1981 - 1998)

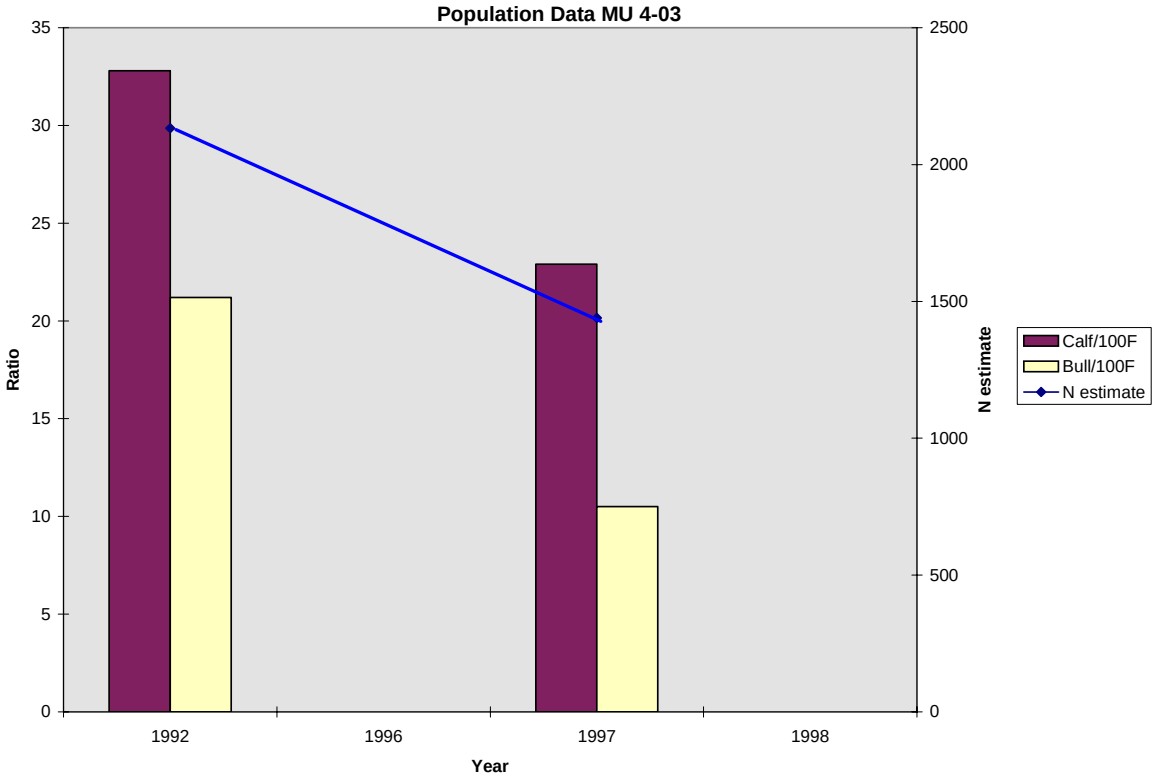


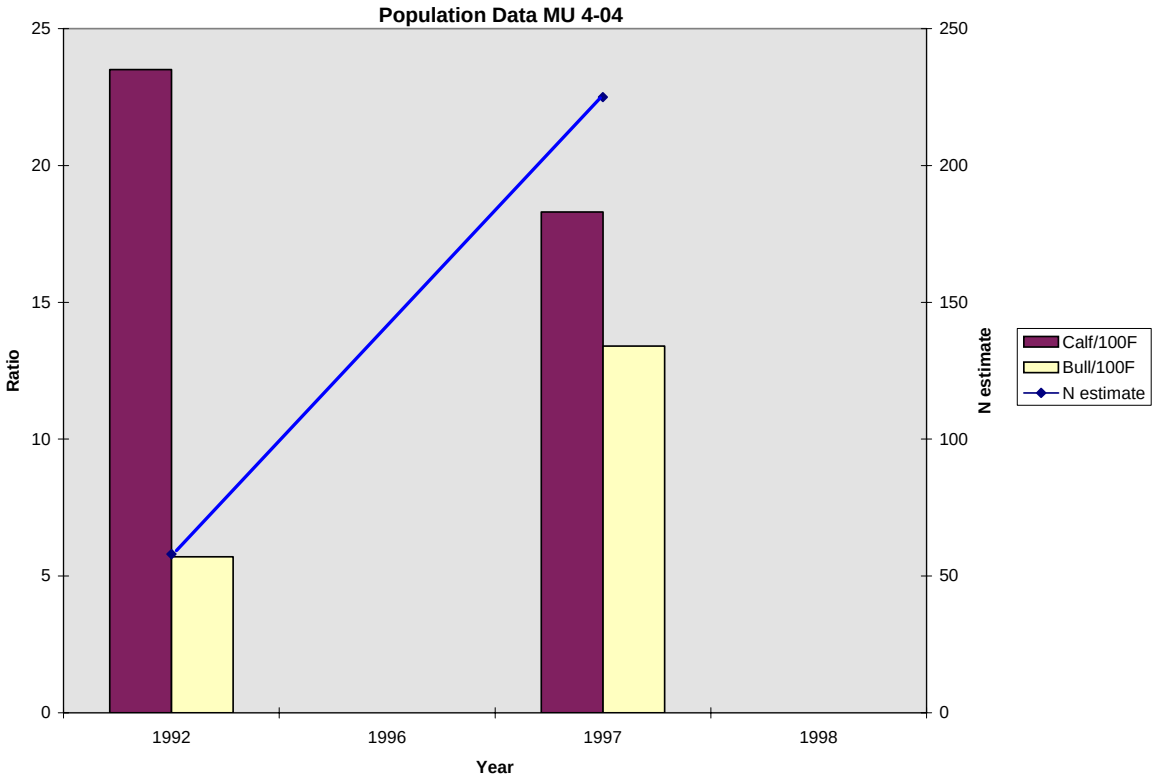
ELK HUNTERS
East Kootenay Trench West EMZ 1976 - 1998 (Non-Resident 1981 - 1998)



ELK HUNTER SUCCESS
East Kootenay Trench West EMZ 1976 - 1998 (Non-Resident 1981 - 1998)




Population Data MU 4-03
Ratio
N estimate
Year
0
5
10
15
20
25
30
35
0
500
1000
1500
2000
2500
1992
1996
1997
1998
Calf/100F
Bull/100F
N estimate


Population Data MU 4-04
Ratio
N estimate
Year
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5
10
15
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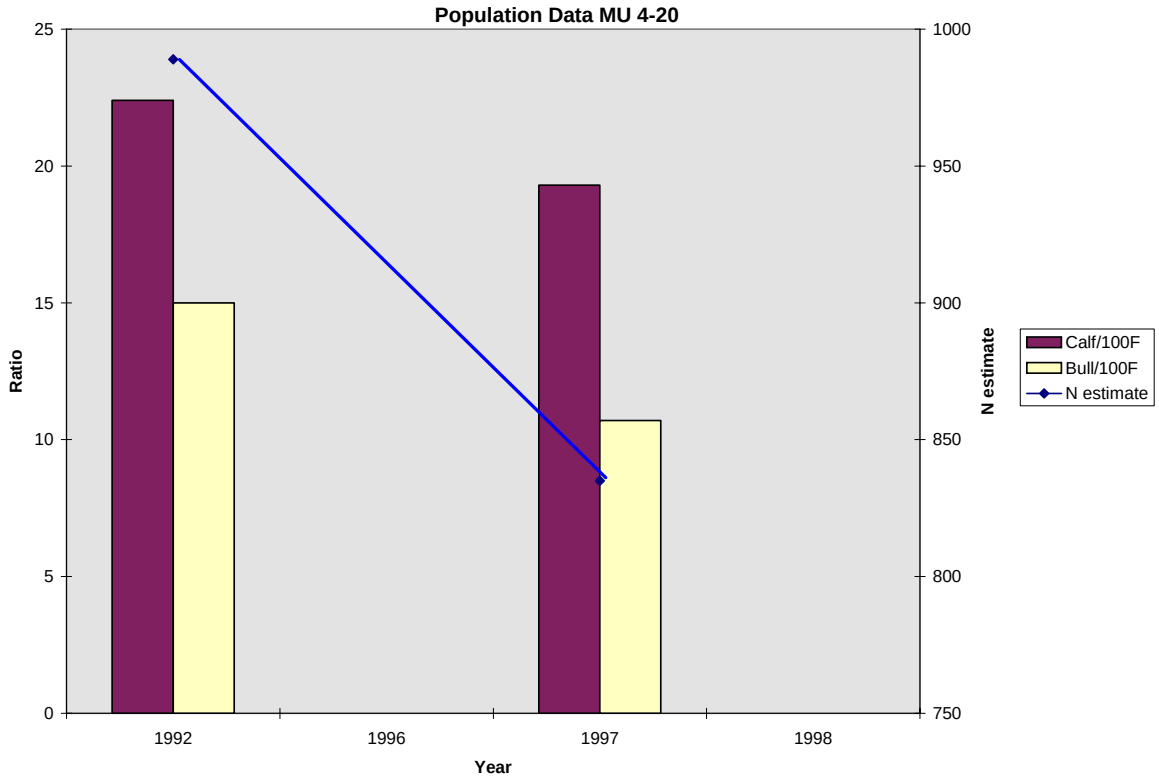
0
50
100
150
200
250
1992
1996
1997
1998
Calf/100F
Bull/100F
N estimate


Population Data MU 4-20
Ratio
N estimate
Year
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5
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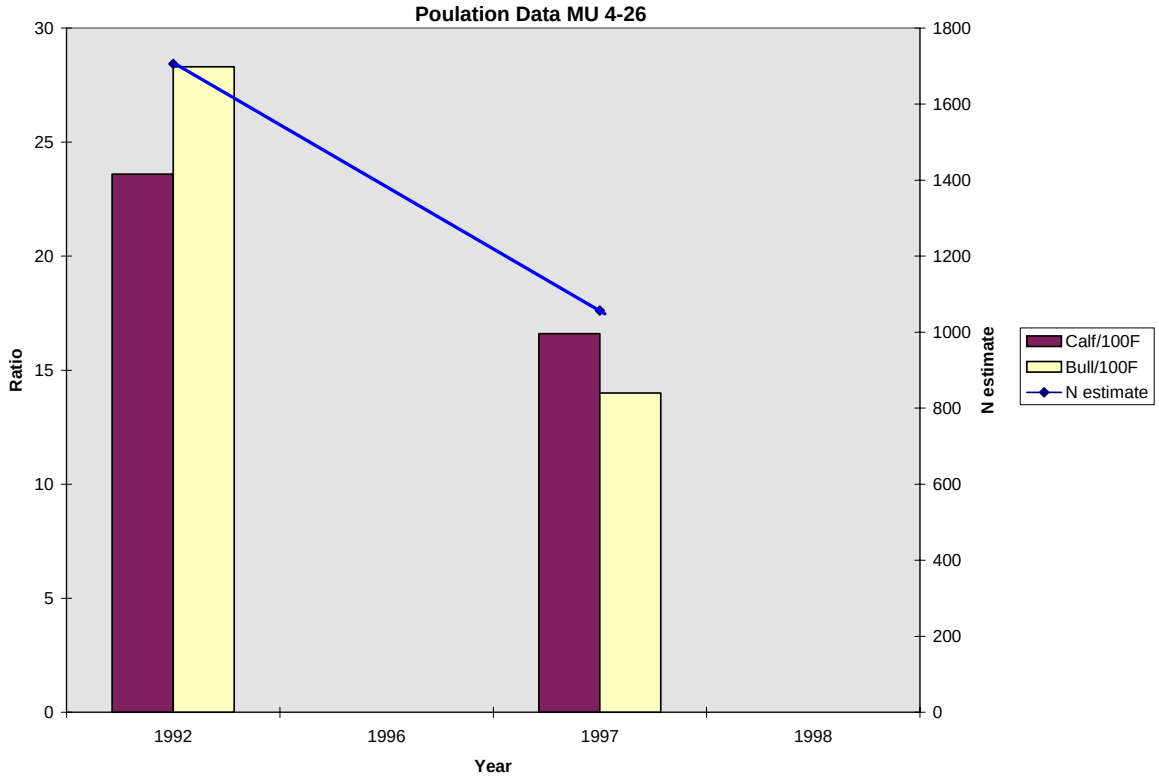
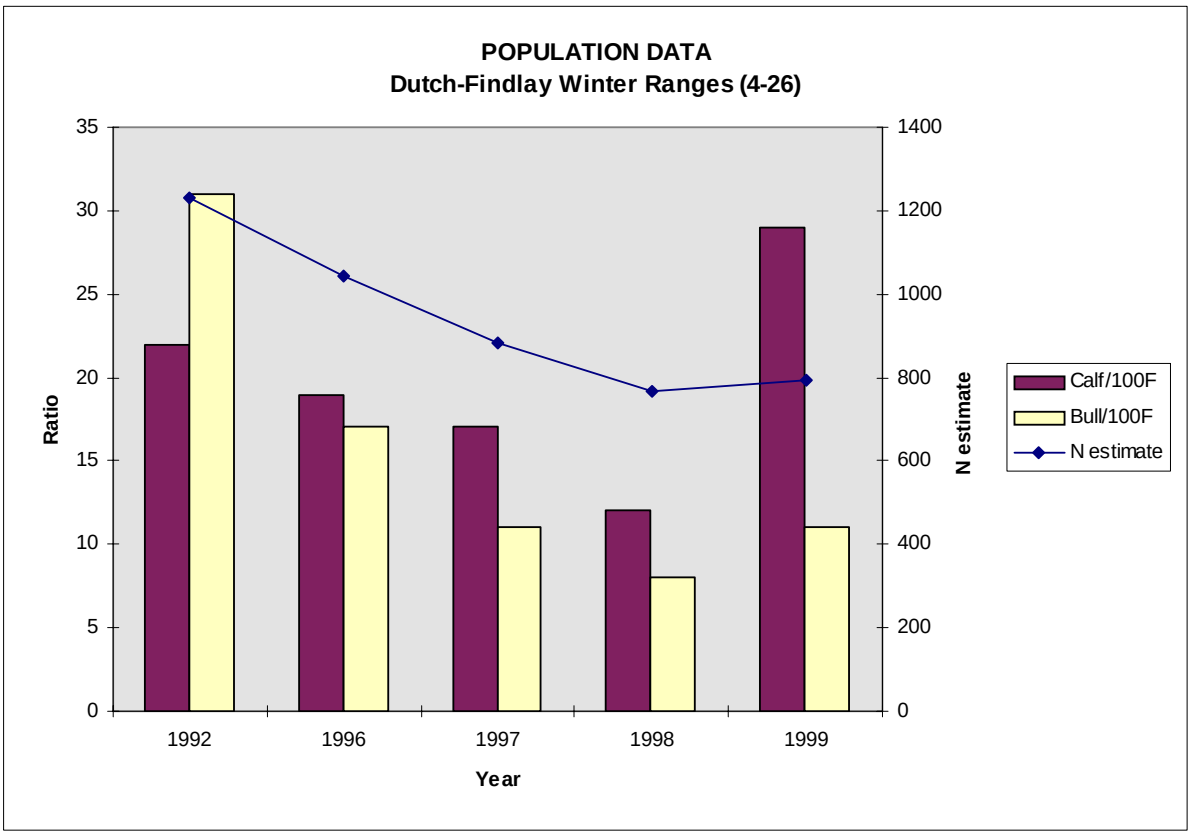
15
20
25
750
800
850
900
950
1000
1992
1996
1997
1998
Calf/100F
Bull/100F
N estimate


Poulation Data MU 4-26
Ratio
N estimate
Year
0
5
10
15
20
25
30
0
200
400
600
800
1000
1200
1400
1600
1800
1992
1996
1997
1998
Calf/100F
Bull/100F
N estimate


POPULATION DATA
Dutch-Findlay Winter Ranges (4-26)
Ratio
N estimate
Year
0
5
10
15
20
25
30
35
0
200
400
600
800
1000
1200
1400
1992
1996
1997
1998
1999
Calf/100F
Bull/100F
N estimate

D. Upper Columbia

Private land and parks - area summary

Management Unit	Total Area (km2)	% Private Land	% National Park	% Provincial Park
4-34	4,056	3.8	11.5	3.4
4-35	2,658	8.5	48.3	0.0
4-36	4,274	2.9	17.7	0.1
4-37	2,273	0.1	22.8	1.1
4-40	2,579	0.2	0.0	17.6
Total	**15,839**	**3.2**	**19.1**	**18.5**

Biogeoclimatic Ecosystem Classification (BEC) zone - area summary

Management Unit	Total Area (km2)	% AT	% ESSF	% ICH	% IDF	% MS	% PP
4-34	4,056	36.7	30.4	11.5	11.0	10.3	0.0
4-35	2,658	30.5	38.9	3.0	9.7	17.7	0.0
4-36	4,274	41.7	30.3	24.3	0.5	2.8	0.0
4-37	2,273	53.1	23.7	23.2	0.0	0.0	0.0
4-40	2,579	52.7	23.7	23.3	0.0	0.0	0.0
Total	**15,839**	**42.0**	**29.8**	**17.1**	**4.6**	**6.3**	**0.0**

Natural Disturbance Type (NDT) - area summary

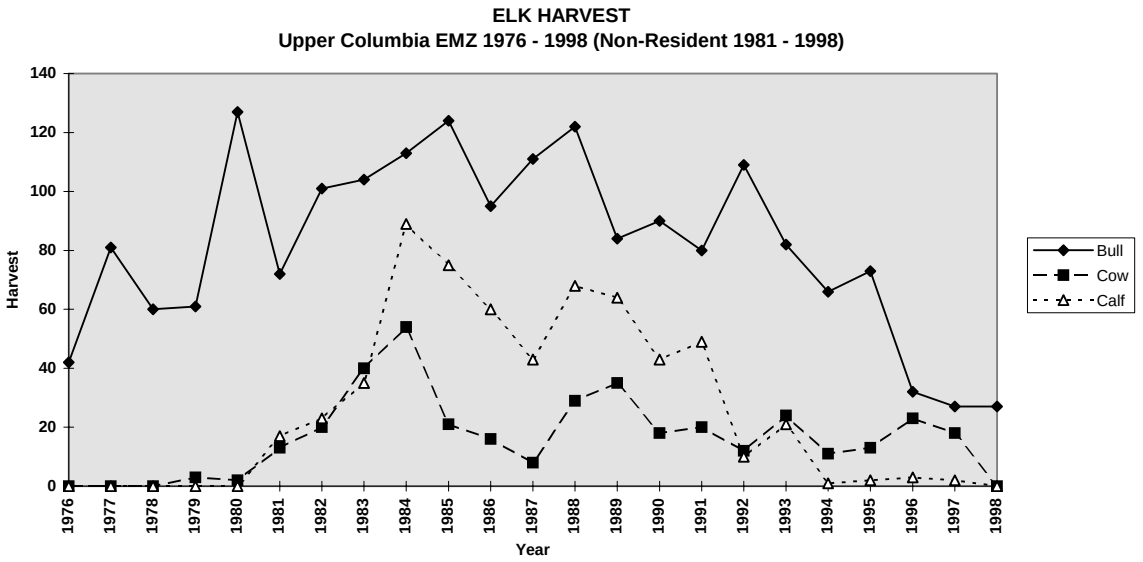
Management Unit	Total Area (km2)	% NDT1	% NDT2	% NDT3	% NDT4	% NDT5
4-34	4,056	8.1	16.1	28.0	11.0	36.7
4-35	2,658	2.7	1.5	55.5	9.7	30.6
4-36	4,274	22.4	19.0	15.9	0.5	42.0
4-37	2,273	41.5	5.5	0.0	0.0	53.1
4-40	2,579	34.9	8.5	3.6	0.0	52.7
Total	**15,839**	**20.2**	**11.7**	**21.4**	**4.6**	**42.1**

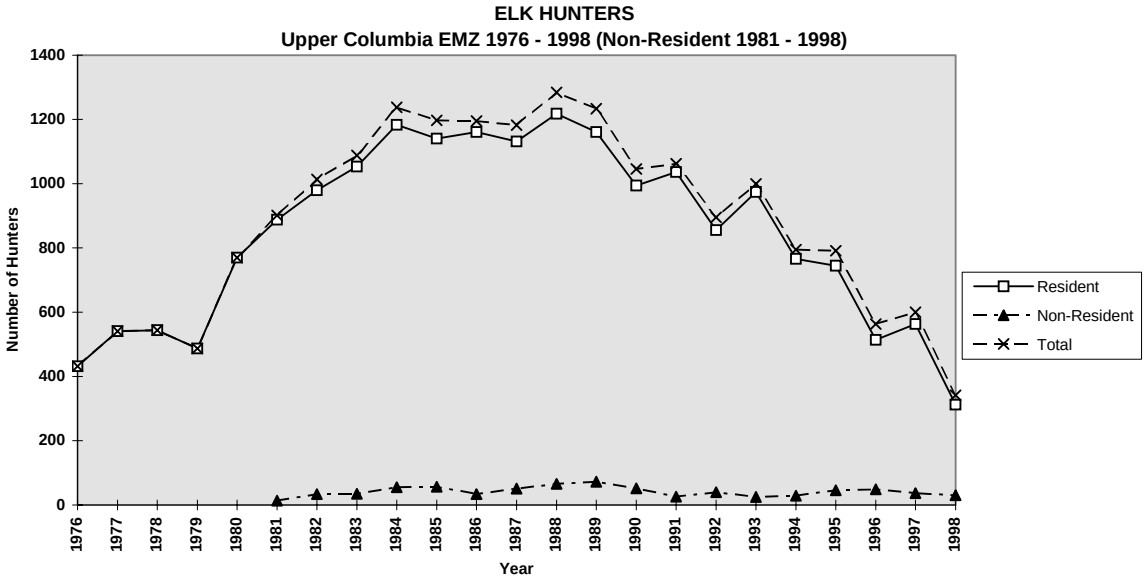
Population estimates based on winter habitat capability

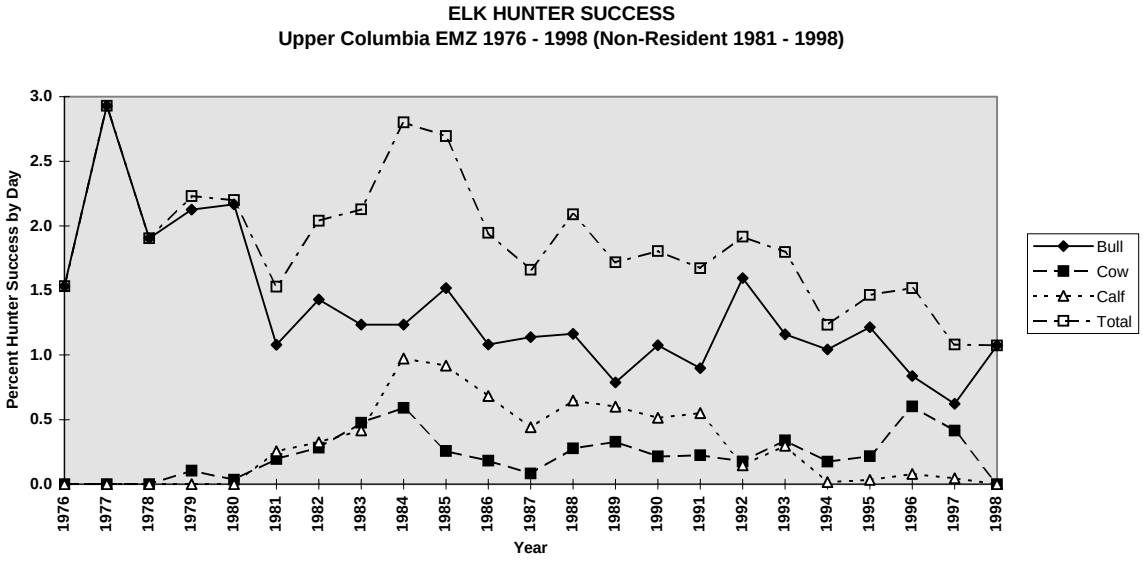
Capability Class	Gross sq km	Net (Public) Land Base (km2)	Density/km	Gross Number of Elk	Net Number of Elk
0	35	35			
1	485	270	15.0	7,271	4,056
2	45	35	10.0	446	348
3	389	218	5.0	1,944	1,089
4	1,380	1,343	2.0	2,761	2,686
5	9	4			
6	13,770	13,700			
Total/Mgmt Zone	**16,112**	**15,606**		**12,423**	**8,178**

Population estimates based on winter habitat suitability

Suitability Class	Gross sq. km.	Net (Public) Land Base (km2)	Density/km	Gross Number of Elk	Net Number of Elk
0	264	227			
1	84	59	15.0	1,258	892
2	360	194	10.0	3,599	1,944
3	340	190	5.0	1,698	951
4	542	516	2.0	1,084	1,031
5	401	376			
6	14,122	14,043			
Total/Mgmt Zone	**16,112**	**15,606**		**7,639**	**4,818**


ELK HARVEST
Upper Columbia EMZ 1976 - 1998 (Non-Resident 1981 - 1998)
Harvest
Year
Bull
Cow
Calf


ELK HUNTERS
Upper Columbia EMZ 1976 - 1998 (Non-Resident 1981 - 1998)
Number of Hunters
Year
Resident
Non-Resident
Total



Appendix 2. Examples of low recruitment rates in other jurisdictions.

In the Blue Mountains of southeastern Washington, the elk herd has declined by one-third from 1985 to 1997, with a harvest decline of 85% (Fowler 1998). Low pregnancy rates were recorded in the late 1980's that may have been related to low bull ratios (2-5:100 cows) and drought conditions. In 1989 a spike-only GOS with branch-antlered bull by permit-only harvest system was adopted, and within 2 years the bull ratio increased to 16 and pregnancy rates increased to 90%. However, post-season calf:cow ratios that historically ranged from 38-45 calves:100 cows declined to current levels of 16-25. Investigations of calf mortalities (Myers et al. 1999) indicate that average annual calf mortality is about 53% and that 78% of the mortality is due to predation, primarily by cougar (48%) and black bear (16%). Early neonatal losses to bears was likely underestimated as a large portion of calves were collared at >8 days of age (P. Flowler, pers. comm.).

Northwestern Montana (Region 1) has also experienced lower ungulate recruitment rates since the early 1990s that has a habitat condition and predation background (H. Nybert, D. Pletscher, pers. comm.) The cougar harvest has increased from 63 in 1989 to 245 in 98/99, and wolves are becoming re-established. As well, the 1997 winter caused a 25-30% decline in elk numbers. More conservative seasons have been instituted to aid population recovery. The impacts of predation, studied in the North Fork Flathead River vicinity from 1992 to 1996 (Kunkel 1997) indicated that cougar and wolf predation was the most significant mortality source for deer and elk, and that declines in these populations were associated with increasing wolf numbers.

In response to declining or inadequate elk calf recruitment in many important elk management units, Idaho has initiated a comprehensive 10 year investigation on causes (P.

Zager, pers. comm.). The study, designed to identify both proximate agents and ultimate causes of low recruitment, is focused on elk density/habitat issues (animal condition, pregnancy rates), the role of predation, and the influence of bull:cow ratios and bull age structure (Gratson and Zager 1998). Two contrasting study areas have been selected for intensive studies. The Lochasa/North Fork is characterized by poor recruitment, moderate bull ratios, poor access, relatively high predator densities, and habitat that has experienced 70 years of succession and fire suppression since being burned by large wildfires in the early 1900s. The South Fork has lower bull ratios, relatively good recruitment history, good access, more recently disturbed habitats created by logging and a major burn in 1967, and possibly lower predator densities and higher alternate prey (deer) abundance. In 1997, after the severe winter, Lochsa cows were older (likely a result of 20 years of bull-only hunting) and in poorer condition that South Fork cows, and pregnancy rates were 72% and 89%, respectively. Following the relatively mild winter in 1998, the South Fork cows were in better condition and had slightly higher pregnancy rates (92%) than in 1997. Unfortunately, similar samples were not obtained for the Lochsa area in 1998. Preliminary information however suggests the possibility of a selenium deficiency on the Lochsa study area (Gratson and Zager 1999).

Calf mortality rates and causes of death of radio-collared calves were monitored in 1997 and 1998 in both areas. Predicted day-old weights of calves were heavier in 1998 than in 1997, but there was no significant difference between the two study areas. The difference in annual survival rates of calves captured in 1997 was significantly lower in the Lochsa than the South Fork by nearly 50%, 0.06 vs. 0.54. Predation by bears and mountain lions was the greatest proximate cause of calf mortality in both study areas, 55-60% by bears and 40-45% by cougar. Observations of black bears during the spring calf capture operations in 1997 and 1998 were far greater in the Lochsa than the South Fork (approx. 1.76 vs. 0.10 bears/flying hours), indicating either differences in bear abundance were not conducted.

Given that the data did not indicate that calves were predisposed to predation because of poor condition (Lochsa calf condition was similar to South Fork, and predator-killed calves were in similar condition compared to calves that survived), these findings strongly suggest that predation by itself is the major factor both for the failure of recruitment of the Lochsa herd to recover and for the moderate recruitment rate on the South Fork (Gratson and Zager 1999). The next phase of this study will entail manipulation of black bear and mountain lion densities compared to unmanipulated control areas, and continued monitoring of calf conditions, survival, and causes of mortality, elk, predator, and alternate prey abundance and habitat condition.