East Kootenay Elk Monitoring Project

Progress Report – December 2007

Prepared by:
Becky Phillips, BC Conservation Corp and
Tara Szkorupa, Ministry of Environment
Introduction

Elk are highly valued in the East Kootenay (EK) by resident and non-resident wildlife enthusiasts and are hence a management priority in the region. The Ministry of Environment (MoE) strives to ensure good hunting and viewing opportunities for the public over the short and long term. We also intend to manage elk populations within the habitat’s carrying capacity, which will contribute to healthy grassland ecosystems.

There is substantial evidence that elk populations, and in particular non-migratory elk, have increased recently in the East Kootenay. Concerns are mounting with overgrazing on public land and crop depredation on private land, and much of the blame is targeted at non-migratory elk (i.e., animals that do not leave the low elevation Trench during summer). In response, the Ministry of Environment has initiated cow/calf hunts on public land. These hunts are restricted to low elevations and close by mid October to focus harvest on non-migratory elk. Through this project, we intend to monitor the response of elk populations and individual elk to these hunts, to determine whether they are effectively reducing year-round elk pressure in low elevation areas. The East Kootenay Elk Management Plan (2005-09) (Wilson and Morley, 2005) recommends that a monitoring program be established to assess the effectiveness of the cow/calf hunt in meeting private and public land objectives.

In addition, current information on elk migratory behaviour in the East Kootenay is lacking. Research in the early 1990s (Jamieson and Hebert 1992) provided vital information on elk movements and population dynamics. However, much has changed in the East Kootenay Trench over the past 15 years and we require updated information on elk movements, habitat use and population dynamics to make informed management decisions. Our project is designed to replicate past work, so that changes in migratory behaviour over time can be assessed. Research in Alberta found that elk migratory behaviour can change substantially in a 15 year span (Hebblewhite et al. 2006). The public perception in the East Kootenay is that migratory behaviour has changed recently, and that a much higher percentage of the elk population is now non-migratory, exacerbating social and economic conflicts. Also, substantial changes have occurred since the early 1990s: the elk population has increased, perhaps substantially, and the East Kootenay Trench has seen significant development and widespread wildlife exclusion fencing.

Information gathered throughout this project will allow us to build on pre-existing knowledge of elk behaviour in the region, and therefore, make better management decisions that are crucial for the health of the elk population and the health of our grassland ecosystems.

The East Kootenay Elk Monitoring project is currently gathering information to address the following issues in the region:
**Sound Scientific Management:** To reduce the population of non-migratory elk and/or encourage elk migration out of the East Kootenay Trench, the Ministry of Environment has initiated several low-elevation cow/calf hunts on public land. In 2005 and 2006 we offered a bow-only General Open Season (GOS) and Limited Entry Hunt (LEH) permits. In 2007, we further liberalized the hunt by adding a General Open Season for youth and senior hunters. Prior to this (1999-2004), a limited number of cow/calf permits were issued for private land only. The cow/calf hunts close on October 10th to focus the harvest on non-migratory animals. Past research (Jamieson and Hebert, 1992) found that migratory elk typically return to winter range after October 15th.

We have several questions related to the effectiveness of the cow/calf hunts in reducing the size and persistence of the non-migratory elk population:

First, are current harvest levels effectively reducing the non-migratory population? It is difficult to answer this question without knowing the size of this population. We plan to use migratory data from collared elk and an inventory planned for 2007/08 to estimate these populations (e.g., if 15% of collared elk are non-migratory and a population estimate is 2000, the non-migratory population is 15% of 2000, or ~300).

Second, will the cow/calf hunt reduce non-migratory elk populations over the long term? If individual elk migrate some years but not others, harvesting low-elevation elk one year may do little to affect population levels in subsequent years. In addition, we assume that current cow/calf hunts will have little impact on the overall elk population, because non-migratory animals are targeted. However, if elk that are typically migratory do not migrate in some years (or return to the trench before mid October), current cow/calf hunts may have a greater impact on the overall population.

Third, will hunting during the cow/calf season sufficiently reduce elk pressure on public and private land throughout the forage growing period? It is possible that a significant component of the elk population migrates late in the spring and can impact early forage growth before they leave. However these elk may move out of the Trench eventually, and hence not be available for harvest during the low elevation cow/calf hunt. If this is the case, we may need to consider other management approaches to encourage earlier migration (e.g., enhancement of transitional habitats next to Trench, targeted aversive conditioning in particularly problematic areas).

Forth, does the cow/calf hunt force a behavioural shift, and encourage elk to migrate out of the Trench? Although we presume a segment of the population responds to hunting by leaving the Trench, elk may instead respond by foraging in open areas at night only, making them difficult targets for hunters.
By answering these questions, we hope to improve elk management in the East Kootenay. Although an extensive elk monitoring program was conducted 15 years ago, elk behaviour may have changed substantially since then. This is reflected in the “2005-09 East Kootenay Elk Management Plan” (Wilson and Morley, 2005). The plan recommendations are based on the assumption that there are distinct migratory and non-migratory elk populations, and that reducing non-migratory elk will adequately reduce overgrazing and private land crop depredation. However we do not know whether this assumption is correct. Ranchers and hunters alike believe that there is now a much higher percentage of the elk population that does not migrate.

**Grassland Ecosystem Health:** There is a growing concern in the region for the decline in the health of grassland ecosystems. One issue that is of particular concern is overgrazing from both wild and domestic ungulates. The information gathered from this project will be invaluable for resource managers when assessing and planning grazing allocations. By taking appropriate measures we hope that pressure on the grasslands will be reduced. This would help to ensure the ecosystem remains a viable habitat for both grassland dependent wildlife species and for the ranching industry.

**Crop depredation on Private Land:** Many ranchers in the region consider elk to be a nuisance, and believe that the elk population and crop depredation on private land has increased in recent years. To bring an end to the depredation over 12,000 acres of private land were fenced between 2001 and 2006. This fencing is of particular concern to wildlife managers as movement corridors and habitat may no longer be accessible. Through better elk management we hope to avert some future fencing. We plan to obtain a population level that is socially acceptable, with a focus on reducing the non-migratory population.

**Objectives**
There are two main objectives for this project. The first is to assess the response of elk to low elevation cow/calf hunts, to determine whether these hunts are effectively reducing overgrazing and crop depredation. We will assess both population responses (e.g., declines in population size) and individual responses (e.g., individual elk movement, habitat use, etc.). The second objective is to update information on the migratory behaviour of East Kootenay elk, and compare this to the early 90s, when movement patterns were last monitored. Specifically, we are interested in the proportion of the elk population that is non-migratory, and average spring/fall migration times.

We hope to build on the findings of the early 1990s work by expanding the scope of the study to include additional areas in the East Kootenay Trench. In addition, GPS collars will be used to collect frequent, detailed, round-the-clock locations. This will enable assessments of individual behavioural responses to the cow/calf hunts, and detailed information on migration routes.
Study Area
The study area lies in south-eastern British Columbia, in the southern East Kootenay (EK) Trench, south of Invermere to the USA Border. The East Kootenay Trench, or Kootenay River Valley, provides winter range habitat for elk, while higher elevation habitat on either side of the Trench provides summer range. To date, the project has been conducted in the following Wildlife Management Units: 4-3, 4-20, 4-21, 4-22 and 4-24 and 4-25.

Methods

Capture Methods: Corral traps were used to capture the elk for collaring. Areas with high numbers of elk and easy winter access (i.e. ploughed roads) were chosen to set up the corral traps. We operated two traps in different locations. The traps were pre-baited using high quality alfalfa hay for a few days to ensure the elk were comfortable with the area before the gate trigger was set. The trigger was set by fastening a cord to a hay bail that sat on a barrel at the back of the corral. We then ran the cord out to the gate to hold it open. Once elk entered the corral they would eventually pull the hay bail off the barrel which would trigger the release mechanism, shutting the gate to the corral. Corrals were monitored at first light each morning. If elk were captured in the corral, Ministry of Environment staff and volunteers would quietly approach the site and release any bulls and calves, by opening the gate as they ran towards it. If the calves and bulls could not be released using this method, they would be moved through the chute and released.

Once the calves and bulls were released and the remaining cows calmed down, we would slowly herd the elk in to pens using swing doors and then, one at time, into a chute and animal squeeze for sampling and marking. The squeeze area was kept dark and elk were blindfolded during processing, to reduce stimuli. The cow elk were physically restrained and fitted with a collar and then released one at a time. Handling time was kept to a minimum (< 20 min.), and only necessary samples were taken.

Timing: Capture and collaring took place in the winter (January to March), when elk are easily baited and non-migratory and migratory elk overlap on their winter range.

Location: We collared 40 cow elk at 5 different locations: Premier and Skookumchuck in the north and Steeples/Wildhorse, Pickering Hills and Cranbrook/Chipka in the south. The north capture areas and Pickering Hills sites were similar to those used by Jamieson and Hebert (1992). However, in the south we expanded to two new areas because the Pickering Hills had relatively few elk and abundant deer at baiting sites.

Collar type: We deployed a combination of GPS (Global Positioning System) (Advanced Telemetry Systems GPS collars -model G2000) and VHF (Very High
Frequency) radio collars. GPS collars provide accurate and frequent locations to assess behaviour and habitat use year-round as well as throughout the day and night. However they are expensive and limited to 2 years of data collection, because of battery life. To increase our sample size and enable long term data collection on survival and reproduction, we also deployed VHF collars. These collars are monitored using telemetry, and provide sufficiently accurate data on broad migratory behaviour and habitat use.

**Radio collar monitoring:** GPS collars were set up to collect UTM locations every 9 hours to ensure that detailed data are collected at different times throughout the day (e.g., at 9 am and 6 pm the first day, at 3 am, 12 noon and 9 pm the next day and so on). These collars store data on-board and must be retrieved to download the information. GPS collars are checked once per month, to determine if any collared elk have died and to ensure collars are properly functioning. Different VHF signals (e.g., double beep every 6th beep) indicate successful GPS fixes, animal mortality and battery life.

The VHF collars were monitored weekly or bi-weekly during migration periods and monthly otherwise. Migration periods span about 10 weeks in the spring (mid March through May) and 12 weeks in fall (October through December). From the ground, collared elk were relocated using triangulation. We used Locate II software (Nams, 2000) to estimate locations and error for ground relocations.

Collared elk that were unable to be located from the ground were relocated from the air using a single engine aircraft (Super Cub or Cessna 206). During April and May, collars were relocated from the air every second week to capture any migratory movements. From June to September elk were relocated once a month by air. Beginning in October through to December flights were taken every two weeks to ensure an approximate migration date could be determined as the elk returned to their winter range.

**Migratory vs. Non-migratory:** For this project, we defined “non-migratory elk” as those animals that did not leave the Rocky Mountain Trench (i.e., areas below 1100m). “Migratory elk” left the Trench for the summer and “partially migratory elk” moved in and out of the Trench during the summer months. To determine whether an elk was migratory or not, an animals’ relocations were plotted in Arc Map along with a layer depicting the Rocky Mountain Trench. This allowed us to visually determine whether the elk had moved out of this zone or not. In 1991, elk were considered to be migratory once they left the East Kootenay Trench Ecosystem Boundary (Jamieson and Hebert, 1992) (Please see appendix A for definition). There is a slight difference between these two boundaries, but efforts have been made to consider the 1991 boundary when making comparisons between the two studies.
Data compilation and analysis: Wildlife Species Inventory databases (MS Excel format) were set up for capture and relocation data and initial data were entered. Data will be imported into the Wildlife Species Inventory annually.

Each month two maps were created in Arc Map, one for the northern portion of the study area and one for the southern portion. These maps highlight the last known locations of each of the collared elk giving us a sense of how many animals migrated to summer range. These maps also assist us in relocating elk during subsequent flights or ground relocation attempts.

Project Photos

Collaring one of the 40 cow elk

Setting out the bait
Results

Collaring: To date 40 cow elk have been fitted with collars (25 GPS and 15 VHF collars) and we are set to collar an additional 41 cows in January and February 2008 (Table 1).

VHF Locations: Tracking of the radio collared animals began in March 2007 and we are on track to have 20 relocations per collared elk. Figure 1 displays an example of the relocations collected from a non-migratory elk and Figure 2 shows the relocations from a migratory elk.

Collar Retrieval: To date 9 collared elk have died, and all collars have been retrieved successfully. Hunting caused 4 fatalities, a vehicle collision caused 1 death and 4 causes of death are undetermined. Data have been downloaded from the 6 GPS collars and an example of a map created from the GPS data (Figure 3). The 6 GPS collars will be refurbished for the capture and collaring set to go in January 2008. Unfortunately it was not possible to determine the cause of death for many animals. The VHF signal on our GPS collars is only on for 5 days per month (1st to 7th of each month, during business hours only), so we often identify mortalities many days or even weeks after the animal has died.

Data Compilation: Detailed information about the winter 2007 capture has been recorded and information from the winter 2008 capture will be added to this. To date 145 VHF relocations have been recorded on a Wildlife Species Inventory spreadsheet. Mortality data have also been compiled.
Table 1. Elk radio-collared by winter range in the East Kootenay Trench in 2006/07 and plans for 2007/08. Values refer to both GPS and VHF collars, with GPS collar values in parentheses.

<table>
<thead>
<tr>
<th>Winter Range (Management Unit)</th>
<th>Elk collared (06/07)</th>
<th>Elk mortalities (to Sept 07)</th>
<th>Active collars (Sept 07)</th>
<th>Elk to collar (07/08)</th>
<th>Elk to monitor (08/09)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premier (4-21)</td>
<td>10 (7)</td>
<td>0 (0)</td>
<td>10 (7)</td>
<td>2 (0)</td>
<td>12 (7)</td>
</tr>
<tr>
<td>Skookumchuck (4-20)</td>
<td>5 (3)</td>
<td>1 (1)</td>
<td>4 (2)</td>
<td>8 (3)</td>
<td>12 (5)</td>
</tr>
<tr>
<td>Steeples/Wildhorse (4-22)</td>
<td>14 (8)</td>
<td>5 (2)</td>
<td>9 (6)</td>
<td>3 (0)</td>
<td>12 (6)</td>
</tr>
<tr>
<td>Pickering Hills (4-22)</td>
<td>6 (4)</td>
<td>1 (1)</td>
<td>5 (3)</td>
<td>7 (3)</td>
<td>12 (6)</td>
</tr>
<tr>
<td>Cranbrook/Chipka (4-03)</td>
<td>5 (3)</td>
<td>2 (2)</td>
<td>3 (1)</td>
<td>9 (5)</td>
<td>12 (6)</td>
</tr>
<tr>
<td>Wycliffe (4-20)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>12 (6)</td>
<td>12 (6)</td>
</tr>
<tr>
<td>Total</td>
<td><strong>40 (25)</strong></td>
<td><strong>9 (6)</strong></td>
<td><strong>31 (19)</strong></td>
<td><strong>41 (17)</strong></td>
<td><strong>72 (36)</strong></td>
</tr>
</tbody>
</table>
Figure 1. Example of relocations for a VHF collared non-migratory elk in the EK Region.
Figure 2. Example of relocations for a VHF-collared migratory elk in the EK Region.
Figure 3. Example data from a GPS collared elk, East Kootenay 2007.
Data Analysis: Two maps are created each month highlighting the last known locations of the collared elk in the North and South regions of the study area (see Figure 4 and 5 for an example of the maps created for each region). These maps give us a preliminary idea about how many elk are migratory and when the elk are moving.

Table 2 and 3 provide a brief overview of migratory behaviour to date. Migratory elk left the Trench for the summer, non-migratory elk did not leave the Trench and partially migratory elk moved in and out of the Trench during the summer months. We did not obtain sufficiently detailed data from 6 GPS collared elk, and hence their migratory behaviour is indicated as unknown. The migratory status of these individuals will be determined from downloading the GPS data in 2009. Elk that died before August 15, 2007 were not included in the calculations because of insufficient data. North areas include Skookumchuck and Premier Ridge. South areas include Cranbrook/Chipka, Pickering Hills and Steeples/Wildhorse. Please see Appendix C to see Tables for the Elk Capture and Monitoring in the East Kootenay Trench in 1991-92.

Table 2: Number of migratory and non-migratory elk in the East Kootenay Trench in 2007.

<table>
<thead>
<tr>
<th>Location</th>
<th>Migratory</th>
<th>Partially Migratory</th>
<th>Non-Migratory</th>
<th>Unknown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>9</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>South</td>
<td>6</td>
<td>0</td>
<td>16</td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>2</td>
<td>17</td>
<td>6</td>
<td>40</td>
</tr>
</tbody>
</table>

Table 3: Percent of migratory and non-migratory elk in the East Kootenay Trench in 2007 (not including unknowns).

<table>
<thead>
<tr>
<th>Location</th>
<th>% Migratory</th>
<th>% Partially Migratory</th>
<th>% Non-Migratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>75.0%</td>
<td>16.7%</td>
<td>8.3%</td>
</tr>
<tr>
<td>South</td>
<td>27.3%</td>
<td>0.0%</td>
<td>72.7%</td>
</tr>
<tr>
<td>Average</td>
<td>51.1%</td>
<td>8.3%</td>
<td>40.5%</td>
</tr>
</tbody>
</table>
Figure 4. Last known locations for GPS and VHF collared elk in northern study area, August 2007, East Kootenay.
Figure 5. Last known locations for GPS and VHF collared elk in southern study area, August 2007, East Kootenay.
Extension: An article on the East Kootenay Elk Monitoring project has been featured in the local community newspapers and an additional article was featured in the East Kootenay Advertiser, Hunting & Wildlife edition. Four presentations outlining the project background, objectives and goals have been delivered to the following interest groups:

− Ministry of Environment staff from the Kootenay Region and Headquarters.
− East Kootenay Wildlife Association
− Ministry of Forests- Annual Range Field Day
− A group of Chinese Resource Managers visiting the East Kootenay region.

Discussion

Although not directly comparable to the data collected in 1991-92, due to boundary differences, we have noticed a difference in the migratory behaviour of the elk in the East Kootenay. In 1991-92, 100% (23 animals) of the collared elk in the north migrated to summer range (Jamieson and Hebert, 1992). To date, in the north, we found that 75% or 9 collared elk migrated to summer range and 16.7% (2 collared animals) moved in and out of the Trench (i.e., “partially migrated”). In the south, 84.2% (16 animals) were migratory in 1991-92 (Jamieson and Hebert, 1992). To date, in our study only 27.3% (6 elk) were migratory. Our preliminary findings show a 25% difference in migratory behaviour in the northern study area, and a 56.9% difference in the southern study area. We feel it is important to note a potential bias in the southern study area which may have resulted in such a large percent of migratory behaviour change. In 1991, all of the animals collared in the south were captured in the Colvalli/Pickering Hills areas, and no animals were collared in the Steeples/Wildhorse area. During the capture in 2007 only 6 animals were captured in the Colvalli/Pickering Hills area and 14 were captured in the Steeples/Wildhorse area. As in 1991, all of the elk collared in the Pickering Hills area migrated to summer range in 2007.

Future Work

Radio Collar Monitoring: GPS collars will continue to be relocated using radio telemetry on a monthly basis while VHF collars will be relocated twice a month from October through to December to determine the approximate migration date. After winter migration the VHF collars will be relocated on a monthly basis until spring at which time they will be relocated twice a month to determine the approximate summer migration date.

Collar retrieval: All GPS/VHF collars on mortality mode will be retrieved by ground or air as soon as possible and the cause of mortality will be investigated. In late winter 2009, we will also remotely release GPS collars deployed in winter 2007 (n=19). These
collars will be collected from the ground or, if necessary, by air (via helicopter). We will then download the 2 years of data.

Additional Capture and Collaring: In January and February 2008, we plan to build on the existing project by collaring 41 additional elk on 6 winter ranges (Table 1). This will significantly increase our sample size, providing more information on when and how many elk are migrating, and the variability among winter ranges. In December and early January we will begin to explore and evaluate possible capture areas as well as coordinate volunteers and contractors for the capturing. We plan on capturing elk using chemical immobilization (darting) from the ground. This capture method will likely reduce bias, as non-migratory elk may be more habituated, and hence more easily attracted in to corrals, than migratory elk. Elk may be initially baited to a site, if required to approach them closely enough for safe darting. Darting will be conducted by experienced wildlife technicians certified in chemical immobilization. The newly collared elk will be relocated biweekly during migration periods and monthly otherwise.

Data Interpretation and Analysis: During the winter months summary statistics will be prepared for analysis and interpretation. For example, we will determine how much time is being spent on winter range versus summer range by migratory elk using the data we have gathered. Data analysis and interpretation will consider annual variation in environmental conditions such as snow depth and persistence. Weather and snow pack data will be obtained from Ministry of Environment and Ministry of Forests and Range for stations throughout the Trench and adjacent mountains. Comparisons of our study to the early 1990s work will also take in to account differences in weather conditions. Migratory behaviour is expected to change in response to snow. For example, a deep persistent snow pack in late spring may push back the timing of migration.

Management: Changes in management based on the preliminary findings will be completed during the winter months. For example, we will estimate the size of the non-migratory elk population, using population inventory and animal movement data (e.g., if the population estimate for a winter range is 2000 elk and 15% of collared animals are non-migratory, we can estimate that the non-migratory population is approximately 15% of 2000 or ~300). We will then set the target harvest levels and LEH permit numbers accordingly, to reduce the non-migratory elk population.
Literature Cited


Table A and B provide an overview of the migratory behaviour of the collared elk in the 1991-92 study in the East Kootenay Trench. An elk was considered to be migratory once it was outside of the East Kootenay Trench Eosection Boundary (Jamieson and Hebert, 1992) whereas as non-migratory elk did not go outside of this boundary. Migratory elk were further categorized into long distance migratory elk (30-110km migration) and medium distance migratory elk (10-30km migration). The migration boundary, the East Kootenay Trench Eosection, is part of the Southern Rocky Mountain Trench Ecoregion and it characterised as the broad, flat glacial plain with a distinctive rainshadow. (BC Ministry of Environment, 2006).

Table A. Number of migratory and non-migratory elk in the East Kootenay Trench in 1991-92.

<table>
<thead>
<tr>
<th>Location</th>
<th>Migratory</th>
<th>Non-migratory</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>23</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>South</td>
<td>16</td>
<td>3</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>3</td>
<td>42</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Location</th>
<th>Migratory</th>
<th>% Non-migratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>South</td>
<td>84.2%</td>
<td>15.8%</td>
</tr>
<tr>
<td>Average</td>
<td>92.1%</td>
<td>7.9%</td>
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