Elk Calf Survival Evaluation: Big Creek and Cold Meadow, Salmon River Mountains, Idaho Summer 2004

Undergraduate Researcher: Troy Hinck

Academic Advisor: Dr. Jim Peek

Research Advisors: Holly &Jim Akenson

University of Idaho
Department of Fish and Wildlife
Moscow, ID 83844

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Abstract:

The Rocky Mountain elk (*Cervus elaphus nelsoni*) population of the Salmon River Mountains in the Big Creek Drainage, and Cold Meadows vicinity has shown a recent trend of low calf recruitment. The presence of a denning wolf pack, habitat change due to fire, and changes in elk density and distribution are all factors that could be contributing to marked changes in elk abundance of this area. Observing these herds over the course of the summer will shed some light on the magnitude, timing, and nature of the elk calf mortality and survivorship trends in this study area. Prior research has shown that pregnancy rates in this region are high, but that wolf predation is the primary mortality factor for wintering elk. This area will be flown in a fixed wing aircraft and the locations of elk will be documented on topographic maps and stored on a GPS handheld unit. Hiking survey routes have been developed to visit two study areas; high elevation and low elevation. Documentation will be made on predator presence, timing of mortality, habitat characteristics where mortality occurs, and elk response to predators. Composition counts will be performed on every group of elk seen to monitor the calf: cow ratios on a weekly basis. Analysis will be done to draw correlation between herd composition changes over the course of summer. I will compare differences in early and late summer calf:cow ratios, calf:cow ratios between study sites, and calf:cow ratios in different habitat types. The data gathered will give insight into the causes of mortality affecting the timing, magnitude, and nature for elk calf recruitment in the central Idaho wilderness. The research will begin May 17th and conclude August 13th 2004. The findings of this research will be presented at the Student Conclave and/or the Idaho Chapter meeting of The Wildlife Society as well as the UI McNair Scholars Symposium.

Introduction:

Recruitment of calves into elk populations has become a major source of concern in recent times. During the summer of 2003 as an intern at the University of Idaho Taylor Ranch Field Station I became interested in the Rocky Mountain elk (*Cervus elaphus nelsoni*) in the Big Creek drainage and the Cold Meadows area. I observed herd compositions that appeared to show a low calf composition and recruitment. During the summer two calves were found that had died, one from drowning and the other from wolf predation. Through changes in herd composition counts near the field station other mortality was believed to happen, but no remains were found and the causes were unknown. During four winters of large carnivore-ungulate research on Big Creek (1999-2002) Akenson and Akenson (2002) documented low calf:cow ratios. Ground survey results were the same as Idaho Department of Fish and Game (IDF&G) helicopter sightability elk herd composition counts in 1999 and 2002. IDF&G aerial observations showed calf:cow ratios to be low when compared to 1989 and 1992 data. (Rohlman 2003).

This problem of low calf recruitment has been identified and investigated in many states including Idaho. (Singer et. al 1997, Huff and Varley 1999, Mech et. al 2001, Zager et. al 2002) The Clearwater and Lochsa rivers have been studied extensively by Idaho Department of Fish and Game since 1973 to investigate the causes of low recruitment numbers. Over the course of many years of study they have found that three factors are affecting elk calf recruitment: 1.) Balance between elk density and habitat, 2.) Number and age structure of bulls, 3.) Calf mortality (Zager et. al 2002)

Interest in the decline of calf recruitment in this area has caused further investigations into the potential causes. Fecal hormone testing for progesterone levels in cows in the Big Creek drainage revealed that over 90% of cow elk tested were pregnant in late spring. (Akenson 2002). This would suggest high fecundity, but low survivorship of the calves. Fires in the summer of 2000 that burned much of this study area have potentially created much more forage. Therefore mortality of the calves during their first year rather than low birth rates may be the cause of low calf recruitment.

Predation on young calves by wolves (*Canis lupus*), black bears (*Ursus americanus*), and cougars (*Puma concolor*) can be a major mortality factor affecting population dynamics. (Toweill and Thomas 2002) All three of these predators occur within the study area (Akenson

and Akenson 2002). The Chamberlain Wolf Pack of 7-12 wolves has denned within five miles of Cold Meadows in the last few years. Last summer I observed this pack of wolves chasing elk at Cold Meadows, heard them kill a calf elk at night, investigated the kill site, and saw abundant evidence of wolf activity in the area. The locations of several active rendezvous sites are known that wolf activity centralizes around during the summer. I also observed a group of 36 cow elk with no calves in mid June, several other smaller groups were observed with no calves. Not a single calf was seen by four individuals hiking for five days in country with cow elk present. These observations suggest that wolf predation in the Cold Meadows area may be a significant cause of calf mortality. Carbyn (1983) found that wolves kill calf elk in excess of their proportion of abundance in the population. As a response elk have adopted two basic strategies to minimize their predation risks, especially by pack hunting wolves. They live in small herds that are rarely encountered by wolves or gather in large herds that reduce their predation risk through dilution (Hebblewhite and Pletscher 2002).Cougar tracks were also seen in the meadow suggesting that several species of predators are keying in on this area in search of elk calves.

However, the factors of calf survival are variable among years and populations. While calf:cow ratios are used to estimate calf production and survival they are not always indicative of population trends; instead they represent a combination of survival for calves and adults. The influence of predation is an integral and essential component of the elk ecology (Peek 2003). Predation is not the sole factor limiting recruitment of elk calves into the population, but it is certainly one of interest that warrants investigation at this time in this unique region.

Research Objectives:

The primary objective of this research will be to gather information on the summer elk population, especially the calves in nursery bands, inhabiting the Big Creek Drainage and Cold Meadow complex of the Salmon River Mountains of central Idaho.

The key points of this project:

1. Identify calving and nursery areas used by elk in the study area.
2. Identify the birth synchrony of elk in the study area.
3. Observe the magnitude of change in calf:cow ratios within the study area.
4. Document the timing when mortality occurs.
5. Identify and investigate the nature of the elk calf mortality.

6. Compare differences in calf:cow ratios affected by habitat type.
7. Compare calf:cow ratios between the high and low elevation study areas.
8. Plot GPS points over time to correlate predator presence and calf mortality.

Hypotheses:

Question 1: Where are cow elk calving and rearing their calves on the summer range?

Hypothesis 1a: Calves less than one week old will be found in secluded forest habitat with horizontal cover

Hypothesis1b: Nursery bands will be located in the meadows and open slopes.

Question 2: What is the birth synchrony of calves in the study area?

Hypothesis 2: 80 percent of 1 day to 2 week old calves observed will have been born within a 3 week period.

Question 3: What is the magnitude of elk calf mortality in the study area?

Hypothesis 3: Calf:cow ratios will be significantly lower at the end of the summer than observed in early summer after calving season is complete.

Question 4: What is the timing of elk calf mortality in the study area?

Hypothesis 4: There will be a larger decline in the calf:cow ratios in early summer than late summer.

Question 5: What is the nature of elk calf mortality in the study area?

Hypothesis 5: Predation will be the primary cause of mortality observed.

Question 6: Do elk calf ratios differ among habitats?

Hypothesis 6a: Elk in forested habitats with horizontal cover will have higher calf:cow ratios than those in open habitat without the horizontal cover.

Hypothesis 6b: Elk in the high elevation Cold Meadow study site will have lower calf: cow ratios than those in the lower elevation Big Creek study site.

Study Area:

Taylor Ranch Field Station and Cold Meadows are located in the 2.35 million acre Frank Church River of No Return Wilderness in central Idaho. The field station is located on Big Creek, a main tributary to the Middle Fork of the Salmon River. The field station will be my primary base for the summer used for lodging and supply storage. Cold Meadows will be my secondary base where a tent camp will be set up with supplies flown to an airstrip at the site and stored in bear-proof containers. I will initiate day hikes and spike camps from these sites to observe the surrounding areas suspected of holding elk groups.

Observations will take place at two study sites. (See attached maps, appendix V.) The first will be the Big Creek complex that will encompass the middle to lower regions of the Big Creek drainage and tributaries. This low elevation study area will extend along Big Creek from Acorn Creek to Goat Creek. This corridor has an elevation range from 1158 m (3800 feet) at Goat Basin to 1370 m (4494 feet) at Acorn Creek. However, some of the peaks rising above the riparian corridor are over 2744 m (9000 feet). This complex will be broken into two subunits, Mid-Big Creek and Taylor Ranch vicinity. The dividing line between these two subunits will be Brown's Basin; everything upstream will be mid-Big Creek and downstream will fall under the Taylor Ranch subunit. The Big Creek complex is a much lower elevation by comparison to the Cold Meadows. This lower elevation complex is composed of Douglas fir (*Pseudotsuga menziesii*), mountain mahogany (*Carcocarpus ledifolius*), and bluebunch wheatgrass (*Agropyron spicatum*) plant communities. Bluebunch wheatgrass, Idaho fescue (*Festuca idahoensis*), cheatgrass (*Bromus tectorum*), and arrowleaf balsamroot (*Balsamorhiza sagitata*) are important species for elk foraging. The riparian zones and flood plains contain grassy meadows and riparian shrubs and trees. There are several grassy meadows and southern exposure slopes where historically elk calving has occurred in the vicinity of the field station. (J. Akenson pers. comm. 2003). Most of this low elevation study area was burned during the Diamond Point Fire of 2000.

The second complex will be the Cold Meadows high elevation site. The elevation range for this study area varies from 1701 m (5580 feet) at Whimstick Creek to 2402 m (7880 feet) on Runaway Ridge, Cold Meadows Landing strip is 2144 m(7034 feet) (Topozone). The Cold Meadows surrounding area is dominated by coniferous forest vegetation with species composition varying in accordance with elevation and fire disturbance. Ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii*), and Engelmann spruce (*Picea engelmanni*)

compose the forest types. Currently large portions of the Douglas fir and Spruce zones are dominated by lodge pole pine (*Pinus contorta*) in seral stages following forest fires. The meadows are composed of moist to wet soils and support sedges, grasses, forbs, and shrubs. (Wing 1969). Most of this high elevation study area was burned in the 1988 fire season. Additional historic fire data may available through the Payette National Forest.

Because the nursery bands of elk will tend to move throughout the summer the boundaries of my study area are large. However, most of the observations will be made within repeat locations along main travel corridors on established pack trails and in open meadows or hillsides where the elk tend to graze in the mornings and evenings making them easy to observe.

Research Methods:

This project is set up on a twelve week time schedule laid out in Appendix I. Upon arrival at the Taylor Ranch Field Station in late May a 2 hour aerial reconnaissance flight will be made over the entire study area by me and a field station scientist in a Cessna 185 or 206. During this flight Global Positioning System (GPS) coordinates will be taken on groups of elk observed and plotted on topographic maps. An initial observation number and composition count will be conducted, but I do not expect that any calves will be born by this date. This initial information will then be used to concentrate efforts to maximize observation of elk groups, mainly nursery bands. This will also allow a general overview of the study area to facilitate better planning for travel and observations. The flights will be performed in the manner outlined in “Estimation of wildlife population ratios incorporating survey design and visibility bias” (Samuel et al. 1992).

I will conduct a second flight during the first week of June to identify early summer calving grounds. It would be time prohibitive for foot travel to sample all of the study area simultaneously in a thorough manner. An assistant and I will then visit these calving areas on foot to record calf:cow ratios and possibly document neonatal mortality. This information about the calving areas may be useful in identifying calf mortality that occurs during the first week after birth and prior to joining the nursery bands. (Peek 2003)

In early June an assistant will fly to the Cold Meadows study sight and join me for eight weeks to assist in finding the herd locations and then performing composition counts. We will collect this data through direct observations of elk while hiking through the study areas or from

stationary positions with binoculars. With the initial information from the reconossanince flights we can target areas known to hold groups of elk. We will survey designated routes through the study area spending more time at points where elk were seen during the flights. After the calving in early June these cows and calves are expected to join together in nursery bands that should remain fairly stable until August. Although wapiti are highly gregarious, aggregations are not consistently composed of the same individuals. Considerable interchange among groups occurs and associations appear to be short termed. A cow with a calf less than 3 months old may be the most consistent, stable social group of the species. (Peek 2003) Still because most approaches to these bands will be performed on foot while backpacking most of the surrounding area that could hold smaller groups or singles will also be observed in the approach or leaving the meadows where the focus of observations will be during peak use times.

Travel between the study sites will be performed largely on foot, by stock when available, or by airplane when large distances are required in short time periods. Any group of elk encountered during the travel times will be recorded and associated with the appropriate study site. Most observations will be performed during the morning and evening hours when elk activity is the highest in the meadows (Wing 1969). Observation will be performed from stationary positions with 10x binoculars and a variable power spotting scope by two observers(when available). Digital photos will be taken at each site. Plant communities will be classified by general categories for comparison to Wing's 1969 observations. Because of the seral stages or regeneration over much of this area little of it will truly fall under the climax communities described by either Daubenmire (1968) or Steele (1989). Instead a general grouping of whether it is forested, burned or not, the dominant species, and an estimate of open, moderate, or closed canopy will be recorded. Other classifications will be mountain meadow, shrub-steppe or bunchgrass. The mid day will be used to examine previously documented elk sites for further habitat analysis, analyzing data gathered in morning, maintaining camp, and for travel between survey areas.

While studying elk is the primary focus it is quite likely that their interactions with predators will be observed as well. We will fill out a daily report form (Appendix III) to document all predator sign and carnivore-ungulate interactions that occur along survey routes including track and scat surveys, vocalization, animal sightings, and carcasses. We will use remote sensing camera sets when feasible to gather further evidence of the presence of predators

and scavengers. Any mortality that is identified will be investigated in the manner outlined in "Evaluation of Causes of Wildlife Mortality" (Roffe et al. 1996). Since calves are the primary focus of the project the ages of dead calves will be assessed using Biology of the Elk Calf (Johnson 1951). A necropsy report will be filled out, photographs taken, and any other information of interest recorded. (See appendix IV.)

A satellite phone will be carried by the researcher and used as a daily check-in system with Taylor Ranch when not at the field station and for emergency use when observations require solo work away from the field station. The researcher and assistant will work together to locate and count elk herds. Each will have a linked GPS and a two-way radio that will allow both verbal contact and to know the location of the other person. A first aid kit will be available at all times. Other necessary precautions and care will be taken to ensure the safety of the researcher and assistant at all times during this project. Proper training will be given to any individuals who assist with this project to assure both scientific protocols is followed and to minimize safety hazards.

A record will be kept to record all observations of groups of cow elk, with or without calves. Additionally digital photographs will be taken of all groups for comparative use in herd composition and vegetative characteristics. An observational datasheet has been formulated to consider as many variables as possible. (See appendix II.)

All of the acquired data will be analyzed at the University of Idaho campus in Moscow, ID with consulting of Dr. Jim Peek. Within each study site 15 independent samples will be taken to provide a total sample size of no less than 30 independent observations for the whole project. Chi-squared analysis will be used in hypothesis testing to compare calf:cow ratios at different times of summer between different habitat types and the study areas. The GPS points gathered during aerial and ground surveys will be plotted for Geographical Information System (GIS) mapping with vegetation overlays. My research results will be summarized and presented at the University of Idaho McNair Scholars summer research symposium, Western Student Wildlife Society Conclave, and/or the Idaho Chapter Wildlife Society annual meeting. A final draft of the research report will be turned into the College of Natural Resources dean's office by April 2005.

Materials List:

Burris Landmark Spotting Scope 15-45 x 60 model
includes hardside carry case & adjustable tripod…….. $230
Garmin Rhino 120 GPS/radio 2pk with accessories& software..……...$600
Satellite phone ($10.75 per month + $2.99 per minute use)……...……..$32
Datasheets printing……$17
Thermometer…… .$3
First Aid Kit……..$20
Storage container……..$19
Batteries……....$54
Subtotal **$975**

Budget:

Flight to Taylor Ranch for Researcher & Assistant……...$100
Flights to Cold Meadows Study site……...$200
Flight time expenses for 4 hours @ $265/hr……$1060
Food for 86 days @ $7/day…….....$588
Assistant food for 56days @$7/day……...$392
Freight charges @ .20 per pound…….$80
Student Salary
10 weeks,40hr/week@$7.50……$3000
Cost of attending conferences to present results……$500
Subtotal $5773
Grand Total $**6448.00**

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Appendix 1: Timetable/schedule

May 26	Fly to Taylor Ranch and get moved in
May 28	Fly reconnaissance flight over all study area
May 28-30	Field test gear/ discuss plans with Akensons
June 2	Fly early summer calving grounds
June 1-4	Taylor Ranch observations
June 5-8	Mid-Big Creek observations
June 9	Fly assistant to Cold Meadows
June 10-19	Cold Meadows observations
June 20-26	Mid-Big Creek observations
July 1-6	Assist with haying season @ Taylor Ranch
July 7-10	Taylor Ranch observations
July 11-17	Mid-Big Creek observations
July 18-24	Cold Meadows observations
July 25-31	Mid-Big Creek observations
August1-7	Cold Meadows observations
August 7-14	Taylor Ranch observations
September 1 December31, 2004	Compile and analyze summer data
January 15-March 1	Write Report
March	Present McNair symposium & Western Student Wildlife Conclave or Idaho Chapter The Wildlife Society

Appendix II.

Elk Observation datasheet

Date:	Time:	Observer:		
Temperature:	Weather:	Picture #:		
UTM Coordinates N:		E:		
Vegetation Type:			Distance from cover:	
Total # animals:	Cows:	Calves:	Bulls:	Branch antler:
Behavior observations:				
Additional Comments:				

The back of the datasheet will be used to draw a map of the area and the animals' movement over time to accompany the digital photographs taken on site.

Appendix III. Carnivore Presence Datasheet

Date: Observer: Habitat Type:

Beginning UTM Coordinates: Ending UTM Coordinates:

No Carnivore Sign Observed:

Observed Sign	UTM Coordinates	Type of Sign	Comments
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Total Distance traveled along survey route:

Appendix IV.

KILL INVESTIGATION & NECROPSY FORM_____Date _____

Study Area: 1) Big Creek 2) Cold Meadows
Field Investigators _____
Species _____ Sex: M F Unk Time since death ____ 1)known 2)est.
Age: 1) <1 week 2) 2-3 weeks 3) 3-4weeks 4) 4-5weeks 5) yearling 6) adult 7) unk

KILL SITE DESCRIPTION:

General Location_____
Kill: UTM _____E x _____N Elev. (m) _____
Habitat type _____ Forest canopy cover _____%
Vegetation _____
Describe kill area_____

SITE EVIDENCE AND ASSESSMENT OF CARNIVORE INVOLVEMENT:

Carnivore Sign Present: 1)wolf 2)cougar 3)coyote 4)bobcat 5)black bear 6)none 7)other _____
Carnivore present: Y N _____
Fresh tracks _____ Old tracks _____ Beds _____ Hair _____ Scats _____ # scats ____ Tree scratching _____ Scrapes _____ # scrapes ___ Urine marking _____

Mortality Site: Carcass located: 1)under tree/shrub 2)in open _____
Carcass covered: Y N Cover material _____ Prey slid/moved: Y N ?
How far (m) _____ Carcass moved postmortem: Y N ? Distance dragged (m) _____
Signs of struggle or chase: Y N _____
Scavengers present: Y N # observed: 1)wolf __ 2)cougar __ 3)coyote __ 4)bobcat __ 5)bl bear __ 6)raven ____ 7)golden eagle ____ 8)bald eagle ____ 9)magpie ____ 10)other _____

CARCASS DESCRIPTION, UTILIZATION, AND CONDITION:

Canine punctures: Y N Distance between canines (mm): upper _____ lower _____
Location on body:_____
Bones crushed: Y N Which bones _____
Hair plucked: Y N ? Hide peeled: Y N Hide torn/shredded: Y N Nasal area eaten: Y N
SubQ hemorrhage: at base of skull Y N ? at throat Y N ? at other site _____
Point of first feeding: _____
Blood on carcass or ground: Y N ? _____ Aspirated blood: Y N ?
Probable kill method: 1) choke 2) bite to skull 3) broken neck 4) unknown 5) other _____
Describe kill/carcass: _____
_____

Utilization

1) 76-100% No soft tissue; hide usually present; generally disarticulated
2) 51-75% All organs consumed, all/most of quarters consumed; some head/neck present; partial/slight disarticulation.
3) 26-50% Organs usually consumed, major portions of several quarters consumed; head/neck mostly intact; usually articulated.
4) 0-25% Some organs consumed; most muscle tissue intact; skeleton articulated.

Bones found & #: 1)all 2)skull 3)jaw 4)vertebra ____ 5)ribs ____ 6)scapula ___ 7)humerus ___ 8)radius/ulna ___ 9)metacarpus ___ 10)pelvis 11)femur ___ 12)tibia ___ 13)metatarsus ___

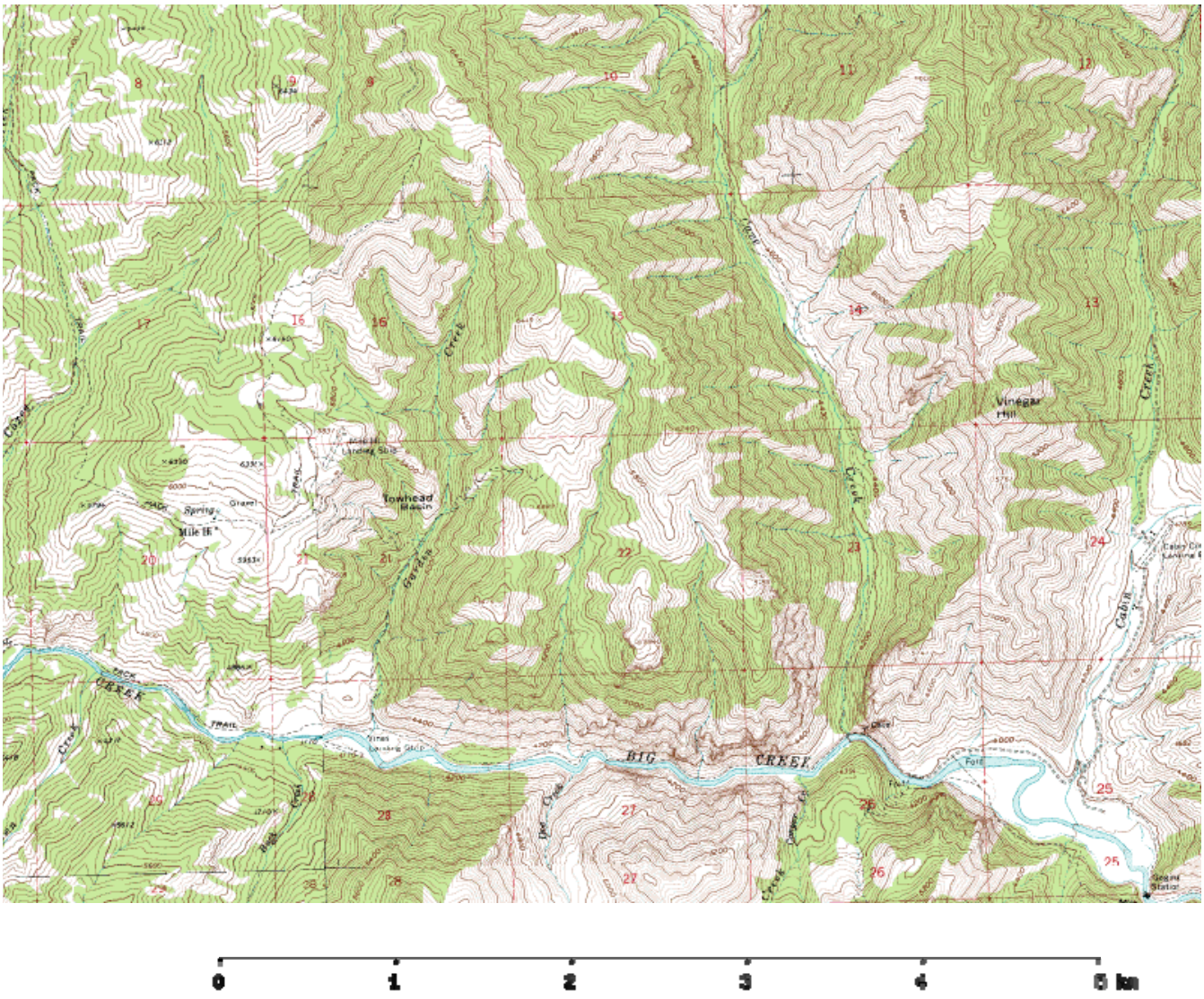
SAMPLES COLLECTED:

Carnivore _____: 1) scats: #___ 2) hair 3) other _____ Photo #s_____

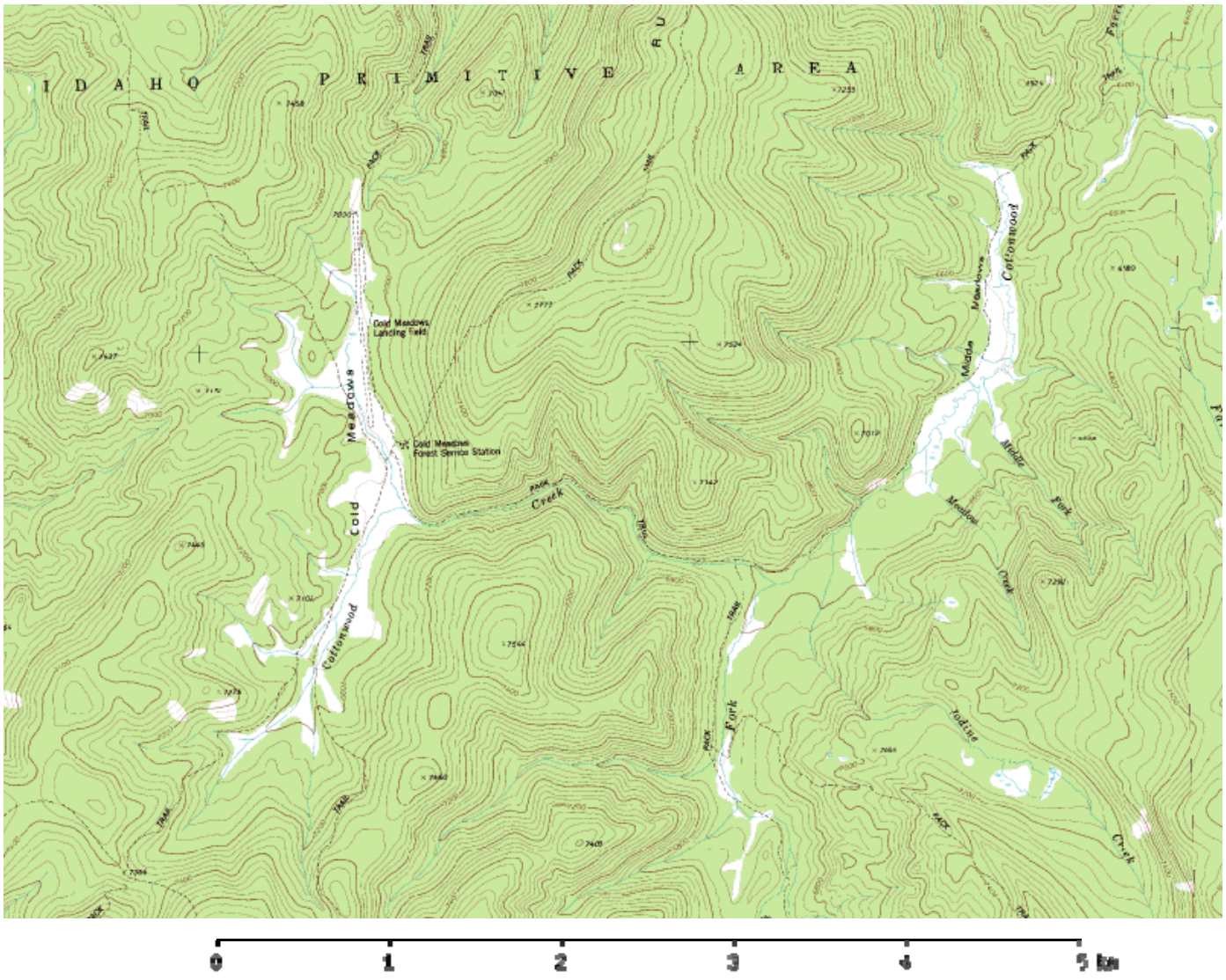
Appendix V. Study Area Maps

Big Creek: Goat Creek-Brown Basin

Big Creek: Cabin Creek- Acorn Creek



Cold Meadows: **Cold and Middle Meadows**



Cold Meadows: Whimstick & Wapiti Creek