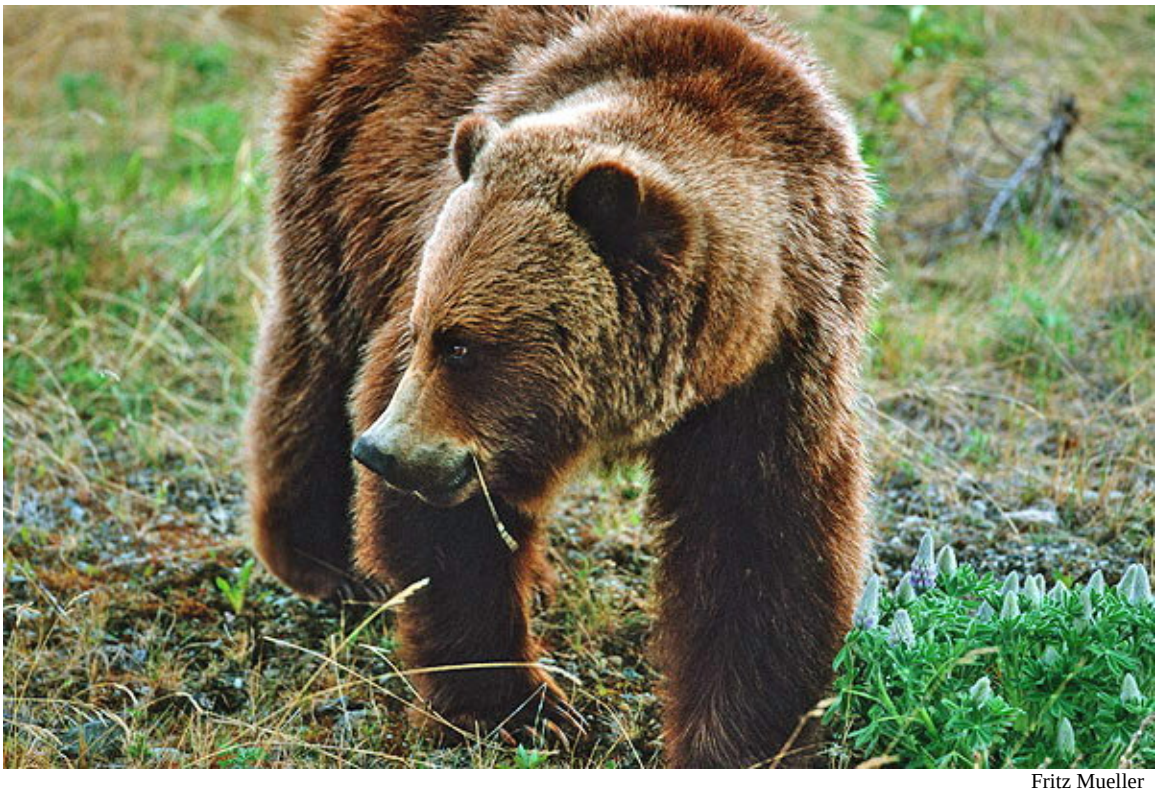

Fritz Mueller

GRIZZLY BEARS IN THE TATLAYOKO VALLEY AND ALONG THE UPPER CHILKO RIVER: POPULATION ESTIMATES AND MOVEMENTS

ANNUAL PROGRESS AND DATA SUMMARY REPORT: YEAR 2 (2007)

Prepared for:

Nature Conservancy of Canada
Victoria, BC

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GRIZZLY BEARS IN THE TATLAYOKO VALLEY AND ALONG THE UPPER CHILKO RIVER: POPULATION ESTIMATES AND MOVEMENTS

Year 2 (2007) Executive Summary

This is a progress report for Year 2 (2007) of a three-year grizzly bear (*Ursus arctos)* survey initiated by Nature Conservancy of Canada in the Central Chilcotin region of British Columbia. Results will be used to determine population estimates and trends of grizzly bears found in the Tatlayoko Valley during the spring/early summer season and along the upper Chilko River during the fall salmon run. Bear hair was collected from barbed wire hair traps and analyzed for DNA. During 2007, the study area was expanded with hopes of increasing the number of individual bears identified and thereby improving statistical power of population estimates.

A total of 859 hair samples (Year 1 - 509) were collected from the Tatlayoko Valley and 494 samples (Year 1 - 344) were collected along the Chilko River. Increased sample numbers was largely due to more sampling sites (26 sites, rather than 20), inclusion of samples from 22 rub trees and two barbed wire range fences during each session, and improved efficiency of sampling sites along the Chilko River. Of the 1353 total samples sent to the genetics lab for analysis, 284 (21%) were grizzly bear samples. From these 284 samples, a total of 87 individuals were defined (41 males, 46 females). Thirty-three individuals were detected in the Tatlayoko Valley (14 were recaptures from 2006), while 66 individuals (24 recaptures) were detected on the upper Chilko River. Twelve out of 33 (36%) of the individuals detected in the Tatlayoko Valley were also detected on the Chilko River. Three of four individuals that were detected in both Tatlayoko and Chilko in 2006 were only detected in Tatlayoko this year, and the fourth was detected in Chilko, but not Tatlayoko. Nine individual grizzly bears were detected on existing Nature Conservancy properties. Six males were also detected by a grizzly bear study in the South Chilcotin Mountains. The distance between the location of 2 of these males near Gold Bridge, BC in June/July 2007 and the upper Chilko in fall 2007 was over 100 linear km. The total of 105 individual grizzly bears detected over two seasons with 36 different bears in Tatlayoko and 83 along the upper Chilko, plus the large movements to obtain salmon, is evidence that the Tatlayoko Valley and the upper Chilko River are particularly important areas for grizzly bears in the Chilcotin.

Grizzly bears in the Central Chilcotin appear to be healthy, abundant, and unique given their relatively undisturbed environment. As important habitats and critical food sources change with human pressures and global warming, we must ensure their long-term conservation. Continued study is needed to monitor effects of changes to their environment and to increase our understanding of grizzly bear ecology in this region.

Introduction

The Central Chilcotin region is part of the largest, least disturbed wilderness area in southern British Columbia. Like everywhere else, however, humans are steadily infiltrating the area. Settlement, logging, mining, cattle ranching (with huge backcountry range use), and recreation are all gradually altering the landscape and compromising this unique wilderness. Bears - both black (*Ursus americanus*) and grizzly - are an important ecological component of the region. Long-term protection and successful management of grizzly bears throughout the Central Chilcotin is unlikely to be successful without scientific information about the animals and their needs in a local context.

Recent advances in genetic technology allow identification of species, sex, and individuals without handling bears. DNA is analyzed from bear hair collected along established bear trails and from systematically positioned barbed wire hair traps. The number of individuals and species identified from surveys yield minimum counts and a baseline index of population size. Bears identified from snagged hair are used in mark-recapture models to estimate population density. DNA profiles can also be used to determine the degree of genetic variation and structure of the population.

Grizzly bears have been recorded in high concentrations along the Chilko River during the fall salmon run. Historical and current observations also record significant numbers of grizzly and black bears throughout the Tatlayoko Valley, and south along the Homathko River and Mosley Creek drainages. However little is known about their numbers, movements, and critical habitats.

This is a progress report of data collection for the second year (2007) of a three-year grizzly bear survey using DNA from hair snagged on barbed wire sites. The goal of this study is to obtain a reasonable estimate of the number of grizzly bears found in the Tatlayoko Valley during the spring/ early summer and along the upper Chilko River during the fall salmon run, and to document movement of bears between these two areas.

Goals and objectives

Project goals and specific objectives are summarized as follows:

<u>Project Goals</u>

- To provide scientific information to help managers make resource and conservation decisions in relation to grizzly bears.
- To enhance Nature Conservancy of Canada's (NCC) efforts in protecting and preserving the ecological integrity of the Tatlayoko Valley and the upper Chilko River area.
- To increase local knowledge and interest in the status and issues surrounding grizzly bears in the region.

- To generate interest in grizzly bears and grizzly bear conservation in the region by attracting funding for longer-term and more comprehensive studies in upcoming years.

Specific project objectives

- To obtain estimates of the number of grizzly bears utilizing the Tatlayoko Valley during spring/early summer.
- To obtain estimates of the number of grizzly bears utilizing the upper Chilko River during the fall salmon run.
- To detect movement of grizzly bears between the Tatlayoko Valley and the Chilko River salmon run.
- To detect movement of grizzly bears within the Tatlayoko Valley.
- To obtain data to help tell a "story" and increase outside interest in protecting grizzly bears in the region.

Study area

The Year 2 sampling area in the Tatlayoko Valley was over 100 square km larger than the Year 1 study area for a total of 622 km^2. The Year 2 study area included the Tatlayoko Valley as far north as Skinner Creek and south to the Nostetuko River at the south end of Tatlayoko Lake. Sampling along the upper Chilko River was along approximately 25 km of the river from where it exits Chilko Lake to where it joins Brittany Creek downriver of "Henry's Crossing". Road access to the site is via gravel road from Tatla Lake on Highway 20, 30 km to the north (Figure 1).

A portion of the Tatlayoko Valley study area overlaps the Homathko River/ Tatlayoko Protected Area and the upper Chilko River study area borders Tsi'los Provincial Park. The study area includes a portion of the Klinaklini-Homathko Grizzly Bear Population Unit (GBPU) where grizzly populations are currently assigned a conservation status of "viable", and borders the South Chilcotin Ranges GBPU which is assigned a conservation status of "threatened" (Hamilton et al. 2004).

Both Tatlayoko Lake and the upper Chilko River are in the western portion of the Central Chilcotin Ranges Ecosection (CCR), which is a dry mountainous area in the rain shadow of the Coast Mountains. Highest summits are generally about 3,000 m. The ecosection contains three large lakes including Chilko, Tatlayoko, and the two connected Taseko Lakes. The Homathko River flows out of Tatlayoko Lake, converges with Mosley Creek as it flows out of the West Branch Valley, and transects the coast range to Bute Inlet creating a unique low elevation corridor between the dry interior and the wetter BC coast.

The Chilko River eventually flows into the Fraser River and has one of British Columbia's largest sockeye salmon (*Oncorhynchus nerka*) runs. Chinook salmon (*O. tshawytscha*), coho salmon (*O. kisutch*), and steelhead trout (*O. mykiss*) are also found in the Chilko River. The run occurs annually sometime between late August and October. The spawning beds are located within a few kilometers of Chilko Lake and the run draws

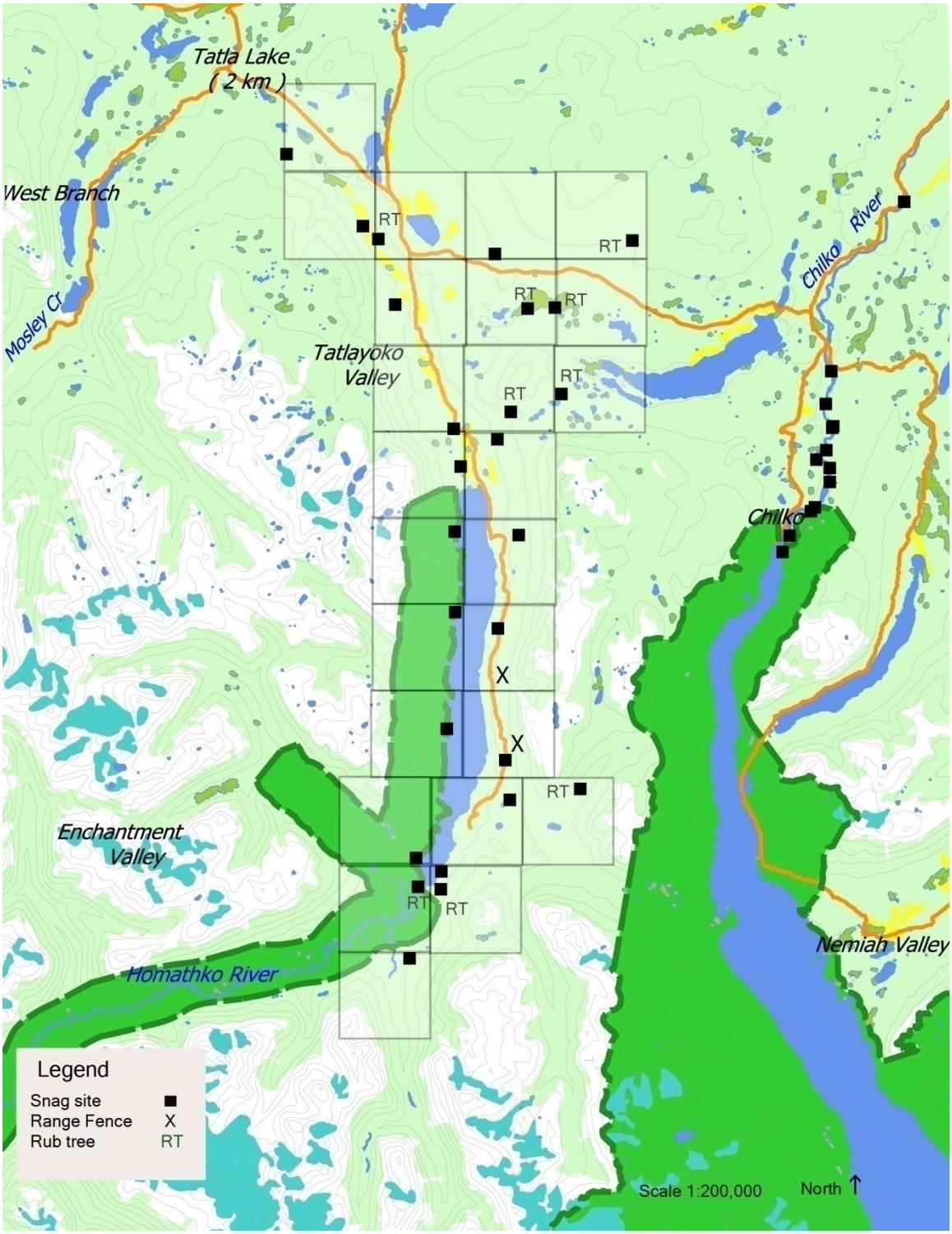

Figure 1. Year 2 (2007) study area, grid cells and hair snagging sites.

large concentrations of both bears and humans to the region each year. During the salmon spawning season, the river, and riparian and upland forest habitats associated with the Chilko River, contains the highest population density of grizzly bears in the Chilcotin Forest district.

Significant human use occurs along the Chilko River during spawning season. Several tourism facilities border the river. Cattle and horses graze in the area and numerous trails follow along the river on both sides. Guided and non-guided recreational fishing occurs from shore and in motorized and non-motorized boats. Department of Fisheries and Oceans conducts salmon enumeration in and along the banks of the river, particularly where Lingfield Creek joins the Chilko. Nemiah First Nations (the Xeni Gwentin) as well as other First Nation individuals fish along the shores and hold gatherings within the area.

The Tatlayoko community (population approximately 100) is located in the valley bottom north of Tatlayoko Lake and includes a mixture of ranches and hobby farms. Cattle from ranches at Tatlayoko graze throughout the valley, along both sides of Tatlayoko Lake, and high into alpine areas both east and west of the valley.

Methods

Spring sampling

Sampling methods remained largely the same as in Year 1. For Year 2 the number of hair-snagging trap sites was increased from the first season in hopes of capturing more individual grizzly bears and thereby improving statistical power of population estimates. Hair-snagging trap sites were selected systematically (using grid cells as the sampling unit) and 25 (Year 1 - 20) grid cells of 5 x 5 km (25 km^2) were identified within the Tatlayoko study area (Figure 1). One site location was chosen within each new cell, with site locations from cells identified in Year 1 remaining largely the same. Sites were chosen based on local knowledge of bear use/travel in the area. Locations were also chosen based on accessibility to keep costs down. One cell contained two snag sites (due to its location on Tatlayoko Lake), for a total of 26 sites.

Each hair-sampling site consisted of a small corral-like enclosure of approximately 30 meters of 4-pronged, double-strand barbed wire nailed around several (3 to 6) trees at about 0.5 m from the ground. Within each enclosure, a brush pile was built and baited with a non-reward liquid lure to entice bears to enter and leave hair on the wire. The non-reward scent lure for attracting bears to sampling stations was a combination of liquid rotting cow blood and rotten fish (3 litres of blood/ 1 litre of fish oil combination per snagging site, per session). The blood and fish lure was rotted for several months prior to application.

Sites were accessed by foot, by 4x4 truck along old logging roads, by a 16 foot outboard motor boat along the west side and south end of Tatlayoko Lake, by mountain bike south of Tatlayoko Lake, and by quad in a few harder to get spots on the north end of the lake. Sites in the Tatlayoko Valley were sampled in four 12-day (on average) sessions between mid-May and early July 2007. Snagging sites were not moved between sessions. Hair

was collected at the end of each session from two barbed wire range fences located on the east side of Tatlayoko Lake (Figure 2). Hair was also collected from rub trees (Figure 3) which were opportunistically identified within the study area. A total of 19 rub trees were identified during the sampling period and fitted with crossing pieces of barbed wire to facilitate hair collection.

Cedar Mueller

Figure 2: Barbed wire fence in the Tatlayoko Valley with grizzly hair samples.

Fall sampling

Grizzly bear hair was collected at 13 different hair-snagging sites along the shores of the upper Chilko River between September 1st and November 5th 2007 (Figure 1). Dates were shifted from Year 1 sampling (Aug. 7 – Oct. 20, 2006) to better correspond with peak salmon escapement and bear activity. Three site locations from the 2006 season were not used in 2007 and three new locations were selected. Site locations were chosen based on local knowledge of bear use/travel in the area and put in areas where human disturbance was minimal. Hair was collected from barbed wire stretched across bear trails beside the river and across shorelines by stretching wire to a metal post pounded into the river just off shore (Figure 4). Sampling sites did not include a scent lure. Hair was collected over six 10-day sessions. Snagging sites were not moved between sessions.

Sites were accessed by a 17-foot canoe from the Tsylos Park campground on the north end of Chilko Lake to Henry's Crossing. Data on salmon run volume and timing, and water levels are collected by the Department of Fisheries and Oceans and will be summarized for this study at the end of Year 3.

Barbed wire was placed along wildlife trails but posed little barrier to wildlife movement. Warning signs were posted at all hair-snagging sites and sites were located in areas of little to no human use. Potential users of areas in close proximity to sites were contacted and informed of snagging locations.

Figure 3: Bear trail leading past a well used rub tree.

Steve Ogle

Figure 4: Hair snagging site on the Chilko River.

Lab work

All hair samples were sent to Wildlife Genetics International (WGI) of Nelson, BC, for DNA analysis under the supervision of Dr. David Paetkau.

Prior to detailed genetic analysis, samples were excluded based on quality and visual appearance (obviously not from grizzly bears). For Year 2 there was also a cap for the maximum number of extractions per site/session to keep costs down. Hair-snag samples from black bears were differentiated from grizzly bears using both visual inspection (for obvious black bears) and a single-locus (the locus is the location of a gene on a chromosome) species test with marker *G10J* to eliminate weak samples and black bear samples.

The use of a minimum number of genetic markers (segments of DNA with identifiable physical locations on a chromosome) is required to discriminate among individual grizzly bears with acceptably low error rates (Paetkau 2004). For this study, WGI used 7 microsatellite markers (repetitive stretches of short sequences of DNA used as genetic markers) that were found to be highly variable for grizzly bears in the area immediately to the south of our study (Apps et al. 2006). Each grizzly bear sample is genotyped for individual identity in several phases. First an initial pass is made with all 6 microsatellite markers (in addition to *G10J*). The next step involves cleanup of those samples that produced incomplete results during the first pass. The next phase is error checking to prevent genotyping errors from inflating the true number of sampled individuals. Once the genotypes are completed and checked for errors, a computer search for identical

genotypes is performed and individuals are defined for each unique genotype. Each individual grizzly bear is then identified for gender.

Results and Discussion

Sampling success

A total of 859 hair samples (Year 1 – 509), a 69% increase, were collected from the Tatlayoko Valley and 494 samples (Year 1 – 344), a 44 % increase, were collected along the Chilko River. Increased sample numbers was largely due to more sampling sites in the Tatlayoko Valley (26 sites, rather than 20), inclusion of samples from 22 rub trees and two barbed wire range fences during each session, and improved efficiency of sampling sites along the Chilko River.

In order to keep lab work costs at a reasonable level, Year 2 required stringent sample sub-selection rules for DNA extraction. In Year 1 samples were excluded based on quality and visual appearance, whereas in Year 2 a cap was added for the maximum number of extractions per site/session. Extractions at a given site/session were spread out to maximize the chance of detecting multiple individuals. Of 1353 samples sent to the genetics lab for analysis 539 samples (40%) were excluded from analysis due to the sub-selection rules; 111 samples (8%) lacked suitable material for extraction; 62 samples (5%) were not extracted based on non-grizzly bear appearance; 119 samples (9%) failed during the pre-screen or during the multilocus analysis of individual identity; 225 samples (17%) had odd-numbered alleles at *G10J* (i.e. they were black bears); 13 samples (1%) contained DNA from more than one bear, and 284 samples (Year 1 – 130), a 118% increase, were grizzly bear samples that could be assigned to individual grizzly bears. Sampling success was consistent with Year 1 with 21% (Year 1 – 24%) of the samples being grizzly bear.

Individual grizzly bears

From these 284 grizzly bear samples a total of 87 individuals were defined (41 males, 46 females). Thirty-three individuals were detected in the Tatlayoko Valley (14 were recaptures from 2006), while 66 individuals were detected on the upper Chilko River (24 were recaptures from 2006). Twelve out of 33 (36%) of the individuals detected in the Tatlayoko Valley were also detected on the Chilko River (Figure 5). Tables 1 and 2 provide a summary of visits by individual grizzly bears to snagging sites each session during spring and fall sampling periods. Several individuals were detected multiple times during the spring sampling period (Table 3). These multiple locations give us an idea of bear movement in the Tatlayoko Valley (Figure 6). Three of four individuals that were detected in both Tatlayoko and Chilko in 2006 were only detected in Tatlayoko this year, and the fourth was detected in Chilko, but not Tatlayoko. Six individuals (all males) were detected in June/July 2007 by a grizzly bear DNA study to the south of our study area. Two of these were located over 100 km from their fall locations on the upper Chilko River (Table 5, Figure 7). A total of 105 different individual grizzly bears were identified in Tatlayoko and Chilko during both 2006 and 2007. Thirty-six different bears were detected in Tatlayoko and 83 individuals were detected on the upper Chilko.

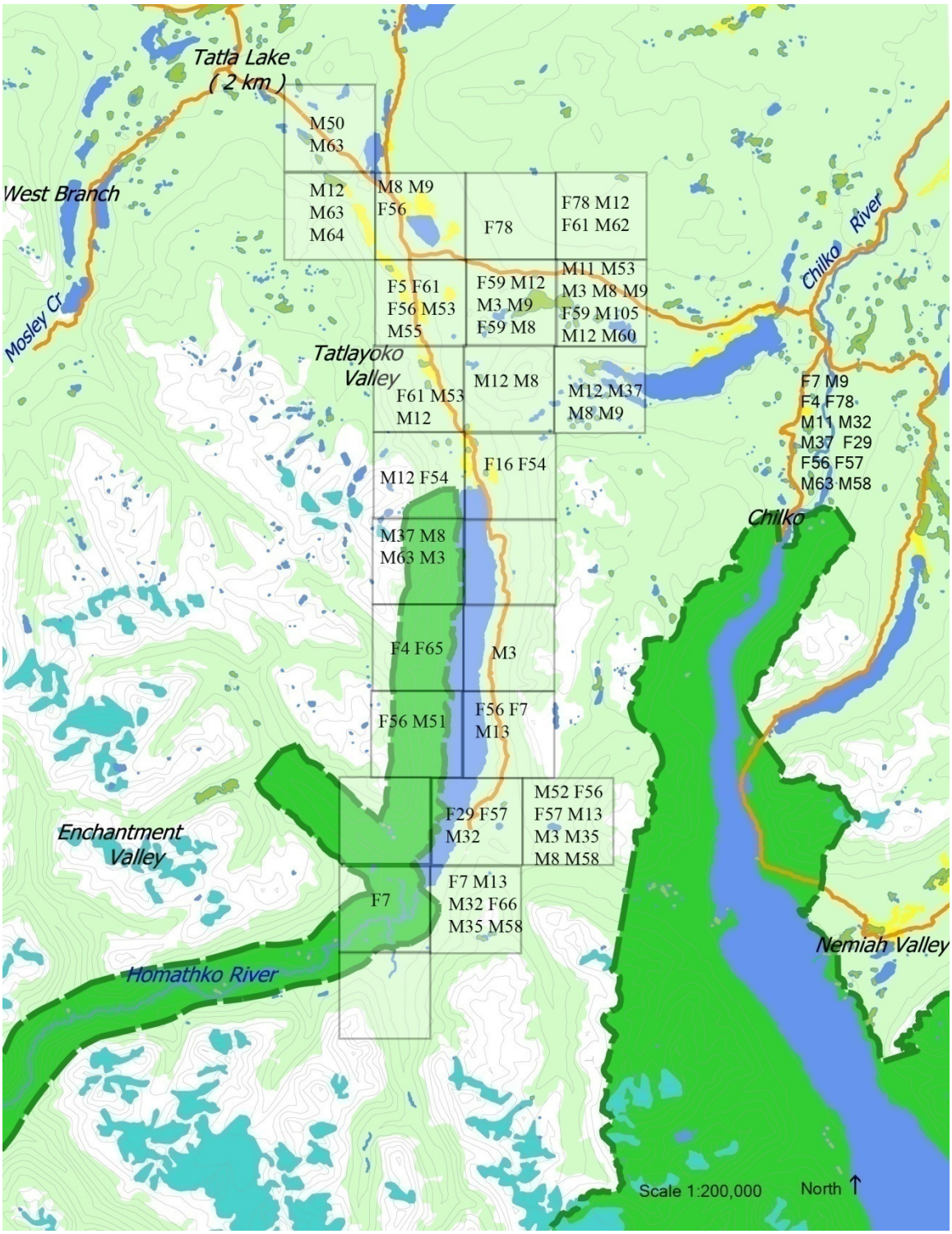

Figure 5. Locations by snagging cell for bears detected during spring in Tatlayoko and fall on the upper Chilko, 2007.

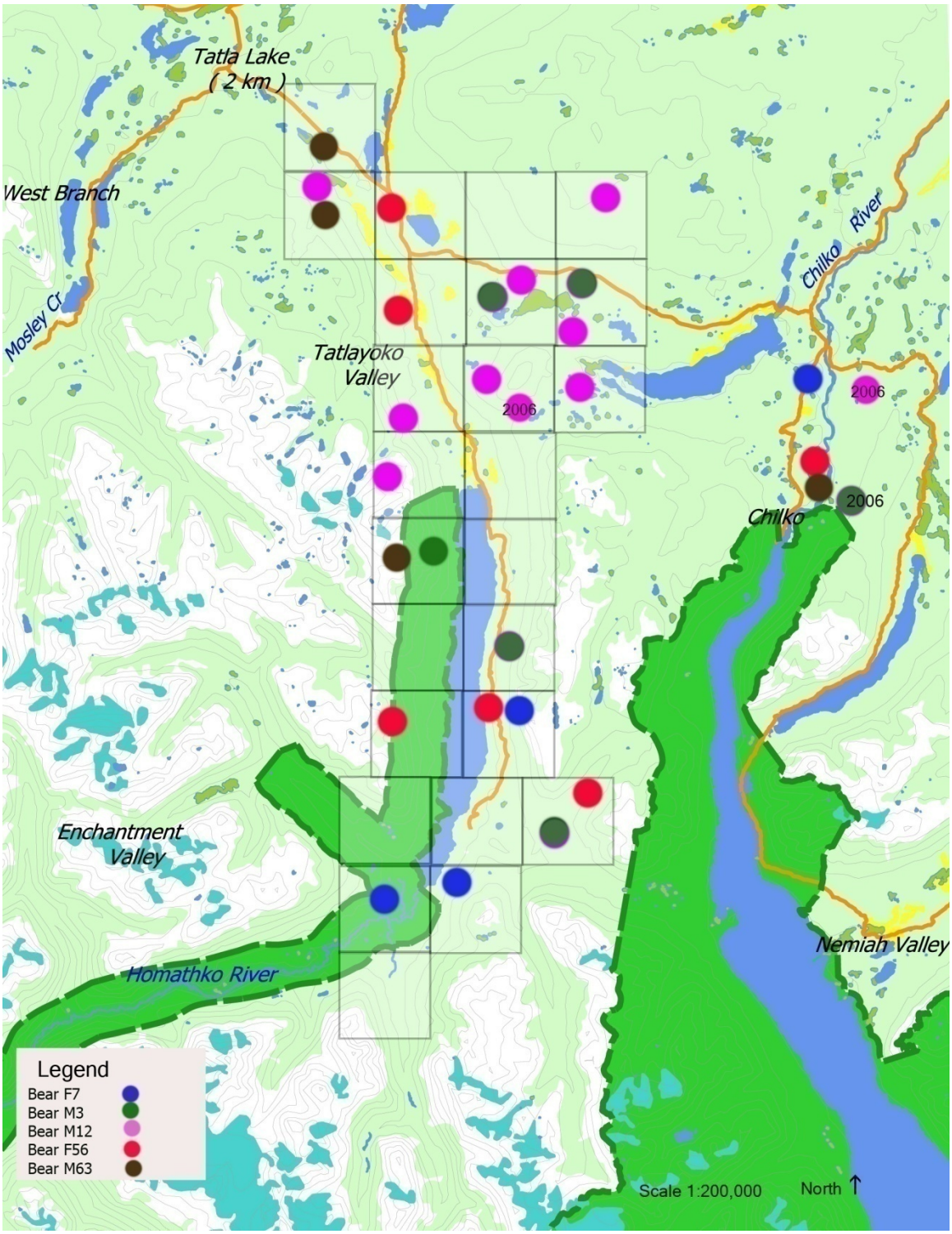

Figure 6. Colour coded locations showing multiple detections of five grizzly bears in Tatlayoko and along the upper Chilko River (three 2006 locations noted).

Population estimate
A population estimate for spring in the Tatlayoko Valley and fall along the upper Chilko River will be derived using capture-recapture analyses with program MARK (White and Burnham 1999) after Year 3 of this study. Our goal of detecting over 25 individual grizzly bears in the Tatlayoko Valley to improve modeling power was achieved. With the variability in results between Year 1 and 2, and our relatively low recapture rates - estimated at 0.24 in Tatlayoko (Table 3) and 0.14 in Chilko (Table 4) - obtaining adequate statistical power to detect changes and trends in bear abundance in these areas will probably require more than three years of sampling.

Genetic variability
The mean observed heterozygosity for the 7 individual ID markers is 0.70 for the 105 individual bears captured over the two years. Consistent with last year's preliminary perspective, there is no indication that the bears in this area are genetically isolated from bears to the north or south (Paetkau, unpublished report).

Home range sizes
Minimum home range sizes were estimated based on the maximum distance between detection locations for bears with more than one location. Two bears moved 113 km from near Gold Bridge during spring/summer 2007 and the upper Chilko River in fall 2007. An estimated home range size, using this distance as the diameter of a circle, gives both bears a home range of over 10,000 km^2. Reports from the literature state that an average grizzly bear home range is 200 – 600 km^2 for females and 900-1800 km^2 for males. Generally, the more plentiful the food supply, the smaller the home range. The large movements between Gold Bridge and the upper Chilko River may be an indication of how important salmon is for grizzly bears in the Chilcotin. In fact, assuming bears will travel 113 linear km to access Chilko River salmon, this could provide a critical food source over an area of 40,000 km^2 (a circle with a radius of 113 km). An area this size is 4 times the size of Banff, Yoho and Kootenay National Parks combined (9360 km^2) and over 4 times the size of Yellowstone National Park (8983 km^2). Although movement of grizzly bears to the upper Chilko River from this entire area is unlikely due to the topography and proximity to salmon runs in other parts of the region (i.e. Bute Inlet/lower Homathko and Knight Inlet/ lower Klinaklini River), the potential area of influence is still enormous (Figure 7).

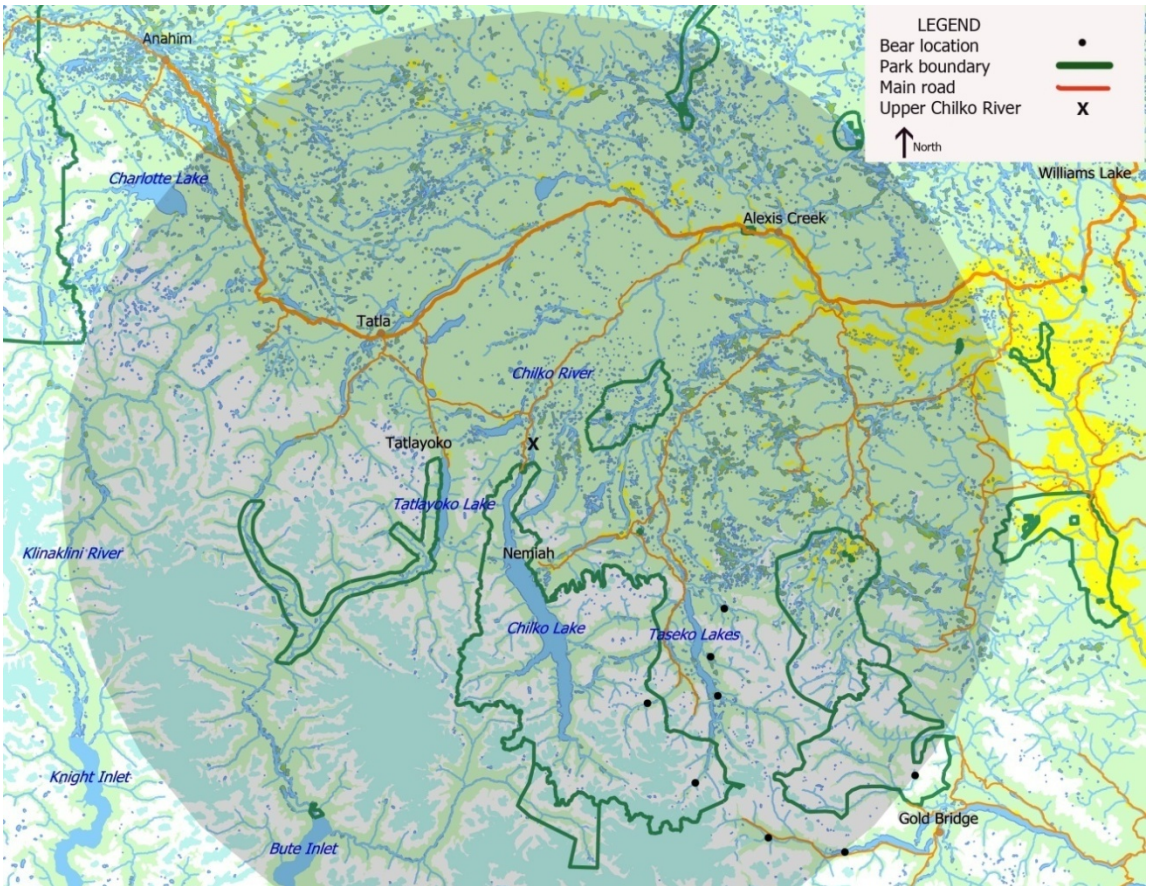

Figure 7. Locations of six male grizzly bears detected in the Southern Chilcotins, and the area of a circle around the upper Chilko River with a radius of 113 km (location data courtesy of Clayton Apps).

Salmon

The 2007 sockeye run estimate for Chilko River/Lake was 306,952 fish. Peak spawn occurred between September 28 – October 3, 2007 (www.pac.dfo-mpo.ca). This is significantly less than the count for 2006 which was between 400,000 and 500,000 sockeye. Despite this reduced fish count, 25 more individual grizzly bears were detected along the upper Chilko River during the fall 2007 run. This could be a reflection of improved sampling efficiency and an adjusted sampling period, or due to changes in the availability (accessibility) of salmon for bears because of variables such as water level or human presence in the area. A DNA study in the Owikeno area of BC found significant fluctuations in grizzly bear numbers using salmon streams that correlated with salmon availability. For example, DNA mark-recapture estimates from 1998-2002 showed there were 43 (annual range 3-26) bears using the Chuckwalla/Ambach area, 52 (4-28) in the Neechanz/Genesee area, and 28 bears (0 – 16) in the Washwash/Inziana area (Boulanger et. al 2004). Similarly, during the first two years of this study, salmon availability has varied from year to year. A salmon availability index will be derived from salmon counts and water level measurements taken by the Department of Fisheries and Oceans.

Benefits of this study

Bear abundance is dependent on the habitat quality of an area, the number of people in that area, and how those people behave towards bears (McLellan 2006). Habitat quality is dynamic and the mechanisms of change are often caused by humans. Changes such as alteration of forested land to agricultural land, agricultural land to urban areas, large-scale tourism, and even well managed forestry practices, can have significant impacts on important bear habitats. Human-influenced habitat changes are entangled with global climate change that will also have a great effect on the quality of bear habitats. For instance, global climate change and climate oscillations can have major effects on Pacific salmon populations. Some coastal BC and Alaskan salmon populations have almost crashed completely in recent years (Himmer 2006). Another example, particularly in the Chilcotin, is the large scale pine beetle (*Dendroctomus ponderosae*) devastation and the changes in habitats (i.e. fire, logging and logging roads) that come with it.

The future of grizzly bears depends on the quality of their habitat, the number of people where they live, and the behavior of these people. Changes to bear habitat are complex and must be managed with great ecological understanding of specific areas (McLellan 2006). Estimates of population trends are essential for the evaluation of population responses to changes in management practices and environmental conditions (Boulanger et al. 2004). This study provides important baseline information and improves our understanding of grizzly bear abundance and habitat use in the Central Chilcotin. This information can be used as part of a continued monitoring program to estimate population trends and assess and compare the effects of specific changes to habitat/human use in the area, as well as be used in decision making processes to help people manage changes in ways that might minimize the impacts to bears and important bear habitats in the region.

Further study

Given the small study area for this project, and given the wide ranging habits of grizzly bears, the results from this research is a preliminary snapshot of the bear ecology of this region. While this study will answer some important questions, such as how many grizzly bears come to feed on the upper Chilko River salmon, it also creates more. For instance, how big of an area is influenced by the availability of these salmon? Where are bears feeding in the fall if they are not travelling to access salmon? What proportion of the population, if any, migrates to the nearby coast for salmon? The Tatlayoko Valley is acting as a spring “attractant” much in the way that the Chilko River attracts bears in the fall. Rich spring vegetation in the valley bottom draws bears from a larger area until green-up occurs at other elevations throughout the region. How large is this area? What are some of the important migration corridors used to access these high quality areas? Where are some of the other important spring and summer habitats located throughout the region? Grizzly bears in the Central Chilcotin appear to be healthy, abundant, and unique given their relatively undisturbed environment. As important habitats and critical food sources change with human pressures and global warming, we must ensure their long-term conservation. Further study is needed to continue monitoring effects of changes to the environment and to increase our understanding of grizzly bear ecology in this region.

Table 1. Visits of individual grizzly bears to hair-snag DNA stations by sampling site and session in the Tatlayoko Valley May 14 – June 28, 2007.

Site/Rub tree #	Site Name	Tatlayoko Valley Session 1 May 14 - May 25*	Session 2 May 25 - June 5	Session 3 June 5 - June 18	Session 4 June 18 - June 28	Total (hits-indiv)
T01	Chesi Falls Road	F29,F57	M32		M32	4-3
T03	Lookback Creek				F56	1-1
T04A	Grub Creek 2007	M3				1-1
T05	Escalator					
T06	Two-two-two		F16, F54			2-2
T07	Top Place					
T07-RT1	Top Place Rub Tree 1	M12	M8			2-2
T07-RT2	Top Place Rub Tree 2					
T08	Skinner Meadow		F59, M12, M3	M9	F59,M12	6-4
T08-RT1	Skinner Rub Tree 1					
T08-RT2	Skinner Rub Tree 2			M8		1-1
T08-RT3	Skinner Rub Tree 3			M9		1-1
T08-RT4	Skinner Rub Tree 4					
T09	Little Meadow	F78				1-1
T10	Eric's Site	M9	F56			2-2
T10-RT1	Eric's Site Rub Tree 1			M8		1-1
T11	Lars' Site				M12,M63,M64	3-3
T12	Charlie Creek	F5,F61	F56,M53	M55		5-5
T14	F & T's Bear Heaven		F61	M53	M12	3-3
T15	Fisher's Field	M12		F54		2-2
T16	Westside North	M37	M8	M63	M3	4-4
T17	Westside Middle	F4			F65	2-2
T18	Westside South	F56,M51				2-2
T19	Feeney Cabin					
T20	Homathko Outlet	F7				1-1
T21	Hydro Landing	F7	M13			2-2
T21-RT1	Hydro Landing Rub Tree 1	M13				1-1
T22	Cheshi Pass 2007		M52		F56,F57	3-3
T22-RT1	Cheshi Pass Rub Tree 1	M13	M52		M58	3-3
T22-RT2	Cheshi Pass Rub Tree 2	M3	M35	M35,M8		4-3
T22-RT3	Cheshi Pass Rub Tree 3	M13		M35		2-2
T22-RT4	Cheshi Pass Rub Tree 4	M58	M13			2-2
T22-RT5	Cheshi Pass Rub Tree 5	M13				1-1
T22-RT6	Cheshi Pass Rub Tree 6	M13				1-1

Table 1 continued…

Site/Rub tree #	Site Name	Tatlayoko Valley Session 1 May 14 - May 25*	Session 2 May 25 - June 5	Session 3 June 5 - June 18	Session 4 June 18 - June 28	Total (hits-indiv)
T23	Jurassic Junction		M13,M32		F66	3-3
T24	Copper Creek Ranch					
T23-RT1	Jurassic Rub Tree 1	M35				1-1
T23-RT2	Jurassic Rub Tree 2			M13		1-1
T23-RT3	Jurassic Rub Tree 3					
T23-RT4	Jurassic Rub Tree 4	M58				1-1
T23-RT6	Jurassic Rub Tree 6			M13		1-1
T23-RT7	Jurassic Rub Tree 7					
T26	Beaver Dam	M11,M53	M3,M8,M9,F59 ,M105,M12	M9	F59,M60	11-9
T28	Sidehill Community Pasture	M50			M63	2-2
T27	Upper Skinner		F78,M12		F61,M62	4-4
T27-RT1	Upper Skinner Rub Tree 1					
T27-RT2	Upper Skinner Rub Tree 2		M12			1-1
T25/T25A	Fish Lake / Lincoln Pass	M12,M37	M8	M9		4-4
T25-RT1	Lincoln Pass Rub Tree 1					
T25-RT2	Lincoln Pass Rub Tree 2					
MFE	Maggot Fence East	F7	M13			2-2
MFW	Maggot Fence West		M13			1-1
FFE	Fossil Fence East					
New Bears		**19**	**7**	**2**	**5**	

*Precise dates vary slightly among stations

Table 2: Visits of individual grizzly bears to hair-snag DNA stations by sampling site and session along the upper Chilko River, September 2 – November 4, 2007.

Site #	Site Name	Chilko River Session 1	Session 2	Session 3	Session 4	Session 5	Session 6	Total (hits-indiv)
		Sept 2 - Sept 11	Sept 11 - Sept 20	Sept 20 - Oct 1	Oct 1 - Oct 11	Oct 11 - Oct 21	Oct 21 - Nov 4	
C38	Upper Henry's Crossing	M21,M37		F95		M37		4-3
C40	Chilko Lodge	M70,M71	F31,F43	F29,F40, F78,F79	F7,F82, F84,M83, M86	F29,F82, F89,M27	F29,F40, F80,F97, F98	22-18
C41	Lower Spawning Channel	F43,F68, F69		F99,M48	M85	F56,M48	F1,F99	10-8
C42	Raspberry Point			F78,M27		F75,F90, M100,M22	M100,M32, M48	9-8
C43	Canoe Crossing	F31,F43, M63	F42,M71	F26,M48, M58,M77, M87	F57,M32, M86,M87	F91,F99, M102,M32, M92	M101,M58	21-18
C44	Rod's Dock	F80		F75,F76, F93,F94		F93,F94	F38	8-6
C45	Gravel bar	F41,F69	F41,F74, M87	F23,F99, M87	M102	M28,M9		11-9
C46	Clay bank	F81	M73,M85	F93,M77, M96	F88,M96	F95,M32	M102	11-10
C49	Upper Lingfield (Westside)	F67,F80	F103,M87		F38		F103,M87	7-5
C50	Upper Lingfield (Eastside)	F38,F41, F42		F23,M87	F19,F38	M37,M96	F38,M11, M48	12-10
C51	Chilko Lake site	F31,M87	F67,F72, F97	F67,F72, F80	F81	M24	F4,F40	12-11
C52	Upper Housi 2007	M63	M103				M37,M96	4-4
C53	Brittany Creek	M63		M33				2-2
C38-RT1	Upper Henry's Rub Tree 1	M9,M87					M104,M37	4-4
New Bears		**17**	**6**	**18**	**10**	**9**	**6**	

Table 3. Capture summary by session for identified grizzly bears in the Tatlayoko Valley May 14 – June 28, 2007.

Bear ID #	Sex	Captures Per Session at Sites (and Rubtrees) 1	2	3	4	Estimated Recapture Rate	Fall Capture**
3	M	1 (1 RT*)	2		1	0.67	In 2006
4	F	1				0	YES
5	F	1				0	
7	F	3				0	YES
8	M		3 (1 RT)	(3 RT)		0.33	In 2006
9	M	1	1	3 (1 RT)		0.67	YES
11	M	1				0	YES
12	M	2 (1 RT)	3 (1 RT)		3	0.67	In 2006
13	M	(5 RT)	4 (3 RT)			0.33	
16	F		1			0	
29	F	1				0	YES
32	M		2		1	0.33	YES
35	M	(1 RT)	(1 RT)	(2 RT)		0.67	
37	M	2				0	YES
50	M	1				0	
51	M	1				0	
52	M		1 (1 RT)			0	
53	M	1	1	1		0.67	
54	F		1	1		0.33	
55	M			1		0	
56	F	1	2		2	0.67	YES
57	F	1			1	0.33	YES
58	M	(2 RT)			(1 RT)	0.33	YES
59	F		2		2	0.33	
60	M				1	0	
61	F	1	1	1	2	1	
62	M				1	0	
63	M			1	2	0.33	YES
64	M				1	0	
65	F				1	0	
66	F				1	0	
78	F	1	1			0.33	YES
105	M		1			0	
Summary		**20 (10 RT)**	**26 (7 RT)**	**8 (6 RT)**	**19 (1 RT)**	**0.24**	

* RT = Rub-tree captures
** Fall 2007 unless otherwise noted

Table 4. Capture summary by session for identified grizzly bears along the upper Chilko River September 2 – November 4, 2007.

Bear ID #	Sex	Captures Per Session at sites (and Rubtrees)						Estimated recapture rate
		1	2	3	4	5	6	
1	F						1	0
4	F						1	0
7	F				1			0
9	M	(1 RT)				1		0.2
11	M						1	0
19	F				1			0
21	M	1						0
22	M					1		0
23	F			2				0
24	M					1		0
26	F			1				0
27	M			1		1		0.2
28	M					1		0
29	F			1		1	1	0.4
31	F	2	1					0.2
32	M				1	1	1	0.4
33	M			1				0
37	M	1				2	1 (1 RT)	0.4
38	F	1			2		2	0.4
40	F			1			2	0.2
41	F	2	1					0.2
42	F	1	1					0.2
43	F	2	1					0.2
48	M			2		1	2	0.4
56	F					1		0
57	F				1			0
58	M			1			1	0.2
63	M	3						0
67	F	1	1	1				0.4
68	F	1						0
69	F	1						0
70	M	1						0
71	M	1	1					0.2
72	F		1	1				0.2
73	M		1					0
74	F		1					0
75	F			1		1		0.2
76	F			1				0
77	M			2				0
78	F			2				0
79	F			1				0

Table 4 continued…

Bear ID #	Sex	Captures Per Session at sites (and Rubtrees) 1	2	3	4	5	6	Estimated recapture rate
80	F	2		1			1	0.4
81	F	1			1			0.2
82	F				1	1		0.2
83	M				1			0
84	F				1			0
85	M		1		1			0.2
86	M				2			0
87	M	1 (1 RT)	3	3	1		1	0.8
88	F				1			0
89	F					1		0
90	F					1		0
91	F					1		0
92	M					1		0
93	F			2		1		0.2
94	F			1		1		0.2
95	F			1		1		0.2
96	M			1	1	1	1	0.6
97	F		1				1	0.2
98	F						1	0
99	F			2		1	1	0.4
100	M					1	1	0.2
101	M						1	0
102	M				1	1	1	0.4
103	F		2				1	0.2
104	M						(1 RT)	0
Total		**22 (2 RT)**	**16**	**30**	**17**	**24**	**22 (2 RT)**	**0.14**

Table 5. Maximum distance between multiple detections of individual grizzly bears in the Tatlayoko Valley and upper Chilko River, May – November 2007. Bears in blue were located in the South Chilcotin Mountains in spring/summer 2007 (data courtesy of Clayton Apps).

Bear ID	Sex	Number of detections	Max interval (days)	Max distance (km)	Estimated movement area*
3	M	5	45	28	615
4	F	2	173	24	452
7	F	4	149	33	855
8	M	7	21	17	227
9	M	8	159	29	660
11	M	2	173	19	283
12	M	10	45	15	177
13	M	12	22	10	79
29	F	4	173	28	615
32	M	6	162	33	855
35	M	4	35	10	79
52	**M**	**3**	**45**	**61**	**2921**
53	M	3	35	9	64
54	F	2	21	3	7
56	F	6	159	30	707
57	F	3	149	28	615
58	M	5	173	35	962
59	F	4	34	2	3
61	F	5	45	16	201
63	M	6	98	36	1017
78	F	4	138	23	415
85	**M**	**3**	**84**	**81**	**5150**
96	**M**	**5**	**129**	**68**	**3630**
100	**M**	**4**	**118**	**113**	**10024**
34**	**M**	**3**	**250+**	**113**	**10024**
44**	**M**	**3**	**250+**	**60**	**2826**

*Movement area is area (km^2) of a circle with diameter equal to the maximum distance between multiple detections
**Includes fall 2006 locations

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