NORTHERN CONTINENTAL DIVIDE ECOSYSTEM

GRIZZLY BEAR POPULATION MONITORING TEAM

ANNUAL REPORT - 2005

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U.S. Geological Service

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This annual report summarizes data collection efforts to date. It is not a peer-reviewed document, and data summaries and interpretations are subject to change.

Cover Photo: Trend monitoring subadult female roaming the Rocky Mountain Front; April 2005. FWP photo.

ABSTRACT

The monitoring of grizzly bear population trend in the NCDE was initiated in 2004, by following the survival and reproductive rates of radio-instrumented females. Thirty-two individual females were captured during the first 2 years of monitoring. Twenty-eight male grizzly bears were incidentally captured and released. Over these 2 years, the capture success averaged 1 grizzly bear capture per 18.0 trap-nights. No adult trend monitoring females died during 2004, but 2 subadult females did die that year. We monitored the fate of 31 trend monitoring female grizzly bears in 2005. All subadult females survived in 2005. Two of 27 adult females died in 2005, of which 1 was a known mortality and 1 was classified as a probable mortality. We monitored the fate of 13 adult females and 6 subadult females that were captured for management actions in 2004 and 2005. These13 adults were accompanied by 19 non-radioed young (cubs or yearlings). In total, 31 and 17 management bears were monitored in 2004 and 2005. Eighteen management bears, or their attendant young were known to die; 15 were removed from the ecosystem in management actions, 1 was killed by a train, 1 bear was illegally killed, and 1 death was from an unknown cause. In 2004, 34 known or probable man-caused mortalities were recorded in the NCDE. We recorded 24 known/probable and man-caused mortalities of grizzly bears in the NCDE as a whole during 2005.

ACKNOWLEDGEMENTS

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I. INTRODUCTION / STATEMENT OF NEED

Since 1973, there has been an interagency study team for the Greater Yellowstone Ecosystem (GYE). This team has the responsibility to coordinate research on grizzly bears in the GYE, and to collect, manage, analyze, and distribute ecological information on the grizzly bear and its habitat in this recovery zone (Final Conservation Strategy for the grizzly bear in the Yellowstone Ecosystem, March 2003, Interagency Conservation Strategy Team, 2003). A major function of the study team is that of coordination among agencies and members of the public to prevent duplication of effort, and to synthesize and report findings regarding the status of recovery efforts in the GYE. This long-standing interagency effort has lead to significant advancements in our knowledge of grizzly bears and their habitats, and has provided managers with necessary tools and information to judge progress of recovery under the Endangered Species Act.

Conversely, no such interagency team exists for the Northern Continental Divide Ecosystem (NCDE). This has lead to compartmentalization of research and management effort with unclear lines of responsibility or authority for recovery issues. The result is that our understanding of the status of the grizzly bear population and habitats in these areas are poorly understood relative to the GYE. Further, there is no centralized reporting system for population and habitat monitoring issues in this Ecosystem. This lack of structure and information flow has lead to a high level of management uncertainty relative to the status of the grizzly bear population and its habitat. For this reason, state and federal agencies have sought to improve the current model by developing and institutionalizing an interagency population and habitat monitoring team for the NCDE and adjacent lands outside of the designated recovery zone.

II. PROGRAM OBJECTIVES

The Northern Continental Divide Ecosystem Grizzly Bear Monitoring Team will conduct the following activities, in which the lead responsibility for implementation and reporting will be assigned to appropriate agencies in mid-2006. The ultimate responsibility of the monitoring team is to collect life history and habitat data on grizzly bears in western Montana and summarize findings in a comprehensive annual report. Major monitoring categories will initially include:

Population Monitoring

1. Population size reporting and updates
2. Population trend monitoring
3. Grizzly bear distribution (Female/young)
4. Mortality
5. Genetic diversity

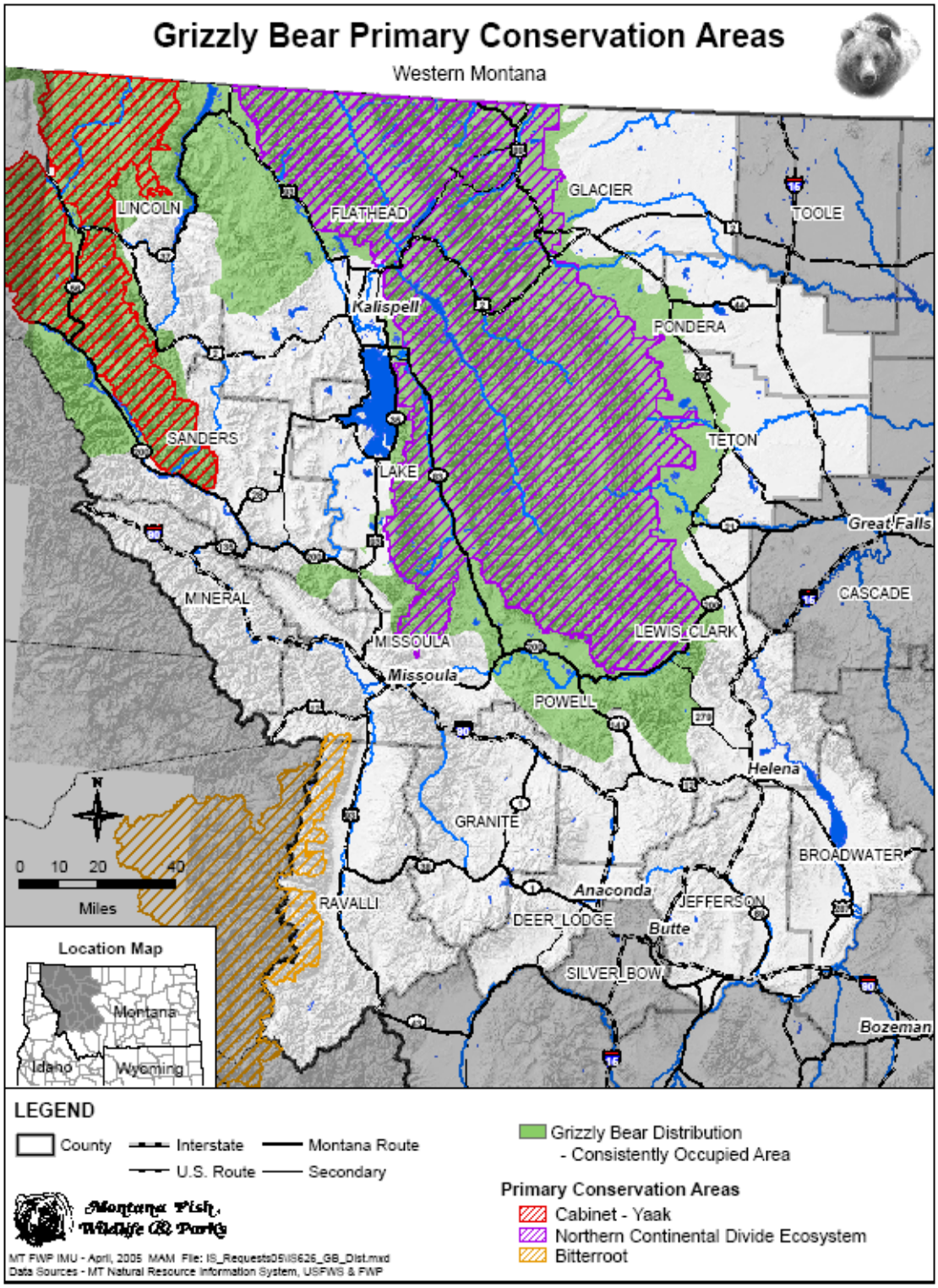
Habitat Monitoring

1. Secure habitat and motorized access route density
2. Developed sites (non-private)
3. Livestock allotments
4. Habitat effectiveness and habitat value (CEM)
5. Private land development
6. Habitat connectivity
7. Conflict management

III. GEOGRAPHIC SCOPE OF MONITORING PROGRAM

Primary monitoring emphasis for grizzly bear populations and their habitat will be placed within the designated Northern Continental Divide Ecosystem (NCDE) Recovery Zone (U. S. Fish and Wildlife Service, 1993) and surrounding portions of Montana, British Columbia, and Alberta. As resources permit, monitoring will be expanded to include the Cabinet-Yaak Ecosystem Recovery Zone (U. S. Fish and Wildlife Service, 1993) and remaining portions of northwest Montana where grizzly bear occupancy is expected (Montana Fish, Wildlife and Parks, In Prep). (Fig. 1).

Fig. 1.Western Montana habitats where population and habitat monitoring for grizzly bears is envisioned.



IV. METHODS

Delineation of Study Bears and Capture Methods

Female grizzly bears were captured, radio-instrumented, and monitored throughout the NCDE and into southern British Columbia and Alberta, Canada. Capture effort was designed in a density-distributed fashion; more collars were placed in areas with higher grizzly bear density. The relative density of bears across the NCDE was determined using data from the recent USGS ecosystem-wide DNA study conducted during June of 2004 (Fig. 2). From these data, capture zones for the NCDE were established in a delphi fashion using broad-scale geographic/administrative boundaries (Fig 3). The population of grizzly bears in the NCDE intermixes with grizzly bears in Canada. Fortunately, a sample of radioed females from ongoing research in British Columbia and Alberta Canada was available for survival estimates. During some years, it is possible to have an over-representation of bears in a given capture zone. In these instances, the appropriate number of bears will be randomly excluded from survival analyses.

We used the methods of Schwartz et al. (2005) to delineate study bears. Adult or subadult females first captured and radioed at a research site became study animals. Females first captured and radioed at a conflict site by bear managers were members of a "conflict" sub-sample. A conflict bear could become a study bear if later captured at a research site. Conversely, study animals captured at a conflict site retained their place as a study bear if wearing a functional radio collar at time of conflict capture. Study bears whose collars failed, fell off, or were censored from the study sample for some other reason and were later captured at a conflict site were reclassified as part of the conflict

sub-sample. Non-target individuals captured at conflict sites were considered members of the conflict sub-sample.

Grizzly bears were captured using leg-hold snares, culvert traps, and in some instances were free-ranged over baits. Road-killed deer, livestock carcasses, or other lures were used to attract bears to sites. Bears were immobilized using either Ketamine/Rompun (ketamine HCL/xylazine HCL) or Telazol (tiletamine HCL/zolazepam HCL). All bears were micro-chipped. Morphological measurements were taken on all bears. Cotton spacers and mortality sensors were used on all radio collars. Tooth (Stoneberg and Jonkel 1966) and hair samples were taken for age estimation and DNA genotyping. Adult bears were considered to be those $\geq$ 5 years of age.

Grizzly bears were fitted with one of 3 types of radio collars, depending on body size and geographic location within the NCDE. Traditional vhf collars (Telonics Inc. Mod 500) having a battery life of 5 years were placed on subadult females (<100 lbs) and most adult bears. Female grizzly bears in Glacier National Park were fitted with Argos GPS (Telonics Inc. TGW-3580) collars to minimize over-flights. Some females along the Rocky Mountain Front (east side of the Continental Divide) were fitted with Telonics Generation III GPS collars (TGW-3500), with a battery life of 3 years, in an effort to gather more specific information on habitat selection in this area.

Capture success measured how successful field crews were at capturing bears at a site, and was based on the number of sites where snares/culverts were set, and the number of nights that capture sites were operational. Each operational capture site, regardless of how many snares/culverts were deployed, constituted a “capture night.” The sum of

capture nights (effort), divided by the number of bears captured was termed "capture success."

Telemetry

The locations of all collared bears were determined once per month, as possible, using fixed-wing aerial telemetry. In addition, whenever possible, ground locations were determined by triangulation. During the bears' active season, we also monitored the status of each bears' mortality sensor to determine if the bear was alive. Home range polygons (100%) were constructed for each bear, regardless of sample size, using the minimum convex polygon method (Mohr 1947).

Mortality

Mortality censors on radio-collars indicated when a collar had either been prematurely cast by a study bear, or when a study bear had died. Bears whose collars were on mortality were investigated by field crews as soon as possible to determine whether the bear had died, and document cause of death. When a death did occur, necropsies were conducted in the field, and relevant tissue and hair samples were collected. We used a metal detector to ascertain whether dead bears had been shot. Except for arduous backcountry situations, whole carcasses were retrieved from the field and sent to the FWP laboratory.

Researchers and managers filled out a mortality form describing the specifics of each mortality in the NCDE. These reports were entered into a spreadsheet and information was coordinated among agencies. Terminology for mortalities followed those in Cherry et al. (2002) (Table 1).

Fig. 2. Results of USGS grid sampling of grizzly bear hair in the NCDE for the first (June) of 4 capture/recapture sessions; 2004. DNA results are superimposed on capture zones for the ecosystem. Preliminary data supplied by K. Kendall (USGS).

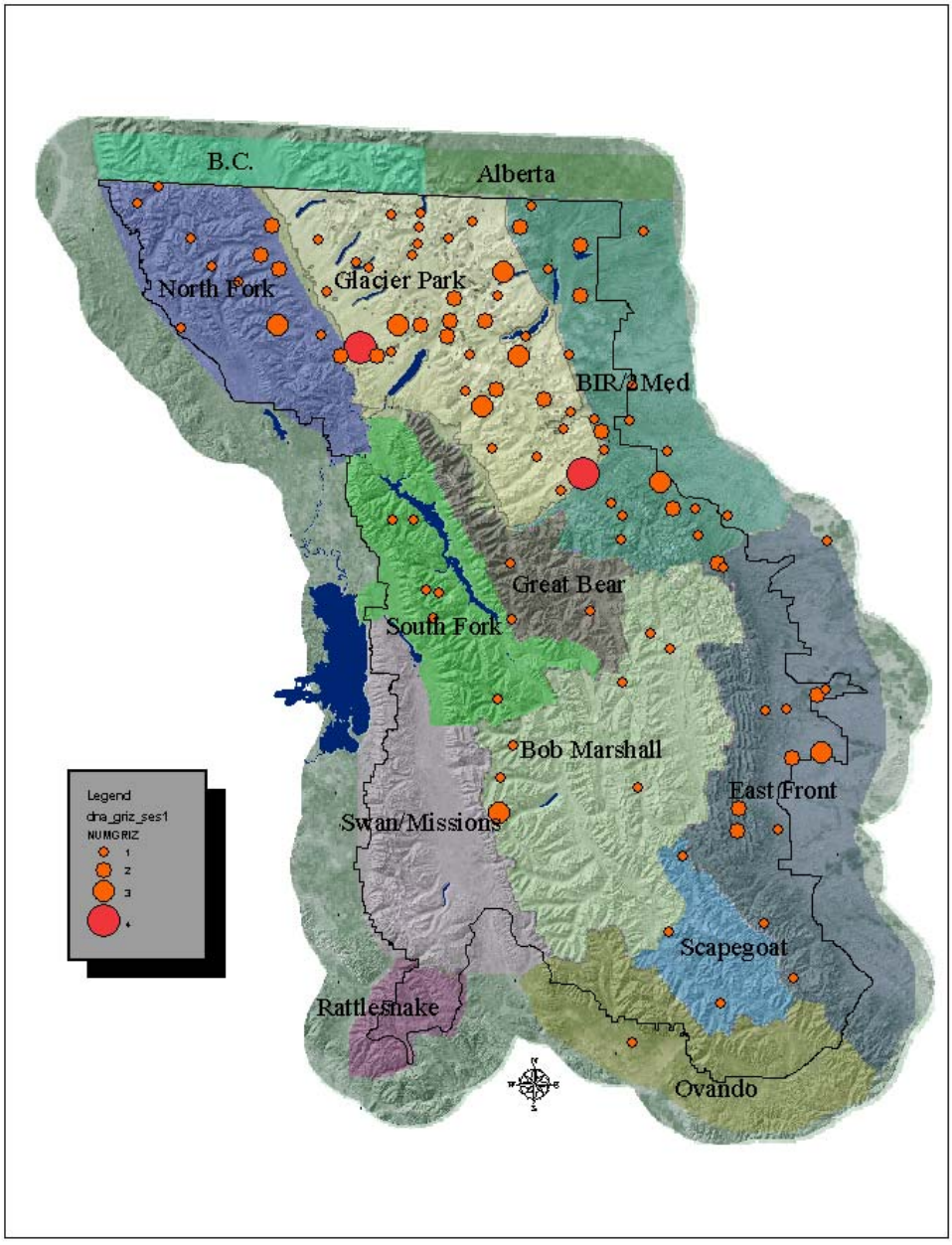


Fig. 3. Desired distribution of 29 radio-instrumented female grizzly bears in the NCDE by Capture zone. Distribution was of collared bears was based on results of NCDE-wide DNA surveys during the June session of 2004.

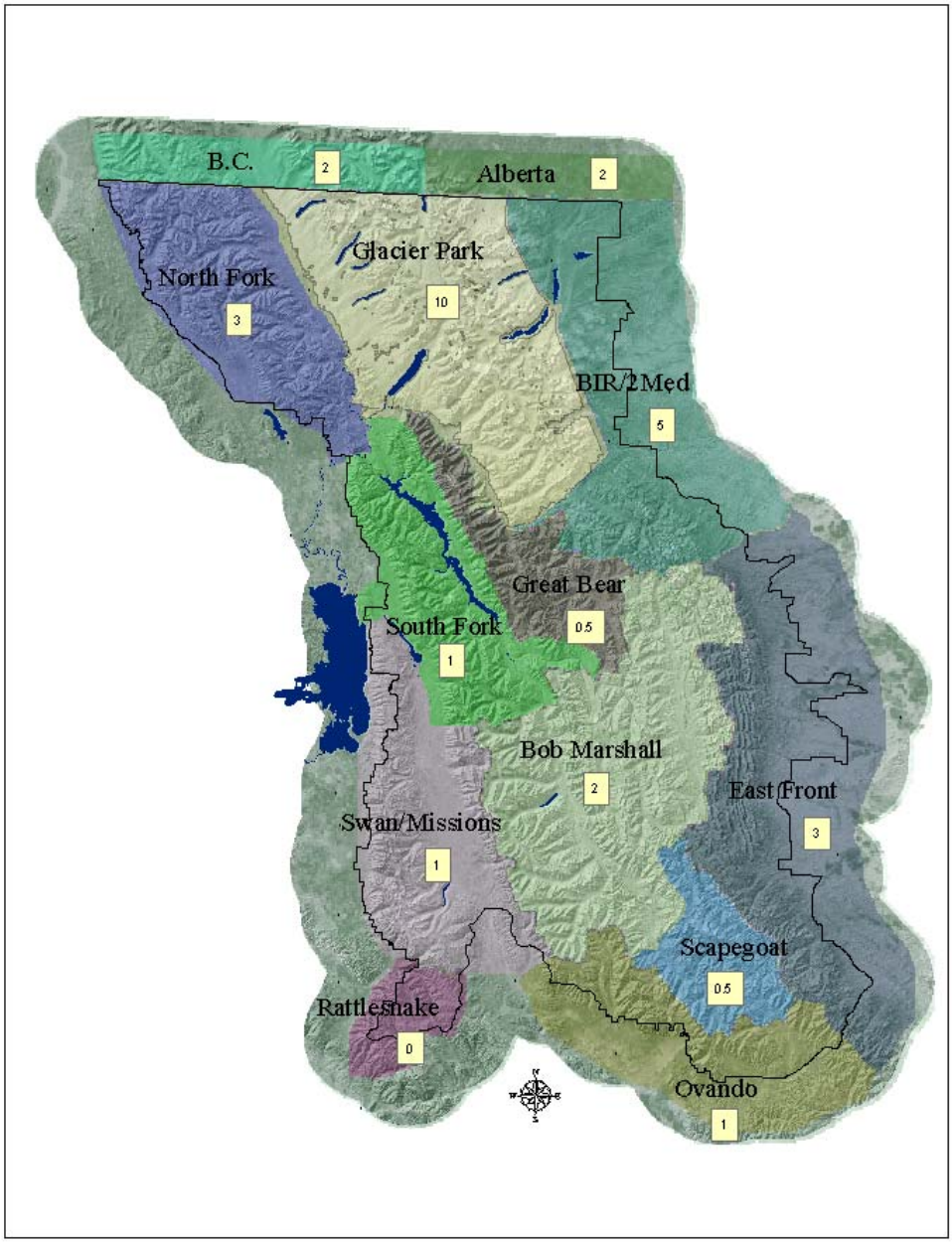


Table 1. Terms and definitions used to classify the cause, certainty, and discovery of grizzly bear mortalities (From Cherry et al. 2002).

Terms	Definitions
Cause of Mortality	
Known Natural	Positively or reasonably attributed to natural cause
Known Human-caused	Positively or reasonably attributed to humans.
Management	Bear legally killed because of management action
Defense of life	Bear legally killed by person while defending their life.
Capture related	Death of bear due to capture and immobilization. This includes dependent cubs that were abandoned following management relocation.
Illegal	Known illegal human-caused mortality
Hunt	Bear legally harvested during a sanctioned hunting season.
Train	Bear killed by train
Vehicle	Bear killed by motor vehicle
Augmentation	Bear legally moved from NCDE to augment other ecosystems
Probable illegal	Cause could not be definitively determined. However, death occurred in area frequented by humans.
Undetermined	Cause could not be determined. However, death did not occur adjacent to area frequented by humans.
Certainty of Mortality	
Known	A carcass or parts to substantiate death
Probable	Strong evidence to indicate mortality but no carcass recovered. Included cases where evidence indicates severe wounding, and observations suggest the bear displayed abnormal behavior.
Possible	Some presumptive evidence of mortality by no prospects for validation. Includes defense of life situations where shots were fired by no evidence of significant wounding was found and hearsay evidence of poaching or malicious death.
Unresolved	Pulse rate and stationary location of a transmitter indicated a cast-off collar or mortality, and transmitters could not be retrieved due location (i.e., cliff, log-jam in river) or failure; bear never recaptured so fate was unresolved
Unexplained	Premature failure of a working transmitter occurred that could not logically be attributed to expected battery life; bear never recaptured so loss was unexplained.
Discovery of Mortality	
Reported	Mortality of an instrumented or non-instrumented bear discovered without the aid of telemetry.
Unreported	Mortality of an instrumented bear discovered due to telemetry and not reported by the public
Unexplained	Premature failure of radio collar that could not be attributed to battery life. Bear never encountered again

V. RESULTS

POPULATION MONITORING IN THE NCDE

Population Trend

Research Captures:

The trend-monitoring program began with a limited field effort in 2004. Capture and monitoring efforts intensified in 2005.

Twenty grizzly bears were captured in 2004, 11 (55%) of which were females (Table 2). During 2005, 40 grizzly bears were captured 43 times in the NCDE. Twenty-one (53%) of 40 individuals were female. Most (76%) female captures in 2005 were of adults ($\geq$ 5 years old). The locations of male and female grizzly bear captures during 2004 and 2005 are given in Fig. 4. The fates of female grizzly bears are given in Fig. 5. A list of monitoring captures to date is given in Appendix A.

Thirty-two individual females have been captured during the first 2 years of monitoring. Two of these females in the monitoring sample had previously been captured in management actions (F205 from the Rocky Mountain Front, and F418 who was relocated from the Blackfeet Reservation to the North Fork areas in 2004). One female from Alberta (F77), captured in 2004, was involved in a management action in 2005. Seven of 28 (25%) males captured in monitoring efforts had previously been captured in management actions.

Capture success for each capture zone was determined for 2004 and 2005 efforts. In total, 956 capture nights were achieved for the two years; most effort occurred in 2005. For the first 2 years, an average capture success of 1 grizzly per 18.0 nights was

calculated (Table 3). Capture success for the Blackfeet/Two Medicine zone was not calculated, as some bears were free-ranged over baits.

Table 2. The number of female and male grizzly bear captures and recaptures in the NCDE; 2004-2005. Table does not include Canadian capture data.

Capture Year	Sex/age Class	Number Individuals	Number Recaptures	Row Total
2004[a,b]	Adult Female	7	0	7
2004 [b]	Sub-adult Female	4	0	4
2004	Male	9	0	9
2004 Total		20	0	20
2005	Adult Female	16	0	16
2005	Sub-adult Female	5	1	6
2005	Male	17	3	20
2005 Total		38	4	42
Column Total		58	4	62

[a] includes one adult female captured in 2003 yet monitored in 2004.
[b] 2004 data include 2 adults (f40, f296) and 1 subadult (f111) captured in the Swan Valley that was randomly excluded from survival analyses because of over-representation with the Swan Capture zone.

Table 3. Capture effort and success by capture zone; 2004 and 2005.

Capture Zone[a]	Total Capture-nights	Number Grizzly Captures			Capture Success
		Ad F	Sub F	Male	
Glacier Park	199	6	0[b]	3	22.1
South Fork	243	1	0	6(1)	30.4
North Fork	113	5	0	6(1)[c]	9.4
Swan/Missions	280	2	3	2	40.0
East Front	96	2	4(1)	7(1)	6.4
Blackfeet/Two Medicine[d]	N/A				
Ovando	9	1	0	0	9.0
Scapegoat	16	1	0	0	16.0
All Zones	956	18	7(1)	24(3)	18.0

[a] table does not include one adult female (#648) captured outside of recovery zone in 2003. Data include 2 adults (F40, F296) and 1 subadult (F111) captured in 2004 in the Swan Valley that were randomly excluded from survival analyses because of over-representation with the Swan Capture zone.
[b] table does not include one free-ranged sub-adult bear that was not radioed.
[c] numbers in parentheses are recaptures. For example, in the North Fork Capture zone, 6 individual males were captured 7 times.
[d] bears were generally free-ranged in this capture zone trap-night concept does not apply. However,7 bears have been captured in this zone.

Fig. 4. The distribution of capture sites within the NCDE during 2004-05. Yellow triangles depict sites where either a male or a female grizzly bear was captured. Grizzly bears were not captured at sites represented by red triangles. Data do not include Canadian captures.

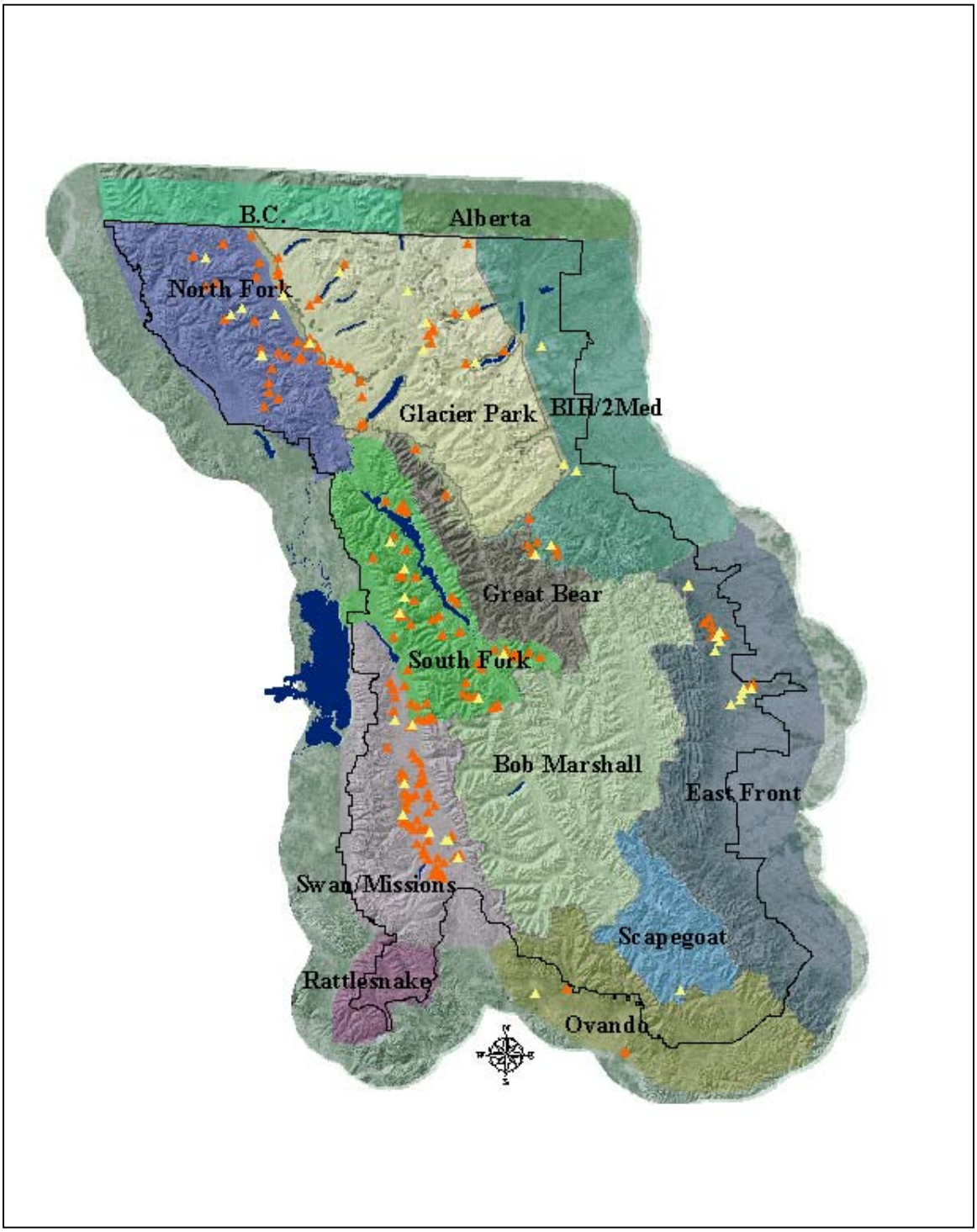
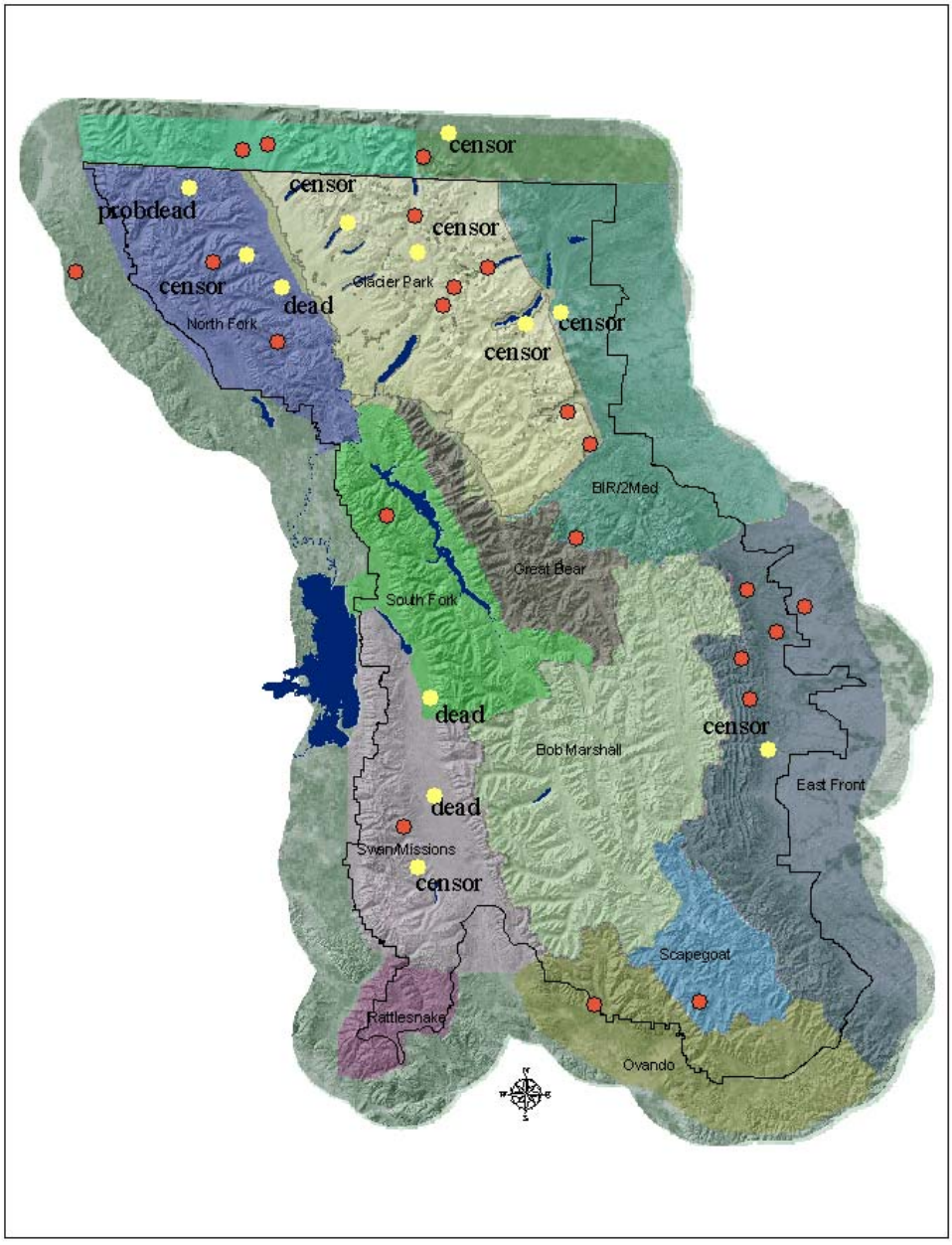


Fig. 5. The status of radio-instrumented female grizzly bears. Labeled individuals (yellow dots) either died, probably died, or lost their radio collars (censored); 2004-2005. Bear locations are generalized.



Home Range and Telemetry Results

Simple convex polygons were constructed for each bear radio-monitored in 2004 and 2005 to ascertain the extent that bears crossed designated capture zones. Home ranges for 32 individuals were constructed (Fig.6), 10 of which transcended several zones. Of particular interest, were the crossings of the international boundary by 3 of 4 Canadian bears. Additionally, two of 5 monitoring females moved seasonally from the East Front capture zone to the Bob Marshall zone in 2005.

Most of the 32 radio collars placed on grizzly bears in the NCDE were traditional vhf collars manufactured by Telonics, Inc. Approximately 18% of these collars were prematurely removed by bears (Table 4). An even higher proportion (42.8%) of Argos collars (Telonics TGW-3580) were cast prematurely. Conversely, we have had good success in fitting female grizzly bears with Telonics Generation III GPS collars.

Mortality of Trend Monitoring females

Twelve female grizzly bears (7 adults, 5 subadults) were radio-monitored in the NCDE and Canada during 2004. An additional 3 females (F40, F296, and F111), captured in the Swan /Missions capture zone were randomly excluded from survival

Table 4. Types of radio collars fitted on female grizzly bears during 2004-2005, and percent premature casting. Data do not include Canadian bears.

Radio Collar Type	N Deployed On Bears	Percent Prematurely Cast by Bears
No Collar	1	N/A
Vhf	17	17.6%
GPS Gen III	7	0%
GPS Argos	7	42.8%

analyses in 2004 because of over-representation of females in this zone, where the goal is to annually monitor 1-2 bears. Although 5 females were monitored in 2004, only F190 and F181 were used. No adults died during 2004 (Table 5). Conversely 2 of five subadults died in 2004, (F190, and F181) all in the Swan Valley. Approximately 74 radio-months of survival data were calculated for 2004 (Table 6).

We monitored the fate of 31 female grizzly bears in 2005. All subadult females survived in 2005 (Table 5). Twenty-five of 27 (93%) adult females survived either the entire year of 2005 or until their collars were prematurely cast. The mortality of one adult female was classified as capture-related. This bear, captured in a culvert trap, died approximately 1 week post-release. No specific cause of death could be determined upon necropsy. One adult female was classified as a probable mortality in 2005. The radio collar from this female (Avid # 84623110) was found under a bridge under suspicious circumstances: no carcass was found. Approximately 198 months of survival data were collected in 2005 (Table 6).

Reproductive Data

The reproductive status of adult females was determined each year. In 2004, we monitored 10 adult females with 10 attendant young (Table 7). In 2005, 25 adults were monitored and with a minimum of 16 young. The reproductive history of each adult female is given in Appendix B.

Monitoring of Management bears

We monitored the fate of 13 adult females and 6 subadult females that were captured for management actions in 2004 and 2005. These 13 adults were accompanied

Table 5. Fate of trend monitoring female grizzly bears in 2004 and 2005. Data include 4 female grizzly bears monitored in Canada. Data do not include 3 female bears (F40, F296, and F111) captured in 2004 in the Swan Valley that were randomly excluded from analyses because of over-representation within the Swan capture zone.

Year	Ad F Survived	Ad F Died	Ad F Probably Died	Ad F Censored	Sub F Survived	Sub F Died	Sub F Censored	Total F Monitored
2004	7	0	0	0	3	2	0	12
2005	19	1	1	6	3	0	1	31

Table 6. Radio-months of telemetry data for females monitored in 2004 and 2005. Data include 4 female grizzly bears monitored in Canada. Data do not include 3 female bears (F40, F296, and F111) captured in 2004 in the Swan Valley that were randomly excluded from analyses because of over-representation with the Swan Capture zone.

	Radio-months per Age Class of Female Grizzly Bear		
Year	Adult	Subadult	Total
2004	52	22	74
2005	162	36	198
Total:	214	58	272

by 19 non-radioed young (cubs or yearlings). In total, 31 management bears were monitored in 2004, and 17 management bears in 2005 (Table 8). Thirteen management bears, or their attendant young, were known to die in 2004, and 5 died in 2005. Of these 18 mortalities, 15 were management removals, 1 was killed by a train, 1 bear was illegally killed, and 1 death was from an unknown cause. A list of these management bears is given in Appendix C.

Grizzly Bear Mortalities in the NCDE: 2004-2005

In 2004, 34 known or probable man-caused mortalities were recorded in the NCDE (Appendix D, Fig. 7). No natural mortalities, nor possible mortalities were recorded for 2004. Grizzly bears removed from the ecosystem because of management actions (n = 13) was the leading cause of mortality during the year (Table 9). Most of the mortalities in 2004 were female (Table 10).

We recorded 24 known/probable and man-caused grizzly bear mortalities in the NCDE during 2005 (Appendix C). An additional 5 mortalities that were either natural deaths (n = 2), possible (n = 2), or undetermined (n = 1) were tallied. These mortalities were distributed throughout the NCDE (Fig. 7). Illegal kills (n = 9) and management removals (n = 6) were leading causes of grizzly bear mortality in 2005 (Table 9). One adult female was moved from the NCDE to the Cabinet/Yaak Ecosystem in an effort to augment that population. Nine males and 9 females died in the NCDE in 2005 (Table 10). The genders of 6 mortalities are unknown at present, but hair samples have been submitted to Wildlife Genetics International for DNA analyses.

Table 7. Reproductive status of adult female grizzly bears in the NCDE; 2004-05.

Year	Number Adult F	Reproductive Status	N	Total Young
2004	10	No young	5	
		1 cub	1	
		2 yearlings	1	10
		2 3-yr-olds	1	
		2 cubs	1	
		3 cubs	1	
2005	25	No young	16	
		Ukn, but cubs[a]	1	
		3 cubs	1	
		1 yearling	4	Minimum of 16[a]
		2 yearlings	2	
		2 cubs	1	
		2 2-yr-olds	1	

[a] tracks of one female with unknown number of cubs were observed near den.

Table 8. Fate of grizzly bears that had been captured during conflict management actions in the NCDE; 2004-2005.

Year	Ad F Survived	Ad F Died	Ad F Censored	Sub F Survived	Sub F Died	Sub F Censored	Young Alive	Young Died	Young Censored/ unknown	Total Bears Monitored
2004	10	2	0	0	4	2	5	7	1	31
2005	3	3	3	0	0	0	4	2	2	17

Table 9. Cause-specific, man-caused mortalities in the NCDE, 2004-2005. Table includes only known and probable mortalities.

Year	Mortality Cause	Mortality Certainty		Row Total
		Known	Probable	
2004	Mgmt	13	0	13
	Train	4	0	4
	Self defense	1	0	1
	Illegal	5	0	5
	Mistaken Id	1	0	1
	Vehicle	3	0	3
	Capture related	0	3	3
	Augmentation	0	0	0
	Probable illegal	4	0	4
Total:2004		31	3	34
2005	Mgmt	6	0	6
	Train	0	0	0
	Self defense	2	0	2
	Illegal	6	3	9
	Mistaken Id	1	0	1
	Vehicle	0	1	1
	Capture related	4	0	4
	Augmentation	1	0	1
	Probable illegal	0	0	0
Total:2005		20	4	24

Table 10. Sex and age class distribution of man-caused mortalities in the NCDE; 2004-2005. Table includes only known and probable mortalities.

	Age Class (2004,2005)					
Sex	Adult	Sub-adult	Cub	Yrling	Ukn	Row total
Male	2,6	5,3	2,0	2,0	0,0	11,9
Female	5,7	5,0	8,2	3,0	0,0	21,9
Unknown	1,0	0,0	0,5	0,0	1,1	2,6
All groups	8,13	10,3	7	5,0	1,1	34,24

Fig. 6. Minimum convex polygon home ranges for 31 female grizzly bears monitored in the NCDE, Alberta, and British Columbia; 2004-05.

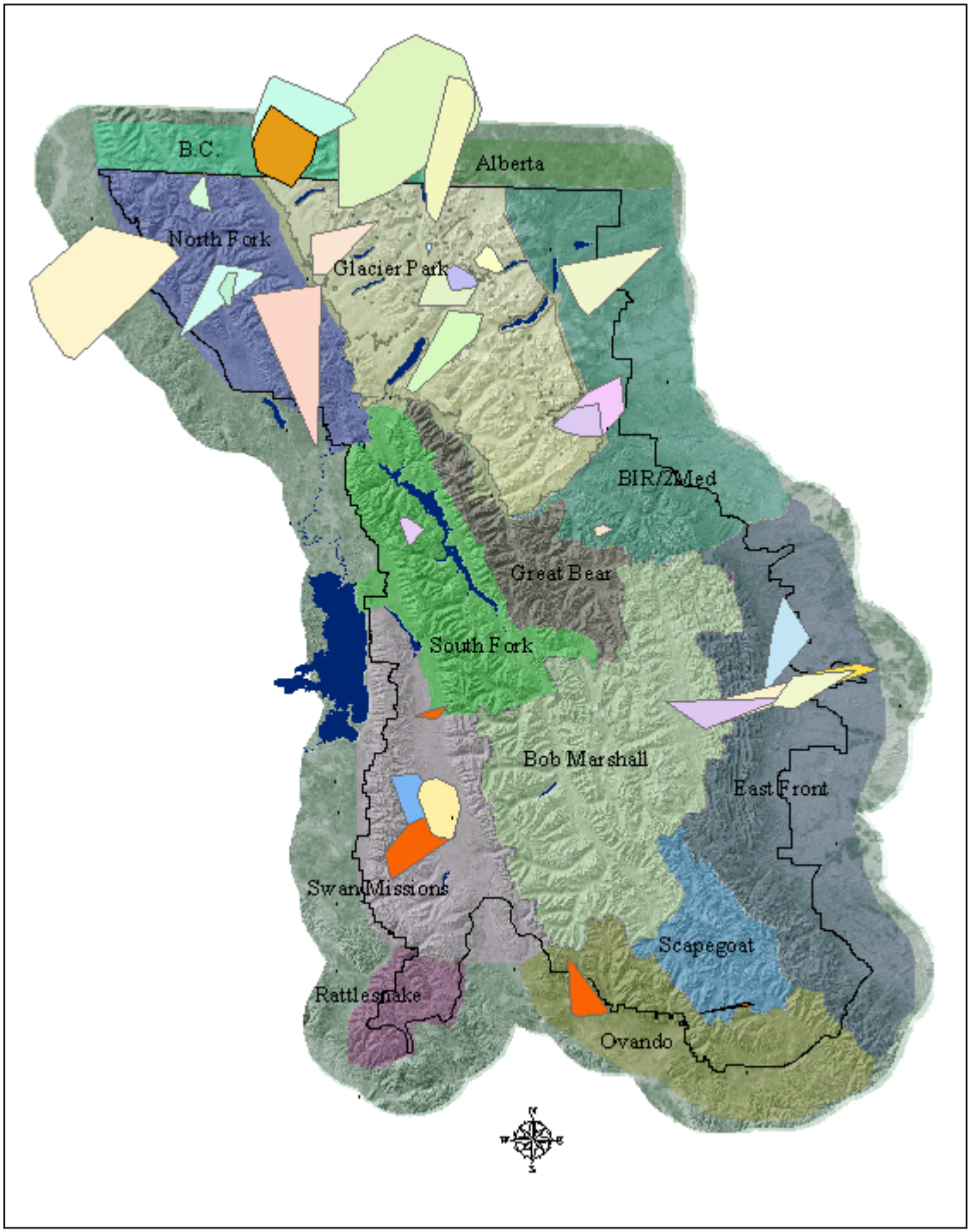
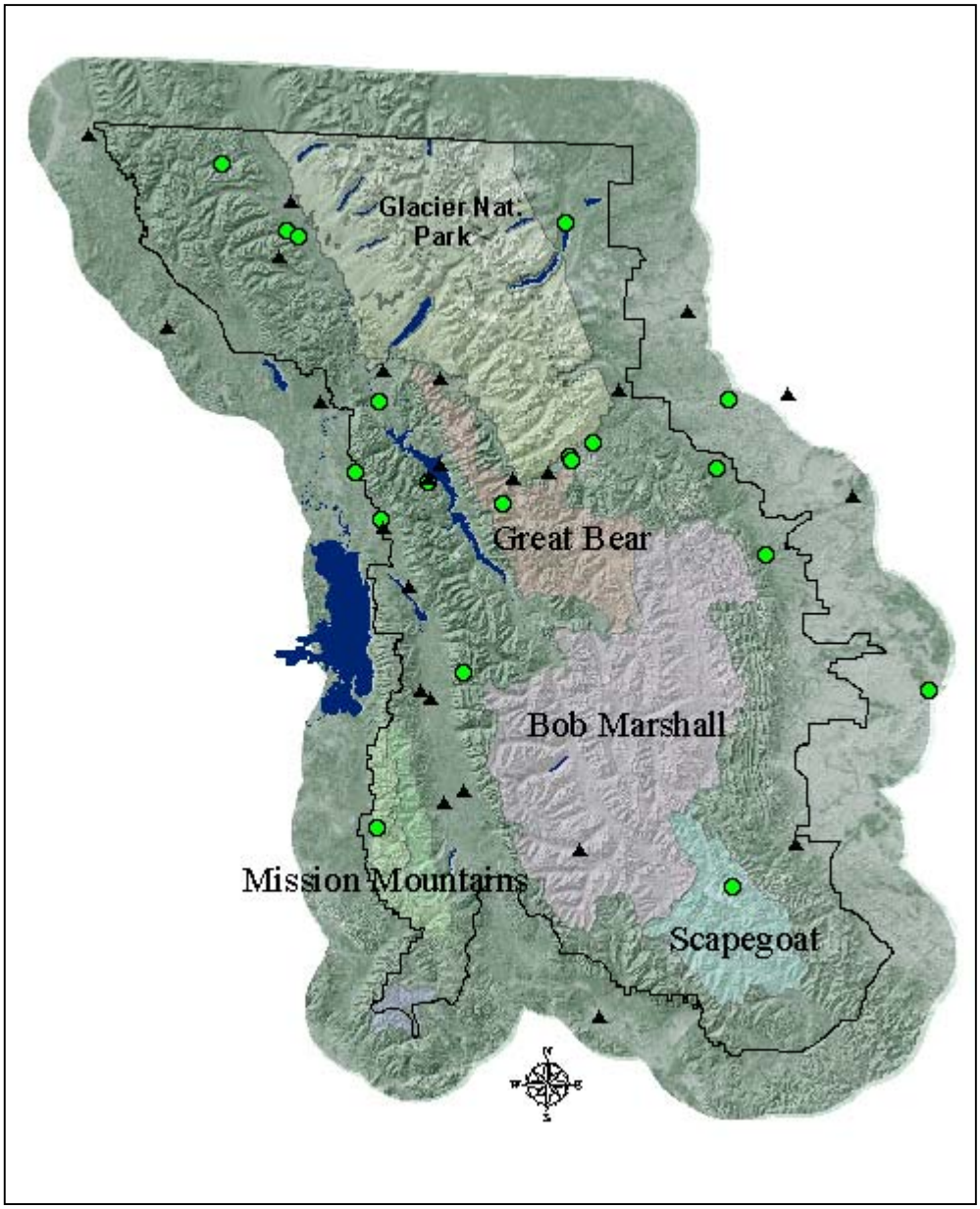


Fig. 7. The locations of grizzly bear mortalities in the NCDE; 2004-2005. Mortalities in 2004 are shown as black diamonds, and those in 2005 are shown as green circles.



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Appendix A. Summary of grizzly bear research captures in the NCDE; 2004-2005.

Capture Year	Capture Date	Sex	Eartag	Micro chip	Age Class	Capture-recapture	Mgmt History	Geographic Area	2004 Status	2005 Status
2004	5/2/2004	F	G064		adult	cap	no	Alberta	alive	alive
2004	5/7/2004	F	G077		subadult	cap	no	Alberta	alive	
2004	10/27/2004	F	G077		subadult	recap	no	Alberta	alive	
2005	4/30/2005	F	G077		adult	recap	yes	Alberta	alive	censor
2004		F	82		adult	cap		BC	alive	alive
2004		F	88		adult	cap		BC	alive	alive
2005	5/31/2005	F		71814874	adult	cap	no	BIR		alive
2005	6/1/2005	F		72023614	adult	cap	no	BIR		alive
2005	6/22/2005	F		71816812	adult	cap	no	BIR		censor
2005	7/7/2005	F		72113035	subadult	cap	no	BIR		censor
2004	4/28/2004	F	285	51072381	subadult	cap	no	East Front	alive	
2005	5/15/2005	F	297	76553865	subadult	cap	no	East Front		alive
2005	5/15/2005	F	205		adult	cap	yes	East Front		alive
2005	5/15/2005	F	295	51071845	subadult	cap	no	East Front		alive
2005	5/13/2005	F	253	51605816	adult	cap	no	East Front		alive
2005	4/28/2005	F	312	84623066	subadult	cap	no	East Front		alive
2005	5/4/2005	F	312	84623066	subadult	recap	no	East Front		alive
2004	9/15/2004	F		84525082	adult	cap	no	Glacier Park	alive	censor
2005	9/16/2004	F		84625525	adult	cap	no	Glacier Park		alive
2005	6/24/2005	F		76361015	adult	cap	no	Glacier Park		alive
2005	6/22/2005	F		76560093	adult	cap	no	Glacier Park		alive
2005	9/9/2005	F		84624383	subadult	cap	no	Glacier Park		
2005	9/24/2005	F		76615038	adult	cap	no	Glacier Park		censor
2005	9/26/2005	F		23813296	adult	cap	no	Glacier Park		alive
2005	6/25/2005	F		84524018	adult	cap	no	middle fork		alive
2004	6/9/2004	F		84528858	adult	cap	no	N.F.Flathead	alive	censor
2004	10/13/2004	F		84623110	adult	cap	no	N.F.Flathead	alive	POSSIBLE_DEAD
2005	5/27/2005	F	418		adult	cap	yes	N.F.Flathead		alive
2005	7/7/2005	F		84523288	adult	cap	no	N.F.Flathead		alive
2005	9/23/2005	F		84628889	adult	cap	no	N.F.Flathead		DEAD
2005	5/28/2005	F	5	51586884	adult	cap	no	Ovando		alive
2005	6/10/2005	F	317	79050043	adult	cap	no	S.F.Flathead		alive
2003	8/18/2003	F	648		adult	cap	no	Salish	alive	alive
2005	8/8/2005	F	6	51561597	adult	cap	no	Scapegoat		alive
2004	5/20/2004	F	40		adult	cap	no	Swan Valley	NOT USED[a]	alive
2004	4/20/2004	F	296	84529290	adult	cap	no	Swan Valley	NOT	censor

									USED	
2004	4/21/2004	F	a111	84625548	subadult	cap	no	Swan Valley	NOT USED	
2004	4/27/2004	F	190	84628512	subadult	cap	no	Swan Valley	DEAD	
2004	5/15/2004	F	181	84623296	subadult	cap	no	Swan Valley	DEAD	
2004		M	4238	51320595	adult	cap	no	East Front	ukn	ukn
2005	5/6/2005	M	315	76316585	adult	cap	no	East Front	ukn	ukn
2005	4/30/2005	M	4238	51320595	adult	recap	no	East Front	ukn	ukn
2005	5/15/2005	M	154 tattoo		adult	cap	yes	East Front	ukn	ukn
2005	5/15/2005	M	296	51272891	adult	cap	yes	East Front	ukn	ukn
2005	5/19/2005	M		67296863	subadult	cap	yes	East Front	ukn	ukn
2005	5/19/2005	M	266 tattoo	51320361	subadult	cap	yes	East Front	ukn	ukn
2005	5/13/2005	M	294		adult	cap	yes	East Front	ukn	ukn
2004	9/16/2004	M		84627371	adult	cap	no	Glacier Park	ukn	ukn
2005	6/2/2005	M		51088798	adult	cap	no	Glacier Park	ukn	ukn
2005	09/27/2005	M		23330315	adult	cap	no	Glacier Park	ukn	ukn
2005	6/21/2005	M		84517797	adult	cap	no	MiddleFork	ukn	ukn
2004	10/13/2004	M		84629344	adult	cap	no	N.F.Flathead	ukn	ukn
2004	10/17/2004	M		82445255	adult	cap	no	N.F.Flathead	ukn	ukn
2005	5/22/2005	M		84529557	subadult	cap	no	N.F.Flathead	ukn	ukn
2005	5/5/2005	M		84529515	adult	cap	no	N.F.Flathead	ukn	ukn
2005	09/21/2005	M		84624372	adult	cap	no	N.F.Flathead	ukn	ukn
2005	09/26/2005	M		84624372	adult	recap	no	N.F.Flathead	ukn	ukn
2005	09/26/2005	M		84383059	adult	cap	no	N.F.Flathead	ukn	ukn
2004	6/19/2005	M		84627845	adult	cap	no	S.F.Flathead	ukn	ukn
2004	6/8/2004	M		84374365	adult	cap	yes	S.F.Flathead	ukn	ukn
2005	5/18/2005	M		84624376	subadult	cap	no	S.F.Flathead	ukn	ukn
2005	5/20/2005	M		84624376	subadult	cap	no	S.F.Flathead	ukn	ukn
2005	5/13/2005	M		84625345	adult	cap	no	S.F.Flathead	ukn	ukn
2005	5/23/2005	M	316	79038096	adult	cap	no	S.F.Flathead	ukn	ukn
2004	4/26/2005	M	191		adult	cap	no	Swan Valley	ukn	ukn
2004	4/25/2005	M	193		adult	cap	no	Swan Valley	ukn	ukn
2004	10/1/2005	M	12	84525021	adult	cap	no	Swan Valley	ukn	ukn
2005	5/26/2005	M		72072053	adult	cap	no	BIR		ukn
2005	5/6/2005	M		37585521	adult		yes	BIR		ukn

[a] Bear was not used for survival analysis because of over-representation within the Capture zone.

Appendix B. Reproductive histories of trend monitoring females in the NCDE and Canada; 2004-2005.

Year	Eartag	Avid Tag	Capture zone	Reproduction
2004	40		Swan/Missions	2_yrlings
2005	40		Swan/Missions	2_2yr_olds
2004	296		Swan/Missions	none
2005	296		Swan/Missions	ukn_but_cubs
2004	648		Northfork	1_cub
2005	648		Northfork	1_yrling
2004		84525082	GlacierPark	none
2005		84525082	GlacierPark	none
2004		84625525	GlacierPark	none
2005		84625525	GlacierPark	none
2004		84623110	Northfork	none
2005		84623110	Northfork	3_cubs
2005	205		East Front	2_yrlings
2005	253	51605816	East Front	2_yrlings
2004		84528858	Northfork	none
2005		84528858	Northfork	none
2005	5	51586884	Ovando	1_yrling
2005		71814874	BIR/2Med	none
2005		72023614	BIR/2Med	none
2005		71816812	BIR/2Med	none
2005	317	79050043	Southfork	none
2005		84524018	BIR/2Med	none
2005		76361015	GlacierPark	none
2005		76560093	GlacierPark	none
2005	6	51561597	Scapegoat	none
2005		84523288	Northfork	2_cubs
2005		84628889	Northfork	none
2005		76615038	GlacierPark	none
2005		23813296	GlacierPark	1_yrling

2004	82	British Columbia	3_cubs
2005	82	British Columbia	none
2004	88	British Columbia	2_3yr_olds
2005	88	British Columbia	none
2004	G064	Alberta	2_cubs
2005	G064	Alberta	1_yrling

Appendix C. Information on female grizzly bears and their young (some young were captured, some young were not captured) involved in management actions; 2004-2005.

Year	Type of Bear	Left tag	Right tag	Avid No.	Area	Fate	Cause of death
2004	mgmt solitary adult	257	257	34375517	BIR	ALIVE	
2004	mgmt subadult			51085276	BIR	COLLAR_FAILURE	
2004	mgmt subadult			51593054	BIR	COLLAR_DROP	
2004	mgmt adult with young			37887572	Flathead Valley	ALIVE	
2004	mgmt young			84625280	Flathead Valley	ALIVE	
2004	mgmt young			84624376	Flathead Valley	ALIVE	
2005	mgmt adult with young			37887572	Flathead Valley	LOST_CONTACT	
2005	mgmt young			84625280	Flathead Valley	LOST_CONTACT	
2005	mgmt young			84624376	Flathead Valley	LOST_CONTACT	
2004	mgmt subadult			84528778	Swan Valley	DEAD	mgmt
2004	mgmt adult with young			84529806	N.F.Flathead	ALIVE	
2005	mgmt solitary adult			84529806	N.F.Flathead	ALIVE	
2004	mgmt young			084623883_a	Fortine	DEAD	mgmt
2004	mgmt young			084624095_b	Fortine	DEAD	mgmt
2004	mgmt young			084383813_c	Fortine	DEAD	mgmt
2004	mgmt adult with young	254	254	232996344	Glacier Park	ALIVE	
2004	mgmt young	254_a	254_a		Glacier Park	ALIVE	
2004	mgmt young	254_b	254_b		Glacier Park	ALIVE	
2005	mgmt solitary adult	254	254	232996344	Glacier Park	COLLAR_DROP	
2005	mgmt adult with young			53323794	Glacier Park	ALIVE	
2005	mgmt young				Glacier Park	ALIVE	
2005	mgmt young				Glacier Park	ALIVE	
2004	mgmt solitary adult			23518519	middle fork	ALIVE	
2004	mgmt subadult			37557822	middle fork	DEAD	illegal
2005	mgmt adult with young			23518519	middle fork	DEAD	mgmt
2005	mgmt young				middle fork	DEAD	to zoo
2005	mgmt young				middle fork	DEAD	to zoo
2004	mgmt adult with young	212	4263	51566878	middle fork	ALIVE	
2004	mgmt young			84382811	middle fork	ALIVE	
2005	mgmt solitary adult	212	4263	51566878	Rocky Mtn Front	DEAD	mgmt
2003	mgmt solitary adult	92	92		Swan Valley	ALIVE	
2004	mgmt solitary adult	92	92		Swan Valley	ALIVE	
2005	mgmt solitary adult	92	92		Swan Valley	DEAD	undetermined
2003	mgmt solitary adult	22	22	38100864	Swan Valley	ALIVE	
2004	mgmt solitary adult	22	22	38100864	Swan Valley	ALIVE	
2005	mgmt adult with young	22	22	38100864	Swan Valley	ALIVE	
2005	mgmt young	22_a	22_a	81770822	Swan Valley	ALIVE	
2005	mgmt young	22_b	22_b	96597530	Swan Valley	ALIVE	

2004	mgmt solitary adult	216	216		Rocky Mtn Front	ALIVE	
2005	mgmt solitary adult	216	216		Rocky Mtn Front	COLLAR_DROP	
2004	mgmt adult with young	22_a	22_a		Rocky Mtn Front	ALIVE	
2004	mgmt young	144_a	144_a		Rocky Mtn Front	ukn	
2004	mgmt subadult	4	22		Rocky Mtn Front	DEAD	mgmt
2004	mgmt subadult	3	21	51561278	Rocky Mtn Front	DEAD	mgmt
2004	mgmt adult with young			84524096	Fortine	DEAD	mgmt
2004	mgmt young			84381861	Fortine	DEAD	mgmt
2004	mgmt young			84516308	Fortine	DEAD	mgmt
2004	mgmt adult with young			84383870	middle fork	DEAD	train
2004	mgmt young			84623527	middle fork	DEAD	to zoo
2004	mgmt young			84623539	middle fork	DEAD	to zoo

Appendix D. Summary of grizzly bear mortalities in the NCDE; 2004-2005.

Date	Avid	Tag	Sex	Age class	Cause	Certainty	Discovery	Mortality Specifics
04/10/2005		274	M	adult	Mgmt	Known	Reported	cattle
04/30/2005	84626074		M	subadult	Self defense	Known	Reported	self defense
05/02/2005			M	adult	Natural	Known	Reported	predation
05/03/2005			M	subadult	Natural	Known	Reported	predaton
05/12/2005			F	adult	Illegal	Known	Reported	poached/malicious
05/14/2005		13	M	adult	Mistaken id	Known	Reported	mistaken id
05/15/2005	51303813		M	adult	Illegal	Known	Reported	poached/malicious
05/17/2005			Ukn	cub?	Illegal	Known	Reported	poached/malicious
06/05/2005	51273314	291	M	subadult	Mgmt	Known	Reported	sheep
06/10/2005			Ukn	Ukn	Vehicle	Probable	Reported	road kill
06/19/2005	84629365		M	adult	Illegal	Known	Unreported	poached/malicious
06/20/2005	407751970	16 and 17	F	adult	Capture related	Known	Unreported	research capture
06/20/2005			Ukn	Cub	Capture related	Known	Unreported	research capture
06/20/2005			Ukn	Cub	Capture related	Known	Unreported	research capture
07/08/2005	37605609	92	F	adult	Undetermined	Known	Unreported	undetermined
09/06/2005			M	subadult	Illegal	Known	Reported	poached/malicious
09/14/2005	84623110		F	adult	Illegal	Probable	Reported	poached/malicious
09/14/2005			Ukn	Cub	Illegal	Probable	Reported	poached/malicious
09/14/2005			Ukn	Cub	Illegal	Probable	Reported	poached/malicious
09/15/2005	51566878	212	F	adult	Mgmt	Known	Reported	cattle
09/20/2005			Ukn	Ukn	Self defense	Possible	Reported	self defense
09/30/2005	84626290		F	adult	Augmentation	Known	Reported	augmentation
09/30/2005	84628889		F	adult	Capture related	Known	Unreported	research capture
10/05/2005	23528519		F	adult	Mgmt	Known	Reported	frontcountry development mgmt removal
10/05/2005			F	Cub	Mgmt	Known	Reported	frontcountry development mgmt removal
10/05/2005			F	Cub	Mgmt	Known	Reported	frontcountry development mgmt removal
10/17/2005			F	adult	Illegal	Possible	Reported	frontcountry development illegal
10/18/2005	84525021	12	M	adult	Illegal	Known	Reported	frontcountry development illegal
10/27/2005			M	adult	Self defense	Known	Reported	self defense
04/26/2004		1	M	subadult	illegal	Known	Reported	Possible mistaken id
05/16/2004			M	adult	Mistaken id	Known	Reported	mistaken id
06/07/2004	37557822		F	subadult	Illegal	Known	Reported	undetermined
05/26/2004	84628512	190	F	subadult	illegal	Known	Reported	Possible mistaken id
07/08/2004		181	F	subadult	Probable illegal	Known	Reported	undetermined
07/23/2004			M	subadult	Vehicle	Known	Reported	vehicle
08/02/2004			M	ylg	Mgmt	Known	Reported	orphaned
08/02/2004			F	ylg	Mgmt	Known	Reported	orphaned

08/17/2004		111	F	subadult	Probable illegal	Known	Reported	undetermined
08/17/2004		413-414	F	adult	Mgmt	Known	Reported	frontcountry development mgmt removal
08/17/2004			F	Cub	Mgmt	Known	Reported	frontcountry development mgmt removal
08/17/2004			M	Cub	Mgmt	Known	Reported	frontcountry development mgmt removal
08/31/2004			F	Cub	Vehicle	Known	Reported	vehicle
08/31/2004			M	adult	Mgmt	Known	Reported	frontcountry development mgmt removal
09/05/2004			M	subadult	Vehicle	Known	Reported	vehicle
09/15/2004	84524096	206	F	adult	Mgmt	Known	Reported	frontcountry development mgmt removal
09/15/2004	84381861		F	Cub	Mgmt	Known	Reported	frontcountry development mgmt removal
09/15/2004	84516308		F	Cub	Mgmt	Known	Reported	frontcountry development mgmt removal
09/16/2004			F	ylg	Mgmt	Known	Reported	frontcountry development mgmt removal
09/16/2004			F	ylg	Mgmt	Known	Reported	frontcountry development mgmt removal
09/24/2004			F	adult	self-defense	Known	Reported	self defense
09/29/2004	84383870		F	adult	Train	Known	Reported	train
09/29/2004	84623527		F	Cub	Train	Known	Reported	train
09/29/2004	84623539		M	Cub	Train	Known	Reported	train
10/05/2004	84528778		F	Sub	Mgmt	Known	Reported	frontcountry development mgmt removal
10/06/2004		292	M	ylg	Mgmt	Known	Reported	frontcountry development mgmt removal
10/24/2004			M	subadult	Illegal	Known	Reported	frontcountry development mgmt removal
10/25/2004		17	F	adult	Illegal	Known	Reported	poach/malicious
10/28/2004			uk	Ukn	Probable illegal	Known	Reported	poach/malicious
11/09/2004			uk	adult	Probable illegal	Known	Reported	poach/malicious
11/17/2004	84626881		M	subadult	Train	Known	Reported	train
11/01/2004	84623883		F	Cub	Capture related	Probable	Unreported	orphaned
11/01/2004	84624095		F	Cub	Capture related	Probable	Unreported	orphaned
11/01/2004	84383813		F	Cub	Capture related	Known	Reported	orphaned