NORTHERN CONTINENTAL DIVIDE ECOSYSTEM

GRIZZLY BEAR POPULATION MONITORING

ANNUAL REPORT - 2008

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U.S. Fish and Wildlife Service

U.S. Forest Service

U.S. Geological Service

National Park Service, Glacier National Park

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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.

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Cover Photo: Adult female wandering around in the Swan Valley, 2008

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ABSTRACT

An interagency effort to monitor the population trend of grizzly bears in the Northern Continental Divide Ecosystem (NCDE) of Montana was initiated in 2004. The goal of this long-term program is to estimate population trend by monitoring the survival and reproductive rates of radio-instrumented female grizzly bears. Since 2004, the team has captured and monitored 73 female grizzly bears in the U.S. and Canada for Trend Monitoring. Sixteen new females were captured in 2008. Including management bears and bears captured for other research purposes, 79 individual bears were radio-monitored in 2008. Thirty-nine of these monitored bears were trend females. An additional 25 young of these females were monitored through visual observations. These 79 individuals were well distributed throughout the NCDE and included multiple age classes. For our trend bears, we have obtained approximately 87.6 telemetry-years of data on adult females and 8 years of data on sub adult females. Based on the distribution of female home ranges, the Glacier National Park capture zone has been under-sampled to date, while the Swan/Mission zone has been over-sampled. Ten trend females have died since 2004, 1 of which occurred in 2008. Fourteen radio instrumented management females were monitored during the year with one mortality. We recorded 11 known/probable and man-caused mortalities of grizzly bears in the NCDE during 2008. Management removals accounted for 36% of these mortalities.

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I. INTRODUCTION/STATEMENT OF NEED

The grizzly bear *(Ursus arctos horribilis*) occupies over 8 million wilderness and non-wilderness acres in the Northern Continental Divide Ecosystem (NCDE) of western Montana. Notable regions within this ecosystem include Glacier National Park and the Bob Marshall wilderness complex. Grizzlies were listed as Threatened under the Endangered Species Act in 1975 for lack of biological information on its population status and habitat requirements. The NCDE has the largest population of grizzly bears in the lower 48 states; mean population size during 2004 was 765 bears (Kendall et al. 2008).

Managers and the public agree that information on both population size and trend is needed. Having estimates of size and trend will greatly improve our collective knowledge of grizzly bear ecology and provide more measurable and precise information with which to judge the status of the grizzly population in the NCDE. Therefore, Montana Fish, Wildlife & Parks (MFWP), in cooperation with other state and federal agencies, has established a team to monitor the population trend of grizzly bears in the NCDE. The purpose of this long-term program is to monitor the vital population parameters of grizzly bears by assessing the survival and reproductive rates, and population trend. This will be accomplished by radio-monitoring female grizzly bears.

II. PROGRAM OBJECTIVES

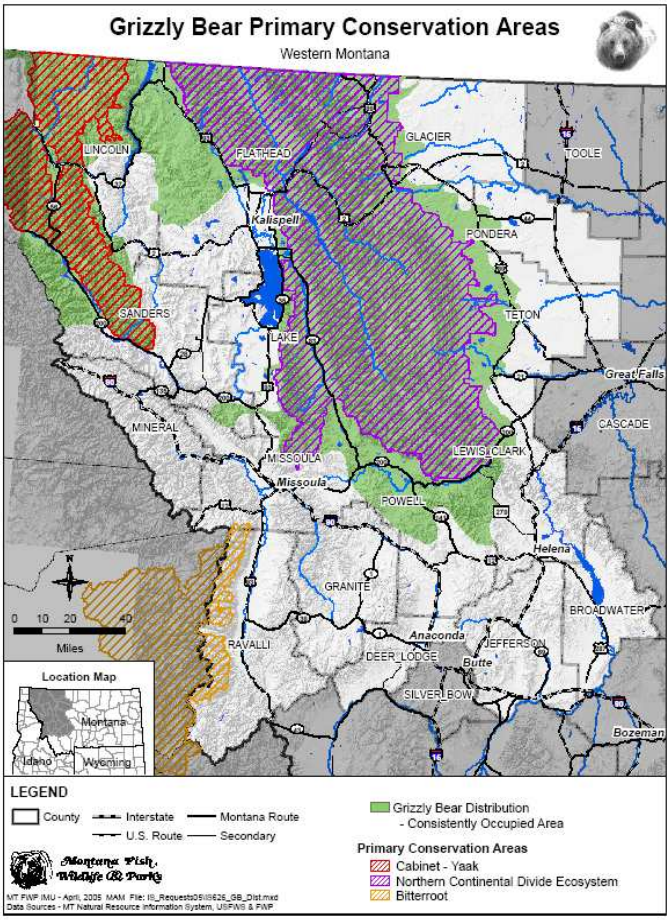
The primary objective of this program is to monitor the population trend of grizzly bears in the NCDE using known-fate estimators of survival, and documentation of reproductive rates. This will be accomplished by following the survival and reproductive rates of representative female grizzly bears throughout the Ecosystem. Estimates of both population size and trend will be required for recovery programs in this area as dictated by the Endangered Species Act. 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 population monitoring categories will initially include:

1. population trend,
2. grizzly bear survival rates,
3. grizzly bear reproductive rates,
4. grizzly bear movements,
5. grizzly bear distribution in western Montana,
6. mortality levels in the NCDE, and
7. levels of reported and unreported mortality.

III. GEOGRAPHIC SCOPE OF THE MONITORING PROGRAM

Primary monitoring emphasis for grizzly bear populations and their habitat will be placed within the designated 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 remaining portions of northwest Montana (Fig.1) where grizzly bear occupancy is expected (Dood et al. 2006)

Fig. 1. Western Montana habitats where population and habitat monitoring for grizzly bears is envisioned (Dood et al. 2006).



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 density-distributed; 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 USGS ecosystem-wide DNA study conducted in 2004 (see web site http://www.nrmsc.usgs.gov/research/beardna.htm). From these data, capture zones for the NCDE were established in a Delphi fashion using broad-scale geographic and administrative boundaries (Fig. 2). The population of grizzly bears in the NCDE intermixes with grizzly bears in Canada.

Because grizzly bears may move extensively throughout the NCDE, and will probably occupy several capture zones, proportional use of each zone by females is assessed annually, and based upon this use, adjustments made in capture effort during subsequent years. Take for example a capture zone that is scheduled to have one radioed bear. If ½ the home ranges of 2 females from adjacent zones overlap with the zone in question, then bear equivalent use of that zone will equal 1 bear, and sampling will be deemed adequate.

We used the methods of Schwartz et al. (2006) to delineate study bears. Adult or subadult females first captured and radioed at a research site were termed “study animals.” Females first captured and radioed at a conflict site by bear managers, including non-target captures, 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 or fell off and were later captured at a conflict site were reclassified as members of the conflict sub-sample.

Grizzly bears were captured using leg-hold snares, culvert traps, and in some instances were free-ranged over bait. Beginning in 2007, we used remote-controlled door openers for culvert traps in the backcountry of Glacier National Park. Winches and remote controllers were obtained from Bwieagle, Inc. (www.bwieagle.com). We used the 38-2000INT-HP-WINCH and the Air-Eagle SR PLUS 2.4 GHz transmitter #36-1300 for these traps. These transmitters successfully opened aluminum culvert trap doors at a distance of 180 m. Road-killed deer and other lures were used to attract bears to sites.

From 2004 through 2006, bears were immobilized using either Ketamine/ Rompun® (ketamine HCL/xylazine HCL) or Telazol® (tiletamine HCL/zolazepam HCL). Beginning in 2007, we began using the combination of Telazol® and Medetomidine, with atipamezole as the antagonist. We used drug dosages as per Kreeger et al. (2002). All captured bears were micro-chipped. Morphological measurements were taken on each bear. 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, respectively. Adult bears were considered to be those $\geq$ 5 years of age.

Grizzly bears were fitted with 1 of 3 types of radio collars, depending on body size and geographic location. Very high frequency (VHF) collars (Telonics,

Inc. Mod 500) having a battery life of approximately 5 years were placed on subadult females (<100 lbs) and adult bears living in front-country areas. Female grizzly bears in Glacier National Park and wilderness areas were fitted with Argos GPS (Telonics, Inc. TGW-3580) collars to minimize over-flights. These Argos collars were programmed to obtain a GPS fix every 6 hours (000, 600, 1200, and 1800 GMT). Some females were fitted with Telonics store-on-board generation III or IV GPS collars (TGW-3500) to gather specific information on habitat selection.

Capture success measured how successful field crews were at capturing bears in an area and was based on the number of sites where snares or 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 number of grizzly bears captured divided by the sum of capture nights (effort) was termed "capture success." Beginning in 2005, we began using digital cameras at many capture sites in an effort to optimize captures of female grizzly bears. Often, cameras were placed at potential capture sites before either traps were set, in an effort to ascertain which bear species and sex was visiting sites. In this fashion, we have increasingly reduced the number of non-target captures and the number of days that snares and culverts are set for capture. With increased use of these cameras, the capture success statistic will become less applicable.

Telemetry

The location of each collared bear was determined at least once per month, as possible, using fixed-wing aerial telemetry. In addition, whenever

possible, ground locations were determined by triangulation. Locations from bears fitted with Argos GPS collars were downloaded almost daily from the Argos web site. During the bears' active season, we also monitored the status of each bear's mortality sensor to determine if the bear was alive. Home range polygons (100%) were constructed for each bear using the minimum convex polygon method (Mohr 1947).

Mortality

Mortality censors on radio-collars, or multiple Argos locations at the same coordinate, indicated when a collar had either been prematurely cast by a study bear or when a bear had died. Bears with a questionable mortality status were promptly investigated by field crews to ascertain whether the bear had died or simply dropped its collar and to document cause of death when possible. Necropsies were most commonly conducted in the field, and relevant tissue and hair samples were collected for laboratory analyses. We used a metal detector or x-ray technology 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 or USFWS laboratories for analyses.

Field personnel completed a mortality form describing the specific circumstances surrounding each mortality in the NCDE. These reports were entered into an interagency database for coordination among agencies. Terminology for mortalities followed those in Cherry et al. (2002, Table 1).

Definitions of Bear Fate and Determination of Monitoring Period

The fate of each radio-instrumented bear was determined for each year it carried a functional radio-collar. Each bear was classified as belonging to one of 5 fate categories as defined below:

1. *Alive*: a bear that was known to survive the year

2. *Dead*: a bear that was known to have died during the year

3. *Censored*: a bear which was monitored for a portion of the year, but who ultimately shed the radio collar during the year

4. *Unresolved*: a bear whose fate could not be ascertained during the year. In most cases these were individuals who we lost radio contact with. Either the radio collar failed prematurely based on expected battery life, or the bear moved to an unknown location. Occasionally, mortality signals were received from a bears collar, but it was not investigated or could not be found during the year. Thus it could not be determined if the bear shed the collar or died.

5. *Unexplained*: premature failure of a working transmitter occurred that could not logically be attributed to expected battery life; bear was never recaptured, so loss was unexplained.

The number of days (radio-days) that a bear was monitored each year was determined using the following rule-set:

1. A bear that was radio-monitored and survived an entire year (1 January-31 December) was classified as being alive for 365 days.

2. For bears that were captured and radioed early in a given year, and survived the remainder of the year, we used date of capture as the beginning of the monitoring period and 31 December as the end of the monitoring period.

3. For bears entering a given year wearing a functional radio collar but shed their collar during the year, we used 1 January as the beginning monitoring date, and the ending monitoring date was the last date the bear was known to be wearing the radio collar.

4. Cubs-of-the-year, yearlings, and dependent 2 year olds were rarely radio-instrumented. Their annual fate was documented from visual

observations of the family during telemetry flights. Radio-days were not ascribed to dependent young, rather the fate each dependent young was classified as being either alive, dead, or censored/undetermined (based on mother being censored). Two or 3 year-old bears that were observed with their mothers during the spring, but not observed later in the year were assumed to have dispersed. Documenting the fate of non-radioed yearling bears was more problematic when they are observed early in the year with their mother, but were not seen there after. Some bears do disperse as yearlings on the Rocky Mountain East Front portion of the NCDE (Aune and Kasworm 1989, pp 197). Conversely, Mace and Waller (1997) did not observe yearling dispersal in the Swan Mountains on western side of the NCDE. Similarly, no yearling dispersal was observed in the Greater Yellowstone Ecosystem, and all yearlings that disappeared from a family were presumed dead (Schwartz et al. 2006, pp.27). Until we have further empirical evidence of yearling survival, we will classify East Front yearlings as dispersers, and all other yearling disappearances as mortalities.

Fig. 2. Desired distribution of radio-instrumented female grizzly bears in the NCDE by capture zone. White line is federal Recovery Zone for grizzly bears.

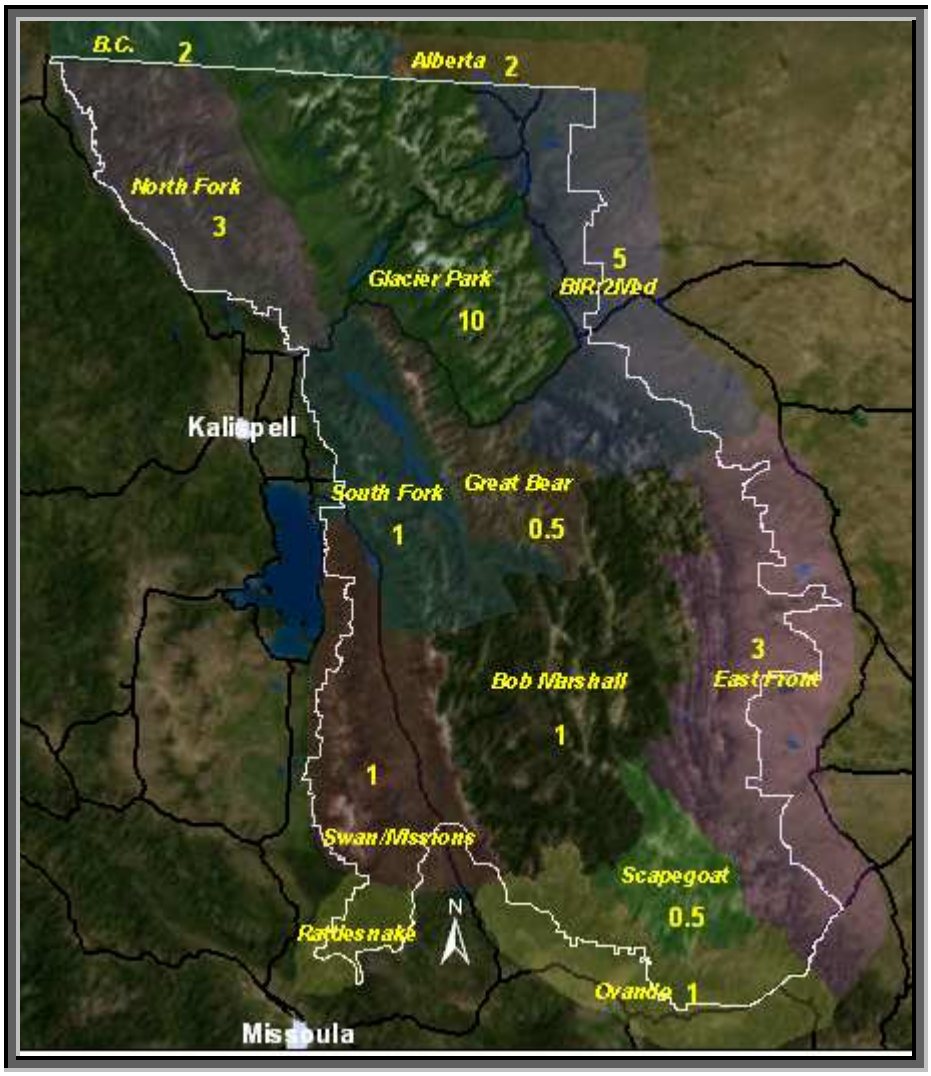


Table 1. Terms and definitions used to classify the cause, certainty, and discovery of grizzly bear mortalities (Cherry et al. 2002).

Terms	*Definitions*
Cause of Mortality	
Natural	Positively or reasonably attributed to natural cause.
Human-caused	Positively or reasonably attributed to humans.
Undetermined	Cause could not be determined.
Under Investigation	Cause of mortality is has not been positively determined. Laboratory work, to ascertain cause, is ongoing.
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, but no prospects for validation. Includes defense-of-life situations where shots were fired (no evidence of significant wounding was found). Hearsay evidence of poaching or malicious death is included here.
Unresolved	Pulse rate and stationary location of a transmitter indicated a cast-off collar or mortality, and transmitters could not be retrieved due to 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

Research Captures, 2004-2008

Grizzly bears have been captured since 2004 for population Trend Monitoring. Although females were the focus of the research, males were inadvertently captured as well. Annual capture of females has varied from 12 in 2007, to 25 in 2005 (Table 2). In 2008, the team captured 34 individuals (Table 2), 53% of which were female bears.

Seventy-three individual female grizzly bears have been captured and radio-monitored in the first 5 years of monitoring in the U.S. and Canada (Table 3). The generalized geographic distribution of female grizzly bears is shown in Fig. 3. A map of capture locations since 2004 is given in Fig. 4. A list of bears captured for population monitoring is given in Appendix A.

We have captured 3 individual females that have transitioned between the management sub-sample and Trend bear sample. Adult female #205 was captured in 1997 and 2002 as a management bear along the Rocky Mountain Front. This bear was recaptured for Trend Monitoring in 2005. Similarly, female #067006850 was captured at a conflict site 2004 on the Blackfeet Indian Reservation and relocated to the west side of Glacier National Park. In 2005, she was captured for Trend Monitoring in the North Fork Flathead River. This bear spends approximately ½ of her time in the Park. Finally, female grizzly #093638000 transitioned from a trend bear to a management bear in 2008. This female was first captured for trend on 6/7/2008 along the western front of the

Mission Mountains. Several weeks later this bear shed its radio collar, and became a non-target bear captured at a conflict site in the Swan Valley.

Management and Other Grizzly Captures, 2004-2008

Each year grizzly bears were captured in the NCDE for purposes other than Trend Monitoring. The majority of these captures were for management purposes. Not all of these bears, especially attendant young, were radioed. In 2008, 28 (9 female and 19 males) additional bears were captured in the ecosystem (Table 4). A list of the bears captured for management reasons is given in Appendix B.

Number of Bears Radio-Monitored Each Year in the NCDE

Each year, grizzly bears were captured and radio-instrumented for several purposes. These include captures for Trend Monitoring, for management, and for other research purposes. Sample sizes of radioed bears in the NCDE varied from 50 to 79 (Table 5).

In addition to the 39 female grizzly bears monitored for Trend Monitoring research in 2008, the study team also followed the fate of 40 grizzly bears that were radioed for other reasons, for a total of 79 grizzly bears radio-monitored in 2008. This sample included 26 males and 14 females (Table 5). These 79 radio-instrumented bears were well distributed throughout the NCDE (Fig. 5).

Table 2. The number of grizzly bear captures and recaptures in the NCDE for population Trend Monitoring, 2004-2008. Data include Canadian captures. Some individuals were captured in multiple years, thus total captures does not mean total individuals.

Capture Year	*Sex*	*Number Individuals*	*Number Recaptures*	*Total*
2004	Female[a]	15	1	16
2004	Male	9	0	9
2004	Total	24	1	25
2005	Female	24	1	25
2005	Male	18	2	20
2005	Total	42	3	45
2006	Female	17	1	18
2006	Male	31	4	35
2006	Total	48	5	53
2007	Female	10	2	12
2007	Male	10	2	12
2007	Total	20	4	24
2008	Female	18	2	20
2008	Male	16	0	16
2008	Total	34	2	36

[a] Includes one adult female captured in 2003 but not monitored until 2004.

Table 3. Number of new individual female grizzly bears captured each year for Trend Monitoring in the NCDE.

	Number of New Individual Female Grizzly Bears Captured					*Total*
Year	***2004***	***2005***	***2006***	***2007***	***2008***	
# New individuals	15	23	12	7	16	73

Table 4. Capture of grizzly bears in the NCDE for purposes other than Trend Monitoring. This includes captures for management, augmentation to the Cabinet-Yaak Ecosystem, or other research efforts, 2004-2008. Not all individuals were radio-collared.

Year	***Number of Individual Bears Captured for Purposes Other Than Trend (total recaptures)***			***Total # Individuals***
	Subadult or adult Female	***Attendant young***	***Independent males***	
2004	15 (20)	12(15)	15(24)	42
2005	8(8)	4(4)	8(9)	20
2006	5(5)	2(2)	13(19)	20
2007	4(5)	5(7)	18(22)	27
2008	9 (13)	0	19 (20)	28

Table 5. Total radioed sample of grizzly bears in the NCDE, 2004-2008.

Year	***Radioed Males (mgmt and other research)***	***Radioed Females (mgmt and other research)***	***Radioed Trend Females***	***Total Number Radioed Bears***
2004	16	19	15	50
2005	14	10	31	55
2006	19	6	34	59
2007	30	7	35	72
2008	26	14	39	79

Fig. 3. Geographic distribution of 73 female grizzly bears radio-instrumented for Trend Monitoring in the NCDE. Capture locations for the 39 females radio-monitored during 2008 are shown in blue. Red dots represent bears monitored in previous years. Federal Recovery Zone perimeter is shown in white. Bear locations are generalized, and in several cases, more than one bear was captured at the same site.

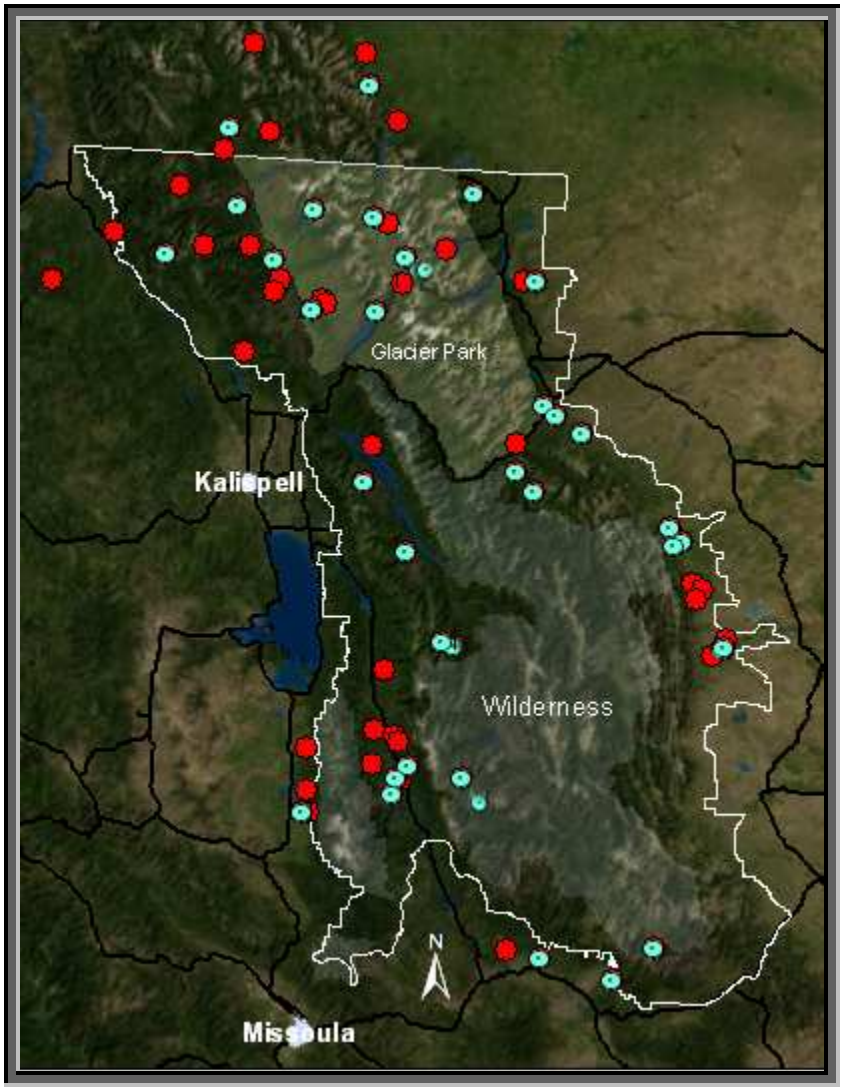


Fig. 4. Capture site locations in the NCDE, 2004-2008. Blue dots represent capture sites used in 2008. Map does not include Canadian captures sites.

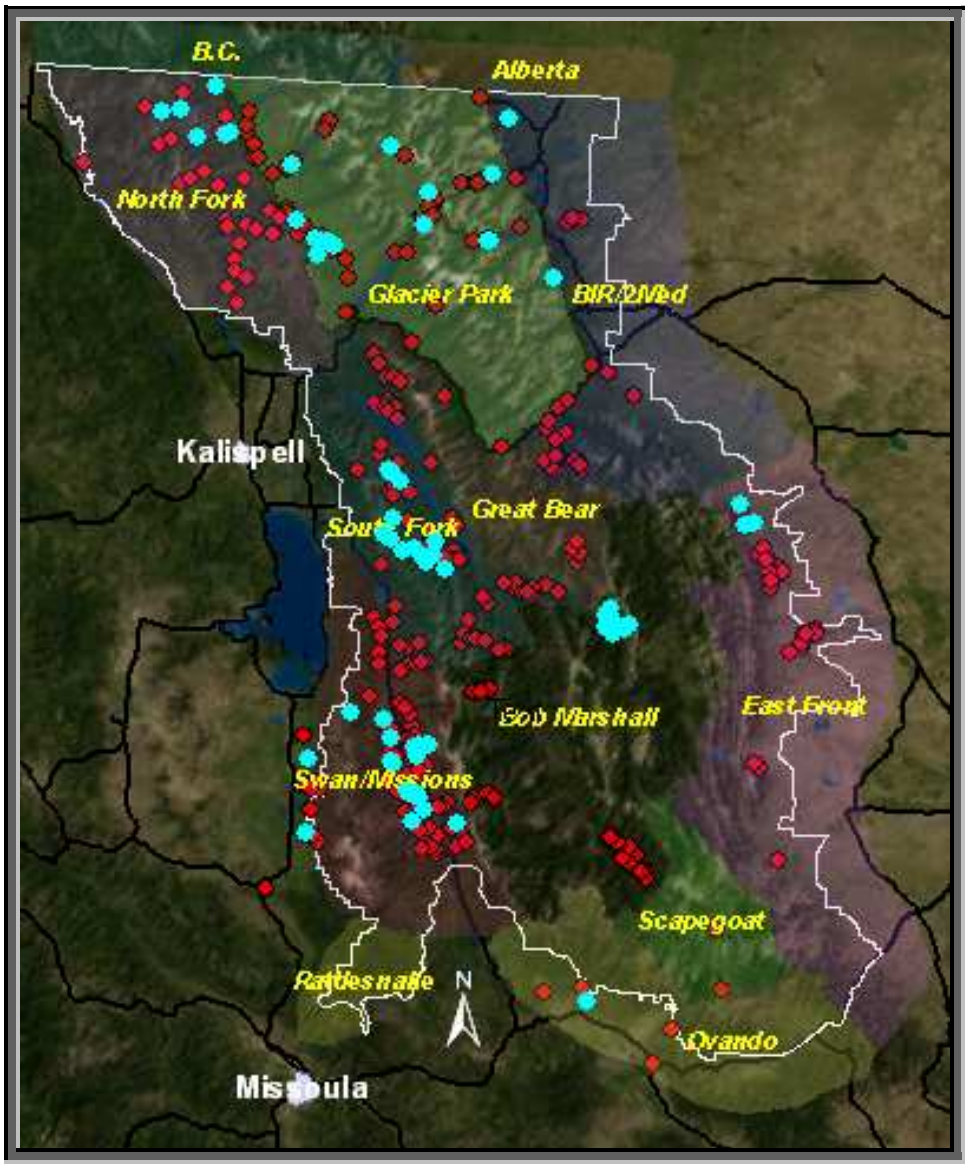
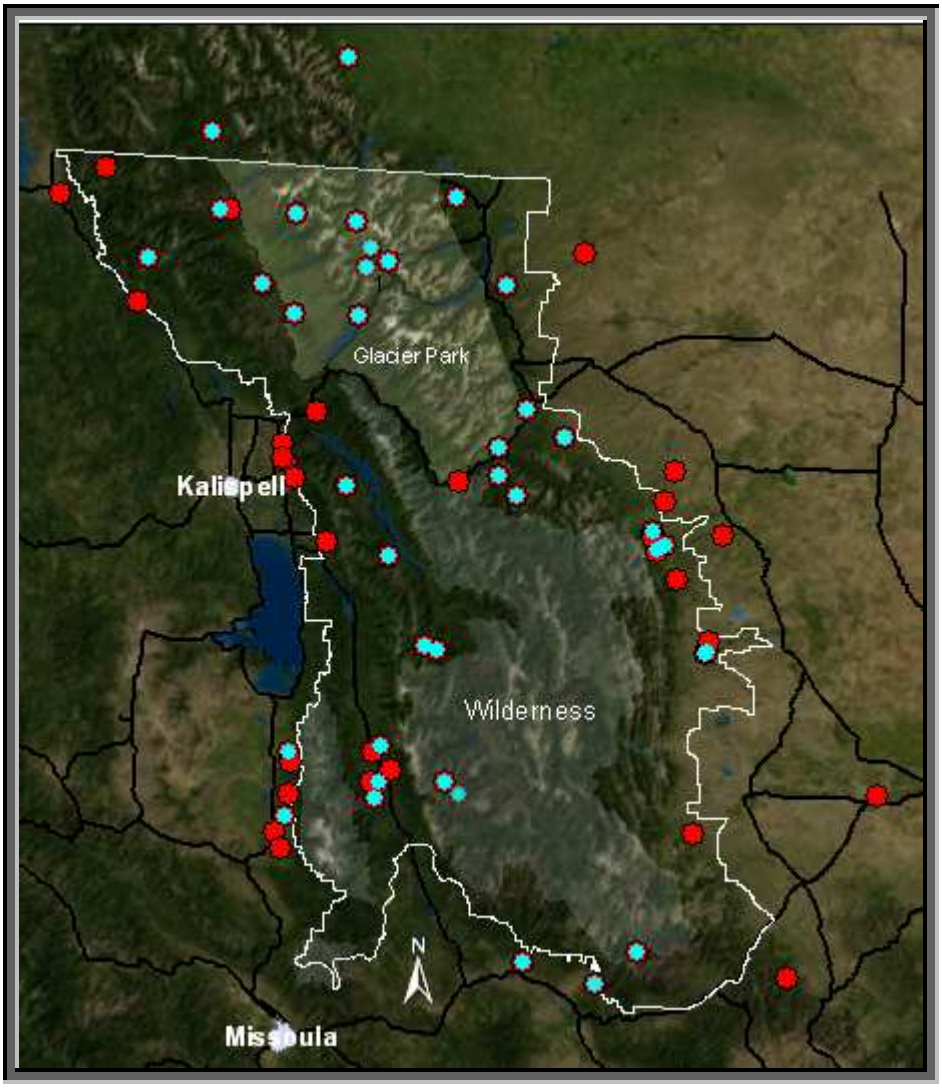


Fig. 5. Distribution of 79 radio-instrumented grizzly bears monitored in the NCDE during 2008. Blue dots depict locations of 39 Trend Monitoring females. Red dots depict male and female bears captured for other research or management purposes. Locations are generalized.



Annual Fate of Trend Monitoring Female Grizzly Bears and Their Young

Fifteen female grizzly bears were radio-monitored for Trend in the U.S. portion of the NCDE and in Canada during 2004 (Table 6). Twelve of 15 (80%) females survived the year or until censored (Table 6). Three trend females died in 2004, all in the Swan Valley area (#s 084625548, 037885843, and 084623296). A brief description of these deaths is given in Table 7.

The fate of 31 female grizzly bears was monitored in 2005 (Table 6). Twenty-nine of 31 (94%) females survived either the entire year or until censoring. The mortality of one adult female was classified as capture-related. The other adult female mortality was classified as a "probable" in 2005. The radio collar from this female (#84623110), who had 3 cubs of the year, was found under a bridge under suspicious circumstances; no carcass was found (Table 7).

Thirty-four females were radio-monitored in 2006 (Table 6). Thirty-two of 34 (94%) females survived the year or until censoring. Two (6%) females died in 2006. Female #076553352 was killed illegally in the Swan Valley area, and the partial remains of female #076589366 were found on the east side of Hungry Horse Reservoir (Table 7). Cause of death has not been determined in this third case. In our annual report for 2007, we reported the death of Trend female #082024327 in the southern Whitefish Mountain Range. Several weeks after being captured and radio-instrumented, we noted the activity sensor on her collar had switched to a "mortality pulse", indicating the collar had either been shed or the bear was dead. Upon inspection of the site, we found the fresh remains of a grizzly bear that had been fed upon by another grizzly bear. As the radio collar

was lying near the carcass, we assumed that the dead bear was #082024327. However, the following year, a dead grizzly bear, without a radio collar, was found near a road by a hunter and reported to FWP authorities. Hair samples from this dead bear were sent to the genetics lab for analysis. Interestingly, this non-radioed bear was a genetic match to female #082024327, indicating she in fact did not die the year before as assumed, rather a different grizzly had died at the original site.

We monitored 34 trend females during 2007 (Table 6). Thirty-two (94%) of these females survived until year's end or until their collars failed or fell off. Two trend females died in 2007 (#s 081577636 and 084624383, Table 7), both of which lived in the Whitefish Mountain Range in the North Fork Flathead River drainage. The carcasses of both bears were found near open forest roads. No bullets were found in either bear.

Thirty-nine females were radio-monitored in 2008. Most (97%) survived the year (Table 6). The large number of censored bears in 2008 was due to Argos collars that were pre-programmed to fall off during the fall. One bear mortality occurred in 2008. This was a subadult female from the Swan Valley that was captured and moved from the NCDE to the Cabinet/Yaak Ecosystem for population augmentation. We monitored the fate of 25 attendant young in 2008, 6 of which (24%) died during the year. Thus far, we have obtained approximately 87.6 years of telemetry data on adult females, and 8.2 years on subadult females (Table 8).

Table 6. Fate of Trend Monitoring female grizzly bears and their attendant young, 2004-2008.

	Radioed Trend Females				*Non-radioed Attendant Young*				
Year	***Survived***	***Died***	***Censored/ unresolved***	***Total Females***	***Survived***	***Died***	***Censored/ unresolved***	***Dispersed***	***Total Young***
2004	11	3	1	15	4	3	3	0	10
2005	19	2	10	31	5	3	7	0	15
2006	27	2	5	34	12	4	3	0	19
2007	22	2	10	34	7	8	15	2	25
2008	24	1	14	39	10	6	4	5	15

Table 7. Summary of 10 Trend Monitoring female grizzly bears that have died, 2004-2008.

Bear Avid Number	***Date of Death***	***Geographic Area***	***Cause***
37885843	5/26/2004	Swan Valley	Probable mistaken Id. Carcass in ditch. bullet found.
84625548	8/17/2004	Swan Valley	Unknown cause. No bullet found.
84623296	7/8/2004	Swan Valley	Unknown cause. No bullet found. Near houses the night before.
84623110	9/14/2005	North Fork Flathead	Probable death. Collar found under bridge. Collar not cut. 3 cubs of year.
84628889	9/30/2005	North Fork Flathead	Capture mortality. Captured in culvert trap. Found dead 1 week later.
76553352	7/20/2006	Swan Valley	Illegal. Shotgun pellets. Died near house
76589366	9/28/2006	Hungry Horse Reservoir	Unknown cause. No carcass found. Lots of hair on ground, and radio found.
81577636	8/18/2007	North Fork Flathead	Unknown. Near road. No bullet found. Broken pelvis. Had 2 cubs of year.
84624383	Late Nov. 2007	North Fork Flathead	Unknown cause. Bear found 150 yds from road. No bullet found.
93604815	8/8/2008	Swan Valley	Management removal. Bear sent to Cabinet Mtn's for augmentation

Annual Fate of Non-Trend Grizzly Bears

Along with trend bears, management females and their young were monitored each year in the NCDE. The number of radioed management bears that were monitored annually varied from a high of 34 in 2004 to a low of 13 in 2006 and 2007 (Table 9). Since 2004, 10 mortalities of radioed female management bears, and 12 of their attendant young were documented. The fate of male grizzly bears is given in Appendix C.

Table 8. Radio years of telemetry data for Trend Monitoring females, 2004-2008.

Age Class	*Radio Years of Survival Data per Year*					*Total*
	2004	*2005*	*2006*	*2007*	*2008*	
Sub adult female	1.0	2.2	2.0	0	3.0	8.2
Adult female	7.4	15.2	20.4	23.2	21.4	87.6

Table 9. Annual fate female grizzly bears and attendant young that were monitored in the NCDE, but were not a part of the Trend Monitoring sample, 2004-2008.

	Radioed Independent Mgmt Females				*Attendant Young (both radioed and non-radioed)*				
	Survived	*Died*	*Censored/ unresolved*	*Total*	*Survived*	*Died*	*Censored/ unresolved*	*Alive to Dispersal*	*Total*
2004	10	5	4	19	7	8	0	0	15
2005	4	4	2	10	6	4	0	0	10
2006	5	0	1	6	6	0	1	0	7
2007	5	0	2	7	4	0	2	0	6
2008	11	1	3	15	2	0	0	1	3

Home Range and Telemetry

We were interested in assessing how well our sampling of Trend females in 2008 corresponded with the desired distribution of cumulative bears based on our pre-established capture zones (Fig. 2). We constructed 100% minimum convex polygons for each female and determined the proportion of each bears' home range in each capture zone. The proportions in each capture zone were then totaled and adjusted for the desired total of 30 bears. Finally, this total was compared to the desired total of radios as outlined in the program's study design (Mace 2005). Results suggest that, in 2008, the distribution of our sample of radioed females bears matched closely the desired distribution for most capture zones (Table 10). For example, our desired distribution called for approximately 10 bears using Glacier National Park (or 33% of the total home range volume across the NCDE). For Glacier Park in 2008, we had 9.5 bear equivalents (24% of the 2008 home range volume). The Swan/Missions capture zone was most notably over-sampled during the year. Home range polygons for in 2008 for these bears are given in Fig. 6. Composite 100% home ranges for all trend bears since 2004 are given in Fig. 7.

Fig. 6. Minimum convex polygons for Trend female grizzly bears Monitoring in the NCDE during 2008. Red rectangles represent trend females with too few locations to build a home range. Red line is federal Recovery Zone for grizzly bears.

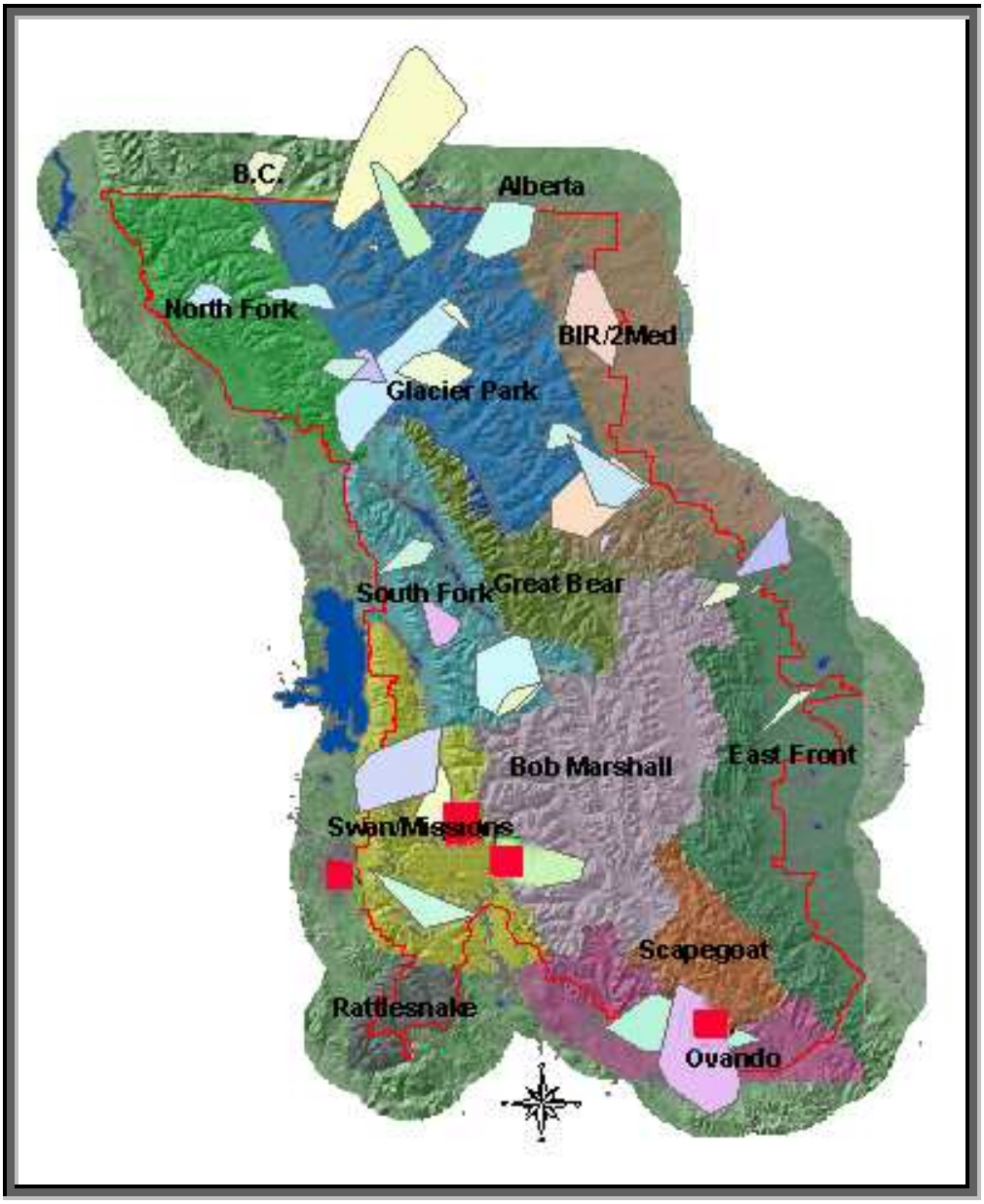
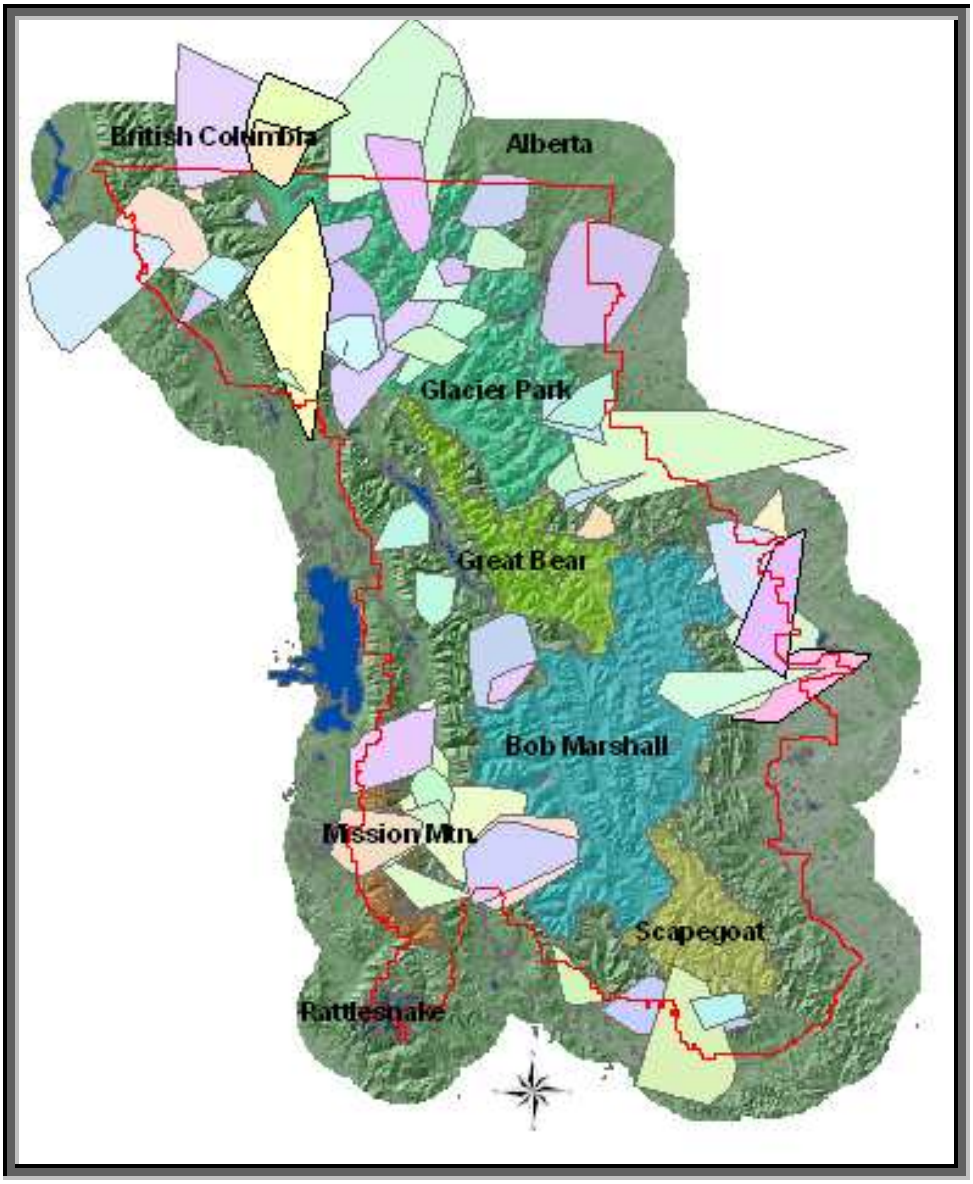


Fig. 7. Minimum convex polygon home ranges for 73 female grizzly bears monitored in the NCDE, Alberta, and British Columbia, 2004-2008
Red line is federal Recovery Zone for grizzly bears.



Grizzly Bear Reproduction

The number of adult females radioed for Trend Monitoring has varied each year from 11 in 2004 to a high of 30 in 2008 (Table 11). In 2008, we monitored 30 adult females for variable lengths of time; 11 of which (37%) were known not to have litters. Also in 2008, the reproductive status for 6 females was not ascertained. A minimum of 25 attendant young from ages 0.5 to 3 years were monitored along side 11 adult females in 2008. The reproductive history of each adult female is given in Appendix D.

Since 2004, we have monitored the size of 30 cub-of-year (0.5 yrs) litters (Table 12). The majority (60%) of litters consisted of 2 cubs. We observed no cub litters greater than 3 individuals. Yearling litters were again dominated by 2 individuals.

Table 10. Distribution of grizzly bear minimum convex polygon home ranges relative to capture zones for the NCDE. Comparisons are made between the actual percent of home ranges within each capture zone and the desired distribution of radioed samples.

	Capture Zone												
	Alberta	***B.C.***	***BIR/2 Med***	***Bob Marshall***	***East Front***	***Glacier Park***	***Great Bear***	***North Fork***	***Ovando***	***Rattle-snake***	***Scape-Goat***	***South Fork***	***Swan/ Missions***
Number Desired (% of Total)	2 (6.6)	2 (6.6)	5 (17.0)	1 (3.3)	3 (10.0)	10 (33.3)	0.5 (1.6)	3 (10.0)	1 (3.3)	0	0.5 (1.6)	1 (3.3)	1 (3.3)
Bear equivalents 2008 (% of Total)	2 (5.0)	2 (5.0)	6.2 (15.5)	1.9 (4.8)	4.5 (11.3)	9.5 (23.8)	0.02 (0.001)	3.8 (9.5)	2.3 (5.8)	0	0.73 (1.8)	4.0 (10.0)	6.0 (15.0)

Grizzly Bear Mortalities in the NCDE, 2008

In 2008, 14 grizzly bear mortalities were tallied for the ecosystem (Fig. 8). Three of these mortalities did not count as official man-caused mortalities using criteria established in the grizzly bear recovery plan. Two of these three mortalities were natural, and the third mortality was >10 miles from the federal Recovery Zone. In fact, this male bear (#097-777-564) was illegally killed by a rancher approximately 40 miles from the Recovery Zone.

The remaining 11 mortalities constitute the official federal mortality list. Thirty-six percent of these 11 deaths were adult bears (Table 13). Management removals (36%) were the leading cause of grizzly bear deaths in 2008. Grizzly bear mortalities in the NCDE during 2008 are listed in Appendix E.

Table 11. The number of attendant young of Trend Monitoring females from 2004 through 2008.

Year	*Number Adult Females*	*Status*	*n*	*Total Young*
2004	11	No young 1 cub 2 yearlings 2 3-yr-olds 2 cubs 3 cubs	5 1 0 1 2 1	10
2005	26	No young 1 cub 2 cubs 3 cubs 1 yearling 2 yearlings 2 2-yr-olds unk, but cubs	16 0 1 1 4 2 1 1	Minimum of 16
2006	25	No young 1 cub 2 cubs 3 cubs 2 yearlings unk	14 2 4 1 3 1	Minimum of 19
2007	28	No young 1 cub 2 cubs 3 cubs 1 yearling 2 yearlings 3 yearlings 2 2-yr-olds unk	9 1 7 1 1 3 1 2 3	Minimum of 32
2008	30	No young 1 cub 2 cubs 3 cubs 1 yearling 2 yearlings 3 yearlings 2 2-yr-olds unk	11 2 4 2 2 2 1 0 6	Minimum of 23

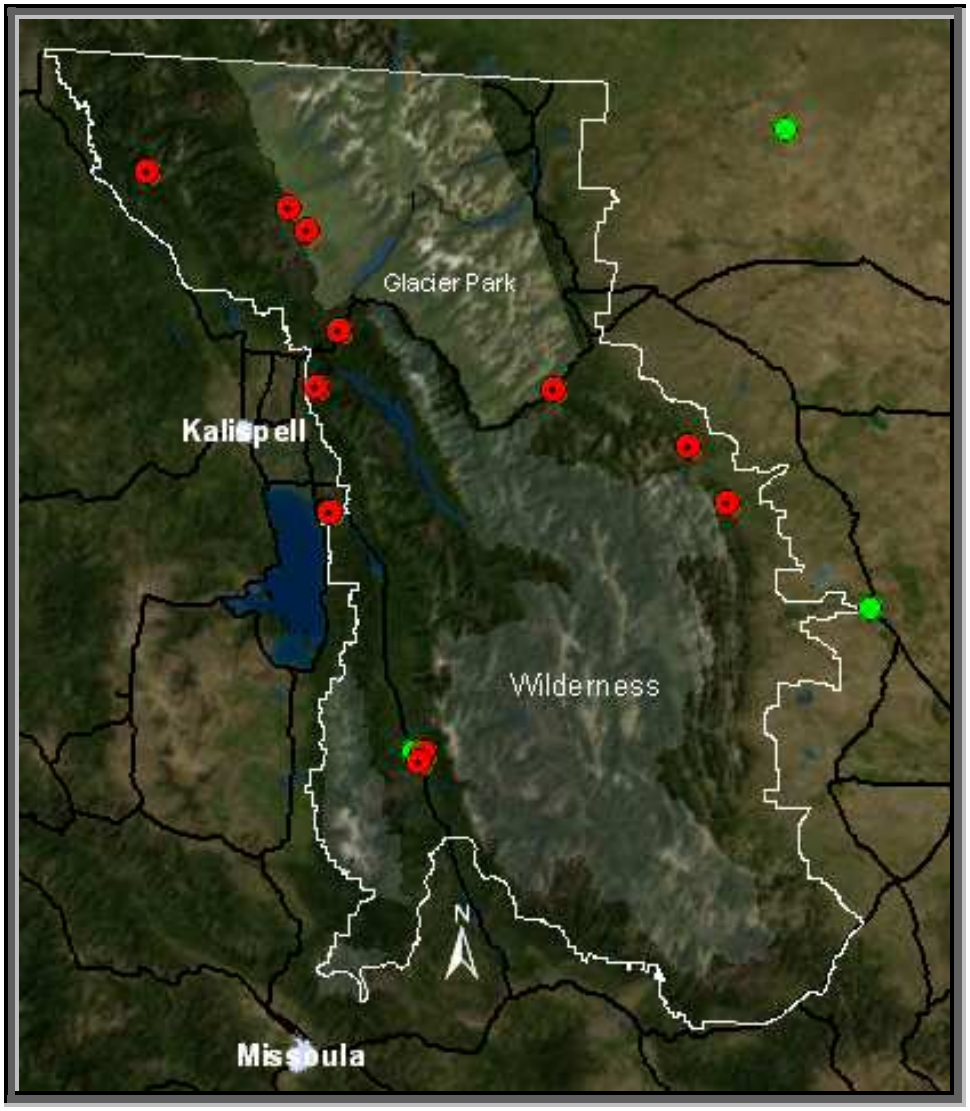
Table 12. Grizzly bear litter sizes observed from Trend Monitoring females in the NCDE, 2004-2008.

Litter Size Per age	*n*	*Cub Litter Size %*	*Yearling Litter Size %*	*2-yr old Litter Size %*	*3-yr old Litter Size %*
1 cub	6	20			
2 cubs	18	60			
3 cubs	6	20			
1 yearling	7		37		
2 yearlings	10		53		
3 yearlings	2		11		
1 2-year old	0			0	
2 2-year olds	3			100	
3 2-year olds	0			0	
1 3-year old	0				0
2 3-year olds	1				100
3 3-year olds	0				0

Table 13. Summary of 11 man-caused mortalities in the NCDE, 2008. Table includes only man-caused, known, and probable mortalities within 10 miles of the federal Recovery Zone.

Sex/Age Class	*Manage-ment*	*Self Defense*	*Illegal*	*Mistaken Id*	*Vehicle*	*Capture*	*Total*
Subadult Male	0	0	0	1	0	0	1
Adult Female	0	1	0	0	0	0	1
Adult Male	1	0	1	1	0	0	3
Subadult Female	3	0	1	0	1	1	6
Total	4	1	2	2	1	1	11

Fig. 8. Locations of 14 grizzly bear mortalities reported in the NCDE during 2008. Eleven of these mortalities (red dots) were man-caused deaths within 10 miles of the Recovery Zone. Mortalities depicted in green did not count in official records. The outer white line is the federal Recovery Zone boundary.



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Appendix A. Summary of female grizzly bear captures and annual fates in the NCDE and Canada for population Trend Monitoring, 2004-2008.

Year	Reference Number	Avid/ear Tag	Capture Date	Age Class	Capture zone	Fate 2004	Fate 2005	Fate 2006	Fate 2007	Fate 2008
2004	resfem1	38052875	5/20/2004	adult	Swan/Missions	alive	censor			
2004	resfem2	84529290	4/20/2004	adult	Swan/Missions	alive	censor			
2003	resfem3	648	8/18/2003	adult	North Fork	alive	censor			
2004	resfem4	84625548	4/21/2004	subadult	Swan/Missions	DEAD				
2004	resfem5	37885843, 84628512	4/27/2004	subadult	Swan/Missions	DEAD				
2004	resfem6	84623296	5/16/2004	subadult	Swan/Missions	DEAD				
2004	resfem7	84528858	6/9/2004	adult	North Fork	alive	censor			
2004	resfem8	84525082	9/15/2004	adult	Glacier Park	alive	censor			
2004	resfem9	51072381	4/28/2004	subadult	East Front	censor				
2004	resfem10	84623110	10/13/2004	adult	North Fork	alive	Probable DEAD			
2004	resfem11	84625525	9/16/2004	adult	Glacier Park	alive	alive	alive	censor	
2004	resfem12	238		adult	British Columbia	alive	alive	alive	alive	
2004	resfem13	233		adult	British Columbia					
2006	resfem13	233	9/4/2006	adult	British Columbia		alive	alive	censor	
2004	resfem14	132353547	5/2/2004	adult	Alberta	alive	censor			
2004	resfem15	132335546	5/7/2004	subadult	Alberta	alive				
2004	resfem15	132335546	10/27/2004	subadult	Alberta					
2005	resfem15	132335546	4/30/2005	subadult	Alberta		alive			
2008	resfem15	132335546	5/2/2008	adult	Alberta					alive
2005	resfem16	76553865	5/15/2005	subadult	East Front		alive	alive	alive	alive
1997	resfem17	205	9/29/1997		East Front					
2002	resfem17	205	10/14/2002		East Front					

2005	resfem17	205	5/15/2005	adult	East Front		alive	alive	censor	
2005	resfem18	51071845	5/15/2005	subadult	East Front		alive	alive	censor	
2005	resfem19	51605816	5/13/2005	adult	East Front		alive	censor		
2005	resfem20	84623066	4/28/2005	subadult	East Front					
2005	resfem20	84623066	5/4/2005	subadult	East Front		alive	alive	censor	
2005	resfem21	51586884	5/28/2005	adult	Ovando		alive	alive	censor	
2004	resfem22	67006850	9/23/2004	subadult	BIR/2Med					
2005	resfem22	67006850	5/26/2005	subadult	North Fork					
2007	resfem22	67006850	9/2/2007	subadult	North Fork	alive	alive	alive	alive	alive
2005	resfem23	71814874	6/1/2005	adult	BIR/2Med		alive	alive	alive	alive
2005	resfem24	72023614	5/31/2005	adult	BIR/2Med		alive	censor		
2005	resfem25	71816812	6/22/2005	adult	BIR/2Med		censor			
2005	resfem26	72113035	7/7/2005	adult	BIR/2Med					
2006	resfem26	72113035	5/12/2006	adult	BIR/2Med		censor	alive	alive	censor
2005	resfem27	79050043	6/10/2005	adult	South Fork		alive	alive	alive	alive
2005	resfem28	84524018	6/25/2005	adult	BIR/2Med		alive	alive	alive	alive
2005	resfem29	76361015	6/24/2005	adult	Glacier Park		alive	alive	censor	
2005	resfem30	76560093	6/22/2005	adult	Glacier Park		censor			
2005	resfem31	51561597	8/8/2005	adult	Scapegoat		alive	alive	alive	censor
2005	resfem32	84523288	9/7/2005	adult	North Fork					
2008	resfem32	84523288	6/27/2008	adult	North Fork		alive	alive	alive	alive
2005	resfem33	84624383	9/9/2005	subadult	Glacier Park					
2006	resfem33	84624383	9/17/2006	subadult	Glacier Park					
2007	resfem33	84624383	9/28/2007	subadult	North Fork			alive	DEAD	
2005	resfem34	84628889	9/23/2005	adult	North Fork		DEAD			
2005	resfem35	76615038	9/24/2005	adult	Glacier Park		alive	alive	alive	censor
2005	resfem36	23813296	9/26/2005	adult	Glacier Park		censor			

2006	resfem37	79110541	5/12/2006	adult	Glacier Park					
2006	resfem37	79110541	9/15/2006	adult	Glacier Park					
2007	resfem37	79110541	9/10/2007	adult	Glacier Park					
2007	resfem37	79110541	9/13/2007	adult	Glacier Park			alive	alive	censor
2005	resfem38	4077420c51	5/26/2005	subadult	Swan/Missions					
2006	resfem38	4077420c51	5/14/2006	subadult	Swan/Missions			censor		
2006	resfem39	81577636	5/15/2006	adult	North Fork			alive	DEAD	
2006	resfem40	76553352	6/2/2006	adult	Swan/Missions			DEAD		
2006	resfem41	71868109	6/1/2006	adult	BIR/2Med			alive	alive	censor
2006	resfem42	76584107	6/11/2006	adult	Swan/Missions			alive	censor	
2006	resfem43	76589366	6/26/2006	subadult	South Fork			DEAD		
2005	resfem44	263	9/26/2005	subadult	British Columbia					
2006	resfem44	263	6/23/2006	subadult	British Columbia			alive	alive	censor
2006	resfem45	76613125	8/12/2006	adult	South Fork			alive	alive	alive
2006	resfem46	82024327	9/7/2006	adult	North Fork			censor		
2006	resfem47	76600783	9/23/2006	adult	South Fork			alive	alive	censor
2006	resfem48	81886333	9/23/2006	adult	South Fork			alive	alive	alive
2006	resfem49	81602889	10/8/2006	adult	Bob Marshall			alive	alive	censor
2006	resfem50	81603277	10/15/2006	subadult	Bob Marshall			alive	alive	censor
2007	resfem51	93585538	5/21/2007	subadult					censor	
2008	resfem51	93585538	7/12/2008	subadult	BIR/2Med					alive
2007	resfem52	76570875	5/24/2007	adult	BIR/2Med				alive	alive
2007	resfem53	51597096	5/23/2007	subadult	East Front				alive	alive
2007	resfem54	81605772	6/13/2007	adult	Glacier Park				alive	censor
2007	resfem55	51571800, 64028820	6/20/2007	adult	Ovando				alive	alive
2007	resfem56	93619344	9/20/2007	adult	Glacier Park					
2007	resfem56	93619344	9/23/2007	adult	Glacier Park				alive	alive

2007	resfem57	93639873	9/27/2007	adult	Glacier Park				alive	alive
2008	resfem58	97616524	5/9/2008	adult	Glacier Park					alive
2008	resfem59	93604815	5/11/2008	subadult	Swan/Missions					
2008	resfem59	93604815	8/8/2008	subadult	Swan/Missions					DEAD
2008	resfem60	97774544	5/11/2008	subadult	Swan/Missions					alive
2008	resfem61	93571631	5/17/2008	subadult	Swan/Missions					alive
2008	resfem62	97630806	5/31/2008	adult	North Fork					alive
2008	resfem63	93638000	6/7/2008	adult	Swan/Missions					
2008	resfem63	93638000	7/19/2008	adult	Swan/Missions					alive
2008	resfem64	97559276	5/14/2008	subadult	East Front					censor
2008	resfem65	97605011	5/14/2008	subadult	East Front					alive
2008	resfem66	97637608	5/15/2008	adult	East Front					alive
2008	resfem67	97631049	6/5/2008	subadult	East Front					alive
2008	resfem69	63834064	6/28/2008	adult	Ovando					alive
2008	resfem70	81289085	7/17/2008	adult	BIR/2Med					alive
2008	resfem71	93586336	9/22/2008	subadult	Swan/Missions					alive
2008	resfem72	107581802	9/27/2008	adult	Glacier Park					alive
2008	resfem73	18098036	10/1/2008	adult	Swan/Missions					alive

Appendix B. Management bear captures and annual fates in the NCDE, 2004-08.

Year	Avid	Sex	Class	Capture Date	Age Class	Area	Fate 2004	Fate 2005	Fate 2006	Fate 2007	Fate 2008
2003	232996344	F	mgmt female	8/21/2003	adult	Glacier Park	alive	censor			
2004	34375517	F	mgmt female	8/21/2003	adult	BIR	alive				
2004	51085276	F	mgmt female	5/18/2004	yearling	BIR	censor				
2004	51593054	F	mgmt female	5/18/2004	subadult	BIR	censor				
2004	37887572, 81630006	F	mgmt female	8/25/2004	adult	Flathead Valley	alive				
2004	84625280	F	mgmt young	8/26/2004	yearling	Flathead Valley	alive				
2006	37887572, 81630006	F	mgmt female	9/24/2006	adult	Flathead Valley			alive		
2006	81580095	F	mgmt young	9/24/2006	cub	Flathead Valley			alive		
2006	81639835	F	mgmt young	9/24/2006	cub	Flathead Valley			alive		
2007	37887572, 81630006	F	mgmt female	9/17/2007	adult	Flathead Valley					
2007	37887572 ,81630006	F	mgmt female	10/11/2007	adult	Flathead Valley				alive	censor
2007	81580095	F	mgmt young	09/17/2007	yearling	Flathead Valley					
2008	81580095	F	mgmt subadult	06/07/2008	subadult	Flathead Valley					
2008	81580095	F	mgmt subadult	10/17/2008	subadult	Flathead Valley					alive
2007	81639835	F	mgmt young	09/17/2007	yearling	Flathead Valley					
2007	81580095	F	mgmt young	10/11/2007	yearling	Flathead Valley					
2007	81639835	F	mgmt young	10/11/2007	yearling	Flathead Valley					
2004	84529806	F	mgmt female	10/11/2004	adult	N.F.Flathead	alive	alive	alive	alive	
2004	84623883	F	mgmt young	10/11/2004	cub	N.F.Flathead	DEAD				
2004	84624095	F	mgmt young	10/11/2004	cub	N.F.Flathead	DEAD				
2004	84383813	F	mgmt young	10/11/2004	cub	N.F.Flathead	DEAD				
2005	53323794	F	mgmt female	7/28/2005	adult	Glacier Park		alive	censor		
2004	23518519	F	mgmt female	5/23/2004	adult	Middle Fork	alive				
2004	38051794	F	mgmt young	5/27/2004	subadult	Middle Fork	DEAD				
2004	23518519	F	mgmt female	9/8/2004	adult	Middle Fork	alive				

2005	23518519	F	mgmt female	10/6/2005	adult	Middle Fork		DEAD			
2005	none	F	mgmt young	10/5/2005	subadult	Middle Fork		DEAD			
2005	none	F	mgmt young	10/5/2005	subadult	Middle Fork		DEAD			
2004	51566878	F	mgmt female	10/24/2004	adult	Middle Fork	alive				
2004	84382811	F	mgmt young	10/24/2004	cub	Middle Fork	ukn				
2005	51566878	F	mgmt female	9/14/2005	adult	East Front		DEAD			
2004	37605609	F	mgmt female	10/25/2004	adult	Swan Valley	alive	DEAD			
2005	38100864	F	mgmt female	10/22/2005	adult	Swan Valley		alive	alive		
2005	81770822	M	mgmt young	10/22/2005	cub	Swan Valley		alive			
2005	96597530	M	mgmt young	10/22/2005	cub	Swan Valley		alive			
2007	81770822	M	mgmt male	5/25/2007	subadult	Swan Valley					
2007	81770822	M	mgmt male	6/23/2007	subadult	Swan Valley				DEAD	
2004	38047294, 84524096	F	mgmt female	7/22/2004	adult	Fortine	DEAD				
2004	84381861	F	mgmt young	7/22/2004	cub	Fortine	DEAD				
2004	84516308	F	mgmt young	7/22/2004	cub	Fortine	DEAD				
2004	84383870	F	mgmt female	8/28/2004	adult	Middle Fork	DEAD				
2004	84623527	F	mgmt young	08/28/2004	cub	Middle Fork					
2004	84623527	F	mgmt young	9/30/2004	cub	Middle Fork	DEAD				
2004	84623539	M	mgmt young	8/28/2004	cub	Middle Fork					
2004	84623539	M	mgmt young	9/30/2004	cub	Middle Fork	DEAD				
2005	34270060	F	mgmt female	5/24/2005	subadult	BIR					
2005	71552097	F	mgmt female	5/24/2005	subadult	BIR					
2004	22	F	mgmt female	9/17/2004	subadult	East Front	DEAD				
2004	51561278	F	mgmt female	09/17/2004	subadult	East Front	DEAD				
2003	34259287, 34259592	F	mgmt female	8/29/2003	adult	BIR					
2004	34259287 ,34259592	F	mgmt female	8/17/2004	adult	BIR	DEAD				
2004	none	M	mgmt young	8/17/2004	cub	BIR	DEAD				
2004	none	F	mgmt young	8/17/2004	cub	BIR	DEAD				
2003	84626296	F	mgmt female	10/14/2003	subadult	Fortine					
2004	84626296	F	mgmt female	7/1/2004	subadult	N.F.Flathead					
2004	84626296	F	mgmt female	8/2/2004	subadult	N.F.Flathead	DEAD				
2004	84528778	F	mgmt female	9/21/2004	subadult	Swan Valley					
2004	84528778	F	mgmt female	9/29/2004	subadult	Swan Valley					

2004	84528778	F	mgmt female	10/4/2004	subadult	BIR	DEAD				
2005	84626290	F	augmentation female	9/30/2005	adult	N.F.Flathead		Augmentation			
2006	41503d5a16	F	mgmt female	5/29/2006	adult	CSKT			censor		
2006	81542363	F	mgmt female	8/17/2006	subadult	South Fork			Augmentation		
2006	82018000	F	mgmt female	9/12/2006	adult	Flathead Valley			alive	alive	alive
2006	72121834	F	mgmt female	9/21/2006	adult	BIR			alive	alive	alive
2007	76313032	F	mgmt female	5/28/2007	subadult	CSKT				alive	censor
2007	64054290	F	mgmt female	9/6/2007	subadult	Southend					
2007	81567088	F	mgmt female	9/25/2007	adult	Trego				censor	
2008	81567088	F	mgmt female	5/31/2008	adult	Eureka					
2008	81567088	F	mgmt female	7/12/2008	adult	North Fork					unresolved
2007	81562048	M	mgmt young	9/27/2007	subadult	Trego					
2008	81562048	M	mgmt subadult male	5/31/2008	subadult	Eureka					alive
2007	93558362	M	mgmt young	9/26/2007	subadult	Trego					
2007	93550102	F	mgmt young	9/26/2007	subadult	Trego					
2008	93550102	F	mgmt subadult female	5/31/2008	subadult	Eureka					
2008	93550102	F	mgmt subadult female	6/25/2008	subadult	Eureka					alive
2008	95621534	F	mgmt female	7/23/2008	subadult	North Fork					Augmentation
2008	18079257	F	mgmt female	9/26/2008	adult	FIR					alive
2005	4077515970	F	otherresearch female	6/17/2005	adult	FIR		DEAD			
2008	107559301	F	otherresearch female	10/3/2008	subadult	Swan Valley					alive

Appendix C. Summary of male grizzly bear captures and annual survival in the NCDE, 2004-2008. Bears whose ID is labeled as "none" were released from culverts without immobilization.

Bear ID	*Radioed*	*Bear Type*	*First Capture year*	*Age Class*	*Area*	*Fate 2004*	*Fate 2005*	*Fate 2006*	*Fate 2007*	*Fate 2008*
5761	YES	research	2004	adult	Swan Valley	censor				
193	YES	research	2004	adult	Swan Valley	censor				
84525021	YES	research	2002	adult	Swan Valley	censor				
84627845	NO	research	2004	adult	S.F.Flathead					
84629344	NO	augmentation	2004	adult	N.F.Flathead					
84525524	YES	research	2004	adult	S.F.Flathead	alive	unresolved	alive	censor	
84374365	YES	research	2003	adult	S.F.Flathead	alive	alive	alive	censor	
84627371	NO	research	2004	adult	Glacier Park					
51320595	NO	research	2004	adult	East Front					
72072053	NO	research	2006	adult	BIR					
37585521	NO	research	200	adult	BIR					
84529557	NO	research	2005	subadult	N.F.Flathead					
37619308	NO	research	2005	adult	N.F.Flathead					
84517797	NO	research	2005	adult	MiddleFork					

84624376	NO	research	2004	subadult	S.F.Flathead					
51088798	NO	research	2005	adult	Glacier Park					
84625345	NO	research	2005	adult	S.F.Flathead					
79038096	NO	research	2005	adult	S.F.Flathead					
76316585	YES	research	2005	adult	East Font		alive	alive	alive	
154	NO	research	1992	adult	East Front					
51272891	NO	research	2005	adult	East Front					
67296863	YES	research	2004	subadult	East Front	alive	censor			
51320361	NO	research	2003	subadult	East Front					
294	NO	research	2005	adult	East Front					
84624372	NO	research	2005	adult	N.F.Flathead					
84383059	NO	research	2005	adult	N.F.Flathead					
23330315	NO	research	2005	adult	Glacier Park					
40774D1C07	YES	research	2006	subadult	Swan					alive
81576580	YES	augmentation	1992	adult	N.F.Flathead		alive	censor	alive	alive
79050602	NO	research	2006	adult	Glacier Park					
79283340	NO	research	2006	adult	Glacier Park					
81596581	YES	mgmt	2006	subadult	N.F.Flathead			DEAD		

81774014	YES	mgmt	2006	subadult	BIR			DEAD		
76517578, 415051031	YES	otherresearch	2006	adult	Missions		censor			
79279098	NO	research	2006	adult	Glacier Park					
79046784	NO	research	2006	adult	Glacier Park			DEAD		
76600112	YES	research	2006	subadult	East Front			censor		alive
76614342	YES	research	2006	subadult	East Front			censor	censor	
51589351	YES	research	2006	subadult	East Front			alive	DEAD	
76554835	YES	research	2006	subadult	East Front			DEAD		
76558780	NO	research	2006	adult	Swan Valley					
80626085	NO	augmentation	2006	adult	N.F.Flathead					
79075329	NO	research	2006	subadult	Bob Marshall					
none	NO	research	2006	subadult	Glacier Park					
none	NO	research	2006	subadult	Glacier Park					
63615794	YES	research	2006	subadult	Swan Valley			censor		
81610591	NO	augmentation	2006	subadult	N.F.Flathead			DEAD		
none	NO	augmentation	2006	subadult	N.F.Flathead					
96808303	NO	augmentation	2005	adult	N.F.Flathead					

51573784	NO	research	2006	adult	Bob Marshall					
76305807	NO	research	2006	subadult	Middle Fork					
none	NO	augmentation	2006	subadult	N.F.Flathead					
81552593	YES	augmentation	2006	adult	N.F.Flathead			alive	censor	
81631088	YES	augmentation	2006	adult	N.F.Flathead			alive	censor	
none	NO	research	2006	adult	Glacier Park					
81580106	YES	augmentation	2006	adult	N.F.Flathead			alive	censor	
53594886	YES	mgmt	2006	subadult	BIR			alive	alive	
none	NO	research	2006	subadult	Glacier Park					
72001530	NO	research	2006	subadult	BIR					
71783886	NO	research	2006	subadult	BIR					
71876351	NO	research	2006	subadult	BIR					
72265850	NO	research	2006	subadult	BIR					
37860849	YES	research	2003	subadult	Middle Fork	alive	alive	alive	DEAD	
81624047	NO	research	2007	adult	Middle Fork					
81603078	NO	research	2007	subadult	Middle Fork				DEAD	
51272543	YES	research	2007	subadult	East Font				alive	censor
51304876	YES	mgmt	2007	subadult	East Font				alive	DEAD

51368573	YES	research	2007	subadult	East Font				DEAD	
none	NO	augmentation	2007	subadult	N.F.Flathead					
none	NO	augmentation	2007	subadult	N.F.Flathead					
none	NO	augmentation	2007	subadult	N.F.Flathead					
none	NO	augmentation	2007	adult	N.F.Flathead					
97625062	YES	research	2008	subadult	Swan Valley					alive
97637327	YES	research	2008	subadult	East Front					alive
97628566	YES	research	2008	subadult	East Front					alive
97612565	YES	research	2008	adult	East Front					alive
28346107	YES	research	2008	adult	East Front					alive
93544597	NO	research	2008	subadult	Glacier Park					
93580317	NO	research	2008	subadult	Middle Fork					
93607865	NO	research	2008	adult	Middle Fork					
93620335	NO	research	2008	adult	Middle Fork					
81592525	NO	augmentation	2008	subadult	N.F.Flathead					
38043801	YES	research	2008	subadult	Swan Valley					alive
107574339	NO	research	2008	adult	Glacier Park					

81604564	NO	research	2008	adult	Glacier Park					
81290367	NO	research	2008	subadult	BIR					
107788000	NO	research	2008	subadult	Glacier Park					
96597530	NO	mgmt	2005	cub	Swan Valley					
84623539	NO	mgmt	2004	cub	Middle Fork	DEAD				
none	NO	mgmt	2004	cub	BIR	DEAD				
81562048	YES	mgmt	2007	subadult	Eureka					alive
93558362	NO	mgmt	2007	subadult	Trego					
84626881	YES	mgmt	2004	subadult	Swan Valley	DEAD				
51272050	NO	mgmt	2004	yrling	East Front					
51310617	NO	mgmt	2004		East Front					
84626074	YES	mgmt	2004	subadult	Flathead Valley	alive	DEAD			
84383560	YES	mgmt	2004	subadult	Swan Valley	alive	DEAD			
79090808	YES	mgmt	2005	adult	Bob Marshall		alive	alive	unresolved	
84629365	YES	mgmt	2005	adult	Middle Fork		DEAD			
51299051	YES	mgmt	2004	subadult	East Front		DEAD			
51273314	YES	mgmt	2004	subadult	East Front	alive	DEAD			
51303813	NO	mgmt	2004	subadult	East Front		DEAD			

84379069	YES	mgmt	2003	cub	N.F.Flathead	DEAD				
38043533	YES	mgmt	2003	subadult	flathead	UNRESOLVED				
84524536		mgmt	2004	subadult	c falls	DEAD				
254	YES	mgmt	2001	adult	East Front	UNRESOLVED				
24595039	YES	mgmt	2003	subadult	East Front	alive	censor			
293	NO	mgmt	2005	adult	East Front					
72018558	YES	mgmt	2005	subadult	BIR		UNRESLOVED			
51585311	NO	mgmt	2004	subadult	BIR					
28585610	NO	mgmt	2004	adult	BIR					
72098344	YES	mgmt	2006	subadult	BIR			alive	alive	unresolved
81583847	NO	mgmt	2006	subadult	N.F. Flathead			DEAD		
82033566, 84629588	YES	otherresearch	2006	subadult	whitefish			alive	DEAD	
71537785	YES	mgmt	2007	subadult	BIR				DEAD	
81258126	NO	mgmt	2007	subadult	BIR					
28582609	YES	mgmt	2007	adult	BIR				censor	
72088084	YES	mgmt	2006	subadult	BIR				censor	
81891531	YES	mgmt	2007	subadult	Flathead Valley				DEAD	

82024836	YES	mgmt	2007	adult	MiddleFork				alive	censor
34265368	YES	mgmt	2007	adult	BIR				alive	
82024121	YES	mgmt	2007	subadult	Trego				alive	unresolved
97777564	YES	mgmt	2007	subadult	East Front				alive	DEAD
82023820	YES	mgmt	2007	adult	Swan Valley				alive	
81552264	YES	mgmt	2007	adult	Swan Valley				alive	unresolved
82025350	YES	mgmt	2007	adult	Swan Valley				DEAD	
93572867	YES	mgmt	2007	subadult	Swan Valley				alive	unresolved
81623770	YES	mgmt	2008	adult	North Fork					censor
97772635	YES	mgmt	2008	subadult	East Front					alive
93550369	YES	mgmt	2008	adult	FIR					censor
93618280, 93600058	NO	mgmt	2008	subadult	FIR					
93771116	NO	augmentation	2008	subadult	SF flathead					
none	NO	augmentation	2008	adult	North Fork					
82024305	NO	augmentation	2008	subadult	North Fork					
none	NO	augmentation	2008	adult	North Fork					
none	NO	augmentation	2008	subadult	North Fork					
63606347	YES	mgmt	2008	subadult	Drummand					censor

none	NO	augmentation	2008	subadult	North Fork					
none	NO	augmentation	2008	adult	North Fork					
97605021	YES	mgmt	2008	subadult	East Front					alive
	NO	augmentation	2008	subadult	North Fork					
76598090	YES	mgmt	2008	subadult	East Front					alive
none	NO	mgmt	2008	adult	North Fork					
81278605	NO	mgmt	2008	subadult	BIR					
925	YES	mgmt	2008	adult	East Front					alive
76590799	YES	mgmt	2008	subadult	East Front					alive
81770822	YES	mgmt	2005	subadult	Swan Valley				DEAD	
48324259	YES	Other research	2005	adult	Swan Valley		censor			

Appendix D. Reproductive history of Trend Monitoring females and management females in the NCDE, 2004-2008.

Bear id	*Type*	*Young per Year*				
		2004	*2005*	*2006*	*2007*	*2008*
38052875	research	2_yrlings	2_2yrolds			
84529290	research	none	Ukn_but cubs			
648	research	1_cub	1_yrling			
84528858	research	ukn	none			
84525082	research	none	none			
84623110	research	none	3_cubs			
84625525	research	none	none	none		
238	research	3_cubs	none	1_cub		
233	research	2_3yrolds	none	none		
132353547	research	2_cubs	1_yrling			
132335546	research			none	none	2_cubs
76553865	research				2_cubs	Dispersed 2 yrlings
51605816	research		2_yrlings	none		
84623066	research		none	2_cubs	2_cubs	
51586884	research		1_yrling	ukn	ukn	
71814874	research		none	none	ukn	1_cub
72023614	research		none	2_cubs		
71816812	research		none			
72113035	research					lost 1 cub
79050043	research		none	none	none	none
84524018	research		none	none	3_cubs	ukn
76361015	research		none	2_cubs	2_yrlings	
76560093	research		none			
51561597	research		none	ukn	ukn	ukn
84523288	research		2_cubs	2_yrlings	2_2yrolds	3_cubs
84624383	research		none	none	none	
84628889	research		none			

76615038	research		none	none	2_cubs	
23813296	research		1_yrling			
79110541	research			none	1_cub	1_yrling
4077420c51	research			none		
81577636	research			2_yrlings, mgmt removal	2_cubs	
76553352	research			none		
71868109	research			2_yrlings	2_2yrolds	2_cubs
76584107	research			3_cubs	3_yrlings	
76589366	research			none		
263	research					2_cubs
76613125	research			none	2_cubs_1died	1_yrling_dead
82024327	research			none		
76600783	research			1_cub	1_yrling_dead	none
81886333	research			none	none	none
81602889	research			2_cubs	2_yrlings_dead	ukn
81603277	research			none		ukn
93585538	research				none	none
76570875	research				none	none
51597096	research				none	
81605772	research				none	ukn
51571800, 64028820	research				2_yrlings	ukn
93619344	research				none	ukn
93639873	research				2_cubs	2_yrlings_1 dead
97616524	research					none
93604815	research					none
97774544	research					none
93571631	research					none
97630806	research					none
97559276	research					none
97605011	research					none
97637608	research					3_yrlings_ dispersed
97631049	research					none
	research					none
63834064	research					none

81289085	research					none
93586336	research					none
107581802	research					none
18098036	research					3_cubs
93638000	mgmt					none
34375517	mgmt	none				
37887572, 81630006	mgmt	2_yrlings	2_2yrolds	2_cubs	2_yrlings	unknown
84529806	mgmt	3_cubs_died	ukn	2_cubs	2_yrlings	
53323794	mgmt		2_yrlings			
23518519	mgmt	1_2yrold	2_cubs			
51566878	mgmt	1_cub	1_yrling			
37605609	mgmt	1_2yrold	none			
38100864	mgmt	none	2_cubs	2_yrlings	2_2yrolds	2_cubs
38047294, 84524096	mgmt	2_cubs				
84383870	mgmt	2_cubs				
34259287, 34259592	mgmt	2_cubs				
41503d5a16	mgmt			1_yrling		
81542363	mgmt			none		
82018000	mgmt			none	ukn	none
72121834	mgmt			none	1_cub	1_dispersed yrling
76313032	mgmt				none	
64054290	mgmt				none	
81567088	mgmt				3_yrlings	2_2yrolds
18079257	mgmt					none
81781376	mgmt					none
81600578	mgmt					none
107585006	mgmt					none
232996344	mgmt	2_yrlings				
216	mgmt	none	none			
93638000	mgmt					none
4077515970	mgmt		2_cubs			
107559301	mgmt					none
67006850	both			none	none	lost_2_cubs
205	both	2_cubs	2_yrlings		2_cubs	

Appendix E. Summary of grizzly bear mortalities in the NCDE, 2008.

Mortality #	*Date*	*Avid/ Ear tag*	*Collared/ tagged*	*Age Class*	*Sex*	*Cause*	*Certainty*	*Discovery*	*Location*
NCDE_2008_1	04/20/2008		No	Ad	M	Mistaken Id	Known	Reported	North Fork, N of Camas bridge
NCDE_2008_2	05/15/2008		No	SA	F	Capture related	Known	Reported	East Front, private land
NCDE_2008_3 [a]	05/08/2008		No	SA	M	Natural	Known	Reported	Teton River area
NCDE_2008_4 [a]	05/29/2008	97777564	collared/ tagged	SA	M	Illegal	Known	Reported	1 mile east of Landslide Butte
NCDE_2008_5 [a]	07/04/2008		No	COY	F	Natural	Known	Reported	Found on island near Glacier Cr ,Swan
NCDE_2008_6	07/23/2008	95621534	No	SA	F	Mgmt	Known	Reported	Fitzsimmons Cr
NCDE_2008_7	08/08/2008	93604815	collared/ tagged	SA	F	Mgmt	Known	Reported	Cooney Cr private land
NCDE_2008_8	09/20/2008		No	SA	F	Vehicle	Known	Reported	Swan Hwy by Rumble Cr
NCDE_2008_9	09/20/2008		No	Ad	M	Illegal	Known	Reported	Coal Cr North Fork
NCDE_2008_10	10/18/2008		No	SA	F	Illegal	Known	Reported	Mission Mtn. front
NCDE_2008_11	10/24/2008	51304876/ 4272	Yes	Ad	M	Mgmt	Known	Reported	South of Heart Butte
NCDE_2008_12	10/25/2008		No	SA	M	Mistaken Id	Known	Reported	Crane Mtn, Ferndale
NCDE_2008_13	10/27/2008		No	Ad	F	Self defense	Known	Reported	Near Summit, Middle Fork Flathead
NCDE_2008_14	11/07/2008	81580095	collared/ tagged	SA	F	Mgmt	Known	Reported	Near Lake 5 and West Glacier

[a] Mortality does not count in official federal mortality records.