Northern Continental Divide Ecosystem
Grizzly Bear Population Monitoring Team
Annual Report 2024

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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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ABSTRACT

This report summarizes 2024 results of the interagency population monitoring program for grizzly bears in the Northern Continental Divide Ecosystem (NCDE) of Montana, initiated in 2004. The program is focused on modeling population trend using survival and reproductive rates obtained from captured and radio-marked bears, particularly females. The program also maintains all grizzly bear data; conducts research to meet management needs; summarizes agency actions to prevent and respond to human-grizzly bear conflict; and evaluates demographic objectives outlined in the NCDE Conservation Strategy. Within the Demographic Monitoring Area (DMA), we captured 21 grizzly bears (16F, 5M) for trend monitoring and 8 bears (4F, 4M) as potential candidates for genetic augmentation of the greater Yellowstone Ecosystem (GYE). With interagency partners, we translocated 2 bears (1 F, 1M) to the GYE. We also captured 38 bears (20F, 18M) for management inside and outside of the DMA. We radio-monitored 39 bears (32F, 7M) for trend and documented 0 deaths. For management, we radio-monitored 35 bears (22F, 13M) and documented 5 deaths (2F, 3M). We recorded the reproductive status of 42 females ≥4 years old (28 trend,14 other), including 17 females with cubs (40%), 8 with yearlings (19%), 2 with 2-year-old offspring (5%), and 15 with no offspring (36%). We documented 6 presumed cub mortalities among 15 litters and 4 presumed yearling mortalities among 6 litters. Including unmarked bears, we documented 36 (14F, 16M, 6U) known or probable mortalities of grizzly bears in or near the NCDE. During the 6-year period of 2019–2024, all 23 Bear Management Units (BMUs) and 7 Occupancy Units (OUs) were occupied by females with offspring, above the minimum thresholds of 21 BMUs and 6 OUs. During 2019–2024, we estimated an annual survival rate of 0.93 (± 0.01 SE) for independent females. Within the DMA, we estimated 12 total reported and unreported (TRU) mortalities for independent females and 15 TRU mortalities for independent males. During 2019–2024, average TRU mortalities were 14 and 19 for independent females and males respectively. Our estimates of occupied range of the NCDE grizzly bear population for the period 2010–2024 encompassed 62,608 km^2, a 12% increase from 2008–2022. Based on genetic data through 2023 or field data in 2024, we detected the first occasion of gene flow to the Cabinet-Yaak population from the NCDE, whereby an immigrant male fathered a female offspring. Management specialists in the NCDE responded to at least 206 incidents of human-grizzly bear conflict and another 95 reports or complaints not involving conflict behavior. They applied 631 tools or actions to prevent conflict and took another 48 actions involving captured bears.

CONTENTS

INTRODUCTION

The grizzly bear (*Ursus arctos horribilis*) was listed as threatened under the Endangered Species Act in the lower 48 states in 1975. The grizzly bear population in the Northern Continental Divide Ecosystem (NCDE) was considered the largest among the listed populations and was contiguous with populations in Canada. Various regional studies of ecology and population dynamics were conducted within this ecosystem during the 1970s through 1990s (e.g., Martinka, 1976, Servheen 1983, Zager et al. 1983, Mace and Jonkel 1986, Aune et al. 1994, Mace and Waller 1997). Attempts to estimate overall population size from counts of females with cubs, as described in the Recovery Plan (USFWS 1993), were compromised by the dense forest cover in many parts of the ecosystem and experimental photographic sighting methods for estimating population size (Mace et al. 1994) were not applied ecosystem wide. In 2004, our interagency team was formed to provide ecosystem-wide information on population size and trend (Mace 2005). An ecosystem-wide genetic mark-recapture study, led by the US Geological Survey (USGS), estimated the population size at 765 bears in 2004 (Kendal et al. 2009). Ongoing field studies, led by Montana Fish, Wildlife & Parks (FWP), allowed us to model population trend using survival and reproductive rates obtained from captured and radio-marked bears, particularly females (Mace et al. 2012, Costello et al. 2016). In 2019, these methods were used to develop a set of population objectives for the NCDE Conservation Strategy (NCDE Subcommittee 2019). Although the Conservation Strategy was intended to take effect upon removal of the NCDE grizzly bear population from threatened status under the Endangered Species Act, the objectives and thresholds represented the most recent monitoring methodologies. The Conservation Strategy also called for annual reporting of incidents of human-grizzly bear conflict and agency response.

Our trend monitoring program was focused within the Demographic Monitoring Area (DMA; Fig. 1), which encompasses the Primary Conservation Area (PCA: equivalent to the Federal Recovery Zone) and Zone 1, a buffer surrounding the PCA (USFWS 1993, NCDE Subcommittee 2019). The DMA includes Glacier National Park, parts of 4 National Forests (Flathead, Helena/Lewis and Clark, Kootenai, and Lolo); parts of the Blackfeet and Flathead Reservations; Bureau of Land Management lands; state lands, and private lands. The NCDE grizzly bear population was also contiguous with those in the Canadian provinces of British Columbia and Alberta, therefore occasional captures and monitoring occurred north of the United States in Canada.

Although our focus for trend monitoring was the DMA, we also worked in areas where grizzly bears were present outside of the DMA. Notable areas included: Zone 2, an area of potential connectivity between the NCDE and the Greater Yellowstone Ecosystem (GYE); Zone 3, an area occupied by grizzly bears which does not provide habitat linkage to other grizzly bear populations (NCDE Subcommittee 2019); and areas between the NCDE and the Bitterroot Ecosystem (BE).

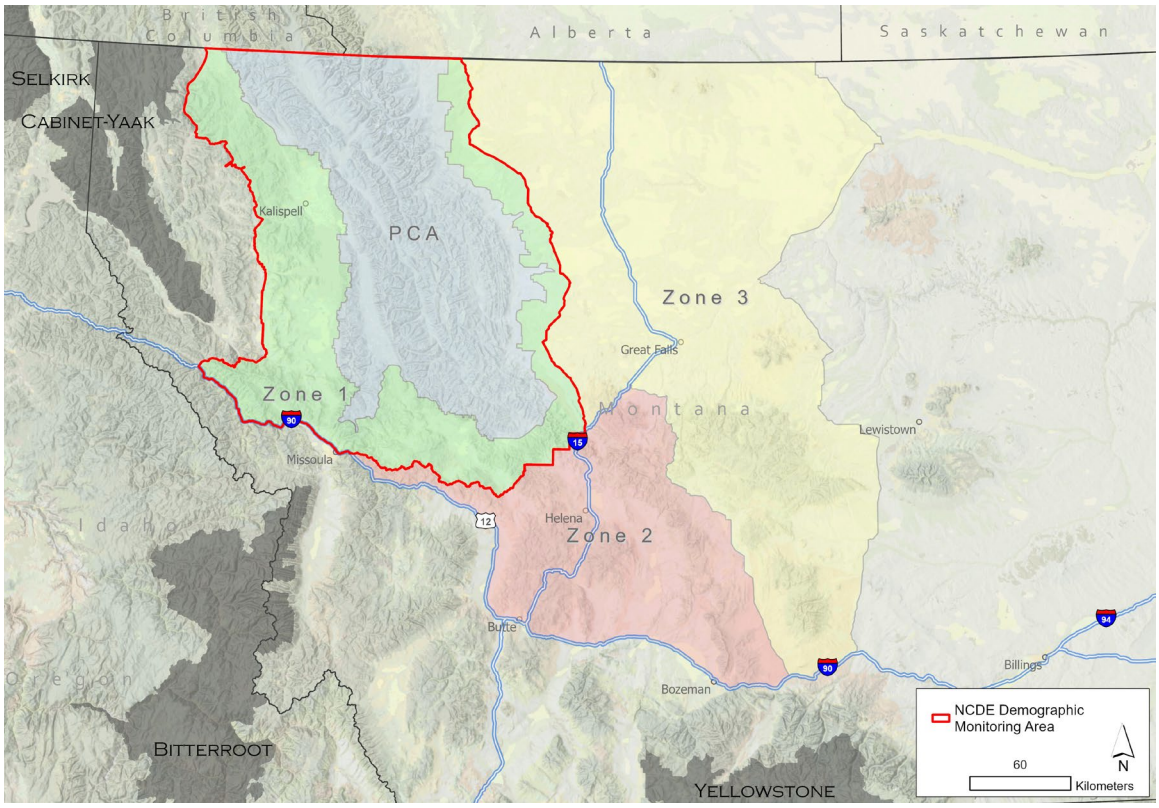

Fig. 1. Zones of the NCDE. The Demographic Monitoring Area (DMA; red line), where population monitoring is conducted, consists of the Primary Conservation Area (PCA; blue) and Zone 1 (green). Zone 2 (pink) is the area of potential genetic connectivity between the NCDE and the Greater Yellowstone Ecosystem. Zone 3 (orange) is an area occupied by grizzly bears which is not likely to provide habitat linkage to other populations.

SUMMARY OF ANNUAL TREND MONIORING FIELD ACTIVITIES

Methods

We captured grizzly bears using leg-hold snares and culvert traps. We followed the handling and immobilization procedures found in the Montana Animal Care and Use Committee protocols for grizzly bears and black bears (IACUC# FWP08-2023). We tagged all bears subcutaneously with passive transponder tags and pulled a premolar tooth for age determination when possible (Stoneberg and Jonkel 1966). For trend monitoring, we radio-marked most females and a sample of males with radio-transmitters. Currently deployed transmitters included: Iridium neck-mounted GPS collars (TGW-4570-3; Telonics, Inc.). We captured trend bears throughout the DMA. Grizzly bears were also captured and radio-marked for management and other research outside of the DMA and monitored with Iridium collars, very high frequency (VHF) collars, and VHF ear-tag transmitters. Individual bears were classified as either trend bears or other (non-trend) bears using the terminology of Mace et al. (2012).

We monitored survival and reproduction using aerial telemetry flights conducted during the active season and remote downloads of GPS data. We attempted to investigate mortality

signals within 2 weeks to ascertain whether the bear died or shed its collar. If a dead bear was found, we conducted preliminary necropsies in the field and collected relevant samples for laboratory analyses. In early spring, when bears were beginning to emerge from dens, we conducted observation flights for adult female bears to ascertain reproductive status, age of offspring, and litter size (if present). We continued to conduct telemetry flights throughout the active season, when possible, to document survival of dependent offspring.

We recorded known and probable mortalities of marked and unmarked grizzly bears inside and outside of the DMA. Known mortalities involved a whole or partial carcass which substantiated death; probable mortalities lacked a carcass but involved strong evidence that a bear had died (e.g., blood loss).

Whenever possible, we collected hair or tissue samples from captured bears or mortalities. Genetic analyses were conducted by Wildlife Genetics International (Nelson, BC). We also opportunistically collected hair samples left by bears under various circumstances, such as bears that visited trap sites, bears that rubbed on natural and man-made objects, or bears that were present at sites of human-grizzly bear conflict. If the samples appeared adequate, we included them in DNA analyses for individual identification. These samples contributed to our sample of genotypes for analyses of population genetics and provided additional information about captured individuals, such as conflict history or continued presence in the population.

Results

In 2024, we captured 68 individuals during 74 capture occasions (6 recaptures). We captured 22 individuals for trend monitoring purposes within the DMA (Table 1, Fig. 2), including 16 females and 5 males. Fifteen females and 4 males were fitted with radio-transmitters. In addition to trend captures, 39 bears were captured in association with management actions, although some were non-target individuals or were captured preemptively. These captures included 20 females and 19 males. Of these, 10 females and 11 males were fitted with radio-transmitters. Eight bears were captured as potential candidates for genetic augmentation of the grizzly bear population in the Greater Yellowstone Ecosystem (GYE), including 4 females and 4 males. One female and 1 male were radio-marked and translocated to the GYE. Two females and 1 male were radio-marked and added to the trend sample in the NCDE. In 2024, 77% of trend-captured bears were new individuals. This was higher than the mean of 65% and at the high end of the range of 50–77% for percentage of new individuals captured each year since 2004.

Including bears collared during previous years, we radio-monitored 39 independent bears during all or part of 2024 for trend monitoring within the DMA: 32 females and 7 males. Among this sample, we documented no deaths of radio-marked bears. For management or other purposes, we monitored 35 bears: 21 independent females, 1 dependent female, 12 independent males, and 1 dependent males. Among this other sample, we documented the deaths of 5 radio-marked bears: agency removal due to human-bear conflict (3M); train (1F); and under investigation (1F). The two bears (1F:1M) translocated to the GYE were counted as mortalities. Appendix A is a summary of the fates of radio-marked bears during 2024 in the NCDE.

Table 1. Number of individual grizzly bears captured and fitted with radio-transmitters in the NCDE, 2024.

Type	Captured			Radio-marked		
	Female	Male	Total	Female	Male	Total
Trend research in DMA	16	5[1]	21	15	4	19
Management[2]	20	18	38	10	12	22
Augmentation	4	4	8	2	1	3
Total	40	27	67	27	17	44

1: one male was captured for management and trend. 2: management captures included bears captured for conflict, non-target bears captured at conflict sites, bears captured preemptively to prevent conflict, and bears captured in other circumstances.

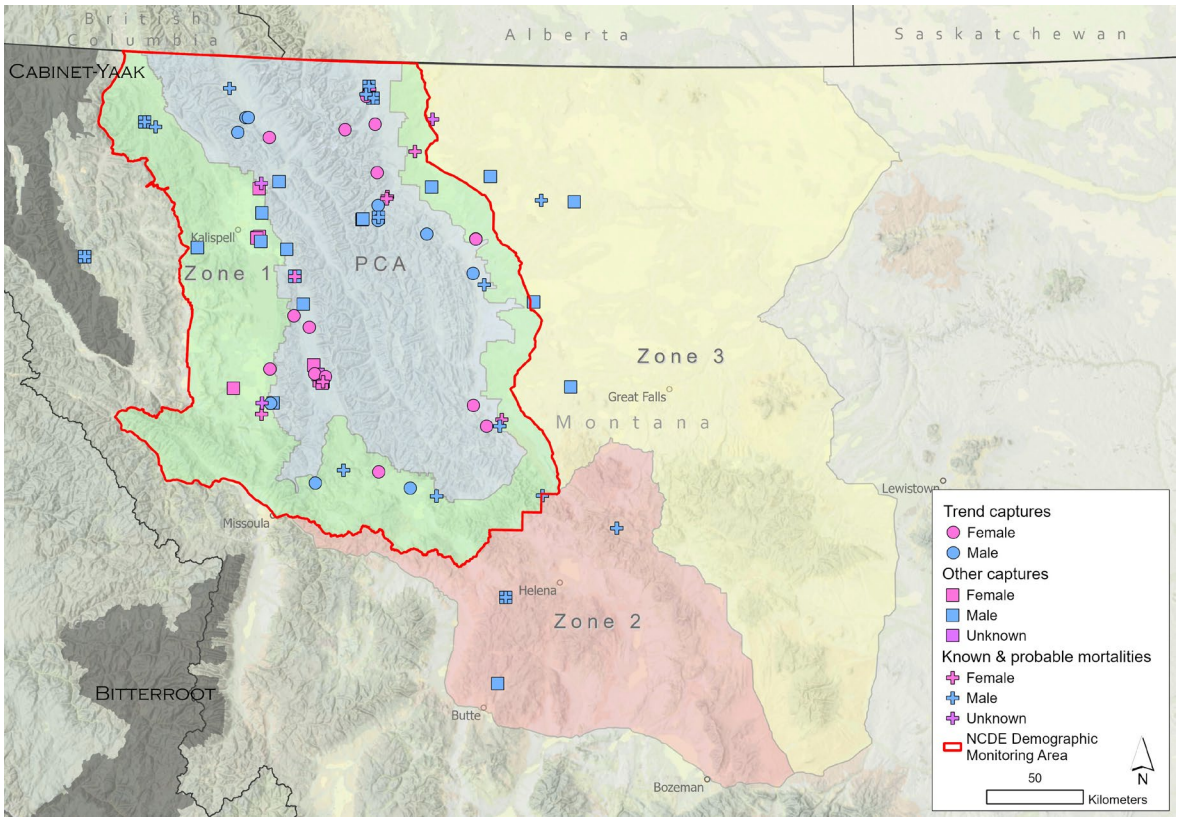

Fig. 2. Location of captures and mortalities of grizzly bears in the NCDE, 2024. Zones as described in Fig. 1.

We recorded the reproductive status of 42 females ≥4 years old during 2024 (28 trend,14 other). Among all observations, there were 17 females with cubs (40%), 8 with yearlings (19%), 2 with 2-year-old offspring (5%), and 15 with no offspring (36%). Cub litter sizes ranges from 1 to 3, with a mean of 2.0. Dates of first observations for reproductive status ranged from April 18 to Nov 27 and averaged July 6, therefore some individuals may have changed status due to whole litter loss or independence of offspring. We monitored survival of 15 cub litters (29 cubs) and 6 yearling litters (9 yearlings) through repeated observations during different months of the year. This sample included 1 cub litter of a mother that died during 2024. We documented 6 presumed

or known cub mortalities and 4 presumed yearling mortalities. Appendix B is a summary of the reproductive observations of females in the NCDE.

Thirty-six known or probable grizzly bear mortalities were documented in or near the NCDE during 2024 (Fig. 3; Table 2). Twenty-eight occurred within the DMA: 18 inside the PCA and 10 within Zone 1. Eight mortalities occurred outside the DMA: 3 in Zone 2, 4 in Zone 3, and 1 outside of NCDE zones. Among 28 mortalities of independent bears, causes of death were: agency removal due to human-bear conflict (10); agency removal for GYE genetic augmentation (2); automobile collision (5); defense of life (3); mistaken id by black bear hunter (2); poached/malicious (2); under investigation (2); and undetermined (2). Eight dependent bear mortalities included cubs or yearlings that died or cubs that were orphaned and assumed dead (if fate is unknown, cubs were assumed dead). Causes of death included: orphaning due to defense-of-life mortality of mother (3); orphaning due to agency removal of mother (2); agency removal due to injury (1); agency removal after orphaning due to defense-of-life mortality of mother (1); and train collision (1). Appendix C is a summary of all documented mortalities in the NCDE during 2024.

Table 2. Number of known or probable mortalities of grizzly bears in the NCDE, 2024.

		Sex			
Area	Age class	Female	Male	Unknown	**Total**
Inside DMA	Dependent	2	2	3	7
	Independent	10	10	1	21
	Subtotal	12	12	4	28
Outside DMA	Dependent	0	0	1	1
	Independent	2	4	1	7
	Subtotal	2	4	2	8
Total		14	16	6	36

During 2023, we collected 112 opportunistic samples. When samples were analyzed for genotypes in 2024, 63 (56%) were successfully genotyped as grizzly bears (Fig. 3). The remaining samples were found to be from black bears or were not successfully genotyped due to scarcity of hair follicles, mixture of individuals within the sample, or failure of DNA extraction or genotyping. A total of 31 individuals were detected among these samples (Table 3). The number of total detections per individual ranged from 1–7 with an average of 2.0. Forty-eight percent of these individuals had not been previously genotyped and were identified as new individuals. This was higher than the mean of 42% and within the range of 28–81% for percentage of new individuals genotyped from opportunistic samples each year since 2009.

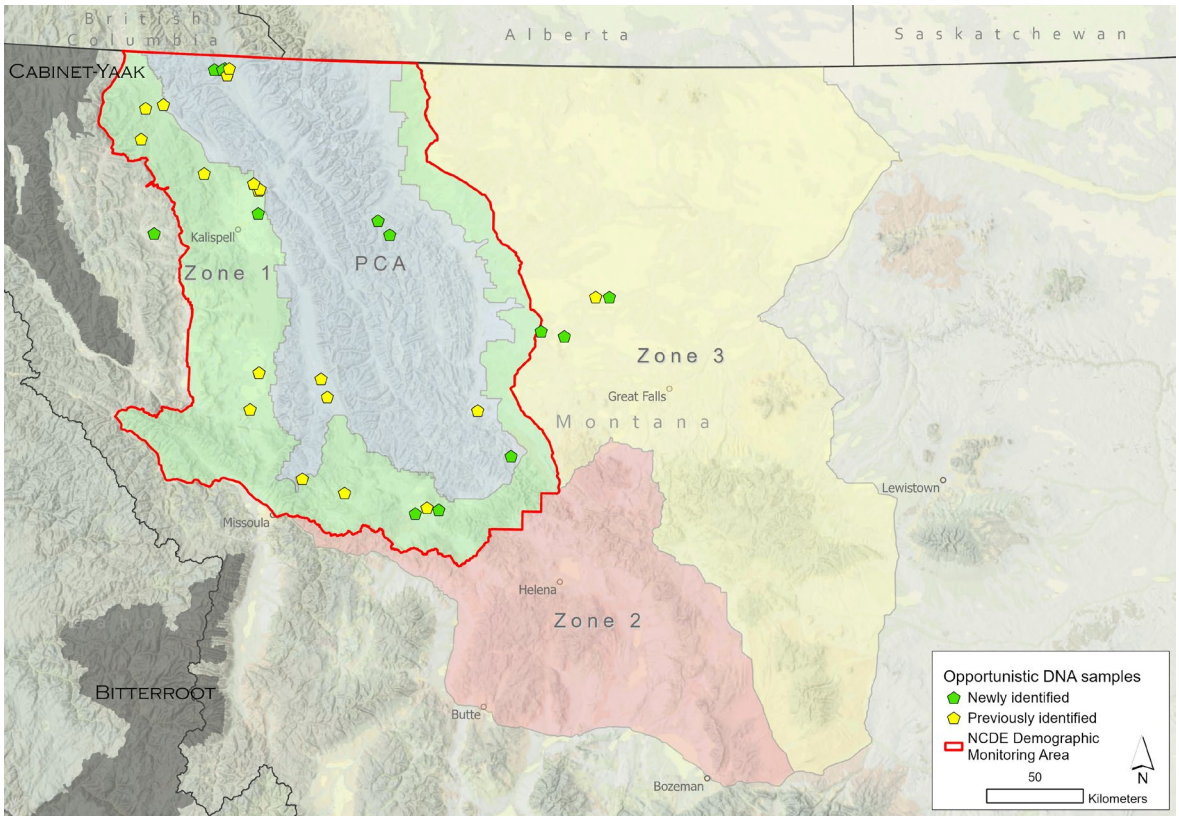

Fig. 3. Locations of opportunistic samples from grizzly bears successfully genotyped in the NCDE, 2023. Zones as described in Fig. 1.

EVALUATION OF CONSERVATION STRATEGY OBJECTIVES AND THRESHOLDS

The NCDE Conservation Strategy (NCDE Subcommittee 2019) articulated an overarching management goal to maintain a recovered, genetically diverse grizzly bear population throughout the DMA while maintaining demographic and genetic connections with Canadian populations and providing the opportunity for demographic and/or genetic connectivity with other ecosystems, with the following objectives and thresholds:

Objective 1: Maintain a well-distributed grizzly bear population within the DMA

- Occupancy threshold: Maintain the documented presence of females with offspring in at least 21 of 23 BMUs of the PCA and in at least 6 of 7 occupancy units of Zone 1 at least every 6 years.

Objective 2: Manage mortalities from all sources to support a ≥90% estimated probability that the grizzly bear population within the DMA remains above 800 bears, considering the uncertainty associated with all the demographic parameters.

- Independent female survival threshold: Using a 6-year running average, maintain estimated annual survival of independent females within the DMA to: (a) a rate of ≥ 0.90; and (b) a rate at or above the minimum level consistent with a projected ≥90%

probability that the population within the DMA will remain above 800 bears based on population modeling.

- Independent female mortality threshold: Using a 6-year running average, limit annual estimated number of total reported and unreported (TRU) mortalities of independent females within the DMA to: (a) a number that is ≤10% of the number of independent females estimated within the DMA based on population modeling; and (b) a number that is at or below the maximum level consistent with a projected ≥90% probability that the population within the DMA will remain above 800 bears based on population modeling.
- Independent male mortality threshold: Using a 6-year running average, limit annual estimated number of TRU mortalities of independent males within the DMA to a number that is ≤15% of the number of independent males estimated within the DMA based on population modeling.

Objective 3: Monitor demographic and genetic connectivity among populations

- Estimate spatial distribution of the NCDE grizzly bear population biennially.
- Identify the population of origin for individuals sampled inside and outside of the DMA to detect movements of individuals to and from other populations or recovery areas.

Methods

We documented presence of females with cub, yearling, or 2-year-old offspring within units, based on visual observations obtained from radio-marked females; verified remote camera photos; other verified visual observations; known or probable mortalities of family groups (death of the mother, dependent young, or both); and telemetry or GPS locations of radio-marked females known to have offspring. For Objective 1, the PCA component represented a continuation of the occupancy targets established within the Recovery Zone prior to delisting (USFWS 1993) and utilized the same BMUs (Fig. 4). The Zone 1 component utilized Occupancy Units (OUs) demarcated using established political boundaries (i.e., state/tribal boundaries and FWP regional boundaries) and the boundaries of the 2 Demographic Connectivity Areas (NCDE Subcommittee 2019).

We estimated survival of independent females within the DMA based on known-fate analysis of data collected from radio-marked female bears within the DMA (Costello et al. 2016). Analysis incorporated the time series of survival data from known-fate monitoring since 2004 and differentiated the most recent 6 years of data to compare to the threshold. We estimated numbers of TRU mortalities of independent female and male grizzly bears within the DMA and assessed thresholds using an average for the last 6 years. For each sex, the number of TRU mortalities was the sum of: the count of agency-sanctioned management removals; the count of known or probable deaths of bears wearing functional radio-transmitters (excluding those that were agency removals); and an estimate of the numbers of other mortalities that were or were not reported or discovered. To obtain these estimates, we summed mortalities of non-radioed bears reported by the public or discovered by agency personnel for each sex. If sex was unknown, it was randomly assigned. Because these counts represented some unknown fraction of the true

number, we applied reporting/discovery rates observed among deaths of radio-marked bears to inflate this count to an estimate of the numbers of reported plus unreported mortalities of non-radioed bears (Cherry et al. 2022, Costello et al. 2016).

Thresholds for Objective 2 were previously developed for a 6-year management period of 2019–2023 (NCDE Subcommittee 2019). To establish thresholds, we simulated population growth using observed vital rates (Costello et al. 2016) to year 2012 and then projected another 25 years using multiple levels of independent female survival (i.e., 0.90, 0.91, 0.92, 0.93, and 0.94), while holding independent male survival at 0.85. By constraining the models to maximum allowable mortality for males, the resulting female thresholds would be the most conservative values associated with meeting Objective 2. Under simulations for the 6-year management period of 2019–2023, the minimum threshold for independent female survival in 2023 was 0.92, the maximum threshold for the number of independent female mortalities in 2023 was 26, and the maximum threshold for the number of independent male mortalities in 2023 was 31 (NCDE Subcommittee 2019).

We estimated occupied range of the NCDE grizzly bear population by applying zonal analysis and ordinary kriging to 3 x 3-km cells with verified grizzly bear locations documented during a 15-year window up to the current year (Bjornlie et al. 2014). Verified locations used to determine occupancy of cells were collected from GPS transmitters; VHF telemetry flights; capture and mortality locations; human-grizzly bear conflict sites; verified observations (sightings or tracks) or remote camera photos confirmed by agency personnel; and opportunistic samples of grizzly bear hair, blood, scat, or tissue confirmed by DNA analysis. We screened GPS data to exclude all but one randomly selected location per bear per day. This ensured that GPS data were not overrepresented in the data set and were appropriately scaled to the daily activity radius used to determine grid size. We defined occupied range as an estimate of the roughly contiguous area within which bears have established residency or have demonstrated habitat use.

Cooperating with other agencies, we continued to collect data on verified outlier locations outside of occupied range, which was used to delineate known extent of grizzly bear occurrence, also known as the “may be present” map. For this analysis, 12-digit hydrologic unit-code watersheds (HUCs) were included if: they overlapped the estimated occupied range (above); they encompassed any verified location documented during the last 10 years; or they were adjacent to HUCs that encompassed verified outlier locations during the last 10 years (US Fish and Wildlife Service 2020).

DNA samples obtained during captures or at any of verified grizzly bear sites were analyzed for population of origin to document movement of individuals to and from other populations or recovery areas (Haroldson et al. 2010). Genetic samples were not submitted until the end of each field season, therefore there was typically a 1-year lag in reporting results for population of origin.

Results

During 2024, we verified presence of reproductive females within 20 of 23 BMUs (87%) and within 6 of 7 OUs (86%; Fig. 4). For the 6-year period 2019–2024, all 23 BMUS were occupied

by females with offspring, exceeding the objective of 21 of 23 BMUs occupied (Appendix D). All 7 OUs were occupied during the last 6 years, exceeding the objective of 6 of 7 OUs occupied. Using the 6-year occupancy thresholds for the PCA and Zone 1 have been met each year since 2006.

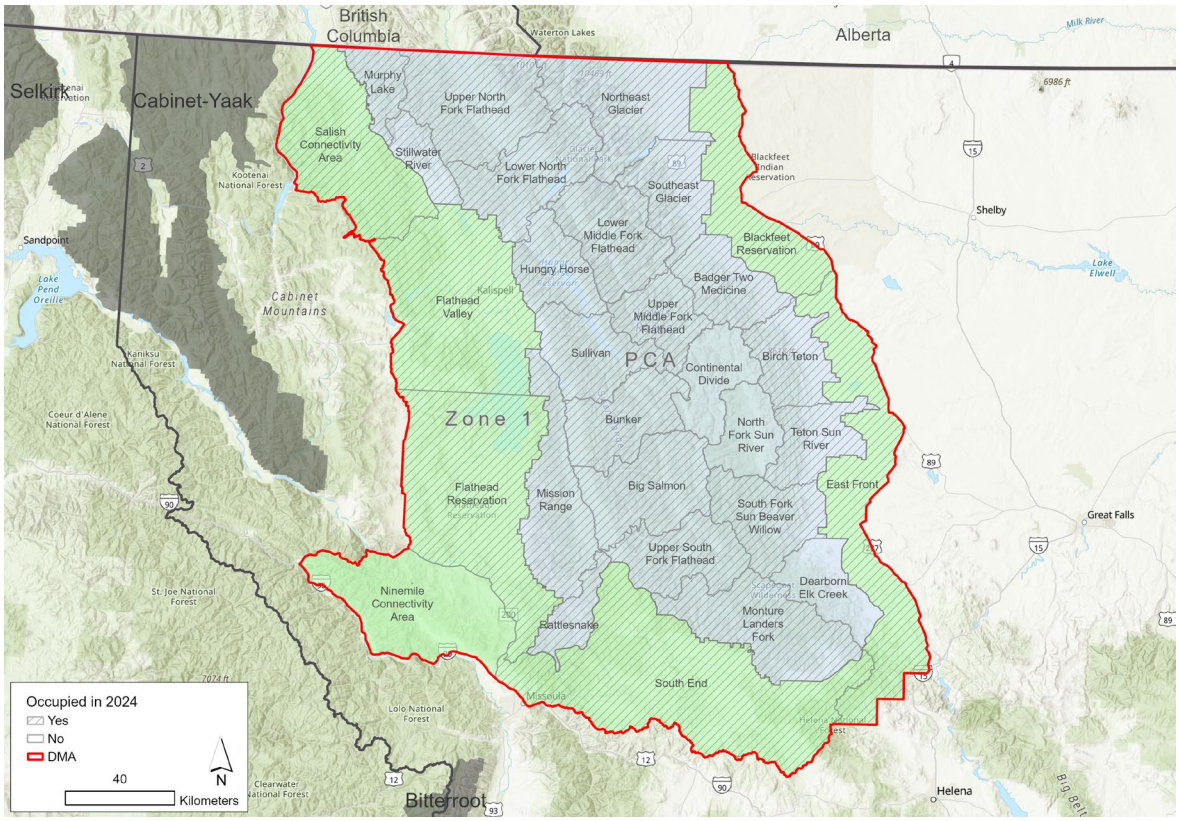

Fig. 4. Documented occupancy of female grizzly bears with offspring within 23 BMUs of the PCA and 7 OUs of Zone 1, 2024. Occupancy was documented in all units during the last 6 years. Zones as described in Fig. 1.

For the 6-year period 2018–2023, we estimated an annual survival rate of 0.93 (± 0.01 SE) for independent females within the DMA. Current population modeling has not been completed, and thresholds have not been established for 2024, but the observed survival rates exceeded the minimum threshold rates for 2018–2023 (NCDE Subcommittee 2019).

Within the DMA, there were 10 and 10 known mortalities reported for independent females and independent males during 2024, respectively (Table 2). One unknown sex bear was randomly assigned as male. We estimated the number of total reported and unreported (TRU) mortalities of independent bears within the DMA using these numbers and the reporting rates observed among radio-marked bears. We estimated 12 TRU mortalities of independent females and 15 TRU mortalities of independent males within the DMA (Table 3). During 2019–2024, the average annual number of TRU mortalities for independent females within the DMA was 14 and the average annual number for independent males was 19. Current population modeling has not been completed, and thresholds have not been established for 2024, but the observed numbers

of TRU mortalities fell below thresholds for 2018–2023 (NCDE Subcommittee 2019). A summary of all demographic objectives for 2019–2024 are reported in Appendix E.

Table 3. Summary of independent grizzly bear mortalities within the DMA, NCDE, 2024.

	Documented mortalities by method of discovery				Estimated reported and unreported[5] (C)	Estimated total mortality (A+B+C)
Sex	Agency Removal[1] (A)	Telemetry[2] (B)	Reported[3] (high)	Reported[4] (low)		
Female	4	0	6	0	8	12
Male	6	0	4	1	9	15
Total	10	0	10	1	17	27

1: count of agency removals, including those involving radio-marked bears. 2: count of deaths for bears wearing functional radio-transmitters, except for agency removals. 3: count of non-radioed bear deaths reported by the public or discovered by agency personnel with high reporting rates (defense-of-property, defense-of-life, train, automobile, hunting mistaken ID). 4: count of non-radioed bear deaths reported by the public or discovered by agency personnel with low reporting rates (poaching/malicious, natural, undetermined). 5: estimate of the total number of reported and unreported deaths of non-radioed bears (Cherry et al. 2002 and Costello et al. 2016).

Occupied range of the NCDE grizzly bear population was estimated for the period 2010–2024 and encompassed 62,608 km^2 (Fig. 5). It encompassed 100% of the PCA, 87% of Zone 1, 26% of Zone 2, and 26% of Zone 3. Of estimated occupied range, 37% was within the PCA, 27% was within Zone 1, and 36% was outside of the DMA. Nearly 4,500 km^2 of occupied range occurred outside of the NCDE Conservation Strategy Zones between the NCDE, CYE, and BE. The area of estimated occupied range increased by about 12% compared to the 2022 estimate, which encompassed 55,652 km^2. In 2024, we obtained verified outlier observations in the Sapphire, Anaconda, Beaverhead, Pioneer, Boulder (Bull), Highwood, Big Snowy, Moccasin, and Bear Paw Mountains, as well as in the Boulder, Teton, Milk, and Judith basins.

We completed genetic analysis of NCDE samples collected through 2023. We examined genotype, capture, and monitoring data in the NCDE and other recovery areas to document movements among ecosystems.

In 2024, no new evidence of movements between the NCDE and CYE was documented. However, CYE pedigree analyses provided the first observation of gene flow (observed reproduction by an immigrant) from the NCDE to the CYE (Fig. 6). The immigrant father was CYE Bear 737, a male that was previously reported to have moved from the NCDE to the CYE and set up residency there (Costello and Roberts 2021). The mother was identified as CYE Bear 784, a known resident monitored periodically between 2007 and 2022. The offspring was bear detected via photograph and an opportunistic DNA sample in 2023 and confirmed as a female (Wayne Kasworm, USFWS, personal communication).

In 2024, no additional information was obtained about movements between the NCDE and GYE. However, two subadult bears (1F, 1M) were translocated from the NCDE to the GYE in July 2024 to help improve genetic diversity. The female was released in the Bridger-Teton National Forest and the male was released in Yellowstone National Park. Despite some wide-ranging exploratory movements (especially by the female) both individuals remained relatively close to their release areas.

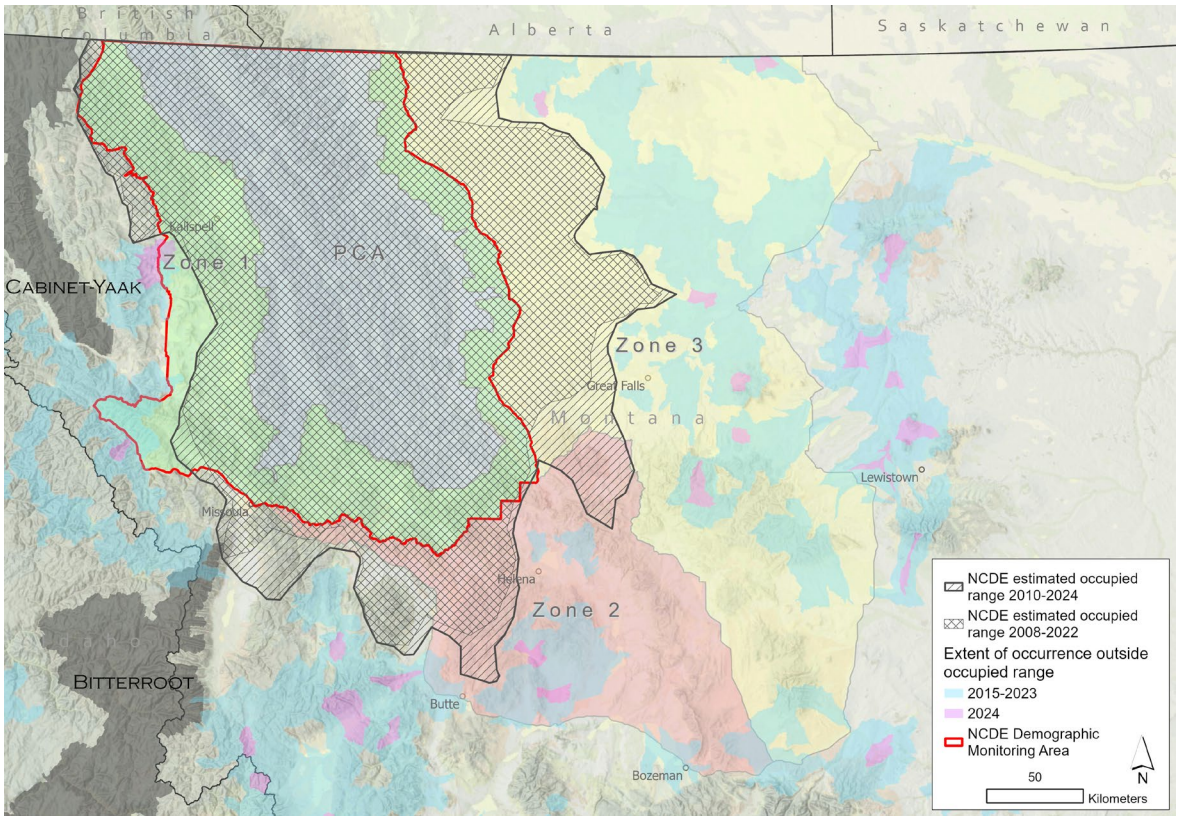

Fig. 5. Estimated occupied range of the NCDE grizzly bear population (2010-2024) and extent of occurrence in the surrounding areas (2015-2024). The previous estimate of occupied range (2008–2022) is shown for comparison and watersheds with verified outliers observed in 2024 are shown in purple. Zones as described in Fig. 1.

We documented parentage for a bear observed and photographed in the North Moccasin Mountains in central Montana in 2022 (Fig. 6). Photographs suggested the bear was a subadult and DNA collected at the site confirmed the bear was a male. Parentage analyses concluded that his likely mother (Bear 81288378) was an adult female who was last known alive in 2015 and whose home range was found along the Two Medicine River in Zone 3. His likely father (Bear 39054769) was an adult male who was observed in the same area and who died in 2021. The distance of this offspring's movement from his mother's home range center to the site of the photograph was 244 km.

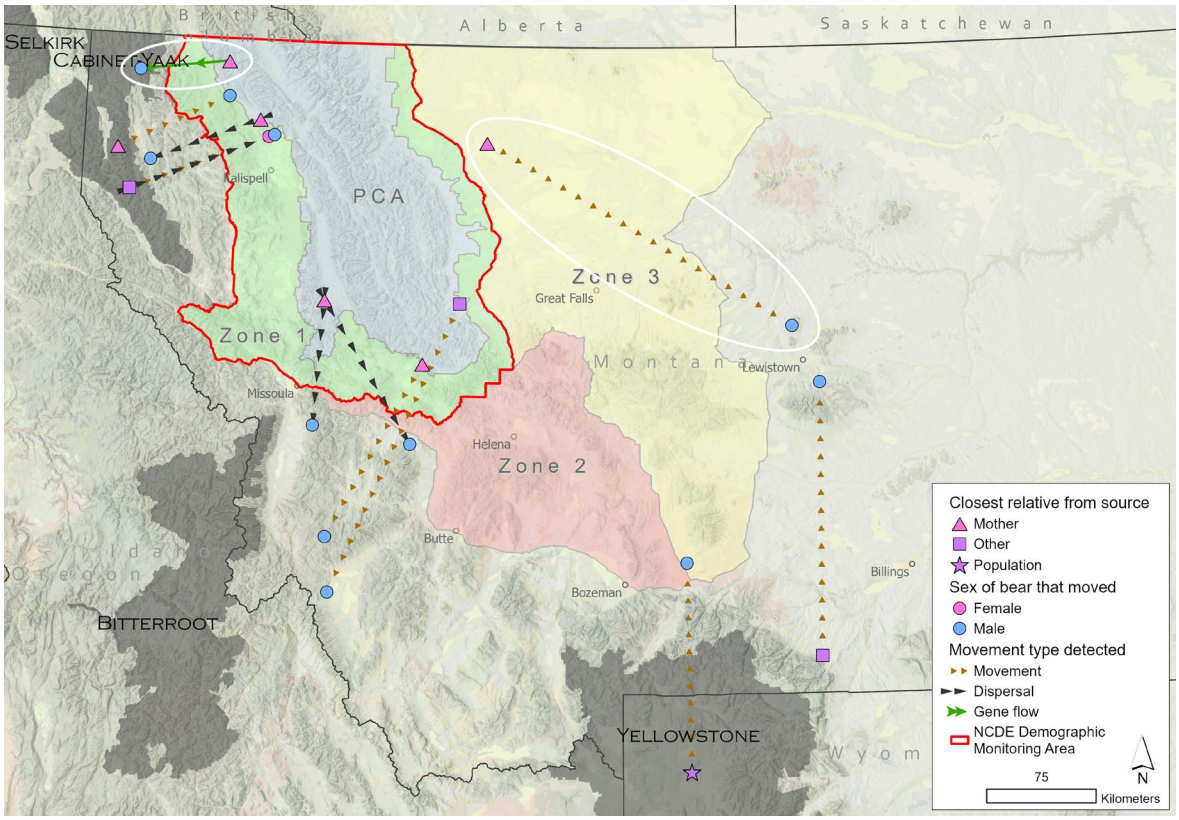

Fig. 6. Movements, dispersal, or gene flow to or from the Northern Continental Divide Ecosystem (NCDE) documented from genetic relationships and field data, 2010–2023. New information was obtained for two bears based on 2023 DNA results (white circles): the green arrow represents an adult male grizzly bear that was previously observed to have dispersed from the NCDE to the Cabinet-Yaak Ecosystem but was now documented to have produced an offspring; and the brown line represents a subadult male that was photographed in the North Moccasin Mountains in 2022 and genetically determined to be the offspring of a mother that resided in Zone 3. Zones as described in Fig. 1.

SUMMARY OF HUMAN-GRIZZLY BEAR CONFLICT PREVENTION AND RESPONSE

Methods

Our monitoring team agencies employ specialists involved in human-grizzly bear conflict prevention and response. We recorded data on agency responses to grizzly bears or human-grizzly bear conflict and preventative measures taken, as described in the Conservation Strategy (NCDE Subcommittee 2019).

Results

Agency management specialists responded to >233 incidents of human-grizzly bear conflict (Fig. 7, Table 4). Only conflicts resulting in capture or management removal were recorded for the Blackfeet Reservation. Conflicts involved an interaction between a grizzly bear and human in which bears either did, or attempted to, damage property, kill or injure livestock, damage beehives, injure people, or obtain anthropogenic foods, attractants, or agricultural

crops. The highest number of conflicts involved bears accessing unnatural foods (25%), with garbage and pet or livestock feed accounting for the highest proportions. Other unnatural foods included anthropogenic foods, bird feeders, garden fruit, compost, deer food, and grease traps. Depredation or attempted depredation events accounted for 24% of conflicts, with chicken/poultry and cattle incidents occurring most frequently. Other events involved sheep, pigs, and a dog. Property damage accounted for 18% of conflicts, with most incidents involving grizzly bears breaking into buildings (e.g., sheds, garages, barns) attempting to access unnatural foods. Other property damage involved vehicles, campers, enclosures, a dog kennel, and an unoccupied tent. Human interactions represented 17% of conflicts. These included public reports of aggressive encounters, habituated bears, two minor injuries occurring during surprise encounters, shootings in frontcountry and backcountry settings, and one bear attempting to enter an occupied residence. Agricultural damage accounted for 16% of conflicts. Damage included stored grain, beehives, crops, and fruit/gardens.

Table 4. Summary of human-grizzly bear conflicts in the NCDE and surroundings, 2024.

Category	Detail	BIR[1]	FIR	FWP R1	FWP R2	FWP R3	FWP R4	GNP	Total
Unnatural foods	Garbage/waste site			17	5				22
	Pet/livestock feed			8	2	2	7		19
	Other			5			4	1	11
	Subtotal			30	7	2	12	1	51
Depredation	Chickens/poultry		2	20	1		2		25
	Cattle	4		2	4		9		19
	Other			1	1		3		5
	Subtotal	4	2	23	6		14		49
Property damage	Building			16	3		6		25
	Other	1		5	3		3	1	13
	Subtotal	1		21	6		9	1	38
Human interaction	Aggressive encounter			7	1		10		18
	Habituation			8			2		10
	Other			3	1		2	2	8
	Subtotal			18	2		14	2	36
Agricultural damage	Stored grain			7	1		13		21
	Other						11		11
	Subtotal			7	1		24		31
Total		5	2	99	22	2	72	4	206

1: only data associated with captures or mortalities were reported.

Numbers of conflict incidents were highest within FWP Region 1. Numbers of conflicts were low on the Flathead Reservation and in Glacier National Park. Most (75%) of conflicts occurred within the DMA, with similar proportions in the PCA (38%) and Zone 1 (36%). Twenty-two percent of conflict occurred in Zone 3 and 3% occurred outside of NCDE Conservation Strategy Zones.

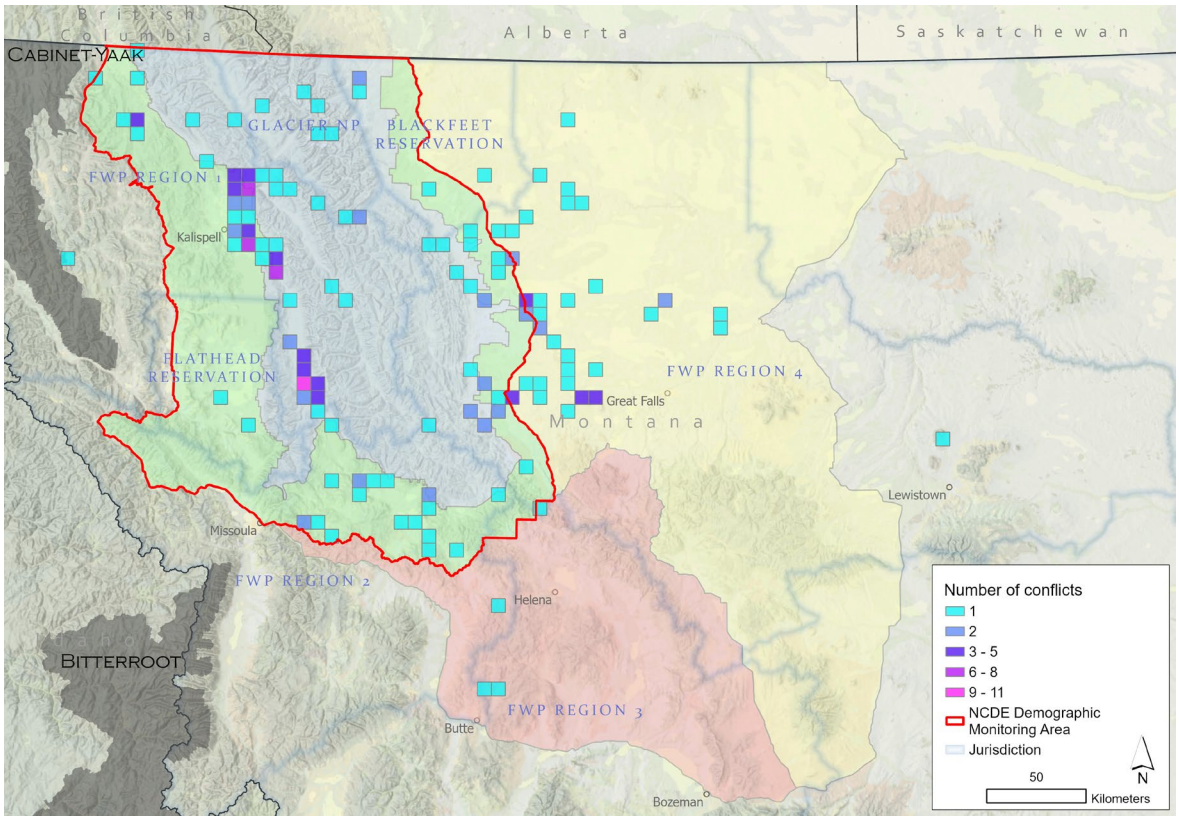

Fig. 7. General distribution of reported human-grizzly bear conflicts in the NCDE and surroundings, 2024. Colors correspond to counts of conflicts recorded within 7 km × 7km grid cells. Zones as described in Fig. 1.

Bear managers also responded to >95 other reports or complaints, where bears were near people, homes, or other property, but not involved in conflict behavior (Table 5). Proactively and when responding to conflicts, agency management specialists took >631 actions, including providing education and outreach; securing attractants (sometimes with electric fence); removing attractants (including carcass removal); monitoring (usually with remote cameras); hazing or use of scare devices; posting of warnings or temporary closures; and issuing warnings for violations related to food storage or feeding wildlife (Table 6). Management specialists took 48 capture or removal actions, including: preemptively capturing bears to prevent conflict; relocating bears to prevent or in response to conflict, and removing bears involved in conflicts (Table 8). Two cubs were relocated when their mother was removed for conflict. Another cub was live-captured and taken into captivity when its mother was killed in a defense of life incident. All three of these cubs were counted as mortalities (Table 2).

Table 5. Summary of reports or complaints where grizzly bears were near people or property but not involved in conflict behavior in the NCDE and surroundings, 2024.

Category	Detail	BIR[1]	FIR	FWP R1	FWP R2	FWP R4	Total
Bear near people or home	Naturally			14	7	19	40
	Known or possible attractants	1	1	13	10	6	31
Bear near other property	Livestock				6	5	11
	Boneyard or carcass			2	6	2	10
	Spilled grain					2	2
	Other property					1	1
Total		1	1	29	29	35	95

1: only data associated with captures or mortalities were reported.

Table 6. Summary of non-capture management actions taken to reduce human-grizzly bear conflict, NCDE and surroundings, 2024.

Event	Education/ outreach	Secured/ removed attractants	Patrolled/ monitored/ cameras	Hazed/ scare device	Posted warning/ closure	Warning/ citation	Total
Proactive	10	15	5				30
Report/complaint	77	28	45	20	11	2	183
Conflict	140	149	95	27	7		418
Total	227	192	145	47	18	2	631

Table 7. Summary of management-related captures or removals of grizzly bears, NCDE and surroundings, 2024.

	Released onsite		Relocated		Removed		
Event type	**AD/SA**	**CB/YR**	**AD/SA**	**CB/YR**	**AD/SA**	**CB/YR**	**Total**
Preemptive	1		3				4
Non-target	2		5				7
Conflict	1	2	15	4	12		34
Orphaned cub				2		1	3
Total	4	2	23	6	12	1	48

SUMMARY OF OTHER RESEARCH AND MONITORING

During 2024, members of the NCDE trend monitoring program were also involved in other research projects related to grizzly bears in the NCDE, Montana, and elsewhere.

With collaborators from the IGBST, USGS, and USFWS, we published a paper describing a technique for remotely detecting litter production by grizzly bears and polar bears based on movement patterns in the first few weeks after den emergence (Andersen et al. 2025).

With collaborators from the CYE, IGBST, and Gates of the Arctic National Park and Preserve, we submitted two manuscripts that are in review. The first described a method for detecting presence and timing of parturition events from activity data collected by GPS radio-

collars (Roberts et al. *In review*). The second tested two hypotheses for explaining the ultimate factor determining birth timing in grizzly bears (Costello et al. *In review*). We completed analyses and began preparing a manuscript on our investigation into use of grain bins by grizzly bears along the Rocky Mountain Front of the NCDE. We continued analyses on grizzly bear dispersal behavior in the NCDE, based on known and DNA-based parentage. We continued analyses on grizzly bear habitat selection in response to forest disturbance. The first part of this project aims to address if grizzly bears select or avoid forest disturbance patches (both harvested and burned patches); how selection (or avoidance) is mediated by spatial/temporal characteristics of disturbance patches; and how these patterns are influenced by variation in availability of forest disturbance within individual grizzly bear home ranges. This work is part of a PhD project at the University of Montana. We continued our collaboration with Birchdale Ecological to analyze responses and outcomes associated with residential human-grizzly bear conflicts in the NCDE and nearby populations in British Columbia. Collaborating with IGBST and USFWS, we continued the ongoing effort to collect, verify, and compile records of outlier grizzly bear observations.

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APPENDICES

Appendix A. Fates of radio-monitored grizzly bears captured for trend monitoring within the DMA or for other purposes inside and outside of the DMA, NCDE, 2024.

Sample	Bear ID	DMA	Independent	Age	Collared fate
Trend	207706	Yes	Yes	6	Alive
Trend	11027854	Yes	Yes	12	Alive
Trend	39036349	Yes	Yes	16	Censored
Trend	41330870	Yes	Yes	6	Censored
Trend	41519364	Yes	Yes	16	Censored
Trend	41580379	Yes	Yes	16	Censored
Trend	55597781	Yes	Yes	14	Alive
Trend	79597603	Yes	Yes	17	Censored
Trend	81279041	Yes	Yes	13	Alive
Trend	97605011	Yes	Yes	17	Alive
Trend	97616524	Yes	Yes	23	Censored
Trend	601610593	Yes	Yes	15	Censored
Trend	605562595	Yes	Yes	4	Alive
Trend	605564553	Yes	Yes	14	Censored
Trend	605565880	Yes	Yes	7	Alive
Trend	605567617	Yes	Yes	10	Censored
Trend	605570788	Yes	Yes	14	Censored
Trend	605572582	Yes	Yes	6	Alive
Trend	605574067	Yes	Yes	6	Censored
Trend	605578072	Yes	Yes	6	Alive
Trend	605579378	Yes	Yes	11	Alive
Trend	605579539	Yes	Yes	2	Censored
Trend	606612073	Yes	Yes	4	Alive
Trend	606612110	Yes	Yes	4	Censored
Trend	606612565	Yes	Yes		Alive
Trend	606612830	Yes	Yes	8	Alive
Trend	606613057	Yes	Yes	3	Alive
Trend	606615630	Yes	Yes	13	Alive
Trend	606845087	Yes	Yes	6	Alive
Trend	839831892	Yes	Yes	12	Alive
Trend	839843603	Yes	Yes	8	Alive
Trend	842014813	Yes	Yes	13	Censored
Trend	842029879	Yes	Yes	5	Censored
Trend	605559850	Yes	Yes	5	Censored
Trend	605567803	Yes	Yes	18	Censored
Other	605568068	No	Yes	4	Censored
Trend	605572790	Yes	Yes	2	Censored
Trend	605575053	Yes	Yes	10	Censored

Sample	Bear ID	DMA	Independent	Age	Collared fate
Trend	606616305	Yes	Yes	2	Censored
Trend	606616346	Yes	Yes	6	Alive
Other	11023062	Yes	Yes	4	Censored
Other	18076565	Yes	Yes	15	Alive
Other	95636784	Yes	Yes	18	Censored
Other	601604325	Yes	Yes	4	Censored
Other	604521558	No	Yes	7	Alive
Other	605559000	Yes	Yes	6	Alive
Other	605559048	Yes	Yes	8	Alive
Other	605561265	Yes	Yes	17	Dead
Other	605563809	Yes	Yes	15	Alive
Other	605566022	Yes	Yes	4	Censored
Other	605569812	Yes	Yes	7	Censored
Other	605570876	Yes	Yes	13	Censored
Other	605572605	Yes	Yes	2	Alive
Other	605575821	Yes	Yes	6	Alive
Other	605577544	Yes	Yes	7	Censored
Other	605633311	No	Yes	2	Censored
Other	606612526	Yes	Yes	2	Alive
Other	606612527	No	Yes	4	Alive
Other	606612769	Yes	No	1	Dead
Other	606615550	Yes	Yes	3	Alive
Other	606840028	Yes	Yes	2	Censored
Other	606848792	No	Yes	10	Alive
Other	41360823	Yes	Yes	25	Alive
Other	601582786	No	Yes	5	Censored
Other	601623097	Yes	Yes	12	Censored
Other	605561592	Yes	Yes	6	Censored
Other	605564622	No	Yes	2	Dead
Other	605571121	Yes	Yes	6	Alive
Other	606612528	Yes	Yes	4	Alive
Other	606612795	Yes	No	1	Censored
Other	606616290	No	Yes	5	Alive
Other	606838805	Yes	Yes	2	Censored
Other	606841073	Yes	Yes	4	Censored
Other	606843514	No	Yes	2	Alive
Other	607800314	No	Yes	3	Dead
Other	842008298	Yes	Yes	5	Censored
Other	NCDE202401	Yes	Yes	5	Dead

1: fate (last known within year): Alive = alive and wearing transmitter; Censored = alive when transmitter was cast, removed or failed; Dead = died wearing transmitter; Lost = lost contact with transmitter.

Appendix B. Observed reproductive status and offspring mortality for adult (≥4 years old) female grizzly bears radio-monitored in the NCDE, 2024.

Sample	Bear ID	Age	Status	Litter size	Offspring mortality	Multiple observations	Date first observed	Status previous year (if known)	Litter size previous year (if known)
Trend	605572582	6	None				4/18/2024	None	
Trend	605579378	11	Yearling	2	1	Yes	4/18/2024	Cub	2
Trend	39036349	16	2-year-old	3	0	Yes	4/20/2024	Yearling	3
Trend	839843603	8	Yearling	3	0	Yes	5/23/2024		
Trend	839831892	12	Yearling	1	2	Yes	5/27/2024		
Trend	79597603	17	Yearling	3		No	6/2/2024	CB	3
Trend	842014813	13	Yearling	2	0	Yes	6/2/2024	CB	2
Trend	601610593	15	None				6/2/2024	Cub	2
Trend	97616524	23	Yearling	2	0		6/2/2024	Cub	3
Trend	606845087	6	Cub	3	3	Yes	6/2/2024	None	
Trend	41330870	6	Cub	2	1	Yes	6/2/2024	None	
Trend	41580379	16	Cub	2	0	Yes	6/2/2024	Yearling	2
Trend	605570788	14	Cub	2	0	Yes	6/20/2024	None	
Trend	41519364	16	Cub	2	0	Yes	6/20/2024	None	
Trend	605564553	14	Cub	2	0	Yes	6/20/2024	None	
Trend	11027854	12	Cub	2	0	Yes	6/26/2024	None	
Trend	605574067	6	Cub	2	0	Yes	6/26/2024	None	
Trend	605578072	6	None				7/27/2024		
Trend	55597781	14	Cub	2	0	Yes	8/15/2024		
Trend	606612830	8	None				8/15/2024		
Trend	606612565		None				8/26/2024		
Trend	606612073	4	None				8/30/2024		
Trend	97605011	17	Cub	1	0	Yes	9/11/2024		
Trend	606615630	13	Cub	1	0	Yes	9/12/2024		
Trend	605565880	7	Cub	1	0	Yes	9/19/2024		
Trend	606612110	4	None				10/4/2024		
Trend	81279041	13	None				10/8/2024		
Trend	207706	6	None				10/30/2024		

Sample	Bear ID	Age	Status	Litter size	Offspring mortality	Multiple observations	Date first observed	Status previous year (if known)	Litter size previous year (if known)
Other	605559048	8	Yearling	1	1	Yes	4/17/2024	Cub	2
Other	842029879	5	Yearling	2		No	4/27/2024	Cub	2
Other	605561265	17	2-year-old	3			4/28/2024	Yearling	3
Other	605577544	7	None				5/4/2024	None	
Other	601604325	4	None				5/4/2024	None	
Other	605570876	13	None				5/4/2024	Yearling	2
Other	606848792	10	Cub	3	0	Yes	6/2/2024	None	
Other	605566022	4	Cub	2	2	Yes	6/20/2024	None	
Other	95636784	18	Cub	2	0	Yes	6/26/2024		
Other	606612527	4	None				7/29/2024		
Other	18076565	15	Cub	3		No	9/6/2024		
Other	605575821	6	None				9/18/2024	None	

Appendix C. Known and probable grizzly bear mortalities in the NCDE, 2024.

Date	Date accuracy	Certainty of death	Sex[1]	Age Class[2]	Age	Collared	Bear ID	Zone	Cause of death
3/25/2024	Day	Known	M	AD	5	Yes		PCA	Agency removal-depredation
4/25/2024	Day	Known	F	AD	14	No		Zone 2	Public-DOL
4/26/2024	Day	Known	M	CB	0	No		Zone 2	Agency removal-orphaned-DOL
4/26/2024	Day	Known	M	AD		No		PCA	Agency removal-depredation
5/11/2024	Day	Known	M	AD	17	No	76590799	PCA	Agency removal-depredation
5/19/2024	Day	Known	M	AD	7	No		Zone 1	Under investigation
5/29/2024	Day	Known	M	AD	19	No		PCA	Public-hunter mistaken ID
6/12/2024	Day	Known	F	AD	17	Yes	605561265	PCA	Under investigation
6/19/2024	Day	Known	F	AD	8	No	41089770	Zone 1	Accidental-Automobile
6/19/2024	2 weeks	known	U	AD		No		Zone 3	Undetermined
6/27/2024	Day	Known	F	YR	1	Yes	606612769	PCA	Accidental-Train
7/1/2024	Month	Known	M	SA	5	No		PCA	Undetermined
7/2/2024	Day	Known	F	YR	1	No		Zone 1	Agency removal-injury/disease
7/18/2024	Day	Known	F	AD	8	No	841893020	PCA	Public-DOL
7/18/2024	Day	Probable	U	CB	0	No		PCA	Orphaned-DOL
7/18/2024	Day	Probable	U	CB	0	No		PCA	Orphaned-DOL
7/18/2024	Day	Probable	U	CB	0	No		PCA	Orphaned-DOL
7/24/2024	Day	Known	M	AD		No		PCA	Agency removal-depredation
7/29/2024	Day	Known	F	SA		No	606612527	PCA	Agency removal-Augmentation
7/30/2024	Day	Known	M	SA	5	No	606616290	PCA	Agency removal-Augmentation
8/13/2024	Day	Known	M	AD	15	No	41086114	Zone 1	Agency removal-depredation
8/28/2024	Day	Known	F	2YO	2	No		Zone 1	Accidental-Automobile
8/28/2024	Day	Known	F	2YO	2	No		Zone 3	Poached-malicious
8/28/2024	Day	Known	M	2YO	2	No		Zone 3	Poached-malicious
8/29/2024	Day	Known	M	SA	3	Yes	607800314	Zone 2	Agency removal-Food/property/habituation
8/30/2024	Day	Known	F	AD	9	No	841793853	PCA	Agency removal-Food/property/habituation
9/16/2024	Day	Known	M	2YO	2	Yes	605564622	Outside	Agency removal-Food/property/habituation

Date	Date accuracy	Certainty of death	Sex[1]	Age Class[2]	Age	Collared	Bear ID	Zone	Cause of death
9/20/2024	Day	Known	M	AD	4	No	601582786	Zone 3	Public-hunter mistaken ID
10/1/2024	Day	Known	F	AD		No		PCA	Accidental-Automobile
10/1/2024	Previous year-fall	Known	U	AD		No		Zone 1	Accidental-Automobile
10/14/2024	Day	Known	F	2YO	2	No		PCA	Accidental-Automobile
10/21/2024	Day	Known	F	2YO	2	No	606613047	PCA	Agency removal-Food/property/habituation
11/2/2024	Day	Known	M	AD	15	No	55586863	Zone 1	Public-DOL
11/18/2024	Day	Known	F	AD	18	No	95636784	Zone 2	Agency removal-Food/property/habituation
11/18/2024	Day	Probable	M	CB	0	No	605567123	Zone 3	Agency removal-Food/property/habituation
11/18/2024	Day	Probable	M	CB	0	No	606613074	Zone 4	Agency removal-Food/property/habituation

1: F = female, M = male, U = unknown sex

2: AD = adult (≥4 years old), SA = subadult (2–3 years old), YR = yearling (1 year old), CB = cub (<1 year old)

Appendix D. Observed occupancy of 23 Bear Management Units within the PCA and 7 Occupancy Units within Zone 1 by female grizzly bears with offspring, 2019–2024. Units known occupied during a given year are signified by the symbol ×. Twenty-three of 23 BMUs and 7 of 7 OUs were occupied during a 6-year period ending with 2024.

Bear Management Unit (PCA)	2019	2020	2021	2022	2023	2024
Murphy Lake		×		×	×	×
Upper North Fork Flathead	×	×	×	×	×	×
Northeast Glacier	×	×	×	×	×	×
Stillwater River	×	×	×	×	×	×
Lower North Fork Flathead	×	×	×	×	×	×
Hungry Horse	×	×	×			×
Lower Middle Fork Flathead	×	×	×	×	×	×
Southeast Glacier	×	×	×	×	×	×
Sullivan	×	×	×	×	×	×
Upper Middle Fork Flathead				×	×	×
Badger Two Medicine	×	×		×	×	×
Mission Range	×	×	×	×	×	×
Bunker	×	×	×		×	×
Continental Divide		×		×		
Birch Teton	×	×	×		×	×
Big Salmon	×	×	×	×	×	×
North Fork Sun River	×	×		×	×	×
Teton Sun River	×	×	×	×	×	×
Rattlesnake			×			×
Upper South Fork Flathead			×			×
South Fork Sun Beaver Willow	×	×	×	×	×	×
Monture Landers Fork	×	×	×	×	×	×
Dearborn Elk Creek	×	×	×	×	×	
Occupied during year	18	20	18	18	19	20
Occupied during last 6 years	22	23	23	23	23	23
Occupancy Unit (Zone 1)						
Salish Connectivity Area	×	×	×	×	×	×
Flathead Valley	×	×	×	×	×	×
Flathead Reservation	×	×	×	×	×	×
Ninemile Connectivity Area	×	×				
South End	×	×	×	×	×	×
East Front	×	×	×	×	×	×
Blackfeet Reservation	×	×	×	×	×	×
Occupied during year	7	7	6	6	6	6
Occupied during last 6 years	7	7	7	7	7	7

Appendix E. Thresholds and observed estimates for demographic objectives described in the 2019 Conservation Strategy, 2019–2024. Parameters include occupancy of females with offspring within 23 Bear Management Units (BMUs) in the Primary Conservation Area (PCA) and 7 Occupancy Units (OUs) in Zone 1, tallied over the last 6 years; survival rate of independent females within the Demographic Monitoring Area (DMA) averaged over the last 6 years; and numbers of total reported and unreported (TRU) mortalities of independent female and male grizzly bears within the DMA averaged over the last 6 years.

Parameter	Area or Sex	Threshold/ observed	Year					
			2019	2020	2021	2022	2023	2024
Occupancy	PCA (BMUs)	Minimum	21	21	21	21	21	21
		Observed	22	23	23	23	23	23
	Zone 1 (OUs)	Minimum	6	6	6	6	6	6
		Observed	7	7	7	7	7	7
Survival rate	Female	Minimum	0.93	0.93	0.93	0.92	0.92	
		Observed	0.94	0.93	0.93	0.93	0.93	0.93
TRU mortalities	Female	Maximum	23	24	25	25	26	
		Observed	16	13	15	15	16	14
	Male	Maximum	29	29	30	30	31	
		Observed	21	21	23	25	22	19