A Summary of Grizzly Bear Distribution in the Lower 48 US States in 2024

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INTRODUCTION

Understanding the distribution of grizzly bear populations in the lower 48 states can support their conservation and management and increase public safety. Previously, our research teams working in grizzly bear ecosystems in the lower 48 states used varying methods to estimate distribution of grizzly bear populations. In the Greater Yellowstone Ecosystem (GYE) and Northern Continental Divide Ecosystem (NCDE), zonal analysis and ordinary kriging were applied to an array of grid cells with or without verified presence of grizzly bears, however the parameters of the methods varied between the two ecosystems. In the Cabinet-Yaak Ecosystem (CYE) and the Selkirk Ecosystem (SE), population distribution was mapped as the Recovery Zone plus "bears outside of Recovery Zone" areas (Allen 2011). Additionally, the U.S. Fish and Wildlife Service developed a method for estimating areas where grizzly bears "may be present" to help agencies or prospective applicants evaluate whether or not proposed actions may affect grizzly bears (U. S. Fish and Wildlife Service 2020). Since the mid 2010s, cooperating agencies have collaborated in documenting verified outlier observations that occur between or well outside of grizzly bear Recovery Zones and these data inform the "may be present" mapping (U. S. Fish and Wildlife Service 2020).

Following preliminary analyses and a joint meeting in 2022, we developed guidance for consistent methods to use across all grizzly bear ecosystems in the lower 48 states. First, we defined two levels of distribution: occupied range and extent of occurence.

> ***Occupied range*** is an estimate of the roughly contiguous, minimum area within which grizzly bears have established residency or have demonstrated habitat use. It does not include occasional forays outside the estimated range or low-density peripheral areas and therefore does not represent the total known extent of occurrences. The area of occupied range is estimated using methods described by Bjornlie et al. (2014) and are detailed below. Due to the smoothing inherent in the methods, range edges may extend over features that might act as partial barriers to grizzly bear movement, such as Interstate Highway 90 or Lake Koocanusa. Range estimates for neighboring populations may also overlap, but this does not represent evidence of genetic or demographic connectivity.

Extent of occurrence is an estimate of the larger area over which grizzly bears have been observed to occur. It encompasses peripheral areas of low density, areas where bear may have made occasional temporary forays, and areas through which bears may be dispersing or newly colonizing. This area is represented by "may be present" mapping (U.S. Fish and Wildlife Service 2020).

METHODS

Occupied Range

We estimated grizzly bear occupied range for each of four populations using the methods, grid cell size, and window length developed by Bjornlie et al. (2014) for use in the GYE. The basis for analysis of occupied range was the documented presence of grizzly bears within an array of grid cells. Presence data included: known locations of captures, mortalities, human-grizzly bear conflicts, and field collection of hair samples attributed to grizzly bears through DNA analysis; Very High Frequency (VHF) and Global Positioning System (GPS) locations from radio-monitored bears; and locations of sightings or tracks reported or verified by experienced agency personnel from strong descriptive or photographic evidence.

We screened data from GPS collared bears. Unlike other data sources that rarely include more than one location per individual per day, GPS data sets included as many as 48 locations per individual per day. To account for this sizable difference in data frequency, GPS data for each individual were screened to exclude all but one randomly selected location 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 the grid size.

We also screened data from bears that were relocated as a response to human-bear conflict or for population augmentation. After relocation, bears often wander widely, because they are trying to return to their original area or are searching for a suitable place to settle. To reduce the effect of these human-influenced movements on occupied range estimates, we excluded post-relocation data if locations were outside of previous estimates of occupied range and they were either: (1) outside of either the bear's known home range or a circular area around the capture site with a radius equal to the mean home-range radius (NCDE: 12 km for females, 21 km for males), indicating they had not successfully returned to their place of origin; or (2) they were wide-ranging and not concentrated (i.e., did not resemble a newly-established home range).

The one location per day-screening of GPS locations helped reduce the influence of occasional long-range, single-track excursions made by GPS-collared bears (not associated with relocation). If, however, unusual excursions unduly distorted the extent of occupied range, we excluded those locations

Grizzly bears are a long-lived species that occur at low densities and due to small sample sizes, a single year of data from observations and radio-collaring efforts cannot accurately represent occupied range. Bjornlie et al. (2014) recommended that location data be pooled over a 15- to 20-year period to ensure the data provide an accurate representation of grizzly bear occupied range. We used a 15-year moving window for the GYE and NCDE populations, in which data from the 15-year period ending with the reporting year were combined for occupied range estimation. For example, for the reporting year 2024, data were combined from 2010 through 2024. Due to the smaller population size and resulting smaller available data sets, we used a 20-year moving window for the CYE and SE populations.

For each population, we overlaid a 3x3-km grid using ArcGIS (Esri, Redlands, California) and assigned a value of 1 to cells with documented grizzly bear presence within the time window. The grid was projected in the Universal Transverse Mercator (UTM) coordinate system, North American Datum (NAD), Zone 12

North, and resulting area estimates were based on this projection. The 3x3-km cell size was selected to represent the area used by a male grizzly bear within a day (Bjornlie et al. 2014), as estimated by roughly doubling the mean daily activity radii measurements for males: 1.4 km for the GYE, 1.3 km for the NCDE, and 1.2 km for the CYE and SE.

We used zonal analysis to assign new values to each grid cell as the sum of that cell and its eight nearest-neighbor cells (i.e., range = 0 to 9). We then applied ordinary kriging to these summed values to obtain a smoothed area within which summed values were generally ≥1.

We reported estimated occupied range relative to Recovery Zones for the GYE, NCDE, CYE and SE (U S. Fish and Wildlife Service 1993); and relative to Demographic Monitoring Areas for the GYE (U. S. Fish and Wildlife Service 2009) and the NCDE (NCDE Subcommittee 2021). Estimated occupied range for the SE included areas outside of the United States in British Columbia, Canada, due to the establishment of a transboundary Recovery Zone. Estimated occupied range estimates for the NCDE and CYE were truncated at the Canadian border, corresponding to Recovery Zone boundaries occurring only within the United States.

Extent of occurrence

We delineated the "may be present" area based on 12-digit hydrologic unit code (HUC) boundaries (U.S. Fish and Wildlife Service 2020). We included HUCs if: they overlapped the estimated occupied range ; they encompassed any GPS locations outside of occupied range during the last 10 years; they encompassed verified outlier locations documented during the last 10 years; or they were adjacent to HUCs that encompassed verified outlier locations during the last 10 years. Twelve digit HUCs are, on average, 40–162 km^2 and approximate the annual home-range size of adult female grizzly bears (27–242 km^2). The larger area including adjacent HUCs approximates the home range of adult male grizzly bears (78–2,115 km^2).

RESULTS

Occupied range

GYE – The 2024 estimate of occupied range was 67,608 km^2, with 44,132 km^2 within Wyoming, 17,681 km^2 within Montana, and 5,755 km^2 within Idaho (Justin Dellinger, Wyoming Game and Fish Department, written communication, 2 May 2025). This current estimate encompassed 100% of the GYE Recovery Zone and 97% of the GYE Demographic Monitoring Area. Of estimated occupied range, 35% was inside the Recovery Zone, 36% was outside the Recovery Zone but inside the DMA, and 29% was outside the DMA. The area of occupied range was slightly smaller than the 2022 estimate, which encompassed 70,101 km^2 (-3.5% change).

NCDE – The 2024 estimate of occupied range for the NCDE grizzly bear population was 62,287 km^2 within Montana (Costello et al. 2025). This current estimate encompassed 100% of the NCDE Recovery Zone and 93% of the NCDE Demographic Monitoring Area (DMA). Of estimated occupied range, 37% was within the Recovery Zone, 27% was within Zone 1 (outside the Recovery Zone but inside the DMA), and 36% was outside of the DMA. The area of estimated occupied range increased by about 12% compared to the 2022 estimate, which encompassed 55,652 km^2.

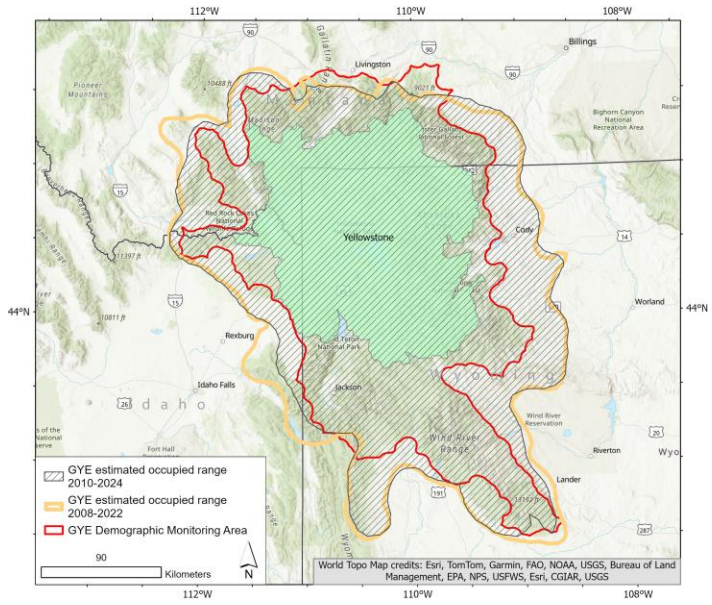

Figure 1. Estimated occupied range of the grizzly bear population in the Greater Yellowstone Ecosystem (GYE) during 2010–2024 (hatched area) compared with 2008–2022 (yellow boundary). The solid green polygon represents the GYE Grizzly Bear Recovery Zone (U. S. Fish and Wildlife Service 1993).

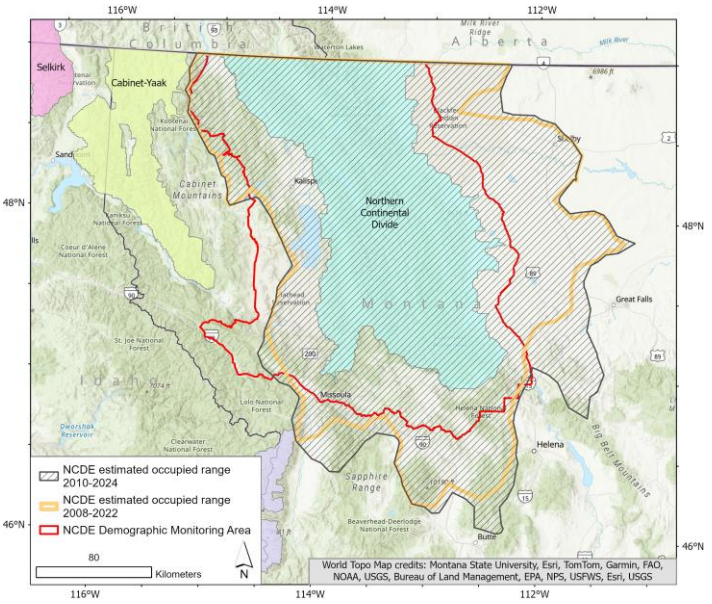

Figure 2. Estimated occupied range of the grizzly bear population in the Northern Continental Divide Ecosystem (NCDE) during 2010–2024 (hatched area) compared to 2008–2022 (yellow boundary). The solid color polygons represent Grizzly Bear Recovery Zones (U. S. Fish and Wildlife Service 1993).

CYE – The 2024 estimate of occupied range for the CYE grizzly bear population (within the United States) was 11,990 km^2, with 8,715 km^2 in Montana and 3,275 km^2 in Idaho (Kasworm et al. 2025a). This current estimate encompassed 93% of the CYE Recovery Zone. Of the estimated occupied range, 52% was within the Recovery Zone and 48% was outside of the Recovery Zone. The area of occupied range was slightly smaller than the 2022 estimate, which encompassed 12,337 km^2 (-2.8% change).

SE – The 2024 estimate of occupied range for the SE grizzly bear population was 13,192 km^2, with 5,223 sq. km^2 within British Columbia, 4,903 km^2 within Idaho, 3,053 km^2 within Washington, and 13 km^2 in Montana (Kasworm et al. 2025b, Appendix 1; Figure 1). This current estimate encompassed 98% of the

SE Recovery Zone. Of the estimated occupied range, 49% was within the Recovery Zone and 51% was outside of the Recovery Zone. The area of occupied range increased by 21% compared to the 2022 estimate, which encompassed 10,928 km^2.

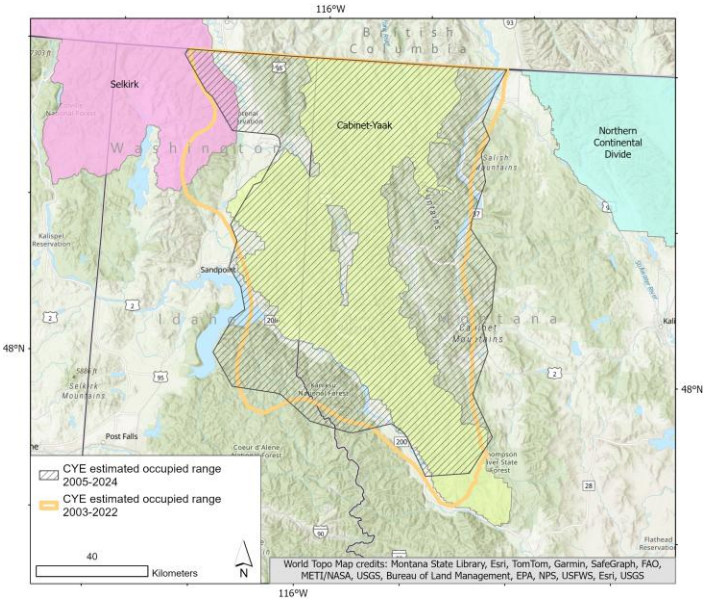

Figure 3. Estimated occupied range (hatched area) of the grizzly bear population in the Cabinet-Yaak Ecosystem (CYE; within the US) during 2005–2024 (hatched area) compared to 2003–2022 (yellow boundary). The solid color polygons represent Grizzly Bear Recovery Zones (U. S. Fish and Wildlife Service 1993).

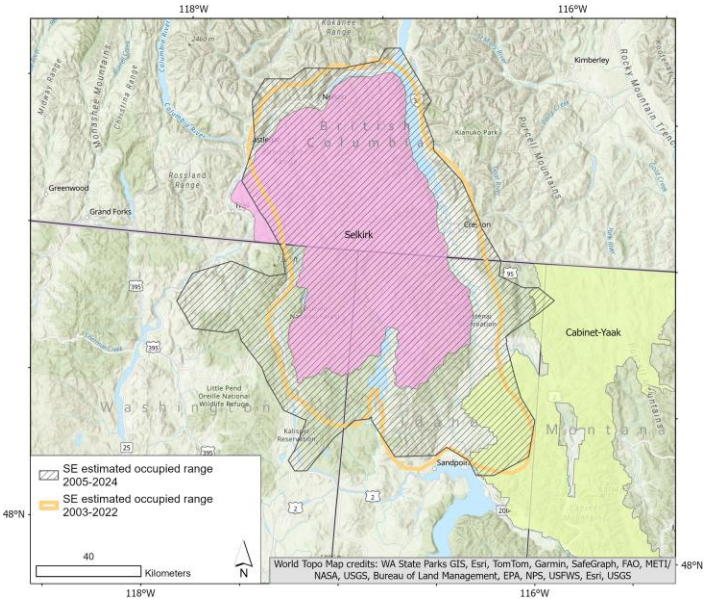

Figure 4. Estimated occupied range of the grizzly bear population in the Selkirk Ecosystem (SE) during 2005–2024 (hatched area) compared to 2003–2022 (yellow boundary). The solid color polygons represent Grizzly Bear Recovery Zones (U. S. Fish and Wildlife Service 1993).

Occupied range estimates for the NCDE, CYE, and SE overlapped spatially (Figure 5). This overlap is due to a limited number of temporary or permanent movements of bears between these ecosystems. Only limited evidence of gene flow among these populatons has been observed to date (Kasworm et al. 2025a,

Kasworm et al. 2025b). Therefore, these three U. S. populations are just beginning to be genetically or demographically connected with one another.

A distance of 72 km separated the 2024 estimated occupied ranges of the GYE population and NCDE populations. This was a 20% decrease from the distance of 98 km separating the 2022 estimated occupied ranges.

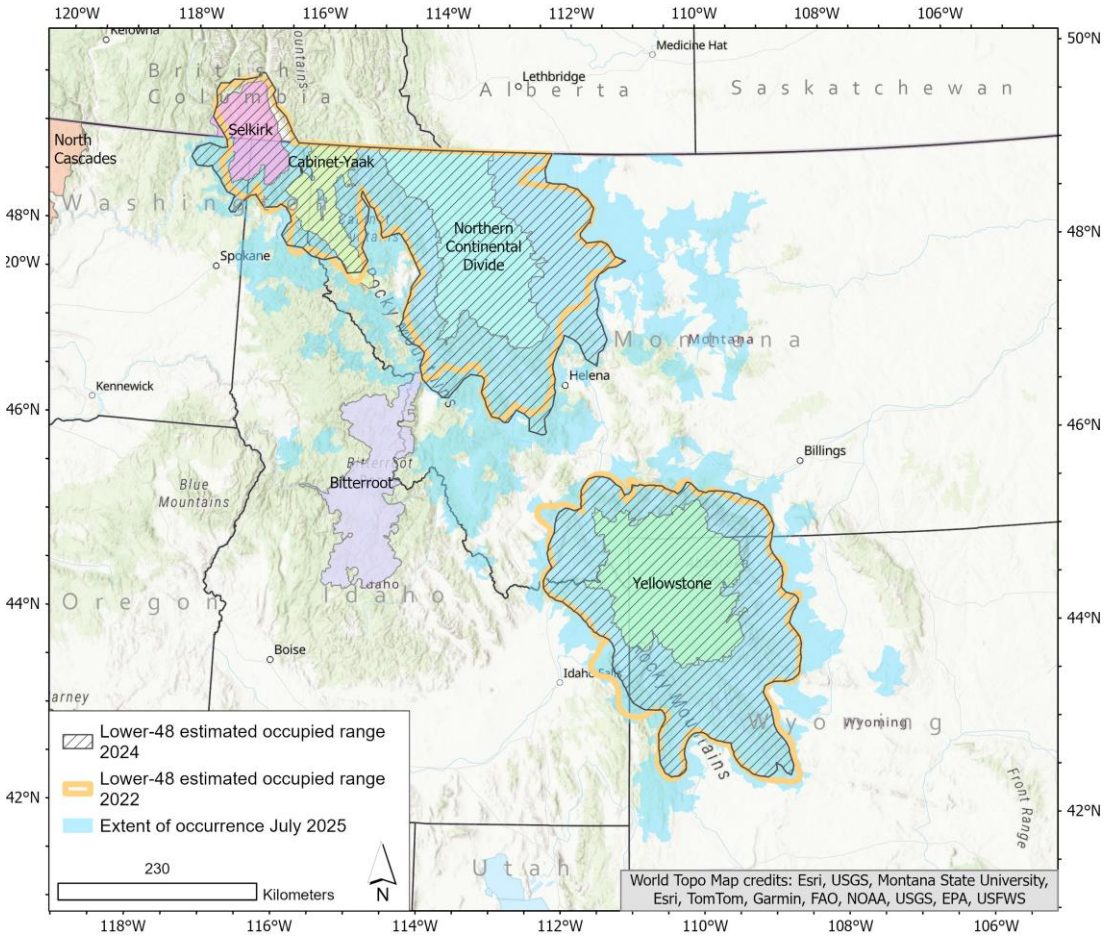

Figure 5. Estimated occupied range and extent of occurrence of grizzly bear populations in the lower 48 states, 2024. The solid color polygons represent Grizzly Bear Recovery Zones (U. S. Fish and Wildlife Service 1993).

Similar to the estimate in 2022, estimated occupied range of the NCDE population in 2024 slightly overlapped the northern portion of the currently unoccupied Bitterroot Ecosystem (BE) Recovery Zone. Estimated occupied ranges of the CYE, GYE, and SE populations were 137 km, 167 km, and 227 km from the BE Recovery Zone in 2024.

Combined, the area of occupied range in 2024 was 152,958 km^2, including 88,185 km^2 in Montana, 44,133 km^2 in Wyoming, 12,296 km^2 in Idaho, 5,291 km^2 in British Columbia, and 3,053 km^2 in Washington. This represents a 4% increase from the combined estimated occupied range of 147,110 km^2 in 2022.

Extent of occurence

Within the lower 48 states, the estimated extent of occurrence (as of July 2025) encompassed 241,951 km^2, with 147,588 km^2 within Montana, 61,157 km^2 within Wyoming, 28,268 km^2 within Idaho, and 4,932 km^2 within Washington. The estimated extent of occurrence increased by about 5% compared to a previous estimate reported for July 2023 (Costello et al. 2022).

ACKNOWLEDGEMENTS

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