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DRAFT

Considerations and preliminary step-down plan:

Translocating NCDE grizzly bears to the GYE for genetic augmentation

For the rationale and overview of this initiative, please see the document "Genetic augmentation of grizzly bears in the Greater Yellowstone Ecosystem: Pilot program rationale and process", dated March 18, 2022.

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Grizzly bears living in the Greater Yellowstone Ecosystem (GYE) have been isolated from other grizzly bear populations for possibly over 100 years, and their continued genetic isolation is a long-term conservation concern. The rate of inbreeding has been very low (0.2% over 25 years), and no inbreeding effects have been detected. Additionally, effective population size has increased well above the level where short-term genetic effects would be expected, and is approaching criteria for long-term population viability. Nonetheless, with lower genetic diversity than other North American grizzly bear populations, it is recognized that infusion of genetic material from other populations would enhance the adaptive capacity and long-term persistence of the GYE population. Although no evidence of immigration has been documented since genetic monitoring began, the potential for natural movement into the population by bears from the Northern Continental Divide Ecosystem (NCDE) is increasing over time. Due to population growth and expansion, distance between the nearest portions of estimated occupied ranges of these two populations to each other had diminished to only 57 km by 2020.

One option for increasing genetic diversity in the GYE is to assist the natural immigration process via occasional human-aided translocation of bears from the Northern Continental Divide Ecosystem. Grizzly bears have been successfully translocated from the NCDE to the Cabinet Mountains to provide genetic and demographic augmentation to the small Cabinet-Yaak Ecosystem population. However, long-distance translocation of bears, especially between populations separated by human-dominated landscapes, is not without risks. Not all bears translocated to the Cabinet Mountains bears survived or settled in the release area. Translocated bears often exhibit unusual movement patterns, likely motivated by their homing instinct or because of spatial competition from resident bears and difficulty in finding a vacant space to settle. Post-translocation movements of grizzly bears can be extensive, often increasing their mortality risk (e.g., vehicle collisions, poor nutrition) or the likelihood of encountering human settlements and engaging in human-bear conflict. If human-aided translocation is

implemented, an imperative is to minimize the probability that translocated bears come into conflict with people.

If a translocation option is chosen by cooperating agencies and the Yellowstone Ecosystem Subcommittee, careful planning with respect to selection of candidate individuals, timing, and locations will help decrease these risks and increase the likelihood of successfully adding to the genetic diversity of the GYE population.

This working document is intended to guide field practitioners (and to inform wildlife managers, land managers, and the interested public) regarding our collected expertise on 'best practices' likely to result in success. Ultimately, successful implementation would entail translocated bear(s) staying within the GYE and producing or siring cubs that themselves survive long enough to attain survival rates comparable to resident bears. Documenting such success, however, is likely to be a difficult and long-term process, will require statistical procedures such as assignment tests based on DNA samples. More immediate metrics of success, such as documenting an individual's fidelity to the new location, will help inform future translocation procedures (if needed).

We emphasize that the objective of any translocation of grizzly bears into the GYE is for ensuring that genetic diversity is sufficient to provide long-term evolutionary potential. The objective is not to increase population size in the GYE generally.

Acknowledging at the outset that 'biological' considerations are not entirely separable from 'social' considerations (and that both are important), we categorize biological issues into four: 1) characteristics of a candidate bear, 2) where captured, 3) where released, and 4) when captured/released.

1) Characteristics of bears being considered (sex/age/history)

a) Management history: Bears with a history of involvement in bear-human conflict, even as offspring, will not be considered candidates for translocation. Furthermore, bears captured away from human settlements will be the best candidates to minimize the likelihood of post-release bear-human conflict.

b) Age/sex of bear: Knowledge of bear behavior and information about post-release movements help inform which sex and age categories are most likely to result in success. Younger bears, primarily between the ages of 2 and 5, often undergo natal dispersal whereby they move away from their natal home range to settle in their own permanent home range. In general, male bears are very likely to disperse, tend to disperse large distances, and can be highly transient for more than a year. In contrast, female bears are more likely to remain near their natal range, rarely disperse large distances, and are less transient than males. Nonetheless, occasional long-distance female dispersal does occur. This natural tendency for movement by young bears of both sexes, in the pursuit of finding and establishing their own permanent home range, is associated with less frequent homing and higher fidelity to release areas when they are translocated. Continued transiency and wide-ranging movements following translocation are not uncommon until bears settle in their permanent home range. In the Cabinet Mountain augmentation program, all of the translocated bears known to have successfully bred were translocated when they were within this age group: three females and one male were translocated as 2-year-olds and one male was translocated as a 4-year-old. Overall, both female and male bears in this age class are good candidates for translocation, as long as evidence indicates they have not previously

reproduced. It is likely that eventual reproduction by females would be easier to document via direct observations, whereas male reproduction will be detected through genetic analysis. Successful female reproduction is constrained to litters every 3 years, but successful males have the potential, but certainly not the certainty, of breeding every year and fathering offspring with multiple females.

By the time bears reach the of 6 or 7 years, most have established a permanent home range and have become reproductively active. Consequently, when adult bears are translocated, they frequently return or attempt to return to their home range, even when moved distances >200 km and even when accompanied by offspring. Homing bears generally move in a linear fashion even though it may take them some time to determine the correct direction toward their home range. When translocated long distance, it is not unusual for bears to take more than a year to return home. Overall, reproductively active adult bears are not good candidates for translocation to augment the GYE population.

Cub and yearling bears are usually still dependent on their mother, however survival of orphaned or early-independent bears in these age classes has been observed. When translocated independently of their mother, initial movements of cub and yearling bears are usually more restricted than those of older bears, but they can also become more transient over time, consistent with their natural dispersal behaviors. They likely have a good probability of settling in the release area, however their survival is likely to be lower than older bears. Their survival and ability to settle in a home range is probably most compromised where the resident bear population density is high. Orphaned cub or yearling bears may be good candidates for translocation, as long as their body size and condition suggest good potential for survival on their own. Given that these bears are unlikely to reproduce for at least 4 years, recapture or genetic analyses would likely be required to document any eventual reproduction. There are no sex/age combinations that would automatically disqualify a bear from consideration. However, evidence and experience suggests that some are better choices than others given other considerations, and that each comes with unique sets of attributes:

i) **Sub-adult female (age ~ 2 to 5, as estimated in the field).** These bears are generally the strongest candidates because they are *relatively* likely to remain in the target area without conflict with humans. A 4-year old female would likely be among the easiest to monitor (collar longevity is good) for survival and reproduction. If later bred, her offspring would most likely be hybrids (sired by a GYE male, i.e., she'd be an effective genetic migrant), but even if pregnant when moved, she and any surviving offspring could mate with GYE in future years. Downsides are that it may require 1-3 years before she is mature enough to breed (particularly if younger). If younger (i.e., <4), collar retention could be problematic. However, younger NCDE sub-adults (aged 2-3) that were translocated > 4 times their sex-specific home range radiuses displayed slightly greater fidelity to areas in which they were released than females aged 4 or 5. If it is possible to capture the independent offspring of females known to be free of conflict (e.g., if collared for trend monitoring), such an animal would probably be unfamiliar with human-related attractants, and thus likely to remain conflict-free. Both managers and the public should be aware, however, that even bears in this optimal sex/age group may display homing movements, or wander considerably before settling down.

ii) **Sub-adult male (age ~2 to 5, as estimated in the field).** These bears are generally less suitable candidates than females of similar ages (above), because a) they are more likely than females to get into conflict situations, b) they are more likely than females of similar age to suffer mortality, even without an obvious human-conflict, c) they are more likely than females of similar age to become

displaced by larger males, and thus possibly leave the GYE entirely, d) it may require some time before they can establish themselves as breeders if they are not displaced, and e) collar retention is not as good as among females. However, in the unlikely event that a subadult male can safely establish itself, it could breed at a younger age than a subadult female (have less time exposed to risk before it makes a genetic contribution). At least 2 male Cabinet augmentees are known to have later sired subs. Sub-adult males are an option if other considerations are strongly positive.

iii) **Orphaned cub of the year (either sex).** Although there is documentation that some orphaned cubs can survive without their mothers, our assessment is that the additional stress of putting them into a unique environment makes their survival unlikely. Orphaned cubs should not be considered candidates.

iv) **Orphaned yearling (either sex**). The likelihood of orphaned yearlings surviving and finding a new home in the GYE is probably higher than of orphaned cubs . Yearlings of a female that had a history of conflict would not be candidates due to the likelihood that they already learned unacceptable behavior. However, yearlings orphaned as a result of mortalities of non-conflict mothers could be considered candidates. If >1 yearling were captured and moved together, their survival would probably be higher than for a single animal and would also double the potential of ultimately producing an effective genetic migrant. However, yearlings would require more years (probably 4) before they could breed, and would be even more difficult to monitor long-term via telemetry than subadults.

v) **Adult female (age 5+, as estimated in the field).** An adult female unaccompanied by cubs in mid-summer has high likelihood of already being bred; thus, cubs she might produce overwinter in the GYE would not be genetically effective migrants (and would not constitute success). However, those cubs would carry NCDE genes, and thus any that survived to become breeders themselves would increase the pool of potential effective migrants. An adult female in mid-summer who'd lost a litter would be very likely to be bred by a GYE male the following spring, assuming she survives and stays in the target area that long. Adult females would offer the greatest opportunity for monitoring their genetic success, an important criterion because they are most amenable to long-term radio-monitoring, and can sometimes be observed visually (and if accompanied by cubs, reproduction documented). However, adult females generally are the most likely to exhibit homing movements (see above), and thus are poor candidates for this program.

vi) **Adult male (age 5+, as estimated in the field).** Although generally not considered an optimal choice due to concerns about potential human-bear conflicts and competition with resident adult males in the release area, there could occasionally be situations in which an adult male could be considered. An adult male that survived and avoided conflict could conceivably mate during the breeding season immediately following translocation, and if it became established, make a disproportionately large genetic contribution. A downside is that documenting effective migration of males would require long-term genetic data and not be assured; it is also difficult to keep collars on adult males. Consider if a) a translocation site can be found at which potential for conflict is low, and/or b) capture is very late in the season, such that the animal has already built up fat reserves and dens shortly after release. Late-season releases would be contraindicated where big-game hunting is still occurring.

2) Areas for capture

i) Although habitat similarity to the GYE (another consideration) could be greatest for an animal captured at the southeastern extent of the NCDE distribution (and such bears might appear to be "trying" to get to the GYE on their own), such an animal could have a higher likelihood of returning (i.e., not remaining within the target area).

ii) We take it as a given that habitat characteristics of the release site will differ from those at the capture site, and challenges translocated animals will face are factored into the expected probability of success. Although 'matching' habitat of the donor to recipient area would be ideal, it's not a critical consideration given how adaptable bears are. That said, bears living in the relatively mesic, huckleberry-dominated areas in the northwest portion of the NCDE are probably not the best candidates, at least initially. As well, potential candidate bears in this area are high priorities for the Cabinet augmentation program.

iv) A likely constraint for capture areas is the need to use culvert traps (so that bears can easily be moved from the site), and thus road access (unless culverts could be flown into remote locations).

v) A female bear originating in a Bear Management Unit (BMU) or Occupancy Unit (OU) where meeting occupancy standards has been a concern should not be a strong candidate.

vi) As with any grizzly bear capture operation, good communication and close coordination with local land managers is critical.

3) Release areas

At this point in the process, we consider areas at a coarse geographic scale. Specific release sites should be well-vetted, and offer the lowest possible opportunity for released bears to find trouble, while recognizing that bears generally don't stay in the immediate area where they are released. Appropriate sites would be within the GYE DMA, but not otherwise be constrained geographically at this coarse level of consideration. That said, bears released where a large expanse of relatively undeveloped landscape exists between the site and the bear's original home range are less likely to engage in conflict behavior or exhibit homing.

We seek areas with enough bears that translocated animals can find (or be found by) mates, but not such a high density that competition or aggression from resident bears will increase the chance of intraspecific predation or displacement outside the GYE DMA. If possible, local density estimates such as produced by Bjornlie et al. (2014) and IGBST (unpublished data) should be consulted, but qualitative assessments made by locally-based staff will be crucial as well. Expecting that translocated bears may not remain close to the release site, an important consideration is the spatial extent and configuration of habitat surrounding the release site where conflicts with humans are unlikely.

As with any grizzly bear translocation, good communication and close coordination with local land managers is critical.

i) **Yellowstone National Park**. Because livestock are absent and attractants generally well controlled, YNP should be strongly considered at the outset of this program. Challenges would be identifying areas where resident grizzly bears are not too dense (see above, e.g., not Hayden Valley), and where recreationists are not highly concentrated.

ii) **Wyoming, outside of YNP**. There may be areas, particularly in the northern portions of the BTNF, where attractants are rare or well-managed, and where a translocated bear would have a good chance to mate with other bears without coming into conflict. Potential areas include the southeastern portions of Blackrock, Togwotee Pass, and Moccasin Basin, where cattle allotments have been bought out or retired, but there is still gated road access to move a bear far from any developed areas (but not further south where cattle density increases).

iii) **Montana, outside of YNP.** Generally, areas where an augmentee might be released in the Montana portion of the GYE are closer to humans (recreationists, livestock, homesites). Thus, we recommend gaining some experience with the program before considering sites in Montana. That said, a list of 32 potential release sites was recently approved by the Montana Fish and Wildlife Commission, about half of which are outside the Grizzly Bear Recovery Zone.

iv) **Idaho, outside of YNP.** Not a candidate translocation recipient at this time.

iv) **Grand Teton National Park**. Not a candidate translocation recipient at this time.

4) Time of year

i) Biologists have typically considered it unwise to transport animals early after den emergence, as bears that time of year are particularly hungry, many plants-based food sources are not yet available, and livestock young are small and vulnerable. Snow typically reduces road access early in the bear-year, which in turn means that capture and release sites are likely closer to people. Spring black bear hunting can also constrain grizzly bear captures.

ii) July and August are typically considered the optimal months to translocate bears, as plant-based food sources are peaking and bears are not yet in hyperphagia. Eighteen of the 22 Cabinet augmentees were moved in July or August to match the peak of huckleberry production. However, the mast peak seen in the Cabinets does not characterize the GYE, so a somewhat earlier time window should be considered.

iii) September through mid-October are generally avoided because i) some bears in hyperphagia descend to low elevations where human attractants are common, and ii) of overlap with big-game hunting. The latter concern would be lower if released centrally within YNP.

iv) Although few data are available to inform it, the possibility that grizzly bears might be successfully translocated very late in the active year, just prior to expected denning, holds promise. Such a bear should have already fattened up, and even in an unfamiliar place we do not expect it to have difficulty finding a place to den. Upon emergence, it may then be more likely to consider its denning area a new home.

In summary, we recommend that for the first few years of this program, managers adopt a conservative approach, moving only bears that are most likely to stay in the GYE, survive, and breed; moved only during the optimum time of year; and released where success is most likely. With time and experience, criteria for acceptable candidate bears, source locations, release locations, and timing of movements can all be revisited if new information becomes available, and this protocol updated and revised if appropriate.

Other considerations

1. FWP and USFWS are cooperating on a long-term project to augment the Cabinet Mountains population; since 2005, all bears have come from FWP Region 1 (Flathead, Swan, Stillwater drainages). The objective is to move 2 subadult bears/year, although fewer have been moved in some years. GYE genetic augmentation would be a concurrent program but could transpire over a more relaxed time schedule. Ideally, appropriate bears can be found for both programs.

2. Bears removed (live) from the NCDE for augmentation are counted as "mortalities" following the NCDE Conservation Strategy when assessing whether thresholds have been exceeded. Typically, capture efforts for augmentation (either to the Cabinets or the GYE) would occur before that year's total mortality has been documented; it's thus possible for mortalities occurring later in the year to put that year's total "over" the threshold. However, the threshold is calculated on a 6-year running average, and because the total reported and unreported estimate would be known for the previous 5 years, the likelihood of reaching the threshold because of live removals can be estimated (albeit with some uncertainty). Because this GYE augmentation is intended to produce 1 or 2 effective migrants per bear generation length (i.e., need not occur rapidly), it would be reasonable to hold off capture efforts in years in which removing more NCDE bears could cause the threshold to be exceeded.

3. Given considerations outlined in this document, we anticipate that trapping efforts for appropriate bears would be planned and deliberate, or be associated with ongoing research and monitoring efforts. It is very unlikely that an appropriate bear would be captured in the course of conflict response work. Thus, additional resources will be required from donor agencies.

4. If released in Montana by MFWP (outside YNP), the release site would have to be one previously approved by the Montana Fish and Wildlife Commission. This constraint would not apply if released by USFWS.

5. If released in Wyoming (outside a NP), WGFD must notify the county sheriff of the county in which the release takes place within 5 days, and issue a press release (W.S. 86 § 1).

6. Released bears will undergo standard data collection and processing, including collection of genetic samples, and must be PIT-tagged, ear-tagged, and outfitted with a GPS telemetry device.

Literature Cited

Bjornlie, D. D., F. T. van Manen, M. R. Ebinger, M. A. Haroldson, D. J. Thompson, and C. M. Costello. 2014. Whitebark pine, population density, and home-range size of grizzly bears in the Greater Yellowstone Ecosystem. PLoS ONE 9:e88160.