Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)

Final Report on Wolf Restoration Logistics Recommendations
November 2021

(Photo credit: National Park Service)

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Contents

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Introduction

This report summarizes Wolf Restoration & Management Plan Technical Working Group[1] feedback to date regarding options for the following restoration logistics, with discussion of 1) technical merit of each option, 2) technical preference among options, and 3) additional considerations:

1. **Capture considerations**: Donor populations; Capture methods at source; Age ratios; Color ratios; Sex ratios; Genetic considerations; Animal reputation; What to do with injured animals at source site; Transportation method from source to Colorado
2. **Animal handling considerations:** Feed options; Where and how to hold animals prior to shipping and upon initial arrival in Colorado; Immobilization drugs to be used; Collars/marks on animals initially reintroduced into the state; Samples collected from animals; Veterinarian care in captivity; Disease testing and vaccine treatment
3. **Reintroduction considerations:** Reintroduction technique; Time of year; Considerations of general landscape characteristics where wolves could be released; Pace of wolf reintroduction; When to stop and/or pause reintroduction Number of release sites (and number of release areas)

Capture considerations

Donor populations

Alternatives considered: Idaho; Montana; Wyoming; Mix of Northern Rockies States; Washington; Oregon; Great Lakes; and Mexican Wolves

Capture and translocation of wolves from other states for translocation to Colorado will require authorization by the respective state wildlife Commission or agency Director. A decision process in the donor jurisdiction(s) will be required for such a project, which will need to be initiated well in advance of project initiation.

[1] **About the TWG**: The purpose of the Technical Working Group (TWG) is to review objective, science-based information as well as provide its own knowledge and experience at the state/federal/tribal level to inform the development of the Colorado Wolf Restoration and Management Plan. The TWG is composed of members who bring experience in wolf reintroduction, wolf management, conflict minimization, depredation compensation, and other relevant topics. CPW is responsible for writing the Wolf Restoration and Management Plan. The Parks and Wildlife Commission (PWC) serves as the decision-making body responsible for approving the Wolf Restoration and Management Plan. The TWG serves in an advisory capacity to Colorado Parks and Wildlife, offering non-binding input into the development of plan content. The TWG is not a decision-making body and has no authority on wolf management policy, research, or operations. The TWG operates by consensus. For purposes of the TWG, consensus refers specifically to general agreement, or lack of objection, that an option or alternative has sufficient technical merit to be recommended for consideration by CPW. In the absence of consensus, dissenting views will be documented.

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Summary of TWG feedback: All alternatives have technical merit. Comparatively, the preferred options from a technical perspective, are:

- Idaho, Montana, Wyoming, and a Mix of these Northern Rocky Mountain (NRM) states are recommended as the preferred donor populations, as logistical, source site jurisdiction, and other considerations allow. Planning for all three states and keeping options open and flexible is also recommended both for the initial donor population and for subsequent donor populations as needed. Some TWG members recommend Wyoming as slightly preferred.
- Washington and Oregon are next in preference.
- Great Lakes are third in preference: wolves from this region should only be further considered if other options above are not available.
- Use of gray wolves from the above states would be consistent with state law in Colorado, which states that *Canis lupus* must be reintroduced to the state.
    - State law does not specify the source of the wolves, nor does it describe the differences among subspecies. With the exception of Mexican wolves, all other wolves in the western US are managed as a single entity, and use of gray wolves from ID, MT, WY, WA, OR, and the Great Lakes would be appropriate for reintroduction to Colorado as well as consistent with state law.
    - Wolves that have naturally colonized and were reintroduced to the NRM states are different subspecies than were mapped to have previously existed there, though delineating precise lines of where one subspecies' distribution ended and the other's began is not possible. The animals reintroduced are of comparable size and weight as to what was historically in the NRM and in Colorado.
- Mexican Wolves (*C. l. baileyi*) are lowest in preference; Mexican wolves should only be further considered if other options above are not available as substantial process hurdles are presented with the consideration of this uniquely listed entity under the Endangered Species Act. Colorado is not historical range for this unique subspecies. The existing 10(j) for Mexican wolves could not be expanded into Colorado, as habitat has not been demonstrated to be irreparably damaged within the historical range of the subspecies. Utilizing Mexican wolves in Colorado would essentially be placing a Federally Endangered Species in the state, with no recovery goals/commitments for the state but with a long horizon as the species is eventually recovered within Arizona, New Mexico, and Mexico. It would not be possible to extend the management flexibility afforded by the 10(j) designation within the Mexican Wolf Experimental Population Area which would lead to extremely challenging management scenarios.
- All decisions are subject to future conversations and decisions with potential donor states.

Rationale/discussion:

Wyoming

- Wyoming has an aerial capture system that is somewhat predictable to time. This could facilitate the scheduling of successful capture and increase the likelihood of catching wolves and thus a capture/shipment event could be planned to move wolves to CO.
- To meet statutory obligations and keep costs down, Wyoming may be a good state to begin sourcing. However, it is important to keep options of where to source from open as there is no

guarantee wolves will be available or that they can be captured in the predator zone when reintroduction begins.

- At least one of the currently documented wolves in Colorado naturally migrated from Wyoming and is currently successful, which may support sourcing from Wyoming. On the other hand, sourcing from states other than Wyoming could provide genetic variability as a complement to the natural migrators. However, it was alternatively suggested that the genetics in Wyoming are similar to those in other NRM states and that genetic variability is not a concern should Wyoming be chosen as a source of wolves.
- Wyoming has a smaller population of wolves and a requirement to maintain a minimum number of wolves, whereas, by comparison, Idaho and Montana have higher populations and may be easier to source donor wolves from. Wyoming has fifteen to sixteen breeding pairs currently, enough to theoretically provide five to ten wolves per year: this currently includes some animals in the predator zone where wolves can be legally killed.
- If WY is chosen as a donor population, wolves will be much closer to home so the homing instinct may be greater and may raise the risk of return to the predator zone where they could be harvested, leading to public criticism.
- It is also recommended to keep options open for getting wolves elsewhere, if available, at later dates. Although genetics are a non-issue now, some new genetics would have benefit if wolves reintroduced from places other than WY are used and become breeders.

Idaho, Montana, Mix of Northern Rocky Mountain Region states (MT, ID, WY)

- Considerations in support of sourcing donor populations from Idaho, Montana, and Wyoming include: the high number of wolves in those states (MT and ID); the very recent legislation in place around the status and management goals for reducing numbers of wolves in those states (MT and ID); generally negative public attitudes toward wolf presence in those states; that taking wolves from states where hunting is allowed may provide wolves that come with a fear of humans (MT, ID, and WY); that the prey preference of wolves in those states is elk (MT, ID, and WY); and their genetic viability (MT, ID and WY).
- Matching to the extent possible the ecological conditions at the capture and release sites (primary prey, migratory/resident behavior of prey, likely denning habitat, etc.) is important. In that sense, wolves across much of WY, MT, ID, eastern OR, and eastern WA would very likely work for western Colorado, where the primary prey is likely to be migratory elk that generally move from intermountain valley or lower elevation winter ranges to high elevation summer ranges.
- A recent genetic analysis of wolves in the Northern Rockies found a genetically connected population, such that selection of source wolves on a genetic basis was not a significant issue. Genetic variation is unlikely to lead to different behaviors.
- Maintaining contingency plans for other potential donor populations is important in the case of lack of availability or other obstacles.
- Proximity to Colorado's border, which facilitates some transportation logistics, was also considered as a factor of donor selection.
- It was also suggested that positive public perceptions of Yellowstone wolf populations may make them/NRM wolves more favorable for use as a source population. However, the public interest in individual wolves specifically from Yellowstone National Park; tolerance of those

wolves to humans; and policy processes make selection of donor populations from Yellowstone NP less desirable. Social acceptance may be low for removing and/or managing Yellowstone wolves outside of the park and thus sourcing wolves from the park is cautioned against.

Washington and Oregon

- Selection of donor populations from Washington and Oregon would be less favorable than selecting wolves from other NRM states, but the option still has technical merit. Although Washington and Oregon wolves are also NRM wolves, Idaho, Montana, and Wyoming donor populations may be in greater alignment with public preference, for political reasons, as compared to the Pacific Northwest donor populations.
- Both Washington and Oregon have programs to capture wolves in winter; however, winter conditions in November and December affect potential success; increased cost and longer transport times also make these states less preferable than other states discussed above.

Great Lakes

- Selection of donor populations from the Great Lakes region has technical merit but is of lesser preference as compared to the Northern Rockies and Pacific Northwest.
- Great Lakes wolf populations are a viable candidate with respect to taxonomy (as are all source locations under consideration as previously described); however, the dissimilarity of the ecological context between the Great Lakes states and Colorado makes this a less favorable option as a donor population. Although there is some historical and contemporary measure of genetic mixture between coyotes and Great Lakes wolf populations, this is not considered an exclusionary factor for Great Lakes as a donor population. Although use of Great Lakes wolves in the restoration effort in Colorado could have technical merit, wolves from this region should only be further considered if other options above are not available.

Mexican Wolves (Arizona/New Mexico)

- Mexican wolves (a subspecies of gray wolves, listed as a separate entity under the Endangered Species Act) is the least desirable of the considered options. The historical range of the Mexican wolf does not include Colorado. Because they are listed as a unique entity under the ESA, maintaining the genetic uniqueness of this subspecies is paramount. If Mexican wolves were present in Colorado, premature interbreeding with wolves from the north could compromise the Mexican wolf recovery effort. Management considerations to address this potential issue in the Mexican wolf geography of recovery (AZ, NM) will reside primarily with the USFWS Mexican Wolf recovery team. Should gray wolves from other source populations described above be used as donor populations to Colorado, coordination between the Mexican Wolf Recovery Program and CPW is recommended to plan for and address potential interbreeding.
- Although the TWG discussed that use of Mexican Wolves in the restoration effort in Colorado could have technical merit, it recommends that Mexican wolves could only be further considered if all other options above are not available.

Breeding programs

- A member of the TWG discussed whether CPW should consider use of a repository of unique genes from a captive population of the McCleery lineage of Great Plains 'buffalo wolves' (*C. l. nubilus)* as part of the gray wolf restoration effort.
- It was suggested by this TWG member that inclusion of this breeding program as part of the restoration effort could potentially conserve and restore unique genes from the original wolf population inhabiting the general region, enhance the populations' gene pool, maximize genetic diversity, and restore genes that would not necessarily be available in any other donor populations of wolves that could be used for restoration in Colorado.
- Several other TWG members raised technical concerns about high levels of inbreeding of the McCleery lineage as well as limited amount of genetic material available for artificial insemination and the overall conservation benefit; therefore, it is very difficult to assume that introduction of these genes is a net positive to the effort.
- Use of these genes is not recommended in the early years of restoration if they are to be used at all. If using a cross-foster method where pups of this lineage are bred in captivity and then introduced to established wolf dens, or artificial insemination of wild wolves, this would occur in later years of the restoration effort.
- One TWG member suggested that adding this genetic material does not address a need or an issue of low genetic diversity, as there is no evidence for low genetic diversity for the source populations of wolves being considered. While not the case, if the source populations were documented to have low genetic diversity, then there might be a reason to seek other genes to solve this currently non-existent problem.

Capture methods at source

Alternatives considered: Net gunning; helicopter darting; traps; snares; discretion of source population management; public trappers; other options.

Summary of TWG feedback: All alternatives have technical merit. The most preferred options are use of a net gun, helicopter darting, and discretion of source population managers, in no particular order. Snares and traps present a variety of concerns related to success rates and injuries.

Rationale/discussion:

Net gunning and helicopter darting

- Biological and social considerations support preference for helicopter darting and net gunning as capture methods. These techniques offer the most precise, data-informed predictive planning options and temporal relevance for fall and winter reintroduction efforts in the Northern Rockies. Either darts or net guns could be used depending on the landscape; helicopter work will be more challenging in highly forested landscapes and thus darting may be the only option if a helicopter is used. A well-coordinated helicopter pilot and gunner is important when undertaking a helicopter darting or net gunning capture method.

- Darting and helicopter capture also provide the best selective potential; however, even these methods are non-selective, particularly in forested areas. The agency may need to consider capturing more wolves than needed to be somewhat selective in taking the desired age, color, and sex ratios in addition to the most fit animals (see below). Use of immobilizing drugs also accompanies these options.
- The use of an advanced spotter plane is recommended to locate wolves, to determine if they are in a workable location, and - if in a workable location- to determine what direction is best to approach them from and to keep an eye on the pack as they scatter once captures are initiated with a helicopter. When wolves selected for transport are shuttled to a holding location, the spotter plane can be used to locate other wolves for the helicopter to pursue once the shuttle is complete.
- Weather conditions may also constrain capture efforts. For example, snow conditions in the Pacific Northwest create difficulty for helicopter capture until closer to February, although a December capture event could be possible. It is valuable to have local staff as scouts to gauge snow and weather conditions in local environments; the ability to predict snow conditions can also improve the speed and efficiency of capture.
- A capture team with ample experience and a history of successful wolf captures will be required for helicopter captures to be a viable option. Helicopter wolf captures are generally more difficult and time consuming than helicopter captures for big game, and experienced pilots and capture crews can be successful where less-experienced teams cannot.
- Wolf capture is generally not a profitable enterprise for helicopter charting companies, and there is likely to be competition with their ungulate capturing enterprises. This may lend to having an alternative method to capture wolves; overreliance on helicopters alone could slow down the process.
- “Judas Wolves” are wolves that are captured and released back into the source population with collars such that they can offer options to track and capture wolves for relocation in future years’ efforts.
- Even with assistance from methods such as “Judas Wolves” or experienced tracking teams, plan for multiple options with low, feasible goals of the number of wolves captured per trip. For example, planning three to four events to capture two to three wolves per trip could be a feasible pace of capture, which would support a medium pace of release. However, lack of familiarity with landscape and pack dynamics is a limiting factor in the pace of reintroduction.

Traps and snares

- Traps and snares have technical merit; however, multiple TWG members advocated against the use of snares and traps as a capture method. Seasonal considerations can complicate capture and release coordination times; foothold traps have limitations based on weather. Neck snares can lead to significant and often unseen injuries to wolves. In past reintroductions, some wolves badly injured by neck snares were rejected as potential donors while others needed veterinary treatment after being damaged by traps. If selected, use snares with stops to prevent strangulation.
- Negative public perception can accompany release of potentially damaged wolves; there may be a heightened fear that damaged wolves could not hunt naturally and would prey on livestock. While the use of trapping generally polls negatively with the public, it polls less negatively when

the purpose of conducting trapping is to enhance wildlife populations rather than be employed as for the purpose of regulated take.

- If traps and snares are to be used, consider strict regulations around the type of device, including features such as coil strength, and the need to check traps within every 24 hours to prevent freezing if wolves are caught in the winter. Trapping can be very effective if experienced trappers are employed (e.g., agency or professional public).
- Captures involving trapping are most likely to occur the summer/fall prior to reintroduction to fit wolves in potential donor packs with collars to aid in leading capture crews to their pack mates come winter. (See Judas wolves, above)
- Although novel capture techniques and technologies may be useful, there are capture techniques that have been proven effective in the NRM over the past twenty-six or more years: there is not a need to change approaches at this time.

Public trappers

- Public trappers can work in tandem with net gunning and helicopter darting tools. Use of public trappers can provide potential additional economic benefit that may viewed favorably by donor states; one TWG member recommended avoiding using government trappers to avoid perceptions of bias and to ensure leading edge approaches. This option requires cooperation between state agencies in the source area and public trappers. In Montana, for example, if Colorado can contract with trappers directly, so they could earn money for their effort (as they may have otherwise, such as if they sold the pelt from a harvested wolf), the request to a state's wildlife commission could be to allow the trappers to capture live wolves to support this effort. Public trappers could also be used to assist agency personnel in capturing and collaring wolves the summer prior to captures in areas that are likely to be accessible to winter capture operations (See Judas wolves, above). While some wolves may not survive to winter, those that do will enhance the ease of winter capture.

Discretion of source population management

- Consider source population management and policies in potential donor population states. Some TWG members expected Montana policies to be highly favorable to selection for donor sourcing; others noted policies around species management in Montana, Idaho, and Wyoming may constrain sourcing options. Immediate engagement with potential donor states' game and fish agencies is important to build relationships in anticipation of potential donor selection, with considerations of the current political landscape in these states.

Additional logistical considerations for capture

- Coordination, knowledge, and understanding of populations, policies, and local officials in the source states enhance efficiency of capture; outreach to potential states' officials should be conducted as soon as possible.
- Advance work and coordination would greatly help in achieving a successful reintroduction by the end of 2023. Coordination with local officials from donor states may allow for early collaring of "Judas Wolves", which could add efficiency in capture: this could be done as early as 2022. Montana has six experts which coordinate to collar about twenty wolves per year over the

course of two to three months of summer trapping and a month of helicopter capture efforts in the winter. Similar capture and collaring efforts occur annually in Idaho and Wyoming.

- The National Park Service in the Northern Rockies states also have considerable infrastructure in place to assist capture, although, as mentioned above, there are also cautions against selecting wolves from Yellowstone National Park, given their notable public reputation.
- Capture methods selection is related to location of the source population and access to animals and holding and transport (including potential need for pens near the capture site) are also considerations.

Age ratios

Alternatives considered: Young of the year; yearlings (one year old); dispersing age (two years and older); mature animals; and a mix of young and mature animals.

Summary of TWG feedback: All alternatives except for young of the year have technical merit, with no preference among the remaining alternatives.

Rationale/discussion:

- There may be some value of mature over younger individuals, as long as a wolf is not senescent.
- Young and mature wolves have little difference in dispersal patterns or predation behaviors: these features are more dependent on the individual wolf than on the age of the wolf.
- Having sexually mature wolves would be sufficient; and selection for age in capture methods may be limited.
- Yearlings and breeding age animals are most likely to be the most encountered animals in capture events. These animals are likely to be successful in Colorado.

Color ratios

Alternatives considered: Gray; black; mix; does not matter.

Summary of TWG feedback: All alternatives have technical merit. Selection by color generally does not matter and in general the color mix is dependent on what wolves are captured ('you get what you get'); use of a mix of colors was preferred slightly over a single color.

Rationale/discussion:

- A heterozygous black wolf has been found to be slightly resistant to disease, as opposed to homozygous black or grey. This difference is very minor, but given that research, having more heterozygous black wolves could lend a survival advantage: yet this would not be possible to determine during capture.
- Black wolves also look more dissimilar to coyotes, are more visible, and thus may reduce illegal take resulting from wolves being mistaken for coyotes; on the other hand, if more easily identified, this could more easily facilitate illegal poaching.
- Gray wolves can have black pups and vice versa; some research in Yellowstone suggests gray and black wolves seek each other out when forming new packs more than wolves of the same color as it may provide some evolutionary benefit.

Sex ratios

Alternatives considered: Female skewed; male skewed; or 50:50.

Summary of TWG feedback: All alternatives have technical merit; the preferred option is a 50:50 sex ratio mix; followed by preference for a female skewed initial population; and least preference for a male skewed initial population.

Rationale/discussion:

- A goal of a 50:50 mix can help to avoid unnecessary releasing when capturing donors, based on the probability of male/female capture.
- Female skewed sex ratios may improve denning success.
- Helicopter darting and net gunning may slightly enhance the ability for selectivity. However, this will be dependent on where donor wolves come from (more open vs. heavily timbered locations).
- Males disperse more whereas females have higher reproductive success and have higher success of joining existing packs; however, the latter is not relevant when there are no preexisting packs.
- Because wolves are monogamous, skewing the sex ratio is not likely to help with reproduction. In Oregon, multiple instances have been documented in which a new male comes into the pack and breeds with a breeding female and her 2-yr-old daughters. In this case, skewing the female ratio could increase reproduction: however, it is unclear that this would happen in a reintroduction scenario when there are not preexisting packs.
- In some cases, whatever wolf presents an opportunity should be captured regardless of what sex and age it might be because that may be the only opportunity for a capture. In many cases, the specifics are determined when wolves are in hand.

Genetic considerations

Alternatives considered: Related pack members; unrelated, dispersing age animals; mix of packs and unrelated individuals.

Summary of TWG feedback: All alternatives have technical merit, with highest preference for unrelated, dispersing age animals; followed by preference for a mix of packs and unrelated individuals; and least preference for selecting only related pack members.

Rationale/discussion:

- Sourcing and capture of whole packs would be more laborious, costly, and constrain sourcing. Under the conditions of a hard release, the pack is more likely to split than stay together, providing support to not intentionally pursue an entire pack.
- As more members of a pack are removed, the pack can become destabilized at the source location, potentially leading to unintended consequences at the source. It was noted that a similar outcome was observed when members of the depredating pack were relocated to

minimize conflict. However, destabilization vs. resilience of the pack at the source site may be specific to the age class removed. The removal of breeding females is most likely to destabilize the source pack, followed by breeding males; juveniles through two year-olds that are removed from the pack appear to have less repercussions on the stability of the source pack.

- If a hard release is used, there is limited impact/benefit of selecting related vs. unrelated animals on the dispersal patterns of released animals.
- There are some concerns that reproductive potential will be low for genetically related animals in localized release locations. However, a recent study in the Northern Rockies and Pacific Northwest that is near conclusion found that while there is some genetic structuring around the edge of the distribution (as expected of any species' population), there is a lot of genetic diversity and mixing across the whole region. Wolves have evolved mechanisms to minimize the effects of inbreeding, so inbreeding is likely to be a non-issue even if related wolves are released close to one another in space and time.

Animal reputation

Alternatives considered: Not known to be a depredator; known depredator; wolves that have been around livestock without conflict; wolves that have not been present around livestock at all

Summary of TWG feedback: The alternatives "not known to be a depredator," "wolves that have been around livestock without conflict," and "wolves that have not been present around livestock at all" were all determined to have technical merit as factors for sourcing donors; "known depredator" has technical merit as a criterion for exclusion from sourcing. Sourcing donor populations not known to be depredators (whether present around livestock or not) was preferential to sourcing populations not exposed to livestock, if possible. However, it is important to consider that most wolves overlap areas with livestock, and there is not a way to know the degree of interaction they have had with humans. No wolf should be translocated that has a known history of chronic depredation, and sourcing from geographic areas with chronic depredation events should not occur.

Rationale/discussion:

- There is nuance in determining depredation habits, with consideration of trends in the behavior of an individual and a pack. If a wolf is depredating livestock, the pack it belongs to is likely to depredate as well; additionally, if a pack is depredating, it is difficult to exclude one individual as non-depredating (see the Beartrap Pack's records of bison depredation). A known wolf or pack of wolves that have been identified as chronic depredators by the source location should not be used for translocation to Colorado.
- If a pack has had infrequent depredation events, as opposed to a chronic and well-known tendency to depredate, this should not, from a technical perspective, necessarily exclude consideration of a wolf or pack as a potential donor. However, from a social perspective, striving to use wolves with no known history of depredation is recommended. The history of a wolf's exposure to livestock populations is a consideration for potential for depredation. Sourcing from a pack that has not been exposed to livestock or a significant livestock grazing presence could be preferable: such packs exist in the central or northern Idaho wilderness, areas which have low grazing presence and scarce livestock, respectively. However, it might be more limiting than

beneficial to constrain potential source populations to areas that are not suitable for livestock. Sourcing from populations which have been exposed to livestock, such as many populations in Montana and Idaho, but do not have a history of depredation, could also be preferable.

- Because depredation is situational, even wolves that are not known to be depredators have the potential for depredation. Situational factors could include public lands grazing and the vulnerability of livestock. Overall, it is difficult to predict depredation behavior.
- A study of wolf-livestock depredation in Montana found that depredation tends to recur in the same places, and the majority of livestock depredations are concentrated in those places. Places with recurrent livestock depredations tend to be places with higher livestock density, higher wolf density, and with intermediate proportions of public land (e.g., about half public land juxtaposed right next to private land that is about half of the area as well). There is at least a possibility that depredations are characteristics of the landscape rather than the wolves that are there (i.e., any wolf that lives there may eventually become involved in livestock depredations). While these areas can be avoided as sources for donor populations, depredation as a function of landscape characteristics suggests that it may be less likely to identify wolf packs that are more or less likely to depredate. Areas known to have chronic depredation should be avoided as a source of donor populations.

Disease issues at source sites

Alternatives considered: Prioritize areas for wolf capture as being those without disease.

Summary of TWG feedback: The alternative "sourcing from areas without disease issues" was determined not to have technical merit.

Rationale/discussion:

- Sourcing populations from areas without disease issues is not technically feasible. All wolves have some pathogens and parasites, such as endo- and ectoparasites, Echinococcus, or canine distemper/parvovirus: this is consistent throughout all populations. A determination of which diseases are parameters for exclusion should consider the diseases that already exist in Colorado; for example, any disease coming out of Montana is likely to already be present in Colorado. Overly broad criteria for exclusion due to pathogens or parasites will significantly limit potential source populations. Be deliberate in selecting populations without known issues and manage public reactions to sourcing diseased wolves via treatment during transport and through education on disease in the wild.

What to do with injured animals at source site

Alternatives considered: Release at source site; treat and release at source site; treat and release in Colorado; consider euthanasia.

Summary of TWG feedback: All alternatives have technical merit. Utilize capture methods to minimize injury and avoid major injuries altogether. No alternative was most preferred; however, "treat and release at source site" was least preferred.

Rationale/discussion:

- In general, it is critical to select the most appropriate capture method, have standard protocols around capture and treatment (e.g., reference manuals from Yellowstone), and follow veterinary advice for appropriate treatment. This will also help assuage public concern or fear regarding injured wolves.
- The alternative selected depends on the severity of the injury. Injury will likely occur during capture; capture method largely determines frequency and severity of injuries (*see above*). Treatment for the minor injuries incurred during darting and net gunning is feasible and easy. Also consider the importance of maintaining capture and treatment methods that would not competitively disadvantage source individuals, and potentially make source populations more likely to prey on livestock.
- Minor injuries are injuries that could be addressed in a single treatment and do not require extended care. Provided there are no significant concerns, plan to translocate animals with minor injuries. Consider a more extensive rubric of conditions that might prevent translocation (e.g., multiple missing digits, multiple missing canine teeth, advanced age/unhealthy, etc.).
- Major injuries should be assessed and treated under veterinary guidance; do not translocate animals with major injuries. Major injuries would be those that would require repeated treatment, extended holding, or cannot be treated and require euthanasia. Portable radiography may be beneficial to have available in making assessments of injuries.
- Alternatives to treatment, such as euthanasia, for injured wolves at the source site not deemed viable to be used as a donor individual should consider veterinary input and local ordinances and protocols from source states. Euthanizing drugs lead to bioaccumulation and should not be used unless the carcass is retrieved. In cases of euthanasia, remove heads to prevent skull collection.
- Long-term care options should also be considered.
- If an animal is not healthy enough to be released into Colorado, it is up to the source site managers to decide whether it is healthy enough to be released back into the source population. Make sure that wildlife veterinarians from the donor jurisdiction and CPW are involved in capture plans and part of the capture team, so they can make real-time decisions about injury treatment and euthanasia. Defer to CPW and source site veterinarians as appropriate.

Transportation method from source to Colorado

Alternatives considered: Air; ground; mix.

Summary of TWG feedback: All alternatives have technical merit, with no group preference among the alternatives; each has situational relevance according to the plan of capture and translocation. Key to success is that capture, transport, and release should occur as quickly as possible to minimize time in captivity and stress on the animals.

Rationale/discussion:

- There is a trade-off between the cost and time of each alternative and options are situationally dependent on the location (e.g., need for over-snow vehicles).
- Volunteer aircraft may help to reduce costs.
- Keeping options open enhances the latitude and flexibility of decision making in the translocation process, especially in the case of inclement weather and unexpected conditions.
- For air transport, consider holding pens near the capture location, transport to the airport in trucks via large crates, use of a cargo-type aircraft that can hold multiple crates for quick transport to Colorado, and transport from airport to release location via vehicle, helicopter or any other transport method.
- Consider the most appropriate handling crates for holding and transport, including consideration that crates provide protection such that wolves cannot chew them. TWG members can provide further details, experiences, and design recommendations from past reintroductions.

Animal handling considerations

What to feed during a period of captivity

Alternatives considered: Roadkill; carnivore logs; minimizing captivity time and feeding needs; ice/snow/free water.

Summary of TWG feedback: All alternatives have technical merits, with various practicalities to consider. Regarding food source, minimizing captivity time and feeding needs is preferable, followed by carnivore logs (typically, conditioned horsemeat) and roadkill. Ice/snow/free water are all recommended.

Rationale/discussion:

- Slight preference for carnivore logs over roadkill is due to the additional logistic details to consider with sourcing roadkill, such as availability, concerns that roadkill could have been poisoned, and prions and other diseases that exist in roadkill, all of which would need to be coordinated with the Colorado (and source state) wildlife health program. Carnivore logs would help guarantee the standards of having available food at a rate of ten pounds per animal per day of captivity.
- Stress in a condition of captivity prevents some wolves from feeding. Feeding approach depends on release method: The goal of a hard-release translocation should be to reduce the amount of time in captivity, and thus reduce the feeding needs. There are no data to suggest that a well-fed, hard released reintroduced animal would have more of a proclivity to stay close to their release site than a hard released animal that was held in captivity for a minimal time and not fed. Roadkill elk and deer would be preferred in holding pens at release sites if soft release is the preferred method, but if capture and transport occurs rather quickly, food is not likely to be needed.

- Technical feedback on topics regarding social perceptions:
    - Providing food may be important for some stakeholders from a public perception standpoint. While feeding may not be biologically important during capture and transport, this may depend on the length of holding and transport. It is still recommended to make food available should it be needed, should delays or other contingencies arise.
    - There could be a social concern that use of carnivore logs would lead to a public perception of training reintroduced wolves to eat cattle. The technical reality is that carnivore logs will not create depredation tendencies. Wolves do not learn to prey on livestock by eating dead livestock; feeding of carnivore logs does not precondition for or against livestock predation.

Where and how to hold animals prior to shipping and upon initial arrival in Colorado

Alternatives considered: Bare bones holding facility to be used for as short a time as possible.

Summary of TWG feedback: Bare bones facility for as short a time as possible is preferred.

Rationale/discussion:

- This topic refers specifically to where and how animals are held, as needed, in their state of capture as well as upon immediate arrival in Colorado. This topic does not refer to whether wolves are hard released or moved to a soft release site after initial arrival (see 'Reintroduction Technique,' below).
- Minimize the period of captivity in a hard-release condition. Past experiences included public scrutiny of the period of captivity; however, gray wolves are resilient and durable.
- Flexibility is key when approaching this issue.
- As noted in capture considerations, holding pens near capture may be needed, in part because not all animals may be captured on the same day.
- Preparations and contingency plans should also be made for holding pens, as needed due to weather or other reasons, in Colorado.

Immobilization drugs to be used

Alternatives considered: Telazol, tranquilizer use during transport

TWG feedback: Telazol is preferred as an immobilization drug for capture; tranquilizer use during transport has technical merit but is not preferred and should be avoided. Travel and holding time should be minimized and use of tranquilizers and immobilization drugs during transport should be minimized as much as possible.

Rationale/discussion:

- Telazol is a standard immobilization drug used in previous processes and is the safest given its streamlined application.

- Tranquilizers for muscle relaxation (not sedation) should be avoided: if needed they should be used under the direction of a veterinarian. Use of multiple drug regimens have previously resulted in seizures and post-release mortalities, and there was advocacy to simplify the drugs used.
- Wolves can be successfully held in a shipping container without tranquilizers from twenty-four to thirty-six hours from capture to release; simplicity is key.
- Defer to CPW and other veterinarians as appropriate. Maintain flexibility to tailor drug protocols to the specific situation.
- As discussed above, consider the most appropriate handling crates for holding and transport, including consideration that crates provide protection such that wolves that are not tranquilized or immobilized cannot chew their crates.

Collars/marks on animals initially reintroduced into the state

Alternatives considered: VHF; GPS; mix of VHF/GPS; no collar; PIT tags; ear tags (perhaps temporarily when in captivity)
Summary of TWG feedback: All alternatives have technical merit, *except* the alternative "no collar" for animals initially reintroduced into the state. It is preferred that every released wolf has a GPS collar, with variability in durability of GPS collar types as an important consideration. Ear tags are less preferred as compared to the other collaring/marking alternatives.

Rationale/discussion:

- There is value in collaring every wolf reintroduced for monitoring and data collection purposes and to learn from and improve upon for future releases; however, it is important to educate the public and set expectations that not every wolf in Colorado will be collared as the population grows. It is also important to understand that collars tell us where wolves have been but not where they are present. Collaring can also help to catch poachers.
- For any collar used, ensure that the frequency used accounts for the potential for interference due to environment/terrain or other collared wildlife and/or domestic dogs that share the same frequency. Coordination with other states on frequencies will also help for tracking dispersers into other states. Use of similar frequencies as neighboring states for wolf collaring is recommended.
- Satellite-linked GPS collars can provide the best remote data but are more breakable/less durable than VHF collars. There are tradeoffs in which GPS collars are selected based on durability vs. frequency of monitoring; survey collars are more durable, but research-type collars will provide more data points. Experiences in other states suggest that some brands may be more reliable, albeit more expensive.
- VHF radio telemetry is more durable. However, any radio collar can have problems at any point in time, and VHF frequencies -- as with other collars -- can be problematic, especially for dispersers; given how much wolves move and how hard the signals can be to find (especially in mountainous environments), some VHF collared wolves may be lost.
- VHF also forces biologists to be in the field and helps increase understanding of how wolves interact with the landscape. This is seen as beneficial. When comparing the two, there is value in the authenticity of monitoring and reporting to the public through use of VHF and the auxiliary

data collected while in the field, in comparison to the remote data collection via GPS collar. However, costs of in field monitoring using VHF may not justify the cost compared to GPS. Be certain that proper FCC licensing has been completed.

- Consider use of GPS to start followed by later use of VHF as wolves begin to form packs; a combination of VHF and GPS could also be considered upon release: however, this is less preferred. When sourcing radios, use stout collars to mitigate damage from chewing.
- Colored collars could discourage illegal harvest by distinguishing wolves from coyotes: however, it could alternatively enable illegal harvest by making wolves more recognizable. Colored collars can be helpful in the event of a report or a photo of a wolf with a failed collar.
- Pit tags are preferred over ear tags due to robustness of monitoring and ear infections. However, DNA studies on captive wolves may obviate use of pit tags, and it may be somewhat expensive to pit tag every wolf. This should not be a requirement but can be employed when feasible. There are no perfect marking identifiers, with tradeoffs to each; selection of tool will be dependent on the goals and objectives of the monitoring program.
- There is no justification for not placing a collar on an animal that is handled for the reintroduction. All animals released should have a collar. Too much money and resources will have been invested in each translocated animal and monitoring the success of reintroduced animals is fundamental to the program.
- Recommendations regarding use of collars for monitoring after initial release will be discussed separately by the TWG in the future.

Samples collected from animals

Alternatives considered: Blood (red and purple tops); tissue; hair; photographs; fecal, other

Summary of TWG feedback: All alternatives have technical merit.

Rationale/discussion:

- Hair is not the best available sampling technique for genetics, especially for long term storage. Consider a simple cheek swab, whether ear tags are used; an ear punch can be collected as well (using a baby cryovial with desiccant).
- Weight, size, and basic physiological characteristics should be collected: these statistics help to address public questions and misconceptions on reintroduced wolves.
- Preexisting anomalies on wolves should be documented to record that the capture team did not negatively impact the wolf.
- Ectoparasites (if present) should also be collected.
- Whisker samples could be taken for stable isotope diet analysis.
- Consider collecting a minimum of 2 sample types from each animal in hand (2 genetic samples, 2 red top blood tubes, 2 EDTA blood tubes, multiple fecal samples, etc.) More would enable banking them in different locations.

Veterinarian care in captivity

Alternatives considered: Defer to handling protocols

Summary of TWG feedback: As also discussed above, it is important to have standard protocols and for experienced veterinarians to be involved when wolves are in captivity to assist with: animal health monitoring, emergency care if necessary, sample collection, administration of vaccinations, etc. Biologists that have experience handling wolves and/or other wildlife will also be on hand to fit wolves with collar, ear tags, and/or PIT tags, and conduct basic monitoring, etc.

Disease testing and vaccine treatment

Alternatives considered: Test and treat everything possible

Summary of TWG feedback: Donor populations will have diseases and naturally migrating wolves will bring them. For captured wolves, the general recommendation is to test and treat everything possible, as this will help establish healthy populations; this will also help to foster social acceptance of reintroduction protocols.

Rationale/discussion:

- See above discussion of disease.
- *Echinococcus granulosus* (tapeworm) has been of concern at times for stakeholders in Montana.
- Some treatments may require multiple treatments for efficacy.
- Defer to veterinary expertise when devising disease treatment plans.

Reintroduction considerations

Reintroduction technique

Alternatives considered: Hard release, soft release, combination

Summary of TWG feedback: All alternatives have technical merit, with hard release preferred to soft release and to a combination of soft and hard release. There are pros and cons to consider for both techniques; however, hard release has greater technical merit as well as greater logistical and economic feasibility and is thus recommended by the TWG as the preferred technique.

Rationale/discussion:

- The key distinction between soft and hard release is related to acclimation. A hard release would entail capturing wolves and immediately translocating and releasing them to a site in Colorado, whereas a soft release would entail a period of conditioning wolves to their surroundings in Colorado before they were released into the wild.

- In experiences with soft releases in Yellowstone National Park (YNP) and hard releases in central Idaho, both techniques worked. However, the hard release in Idaho was more successful in terms of both survival and population growth. Thus, the perspective of technical outcomes, hard release is preferred, and the logistical feasibility and associated economic burden of a soft release should deprioritize consideration of this technique for Colorado.
- Hard releases are quicker and cheaper, but their use may also length the time for individual wolves to locate one another and pair up to produce offspring. Wolves may be more likely to travel further from the release location.
- In a hard release, there is some experience in transporting anesthetized wolves to a temporary pen; however, biologists did not observe much difference in the outcome than in a normal hard release.
- A soft release may be more likely to limit dispersal, with packs more likely to stay together and may be less likely to disperse and interact with livestock, decreasing conflict potential in the short term. However, while documented in the NRM releases, these benefits should not be overstated because wolves that are soft-released will still have post-release movement, as exhibited within the first five years following the soft release in Yellowstone. There is also variability of movement among individual wolves.
- A soft release could be considered should specific areas be identified that are highly suitable for wolves where there is a desire to keep wolves localized closer to the release areas. A soft release strategy should also consider suitable habitat for where wolves will overwinter; pens may need to be located at or near overwinter habitat. Soft release could be considered particularly if there is concern that a lack of distribution of suitable habitat would limit the success of and/or increase conflict with wolves that disperse following a hard release. However, social-ecological suitability mapping data does not provide clarity that there is such a preferred soft release acclimation site for Colorado.
    - TWG members further noted that, while not a technical issue, using soft release to attempt to address social concerns about post-release movement could create other social concerns if specific communities are perceived as being targeted for having wolves in their areas.
- A mating pair may remain together in a soft release strategy to raise a litter after being released, even if auxiliary members split. The soft release strategy with a related pack may build social structure, foster greater reproductive potential, and attenuate dispersal, but at a significantly greater financial and logistic cost. In the Yellowstone soft release, penned animals were unrelated and matched via sex and age. Wolves are likely to disperse regardless of pack dynamics; individual reputation would be a greater factor in conflict.
- The soft release in YNP included significant resources, including building structures, patrolling and staffing pens 24/7 while wolves were in the pens (for 10 weeks), and feeding wolves. Existing infrastructure at Yellowstone enabled the construction and tending of pens, which was not the case during the reintroduction effort in central Idaho.
- There are questions regarding the feasibility of a soft release in Colorado, including whether Colorado has the resources and manpower at its disposal to execute a soft release. The release technique may largely be determined by logistics considerations (including whether there are suitable sites for soft release) and funding.

- Soft release in YNP also resulted in behaviors by wolves reflective of frustration with captivity. Quick capture, moving, and release is preferred.
- There is not a correlation between the method of capture and the method of release. Also, experience in trapping wolves to relocate them away from livestock indicates that capture practice had little to no effect on their dispersal patterns.

Time of year

Alternatives considered: Winter; spring; summer; fall

Summary of TWG feedback: Of the alternatives considered, spring and summer do not have technical merit; winter and fall both have technical merit; and winter is preferred over fall.

Rationale/discussion:

- Summer and spring do not have merit because of the undue heat stress the seasons place on reintroduced individuals.
- Fall presents risks of hunting season in the context of the vulnerabilities of recently reintroduced wolves.
- Winter (November through March) is preferred due to colder temperatures; snow cover to enable tracking; proximity to the first breeding season; proximity to annual peak ungulate prey vulnerability; and greater ease of protecting livestock during winter.

Considerations for where wolves could be released

Alternatives considered: Land ownership; livestock presence; geographic context; prey base; likelihood of supporting multiple packs; proximity to state border; vote results; seasonal elk supply.

Summary of TWG feedback: All alternatives have technical merit; vote results have least preference as a technical alternative to guide reintroduction location, but it is recognized that socio-political considerations will also be at play in selection of release area(s).

Rationale/discussion:

- A release area is any contiguous space where it is suitable for wolves to be released, whether via a single discrete release site or at multiple discrete release sites within the area. A release site can be used multiple times. A site where a wolf is released is not expected to be necessarily where the wolf will stay. See further discussion below.
- The highest quality habitat is generally large, contiguous areas of public lands with a high abundance of prey and low livestock densities. Consider where most big game are located during the time when releases occur and where livestock are or will be in relation to big game during other seasons. Regardless of where wolves are released, habitat selection may differ greatly compared to habitat models.
- Release sites do not necessarily have to be federal lands. Consideration of overall landscape context should inform the selection of release areas/sites.

- Dispersal and homing tendencies of reintroduced wolves may or may not affect donor population selection. The proximity of Wyoming to Colorado may lead to a higher potential of wolves returning across state lines after being reintroduced. Dispersal studies reflect an average dispersal from the release site being sixty to seventy miles but could vary significantly by individual. Some TWG members suggested there is a northernly homing tendency; others suggested wolves disperse in a starburst pattern, with no particular cardinal orientation.
- Post-release dispersal is not comparable to natural dispersal; the average duration of dispersal is five and a half months after release. Seasonal dispersal and seasonal migration patterns of prey species such as wild ungulates will also affect dispersal of wolves.
- It is important to consider the proximity of the release area to a state border. Release at least seventy-five miles from a state border should be considered. This buffer should also be considered for the borders of sovereign Tribal nations in Colorado, in consultation with these Tribes; so that wolves do not immediately disperse to neighboring states/Tribal lands.
- Especially under the conditions of a hard release, not much attention needs to be paid to territoriality. Consider release sites that can support several packs to create a small population that supports reproduction and the sustainability of the reintroduced wolf population. Avoid creating widely dispersed, isolated packs to improve connectivity. Clusters of packs will help to avoid poor survival and recolonization trends.
- Interactions with human populations should be considered, and large populated areas should be criteria for exclusion of release sites and areas. A flexible pace outlined below can also help to address issues as they arise.
- Wolves can succeed anywhere with adequate habitat where there is social acceptance; consider findings from an in press (as of 8/2021) landscape analysis to inform the social and human considerations for release sites and areas. Due to dispersal, where wolves settle may be far away from the release location; consider social and topographic factors where wolves might pass through during dispersal when selecting release sites and areas.

Number of release sites (and number of release areas)

Alternatives considered: Flexibility in specific release sites for an area with multiple release points; multiple release areas; and one release area

Summary of TWG feedback: All alternatives were determined to have technical merit. The alternative to have flexibility in specific release sites for an area with multiple release points is most preferred.

Rationale/discussion:

- Consider the number of release areas *vis a vis* the number of wolves reintroduced. It is likely that not many release areas will be needed in Colorado to ensure wolf population growth. Flexibility between a few (e.g., one to four) release areas would be prudent, with the option to return to the same area or areas to release wolves over the course of several years. Adaptive management will allow refinement of reintroduction logistics and technique year-by-year.
- A minimal number of release sites, such as a one or two logging roads, could serve to meet the goals of reintroduction in a short period of time with minimal logistical complications.

- Use of a higher number of areas and release of wolves in largely geographic dissimilar and dispersed locations complicates the likelihood that wolves will encounter one another and begin breeding. It is therefore not desirable to have too many geographically diverse release areas.
    - If wolf population growth proceeds in Colorado like it did in the NRM following those reintroductions, most of Colorado would be occupied by wolves within about ten years. Reducing the social or geographic burden on specific release sites by distributing these areas is only a consideration for a few years before wolves spread out on their own.
    - If the wolf population in Colorado does not grow following the translocation as fast as occurred in the NRM, there would be an opportunity to establish additional release areas or sites as appropriate to meet recovery goals.
- Alternatively, all wolves could be released in one area, at multiple sites to provide for security and flexibility.
- Lessons from other states include:
    - When combined with natural recolonization into northwestern Montana (as is currently occurring in northwestern Colorado) beginning in the 1980s, two release areas were used in the northern Rockies in the mid-1990s. Within ten years of those releases, much of the suitable habitat in Idaho, Montana, and Wyoming was occupied, and within twenty years wolf populations had become established in Washington, Oregon, and California, all based on these two release areas.
    - To better understand the terminology used, Yellowstone National Park is a large release area with multiple (six) release sites.
    - The human population density of Colorado should play a role in informing the number of release areas and sites.

Pace of wolf reintroduction

Alternatives considered: About thirty to forty- wolves reintroduced for one year (Fast); about ten to fifteen wolves reintroduced per year for two to three years (Medium); about five to ten wolves reintroduced per year for three to six years (Slow), be flexible (*Note:* numbers are not concrete, and are meant to suggest relative pace)

Summary of TWG feedback: All alternatives were determined to have technical merit. The overall goal is ultimately to establish a self-sustaining population. The goal of the initial translocation and restoration is to introduce enough wolves at an adequate pace to establish a growing population that can ultimately achieve a self-sustaining population. Without specifying what that might look like from a numerical perspective and/or other indicators, there are a variety of ways (i.e., paces) that could work to achieve a growing population. The general technical preference is for a “medium” pace, followed by a “slow” pace, and, least favorably, a “fast” pace. It is important to be flexible and adapt the specific logistics of these paces according to conditions of the reintroduction. It is also important to be adaptive around specific dates and numbers. *Note*: Discussion of this topic focused specifically on the number of wolves actively reintroduced, not long-term population goals or management thresholds. The latter will be addressed at a future meeting(s).

Rationale/discussion:

- A medium pace is an appropriate balance between the need to reach critical mass and a maintain a feasible pace to reach critical mass. It is important to employ adaptive management strategies and robust monitoring to maintain the flexibility of reintroduction efforts, to be nimble to adapt to the constraints around capture, and to monitor the success of release. Public support may also be garnered by approaching reintroductions with a moderate and flexible pace.
- Rationale against a slow pace of reintroduction is that the population may not reach critical mass to achieve a growing population under this pace. The vulnerability of recently reintroduced wolves to illegal human-caused mortality may be an additional impediment to reaching critical mass. Colorado has smaller tracts of public land compared to Yellowstone and the NRM region, which may enhance susceptibility to illegal mortality. A slow pace has a higher likelihood of program failure than does a medium pace.
- A fast pace may not be logistically feasible (see capture considerations above) and the complicated logistics associated with a fast pace may also lead the program to a premature failure.
- Much of the discussion around pacing revisited topics of capture methods (see above) as well as considerations for release areas and sites. Coordination of capture efforts with release sites is important; the pace of release may be constrained by efficiency of capture.

When to stop and/or pause reintroduction

Alternatives considered: After about forty animals have been moved; indication of pack establishment; indication of pack establishment with some documented reproduction; two packs raising two pups for two consecutive years; flexible approach: i.e., do releases (e.g., of thirty to forty wolves) and then pause to see what happens

Summary of TWG feedback: All alternatives have technical merit. The preferred option is to do 'a bunch' (undetermined number) of releases (e.g., release a total of approximately thirty to forty wolves), then pause, assess, and adapt based on whether the initial restoration phase has resulted in an adequately growing population that will ultimately achieve a self-sustaining population. *Note***:** This discussion is focused specifically on when to pause active reintroduction, not on long-term population goals, definitions for self-sustaining populations and long-term success, or management thresholds. These latter topics will be addressed at a future meeting(s).

Rationale/discussion:

- Adaptive management is important: generally, it is recommended to release some number for two to three years, pause, and then monitor and model population growth to determine trajectory toward a self-sustaining population, and adaptively manage based on that model.
- The parameter of 'when to stop reintroduction' is not the same as the definition of a 'self-sustaining population,' but is rather a benchmark toward achieving that goal.
- It is important to predict and monitor a rate of growth and conduct analysis between rate of growth and the overall status of the population.

- Experiences in other states can inform the approach; however, adaptive management and flexibility to learn and respond to what happens in Colorado is key.
- TWG members have a variety of perspectives on topics related to 'when to stop reintroduction.' In addition to the general feedback of the group (above), additional *individual perspectives are provided below*:
    - There was discussion around the definition of a pack; some define it as at least a pair of wolves; others define it as a pair of reproducing wolves with a litter. In the Northern Rockies, a breeding pair was defined in the recovery plan as a pair that recruited at least two pups through the end of the year.
    - There is no reason to pause before thirty to forty wolves are released over the course of twelve to eighteen months: data are adequate to support the pause with a more minimal approach.
    - Recognize that a pause in reintroduction might lead to a stop, given a monitoring program to track population growth after two to three years.
    - A pause should occur when the reintroduction target of approximately thirty to forty wolves (released at a 'medium pace' of approximately two to three years as described above) is achieved to assess whether the population is growing at an adequate rate toward a self-sustaining population and if wolf-livestock conflicts can be managed successfully in the areas where wolves become established. In general, some ambiguity is needed to allow for the flexibility required by adaptive management; objectives should not be overly restrictive to prevent adaptation to experiences and/or conflicts during the reintroduction phase. Arbitrary numbers for defining the number of wolves to be reintroduced or when to pause reintroduction should be avoided as they could be limiting or create problems for adaptive management later.
    - Each reintroduction effort's population growth is different; it is possible that the Northern Rockies is the best model to follow to determine models for Colorado's population growth. In Oregon, from a population of fourteen wolves, the population doubled every two years for the first five years. Mexican gray wolves were released from captive stock and repopulation dynamics were considerably different than in the Northern Rockies and are still releasing twenty years after initial reintroduction.

Appendix A: Technical Working Group members

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