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Docket No. FWS-R6-ES-2011-0039; 92220-1113-0000-C6,

and by mail to:

Public Comments Processing

Attn: FWS-R6-ES-2011-0039,

Division of Policy and Directives Management,

U.S. Fish and Wildlife Service,

4401 N. Fairfax Drive, MS 2042-PDM,

Arlington, VA 22203

Re: Comments by the Society for Conservation Biology – North America Section on RIN 1018-AX94: Removal of the Gray Wolf in Wyoming From the Federal List of Endangered and Threatened Wildlife and Removal of the Wyoming Wolf Population's Status as an Experimental Population

On behalf of the North America Section of the Society for Conservation Biology (SCB-NA), we offer the following comments on the "Proposed Rule on Removal of the Gray Wolf in Wyoming From the Federal List of Endangered and Threatened Wildlife and Removal of the Wyoming Wolf Population's Status as an Experimental Population." We are submitting comments because the scientific perspective provided by our organization, and the research conducted by our organization's member scientists, are highly relevant to the proposed policy, and because key deficiencies in the proposed rule should be remedied in order for the US Fish and Wildlife Service (henceforth "Service") to meet its responsibilities under the Endangered

Species Act (ESA; 16 USC 1531 et. seq.), including those mandating use of the best available scientific data in recovery planning.

As described below, SCB-NA has submitted comprehensive comments during previous comment opportunities associated with recovery of the gray wolf (*Canis lupus*) in the Northern Rocky Mountains. However, we focus these current comments on a single aspect of the current proposed rule which is inconsistent with the ESA (especially the Act's provisions for use of best available scientific data in listing and recovery decisions), relevant case law, and previous recovery plans. Specifically, our concerns pertain to the rule's proposal that artificial means for establishing connectivity among populations (e.g., translocation of individuals of the species by vehicle) are in themselves adequate to alleviate relevant threat factors even when feasible methods for ensuring natural dispersal and population connectivity exist. This aspect of the proposed rule has broad legal and policy significance because it attempts to substitute a "museum-piece" interpretation of recovery for the Act's mandate to restore self-sustaining wild populations of species and the ecosystems on which such species depend. Additionally, this aspect of the proposed rule has practical significance for recovery of the Wyoming wolf population because proposed post-delisting management is inadequate to ensure alleviation of relevant threats.

To remedy this inconsistency, we recommend that the Service revise the proposed rule to establish objective and measurable criteria and associated recovery actions that ensure levels of natural dispersal between the Wyoming wolf population and other populations sufficient to alleviate genetic and other threats associated with loss of population connectivity.

We provide details on the requested actions below after reviewing SCB's qualifications to comment on this issue.

SCB is an international professional organization whose mission is to advance the science and practice of conserving the Earth's biological diversity, support dissemination of conservation science, and increase application of science to management and policy. The Society's membership comprises a wide range of people interested in the conservation and study of biological diversity. Resource managers, educators, government and private conservation workers, and students make up the thousands of members worldwide.

SCB-NA has been in communication with the Service on several previous occasions concerning management of wolves under the ESA. In December 2007, SCB-NA submitted scoping comments on the Environmental Impact Statement and Socio-Economic Assessment for the Proposed Amendment of the Rule Establishing a Nonessential Experimental Population of the Arizona and New Mexico Population of the Gray Wolf. In March 2009, SCB-NA submitted a letter to the Service offering assistance in evaluating how current scientific research might better inform the process of setting recovery goals for the gray wolf in the western United States. In November 2010, SCB-NA submitted comments recommending initiation of recovery planning and related actions for the Mexican wolf (*C. l. baileyi*). In July 2011, SCB-NA submitted comments concerning proposed reclassification and initiation of status reviews for the gray wolf.

WHAT IS BEING PROPOSED

The rule proposes to remove the gray wolf (*Canis lupus*) in Wyoming from the List of Endangered and Threatened Wildlife on the basis that "the best scientific and commercial data available indicate that wolves in Wyoming are recovered and no longer meet the definition of endangered or threatened under the Endangered Species Act of 1973, as amended (Act). Wyoming's wolf population is stable, threats are addressed, and a post-delisting monitoring and management framework has been developed" (76 FR 193:61782). Specifically, the rule endorses as adequate a management plan developed by the state of Wyoming which divides the state into three zones: 1) a Wolf Trophy Game Management Area (WTGMA) where wolf hunting is seasonally permitted, 2) the remainder of the state where a designation of the species as a 'predator' allows year-round unrestricted hunting and other forms of lethal control, and 3) seasonal expansion of the WTGMA by 80 km southward for 4.5 months during peak wolf dispersal season (76 FR 193:61785).

The Service states that it "seek[s] information, data, and comments from the public about this proposal including the post delisting monitoring and management framework." The information we present below is specifically relevant to the following questions posed in the proposed rule:

- Does the proposed rule provide accurate and adequate review and analysis of the factors relating to the threats?
- Are the conclusions we reach, including their projection of maintenance of a viable population, logical and supported by the evidence provided?

- Is it reasonable for us to conclude that Wyoming's approach to wolf management is likely to provide for sufficient levels of gene flow (either natural or human assisted) to prevent genetic problems from negatively impacting the GYA's population or the larger Northern Rocky Mountain (NRM) metapopulation in a manner that would meaningfully impact viability?

We additionally address the key question as to whether human assisted gene flow is sufficient to allow a wild wolf metapopulation to be considered recovered, i.e., no longer meeting the Act's definition of a threatened or endangered species.

POPULATION CONNECTIVITY IS NECESSARY TO ADDRESS THREAT FACTORS AND ACHIEVE RECOVERY FOR THIS SPECIES

Efforts to recover endangered species increasingly involve measures to ensure population connectivity among core habitat areas. The ESA requires that species recovery plans define objective and measurable recovery criteria that comprehensively address the threats that led to listing of the taxa as threatened or endangered. Population connectivity is a necessary component of criteria for recovery and delisting of wolf populations. Unexploited wolf populations typically show a considerable degree of genetic and demographic connectivity (Wayne and Hedrick 2011). Wolves were historically present throughout their range in the contiguous 48 states as a largely continuous population with some degree of genetic isolation-by-distance (i.e. increasing genetic difference with increasing geographical distance) and additional heterogeneity reflecting specific ecological factors (Carmichael et al. 2007, Musiani et al. 2007, Muñoz-Fuentes et al. 2009). However, due to loss of suitable habitat and other

factors, wolf distribution in the most areas of the contiguous 48 states (i.e. outside of Alaska), even after delisting, is likely to consist of many subpopulations which are relatively small when compared to historic population sizes (which may approached 100,000s in the western U.S.; Leonard et al. 2005). As has been discussed in relevant wolf recovery plans for the NRM region (e.g., FWS 1994), connectivity among these subpopulations is necessary to alleviate genetic and demographic threats posed by small population size.

This conclusion is also based on extensive data from other species. In order to maintain the ability to adapt to new environments (such as caused by climate change or novel diseases), a metapopulation should be of sufficient size to maintain a balance between loss of alleles via genetic drift and new alleles produced by mutation (Franklin 1980). The 50/500 rule specifies that retention of allelic diversity through a long-term balance between mutation and genetic drift may require that such subpopulations be part of a larger metapopulation with an Ne > 500 (Franklin 1980, Franklin and Frankham 1998). More recent studies have proposed that a Ne of 500 may be inadequate. Estimates of "evolutionary" MVP, the minimum population size required for species to adapt to changing environments through evolution, have ranged from effective population sizes of 500-1000 (Franklin et al. 1980; Franklin and Frankham 1998) to 5,000 (Lynch and Lande 1998).

Several aspects of the social structure and reproductive system of the wolf contribute to the species having a relatively low ratio of effective to census population size (Ne/N), implying that relatively large metapopulations are necessary to maintain heterozygosity and genetic health. Ne/N ratios in gray wolves generally range from 0.2 – 0.4 (vonHoldt et al. 2008, Wayne and Hedrick 2011). Specifically, the pedigree-based effective population size ratio in the

Wyoming wolf population is approximately 0.28 (harmonic mean, with a range from 0.26-0.33; vonHoldt et al. 2008). Given this Ne/N ratio, and assuming that the contributions to Ne from the three NRM subpopulations are additive, a Ne of 500 in wolves might require a census population of 1785. In order to adequately consider and alleviate genetic threats, recovery plans and delisting decisions for wolves should consider effective population size in addition to census population numbers.

Recovery of wolf populations of thousands of individuals that obtain effective population sizes that retain potential for future evolution will be challenging to achieve at the scale of any one region. However, habitat analyses suggest that these population numbers are at least feasible at the scale of the larger metapopulation inhabiting the western U.S. (Carroll et al. 2006). Wayne and Hedrick (2011) proposed that a genetically informed wolf management plan should be designed "to reestablish genetically interconnected wolf populations that can persist into the future." Considering the natural genetic population structure of gray wolves and their distributional range in the recent past, it follows that recovery must be secured by ensuring connectivity at the metapopulation level. In practical terms, this means that long-term sustainability of the Wyoming population is in part dependent on metapopulation connectivity across a larger region.

Connectivity will be important both within a DPS and among wolf DPSs in the western U.S. For example, genetic data suggest that historically, the southern Rocky Mountains were part of a zone of intergradation between Mexican wolves and more northern wolf subspecies (Leonard et al. 2005). If wolves from the NRM, particularly the Wyoming population, disperse southward (as occurred with wolf 341F in 2010, see below) and breed with free-ranging

Mexican wolves, resultant gene flow has the potential to restore genetic variation that has been lost from Mexican wolves (genetic restoration, Hedrick 2005), and increase the fitness of Mexican wolves (genetic rescue, Tallmon et al. 2004). Connectivity models have recently been developed that can help managers predict which areas are likely to be used by wolves dispersing from the Wyoming population to both other NRM populations and potentially suitable habitat in other states such as Colorado and Utah (Carroll et al. 2011, Carroll unpublished data).

The most commonly proposed criterion for population connectivity states that one genetically effective migrant per generation (OMPG) into a subpopulation is sufficient to acceptably slow the loss of polymorphism and heterozygosity (Frankel and Soulé 1981; Allendorf 1983). Because the OMPG criterion depends on simplifying assumptions, other researchers have suggested a more ambitious rule of 10 effective migrants per generation (Mills and Allendorf 1996; Vucetich and Waite 2000). Mills and Allendorf (1996) concluded that "one migrant per generation is a desirable minimum, but it may be inadequate for many natural populations." Absent more detailed species-specific analysis, the above studies suggest that a recovery criterion of **at least** one effective migrant per generation into the Wyoming population is necessary to alleviate threats to the Wyoming population. Although the proposed rule does adopt the OMPG criterion, the rule inappropriately suggests that this criterion may be met through artificial translocation rather than natural dispersal (76 FR 193:61814).

RECOVERY OF NATURAL POPULATION CONNECTIVITY IS FEASIBLE FOR THIS SPECIES

Wolves are among the most vagile of all terrestrial mammals. Natal dispersal of wolves averages 100 km (Boyd and Pletscher 1999). Numerous long-distance dispersal events (greater than 800 km) have been recorded (Boyd and Pletscher 1999). Two recent long-distance dispersal events from the NRM metapopulation demonstrate the potential for restoring natural population connectivity in the western U.S. In 2010, a female wolf from Yellowstone (341F) dispersed over 1,000 km to Colorado. In 2011, a male wolf from eastern Oregon (OR7) dispersed over 900 km to California.

Based on recent research, the NRM wolf metapopulation currently exhibits natural dispersal rates that may be at or near levels adequate to alleviate genetic and other threats. The proposed rule summarizes this research as follows "The available data conclusively demonstrate that this portion of the recovery criteria (i.e., ''genetic exchange'') is met. Specifically, vonHoldt et al. (2010, p. 4412) demonstrated 5.4 effective migrants per generation among all three subpopulations from 1995 through 2004 when the NRM region contained between 101 and 846 wolves" (76 FR 193: 61796).

However, this summary omits key details relevant to the status of the Wyoming population, which experiences a lower level of connectivity than other NRM populations. The vonHoldt et al. (2010) study, which covered 10 years or approximately 2.4 wolf generations, documented 1 genetically effective natural dispersal from Central Idaho into the Greater Yellowstone population for an average effective migration rate of 0.42 migrants per generation. Additionally, 2 wolves were artificially translocated from Northwest Montana and bred in the Greater Yellowstone population, representing 0.83 effective migrants per generation due to

artificial translocation. The rate of natural dispersal into the GYE (0.43 migrants per generation) is lower than that into either of the two other NRM wolf populations (0.83 migrants each per generation for Central Idaho and Northwest Montana). Additionally, zero effective migrants were recorded from the Greater Yellowstone population to the two other NRM populations (vonHoldt et al. 2010). The greater genetic isolation of the Greater Yellowstone (or Wyoming) population is consistent with habitat studies that have documented lower habitat connectivity to this population (Oakleaf et al. 2006). However, the migration rates documented in vonHoldt et al. (2010) represent minimum estimates recorded over a period in which the metapopulation size grew by 800%. Thus these rates would likely be exceeded **if** the size of the NRM metapopulation was maintained at or above current levels.

The Service recently contracted a panel of independent scientists to review the adequacy of the proposed rule. A member of the panel also expressed concerns over the proposed rule's interpretation of vonHoldt et al. (2010):

> The WY plan indicates that its overall management of wolves (with provisions for a regulated public harvest, aerial gunning, lethal take permits, and allowance for property owners to immediately kill a wolf doing damage [or likely to do damage at any moment] to private property) is likely to result in meeting the objective of sufficient genetic connectivity. The primary reason offered by the WY plan for this conclusion is that genetic connectivity was (p. 27) "more than adequate when the NRM wolf population was much lower than the current number (=5.4 migrants per generation at a population of ~835 wolves in 2004 vs. ~1,614 wolves in 2010)." This reason is weakened by two concerns. First: This statement is based on work by Von Holdt et al. (2010). When I read these papers and spoke with an author of these papers, the impression I get is that during the ten years (1995-2010) that were studied: (i) The GYA produced zero emigrants that migrated to and reproduced in either CID or NWMT, (ii) one wolf from CID migrated to and reproduced in GYA, and (iii) two wolves were translocated from NWMT into the GYA. This corresponds to less than 0.5 effective immigrants per generation occurring naturally (i.e., not human---assisted migration). Also, dispersal data gathered from radio-collared wolves living between 1992 and 2008 suggest that the GYA received approximately 1.5 migrants per generation

> (p. 61814 of the proposed rule). Even though the methods used in Von Holdt et al. (2010) are expected to underestimate dispersal, these observations suggest that migration into the WY population may not be =5.4 effective migrants per generation, as implied by the Wyoming plan. Second, much of the migration that has been documented occurred when abundance was greater than that specified for recovery in the NRM (i.e., 30 packs and 300 wolves). It is unclear whether any of the states, including WY, will maintain enough wolves to maintain sufficient genetic connectivity" (FWS 2011:A-22). "Existing evidence indicates that the three populations of the NRM have been sufficiently connected in recent years. However, the least connected subpopulation seems to be Wyoming. In recent years, the number of effective migrants that Wyoming has received is close to the minimum number considered to be sufficient. The rate of effective migration is importantly influenced by abundance and mortality. Moreover, state management will almost certainly lead to reduced abundance and increased mortality. In particular, no state is required to have more than 150 wolves, which is much lower than current or recent population sizes. These circumstances raise concern about whether adequate levels of connectivity would exist under state management. Finally, the Wyoming plan makes no provisions for the Wyoming population to provide emigrants that would reproduce in other NRM populations" (FWS 2011:A-24).

From the above data we conclude that maintaining adequate natural connectivity (e.g., greater than or equal to OMPG) to and from the Wyoming population is feasible but will require specific attention in post-delisting management actions. Specifically, it will require efforts to reduce mortality of wolves present in areas of habitat linking the Wyoming wolf population with adjacent populations.

THE PROPOSED RULE DOES NOT ENSURE NATURAL POPULATION CONNECTIVITY AND DOES NOT ALLEVIATE THREATS ASSOCIATED WITH LOSS OF CONNECTIVITY

By specifying that the threat described above may be alleviated by either natural or artificial (human-assisted) movement between populations, the rule effectively proposes that artificial translocation alone is adequate to achieve population connectivity between wolves inhabiting Wyoming and adjacent states. For example, the rule states "Human-assisted

migration will be used, as necessary, to maintain levels of genetic exchange and connectivity for both the GYA (including Wyoming) and the larger NRM metapopulation (Groan et al. 2008, p. 2; WGFC 2011, pp. 26– 29)”(76 FR 193: 61816). Further, "if genetic exchange drops below one effective migrant per generation, the States will implement a human-assisted migration program (i.e., translocating wolves)"(76 FR 193: 61815).

Because the proposed rule allows the connectivity criterion to be met by artificial translocation, it removes incentives for ensuring the criterion is met via natural dispersal. Although the proposed rule is laudable in that it endorses ongoing multi-stakeholder efforts to preserve connectivity (76 FR 193:61816), these efforts are unlikely to be effective if wolves in putative connectivity areas are subject to excessive mortality, as is proposed in the rule. Proposed post-delisting management has the potential to significantly reduce effective dispersal rates below current levels due to both reduction in the size and distribution of the Wyoming wolf population and the limited seasonal and spatial extent of areas with regulations that promote survival of dispersers (the year-round trophy game zone (WTGMA) and associated areas to which it would be seasonally expanded).

For example, the proposed rule does not consider the importance of smaller areas of suitable habitat that may support small ‘stepping stone’ populations (or single packs) that facilitate effective long-distance dispersal (e.g., via conspecific attraction of dispersers) The proposed rule misrepresents published habitat models (e.g., Carroll et al. 2006, Oakleaf et al. 2006) in order to categorize areas that are unable to support large core populations as unsuitable habitat: "Although Carroll determined there may be some additional suitable wolf habitat in Wyoming beyond the area Oakleaf analyzed, we believe it is marginally suitable at

best, and is insignificant to NRM DPS, GYA, or Wyoming wolf population recovery, because it occurs in small, isolated, and fragmented areas and is unlikely to support many, if any, persistent breeding pairs. While some areas in Wyoming predicted to be unsuitable habitat by the above models have been temporarily occupied and used by wolves or even packs, we still consider these areas as largely unsuitable habitat because wolf packs in such areas have failed to persist long enough to be categorized as breeding pairs and successfully contribute toward recovery" (FR 193:61798).

The rule proposes that increased mortality in areas used currently by dispersing wolves may enhance effective connectivity: “Human-caused mortality may also provide a potential benefit to genetic exchange. Specifically, State management practices will periodically create localized disruptions of wolf pack structure or modified wolf density in select areas of suitable habitat that will create social vacancies or space for dispersing wolves to fill. This outcome will likely increase reproductive success rates for dispersers that enter the GYA” (76 FR 193: 61816). This speculation is contradicted by recent research on wolves and other large carnivores that suggests the opposite conclusion: disruption of local populations and pack territory structure due to hunting or management control may increase local dispersal (colonization by individuals from immediately adjacent areas) but may at the same time reduce effective long-range dispersal movements (by increased mortality of long-range dispersers)(Person et al. 2008, Webb et al. 2011). The latter rather than the former movements are important for increasing gene flow and alleviating genetic threats. A member of the scientific peer review panel for the proposed rule also concluded that "the assertion in the proposed rule and Plan that anthropogenic mortality could enhance and benefit genetic exchange is not scientifically

credible. If natural genetic dispersal is sustained, then a robust wolf population will maintain gene flow on its own" (FWS 2011:9).

Although NRM wolves do not currently show deleterious effects of inbreeding on viability, this is due primarily to the fact that reintroduced wolves were recently drawn from a large and genetically heterogeneous Canadian wolf metapopulation. If post-delisting management does not ensure that natural connectivity is maintained, the studies reviewed above suggest that this may result in a significant threat operating in the foreseeable future on the NRM metapopulation as a whole and particularly on its most isolated component, the Wyoming population.

THE ACT REQUIRES RECOVERY NATURAL POPULATION CONNECTIVITY WHERE FEASIBLE, AND PREVIOUS RECOVERY PLANS HAVE ACKNOWLEDGED THIS

Delisting of a wolf population or metapopulation that is dependent on artificial translocation rather than natural connectivity is inconsistent with the intent of the ESA. The ESA requires recovery of self-sustaining wild populations where feasible. The Services (FWS and National Marine Fisheries Service (NMFS)) have an extensive history of emphasizing recovery of self-sustaining wild populations (i.e., those do not require measures such as controlled propagation or artificial translocation for their persistence) in recovery plans. The Whooping Crane (*Grus americana*) recovery plan states that “the purpose of the Act goes beyond restoring the number of individuals but is to conserve populations in the wild and the ecosystems upon which they depend” (66 FR 33903). The Florida panther (*Puma concolor coryi*) recovery plan states “Restoring endangered or threatened animals or plants to the point where

they are again secure, self-sustaining members of their ecosystems is a primary goal of the Service's endangered species program" (60 FR 478). The Peregrine Falcon (*Falco peregrinus*) recovery plan states "Recovery is the process by which the decline of an endangered or threatened species is arrested or reversed and threats to its survival are neutralized so that long-term survival in nature can be ensured. The goal of this process is the maintenance of secure, self-sustaining wild populations of species with the minimum investment of resources" (63 FR 45446). The recovery plan for the Rio Grande silvery minnow (*Hybognathus amarus*) states "Relegating a species to captivity does not conserve the ecosystem on which they depend. Controlled propagation is not a substitute for addressing factors responsible for an endangered or threatened species' decline. Therefore, our first priority is to recover wild populations in their natural habitat wherever possible, without resorting to the use of controlled propagation" (68 FR 8088). Species whose genetic health remains dependent on translocations are considered "intensively managed" (Redford et al. 2011), which is a more precarious status than "self-sustaining" or "conservation-dependent" (an otherwise self-sustaining species for which continued efforts are required to limit human-caused mortality).

Judicial decisions interpreting the ESA recognize that an important goal of Congress in seeking to protect threatened and endangered species – as well as the ecosystems upon which these species depend – is to recover these species to the point at which they are self-sustaining in their natural habitat. In *Trout Unlimited v. Lohn***,** 559 F.3d 946, 957 (9th Cir. 2009), the court noted that it agreed with plaintiffs, NMFS, and the district court on to the following interpretation of the ESA:

> [T]he ESA's primary goal is to preserve the ability of natural populations to survive in the wild. As the district court put it, "[t]hat the purpose of the ESA is to

> promote populations that are self-sustaining without human interference can be deduced from the statute's emphasis on the protection and preservation of the habitats of endangered and threatened species." *See, e.g.,* 16 U.S.C. § 1531(b) ("The purposes of this [Act] are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, [and] to provide a program for the conservation of such endangered species and threatened species....")… The ESA's legislative history also confirms that the ESA is primarily focused on natural populations. *See* H.R.Rep. No. 95-1625, at 5, *reprinted in* 1978 U.S.C.C.A.N. at 9455.

Similarly, *Trout Unlimited v. Lohn*, 2007 WL 1795036 (W.D.Wash. June 13, 2007) stated "If the ESA did not require that species be returned to a state in which they were naturally self-sustaining, preservation of the habitat of the species would be unnecessary." In *Alliance for the Wild Rockies v. Lyder*, 728 F. Supp. 2d 1126, 1137 (D. Mont. 2010), the court overturned the Service's refusal to consider habitat for a reintroduced population of Canada lynx in Colorado for designation as critical habitat; the court reasoned that a factor such as lack of connectivity to other lynx populations could be what was "holding the population back" from being self-sustaining. In *Center for Biological Diversity v. Salazar*, 2010 WL 3924069 (D. Ariz. 2010), the court stated "The primary goal of the ESA is to restore endangered and threatened animals and plants to the point where they are again viable, self-sustaining members of their ecosystems." In *California State Grange v. National Marine Fisheries Service*, 620 F. Supp. 2d, 1111, 1157 (E.D. Cal. 2008), the court stated "NMFS reasonably interpreted the ESA to allow, if not require, that emphasis be placed on natural (i.e., 'wild') populations of species being considered for listing. Most importantly, the ESA requires that the condition of listed species (or DPSs) be improved so that they will no longer need the protection of the ESA. The reasonable implication of this requirement is that agencies should aim recovery efforts toward establishing self-

sustaining populations. An interpretation that would permit exclusive reliance on hatcheries for 'recovery' purposes is antithetical to the creation of a self-sustaining population."

Both the Services have also consistently emphasized self-sustaining populations as a goal of recovery under the ESA. In the agencies' joint Section 7 Handbook (p. 4-36), the term "recovery" is defined as "the process by which species' ecosystems are restored and/or threats to the species are removed so self-sustaining and self-regulating populations of listed species can be supported as persistent members of native biotic communities." The Services commonly implement recovery actions to further this goal of self-sustaining populations. For example, in reintroducing northern Aplomado falcons (*Falco femoralis*) into New Mexico and Arizona, the Service noted that it hoped its actions "will result in the establishment of a self-sustaining, resident population, which will contribute to the recovery of the species" (70 FR 6823). Moreover, echoing our comments above, the Service in that case emphasized that "[s]elf-sustaining populations need a sufficient number of individuals to avoid inbreeding depression and occurrences of chance local extinction; this can range from 50 to 500 breeding individuals, according to minimum viable populations theory (Soule, M.E. (editor) 1987)" (70 FR 6822). In delineating critical habitat for Canada lynx, i.e. the habitat essential for the recovery of this species, the Service emphasized that "retaining connectivity with larger lynx populations in Canada is important to ensuring long-term persistence of lynx populations in the United States"(74 FR 8641). Applying this emphasis on connectivity, the Service ultimately refused to include the habitat of reintroduced lynx in Colorado within its critical habitat designation for lynx because it found that "absent ingress from Canadian populations to the north, viability of any contiguous U.S. lynx populations may be suspect" (74 FR 8641). (However, a federal court

ultimately overturned this ruling given that such habitat could indeed be important to the recovery of the species if problems such as lack of connectivity "holding the population back" could be solved; see above). In *Carson-Truckee Water Conservancy Dist. V. Watt*, 549 F. Supp. 704, 710 (D. Nev. 1982), the court noted the Service's efforts to "restore the cui-ui [fish] to a non-endangered status by developing a population which is self-sustaining through natural reproduction."

In order to demonstrate consistency with previous agency practice, the proposed rule references previous NRM wolf recovery plans which considered artificial translocation (76 FR 193: 61816). However, two of the scientific peer reviewers (Mills and Vucetich) took issue with this line of reasoning. As one reviewer (Vucetich) stated:

> The Service's position on human-assisted dispersal is not logical for the reasons outlined below: [1] The most basic and general equation in all population biology is: Nt+1 = Nt+Bt+It--- Dt---Et, where N is abundance, B is the number of births, D is the number of deaths, I is the number of immigrants, and E is the number of emigrants. This equation highlights the three fundamental processes of a population: reproduction, mortality, and dispersal. It seems straightforward to expect that a recovered population should be able to perform these fundamental processes without the direct assistance of humans. For example, one cannot reasonably expect a population to be considered recovered if it required the regular addition of individuals from a captive population to offset either low recruitment or survival in the wild. For the same kind of reasoning a population should not be considered recovered if it cannot exhibit critical levels of dispersal on its own. [2] Perhaps an exception could be made if there were something peculiar about the natural history of the population in question that excluded its ability to disperse on its own. However, this case does not apply to NRM wolves. Wolves are capable dispersers. Moreover, the main limitation on dispersal in NRM wolves is anthropogenic mortality and the effect anthropogenic mortality has on population abundance. That is, one of the main limitations to natural dispersal is one of the main threat factors that is supposed to be removed. [4] The Service does attempt to provide a justification for why human---assisted dispersal is acceptable. First they argue that some species should be considered perpetually conservation reliant. The weakness of this reasoning is explained above in point [3]. The Service also attempts to justify the appropriateness of human-assisted dispersal by explaining how it has for a long

> period of time, and in many documents, expressed its intention to use human---assisted dispersal. The weakness of this reasoning is that claiming to have intended an action repeatedly, over a long period of time, does not represent an adequate justification for an action. (FWS 2011:A-9)

Preservation of natural connectivity is analogous to preservation of the habitat that permits persistence of a wild population of any species. Although in many cases it may be easier and cheaper to ensure the continued existence of a threatened species in captivity rather than in the wild, the ESA does not consider this recovery. Although artificial translocation (i.e., "live trapping and transplantation") are listed in ESA Section 3(3) as among the appropriate "methods and procedures which are necessary to bring any endangered or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary", they should not be among those methods on which a delisted species must rely in perpetuity.

A member of the scientific peer review panel for the proposed rule expressed similar concerns and stated that

> "The WY plan says (p. 6): "Genetic exchange can be natural or, if necessary, agency managed." Page 4 of this document offers reason for concern over the appropriateness of considering a population recovered if it depends on human-assisted migration. Moreover, the words "can be" and "if necessary," in the above cited sentence, represent an inappropriate level of inconsistency and vagueness. Specifically, it is unclear whether this statement means: (i) "Natural genetic exchange is preferred so long as it does not conflict with other management preferences; and if natural migration does conflict with other management preferences, then human-assisted migration is appropriate," or does the WY plan mean (ii) "Human-assisted migration is acceptable only if natural migration cannot occur when anthropogenic mortality is negligible"? A passage of text on page 28 suggests (but is not clear) that this ambiguity is of concern: "Population management, to the maximum extent practicable, should facilitate the above objective through natural dispersal. Therefore, if wolf population management strategies implemented by the Department are identified as a meaningful factor preventing the connectivity objective from being met, population management will be modified as necessary and appropriate." It seems very clear that effective migration is limited by wolf abundance and the rate of anthropogenic mortality. Would Wyoming, for

example, reduce the quota for a regulated public harvest to zero (and other sources of anthropogenic mortality) if natural migration did not result in meeting the goals for genetic connectivity? This vagueness and potential inconsistency is of concern, in part, because of the prospect for inadequate connectivity described above in point" (FWS 2011:A-23).

The proposed rule overstates the feasibility of artificial translocation as a means for long-term maintenance of population connectivity, in stating “Human-assisted genetic exchange is a proven technique that has created effective migrants in the NRM DPS. An example of successful managed genetic exchange in the NRM population was the release of 10 wolf pups and yearlings translocated from northwestern Montana to YNP in the spring of 1997. Two of those wolves became breeders and their genetic signature is common throughout YNP and the GYA (vonHoldt et al. 2010, p. 4422). Wolves could easily be moved again in the highly unlikely event that inbreeding or other problems ever threatened wolves in the GYA or any other area. Agency-managed genetic exchange could focus on such proven established methods, or use other novel means of introducing genes into a recovery area (e.g., artificial insemination of wolves)" (76 FR 193: 61816).

The rule does not comprehensively address the numerous practical challenges that may limit the success of the proposed artificial methods. For example, artificial insemination of wolves is possible in captivity because hormone profiles of females can be monitored daily and females can be readily captured and inseminated when they are in appropriate condition. This is unlikely to be feasible in a wild population. Additionally, the proposed rule does not consider the factors that may prevent translocated wolves from becoming genetically effective (i.e., successfully breeding) in the recipient population, nor does it estimate the resources required for states to maintain such a translocation program in perpetuity.

A member of the scientific peer review panel for the proposed rule identified the need for

> "more critical consideration of the prospect of managed relocation of individual wolves. Page 61816 notes that "Human intervention in maintaining recovered populations is necessary for many conservation-reliant species and a well accepted practice in dealing with population concerns (Scott et al. 2005)." It should be clarified, however, that Scott et al. (2005) did not intend for continued managed relocations to be a legitimate strategy for sustaining a conservation reliant species: "Although occasional translocations to maintain genetic diversity would not violate this notion of a self-sustaining population, frequent translocations to overcome anthropogenic dispersal barriers or to compensate for losses due to predation disease, or other mortality factors would." (Scott et al. 2005:386). Although wolves will likely always be a high-investment species for whatever state or federal agency is responsible for managing them, it seems inefficient, unnecessary, and counter to the objective of the ESA to conserve ecosystems [ie ESA sec 2(b)] to rely heavily on managed translocations of a species that would, with management to sustain survival of dispersers, be perfectly capable of persisting on its own (Scott et al. 2005). Another advantage of managing dispersal of natural connectivity as opposed to managed translocations is that managed translocations requires decisions on which individual(s) should be moved. Relevant considerations would need to consider demographic effects of removals on the source populations, screening for potential disease transmission or behavioral issues and, in the long term, whether local adaptation may be compromised by the managed translocation. Risks are inherent in these choices. In short, I encourage a focus on managing for natural connectivity, viewing managed translocation as a rare and extreme option to be implemented only in emergency situations" (FWS 2011:A-20).

For some species, existing barriers to restoration of natural dispersal and population connectivity are of such magnitude that such restoration may not be feasible. One example that has been proposed is that of salmon (*Oncorhynchus* spp.) inhabiting rivers with hydroelectric dams that do not permit fish passage. Terrestrial mammals with low vagility (i.e., those that typically disperse short distances) also present challenges for restoration of natural connectivity. Mean natal dispersal distances of female grizzly bears (*Ursus arctos*)(14.3 km; Proctor et al. 2004) are approximately an order of magnitude less than those of female wolves.

Due to the extremely high vagility (dispersal ability) of the wolf, and the absence of any absolute barriers to dispersal in dispersal zones within the NRM region, it is feasible to achieve population connectivity via natural dispersal rather than translocation of individuals between subpopulations. Mitigation of threat factors (e.g., overexploitation) to a level sufficient to allow natural dispersal between populations will also help achieve additional goals of the Act. Recovery of metapopulations that are large enough to ensure long-term genetic potential may also help achieve goals for recovery of ecologically effective populations. Redford et al. (2011) emphasized that

> an ecologically functional population generally will be larger than a demographically functional population (Soulé et al. 2005). In fact, Svancara and colleagues (2005) estimated that such populations may be orders of magnitude larger. This may be particularly relevant when populations need to be recovered from substantially reduced levels. Ecological functionality may be an important attribute to allow species to respond to changes in the composition of communities in the face of climate and other environmental changes.

CONCLUSION

The proposed rule's reliance on artificial translocation to achieve population connectivity has broad significance for recovery of wolves and other species because it attempts to substitute a "museum-piece" interpretation of recovery of species to highly managed conditions resembling outdoor zoos in place of the Endangered Species Act's clear mandate to restore self-sustaining wild populations of species and the ecosystems on which such species depend (ESA, Section 2(b) Purposes). Unless there is some clear physical barrier to natural genetic exchange (such as a large urban area), the goal of a recovery plan should be natural connectivity rather than artificial translocation, if it is to be consistent with the requirement for use of best available scientific data in listing and delisting decisions (ESA

Section 4(b)(1)(A)). If the Service opts to depend on artificial translocation for recovery of the wolf, perhaps the most vagile terrestrial mammal, it will establish an impermissibly minimal standard for connectivity criteria in recovery plans. If the proposed rule is implemented without modification, it will represent a dangerous fork in the road for interpretation of the nation's premier species protection statute.

Achieving natural population connectivity for wolves in the NRM region does not require expensive habitat restoration measures, but only that humans do not indiscriminately kill dispersing wolves. The proposed rule does not ensure this. We request that the rule be revised to include

1) An objective and measurable criterion for **natural dispersal** between (from and to) the Wyoming population and other NRM wolf populations;

2) Post-delisting management actions that will ensure that this natural dispersal criterion is met. These include spatial and temporal expansion of proposed 'trophy game management' areas (i.e., expansion of 'trophy game management' areas to include a greater proportion of potential dispersal zones, coupled with expansion of the period of seasonal 'trophy game management' in areas with such seasonal restrictions);

3) Specific commitments in state law and/or binding management plans to ensure monitoring of effective dispersal sufficient to detect whether the above criterion is being met by the current management protocol; and

4) A commitment to relisting wolf populations within a specified period of time if the above natural dispersal criterion is no longer met. As a member of the scientific peer review panel for

the proposed rule stated, "Without a relisting trigger related to genetic connectivity, it cannot be taken as a serious objective of recovery" (FWS 2011:A-24).

Thank you for your consideration of these comments, which we believe will assist the Service in meeting the best available science requirements and intent of the ESA.

Dominick A. DellaSala, Ph.D., President, North America Section, Society for Conservation Biology

John M. Fitzgerald, J.D., Policy Director, Society for Conservation Biology

LITERATURE CITED

Allendorf, F. W. 1983. Isolation, gene flow, and genetic differentiation among populations. Pages 51-65 in C. M. Schonewald-Cox, S.M. Chambers, B. MacBryde, L. Thomas, editors. Genetics and conservation. Benjamin/Cummings, Menlo Park, California.

Boyd, D. K., and D. H. Pletscher. 1999. Characteristics of dispersal in a colonizing wolf population in the central Rocky Mountains. Journal of Wildlife Management 63:1094–1108.

Carmichael, L. E., J. Krizan, J. A. Nagy, E. Fuglei, M. Dumond, D. Johnson, A. Veitch, D. Berteaux, and C. Strobeck. 2007. Historical and ecological determinants of genetic structure in arctic canids. Molecular Ecology 16:3466–3483.

Carroll, C., M. K. Phillips, C. A. Lopez-Gonzalez, and N. A. Schumaker. 2006. Defining recovery goals and strategies for endangered species: the wolf as a case study. Bioscience 56:25-37.

Carroll, C., B. H. McRae, and A. Brookes. 2011. Use of linkage mapping and centrality analysis across habitat gradients to conserve connectivity of gray wolf populations in western North America. Conservation Biology 25:00-00 (Online Early).

Frankel, O. H., and M E. Soulé . 1981. Conservation and evolution. Cambridge University Press, Cambridge, UK.

Franklin, I. R., and R. Frankham. 1998. How large must populations be to retain evolutionary potential? Animal Conservation 1:69-70.

Franklin, I. R. 1980. Evolutionary change in small populations. Pages 135-149 in M. E. Soulé and B.A Wilcox, editors. Conservation biology: an evolutionary-ecological perspective. Sinauer Associates, Sunderland, Massachusetts.

FWS (Fish and WIldlife Service). 1994. The Reintroduction of Gray Wolves to Yellowstone National Park and Central Idaho. U.S. Fish and Wildlife Service, Helena, Montana.

FWS (Fish and WIldlife Service). 2011. Final Wyoming Gray Wolf Peer Review Panel Summary Report. U.S. Fish and Wildlife Service, Helena, Montana.

Hedrick, P. W. 2005. ‘‘Genetic restoration’’: a more comprehensive perspective than ‘‘genetic rescue’’. Trends in Ecology and Evolution 20:109.

Leonard, J. A., C. Vilá , and R. K. Wayne. 2005. Legacy lost: genetic variability and population size of extirpated US grey wolves (Canis lupus). Molecular Ecology 14:9-17.

Lynch, M., and R. Lande. 1998. The critical effective size for a genetically secure population. Animal Conservation 1:70-72.

Mills, L. S., and F. W. Allendorf. 1996. The One-Migrant-per-Generation Rule in Consenation and Management. Conservation Biology 6:1509-1518.

Muñoz-Fuentes, V., C. T. Darimont, R. K. Wayne, P. C. Paquet, and J. A. Leonard. 2009. Ecological factors drive genetic differentiation in British Columbia gray wolves. Journal of Biogeography 36: 1516-1531.

Musiani, M., J. A. Leonard, H. D. Cluff, C. C. Gates, S. Mariani, P. C. Paquet, C. Vilà, and R. K. Wayne. 2007. Differentiation of tundra and boreal coniferous forest wolves: genetics, coat color and association with migratory caribou. Molecular Ecology 16: 4149-4170

Oakleaf, J. K. et al. 2006. Habitat selection by recolonizing wolves in the northern Rocky Mountains of the United States. Journal of Wildlife Management 70:554–563.

Person, D. K., and A. L. Russell. 2008. Correlates of mortality in an explioted wolf population. JWM 72:1540-1549.

Proctor, M. F., B. N. McLellan, C. Strobeck, and R. M. R. Barclay. 2004. Gender-specific dispersal distances of grizzly bears estimated by genetic analysis. Canadian Journal of Zoology 82: 1108–1118.

Redford, K. H., G. Amato, J. Baillie, P. Beldomenico, E. L. Bennett, N. Clum, R. Cook, G. Fonseca, S. Hedges, F. Launay, S. Lieberman, G. M. Mace, A. Murayama, A. Putnam, J. G. Robinson, H.

Rosenbaum, E. W. Sanderson, S. N. Stuart, P. Thomas, and J. Thorbjarnarson. 2011. What does it mean to successfully conserve a (vertebrate) species? Bioscience 61:39-48.

Soulé, M. E., J. A. Estes, B. Miller, and D. L. Honnold. 2005. Strongly interacting species: conservation policy, management, and ethics. BioScience 55:168-176.

Svancara, L. K., R. Brannon, J. M. Scott, C. R. Groves, R. F. Noss, and R. L. Pressey. 2005. Policy-driven versus evidence-based conservation: A review of political targets and biological needs. BioScience 55: 989–995.

Tallmon, D. A., G. Luikart, and R. S. Waples. 2004. The alluring simplicity and complex reality of genetic rescue. Trends in Ecology and Evolution 19:489-496.

vonHoldt, B. M., D. R. Stahler, D. W. Smith, D. A. Earl, J. P. Pollinger, and R. K. Wayne. 2008. The genealogy and genetic viability of reintroduced Yellowstone grey wolves. Molecular Ecology 17:252-274.

vonHoldt, B. M., D. R. Stahler, E. E. Bangs, D. W. Smith, M. D. Jimenez, C. M. Mack, C. C. Niemeyer, J. P. Pollinger, and R. K. Wayne. 2010. A novel assessment of population structure and gene flow in grey wolf populations of the Northern Rocky Mountains of the United States. Molecular Ecology 19:4412–4427.

Wayne, R. K., and P. Hedrick. 2011. Genetics and wolf conservation in the American West: lessons and challenges. Heredity 107:16–19.