Summary of Public Comments and Responses

on the

Draft Mexican Wolf Recovery Plan, First Revision

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Southwest Region

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The U.S. Fish and Wildlife Service released the draft Mexican Wolf Recovery Plan, First Revision (draft Recovery Plan) for public comment and peer review on June 30, 2017 (82 FR 29918). The comment period lasted for 60 days and closed on August 29, 2017. At the close of the review period on the draft Recovery Plan there were over 101,000 comments from the public submitted on www.regulations.gov to docket number FWS-R2-ES-2017-0036. These included comments from interested citizens as well as federal, state and local agencies, state and local governments, tribes, non-governmental organizations and interest groups. The majority of comments were either duplicative or non-substantive in nature. We evaluated as non-substantive those comments that only expressed either support for, or opposition to, the recovery of Mexican wolves with no supporting argument. We identified 560 comments that were substantive in nature. Using a comment matrix we divided substantive comments into categories and subcategories for analysis and the determination of appropriate action. We categorized comments according to the major components of the draft Recovery Plan (e.g., range, population abundance, genetics) so that we could efficiently group, condense, and respond to comments. For this reason, and due to the large number of comments we received, we do not identify the commenter in the following summary of public comments. We also do not include responses to many formatting and editorial comments that we accepted by correcting our text; these include punctuation, citation omissions, formatting issues, sentence structure, recommendations for wording changes and similar comments.

Process

1. ***Comments that requested the identification of the authors and others who contributed to the writing of the draft Recovery Plan, including attendees at meetings held during the development of the plan:***

Several comments requested that all persons who contributed to the development of the draft Recovery Plan, either by attendance at workshops and meetings or wrote, reviewed, commented upon or edited the draft be identified along with their agency/organizational affiliation. Excerpts from these comments include:

- We further request that those who actually contributed directly to the writing or were given an opportunity to review, edit, suggest edits, or provide comments on the internal working draft of the recovery plan be specifically identified by name and institution.
- A series of information gathering workshops were held through February 2017. These workshops were closed-door, invitation-only meetings. It is difficult to know for sure the affiliations of invited attendees because the documentation of attendees lists names only. But it is our understanding that only personnel affiliated with the states of Arizona, New Mexico, Utah, and Colorado, and the USFWS were allowed to participate, as well as representatives from Mexico....In the interest of full transparency we request that the list of participants attending the information gathering workshops…be annotated to provide the agency ,organizational, or institutional affiliation of each participant; the number of meetings attended by each participant; which participants were invited to attend closed sessions during the workshops; and which participants were excluded from attending those closed sessions.

Our response: We convened 6 recovery planning workshops from December 2015 to February 2017. These workshops included staff from the Arizona Game and Fish Department, New Mexico Department of Game and Fish, Colorado Parks and Wildlife, and Utah Division of Wildlife Resources; staff from the Forest Service Southwest Regional Office; and staff from the Mexican governmental agencies CONANP and SEMARNAT. The workshops also included several independent scientists from both the United States and Mexico, many of whom served on past recovery teams. The names of the individuals who participated in the workshops are provided in the Biological Report, which is posted on our website. Participants in these workshops reviewed and analyzed biological input parameters for the Vortex extinction risk model and binational habitat assessment model. The States, the government of Mexico,

and the U.S. Forest Service assisted the Service in developing the draft recovery plan and the final recovery plan.

Resolution: No further action.

2. ***Comments on the importance of peer review, identification of peer reviewers and disposition of peer review comments:***

We received comments that expressed concern that the peer review comments on the draft Recovery Plan would be ignored or otherwise discounted. They requested that the peer reviewers be identified, emphasized the view that the peer review was based on the best available science, and stressed the need for peer review comments to be fully evaluated and seriously considered. Excerpts from these comments include:

- ..the preponderance of peer reviewers contracted by USFWS were highly critical of many aspects of the draft recovery plan and draft biological report which purport to provide the best available science ...This should give USFWS serious cause for concern that perhaps this draft plan misinterprets or fails to use the best scientific and commercial data (a requirement of the ESA)…
- …The extensive criticisms of the contracted peer reviewers must be honestly and transparently addressed and not merely brushed off as a contrary opinion unworthy of serious consideration…
- … (I am) concerned that the Service has decided to ignore the many valid concerns of the peer reviewers assigned with critiquing the Draft Plan. As the peer reviewers' concerns are largely rooted in the best available science, the Service's failure to properly remedy these concerns in the Draft Plan renders the Draft Plan itself as failing to meet the ESA's best available science mandate.
- ...we note our disappointment that the peer reviewers have not been identified before the public....The public has a right to know whom the peer reviewers are and what their credentials and expertise in Mexican wolf biology and management is in order to be assured they are the proper folks to carry out the task of a professional, unbiased critique.
- …The Service should also acknowledge the demonstrated bias of AZGFDs SPS representative and principal author of Heffelfinger et al. (2017) and weight it accordingly …That report supposedly provides the scientific foundation for the content and recommendations put forth in the Draft Mexican Wolf Recovery Plan. Without honestly addressing and not ignoring the (peer) reviewer's extensive criticisms, any semblance of the plans scientific credibility is suspect.

Our response: In developing the draft and final recovery plans, we complied with the Service's July 1, 1994 peer review policy (59 FR 34270), the Service's August 22, 2016 Director's Memo on the Peer Review Process, and the Office of Management and Budget's December 16, 2004 Final Information Quality Bulletin for Peer Review. To ensure there was no bias, we contracted with EMSI – Environmental Management and Planning Solutions, Inc. to select the peer reviewers based on the following experience or expertise: large carnivore management, especially wolves; expert knowledge of wildlife biology, wildlife management, demographic management of mammals (especially carnivores), genetics, population modeling, small population management, and/or scientific literature on wolves or other carnivores; expert knowledge of Population Viability Analyses (PVAs); expert knowledge of genetics of small populations; experience as a peer reviewer for scientific publications; and knowledge of wolf management in Mexico. In the contract with EMPSI, we noted that potential conflicts of interest should be avoided, if possible and disclosed if not possible. Potential conflicts of interest would likely include: employment or affiliation with the Service, the States of Arizona, Colorado, New Mexico or Utah, or the Mexican Federal government; and peer reviewers who have personally, or have been or are directly or indirectly employed by any organization that has either litigated the federal government concerning wolves or taken a position on one side or the other about recovery of the Mexican wolves. In addition, none of the reviewers should have served as participants in the 2015-2017 Mexican wolf information gathering workshops held by the Service during the development of the revised recovery

plan. Finally, the reviewers should have no financial or other conflicts of interest with the outcome or implications of the report. We conducted two peer reviews in the development of the draft and final Mexican Wolf Recovery Plans. Thus, we sought independent scientific perspectives on the draft Biological Report and appendices and on the logic of the draft Recovery Plan developed in accordance with requirements of the ESA. We conducted a peer review of the Biological Report and appendices in May 2017 and provided the peer review comments on Regulations.gov and our website for the public to review along with the draft recovery plan. We conducted a second peer review June 30 to August 29, 2017 on the draft recovery plan.

Resolution: We have provided all of the peer reviews on our website. We considered all of the peer review comments and have provided matrices of all of the peer review comments and our responses and actions on the website. The names of the peer reviewers were withheld until the recovery plan was finalized to further ensure a lack of bias. They are now available on the website.

3. Comments on the process of draft Recovery Plan development:

Comments were received that took issue with the process of developing the draft Recovery Plan. These comments expressed distrust in what they viewed as an exclusionary process conducted in closed door meetings in which public input from local government and stakeholder groups was not sought. Some of the comments felt that the 2010-2013 Mexican Wolf Recovery Team (MWRT) should have been fully reengaged in the development of the 2017 draft Recovery Plan and the work and recommendations of that team should have been fully incorporated. Excerpts from these comments include:

- …the 2010 MWRT still exists...as an entity established by the USFWS for the purpose of developing a revised recovery plan. This gives their extensive work legitimacy ...
- …To ignore the existence of the SPS's substantial and material contribution and pretend that it does not exist... is an insult to the expertise and hundreds of hours volunteered by these scientists.
- ... (By)…ignoring their (2010 MWRT) recommendations in favor of the closed-door/invitation-only workshops dominated by representatives of the states…they (the USFWS) got it wrong.
- … (I) see no mention of any involvement in any type of conservation group...
- This plan was formed behind closed doors with state agencies that have thwarted recovery for years.
- ...most input from ranchers and their organizations, local governments, and other affected residents is seldom acknowledged or used. A lack of their involvement during this process is evident...
- Fish and Wildlife should support much broader stakeholder involvement in the next draft of this plan, and implement recommendations from previous such efforts...
- ..The current process, which included a group comprised of a majority lacking training in wolf biology, produced criteria significantly different from the generally consistent criteria produced by previous planning efforts. This new draft plans recovery criteria appears to be heavily influenced by politics and not based on the best available science, but instead a pre-determined policy decision supporting a wolf population with distribution limits negotiated between the U.S. Fish and Wildlife Service (USFWS) and state agencies.
- …the extensive research and analysis culminating in the 2013 recommendations by the USFWS Recovery Team Science and Planning Subgroup… (is)… the foundational elements of the best available scientific information regarding Mexican wolf management and recovery....(the 2015 Final Rule and the DRP)...fall short of standards regarding the best available science and the inappropriate, if not illegal, political disruption of what is supposed to be a rigorous scientific analysis.
- ...add local governments, private landowners and permittees to the list of organization/people who need to participate in the implementation of the Mexican wolf recovery efforts.
- This Plan was developed, not by nationally recognized and credentialed biology and wolf scientists…but by politically appointed hacks from the state governments of New Mexico and

Arizona.

- ...many people, especially those economically affected that would disagree with the statement that the reintroduction has been collaborative since the earliest days.
- The states also do not have wolf experts, and therefore have not provided adequate reliable scientific rationale in contributing to the recovery plan.
- ...It is commonly believed that political leaders and representatives of the states of Arizona, New Mexico, Utah, and Colorado largely drove this process....Conspicuously absent were representatives of conservation organizations…
- ..Skewed representation of these narrow special interests (hunting) on game commissions …is clearly demonstrated by the wide disparity between the best science (management for game species, predator control…) expressed by mostly agency scientists in the proposed Draft Mexican Wolf Recovery Plan, First Revision and the best science expressed by the SPS independent scientists...
- It is almost as though all that previous work (of the MWRT SPS) did not exist. ...That it was so set aside represents effective political pressure applied by Arizona, New Mexico, Utah, and Colorado and the height of administrative arrogance on the part of the FWS and reveals the patently arbitrary and capricious nature of the draft recovery plan.
- …USFWS needs to include private land owners and local governments that represent those landowners in the Recovery Plan process.

Our response:

We are indebted to the contributions of time, information, analysis, and deliberative discussion made by members of the Mexican Wolf Recovery Team (MWRT) (2010-2013) as well as the work of two previous recovery teams in 1998 and 2003. We invited all of the scientists with wolf expertise from the Science and Planning Subgroup of the Mexican Wolf Recovery Team (2010-2013) and scientists recommended by the states and Mexico to participate in the six recovery planning workshops held between December 2015 and February 2017. Those who chose to participate worked with representatives of the Service, state wildlife agencies, U.S Forest Service, and government of Mexico wildlife agencies, CONANP and SEMARNAT, in the review of the input parameters for the Vortex model and the habitat suitability model, which together form the basis for the revised recovery strategy as outlined in the draft Recovery Plan. As noted by Miller (2017), "this most current PVA project, initiated in December 2015, builds upon previous work led by Rich Fredrickson and Carlos Carroll in 2013-2015 (itself based on the published analysis of Carroll et al. (2014))". Using an expanded capability in PVA modeling, we have explored specific scenarios of wolf release from the captive population (based on specific genetic criteria) to existing populations in the U.S. or Mexico, or to currently unoccupied habitat patches in Mexico as defined by the habitat suitability analysis (Martinez-Mayer et al. 2017) of the Biological Report. In addition, we have more accurately tracked the changes in gene diversity (expected heterozygosity) over time across all wild and captive populations – thereby providing more useful guidance in deriving both demographic and genetic population recovery criteria. For any species, there may be more than one strategy that provides a valid path to recovery. This is the case for the Mexican wolf. In our development of the recovery strategy for the revised recovery plan we considered different combinations and alternative scenarios for the location, number of populations, number of releases and number of wolves (population abundance) that could achieve the recovery objective. The recovery strategy focuses on alleviation of the threats to the Mexican wolf from human-caused mortality, lack of gene diversity, and extinction risk due to small population size. The process of recovery must also be formulated to support a smooth transition to state management of a recovered Mexican wolf population post-delisting. We have a criterion in the recovery plan that will ensure regulatory mechanisms are in place to prohibit or regulate human-caused mortality of Mexican wolves in those areas necessary for recovery. The ESA requires that any delisting action ensure that all threats to a species have been sufficiently reduced or managed to provide for a viable population in the long-term and that the species does not meet any of the five listing factors, including "the inadequacy of existing regulatory mechanisms." Our recovery strategy, developed

in cooperation with the states of Colorado, Utah, Arizona and New Mexico and with the government of Mexico, is to focus recovery of the Mexican wolf in the two existing reintroduction areas in the United States and Mexico. We are focusing our recovery in the U.S. south of Interstate 40, which is the area designated as the Mexican Wolf Experimental Population Area (MWEPA) (as defined in the 2015 Final 10(j) Rule). This strategy provides for recovery within the historical range of the Mexican wolf as described in Parsons (1996), which the Service previously adopted when we began reintroducing wolves in 1998 (63 FR 1752).

Resolution: No further action.

4. ***Comments on the legality of the draft Recovery Plan:***

We received comments that argued that the draft Recovery Plan constituted an international treaty because it relies upon the cooperation and actions of a foreign power (Mexico) to achieve the objective of Mexican wolf recovery. Another comment put forward the argument that the draft recovery plan relied upon recovery plans for the Mexican wolf developed by the government of Mexico, and that by doing so was in violation of the planning and review requirements of the Federal Land Policy Management Act (FLPMA) and the National Environmental Policy Act (NEPA). Excerpts from these comments include:

- A treaty is required to enter into an agreement to effectively protect and sustain species across international boundaries… In effect, the USFWS is creating a treaty when it requires international action to complete its legally mandated DRP… a plan contingent on the actions and agreement of a foreign power the USFWS is usurping the power of the President and Congress as set forth by Article II, Section 2 of the US Constitution.
- Use of the… (Mexican recovery plans)… as a basis to establish this proposed plan is illegal and inappropriate under the United States governmental laws as found in FLPMA and the NEPA Processes... .. (by not using the 1982 Recovery Plan)…the Service is attempting to circumvent the planning process requirements by using three more recent Mexican reports to support this proposed plan, rather than using a plan that was proposed using the FLPMA and NEPA processes that are under US laws.

Our response: The purpose of a recovery plan is to provide a scientifically based, logical, and effective roadmap for the recovery of a species. It explains what is needed for species recovery and how to get there. Recovery plans are advisory documents, not regulatory documents. A recovery plan does not commit any entity to implement the recommended strategies or actions contained within it for a particular species, but rather it provides guidance for ameliorating threats and implementing proactive conservation measures, as well as providing context for implementation of other sections of the ESA. Thus the Mexican Wolf Recovery Plan is not requiring any action by the Mexican government. Section 8 of the ESA specifically provides for international cooperation in the conservation of endangered and threatened species. The Mexican government and the Service have cooperated in the recovery of the Mexican wolf since the 1970s and the establishment of a binational captive breeding program. Mexico has demonstrated their commitment to continue that collaboration to achieve recovery of the Mexican wolf in the future. Since 1996, the United States, Mexico, and Canada have been signatory to a Memorandum of Understanding (MOU) Establishing the Canada/Mexico/United States Trilateral Committee for Wildlife and Ecosystem Conservation and Management. This MOU facilitates the collaboration of the United States and Mexico in the management of cross-border species, such as the Mexican wolf. The United States and Mexico also collaborate on recovery of other cross-border species, such as the Kemps-Ridley sea turtle, black-footed ferrets, ocelot, jaguar, Sonoran pronghorn, and California condor. Because recovery plans are guidance documents, they are not subject to the National Environmental Policy Act, and actions by the Service are not subject to the Federal Land Policy and Management Act.

Resolution: No further action

5. ***Comments on Recovery Planning and Implementation (RPI) and public review requirements for the biological report and Recovery Implementation Strategy:***

We received comments that requested clarification on Recovery Planning and Implementation (RPI) and the public review requirements under this process. These comments argued that the biological report should have been included as part of the draft Recovery Plan and that both the biological report and the Recovery Implementation Strategy should be available for public review and comment. Excerpts from these comments include:

- What is the RPI, is it a regulation, rule, or guideline? Was it open for public comment?
- It would appear that under RPI... the agency is circumventing the requirement to provide public notice and an opportunity for public review and comment on a recovery plan by separating meaningful information into the Species Status Assessment and the Recovery Implementation Strategy. All of this information is important in recovery planning, but separated and withheld from public comment and input… (in violation of ESA 4(f) (4) The Secretary shall… provide public notice and an opportunity for public review and comment…).
- If the biological report (BR) represents the biological foundation (lines 391-395) for management actions mentioned in the plan, why was it not included as part of the plan?
- …Why wasn't the BR made available for comment? Will the Recovery Implementation Strategy (RIS), implied as the true recovery plan document (lines 69-72), be made available for comment?

Our response: Recovery Planning and Implementation (RPI) is a revised recovery planning process adopted by the Service in 2016. RPI is intended to reduce the time needed to develop recovery plans, increase the relevancy of recovery plans over a longer timeframe, and add flexibility to recovery plans so they can be adjusted to new information or circumstances. We have posted the recovery plan, the biological report and appendices, and the peer reviews of all four documents on the web site.

Resolution: No further action

Range

1. ***Comments on our determination of the historical range of the Mexican wolf which results in undue reliance on the successful establishment of a population in Mexico as one of the criteria for recovery:***

We received comments that asserted that the draft recovery plan relies too heavily on an inaccurate determination of the historical range of the Mexican wolf which unduly focuses recovery on the successful establishment of a Mexican wolf population in Mexico, as well as limiting the establishment of a U.S. population to southern Arizona and New Mexico. Some comments argue that use of historical range by Heffelfinger et al. (2017a) to delineate historical range was politically driven, was not the best available science and that molecular genetic analysis indicate that the Mexican wolf was much more widely distributed with a range, including zones of intergradation with other gray wolf subspecies, that included all of Arizona and New Mexico and extended into parts of California, Utah, Colorado, Nebraska and Texas. Excerpts from the comments on the historical range of the Mexican wolf include:

- …. this plan relies substantially on Mexico for the recovery program, and rests heavily on the historic range of the species to justify this move.
- The paper by Heffelfinger et al. (2017) presents an archaic (morphological) perspective on delineating the historic range of *Canis lupus baileyi*.
- It is tempting to presume an underlying political agenda for preventing the colonization of Mexican wolves into suitable habitats (currently devoid of wolves) existing north of I-40. Indeed, participants (including Heffelfinger) in the closed-door, states-only workshops chose I-40 as the northern limit for Mexican wolf recovery analyses based on geopolitical considerations.
- ...the Science and Planning Subgroup concluded that successful recovery was unlikely if the recovery area for the Mexican wolf focused solely on the historical range... limits recovery efforts to areas to the south of Interstate 40 based on a description of the species historic range derived from limited morphological analyses (Heffelfinger et al. 2017). This perspective is not consistent with more recent molecular genetic analyses of Mexican wolf specimens, which suggest a broader historic distribution of Mexican wolves.

- The historic range of the Mexican Gray Wolf includes California according to research at UCLA: http://www.latimes.com/science/la-me-mexican-wolf-20150215-story.html. This should be reflected in the proposed recovery area.
- … science supports a larger range such as the good habitat in places like the Grand Canyon. These wolves should be restored to their historic range including parts of Utah, Colorado and Texas...
- The dismissal of modern molecular data and focus on outdated morphological data by Heffelfinger et al. (2017) suggests both a lack of objectivity and scientific sophistication...Whether this wolf was part of the resident CA population or a migrant from AZ, these data clearly show that Mexican wolf genetic ancestry has extended far beyond the small area near the border that Heffelfinger et al. (2017) suggest.
- Underestimation of historical range can be a factor limiting the success of recovery programs, prolonging species endangerment and the expense of recovering them…Heffelfinger...should be viewed with considerable skepticism.
- ..Similarities in morphology may or may not reflect similar ancestry, while differences in genomic data will always reflect different ancestry. Recent comprehensive genomic analyses of canids (Hendricks et al. 2016, von Holdt et al. 2016) more accurately represent best available scientific information than do almost century old morphological studies.

Our response: The southernmost extent of the Mexican wolf's range in Mexico is consistently portrayed as ending near Oaxaca. Depiction of the northern extent of the Mexican wolf's pre-settlement range among the available descriptions in the scientific literature varies depending on the authors' taxonomic treatment of several subspecies that occurred in the Southwest and their related treatment of intergradation zones. Our Final Rule listing the Mexican wolf as an endangered subspecies (80 FR 2488) provides a detailed discussion of the various descriptions of historical range available in the scientific literature. More recent (Hendricks et al. 2016 and Heffelfinger et al. 2017) studies offer additional arguments for either a depiction of a more extensive northern and western historical distribution of Mexican wolves or why such historical range extensions are not supported. The Service continues to recognize the concordance in the scientific literature depicting the Sierra Madre Occidental of Mexico and southern Arizona and New Mexico as Mexican wolf core historical range and will continue to recognize the expanded range as per Parsons (1996) that extends into central New Mexico and Arizona (USFWS 1996). Therefore, we are focusing our recovery efforts in the area that is accepted as historical range for the Mexican wolf. This area comports with the scientific literature that addresses historical range (discussed in the Biological Report), previous Service focus areas (USFWS 1996), and the ecological niche of Mexican wolves (Martínez-Meyer et al. 2017). Martínez-Meyer et al. (2017) used an Ecological Niche Model that was calibrated with all wolf presence records available in the historical range as depicted by Parsons (1996) in Arizona, New Mexico, and Texas, as well as records from Mexico. This model showed all possible areas climatically similar to the presence records, and it recognized that northern areas are quantitatively different.

Resolution: The Service will continue to monitor the scientific literature for exploration of this topic. The 5- and 10- year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change

2. ***Comments on the lack of a scientific rationale for limiting expansion of the Mexican wolf population to areas south of Interstate 40 (I-40) in Arizona and New Mexico:***

We received comments questioning the rationale for focusing the recovery effort for the Mexican wolf to areas in Arizona and New Mexico south of Interstate 40 (I-40) and excluding wolves from dispersing into

abundant suitable habitat in those states, and in southern Colorado and Utah, that are north of what is viewed as an artificial dividing line. Excerpts from the comments on the limitation of Mexican wolf populations to areas south of I-40 include:

- There is no scientific rationale for limiting expansion of the Mexican wolf population north of Interstate 40.
- The argument that Mexican wolves didn't extend further north is extremely weak. Wolves are wide ranging animals with subspecies grading into one another.
- In addition to the current population of Mexican gray wolves in western NM and eastern AZ, two new core populations must be established in the Grand Canyon region of northern AZ and southern UT and in the Southern Rockies region of northern NM and southern CO, areas with the most suitable wolf habitat.
- ..Southern Colorado... has more than adequate habitat for the recovery of the Mexican Grey Wolf and will provide ecological and positive economic effects to the region…
- …the original recommendation (of the SPS, MWRT) was made based on the best available science. This would allow for population connectivity and the possibility of greater genetic diversity. It would also allow for a faster release of captive wolves as they could be dispersed over a larger area...reduce some of the competition for territories and could lead to the set-up of more breeding pairs and formation of new packs...(in) more areas of remote habitat … which would decrease the possible incidence of wolf livestock conflict.
- …the draft recovery plan prepared by the 2010 MWRT SPS provides extensive science-based justification for two such areas north of I-40.
- No explanation has been included as to why these scientific recommendations have not been considered…
- The I-40 boundary is arbitrary. There is more suitable habitat, with less conflicts north of I-40...The wolves' current occupation in the Blue Range Wilderness is fraught with conflict, because of the ranchers, and it makes more sense to have wolves in areas where people don't want to kill them.
- An exclusive focus on historical range is not mandated in the ESA or related FWS policies…
- ...FWS has in the past supported endangered species recovery efforts in regions that were not considered recent historical range, including black footed ferret...
- ...an experimental population can be established outside a species historic range if the Director finds that the primary habitat of the species has been unsuitably or irreversibly altered or destroyed…
- ...available information indicates that the lack of sufficient suitable habitat with low mortality risk in Mexico requires defining a recovery region that includes sufficient suitable habitat from areas to the north of Interstate 40 where secure habitat areas are found in the Grand Canyon region and Southern Rockies...
- ...the agency has caved to the demands of state agencies …this is a clear political compromise that undermines the science.
- Other areas -- including those identified in the scientific literature [Carroll (2006), Wayne and Hedrick [2010), and Carroll [2014]) - are never analyzed and evaluated for recovery purposes.
- … (the Service)…has failed to consider that curtailment by its own northern boundary is a threat. Given the scientific evidence that expanded ranges and numerous core populations must occur to ensure the viability of the species, the limitation that the Service has imposed on Mexican wolves is indeed a threat.
- …(I have) a very hard time accepting the estimated costs as a requisite for recovery when clearly more certain and far more affordable options exist for recovering the Mexican wolf. To wit, costs could be significantly reduced and certainty maximized if the MWEPA only had to contribute the population of 170 wolves because the second population of 320 could be established at an even better site in the US....Such a site does exist and it has been well studied -- the SRE of western

Colorado and north-central New Mexico.

Our response: We agree that there are large areas of suitable wolf habitat with abundant wild ungulate prey species in northern Arizona/southern Utah and northern New Mexico/southern Colorado. We also agree that Mexican wolves may have ranged north of the line now delineated by Interstate 40 within zones of intergradation where interbreeding with other gray wolf subspecies may have occurred.

For any species, there may be more than one strategy that provides a valid path to recovery. One reason to focus on recognized historical range is the direction from our 1984 Experimental Population final rule (49 FR 33885, August 27, 1984) which indicated "it is Service policy to restrict introductions of listed species to historical range, absent a finding by the Director in the extreme case that the primary habitat of the species has been unsuitably and irreversibly altered or destroyed." Furthermore, this finding was incorporated into 50 CFR 17.81(a) which indicates experimental populations are limited to historical range absent a finding this same standard is met ("within its probable historical range, absent a finding by the Director in the extreme case that the primary habitat of the species has been unsuitably and irreversibly altered or destroyed").

While we've accepted Parsons (1996) as the historical range of the Mexican wolf subspecies (approximately I-40 and south) other subspecies of gray wolves occurred in adjoining areas which remain suitable and uninhabited. Exact boundaries of *Canis lupus* subspecies' historical range maps remain highly controversial for many reasons including the species' dispersal capability (many hundreds of miles) and assessments that were based on limited data and dated methodology.

Current Service policy and the current scientific literature support the approach we've taken in this recovery plan; namely, to focus recovery within recognized historical range including the Mexican Wolf Experimental Population Area (MWEPA) in Arizona and New Mexico and the Sierra Madre Occidental in Mexico. We agree with commenters that recovery in Mexico will face substantial biological, logistical, and legal challenges (e.g., lower quality suitable habitat, lower ungulate biomass, a lack of Federal lands, weaker regulatory protections, and multiple forms of human-caused mortality) and we appreciate that many experts are skeptical recovery can be achieved in Mexico. One intention of this plan is to test this hypothesis by working with partners on a reintroduction and recovery program in Mexico's Sierra Madre Occidental. We and Mexico have focused on this area within Mexico as it shows the greatest promise for success; greater than any other area in Mexico. The Service and our partners intend to make every effort for this to succeed. We do not intend to pursue any proactive restoration efforts in either Colorado or Utah during this 5- to 10-year period, unless asked to do so by the states. Failure to show substantial progress at both the 5- and 10-year benchmarks would be evaluated carefully and, depending on the level of progress observed, could be viewed as an indication the standards intended by our 1984 Experimental Population final rule (49 FR 33885, August 27, 1984) and 50 CFR 17.81(a) were met. In other words, if we fail in the best location in Mexico after ten years (seventeen years since the first official release), the habitat may no longer be able to support a recovered population there and it may be necessary to try elsewhere.

Resolution: The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

3. ***Comments that argue that the bulk of the Mexican wolf historical range is in Mexico and that therefore the majority of the population necessary for recovery should also be in Mexico:***

Some comments we received disputed the draft Recovery Plan's geographic focus on recovery consistent with the range described by Parsons (1996). These comments argued that the majority of the historical

range of the Mexican wolf lay further south in Mexico and that therefore the burden for recovery should be proportionate, with the majority of the population objective needed for recovery to be achieved in Mexico, not the United States. Excerpts from these comments include:

- The Services decision to adopt Parson's recommendation to move the recovery area and habitat description 200 miles north of the previously accepted historical range is erroneous.
- The decision to include habitat that was previously described as different species of gray wolves habitat (*C.l. mogollonensis* and *C.l. monstrabilis*) in the Mogollon Rim of Arizona and Northern New Mexico and southwest Texas respectively, goes contrary to all previous literature cited and previously accepted scientific data.
- (we are)...concerned that the recovery objective for the population located in the United States ... is disproportionate...the objective of 320 wolves in the MWEPA represents 65% of the total combined populations objective of 490 wolves, while historic habitat in the United States represent only approximately 10% of the Mexican wolf historic habitat...MWEPA represents only 44% of the 38,828 square miles of high quality habitat…
- …The draft recovery plan creates population targets that emphasize recovery primarily in the U.S. rather than within the historic range in Mexico...Given that this taxon is primarily a Mexican entity, Mexico has to be deeply involved in recovery. If recovery of the subspecies is the true goal, significant effort has to be expended in the core of historical range…
- ...The Department's position is core historical range of the Mexican wolf was most likely defined as southern Arizona, south western New Mexico, a portion of west Texas, and the Sierra Madre Occidental south at least to southern Durango. The Service has, and continues to recognize an extended historical range of the Mexican wolf based upon Parsons (1996), which is a 200- mile northward expansion of the historical range, as described above...are in agreement with the Service that a 200 mile buffer around the core constitutes as an area in which there was an intergradation zone, and recovery efforts within this zone are applicable.
- ...US has less range than Mexico, but US will recover move wolves than Mexico. Not logical!

Our response: The southernmost extent of the Mexican wolf's range in Mexico is consistently portrayed as ending near Oaxaca. Depiction of the northern extent of the Mexican wolf's pre-settlement range among the available descriptions in the scientific literature varies depending on the authors' taxonomic treatment of several subspecies that occurred in the Southwest and their related treatment of intergradation zones. Our Final Rule listing the Mexican wolf as an endangered subspecies (80 FR 2488) provides a detailed discussion of the various descriptions of historical range available in the scientific literature. More recent (Hendricks et al. 2016 and Heffelfinger et al. 2017) studies offer additional arguments for either a depiction of a more extensive northern and western historical distribution or why such historical range extensions are not supported. The Service continues to recognize the concordance in the scientific literature depicting the Sierra Madre Occidental of Mexico and southern Arizona and New Mexico as Mexican wolf core historical range and will continue to recognize the expanded range as per Parsons (1996) that extends into central New Mexico and Arizona (USFWS 1996). Therefore, we are focusing our recovery efforts in the area that is accepted as historical range for the Mexican wolf. This area comports with the scientific literature that addresses historical range (discussed in the Biological Report), previous Service focus areas (USFWS 1996), and the ecological niche of Mexican wolves (Martínez-Meyer et al. 2017). Martínez-Meyer et al. (2017) used an Ecological Niche Model that was calibrated with all wolf presence records available in the historical range as depicted by Parsons (1996) in Arizona, New Mexico, and Texas, as well as records from Mexico. This model showed all possible areas climatically similar to the presence records, and it recognized that northern areas are quantitatively different. The model also shows the area south of Interstate 40 as the area overall with the highest-quality habitat due to the high availability of ungulates, particularly elk and therefore, with the highest estimation of Mexican wolf carrying capacity under any scenario. The Sierra Madre Occidental, both north and south, is the area with the potential to hold the largest number of wolves in Mexico. The estimated carrying capacity for the U.S. Recovery Area is about 1000 wolves, whereas, the estimated carrying

capacity is approximately 300 for the northern Sierra Madre Occidental and 350 for the southern Sierra Madre Occidental. Our recovery strategy, developed in cooperation with the states of Arizona and New Mexico; the U.S. Forest Service; and the government of Mexico, is to focus recovery of the Mexican wolf in the two existing reintroduction areas in the United States and Mexico. We are focusing our recovery in the U.S. south of Interstate 40, which is the area designated as the MWEPA (as defined in the 2015 Final 10(j) Rule). The population objective for each wild population is based on a Vortex Population Viability Model, with targets to achieve at least a 90 percent probability of persistence over 100 years and maintain approximately 90 percent of the gene diversity available in the captive population. This model was developed with the assistance of staff from the states of Arizona, New Mexico, Colorado, and Utah; the U.S. Forest Service; and the Mexican government; and independent scientists from both the United States and Mexico (many of whom were members of past Mexican wolf recovery teams) and is based on wolf life history data. This strategy would provide for recovery within the historical range of the Mexican wolf as described in Parsons (1996), which the Service previously adopted when we began reintroducing wolves in 1998 (63 FR 1752).

Resolution: The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

4. ***Comments on the effect climate change may have on the availability and distribution of suitable habitat for the Mexican wolf:***

We received comments that expressed concern over the effects of climate change on the availability and distribution of suitable habitat for the Mexican wolf. These comments foresaw increasing temperatures and lower levels of precipitation expected in the southwest United States and northern Mexico as the result of a changing climate and postulated that these effects would reduce the availability of suitable habitat and the abundance of native prey in the geographic area focused on for recovery by the draft Recovery Plan. The comments argued that the draft Recovery Plan does not adequately address the potential impact of climate change and therefore ignores the need to establish Mexican wolf populations in northern Arizona and New Mexico and southern Utah and Colorado. Excerpts from these comments include:

- As climate change continues to cause species to shift territory within suitable habitat, the Recovery Plan should focus on suitable habitat to the north, such as the Grand Canyon and the Southern Rockies.
- (the draft Recovery plan should)… Explicitly address the effects of climate change on Mexican wolf recovery, especially as it relates to suitable habitat.
- ...climate, temperature & habitat changes already going North, why prevent Mexican wolves from following them..?
- ...arbitrary boundary at I-40 for the MG wolves, ostensibly based on the historical range of the MG wolf. Multiple scientific facts have not been taken into account in setting this boundary. Climate change is real and is affecting the United States now...If the MG wolf is to survive, it must be allowed above I-40 to compensate for the ever-increasing temperature caused by climate change.
- Climate change is not included as a factor for consideration in the reintroduction of wolves. Why???? Climate change projected considerations such as; increased drought, increase s in wildfires, and possible reductions of food sources and habit will affect all wildlife - and human activity. Contingency measures need to be factored into this plan.
- ..recovering taxa outside purported historical ranges following assessment of historical, contemporary, and future conditions will become increasingly common. This will likely be

especially true for species that are defined by ecologically similar subspecies with historical distributions that included extensive zones of intergradation....

- …listing and recovery actions must consider the implications of projected climate change...increased aridity due to climate change (Notaro et al. 2012), especially in the southern portion of the range, might be expected to decrease forage and prey abundance.
- … recovery plans should consider the role of areas to the north of Interstate 40, within the zone of historic genetic intergradation between Mexican wolves and northern wolves.

Our response:

Wolves successfully occupy a variety of diverse ecosystems in North America and Eurasia from the arctic to deserts and prey on a wide variety of animals. Mexican wolves historically inhabited montane woodlands and adjacent grasslands in northern Mexico, New Mexico, Arizona, and the Trans-Pecos region of western Texas (Brown 1988) at elevations of 4000-5000 ft. where ungulate prey were numerous (Bailey 1931). Climate change would be expected to alter lower elevation vegetative communities more than mesic mountains where the Mexican wolf evolved. Any restriction of suitable habitat may be expected to recede up in elevation rather than north in latitude. The assessment of threats to the Mexican wolf in our 2015 Final Rule listing the Mexican wolf as endangered found that: "The habitat generalist characteristics of the wolf and their primary prey, elk, lead us to conclude that climate change will not significantly affect the Mexican wolf in the future" (80 FR 2488, January 16, 2015). We are unaware of specific information/research published subsequent to this finding that suggests that Mexican wolves will be negatively impacted by climate change. Wolves are dependent on ungulate densities, and some impacts of climate change may be predicted to affect ungulates in a negative fashion (i.e., longer and more intense periods of drought), while other impacts could be predicted to affect ungulates in a positive fashion (i.e., increased fire, or decreased snow amounts, increased seasonal precipitation). Higher elevation areas that Mexican wolves occupy in the southwest are expected to receive less precipitation as snow, but are not predicted to receive significantly less precipitation overall. It is difficult to predict the overall impact of climate change to Mexican wolves through third order impacts (e.g., climate impacts would affect plants which would affect ungulate densities, which would impact Mexican wolves); therefore, we will, at the 5 and 10-year status review assess progress toward recovery and determine whether our current strategy is effective or needs to be revised.

Resolution: The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

5. ***Comments that addressed the ability of wolves to disperse long distances and both challenged the placement of limits on their distribution and questioned the ability of management actions to prevent dispersal and establishment of territories outside of the recovery area:***

A number of comments discussed the probability that wolves, without human interference, will disperse long distances and naturally recolonize areas of suitable habitat. Some of these comments argued against the management actions discussed in the draft Recovery Plan that would limit the Mexican wolf population in the U.S. to the focus recovery area south of I-40 in Arizona and New Mexico. Other comments questioned the ability of these management actions to prevent dispersal north into areas of suitable habitat. Excerpts from these comments include:

- The E.S.A. does not envision the restoration of endangered and threatened species to geographical "zoos", especially with such historically wide ranging species as the Mexican Wolf. It envisions restoration of species to their historic habitat, not currently occupied habitat.
- (the draft recovery plan)...fails to address the inherent nature of wolves to travel with their prey base. If elk move north past Interstate 40, wolves will naturally go north. Over time, there is high

probability that uncollared wolves would travel north of Interstate 40, and into Utah and Colorado, undetected.

- … they will not be restricted to the I-40 boundary; and they will move at will where food, water, and suitable habitat is available. To promise to catch them and return them to below the I- 40 boundary is an empty and unrealistic promise.
- ...No one has ever said why I-40 is off limits and I want to know why. There is more than ample prey, there are fewer people and it's a perfect environment for them. Trying to control a wild animal's movements is fruitless and stupid.
- How does the Service plan to keep the wolves in the proposed release area?

Our response: We recognize that natural dispersal and colonization/recolonization of unoccupied habitat which expands the species' range is important to the recovery of the Mexican wolf. We also agree that there are large areas of suitable wolf habitat with abundant wild ungulate prey species in northern Arizona/southern Utah and northern New Mexico/southern Colorado. Neither do we dispute that Mexican wolves may have ranged north of the line now delineated by Interstate 40 within zones of intergradation where interbreeding with other gray wolf subspecies may have occurred. However, for any species, there may be more than one strategy that provides a valid path to recovery. This is the case for the Mexican wolf. In our development of the recovery strategy for the revised recovery plan we considered different combinations and alternative scenarios for the location, number of populations, number of releases and number of wolves (population abundance) that could achieve the recovery objective. Our recovery strategy, developed in cooperation with the states of Arizona and New Mexico, the U.S. Forest Service and with the government of Mexico, is to focus recovery of the Mexican wolf in the two existing reintroduction areas in the United States and Mexico. We are focusing our recovery in the United States south of Interstate 40, which is the area designated as the MWEPA (as defined in the 2015 Final 10(j) Rule). This strategy would provide for recovery within the historical range of the Mexican wolf as described in Parsons (1996), which the Service previously adopted when we began reintroducing wolves in 1998 (63 FR 1752). This area comports with the scientific literature that addresses historical range (discussed in the Biological Report), previous Service focus on this area (Service 1996), and the ecological niche of Mexican wolves (Martinez Meyer et al. 2017). I-40 provides an easily recognizable and reasonable demarcation of the northern extent of the area. Returning wolves to the MWEPA will ensure that these animals continue to contribute to achieving the population growth and distribution needed to improve the likelihood of persistence of the Mexican wolf. In accordance with the preamble to the Revision to the Regulations for the Nonessential Experimental Population of the Mexican Wolf (80 FR 2512), we revised and reissued the Mexican Wolf Recovery Program's section 10(a)(1)(A) research and recovery permit so that it applies to the management of Mexican wolves both within and outside of the MWEPA. Under this permit, we will authorize removal of Mexican wolves that can be identified as coming from the experimental population that disperse and establish territories in areas outside of the MWEPA. We will make a determination, based in part on their genetic value relative to the Mexican wolf population, to maintain these wolves in captivity, translocate them to areas of suitable habitat within the MWEPA, or transfer them to Mexico.

Resolution: The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

Number of Populations

1. ***Comments questioning why the draft Recovery Plan does not reflect the recommendations of the Science and Planning Subgroup (SPS), 2010-2013 Mexican Wolf Recovery Team:***

Numerous comments were received which expressed disagreement with the draft Recovery Plan's strategy to establish two populations of Mexican wolves, one in the U.S. and one in Mexico. Many commenters felt that the unpublished draft recommendations of the Science and Planning Subgroup (SPS), 2010-2013 Mexican Wolf Recovery Team (MWRT), for the population size and number of sub-populations necessary for recovery should have been followed. These recommendations were to establish a metapopulation of at least 750 individuals with connected subpopulations of at least 250 wolves in the U.S. centered in the Grand Canyon/Kaibab Plateau region of northern Arizona/southern Utah; southern Rocky Mountain region of northern New Mexico/southern Colorado, and; the Mogollon Rim region of central-eastern Arizona and western New Mexico. Excerpts from the comments on the number of Mexican wolf populations in the wild needed for recovery include:

- ... Follow your original research that determined the need for three groups, all in the USA , with interconnected territories for genetic co-mingling.
- To assure redundancy is met... more than two metapopulations… (should be)… established. This is particularly important for this genetically limited species and its ability to withstand stochastic events...
- Scientific evidence indicates that three populations of 250 will be required. Therefore, this plan needs to be revised so as to include habitat in the areas of the Grand Canyon and the Southern Rockies and numbers exceeding 250 in each of the three areas (Blue Range, Southern Rockies, and Grand Canyon).
- ...must listen to the conservationists and biologists that recommended a wild population of at least 3 core populations and 750 individuals.
- In addition to the current wild population, two new core populations must be established. Natural dispersal must be possible between the three core populations through habitat connectivity. Each of the three populations must have a minimum of 200 wolves and, together, must have, at the very least, 750 wolves.
- The scientists composing the 2012 draft plan concluded that Lobo recovery would require a minimum of three interconnected U.S. populations each with at least 250 wolves, for a minimum of 750 overall. That conclusion was based on sound science. The current plan is a response to the political pressure delivered by the governors and legislatures of the states of the southwest....
- ...Sadly, the U.S. Fish and Wildlife Service is ignoring the recommendations of credible scientists who worked on recovery planning in 2011. Instead, the agency has caved to the demands of state agencies that want to keep the wolf population unsustainably small and do not want to see wolves north of I-40.
- Using a sophisticated landscape analysis, Carroll (2006), Wayne and Hedrick (2010), and Carroll [2014) recommend these three Mexican wolf populations include [1] the current population in the Blue Range Recovery Area; [2] a second population near the north rim of the Grand Canyon in Arizona (north of Interstate 40); and [3) a third population in north-central New Mexico's and southern Colorado's San Juan and Sangre de Cristo Mountains. As described above, the Service's draft recovery plan does not even come close to meeting these conservation recommendations.
- These draconian constraints would result in Mexican wolves losing the Endangered Species Act protections when there are only half the number in the wild that scientists say are needed in the U.S. bolstered by only 170 animals in Mexico.

Our response: First, it is important to note that the Service has never proposed three Mexican wolf populations as necessary for recovery. Recovery planning is solely the purview of the Service, and preliminary draft recovery plans developed by Recovery Teams do not represent the Service's position unless and until they are finalized and signed by the Regional Director. Specifically, recovery team recommendations do not represent our position unless they are incorporated into a Recovery Plan that is finalized only after consideration of public and peer review comment. The preliminary draft product of the Science and Planning Subgroup (SPS), 2010 Mexican Wolf Recovery Team (MWRT), suggesting three recovery units was never brought forward into a draft recovery plan for public and peer review

comment and was not finalized and signed. This is not unusual as recommendations by recovery teams are frequently changed before a plan is finalized. Changes can be made to address a lack of familiarity by outside recovery team members with our statutory, regulatory or legal constructs; the result of new science; a difference of opinion among experts; or other factors. In this case, the preliminary draft recovery criteria were largely based on a PVA model without the advances in PVA technology available today. The final recovery plan revisited the inputs to the PVA model, considered current Service policy, compared to other similar species plans, considered species-specific information including past experience with other gray wolf populations, evaluated multiple perspectives from other qualified experts, and other factors.

We are indebted to the contributions of time, information, analysis, and deliberative discussion made by members of the MWRT (2010) as well as the work of two previous recovery teams in 1998 and 2003. We invited all of the scientists with wolf expertise from the Science and Planning Subgroup of the MWRT (2010) to participate in the six recovery planning workshops held between December 2015 and February 2017. Those who chose to participate worked with representatives of the Service, state wildlife agencies, U.S Forest Service, and government of Mexico wildlife agencies, CONANP and SEMARNAT, in the review of the input parameters for the Vortex model and the habitat suitability model, which together form the basis for the revised recovery strategy as outlined in the draft Recovery Plan. As noted by Miller (2017), "this most current PVA project, initiated in December 2015, builds upon previous work led by Rich Fredrickson and Carlos Carroll in 2013-2015 (itself based on the published analysis of Carroll et al. (2014))". Using an expanded capability in PVA modeling, we have explored specific scenarios of wolf release from the captive population (based on specific genetic criteria) to existing populations in the U.S. or Mexico, or to currently unoccupied habitat patches in Mexico as defined by the habitat suitability analysis (Martinez-Mayer et al. 2017) of the Biological Report. In addition, we have more accurately tracked the changes in gene diversity (expected heterozygosity) over time across all wild and captive populations – thereby providing more useful guidance in deriving both demographic and genetic population recovery criteria. For any species, there may be more than one strategy that provides a valid path to recovery. This is the case for the Mexican wolf. In our development of the recovery strategy for the revised recovery plan we considered different combinations and alternative scenarios for the location, number of populations, number of releases and number of wolves (population abundance) that could achieve the recovery objective. Our recovery strategy is focused on alleviation of the threats to the Mexican wolf from human-caused mortality, lack of gene diversity, and small population size. The process of recovery must also be formulated to support a smooth transition to state management of a recovered Mexican wolf population post-delisting. We have a criterion in the recovery plan that will ensure regulatory mechanisms are in place to prohibit or regulate human-caused mortality of Mexican wolves in those areas necessary for recovery. The ESA requires that any delisting action ensure that all threats to a species have been sufficiently reduced or managed to provide for a viable population in the long-term and that the species does not meet any of the five listing factors, including "the inadequacy of existing regulatory mechanisms." Our recovery strategy, developed in cooperation with the states of Arizona, New Mexico, Colorado, and Utah; the Forest Service; and the government of Mexico, is to focus recovery of the Mexican wolf in the two existing reintroduction areas in the United States and Mexico. We are focusing our recovery in the U.S. south of Interstate 40, which is the area designated as the MWEPA (as defined in the 2015 Final 10(j) Rule). This strategy would provide for recovery within the historical range of the Mexican wolf as described in Parsons (1996), which the Service previously adopted when we began reintroducing wolves in 1998 (63 FR 1752).

Resolution: The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

2. ***Comments advocating for the establishment of at least one additional population of Mexican wolves in suitable habitat north of Interstate 40 (I-40):***

We received a number of comments that, for the purpose of providing greater representation, resiliency and redundancy necessary for recovery, advocated the establishment of an additional subpopulation(s) of Mexican wolves north of Interstate 40 (I-40) in northern New Mexico/southern Colorado and/or northern Arizona/southern Utah. These comments argued that ecological representation sufficient for recovery required reestablishment of Mexican wolf subpopulations in areas of suitable habitat throughout its historical range which included areas to the north of I-40. Excerpts from the comments arguing for the need for additional subpopulations in areas of the U.S. north of I-40 include:

- ...recovery in additional places north of Interstate 40 ... would provide greater representation to ensure the recovery of the Mexican wolf in a variety of ecosystems across the likely historical range...
- ... This broader geographic view of recovery is supported by scientific literature, and aligns well with the larger purpose of the Endangered Species Act to protect the ecosystems upon which endangered species depend (Carroll et al. 2006).
- The Draft Recovery Plan states that only two populations of Mexican wolves one in the United States and one in Mexico would possess sufficient representation, resiliency, and redundancy to allow the subspecies to be considered recovered. SCBNA and ASM are uncertain as to how sufficiency for these parameters is defined and characterized.
- It is unclear how representation in this context would be measured or how just two populations of Mexican wolves could possess sufficient representation...this view of representation is very different and much more limited than that proposed by Shaffer and Stein in 2000... successful biodiversity conservation means saving more than the species themselves. It means saving the ecological and evolutionary patterns and processes that not only maintain but also generate those entities we call species.
- Because every species genetic makeup is shaped, through natural selection, by the environments it has experienced, successful conservation also means saving populations of each species in the array of different environments in which it occurs.

Our response: Our recovery strategy, developed in cooperation with the states of Arizona and New Mexico, the U.S. Forest Service and with the government of Mexico, is to focus recovery of the Mexican wolf in the two existing reintroduction areas in the United States and Mexico. We are focusing our recovery in the U.S. south of Interstate 40, which is the area designated as the MWEPA (as defined in the 2015 Final 10(j) Rule). This strategy would provide for recovery within the historical range of the Mexican wolf as described in Parsons (1996), which the Service previously adopted when we began reintroducing wolves in 1998 (63 FR 1752). The habitat suitability analysis of the draft Biological Report assessed the available habitat south of Interstate 40 in the United States and in Mexico. Based on this information and additional analyses, we have developed a recovery strategy that builds on the progress made in current reintroduction areas in the MWEPA and northern Sierra Madre Occidental (SMOCC-N). This area comports with the scientific literature that addresses historical range (discussed in the Biological Report) and the ecological niche model (Martínez-Meyer et al. 2017). Using the Population Viability Analysis, we explored whether these two areas (MWEPA and SMOCC-N) and could achieve at least 90% probability of persistence over 100 years and retain approximately 90% of the captive population's gene diversity. We found that these two populations met those objectives. Our recovery strategy is focused on conservation of the Mexican wolf across large portions of their range in the United States and Mexico, which provides for an array of different environments. The genetic recovery criterion will ensure the gene diversity represented in the captive population is represented in the wild populations. We expect this gene diversity will allow for adaption over time, as animals breed in the wild. Ecological conditions vary between the United States and northern Sierra Madre Occidental sites in both terrain and vegetation, as well as the abundance and distribution of prey. As previously discussed, historically Mexican wolves likely preyed upon a larger proportion of smaller prey in Mexico than the United States. Our data from

the United States and northern Sierra Madre Occidental currently show that Mexican wolves are likely to reestablish this pattern, given the lack of elk in Mexico and lower deer densities in portions of the Sierra Madre Occidental compared to the United States. We anticipate that genetically diverse wild populations in both reintroduction areas will be better able to respond to not only the current range of habitat conditions, but also future changing conditions such as shifts in prey availability, drought, or other environmental fluctuations. The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised.

Resolution: The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

3. ***Comments on the difficulty of cross border dispersal between the Mexican wolf populations in Mexico and the U.S. thereby requiring the establishment of a second U.S population:***

Several comments advocating for the establishment of a second U.S. population of Mexican wolves in an area outside of the MWEPA (U.S. Recovery Area) focused on connectivity and impediments to natural dispersal across the U.S – Mexico border. Excerpts from these comments include:

- The Service acknowledges that the population in Mexico will not be significantly connected to the population in the US. The whole point of having two sub-populations is so individuals can travel between them so that if one population suffered a catastrophic destruction, members of the other subpopulation could recolonize it...
- The population in Mexico will not have the ability to do that in any meaningful way. Therefore, please allow for a second population in the US. The area north of I-40 must be allowed to contribute to wolf recovery and future resiliency. Failing to include it is a political decision.

Our response: Our recovery strategy, developed in cooperation with the states of Arizona and New Mexico; U.S. Forest Service; and with the government of Mexico, is to focus recovery of the Mexican wolf in the two existing reintroduction areas in the United States and Mexico. A population in Mexico with an average annual population abundance of 200 and a population in the U.S. with an average annual population abundance of 320, together with the other elements of the recovery strategy are large enough to achieve the resiliency, redundancy and representation needed for recovery and delisting. Given the current habitat quality in the borderlands area which is predominately patchy and low quality (Martínez-Meyer et al. 2017), we expect and modeled a low level of dispersal (approximately one wolf every 12-16 years) between the U.S. and Mexico populations. It is important to note that Mexican wolves released in Mexico have crossed the border on three occasions (one wolf twice when it entered the United States and then returned to Mexico) and wolves from the United States population have traveled as far south as Interstate 10. Thus, a low level of dispersal is a valid assumption under current conditions. We recognize that the proposed border wall, if built, could further constrain or completely curtail natural dispersal, depending on its design. However, these constraints would not appreciably impact the predicted performance of the populations. The PVA model incorporated catastrophic events, gene diversity, and a low level of dispersal between populations (~one wolf every 12-16 years) and results indicate that populations have a greater than 90% chance of persistence over 100 years under certain conditions. In other words, we do not expect the level of dispersal predicted between the U.S. and Mexico to provide for adequate gene flow between populations to alleviate genetic threats or ensure representation of the captive population's gene diversity in both populations. Therefore, we consider genetic management, such as releases from captivity (including cross-fostering pups) and translocations, to serve as an effective tool during the recovery process to achieve appropriate representation (Miller 2017). That said, we recognize the benefits of connectivity and have added an activity in the Implementation Schedule Table to work

with Customs and Border Protection to explore ways to maintain connectivity between Mexican wolf populations in the U.S. and Mexico. Other activities have also been added to address connectivity, such as implementing measures to facilitate movement across road corridors. Furthermore, the 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised.

Resolution: We added activities in the Implementation Schedule Table to work with Customs and Border Protection to explore ways to maintain connectivity between Mexican wolf populations in the U.S. and Mexico, and to address connectivity in other ways, such as implementing measures to facilitate movement across road corridors. In addition, Miller (2017) conducted model simulations in which dispersal/connectivity was removed completely to verify that both populations achieve at least a 90% probability of persistence for 100 years and maintain approximately 90% of the gene diversity available in captivity. The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

Population Abundance

1. ***Comments disputing the size (abundance) of the Mexican wolf population considered adequate for delisting in the draft Recovery Plan*:**

Comments were submitted which expressed disagreement with the draft Recovery Plan's average Mexican wolf population abundance objective that would be considered adequate for delisting. Not only did the reviewers argue that the population abundance targets of greater than or equal to 320 wolves in the MWEPA (U.S. Recovery Area) and 170 wolves in the SMOCC-N (Mexican Recovery Area) were too small, they also questioned the departure from the recommendations of the Science and Planning Subgroup (SPS), 2010-2013 Recovery Team for a metapopulation of a minimum of 750 wolves necessary to be considered for recovery. Excerpts from the comments on the inadequacy of the draft Recovery Plan's population abundance objective include:

- … the DRP fails to support the departure from the 2012 SPS recommendations... delisting criteria of 320 wolves is genetically insufficient... need to have larger wild pop with a higher population cap to be genetically effective…
- This plan calls for delisting the Mexican gray wolf when the population in the U.S. is only half the size recommended by scientists on the U.S. Fish and Wildlife Service's previous planning team. These experts found 750 wolves in three U.S. locations including the Grand Canyon region are required for the population to be viable.
- …the plan sets the criteria unsustainably small at an average of 320 wolves in the U.S. over four years plus a smaller population in Mexico.
- ...does not adequately address or ensure natural dispersal between populations, including the proposed population in Mexico.
- …to go with full intention (of recovery) to make sure the Mexican wolf plan is successful Federal regulators must err on the side of more of the species than a lesser amount.
- Pursue a goal of 2100 wolves spread across these three meta-populations along with sufficient connectivity throughout ponderosa pine biome to promote genetic migration.
- Once the Mexican Wolf is delisted from endangered status, ranchers will kill them off rapidly...Therefore, the total number of Mexican Wolves needed to be considered sustainable is 750.
- …the Service fails to explain why its present, optimistic scenario for success without natural connectivity between only two populations is valid in the face of the previous science showing three interconnected populations and 750 wolves being required.

- It is against my training or belief to even put a population number on an endangered species...the (gene) diversity in the 113 wild wolves (is) limited. Thus, releasing the captive bred animals is necessary.
- The cap of 320 wolves in these two states is much, much too low. How can 320 wolves in a massive area be genetically diverse, or serve to boost the population in a healthy way?
- There is no indication that the SPS modeling is no longer the best available science when it comes to Mexican wolves.
- …the Service underestimates the masking effect of the practice (supplemental feeding) and thereby underestimated the effects of inbreeding which also enabled the agency to improperly set a delisting threshold at the genetically insufficient number of 320 animals in the U.S.
- …If the population cap and recovery size for the Mexican gray is not increased, it will not be many years down the road before recovery efforts for the wolf will be facing a similar problem (to the inbreeding in the ocelot recovery programs).

Our response: PVA modeling (Miller 2017) shows that a population in Mexico with an average annual population abundance of 200 and a population in the U.S. with an average annual population abundance of 320 has at least a 90% probability of persisting for 100 years, demonstrating both the resiliency of each population and redundancy from having two populations. For any species, there may be more than one strategy that provides a valid path to recovery. This is the case for the Mexican wolf. In our development of the recovery strategy for the revised recovery plan we considered different combinations and alternative scenarios for the location, number of populations, number of releases and number of wolves (population abundance) that could achieve the recovery objective. Alleviation of the threats to the Mexican wolf from human-caused mortality, lack of gene diversity, and extinction risk due to small population size are the biological criteria and imperatives that form the basis of the recovery strategy. The recommended recovery strategy from the MWRT (2010-13) adequately addressed these threats. The process of recovery must also be formulated to support a smooth transition to state management of a recovered Mexican wolf population post-delisting. We have a criterion in the recovery plan that will ensure regulatory mechanisms are in place to prohibit or regulate human-caused mortality of Mexican wolves in those areas necessary for recovery. The ESA requires that any delisting action ensure that all threats to a species have been sufficiently reduced or managed to provide for a viable population in the long-term and that the species does not meet any of the five listing factors, including "the inadequacy of existing regulatory mechanisms." Our recovery strategy, developed in cooperation with the states of Arizona and New Mexico, the U.S. Forest Service and with the government of Mexico, is to focus recovery of the Mexican wolf in the two existing reintroduction areas in the United States and Mexico. We are focusing our recovery in the U.S. south of Interstate 40, which is the area designated as the MWEPA (as defined in the 2015 Final 10(j) Rule). Based on current published research (Miller 2017), the population objective for this area is large enough to achieve our goal of delisting and recovery while also addressing concerns regarding the potential adverse impacts from wolf predation on wild ungulates, specifically elk, and wolf depredation of livestock, specifically cattle. The management measures described in the 2015 ROD and the 2015 Final 10(j) Rule will continue as part of the recovery strategy as outlined in the Recovery Plan. Therefore, we will reduce wolf-livestock and wolf-human conflict through the implementation of pro-active measures to avoid and minimize depredation; facilitate the provision of depredation compensation for the economic impact of wolves on rural ranching communities; employ a phased management approach in Arizona to minimize or avoid possible unacceptable impacts to wild ungulate populations (specifically elk); allow take of Mexican wolves under specific circumstances; and continue to work collaboratively with state and local governments, tribes, livestock producers, state wildlife agencies, and stakeholder organizations to achieve the social tolerance for wolves in rural communities necessary to achieve Mexican wolf recovery. The 5 and 10-year status reviews, discussed in Section V. of the draft recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised.

Resolution: The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

2. ***Comments on the use of management actions to maintain the population in the MWEPA* (U.S. Recovery Area) *at between 320 and 380 Mexican wolves:***

A number of comments were submitted arguing against the use of management actions to maintain the population of Mexican wolves in the MWEPA (U.S. Recovery Area) at between 320 and 380 animals. These comments questioned whether any other recovery plan placed limits on the upper end of population growth for an endangered species and requested to know the scientific justification for the imposition of a "cap" on the wild population of Mexican wolves in the MWEPA (U.S. Recovery Area). Comments also challenged the hypothesis that an erosion of social tolerance would occur and impacts on wild ungulate populations would be at unacceptable levels should the Mexican wolf population in the MWEPA (U.S. Recovery Area) grow significantly above 320 wolves. Excerpts from the comments on the use of management actions to maintain the population of Mexican wolves in the MWEPA (U.S. Recovery Area) at between 320 and 380 animals include:

- No population cap can be included in Recovery Plan: Minimum Viable Populations of mammals are over 5000, rather than the Plan's 320…A 2007 analysis of 30 years of Population Viability Analysis shows the necessary recovery range for mammals.
- …the recovery plan or biological report/population viability analysis should document the science behind how 380 was identified as an upper bound on the U.S. population size.
- …the statement that wildlife managers can kill wolves to keep them at 380 is even more scientifically flawed.
- …(it) is beyond question that the Service refused to permit the drafters of this Plan to conduct population viability modeling above a sustained population of 320 and under no circumstances even temporarily above 380…The Service simply is afraid that population growth significantly above 320 may erode social tolerance in local communities or cause other management concerns such as unacceptable impacts to wild ungulates.
- …cap on wolves of 320. This is an extremely low number to be able to ensure a viable population and genetic diversity. This number should be raised. Previous recovery plans had minimum populations of 750 along with wolf numbers north of I-40.
- …constraining the overall population to specific areas and restricting populations to minimum sizes has its problems.
- Capping the wolf population at all and limiting the number that will ever be allowed to exist in the wild flies contrary to all other recovery plans for other endangered species...The carrying capacity for wolves in the Gila alone is estimated to be on the order of 1000.
- …(there is) no scientific basis is given to support the hypothesis that wolf populations above 320 would significantly decrease tolerance or ungulate abundance…Unsupported assertion by the States of AZ and NM… Setting a cap for endangered species recovery is unheard of…
- … (It) does not appear that the Service undertook any systematic survey of the number of wolves that would be tolerated but merely took the state's words for what population could be workable...The species should be recovered to the extent that it is viable and self-sustaining, and prescribing an ultimate cap on the population to be enforced through lethal and permanent removals is unacceptable...
- …we are unaware of any of other listed endangered species that has a population cap limiting its recovery.
- …the Mexican Wolf should only have a minimum acceptable number to aim for, NOT a maximum limit that it may be killed if it surpasses.

***Our response*:** PVA modeling (Miller 2017) shows that a population in the U.S. with an average annual population abundance of 320 has at least a 90% probability of persisting for 100 years. We recognize that unrestricted Mexican wolf population growth may erode social tolerance in local communities or cause other management concerns, such as unacceptable impacts to wild ungulates (USFWS 2014). We consider it not only possible, but preferable, to achieve recovery while addressing the concerns of local communities and economies. Therefore, we used the Vortex model to explore viability of populations that were not allowed to increase over 380 Mexican wolves in the United States to simulate management response to problem wolves and unacceptable impacts to native ungulate herds (Miller 2017). While 380 Mexican wolves functioned as a population cap in the model, it was not intended as a limit on the number of Mexican wolves in the wild. However, if population growth is causing management concerns, we will consider any and all management options, including allowing mortality rates to increase through permitted take or other mechanisms, provided at least 320 Mexican wolves are likely to be maintained. We will work to reduce wolf-livestock and wolf-human conflict through the implementation of pro-active measures to avoid and minimize depredation; facilitate the provision of depredation compensation for the economic impact of wolves on rural ranching communities; employ a phased management approach in Arizona to minimize or avoid possible unacceptable impacts to wild ungulate populations (specifically elk); allow take of Mexican wolves under specific circumstances, and continue to work collaboratively with state and local governments, tribes, livestock producers, state wildlife agencies, and stakeholder organizations to achieve the social tolerance for wolves in rural communities necessary to achieve Mexican wolf recovery.

Resolution: We clarified the language regarding the management targets in the Rationale for Recovery Criteria. The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

3. ***Comments on the methodology for determining wolf population abundance goals and the undercounting of pup mortality:***

We received several comments recommending clarification and better specificity on how wolf population counts and population abundance estimates will be made. These comments also suggested that better documentation of pup mortality is needed to determine achievement of improved gene diversity in the wild population and alleviation of inbreeding depression. Excerpts from these comments include:

- One area that I do feel adds confusions to the plan is how the population goals are stated. For example (p.9), "MWEPA average population abundance is greater than or equal to 320 Mexican wolves." The way this is stated is rather vague and reduces is value as a measureable criteria. Wolf populations during the annual cycle can probably change as much as 2 fold, and a population of 320 wolves at the end of winter could be as high as 600-650 in spring after pup are born.
- Averaging across the year or among years could add high levels of confusion. Wolf populations in the Northern Rockies have generally been defined as the population on the landscape at the end of the year, or beginning of winter. In the Great Lakes States, wolf population are listed for mid or late winter because snow tracking is used for estimating wolf numbers. In general, by early winter after most big game harvests are completed (most illegal killing of wolves occurs during the big game seasons), wolf populations remain relatively stable until the denning period. Also mortality due to depredation control activity rarely occurs during the winter. Thus I would recommend the population goal makes some reference to the winter wolf population, or wolf population at the end of the year.
- The above statement could be restates as MWEPA mid-winter wolf count of 320 wolves or more or MWEPA end of year wolf population estimate of 320 or more wolves. I think a specific

reference to time of the year for determining the wolf count or population estimate would improve the ability to objectively measure the wolf population criteria.

- Recovery Criteria: Population abundance numbers need to be defined as how the count would be defined i.e. as a minimum population count.
- As the population grows and expands … it will take more effort and resources to obtain minimum population counts that have low variance. There will be more uncollared, non-functioning collars, and higher likelihood of uncensused (*sic*) wolves across a much larger area…Therefore population abundance should be calculated by a method other than minimum population counts that takes into account a variation for uncensored individuals using a probability of detection factor.
- Abundance is a relative term used to express a population's representation in a particular ecosystem. Should this refer to population size? If abundance is what is meant, perhaps for wolves in a specific area, I recommend: increasing in abundance and well-distributed geographically within their range s [or recovery areas] This way, there is some context to the word abundance.
- Population size (is) used here, not abundance. I'm wondering why the recovery plan is using abundance elsewhere.
- At least 342 pups were confirmed born in the wild during that period. Of those 342 pups, only 196 (57%) were confirmed alive at the end of their birth year; 22 (6%) were confirmed dead and included in mortalities; and the remaining 124 first-year pups (3 6%) vanished. This is a minimum estimate because nobody is able to count the pups that are born in the wild but never leave the den. Observed pups that vanished during their first year can be reasonably presumed dead, but FWS never tallied nor analyzed them. What matters is that vanished first-year pups outnumber illegal Mexican wolf killings by 2.25 to 1, and yet FWS fails to consider them significant enough to track and report. Instead, the agency ignores this proverbial, elephant in the room which likely results from severe inbreeding--to promote its false political narrative that illegal killings are its number one excuse for lackluster program results.

Our response: In the U.S., minimum population abundance is currently determined by counts conducted via ground and aerial surveys. The annual count is conducted from November through the helicopter operation in January/February. According to our Standard Operating Procedure "Year End Population Counts of Mexican Wolves," when the U.S. population reaches a point at which statistical sampling techniques are more appropriate, this SOP will be updated to reflect that change. Regarding growth rates and mortality thresholds, simulated populations with mean adult mortality rates less than 25%, combined with mean sub-adult mortality rates less than 33% and mean pup mortality (for radio-marked pups greater than 4 months old) less than 13% resulted in an increasing population that should meet recovery criteria.

Resolution: We have updated our Rationale for Recovery Criteria in the final recovery plan.

4. ***Comments on population distribution within suitable habitat in the MWEPA (U.S. Recovery Area):***

Some comments we received argued that the difference in suitable habitat within the MWEPA (U.S. Recovery Area) requires site specific estimates of where and how many wolves different areas will support. Excerpts from these comments include:

- …the plan fails to meet the elements of a description of such site-specific management actions as required by Endangered Species Act (ESA) (section 4(f)(1). Both this draft plan and the draft biological report cover the entire MWEPA and is too general. Each suitable wolf habitat is different from other suitable habitats within the MWEPA, with its own unique characteristics. The recovery plan should provide details on how, when and quantity of wolves the USFWS would envision for a specific areas within the MWEPA. The biological report should discuss how, when and quantity of wolves with everything being equal the USFWS determines can be supported in a specific site ...

Our response: The suitability of an area to sustain wolves is influenced by both biophysical (vegetation cover, water availability and prey abundance) and socioeconomic (human population density, road density and land status) factors. We generally consider the most important habitat attributes needed for wolves to persist and succeed in pack formation to be forest cover, public land, high native ungulate density, and low livestock density, while unsuitable habitat is characterized by low forest cover and high human density and use. We are focusing our recovery in the U.S. south of Interstate 40, which is the area designated as the MWEPA (as defined in the 2015 Final 10(j) Rule). Recognizing the wide variation in the amount and location of suitable habitat within the MWEPA, the 2015 Final 10(j) Rule identified three management zones within which different management actions would occur. Zone 1 is an area is an area of 12,507mi^2 (32,392 km^2) within the MWEPA where Mexican wolves are allowed to naturally disperse into and occupy and where Mexican wolves may be initially released from captivity or translocated. Zone 2 is an area of 78,756 mi^2 (203,978 km^2) within the MWEPA where Mexican wolves are allowed to naturally disperse into and occupy and where Mexican wolves may be translocated. On federal land in Zone 2, initial releases of Mexican wolves are limited to pups less than five months old to allow for the cross-fostering of pups from the captive population into the wild, and to enable translocation-eligible adults to be re-released with pups born in captivity. On private and tribal land in Zone 2 Mexican wolves of any age, including adults can also be initially released under Service and state approved management agreements with private landowners or a Service approved management agreements with tribal governments. Zone 3 is an area of 62,590 mi^2 (162,108 km^2) within the MWEPA where Mexican wolves would be allowed to disperse into and occupy but neither initial releases nor translocations would occur. Zone 3 is an area of less suitable Mexican wolf habitat where Mexican wolves would be more actively managed under the authorities of the 2015 10(j) Final Rule to reduce human conflict.

Resolution: We have added more actions and details to the Recovery Action Table. Additionally, more detailed activities (stepped-down from the actions) are included in the Implementation Schedule Table.

5. ***Comments on the growth rate of the Mexican wolf wild population:***

Some comments expressed concern over the draft recovery plan's projected growth rate of the wild Mexican wolf population. Excerpts from these comments include:

- Additionally, the low population increase predicted in the next few years is worrisome. An increase of just seven wolves before 2022 is a lackluster effort at a critical time. This should be increased to reflect the current estimated population and a growth rate of at least 10 percent from that.

Our response: The numbers we used for interim abundance targets and interim release targets in Section V of the public draft recovery plan were incorrect. We mistakenly based them on calendar years from the signing of the final recovery plan. However, they should have been based on model years. The PVA model used data through December 2015, so model year 7 equates to calendar year ~~5~~ 2022 (5 years after publication of the revised Final Recovery Plan), and model year 12 equates to calendar year ~~10~~ 2027 (10 years after publication of the revised Final Recovery Plan). The model predicts that in 2022 there will be approximately 145 wolves in the U.S. and 100 wolves in Mexico, with 9 released wolves surviving to breeding age in the U.S. population and 25 released/translocated wolves surviving to breeding age in the Mexico population. The model predicts that in 10 years there will be approximately 210 wolves in the U.S. and 167 wolves in Mexico, with 16 released wolves surviving to breeding age in the U.S. population and 37 released/translocated wolves surviving to breeding age in the Mexico population. The 4 and 8-year durations listed in the criteria are based on generation length and the 5 and 10-year status reviews are aligned with ESA 5-year review requirements.

Resolution: We have corrected the numbers we used for interim abundance targets and interim release targets in Section V of the Final Recovery Plan.

6. ***Comments that argued that the population abundance goals in the draft Recovery Plan are either too large or are adequate:***

Citing previous studies and the 1982 Mexican Wolf Recovery Plan some comments that we received advocated for smaller Mexican wolf population abundance goals. We also received comments that supported the population abundance targets as adequate for recovery. Excerpts from these comments include:

- ...the service is quoted many times in articles too numerous to count that 100 wolves would be needed to establish a viable population. ... I feel like the original 100 and all the hype about how little impact just 100 wolves would have, was just false and the Service's intentions were not made clear to the residents and those most impacted.
- Recovery goals appropriately include a sufficient margin of safety to ensure that unanticipated future events do not cause species to fall below the threshold that would again make listing warranted.

Our response: At the time the 1982 Mexican Wolf Recovery Plan was written, the Mexican Wolf Recovery Team saw "no possibility for complete delisting of the Mexican wolf." The team felt that "conserving and ensuring the survival of the Mexican wolf is the most that can be achieved today" and "worded its prime objective accordingly". The successful reestablishment of an experimental population of Mexican wolves in the Blue Range Wolf Recovery Area (BRWRA) was envisaged "as the first step toward recovery" and the Mexican Wolf Recovery Team at the time recognized that, as written, the prime objective that included the reestablishment "…of at least 100 Mexican wolves in the middle to high elevations of a 5,000-square-mile area within the Mexican wolf's historic range" represented "a working hypothesis" which would be "subject to amendment as more data on the Mexican wolf are acquired." Based on the current PVA model, the reestablishment of a single population of 100 Mexican wolves is inadequate for recovery, and a population of this size limited to the BRWRA can neither be considered "viable" nor "self-sustaining".

Resolution: No further action.

Genetics

1. Comments on the lack of gene diversity in the Mexican wolf population:

Many comments addressed the problems of recovery associated with a lack of gene diversity in a small population and were concerned that a lack of connectivity between the populations in the SMOCC-N (Mexican Recovery Area) and MWEPA (U.S. Recovery Area) under this draft Recovery Plan will increase risk of extinction. Concerns were expressed that the problem of inbreeding caused by limited gene diversity was not addressed adequately in the draft Recovery Plan and suggested that a larger wild population was required to be genetically effective. Some comments recommended that genetically redundant wolves should be removed from the wild. Excerpts from the comments on gene diversity include:

- Already, a lack of genetic diversity is threatening the health of wolf populations, but this plan will take that even further.
- With the current delisting criteria only 320 individuals in the US and 170 in Mexico and no required connectivity between populations, the long-term survival of this iconic Western species is in danger.
- The U.S. population of Mexican wolves is in peril due to their small gene pool, resulting in offspring too weakened by interbreeding to survive and thrive. The draft plan does not address this problem.
- USFWS has not adequately addressed inbreeding in the Recovery Plan. Breeding between the small number of founders has caused excessive inbreeding and loss of adaptive potential
- No amount of genetic mixing of the offspring of the seven founders can completely rid the current Mexican wolf program of the problem. There are no new wolves to infuse new genetic material into this failing population.
- There is also a serious issue with the proposed cap on US Mexican wild wolf populations. The SSP has been able to maintain a genetic diversity amongst Mexican gray wolves of almost 84%.

They have done so by increasing the population. If this success is to be sustainable, we must continue to grow populations in the same fashion.

- We urge the Service to more seriously consider removals of genetically-redundant individuals as a tool to increase overall genetic diversity in the wild.
- The number of initial releases from the captive to wild population determines the proportion of genetic diversity retained at ~ year 10 in the model. This metric is of course in itself highly important for addressing genetic threats.
- To show an increasing trend in diversity retention after these initial releases, the wild population must be of significantly larger size than the proposed population cap, and thus larger (in both census size and genetically effective population size) than the captive population.

Our response: The genetic status of the Mexican wolf population in captivity and the wild is an important factor in our recovery planning. We assessed genetic issues associated with inbreeding, loss of heterozygosity and loss of adaptive potential in the recovery plan as one of the primary threats to the Mexican wolf. A "stressor" described in the recovery plan that may influence the recovery potential of the wolf is the continuing or accelerated loss of genetic diversity in the captive or wild population. Accordingly we are fully cognizant of the critical need to improve the gene diversity of the wild populations of Mexican wolves through the release of wolves from captivity with appropriate genetic background. Release strategies from captivity may include the release of individual or paired adult wolves, a pack of wolves, or cross-fostering of pups. The importance of the releases of Mexican wolves from the captive population into the wild is demonstrated graphically in the PVA report (Miller 2017). Based on the current estimates of first year mortality of wolves released from captivity, we estimate the need to release about 70 wolves to the U.S. population to have 22 of them survive to breeding age. We estimate the need to release about 100 wolves to the wild population in Mexico to have 37 of them survive to breeding age. Including a low level of dispersal/connectivity (approximately 1 wolf every 16 years), the model predicts that at this level of release and at the predicted first year mortality rate, we will achieve gene diversity in the wild population of approximately 90% of that retained in the captive population. Both populations, when releases are incorporated and they are allowed to grow to recovery targets, achieve a greater than 90% probability of persistence over 100 years, with the genetic representation to be considered viable populations. The gene diversity of wild Mexican wolf populations can also be influenced through the dispersal of wolves from one wild population to another. Additional model simulations were conducted that eliminated the low level of dispersal/connectivity between the two populations. Changes to population performance were negligible. Therefore, even without the connectivity needed to support natural dispersal, each population shows a greater than 90% probability of persistence for 100 years with the genetic representation to be considered viable populations.

Resolution: We plan to convene a genetic management group (this is included as an activity in Implementation Schedule Table) to assist us with genetic management and recovery of the Mexican wolf, including addressing the most effective approaches to increase gene diversity in the wild populations.

2. Comments on genetic mixing and augmentation:

We received comments that expressed concern regarding the limited gene diversity found in the Mexican wolf population given the small number of seven founders and the absence of any Mexican wolves except those derived from the three lineages (McBride, Aragon and Ghost Ranch) represented by those founders. Comments addressed the draft recovery plan's lack of consideration for the possibility of genetic mixing and augmentation from other gray wolf subspecies found in North America, specifically the northern Rocky Mountains. Concerns were also raised that should this genetic augmentation happen, either through natural dispersal or through management actions, that the Mexican wolf would not be able to continue to be classified as a distinct gray wolf subspecies. Some commenters raised the issue of hybridization of Mexican wolves through interbreeding with domestic dogs or coyotes. Excerpts from the comments on genetic mixing and augmentation include:

- …you have limited diversity in your genetics and without outside genetics, this issue will never

be solved.

- Male Mexican wolf pups will continue to have a high incidence of cryptorchidism. Further genetic issues will likely occur, (if not already occurring) in the future without new genetics.
- I believe now the expansion of the population and recovery area north of the Mexican Wolf's historical range is an effort to connect the Mexican Wolf population to the Northern Gray Wolf population…
- …you will no longer have a subspecies when this occurs and distinction between the populations will no longer be viable.
- The 2017 recovery plan also discusses the likelihood of interbreeding with Northern Gray Wolves. It mentions as I have predicted that the infusion of Northern genetics is the only way to increase genetic variability in the Mexican wolf.
- The Service needs to better explain how it will ensure that interbreeding is not occurring and what it will exactly do if it occurs. In addition, the Service needs to explain how if after recovery is achieved and interbreeding occurs how this affects the Mexican wolf status in regards to the ESA.
- The northern natural dispersal behavior and the potential hybridization with northern wolves, rendering the Mexican wolf subspecies a moot point, was not addressed in the Recovery Plan.
- Mexican Wolves are constrained by extremely small allelic variation; this genetic limitation means their offspring are less viable than the mean. Thus, the Plan must restore genetic mixing with other wolf populations.
- The cross breeding of wolves with coyotes is diminishing the overall purpose of the program. The lack of genetic diversity is further diminishing the program.
- …the Service has known the genetic issue is unsolvable and without outside blood the sub-species is doomed. But with outside blood from imported northern wolves, the sub-species is erased.
- Hybridization occurs between many species and, particularly in canids, is an important evolutionary process. We know from genomic analysis that intermixing between northern wolves and Mexican wolves occurred historically, and it would contribute to recovery if this genetic cline was reestablished… any hybrids produced between wolf subspecies would be protected under the ESA…
- …intermixing between southwestern and northern wolves would be relatively low compared to interchange within either the northern or southern metapopulation. The Mexican wolf genetic variants that were adaptive in southwestern ecosystems would remain or increase in the mixed population, while detrimental alleles would be selected against.

Our response: Historically Mexican wolves may have dispersed north of Interstate 40 within zones of intergradation where interbreeding with other gray wolf subspecies may have occurred. The original zone of admixture between Mexican wolves and Plains wolves (*C. l. nubilus*) was in central Arizona and New Mexico. There was never a zone of admixture between Canadian wolves and Mexican wolves. The potential for positive benefit through genetic augmentation from cross-breeding Mexican wolves *C.l baileyi* with northern Rockies/Canadian gray wolves (*C. l. occidentalis*) versus the negative potential of "genetic swamping" of the Mexican wolf subspecies is a subject which we intend to further explore as part of our recovery actions. As we state in the Biological Report, careful evaluation of the potential effects of introgression of gray wolves is needed to determine whether allowing gray wolves to breed with Mexican wolves could be appropriate during a later stage of recovery or after recovery (Hedrick and Fredrickson 2010). Until such evaluation occurs, and pending its results, we would manage against such breeding events occurring south of Interstate 40 in the United States. We conduct genetic analyses on all Mexican wolves that are handled in the wild to ensure genetic purity. We also conduct genetic analyses of all other canids we handle in the wild to further monitor for any hybridization. We have not documented any hybridization of Mexican wolves with coyotes (*Canis latrans*). In the nearly 20 years of the reintroduction project, we have documented three instances where Mexican wolves bred with dogs. The resultant offspring were euthanized in all three cases.

Resolution: We plan to convene a genetic management group (this is included as an activity in Implementation Schedule Table) to assist us with genetic management and recovery of the Mexican wolf, including addressing the most effective approaches to increase gene diversity in the wild populations.

3. ***Comments on the need for more releases from the captive population to improve gene diversity in the wild populations:***

We received comments that addressed the need to rapidly improve the gene diversity in the wild populations of Mexican wolves through release of wolves from the captive population. These comments also expressed concern that the draft recovery plan misapplies the criterion that gene diversity in the wild populations should comprise approximately 90% of the diversity in the captive population. Excerpts from the comments on the need to improve the gene diversity in the wild population include:

- At present vital genetic diversity afforded by the licensed captive reproduction facilities needs facilitation as quickly as possible to alleviate the present 24% or so allelic variation of wild Mexican Wolves.
- .. unless a rapid release of a significant number of wolves is effected, a situation such as occurred in the Isle Royale wolf population is relatively imminent.
- The present wild population has had environmental and social learning experience making them priceless to preserve, and immediate release of captives suitable for survival is imperative.
- In the draft plan, that concept gets turned on its head. The draft plan merely accepts that the captive population is badly depleted genetically (and, thus, both a poor representation of what was once a Mexican wolf and also at risk of inbreeding damaging demography), and then uses that shifting baseline" as the standard against which the wild populations will be measured.
- Thus, if the future wild population isn't too badly damaged genetically relative to the current, already depleted captive population, the draft plan assumes that the program meets genetic goals. The actual level of gene diversity that the draft plan is willing to accept as the long term fate of the species approximately 60% to 70% of the initial wild diversity is extremely low.
- …genetic diversity of the captive population will decline relatively rapidly over time unless a larger wild population can be established in the near future.
- …genetic goals should attempt to retain within the wild population a large and increasing proportion of the total overall current diversity present in both the wild and captive population. This is possible if a greater number of initial releases occur, and if the wild population is allowed to grow to a larger size than the captive population.
- The draft recovery plan and associated biological report provide not only an inadequate but also a dishonest justification for its bedrock criterion that gene diversity in the wild populations should comprise approximately 90% of the diversity in the captive population.
- ..the 90% threshold for retaining gene diversity is specific to captive populations, i.e. those managed by the American Zoological Association or AZA..
- The current gene diversity of this population is 83.07%. And the SSP projects that gene diversity in the captive population will decrease even further in the future. There is no logical reason for the draft recovery plan to take the already inadequate 83.07 percent of the diversity inherited originally from the seven founding/surviving wolves, account for continued erosion of that diversity well below the recommended 90% minimum of the founders diversity, and then apply a 90% proportion to the resulting genetic diversity to reach a standard to attain and retain in the wild populations.
- …the Draft Plan fails to apply the best available science and properly analyze and address the questions of probability and certainty (how likely will extinction be?), how long it will take, and what degree of risk is acceptable even if the Draft Plans criteria are met. In the absence of this analysis and information, including proper models and application of the best available science, the Service simply cannot put forth a valid road map to recovery, as required by the ESA.

Our response: We are fully cognizant of the critical need to improve the gene diversity of the wild populations of Mexican wolves through the release of wolves from captivity with appropriate genetic background. Release strategies from captivity may include the release of individual or paired adult wolves, a pack of wolves, or cross-fostering of pups. The importance of the releases of Mexican wolves from the captive population into the wild is demonstrated graphically in the PVA report (Miller 2017). Based on the current estimates of first year mortality of wolves released from captivity, we estimate the need to release about 70 wolves to the U.S. population to have 22 of them survive to breeding age. We estimate the need to release about 100 wolves to the wild population in Mexico to have 37 of them survive to breeding age. We did not require that a released or translocated wolf survive and produce offspring in the population, as the basis for recovery criteria. We instead used a metric (i.e., number of animals that survive to breeding age) that coupled model performance with performance of the wild populations. Including a low level of dispersal/connectivity (approximately 1 wolf every 16 years), the model predicts that at this level of release and at the predicted first year mortality rate we will achieve gene diversity in the wild population of approximately 90% of that retained in the captive population (Miller 2017). Both populations, when releases are incorporated and they are allowed to grow to recovery abundance targets, achieve a greater than 90% probability of persistence over 100 years, with the genetic representation to be considered viable populations. The gene diversity of wild Mexican wolf populations can also be influenced through the dispersal of wolves from one wild population to another. Additional model simulations were conducted that eliminated the low level of dispersal/connectivity between the two populations. Changes to population performance were negligible. Therefore, even without the connectivity needed to support natural dispersal, each population shows a greater than 90% probability of persistence for 100 years with the genetic representation to be considered viable populations.

Resolution: We plan to convene a genetic management group (this is included as an activity in Implementation Schedule Table) to assist us with genetic management and recovery of the Mexican wolf, including addressing the most effective approaches to increase gene diversity in the wild populations.

4. ***Comments on whether the Mexican wolf is a true subspecies, whether Aragon and Ghost Ranch lineages are genetically "pure" and the need to increase the percentage of Aragon and Ghost Ranch lineage wolves in the wild population:***

We received comments that argued that the Mexican wolf is not a true subspecies of gray wolf. There were also comments that asserted that the only pure Mexican wolf is the McBride lineage. Other comments addressed the need to improve the genetic composition of the wild population by increasing the percentage of Aragon and Ghost Ranch lineage wolves while reducing McBride lineage wolf representation. Excerpts from these comments include:

- Are you sure that Mexican gray wolves are a good subspecies all on their own?
- The SSP recommended increasing ancestry from the Ghost Ranch and Aragon lineages to as much as 25 % each, and reducing the McBride lineage to 50%.
- …the Draft Report also claims that the Ghost Ranch lineage and the Aragon lineage are pure Mexican wolves. I believe that this assertion is incorrect as the purity of the Aragon and Ghost Ranch lineages has been in question for years and cannot be elevated to the same status as the McBride lineage.

Our response: Our Final Rule listing the Mexican wolf as an endangered subspecies (80 FR 2488) provides a detailed discussion of the taxonomy of the Mexican wolf available in the scientific literature. During the process of developing this Rule, the Service considered all peer reviewed published literature in determining the Mexican wolf to be an endangered subspecies and that the three founding lineages (McBride, Aragon, Ghost Ranch) of the captive population are pure *C.l baileyi*. Neither the validity of the Mexican wolf as a listed entity nor the certification of the three lineages was revisited in recovery planning.

Resolution: We plan to convene a genetic management group (this is included as an activity in Implementation Schedule Table) to assist us with genetic management and recovery of the Mexican wolf,

including addressing the most effective approaches to increase gene diversity in the wild populations and the relative ancestry of the lineages in the wild populations.

Mexico

1. ***Comments on the proportional sharing of the burden for Mexican wolf recovery between the United States and Mexico:***

We received comments that expressed the view that a disproportionate share of the burden of Mexican wolf recovery fell to the United States. The comments asserted that the majority of historical habitat for the Mexican wolf is in Mexico and felt that it was therefore unfair for the U.S to have a higher share of projected cost as well as a larger population of wolves necessary to achieve recovery was seen as unfair. Excerpts from these comments include:

- … it is unclear if Mexico is contributing to the effort financially and if so are they sharing an equal or greater burden?
- The majority of the historic range of the Mexican wolf is in Mexico and thus its government is committed to recover then it makes sense that Mexico should bear the larger burden both financially as well as wolf population numbers.
- ..To ask the American taxpayer to subsidize a program that is almost entirely in Mexico is absurd...
- ...Since this has been made an international program, why do US citizens pay the cost of success or failure in a foreign country?
- How much have the United Mexican States contributed to Mexican Wolf recovery to date? The American taxpayers have spent millions for the recovery of this species and I believe it is only right that the United Mexican States pay their fair share...
- ..Very simply, the Services Draft Plan does not reflect the species historic habitat and it appears that the U.S. will be forced to shoulder the burden of recovery instead of the United Mexican States. The Draft Plan should be changed to match recovery goals with the historic range of the Mexican Wolf.

Our response: The southernmost extent of the Mexican wolf's range in Mexico is consistently portrayed as ending near Oaxaca. Depiction of the northern extent of the Mexican wolf's pre-settlement range among the available descriptions in the scientific literature varies depending on the authors' taxonomic treatment of several subspecies that occurred in the Southwest and their related treatment of intergradation zones. Our Final Rule listing the Mexican wolf as an endangered subspecies (80 FR 2488) provides a detailed discussion of the various descriptions of historical range available in the scientific literature. More recent (Hendricks et al. 2016, 2017 and Heffelfinger et al. 2017) studies offer additional arguments for either a depiction of a more extensive northern and western historical distribution or why such historical range extensions are not supported. The Service continues to recognize the concordance in the scientific literature depicting the Sierra Madre of Mexico and southern Arizona and New Mexico as Mexican wolf core historical range and will continue to recognize the expanded range as per Parsons (1996) that extends into central New Mexico and Arizona (USFWS 1996). Therefore, we are focusing our recovery efforts in the area that is accepted as historical range for the Mexican wolf. This area comports with the scientific literature that addresses historical range (discussed in the Biological Report), previous Service focus areas (USFWS 1996), and the ecological niche of Mexican wolves (Martínez-Meyer et al. 2017). Martínez -Meyer et al. (2017) used an Ecological Niche Model that was calibrated with all wolf presence records available in the historical range as depicted by Parsons (1996) in Arizona, New Mexico, and Texas, as well as records from Mexico. This model showed all possible areas climatically similar to the presence records and it recognized that northern areas are quantitatively different. The model also shows the MWEPA as the area overall with the highest-quality habitat due to the high availability of ungulates, particularly elk, and therefore, with the highest estimation of Mexican wolf carrying capacity under any scenario. The Sierra Madre Occidental, both north and south, is the area with the potential to hold the largest number of wolves in Mexico. The estimated carrying capacity for the U.S. Recovery Area

is about 1000 wolves, whereas, the estimated carrying capacity for the northern Sierra Madre Occidental (SMOCC-N) recovery area in Mexico is approximately 300 wolves. The carrying capacity for the southern Sierra Madre Occidental, is approximately 350 Mexican wolves. We do not agree with commenter's contention that 90 percent of the historical range of the Mexican wolf is in Mexico and that therefore a recovered Mexican wolf population and the cost of recovery should accordingly be distributed proportionate to this claim.

Our recovery strategy, developed in cooperation with the states of Arizona, New Mexico, Colorado, and Utah; the U.S. Forest Service: and the government of Mexico, is to focus recovery of the Mexican wolf in the two existing reintroduction areas in the United States and Mexico. We are focusing our recovery in the U.S. south of Interstate 40, which is the area designated as the MWEPA (as defined in the 2015 Final 10(j) Rule). The population objective for each wild population is based on a Vortex Population Viability Model, with targets to achieve at least a 90 percent probability of persistence over 100 years and maintain approximately 90 percent of the gene diversity available in the captive population. This model was developed with the assistance of staff from the states of Arizona, New Mexico, Colorado, and Utah; the U.S. Forest Service; and the Mexican government; and independent scientists from both the United States and Mexico, many of whom were members of the last recovery team. This strategy provides for recovery within the historical range of the Mexican wolf as described in Parsons (1996), which the Service previously adopted when we began reintroducing wolves in 1998 (63 FR 1752). We believe the current policy and the current scientific literature support the approach taken in this recovery plan; namely, to focus recovery within recognized historical range including the MWEPA in Arizona and New Mexico, as delineated in the 2015 10j rule, and the northern Sierra Madre Occidental in Mexico. We recognize that recovery in Mexico will face substantial biological, logistical, and legal challenges (e.g., lower quality suitable habitat, lower ungulate biomass, a lack of Federal lands, weaker regulatory protections, multiple forms of human-caused mortality, a wide network of roads increasing wolf human interaction and wolf vulnerability to human caused mortality), and we appreciate that many experts are skeptical recovery can be achieved in Mexico. The Service and our partners intend to make every effort for recovery in Mexico to succeed. Failure to show substantial progress at both the 5- and 10-year benchmarks would be evaluated carefully and, depending on the level of progress observed, could be viewed as an indication the standards intended by our 1984 Experimental Population final rule (49 FR 33885, August 27, 1984) and 50 CFR 17.81(a) were met. In other words, if we fail in the best location in Mexico after ten years (17 years after reintroductions began), the habitat may no longer be able to support a recovered population there and it may be necessary to try elsewhere.

Resolution: The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

2. Comments that addressed what was seen as undue reliance on Mexico for recovery of the Mexican wolf:

Many comments were received that cited multiple reasons why Mexico should not be relied upon to contribute to the recovery of the Mexican wolf. These comments asserted that there is: not enough public land in Mexico; a lack of social tolerance; too high a density of livestock in recovery areas; a lack of law enforcement to minimize poaching, and a lack of financial resources and political will to provide the necessary funding. Excerpts from these comments include:

- Mexico does not have enough public land to support a sustainable population of Mexican gray wolves ...it has a higher density of livestock than the more suitable areas identified in the U.S. ...(it is unknown) if there is suitable social tolerance for the species in Mexico, ... Mexico does not have nearly as much law enforcement to minimize poaching. Additionally, the funding for the

Mexican wolf recovery program in Mexico is uncertain.

- high human -associated mortality risk and low prey density within potential core areas in Mexico suggests that these areas are unlikely to support populations of over 100 individuals (Mexican wolves)
- (there is)... not have enough public land to support a sustainable population of Mexican wolves. There is... higher density of livestock than more suitable areas identified in the U. S. ... There is no evidence of suitable social tolerance of wolves in Mexico... Mexico does not have nearly as much law enforcement to minimize poaching.
- Mexico may offer a good opportunity to augment Mexican wolf recovery, but evidence is problematic at best to suggest it become a primary recovery area.
- ...recovery in the United States (should) be decoupled from recovery in Mexico. ...Unfortunately, Mexico continues to struggle with drug cartels and other serious issues. There is no way that wolf recovery can be a priority issue for that government.

Our response: The recovery of the Mexican wolf has been a binational effort since a binational captive breeding program was first established in 1977. There are 53 facilities in both the United States and Mexico that house and maintain Mexican wolves as part of the captive breeding program, and both countries are now focused on re-establishing wild populations in designated reintroduction areas. Mexico began reestablishing a population of Mexican wolves in the Sierra Madre Occidental in 2011. As of April 2017, approximately 31 wolves inhabit the northern portion of these mountains in the state of Chihuahua with natural reproduction documented in 2014, 2015, and 2016. Our recovery strategy, developed in cooperation with the states of Arizona, New Mexico, Colorado, and Utah; the U.S. Forest Service; and the government of Mexico, is to focus recovery of the Mexican wolf in the two existing reintroduction areas in the United States and Mexico. We are focusing our recovery in the U.S. south of Interstate 40, which is the area designated as the MWEPA (as defined in the 2015 Final 10(j) Rule). The population objective for each wild population is based on a Vortex Population Viability Model, with targets to achieve at least a 90 percent probability of persistence over 100 years and maintain approximately 90 percent of the gene diversity available in the captive population. This model was developed with the assistance of staff from the states of Arizona, New Mexico, Colorado, and Utah; the U.S. Forest Service; and the Mexican government; and independent scientists from both the United States and Mexico and is based on wolf life history data. This strategy would provide for recovery within the historical range of the Mexican wolf as described in Parsons (1996), which the Service previously adopted when we began reintroducing wolves in 1998 (63 FR 1752). We believe the current policy and the current scientific literature support the approach taken in this recovery plan; namely, to focus recovery within recognized historical range including the MWEPA in Arizona and New Mexico, as delineated in the 2015 10j rule, and the northern Sierra Madre Occidental in Mexico. We recognize that recovery in Mexico will face substantial biological, logistical, and legal challenges (e.g., lower quality suitable habitat, lower ungulate biomass, a lack of Federal lands, weaker regulatory protections, multiple forms of human-caused mortality, a wide network of roads increasing wolf human interaction and wolf vulnerability to human-caused mortality), and we appreciate that many experts are skeptical recovery can be achieved in Mexico. The Service and our partners intend to make every effort for recovery in Mexico to succeed. Failure to show substantial progress at both the 5- and 10-year benchmarks would be evaluated carefully and, depending on the level of progress observed, could be viewed as an indication the standards intended by our 1984 Experimental Population final rule (49 FR 33885, August 27, 1984) and 50 CFR 17.81(a) were met. In other words, if we fail in the best location in Mexico after ten years (17 years after reintroductions began), the habitat may no longer be able to support a recovered population there and it may be necessary to try elsewhere.

Resolution: The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve

recovery; change techniques used to address gene diversity; or implement other substantive change.

3. ***Comments that questioned that Mexico, a sovereign nation, will be a reliable partner over the long term necessary to achieve recovery of the Mexican wolf:***

Multiple comments expressed a lack of trust that Mexico will continue as a reliable partner with the United States in the recovery of the Mexican wolf. These comments were skeptical that Mexico was committed to recovering the Mexican wolf and cited the lack of a statutory mandate in Mexico, similar to the ESA in the United States that required the government to fund or otherwise support a recovery program. Excerpts from these comments include:

- …the USFWS cannot enforce their proposed Mexican wolf recovery plan in Mexico.
- …(reliance) on Mexico (for) wolf recovery is problematic. Mexico is a sovereign nation. The draft plan anticipates cooperation of Mexico over a minimum of 20 years ... how can the U. S. count on Mexico for necessary factors, such as adequate funding of Mexican wolf recovery?
- …many questions about funding, protections, and limited public lands. It also raises questions of burdens in international law, how much power the USFWS has to burden a sovereign government (Mexico) with our animals.
- …creating a plan that relies on a foreign nation to implement a US law, makes little legal sense.
- Absent a statutory mandate in Mexico, it seems reasonable to conclude that recovery is a discretionary activity for Mexican officials. If so....the draft recovery plan would abdicate the FWSs statutory mandate to advance recovery to governmental officials representing another country who operate under no such mandate.
- There is no clear, undeniable mandate for the Mexican government to recover the Mexican wolf. With this in mind, it struck me as odd that ~ 35% of the recovery criteria would be relegated to Mexico.

Our response: We agree that the USFWS has no regulatory authority over the actions of the sovereign nation of Mexico. However, Section 8 of the ESA specifically provides for international cooperation in the conservation of endangered and threatened species, and nothing in the ESA limits us to recovery actions that are easy or within our jurisdiction. We often prescribe aspirational recovery actions which may be challenging for a variety of reasons (technical, legal, etc). More generally, the entirety of a recovery plan is a guidance document that is not binding and enforceable regardless of the geography in question. That said, the United States and Mexico have been collaborating on recovery of the Mexican wolf since the initiation of the binational captive breeding program in the 1970s, and Mexico has been reintroducing Mexican wolves into the wild since 2011. Mexico has demonstrated their commitment to continue that collaboration to achieve recovery of the Mexican wolf in the future. Since 1996, the United States, Mexico, and Canada have been signatory to a Memorandum of Understanding (MOU) Establishing the Canada/Mexico/United States Trilateral Committee for Wildlife and Ecosystem Conservation and Management. This MOU facilitates the collaboration of the United States and Mexico in the management of cross-border species, such as the Mexican wolf. The United States and Mexico also collaborate on recovery of other cross-border species, such as the ocelot, jaguar, Sonoran pronghorn, and California condor. We acknowledge the contribution Mexico has made to the conservation of the Mexican wolf and will continue to work with Mexico to ensure coordination in Mexican wolf recovery. Furthermore, Mexico has statutes and plans in place to protect and recover Mexican wolves in Mexico. As we discuss in the recovery plan, Mexico has finalized two recovery plans for the Mexican wolf: 1) the 2000 Proyecto de Recuperación del Lobo Mexicano (Proyecto de Recuperación, commonly known as "PREP") (SEMARNAP 2000); and 2) the 2009 Programa de Acción para la Conservación de la Especie: Lobo Gris Mexicano (Programa de Acción; commonly known as "PACE") (CONANP 2009). The 2000 Proyecto de Recuperación was written pursuant to Mexico's Ley General del Equilibrio Ecológico y la Protección al Ambiente (or General Law for Ecological Balance and Environmental Protection) and the 2009 Programa de Acción was written pursuant to Mexico's Ley General de Vida Silvestre (or General Wildlife Law).

Resolution: We added a paragraph in Section III Recovery Strategy of the Recovery Plan to clarify our role in recovering species outside of the United States. The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

Connectivity

1. ***Comments on the lack of connectivity between the populations of Mexican wolves in the U.S. and Mexico and the possible effects on natural dispersal from a border wall:***

Many comments were received that addressed the issues of connectivity between the U.S. and Mexico populations of the Mexican wolf and possible effects on the ability of wolves to naturally disperse across the U.S.-Mexico international border if a border wall is built. Of particular concern was the ability of migrants to provide, through natural dispersal, the genetic interchange necessary to prevent the two populations of Mexican wolves from being separate, disconnected and isolated. Excerpts from these comments include:

- This plan... does not adequately address or ensure connectivity between the proposed population in Mexico and the population in the U.S.
- Currently there is a barrier across parts of the international border, plans for a wall along the entire border, and a record of removing wolves who try to move between the two populations. The plan rests on translocations to initially improve genetics in the wild populations for a limited duration, then assumes translocations will not be needed after the species is recovered. This essentially proposes two separate, disconnected populations, which is far from what scientists have recommended.
- ...There is no plan for natural connectivity between the U.S. and Mexico...
- Because of that extreme low density and small number of wolves, the USA and Mexico must maintain international population connectivity.
- ...this basically guarantees separate, disconnected populations.
- ..this "border wall" that is being constructed by the administration. The negative impact of this wall on species and habitat will be tremendous. These negative impacts are not included in this Draft Recovery Plan .
- … the plan does not take into consideration any connectivity between the groups of wolves or any wildlife corridors for dispersers or new wolves to come in. If populations of wolves are kept isolated, there will be no new genes entering the reproduction pool, and this would be dooming the population to eventual extinction.
- .. if the fledgling population in northern Mexico increases, it may be reasonable to assume more dispersal of individuals that ultimately join the U.S. population. But to date there has been little dispersal, so relying on movement between these regions is a weak assumption to base the recovery plan upon...
- The draft plan needs to consider the effects of a proposed wall along the US-Mexico border. The plan should clearly define what recovery looks like in the context of such a wall, how international collaborations might be affected, how international gene flow might be affected, what mitigating effects would be necessary, and how much they would cost.
- There are fewer than 150 Mexican wolves in the wild and only 250 in captivity and Mexican wolf populations in the United States and Mexico are isolated. The lack of connectivity and the low numbers of each isolated population (which should number at least 200 individuals with a total of 750 wolves) threatens the species with extinction.

Our response: Given the current habitat quality in the borderlands area, which is predominately patchy

and low quality (Martínez-Meyer et al. 2017), we expect and modeled a low level of dispersal (approximately one wolf every 12-16 years) between the U.S. and Mexico populations. Modeling results indicate that populations still have at least a 90% probability of persistence over 100 years. Mexican wolves released in Mexico have crossed the border on three occasions (one wolf twice when it entered the United States and then returned to Mexico), and wolves from the United States population have traveled as far south as Interstate 10. Thus, a low level of dispersal is a valid assumption under current conditions. We recognize that a border wall, if built, could further constrain or completely curtail natural dispersal. In response to comments, we created an additional modeling scenario to examine the impact of eliminating dispersal between the United States and Mexico populations. The results indicate that eliminating transborder dispersal has a negligible impact on population abundance, and a very small effect on gene diversity retention which would be insufficient to impede achievement of recovery criteria. Thus, such constraints would not appreciably impact the predicted performance of the populations. In other words, we do not expect the level of dispersal predicted between the United States and Mexico to provide for adequate gene flow between populations to alleviate genetic threats or ensure representation of the captive population's gene diversity in both populations. Therefore, we consider genetic management, such as releases from captivity (including cross-fostering pups) and translocations, to serve as an effective tool during the recovery process to achieve appropriate representation (Miller 2017). These releases and translocations will be necessary for at least portions of the recovery process. That said, we recognize the benefits of connectivity and have added an activity in the Implementation Schedule Table to work with Customs and Border Protection to explore ways to maintain connectivity between Mexican wolf populations in the U.S. and Mexico. Other activities have also been added to address connectivity, such as implementing measures to facilitate movement across road corridors. Furthermore, the 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised.

Resolution: We added activities in the Implementation Schedule Table to work with Customs and Border Protection to explore ways to maintain connectivity between Mexican wolf populations in the U.S. and Mexico and to address connectivity in other ways, such as implementing measures to facilitate movement across road corridors. The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

2. Comments on Interstate-40 as an artificial division to natural dispersion and possible interbreeding with northern gray wolves:

A comment was received questioning the imposition of an artificial division between the population of Mexican wolves in the U.S. Recovery Area and northern gray wolves. Excerpts from this comment include:

- I do not understand why I-40 is supposed to be an artificial division between the Mexican Wolf and the Canadian Wolf... Why not let NATURE decide if and where the division line will be between the 2 species.

Our response: We recognize that natural dispersal and colonization/recolonization of unoccupied habitat which expands the species' range is important to the recovery of the Mexican wolf. We also agree that there are large areas of suitable wolf habitat with abundant wild ungulate prey species in northern Arizona/southern Utah and northern New Mexico/southern Colorado. Neither do we dispute that Mexican wolves may have dispersed north of the line now delineated by Interstate 40 within zones of intergradation where interbreeding with other gray wolf subspecies may have occurred. However, for any species, there may be more than one strategy that provides a valid path to recovery. This is the case for

the Mexican wolf. In our development of the recovery strategy for the revised recovery plan we considered different combinations and alternative scenarios for the location, number of populations, number of releases and number of wolves (population abundance) that could achieve the recovery objective. Our recovery strategy, developed in cooperation with the states of Arizona, New Mexico, Colorado, and Utah; with the U.S. Forest Service; and the government of Mexico, is to focus recovery of the Mexican wolf in the two existing reintroduction areas in the United States and Mexico. We are focusing our recovery in the United States south of Interstate 40, which is the area designated as the MWEPA (as defined in the 2015 Final 10(j) Rule). This strategy would provide for recovery within the historical range of the Mexican wolf as described in Parsons (1996), which the Service previously adopted when we began reintroducing wolves in 1998 (63 FR 1752). This area comports with the scientific literature that addresses historical range (discussed in the Biological Report), previous Service focus on this area (Service 1996), and the ecological niche of Mexican wolves (Martínez-Meyer et al. 2017). Interstate-40 provides an easily recognizable and reasonable demarcation of the northern extent of the area. Returning wolves to the MWEPA will ensure that these animals continue to contribute to achieving the population growth and distribution needed to improve the likelihood of persistence of the Mexican wolf experimental population. In accordance with the preamble to the Revision to the Regulations for the Nonessential Experimental Population of the Mexican Wolf (80 FR 2512), we revised and reissued the Mexican Wolf Recovery Program's section 10(a)(1)(A) research and recovery permit so that it applies to the management of Mexican wolves both within and outside of the MWEPA. Under this permit, we will authorize removal of Mexican wolves that can be identified as coming from the experimental population that disperse and establish territories in areas outside of the MWEPA. We will make a determination, based in part on their genetic value relative to the Mexican wolf population, to maintain these wolves in captivity, translocate them to areas of suitable habitat within the MWEPA, or transfer them to Mexico.

Resolution: We plan to convene a genetic management group (this is included as an activity in Implementation Schedule Table) to assist us with genetic management and recovery of the Mexican wolf, including addressing the most effective approaches to increase gene diversity in the wild populations. The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

3. Comments received on the requirement to comply with the National Environmental Policy Act (NEPA)for the proposed border wall:

A comment was received arguing that the USFWS must comply with NEPA and analyze the effects of the proposed border wall on species connectivity. Excerpts from this comment include:

- The USFWS must comply with NEPA and analyze the effects on the border wall between the US and Mexico and its impact on species connectivity. For example, there is a large body of research on the effects of restricting gene flow and what happens to isolated populations.

Our response: The purpose of a recovery plan is to provide a scientifically based, logical, and effective roadmap for the recovery of a species. It explains what is needed for species recovery and how to get there. Recovery plans are advisory documents, not regulatory documents. A recovery plan does not commit any entity to implement the recommended strategies or actions contained within it for a particular species, but rather provides guidance for ameliorating threats and implementing proactive conservation measures, as well as providing context for implementation of other sections of the ESA, such as section 7(a)(2) consultations on Federal agency activities, development of Habitat Conservation Plans, or the creation of experimental populations under section 10(j). Thus, we are not required to conduct NEPA review of a recovery plan; however, implementation of individual actions within a recovery plan may

require compliance with NEPA. Customs and Border Protection (CBP) is the Federal agency that is responsible for the construction of border protection infrastructure along the United States/Mexico border; therefore, CBP would be the lead federal agency responsible for compliance with NEPA and associated analyses for a proposed border wall.

Resolution: No further action.

States

1. Comments that addressed state management and control after delisting:

A number of comments expressed concern that state control and management of the Mexican wolf population in the U.S. Recovery Area after delisting will lead to unwarranted levels of shooting, trophy hunting and trapping and a resultant reduction in the wolf population to an unsustainable level. Excerpts from the comments received include:

- It is well known that under the supervision of Arizona from 2003 - 2009 the population (of Mexican wolves in the BRWRA) actually decreased during a time in which it was projected that their population would more than double…
- The proposed plan turns over management of these rare wolves to state game boards. … Given that makeup of the boards… (appointees with ranching and hunting backgrounds) …it is not surprising that the last time states were in charge of wolves, the wolf population plummeted due to excessive trapping and shooting of Mexican wolves, authorized by state game boards.
- As a former resident of Montana, I saw how …(w)ithin 5 years, the state had almost demolished their wolf population… Do not let this happen in New Mexico and Arizona.
- Please don't let my state, New Mexico, manage Mexican Wolves. People where I live are gun-happy, and they hold wolf and coyote hunting contests.
- … state plans are already in the works to re-open trophy hunting seasons on Mexican Grey Wolves which would mean more hunting, trapping, snaring and high kill quotas that pushed them to the brink of extinction in the first place.

Our response: Following recovery and delisting of the Mexican wolf, full management will be returned to states and tribes. We have a criterion in the recovery plan that will ensure regulatory mechanisms are in place to prohibit or regulate human-caused mortality of Mexican wolves in those areas necessary for recovery. The ESA requires that any delisting action ensure that all threats to a species have been sufficiently reduced or managed to provide for a viable population in the long-term and that the species does not meet any of the five listing factors, including "the inadequacy of existing regulatory mechanisms."

Resolution: We have revised the regulatory criterion in the final recovery plan to "States and Tribes will ensure regulatory mechanisms are in place to prohibit or regulate human-caused mortality of Mexican wolves in those areas necessary for recovery such that the Service determines at least 320 Mexican wolves are likely to be maintained in the U.S. in the absence of Federal ESA protections. In addition, Mexico will ensure regulatory mechanisms are in place to protect Mexican wolves from human-caused mortality, such that the Service determines at least 200 Mexican wolves are likely to be maintained in Mexico."

2. Comments regarding state support for the recovery plan:

Several comments were received that expressed concern that the draft plan had no means of ensuring that states will support the recovery plan or means of enforcement of the state and tribal regulations necessary for recovery. Excerpts from these comments include:

- The draft plan provides no mechanism for enforcement of state and tribal regulations supporting wolf recovery.
- The USFWS needs mechanisms in place to ensure that Arizona, New Mexico, and Mexico carry out the proposed recovery plan successfully. No such mechanisms are in the draft plan.

Our response: The purpose of a recovery plan is to provide a scientifically based, achievable, and effective roadmap for the recovery of a species. Plans provide guidance for ameliorating threats and implementing proactive conservation measures, as well as providing context for implementation of other sections of the Endangered Species Act (ESA). Recovery plans explain what is needed for species recovery and how to get there, but they are advisory documents, not regulatory documents. A recovery plan does not commit any entity, including state and tribal governments, to implement the recommended strategies or actions contained within it for a particular species. The ESA does require that any delisting action ensure that all threats to a species have been sufficiently reduced or managed to provide for a viable population in the long-term and that the species does not meet any of the five listing factors, including "the inadequacy of existing regulatory mechanisms."

Resolution: We have revised the regulatory criterion in the final recovery plan to "States and Tribes will ensure regulatory mechanisms are in place to prohibit or regulate human-caused mortality of Mexican wolves in those areas necessary for recovery such that the Service determines at least 320 Mexican wolves are likely to be maintained in the U.S. in the absence of Federal ESA protections. In addition, Mexico will ensure regulatory mechanisms are in place to protect Mexican wolves from human-caused mortality, such that the Service determines at least 200 Mexican wolves are likely to be maintained in Mexico."

3. ***Comments regarding the provision in the draft Recovery Plan that provides for the states of Arizona and New Mexico to determine the timing, location and circumstances of releases of Mexican wolves into the wild within their respective states:***

Comments were received that expressed dismay at the provision in the draft Recovery Plan that provides for the states of Arizona and New Mexico to determine the timing, location and circumstances of releases of Mexican wolves into the wild within their respective states. These comments argued that the USFWS should retain control over releases because both the Arizona and New Mexico game commissions are beholden to ranching and hunting interests and would therefore continue a policy of obstructing and delaying every proposed release. Excerpts from these comments include:

- It is the job of the USFWS to keep up the good work of Mexican wolf recovery. Instead, the draft plan gives control of wolf releases to the states of Arizona and New Mexico, who have a proven track record of thwarting wolf recovery.
- This plan gives state agencies, openly hostile to wolf recovery, veto power over critical releases and translocations that are necessary for the genetic rescue of the wild Mexican wolf population.
- Besides abdicating its federal responsibility under the ESA, the FWS is clearly playing politics and has chosen to make hostile stakeholders happy rather than uphold its mandate to consider best available science. There is no explanation as to how enforcement of the release plan will occur or what will happen if the states refuse to cooperate.
- … there needs to be fail safe language in the Draft Recovery Plan if the States refuse to cooperate…
- Giving authority to the states of AZ and NM to determine the "timing, location and circumstances" of wolf releases is untenable. Both states have amply demonstrated their hostility to wolf recovery. Relinquishing this decision making undermines the federal endangered species act law and cannot be held to be constitutional…
- The plan relies heavily on cross-fostering of pups. The timing for that is critical… I can see the state's game commission requiring long weeks of comment periods and votes on every single release making sure that by the time a decision is reached, the cross fostering is no longer possible. In short, the state's abilities to obstruct wolf recovery are enhanced and magnified by this plan.
- … The wording that allows states to determine the circumstances of wolf releases should contain a reference that the "releases must be done in the best timing for the recovery of the wolf population"…

- … (there should be a provision made) for the contingency that (if) either or both states fail in their delegated responsibilities to ensure successful releases...authority to release wolves should revert to the Service.
- … the ranching industry in New Mexico, where I live, is incredibly powerful and would do everything in its power to eradicate this necessary predator in order to protect their own interests…protect the Grey Wolf from adverse ranching industry lobbyists by removing any language that attempts to give the states sole authority over determining the timing, location and circumstance of the release of wolves into the wild.

Our response: Multiple sections of the ESA and Service policy provide that the Service shall cooperate to the maximum extent practicable with the states (e.g., 59 FR 34275 and tribes Secretarial Orders 3175 and 3206; Native American Policy of the U.S. Fish and Wildlife Service [2016]). We have worked extensively with the states in developing a strategy for recovery of the Mexican wolf that will ensure recovery while minimizing effects to local communities and landowners. Further, we have coordinated with affected Tribes and Pueblos through the Mexican Wolf Tribal Working Group, and we have consulted government-to-government on the draft recovery plan at the request of Tribes and Pueblos. The revised recovery plan language indicates the states will be working with us in good faith to achieve the genetic recovery criteria. The intention of the language is to indicate the Service will do all it can to avoid reintroducing wolves in a manner the states deem unfavorable, and states do not have the authority to prohibit all reintroductions. If states oppose a particular reintroduction event, it would be incumbent upon them to propose alternative reintroductions to achieve the genetic recovery criteria.

Resolution: We revised the language in the recovery plan as follows: "In order to achieve the genetic criteria for down-listing and delisting the Mexican wolf in this Plan, decisions regarding the timing, location and circumstances of Mexican wolf releases will be based on input from the Interagency Field Team, and will be made cooperatively by the Service with the Arizona Game and Fish Department with respect to releases in Arizona, and by the Service with the New Mexico Department of Game and Fish with respect to releases in New Mexico. Additionally, prior to any releases occurring, the Service will comply with state permit requirements pursuant to (i) 43 C.F.R. pt. 24 and (ii) conditions imposed by any permit issued under section 10(a)(1)(A) of the Endangered Species Act, 16 U.S.C. 1539(a)(1)(A)"

Comments on the obligation of the Federal government to lead the recovery of the Mexican wolf:

Many comments were submitted that argued that the USFWS, as a Federal agency, has a legal responsibility to lead the recovery effort for the Mexican wolf. These comments cited statutory obligations under the ESA and opposed transfer of management decisions or delegation of authority to the states of Arizona and New Mexico. Excerpts from these comments include:

- While we respect and appreciate the willingness of U.S.F.W.S. to empower local agencies and engage states in Mexican gray wolf recovery, state agencies have not shown the dedication to the species necessary for recovery to occur.
- …Collaboration and partnerships are necessary, however in accordance with the Endangered Species Act, U.S.F.W.S. is legally required to lead these efforts.
- (Federal laws are designed)… to make sure that issues of national concern are not unduly influenced and swayed by local interests.
- … given the strong opposition of ranchers and some hunting organizations AND the out-sized influence these relatively small groups have over State Government, it is essential that the Federal Government have final say in guiding this process.
- When the States are given too much power, and they are influenced heavily by ranching, it has cut out any opportunities for wildlife, especially predator species to survive for a sustainable future.
- … if the states refuse to cooperate, which is expected, there is no failsafe back up plan…
- The state agencies it (the USFWS) wishes to transfer power to are the very same agencies that

have blocked wolf releases and recovery in general.

- There should be some level of federal control…This would help prevent local interests, particularly of those who do not want the populations returning and affecting commercial operations, from running the program.
- … Through this provision… (16 U.S. C. § 1535(a) …Congress recognized the expertise of state agencies and required USFWS to solicit and consider relevant information from them. Even through Congress encourages cooperation, the secretary may not abdicate his or her affirmative duty to administer the Mexican wolf recovery program …
- Since wolves are highly vagile … the wolves are an interstate issue by their nature and dispersal habits …This interstate vagility precludes USFWS from ever abandoning management to individual states at any point in the future.
- …it is outside the scope of FWS authority to delegate essential decisions about wolf recovery to the states.

Our response: The Service recognizes its statutory obligation under the ESA to recover endangered and threatened species. In fulfillment of our obligation we have been engaged in efforts to conserve and ensure the survival of the Mexican wolf for over three decades. Nothing in this recovery plan divests the Service or the United States of its authority to recover Mexican wolves. However, Section 6 (a) of the ESA directs that the Service shall cooperate to the maximum extent practicable with the states (59 FR 34275) and Secretarial Orders 3175 and 3206 and the Native American Policy of the U.S. Fish and Wildlife Service (2016) require consultation with tribes in the recovery of listed species. The process of recovery must also be formulated to support a smooth transition to state management of a recovered Mexican wolf population post-delisting. We have a criterion in the recovery plan that will ensure regulatory mechanisms are in place to prohibit or regulate human-caused mortality of Mexican wolves in those areas necessary for recovery. The ESA requires that any delisting action ensure that all threats to a species have been sufficiently reduced or managed to provide for a viable population in the long-term and that the species does not meet any of the five listing factors, including "the inadequacy of existing regulatory mechanisms." With that end in mind we have worked extensively with the states in developing a strategy for recovery of the Mexican wolf that will ensure recovery while minimizing effects to local communities and landowners. Further, we have coordinated with affected tribes through the Mexican Wolf Tribal Working Group, and government-to-government consultations on the draft recovery plan.

Resolution: No further action.

4. Comments on the importance of state and local government's role in the recovery process:

Many comments were received that emphasized the importance of the state and local governments and argued that state partners should have a larger role and authority not only over releases but all aspects of the recovery program. These comments felt state control would better protect state economies and natural resources and that state management, in particular, state law enforcement, was necessary to restore trust and social tolerance for Mexican wolf recovery. Excerpts from these comments include:

- This recovery plan gives states not enough control, especially as New Mexico as a state, as a people, said NO to wolves. States should have veto power over releases and translocation.
- I believe the plan does not give the states of Arizona and New Mexico enough control over the field management of Mexican wolves. I believe that if the Mexican wolf is to recover, the U.S. Fish and Wildlife must be removed from all field activity.
- State partners should be consulted and coordinated with on a much broader basis than just captive Mexican wolf releases as proposed in the Draft Plan. This action is imperative to ensure long term stability and viability of the recovery efforts and New Mexico's economic and natural resources.
- … the Service should acknowledge that Section 6 of the ESA requires that the Service cooperate to the maximum extent practicable with the States, and that the ESA authorizes the Secretary to

enter into Management Agreements or Cooperative Agreements with a state regardless of the status of the Mexican wolf.

- … The U.S. Fish and Wildlife Service must immediately surrender all management of the Mexican wolf to the states, with the exception of Species Survival Plan implementation, international coordination with Mexico, and funding. This is particularly important with respect to law enforcement. USFWS Region 2 "law enforcement" personnel have violated the Constitutional Rights of the people of the recovery area.
- USFWS and other federal agencies should err on the side of consulting and communicating with local governments prior to acting, rather than assuming an action will not affect a local government. There should be a representative for each potentially affected local government on the Interagency Field Team (IFT) for their respective Mexican wolf release area.
- Federal mandates such as this recovery are the responsibility of USFWS and therefore adequate funding should be provided to potentially affected local governments to carryout wolf management, whether or not local governments participate in the recovery program; USFWS should fully fund training, employees, and equipment for local government's involvement in Mexican wolf management.
- … each local government has legal responsibilities to protect public health, safety and general welfare… and …each local government and community have their own customs, cultures, and traditional beliefs which dictate resource management and thus should be consulted with individually… All local governments within the five-state region, including, Arizona, Utah, Colorado, New Mexico and Texas, should be invited to participate and engage at some level.
- … It is important for FWS to understand that lands which may be considered for wolf recovery are the same lands for other species that have greater cultural/economic/traditional significance…
- FWS needs to understand that their priorities may not necessarily be local government priorities and may also conflict with local government management priorities. Non-federal lands are intended for maintaining traditional and cultural values versus refuges for endangered species.

Our response: Multiple sections of the ESA, as well as Service policy, provide that the USFWS shall cooperate to the maximum extent practicable with the states. The Service worked with the states of Arizona, Colorado, New Mexico, and Utah; the Forest Service; and the Mexican government to review biological information and develop the draft and final recovery plans. Management of the Mexican wolf in the wild is conducted under the framework of a Memorandum of Understanding (MOU), signed by Federal and State agencies, Tribes, and counties affected by Mexican wolf recovery. The AZGFD is a signatory to the MOU, and has been a partner in Mexican wolf recovery since the first release of Mexican wolves in 1998. New Mexico was a signatory to the MOU, but withdrew in 2011. Nevertheless, we have continued to coordinate with NMDGF on Mexican wolf recovery issues, and they assisted in the development of the draft and final recovery plans. We encourage and invite all affected Federal and State agencies, Tribes, and counties to become signatories to the MOU and participate in Mexican wolf recovery. We coordinate with affected counties and with landowners and livestock permittees within a 10-mile radius of any wolf release site prior to release. Also, Section 17.84(k)(7)(vii) of *The Revision to the Regulations for the Nonessential Experimental Population of the Mexican Wolf* (80 FR 2512) provides that the Service or a designated agency may take any Mexican wolf in the experimental population in a manner consistent with a Service-approved management plan, special management measure, biological opinion pursuant to section 7(a)(2) of the ESA, conference opinion pursuant to section 7(a)(4) of the ESA, section 6 of the ESA as described in section 17.31 for State game and fish agencies with authority to manage Mexican wolves, or a valid permit issued by the Service through section 17.32. Thus, the AZGFD and NMDGF have the authority to manage Mexican wolves in their respective states through the development of a Service-approved management plan or other provision. AZGFD already does most of the on-ground management of Mexican wolves in Arizona under a joint management plan with the Service and in accordance with standard operating procedures. Following recovery and delisting of the Mexican wolf, full management will be returned to states and tribes.

Resolution: No further action.

5. ***Comments on the need to ensure each state supports achievement of the population abundance target in the U.S Recovery Area:***

Several comments expressed concern that because the U.S. Recovery Area (MWEPA) is in both the states of Arizona and New Mexico a lack of cooperation between the two states might make it impossible to achieve the U.S. population objective in the draft Recovery Plan. Excerpts from these comments include:

- Moreover, the plan makes no provision for cooperation between these two states. What if NM decides it will only allow 50 wolves in the wild, leaving Arizona to pick up the slack for hosting the remaining 270 of the US population? What if Arizona decides similarly creating an impasse that brings wolf recovery to a halt?

Our response: The purpose of a recovery plan is to provide a scientifically based, logical, and effective roadmap for the recovery of a species. It explains what is needed for species recovery and how to get there. Recovery plans are advisory documents, not regulatory documents. A recovery plan does not commit any entity to implement the recommended strategies or actions contained within it for a particular species, but rather provides guidance for ameliorating threats and implementing proactive conservation measures, as well as providing context for implementation of other sections of the ESA, such as section 7(a)(2) consultations on Federal agency activities, development of Habitat Conservation Plans, or the creation of experimental populations under section 10(j). Thus, a recovery plan does not, and cannot compel an agency to assist in the recovery of a particular species, including the Mexican wolf. However, the USFWS continues to coordinate with the states of Arizona and New Mexico, as well as the White Mountain Apache Tribe, Mexico, and other partners, to implement recovery actions for the Mexican wolf.

Resolution: No further action.

6. ***Comments on local county ordinances which would be violated by the provisions of the draft recovery plan for release or translocation of Mexican wolves within the MWEPA (U.S. Recovery Area):***

Several comments were submitted citing local ordinances from various counties within the U.S. Recovery Area (MWEPA) that prohibit the "the import for release into the wild of certain genera, specifically predators of the Canis, Ursus, and Felis genera" within their borders. These comments argue that conducting releases, including cross-fostering, and translocations within the borders of the counties of those counties would be in violation of the ordinance and therefore illegal. Excerpts from these comments include:

- This proposed recovery plan includes, conducting releases (including cross-fostering) and translocations of Mexican wolves into the MWEPA … The MWEPA includes Otero County, New Mexico. Otero County Ordinance No. 07-06, prohibits the import for release into the wild of certain genera, specifically predators of the Canis, Ursus and Felis genera, within and adjacent to the boundaries of the County of Otero … Canis is further defined as the Mexican Wolf. Therefore, this plan would violate Otero County Ordinance No. 07-06.
- Additionally, the Draft Plan is silent regarding local entities that will be impacted by the release and management of wolves in their area, most notably at the county level. Several counties within the MWEPA have passed ordinances regarding the management of Mexican wolves within their jurisdictional boundaries. Some such ordinances contain language such as, it is illegal to translocate, introduce or allow to be introduced, any predatory, experimental, non- native, or any other species into Socorro County, without either fully coordinating with the County prior to any planning efforts, or ensuring compliance with all applicable county ordinance and state and federal laws. NMDA strongly encourages the Service to respect the authority of state and local governments and to coordinate with all affected entities.

Our response: The Service's standard practice is to fully coordinate with local communities on recovery of the Mexican wolf, in particular with regard to releases. Our standard operating procedure for releases

requires that the Interagency Field Team notify (by phone, email, or personal visit) local livestock permittees (i.e. those within 10 miles of the proposed release site), a local county official, and the local District Ranger - not less than 10 calendar days prior to the initial release. Article 6 of the United States Constitution establishes federal law as the highest form of law in the United States legal system (U.S. Const. art. VI.). Local government policy statements, county and conservation district land-use plans, resolutions, and ordinances that impose restrictions on the release "into the wild any animal of the genera Canis...," or in any other way contravene the nonessential experimental rule are inconsistent with Federal law. The Service is not required to comply with local county ordinances when those ordinances in any way obstruct, interfere with, or are in any way contrary to the Service's statutory obligations found under the authority of the Endangered Species Act and other applicable federal laws and regulations. However, the Service remains committed to finding common ground and working collaboratively with local communities to achieve Mexican wolf recovery.

Resolution: No further action.

7. ***Comments on the financial burden of managing the U.S population of wolves as a disincentive for delisting:***

We received one comment that postulated fiscally challenged state agencies might prefer ongoing federal management of a U.S. population of Mexican wolves to taking on the financial burden of managing a delisted species. In this hypothetical scenario the U.S. population would continue to be limited to between 320 and 380 animals while the states obstructed the requisite releases to achieve the delisting criteria of 22 released Mexican wolves surviving to breeding age. Excerpts from this comment include:

- I suppose one could hope that if the states has overarching authority over when and where releases occur and a population target number has been set (i.e., 8-year average of 320 Mexican wolves in MWEPA, 8-year average of 170 wolves in SMOCC-N) they would be incentivized to accomplish the requisite releases. But this assumes that the states desire recovery (i.e., delisting of the Mexican wolf). A case can be made, however, that with the draft recovery plan proposing that the agencies curtail population growth between 320 and 380 in MWEPA (and capping the SMOCC-N population at 200), that continued protection under the ESA and active federal involvement in daily management of wolves will be considered quite acceptable to New Mexico and Arizona. As a state legislator for the last decade, I know that state agencies typically are fiscally challenged. With that in mind and with active federal involvement to limit Mexican wolf population growth to between 320 and 380 animals, a case can easily be made that the states would be foolhardy to actively support delisting and the financial consequences that would arise as the FWS terminates involvement in Mexican wolf management due to delisting.

Our response: We make status changes such as delisting (or listing) based solely on the basis of the best scientific and commercial information available. We are precluded by the ESA from considering cost to an agency. That said, are not aware that either AZGFD or NMDGF have indicated a preference that the Mexican wolf remain an endangered species for fiscal purposes. Instead, the agencies have expressed their desire to recover the Mexican wolf and regain full management authority for it along with other state wildlife species.

Resolution: No further action.

Wolf Mortality

1. ***Comments on the inadequacy of measures in the draft Recovery Plan to address illegal human caused mortality:***

A number of comments thought that the draft Recovery Plan inadequately addressed the problem of illegal human caused wolf mortalities. These comments argued that the primary causes of Mexican wolf mortality are illegal shootings and vehicle collisions and that specific enforcement action, including rigorous investigation, prosecution and stiff penalties for poaching and illegal killings, should be included in the plan. Some comments also proposed that releases of captive wolves should occur as a "replacement

policy" every time a Mexican wolf is killed illegally. Excerpts from these comments include:

- The draft plan also does not adequately address poaching, which accounts for more than half of all Mexican wolf mortality.
- The primary causes of known Mexican wolf mortalities are shootings and vehicle collisions. We suggest the recovery plan address this by suggesting actions that reduce human caused mortality.
- The penalties for killing these wolves should be high and enforcement of the law should be stringent, with penalties for not enforcing the law.
- …the plan does not take into consideration releasing new wolves when wolves are killed. How will wolf numbers be able to grow if they are being shot, trapped and poached, and numbers are not replenished?
- Illegal wolf kills by humans has had a large negative impact on wolf populations, and violators are rarely captured. The plan should address this by increasing numbers of releases for every wolf killed. If the public knows that their "shoot, shovel, and shut up" activities will result in even more releases, perhaps it will curtail their behavior.
- There is also no mechanism for requiring releases in response to illegal killing of wolves. There should be a replacement policy that discourages poaching and encourages states to help law enforcement within the recovery area.
- …the lack of enforcement and prosecution for ESA violations under the McKittrick policy has given de facto permission for bad actors to continue killing wolves … Now that McKittrick has been found unjust, USFWS should rigorously investigate illegal killings, since the Department of Justice (DOJ) is now not barred from prosecuting people even when they claim mistaken identity.
- … the plan does not provide for compensatory releases in response to illegal killing of wolves. There should be a replacement policy that discourages poaching and encourages state agencies to vigorously support law enforcement within the recovery areas.

Our response: Illegal killing has been the biggest source of Mexican wolf mortality since the U.S. reintroduction began in 1998. Approximately 55 percent of total documented mortality between 1998 and 2013 is attributed to illegal killing. In Mexico, illegal killing of Mexican wolves released to the wild has been a continuous source of mortality over the course of the reintroduction project. We have incorporated Mexican wolf mortality from all sources, including illegal killing, in our Population Viability Analysis and population growth rate estimates for reintroduced wild populations of Mexican wolves in both the U.S. and Mexico. All cases of suspected illegal take of Mexican wolves in the U.S. are investigated by the Service's Office of Law Enforcement Special Agents. Personnel involved in preventing illegal take and apprehending those who commit illegal take include Service Special Agents, state wildlife agency Wardens and Conservation Officers and Law Enforcement Officers (LEOs) from the U.S. Forest Service and Tribes. Additionally, the Service recently hired a Conservation Law Enforcement Officer, which is included as an activity in the Implementation Schedule Table. This position will help us address law enforcement issues and conduct outreach on wolf conservation.

While law enforcement and regulatory protections to prohibit and penalize illegal killings are important mechanisms, we recognize that illegal killing will likely continue to occur and may possibly increase as the wolf population increases in size. Since 2009, the Mexican wolf population in the United States has been growing at an average annual rate of over 10 percent, which has enabled the population to grow despite illegal mortalities. Our releases of Mexican wolves into the wild in the United States are now focused on improving the gene diversity of the wild population not on increasing the abundance or replacing wolves illegally killed. In areas where humans are tolerant of the presences of wolves, wolves demonstrate an ability to persist in the presence of a wide range of human activities (e.g. near cities and congested areas) (Fritts et al. 2003). We therefore view efforts to improve social tolerance to wolves as vital to the success of the Mexican wolf recovery strategy.

Resolution: No further action.

2. ***Comments that expressed a lack of confidence in the recovery strategy to adaptively manage the removal rate to improve population growth in the U.S. population of Mexican wolves:***

We received comments that expressed a lack of confidence in the Service's stated intent in the draft Recovery Plan to adaptively manage incidents of wolf depredation or nuisance behavior such that the rate of removal combined with documented mortality does not negatively impact the growth rate of the U.S. population of Mexican wolves. These comments challenged the Service's commitment to proactive management techniques designed to decrease the likelihood of depredation or nuisance behavior and to minimize the number of removals. Several comments requested better explanation and understanding of how mortality rates will be reduced or maintained below 25% to allow the Mexican wolf population to grow to the abundance target as predicted in the PVA. Concerns were expressed regarding the inputs and assumptions that were used in the Vortex model and the relationship between adult, sub-adult and pup wolf mortality, human caused mortality, and removals that function as mortality to the population.

Excerpts from these comments include:

- … These measures (listed in the 2015 Final Experimental Population 10(j) Rule) are at odds with the urgent need to lower mortality to a maximum annual rate of 24.9%. The recovery plan should direct the promulgation of a new rule that would greatly reduce the circumstances in the US in which wolves can be killed or removed alive from the wild.
- The statement that in previous years we (the USFWS) observed the negative impact that a high number of removals can have on population performance in the MWEPA, and in response lessened our removal rate… is … deceptive. In fact, the... Service greatly lessened its removal rate (only) in response to a lawsuit … that resulted in a 2009 settlement agreement …
- It is disingenuous to suggest that the Service's 2009 reduction in destroying and removing wolves from the wild stemmed from the agency's observations of the negative impact, and the …assurance that the Service would exercise similar forbearance in the future raises the troubling prospect that the Service would only refrain from removing and killing wolves if it were again to be sued over such practices.
- …we also have concerns about some of the inputs and assumptions that were used in the Vortex models. Specifically: The PVA uses estimated mortality rates for the MWEPA based on the time period between 2009 and 2015: 0.28 for pups, 0.33 for yearlings, and 0.19 for adults. PVA at 8. Adult mortality rate has been identified as the most important parameter affecting population extinction. … The adult mortality estimate for the Mexican gray wolf population (0.19) appears low, and significantly below what has been observed in some years of the recovery effort…
- Given that the MWEPA wolf population in the United States can grow in abundance to designated management target levels [only] as long as annual adult mortality rates are below 25%, PVA at 40, and given that mortality rates for Mexican gray wolves have exceeded 25% in the past, FWS must explain how it intends to reduce and maintain effective mortality rates (defined to include removals) below this threshold…
- … FWS should develop an objective, measurable recovery criterion that would ensure mortality rates do not exceed the designated threshold.
- … the PVA results, and the adequacy of the proposed population size criteria based on those results, are highly dependent on this assumption of relatively low mortality (24.9%).
- Excessive human-caused mortality, what is excessive? Compared to what?
- … are there goals such as reducing human-caused mortality to a certain level annually?
- … the DMWRP states … that wolf mortality, combined with removal of wolves for management purposes (which functions as mortality to the population), will need to stay below threshold levels such that populations can achieve abundance targets."… Are these "threshold levels" to be implied as requirements for downlisting/delisting or are they only modelling thresholds. Please specify what is included when the word mortality is used.
- …line 545 describes excessive human caused mortality (which includes shooting and other sources)". What other sources? Please specify what is meant by human caused and the specific

actions planned to reduce shooting and vehicle collisions.

Our response: We determined the 2009-2015 data were an appropriate data set to incorporate into the model because the management strategy used during this time is likely to be a strategy that continues into the future. We used the adult mortality observed in this time frame (19%), as a guide to inform model scenarios exploring threshold mortality rates consistent with recovery (rates from 18.9% to 30.9% were explored). Under the set of conditions we used in the PVA, the United States population grows to recovery as long as annual adult mortality rates are below 25% (which is 6% higher than that observed from 2009-2014). This level of mortality is feasible to maintain even under increased removals from the population. We recognize that removals combined with mortality rates caused population declines in the past. However, we also recognize that increased levels of pup production and recruitment can offset some level of adult mortality.

The Service continues to have the authority to remove wolves following the 2009 settlement agreement, which was primarily focused on the Service abrogating it's authority to other entities. Thus, following 2009, the Service could have continued (and was authorized to do so) a high level of removals but recognized the need to limit removals to insure a growing population. Thus, the Service attempted more aggressive proactive management actions to prevent depredations or removals (e.g., diversionary feeding) following 2009. The Service and its partners understand the interaction between mortality and removals, and may adjust removals to address conflict accordingly (e.g., increase removals of problem wolves if mortality is observed below adequate thresholds, and conversely reduce removals when mortality is observed above rates that allow for adequate growth in abundance). Over the course of recovery, we expect fluctuation in mortality and removal rates based on the management goals at the time. Thus, specific mortality rates as recovery criteria are not appropriate.

Resolution: No further action.

Recovery Actions

1. ***Comments received on methods to mitigate the socioeconomic impacts of Mexican wolf recovery in the United States:***

A large number of comments were received that addressed the potential impacts associated with the recovery of the Mexican wolf in the United States. The majority of these comments were focused on socioeconomic impacts on the ranching industry in Arizona and New Mexico from wolf depredation on livestock. Concern was also expressed that populations of game animals, primarily elk, would be negatively affected by wolf predation. A number of comments suggested that coexistence methods to pro-actively minimize wolf depredation on cattle, including payments for grazing allotment permit retirement, would be more effective in reducing impacts on ranchers than wolf removal or lethal control. Many comments emphasized the importance of providing just and full compensation to ranchers for livestock losses or suggested that "payment for presence" is more effective and efficient than investigating livestock kills to try to determine whether or not a wolf was responsible. Excerpts from these comments on the socioeconomic impact of Mexican wolf recovery in the United States include:

- Ranchers must view wolf recovery as part of the cost of doing business...public compensation of their losses to wolves is needed - we cannot be penny-wise and pound foolish by spending millions per wolf - only to shoot them when cattle (worth thousands) is taken - but the rancher must be part of the team and work in conjunction with other stakeholders to find solutions.
- ...recovery plan should also provide funding for compensated voluntary permit retirement of public lands grazing allotments in an effort to reduce livestock conflicts and improve natural prey base.
- … should have independent officials confirm presence of wolves and depredations ...the officials should be given the latitude to make a call that it is suspected ...Payment should be made on suspected and confirmed predations.
- (the DR)...does not discuss the concept of depredation compensation and payments for presence in the Recovery Strategy or in the Collaborative Recovery Implementation…

- ..a mechanism for depredation compensation and payments for presence ...appears to remain an afterthought in the recovery strategy, and ...remains unfunded in any permanent and predictable manner.
- ...the Mexican wolf program (must) be accompanied by congressionally appropriated funding to support a program of federally authorized impact mitigation measures that is administered by USDA APHIS Wildlife Services for interdiction, incentives and compensation payments.
- Commit...to proactive non-lethal programs and tools.... Secure () funding to implement proactive programs ... Creat(e) and implement(), individualized, holistic and progressive plans through partnership with local ranchers…
- Make wolf kill reimbursements, "on the land" payments, and grazing leases contingent on their use of coexistence methods which have been proven more successful in stopping depredations than lethal control.
- ...rural towns is (*sic*) dependent on hunters supporting a local town business during hunting season for motels, restaurants, stores and gas stations...declined income from wolf recovery and will continue to decline as wolf numbers increase and elk numbers decrease in the next 25 to 35 years. This draft lacks correct documented social economic impact.
- .. Arizona (the 3 Cs) is cattle, copper and cotton; increase wolf numbers will decrease cattle business, increasing property taxes. A socia economic hit to a small county like Greenlee County and other rural small counties in AZ and NM for example will affect education or health programs for senior citizens.
- … (recommend)...Provide greater guidance to land management agencies regarding management strategies that increase habitat security for wolves and further enhance recovery objectives.
- …National Forests, BLM, and state lands are multi-use lands. The plan and report both need to address the impact of wolves will have on the Wildland Urban Interface (WUI)...
- …releasing wolves takes elk and deer from the public and also cattle and livestock from the rancher costing the state money...

Our response: Recovery plans are advisory documents, not regulatory documents. A recovery plan does not commit any entity to implement the recommended strategies or actions contained within it for a particular species. It provides guidance for ameliorating threats and implementing proactive conservation measures, as well as providing context for implementation of other sections of the ESA. Therefore, recovery plans are not subject to the requirements of NEPA, and neither the Recovery Plan, nor the supporting reports and analysis, are required to provide a description of affected resources or an analysis of the potential impacts to the human environment from Mexican wolf recovery. The environmental effects of the reintroduction of Mexican wolves were examined in detail in two Environmental Impact Statements (EISs) completed in 1996 (Final EIS for the Reintroduction of the Mexican Wolf with its Historic Range in the Southwestern United States) and 2014 (Final EIS for the Proposed Revision to the Regulations for the Nonessential Experimental Population of the Mexican Wolf [*Canis lupus baileyi*]). These EISs were completed in accordance with the requirements of NEPA. Our 2014 FEIS examined the potential environmental impacts from a population of from 300-325 wolves in the MWEPA, including the socio-economic effects on ranching activities/livestock production and big game hunting activities that could occur from wolf depredation of livestock, specifically cattle, and wolf predation on wild ungulates, specifically elk. We concluded in the 2014 FEIS and in the Record of Decision (ROD) (USFWS, January 6, 2015) that, while direct adverse impacts to individual small ranch operations could be significant and these adverse impacts could be suffered disproportionately by focus minority groups, overall there would be either no significant or less than significant, impacts to ranching activities/livestock production and big game hunting activities from implementation of Alternative One (the Proposed Action and Preferred Alternative). The 2014 FEIS and the 2015 ROD provide a comprehensive description of the affected environment and analysis of potential impacts. They are both available for review on the "NEPA Planning" page of the Mexican Wolf Recovery Program's website: https://www.fws.gov/southwest/es/mexicanwolf/NEPA.cfm . We are focusing our recovery in the U.S.

south of Interstate 40, which is the area designated as the MWEPA (as defined in the 2015 Final 10(j) Rule). Based on current published research (Miller 2017), the population objective for this area is large enough to achieve our goal of delisting and recovery while also addressing concerns regarding the potential adverse impacts from wolf predation on wild ungulates, specifically elk, and wolf depredation of livestock, specifically cattle. The management measures as described in the 2015 ROD and the 2015 Final 10(j) Rule will continue as part of the recovery strategy as outlined in the Recovery Plan. Therefore, we will employ management actions to: work to reduce wolf-livestock and wolf-human conflict through the implementation of pro-active measures to avoid and minimize depredation; facilitate the provision of compensation for the economic impact of wolves on rural ranching communities; employ a phased management approach in Arizona to minimize or avoid possible adverse impacts to wild ungulate populations (specifically elk); allow take of Mexican wolves under specific criteria, and continue to work collaboratively with state and local governments, tribes, livestock producers, state game and fish departments, and stakeholder organizations to achieve the social tolerance for wolves in rural communities necessary to achieve Mexican wolf recovery.

Resolution: We added more actions and details to the Recovery Action Table. Additionally, we developed an Implementation Schedule Table with more detailed activities (stepped-down from the actions in the Recovery Action Table). Examples include actions intended to: reduce human-caused mortality of Mexican wolves; reduce Mexican-wolf livestock conflicts; conduct education and outreach on Mexican wolf conservation; maintain and protect habitat for Mexican wolves; and maintain and enhance connectivity within and between populations.

2. ***Comments on a range of management actions for the U.S. population of Mexican wolves that should be included, or should be better described, as part of recovery strategy and implementation plan:***

We received a wide range of comments that addressed the need for additional actions thought to be needed for proper management of the U.S. population of Mexican wolves or requested more specificity on the management actions that were described in the draft Recovery Plan. These comments suggested the need for actions to: better educate the public about the Mexican wolf recovery; improve captive releases and survival of released wolves; improve coordination with local ranchers; reduce handling and habituation; remove wolves from areas of marginal habitat; better address depredation; assess the progress of the recovery program, and, provide funding to Mexico so as to speed the achievement of recovery objectives as soon as possible. Excerpts from these comments include:

- ...start NOW to educate the public on what recovery means. ... wolf populations will be managed in some way and that will most likely be through hunting... Educating people ... is critical ...
- (there should be)... replacement mechanisms for poaching wolves. There should be (active enforcement) against killing these endangered animals...
- …what steps are being taken to safeguard these valuable animals after they are released? The 72% first year mortality is dangerously high. What can be done to improve the survival of released individuals?
- …there is a remarkable gap of knowledge about wolves. .. An educational program needs to be included in the recovery.
- These wolves are monitored so closely that their natural fear of humans is lost and associate food with man… Let the wolves be and they will survive on their own with the laws already in place.
- Place more personnel on the ground to assist ranchers in knowing pack locations and help with coexistence measures. More personal interaction and assistance might inspire more cooperation.
- ..STOP giving Mexican wolf GPS tracking information to ranchers!
- ...provide stronger language, and maybe management actions, of what will be done with wolves that enter into the dispersal zone....will dispersal be encouraged and residency discouraged (in areas of poor habitat) ?
- While we believe that cross fostering may ha(ve) value in the reintroduction project, the

technique is still experimental and that value has yet to be conclusively demonstrated. The recovery plan should reverse the emphasis on cross fostering as a primary method for releases from captivity and instead rely primarily on releases of intact family groups, i.e. packs, into the wild...

- ... the Service and colleagues in Mexico will need to release at least 28 adults and 42 pups and 20 adults and 30 pups... Providing that number of animals in a short period of time is a very tall order for the SSP population... the draft recovery plan does not recommend a significant increase in the scope of the Mexican wolf captive population to account for the needs of the reintroduction projects in the US and Mexico.
- .. .(the) level of release intensity (68 adults and 102 pups), to say nothing of the survival rates and subsequent successful reproduction by surviving animals, has never been achieved by any wolf restoration effort...Consequently, the requisite number of releases seems unrealistic.
- . .. Does the Service anticipate irregular release from the captive population after the Mexican wolf has been recovered? Regardless, once recovery has been achieved ... further management actions such as genetic augmentation (should be) in the hands of the state not the Service.
- …(we are opposed) to the release of naive adult individual or paired adult wolves, or pack of wolves, and only support(s) the use of cross-fostering to achieve the objective of increasing the MWEPA population genetic diversity.
- Try new efforts to (improve social acceptance and gain support for the recovery program)...the media...student volunteers... more environmental groups... tours … Get Texas involved... celebrities.
- …suggest a shorter period of time before the first review of the plan, especially due to the uncertainty of wolf releases by (the states).
- …(diversionary feeding is a)…problem of humanizing the wolves. They become dependent on food from humans ... (and) are more likely to come into towns and up to ranch houses looking for easy food.
- ..proposed reviews at 5 and 10 years are woefully inadequate to assure steady progress toward recovery of Mexican wolves. Assessments of recovery progress must be made on an annual basis and must be tied to specific benchmarks.
- .. Please clarify what (management) actions would occur within those 8 years (to achieve the goal of 320 average population). One might hope that the population maintains this level with minimal intervention.
- ...regular introductions of wolves from captivity ... to maintain genetic diversity...is indicative of a population that is not fully recovered (and is) the antithesis of a self-sustaining wild population.
- MDA opposes using a 4(d) rule to manage the Mexican wolf because the increased geographic distribution of an apex predator could lead to increased instances of livestock depredation, hybridization, and economic loss.
- …No wolves should be killed over 3-4 cows...
- The Department recommends the Service provide financial assistance to the country of Mexico, especially in the early stages of wolf recovery, to ensure that wolf populations in Mexico reach recovery objectives sooner.

Our response: The management measures as described in the 2015 ROD and the 2015 Final 10(j) Rule will continue as part of the recovery strategy as outlined in the Recovery Plan. Therefore, we will employ management actions to reduce wolf-livestock and wolf-human conflict through the implementation of pro-active measures to avoid and minimize depredation; facilitate the provision of compensation for the economic impact of wolves on rural ranching communities; employ a phased management approach in Arizona to minimize or avoid possible adverse impacts to wild ungulate populations (specifically elk); allow take of Mexican wolves under specific criteria, and continue to work collaboratively with state and local governments, tribes, livestock producers, state game and fish

departments, and stakeholder organizations to achieve the social tolerance for wolves in rural communities necessary to achieve Mexican wolf recovery. As part of these management actions, we conduct diversionary feeding to reduce Mexican wolf-livestock conflicts, especially during denning. We expect to continue diversionary feeding as part of our recovery strategy. We are focusing our recovery in the U.S. south of Interstate 40, which is the area designated as the MWEPA (as defined in the 2015 Final 10(j) Rule). Recognizing the wide variation in the amount and location of suitable habitat within the MWEPA, the 2015 Final 10(j) Rule identified three management zones within which different management actions would occur. Zone 1 is an area of 12,507mi^2 (32,392 km^2) within the MWEPA where Mexican wolves are allowed to naturally disperse into and occupy and where Mexican wolves may be initially released from captivity or translocated. Zone 2 is an area of 78,756 mi^2 (203,978 km^2) within the MWEPA where Mexican wolves are allowed to naturally disperse into and occupy and where Mexican wolves may be translocated. On federal land in Zone 2, initial releases of Mexican wolves are limited to pups less than five months old to allow for the cross-fostering of pups from the captive population into the wild, and to enable translocation-eligible adults to be re-released with pups born in captivity. On private and tribal land in Zone 2 Mexican wolves of any age, including adults can also be initially released under Service and state approved management agreements with private landowners or a Service approved management agreements with tribal governments. Zone 3 is an area of 62,590 mi^2 (162,108 km^2) within the MWEPA where Mexican wolves would be allowed to disperse into and occupy but neither initial releases nor translocations would occur. Zone 3 is an area of less suitable Mexican wolf habitat where Mexican wolves would be more actively managed under the authorities of the 2015 10(j) Final Rule to reduce human conflict.

While the Five-Year status review and evaluation of the recovery strategy will occur in 2022, we will, in accordance with our 2015 Final 10(j) Rule, evaluate Mexican wolf reestablishment progress and prepare periodic progress reports and detailed annual reports. In 2020 the Service will prepare an overall evaluation of the experimental population program that focuses on modifications needed to improve the efficacy of the 2015 Final 10(j) Rule, reestablishment of Mexican wolves to the wild, and the contribution the experimental population is making to the recovery of the Mexican wolf. Using these evaluations we will annually assess our progress toward recovery and update, as needed, our Implementation Schedule Table to reflect the activities needed to achieve our objectives.

An important addition in the current PVA model is the capability to include the captive population, which enables us to incorporate the pedigree of all existing wild and captive wolves. This added capability allows us to explore explicit release scenarios and more accurately track changes in abundance and gene diversity for all populations. We will annually develop and implement our plan to release, translocate, and cross-foster wolves to ensure we are on track to achieve the gene diversity in the wild population specified in the downlisting and delisting criteria. We explain in our Rationale for Recovery Criteria in the recovery plan that Miller (2017) identifies several release scenarios that are able to achieve 90% gene diversity of the captive population in the wild within approximately 20 years, and we acknowledge that the number of releases may change if the survival of released wolves changes over time. Survival rates for adult Mexican wolves released from captivity have been substantially lower during the first year following a release compared to the average adult survival rate of wild wolves (adult survival rate first year after release of 0.28 versus an average adult survival rate of 0.8 using data from 2009 through 2015). Through 2016, all of the packs into which pups were cross-fostered successfully raised pups (either natal or cross-fostered). We are still gathering data on the success of the 2017 cross-fostering efforts. Initial releases of packs or individual wolves from captivity may continue to be necessary in the future, however, initial results of cross-fostering have been promising and this technique may present an opportunity to introduce animals with valuable genetic backgrounds into the wild population while avoiding the high mortality and potential for nuisance behavior associated with the initial release of adult naïve wolves from captivity. After the gene diversity recovery criteria for delisting are met, we do not expect regular releases from the captive population will be necessary because gene diversity from captivity will have been incorporated into the wild populations, and wild populations will be sufficiently abundant such that

releases from captivity for population augmentation will not be necessary (Miller 2017).

The Service has provided funding to Mexico for Mexican wolf recovery efforts through our Wildlife Without Borders-Mexico program. We and our partners will continue to support Mexico as funding allows. A 4(d) Rule is one of the many tools found within the ESA for protecting species listed as "threatened". Typically the Service uses 4(d) rules to incentivize positive conservation actions and streamline the regulatory process for minor impacts. As part of those goals, the rule is often used to clarify or simplify what forms of take of a threatened species are/are not prohibited wherever the animals may occur. Establishment of a 4(d) rule after the status of the Mexican wolf has improved to "threatened" would provide the state wildlife agencies increased management flexibility. The Service would first publish a proposed rule in the Federal Register and seek public comment and peer review before making a decision on the appropriateness of the action.

Resolution: We added more actions and details to the Recovery Action Table. Additionally, we developed an Implementation Schedule Table with more detailed activities (stepped-down from the actions in the Recovery Action Table). Examples include actions intended to: reduce human-caused mortality of Mexican wolves; reduce Mexican-wolf livestock conflicts; conduct education and outreach on Mexican wolf conservation; maintain and protect habitat for Mexican wolves; and maintain and enhance connectivity within and between populations. The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

3. ***Comments on the recovery and downlisting/delisting criteria specified in the draft recovery plan:***

Many comments were submitted that addressed the recovery and downlisting/delisting criteria specified in the draft Recovery Plan. These comments argued against the use of the delisting criteria of 22 released wolves surviving to breeding age; that the requirements of the ESA would be violated unless the Mexican wolf were recovered throughout all or a significant portion of its range; that as long as management actions such as releases and translocations and diversionary feeding continue the Mexican wolf could not be considered recovered; for changes in the delisting criteria to bring more genetic diversity into the wild population, grow the population and expand the recovery area; against having a second criteria option for downlisting; against the inclusion of the performance of the Mexican wolf population in Mexico as criteria for downlisting; for alternate delisting criteria of 100 wolves in the BRWRA; that the use of 90% probability of persistence over 100 years is too low a bar to consider for recovery, and that the recovery criteria were politically derived and not based on the best available science. Excerpts from comments on recovery and downlisting/delisting criteria include:

- … reaching a number of 22 released wolves surviving is unattainable. So your delisting criteria is unattainable.
- The … Draft Plan also fails to properly define what "recovery" means for the Mexican wolf subspecies...(it) allows downlisting from endangered to threatened and delisting well before recovery occurs in violation of the ESA.
- Only two isolated populations ...(are) required for delisting. This is arbitrary and conflicts with the ESA's mandate to conserve/recover the Mexican wolf subspecies "throughout all or a significant portion of its range,"...
- If Mexican wolf numbers in Mexico increase to 170 but the subspecies remains limited to a single isolated population in the contiguous United States, then Mexican wolves are not "recovered" under the ESA...
- ...the plan allows FWS to claim it has met its goals when a certain number of wolves reach

breeding age, regardless of whether those animals are actually thriving and breeding in the wild...

- …the ESA requires listing decisions (and therefore a decision to delist a species) to be made "solely on the basis of the best scientific and commercial data available"...it is extremely difficult to tell when reading the proposal what scientific basis FWS is relying upon when considering these numbers and allowances, and the plan does not seem justified by what we believe to be the best available science.
- … .FWS seems oblivious to the potential result of declaring wolves ready to downlist in the US based solely on success in Mexico; in other words, its plan asserts that FWS meets its ESA mandate as long as Mexico is successful - regardless of the status of the only US population in the wild.
- ..never is the word "delisting" used. The call estimates "recovery" in the 25 to 35 years. "Recovery" and "delisting" are not synonymous. Will delisting ever take place?
- ... the proposed recovery criteria, falls short of the requirements of the ESA, … by: a) failure to accurately represent best available scientific information; b) failure to establish criteria .. to address key threats..
- …the draft plan seems to propose that Mexican wolves will require ...expensive management interventions over many decades, including after delisting. Such an approach is inconsistent with the intent of the ESA...
- ..should review the adequacy and effects of the Rule simultaneously with a three-year review of recovery progress and should consider moving its ten-year evaluation up to year eight (i.e. five years after its initial review)…
- .. authorize delisting of the Mexican gray wolf in the United States when the population goal and related criteria for delisting in the United States are reached...(treat) the experimental populations as a distinct population segment.
- ...will be delisted (when...100 wolf population established in the BRWRA)...not withstanding the status of the Mexican gray wolf in Mexico…
- The Department would like clarification on the criterion to explicitly state what a viable population is...the wording of highly unlikely to need the protections of the ESA is in conflict with the ESA.
- …unless the wild populations of wolves can be shown to be genetically viable and demographically and geographically resilient with no resort to recurring management to control the threats of extinction, including inbreeding, the Mexican gray wolf cannot be considered recovered and may not be delisted.
- The Plans vague reference to a total population for the entire MWEPA begs the question of how the inflexible cap will be allocated between Arizona and New Mexico…
- Downlisting only requires stability for one generation (4 years), which is not enough time...
- ...the downlisting criteria … are arbitrary ... because they are not linked to the PVA or other quantitative analysis. ... the draft plan should be revised to specify downlisting criteria which assure a low probability of the species again falling into the category of an endangered species (based in part on PVA results).
- … at least some of the recommendations from the 2010 FWS Science and Planning Subgroup would ensure a better outcome for the success of the plan...it's clear that some arbitrary decisions were used as inputs, including the northern boundary of I-40 (for geopolitical reasons), the time horizon for accomplishing the recovery goals, and the decision to use a majority of data from the wild populations of Mexican wolves…
- The agency has not rationally justified its determination that a 10% extinction risk over 100 years is acceptable. This risk level is unusually high, and places a species in the vulnerable category by the IUCN Red List.
- …a minimum viable population is "a 99% probability of persistence for 40 generations"...Given that the recovery plan indicates 4.5 years as the generation time for a Mexican wolf, it seems that

the definition of resilience could be modified to be at least a 180 year period per Reed et al. 2002.

- The current plans set the goals of the recovery program beyond the control and jurisdiction of the USFWS, thus the plan is not achievable by the USFWS and thereby does not comply with the ESA.
- There could be several thousand Mexican gray wolves in the United States and yet the species would not be delisted because the Service dislikes Mexico s track record.
- The downlisting recovery criteria in the recovery plan (pages 9, 10, 26) is confusing...The addition of the words "positive growth" does not add confidence since any growth, even extremely low growth could satisfy this requirement. We suggest criteria for downlisting based on the two populations both containing at least 150 individuals be removed.
- Rewrite the down listing criteria (pp. 9, 10, 26) to preclude down listing unless the U.S. population meets appropriate population abundance and genetic diversity.
- It appears that the Service capitulated to Arizona's decade long campaign to cap the population, covered itself during the rulemaking process with the fig leaf of possible change under a revised recovery plan, and now has abandoned any pretense of ever changing the Plan to remove the I-40 wolf fence or the population cap.

Our response: The recovery plan was developed with scientific information available, including the recent PVA (Miller 2017) and habitat analysis (Martínez-Meyer et al. 2017). In the recovery plan, we explain that ecological representation is addressed by the recovery criteria requiring Mexican wolves across a large portion of their historical range in the United States and Mexico. There is no required allocation of the United States population between the states of Arizona and New Mexico. The Mexican wolves in the two states are managed as one population and move freely between the two states. Our focus on establishing a population in the United States south of Interstate 40 was not arbitrary, rather it was based on recognized historical range, which is consistent with the direction from our 1984 Experimental Population final rule (49 FR 33885, August 27, 1984) which indicated "it is Service policy to restrict introductions of listed species to historical range, absent a finding by the Director in the extreme case that the primary habitat of the species has been unsuitably and irreversibly altered or destroyed." This finding was incorporated into 50 CFR 17.81(a) which indicates experimental populations are limited to historical range absent a finding that this same standard is met ("within its probable historical range, absent a finding by the Director in the extreme case that the primary habitat of the species has been unsuitably and irreversibly altered or destroyed"). We analyzed whether or if a population in the historical range in the United States south of I-40 and a population in Mexico would meet our target of retaining approximately 90% of the gene diversity available in the captive population and at least a 90 percent probability of persistence over 100 years. Both targets were met with the recovery criteria provided in the final recovery plan. The United States and Mexico populations are able to achieve at least a 90% probability of persistence over 100 years when managed above 320 wolves and 200 wolves, respectively, when adult mortality is below 25%. In the Explanation of Downlisting Criteria section, we added further explanation that the PVA model (Miller 2017) predicts that a population abundance of 150 Mexican wolves confers a level of genetic and demographic stability (i.e., a low extinction risk). Therefore, at 150 animals (in each of the two populations), the Mexican wolf would no longer meet the definition of an endangered species (i.e., in danger of extinction throughout all or a significant portion of its range), but would qualify for consideration as a threatened species (i.e., any species which is likely to become an endangered species within the foreseeable future throughout all or a signification portion of its range). Delisting is the removal of a species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Downlisting is the reclassification of a species from Endangered to Threatened. To delist or downlist a species, we follow a process similar to when we consider a species for listing under the ESA. We assess the population and its recovery achievements; we assess the existing threats and we seek advice from a variety of species experts. All classification decisions consider the following five factors: 1) is there a present or threatened destruction, modification, or curtailment of the species' habitat or range; 2) is the species subject to overutilization for commercial,

recreational scientific or educational purposes; 3) is disease or predation a factor; 4) are there inadequate existing regulatory mechanisms in place outside the ESA (taking into account the efforts by the states and other organizations to protect the species or habitat; and 5) are other natural or manmade factors affecting its continued existence. When delisting or downlisting a species, we first propose the action in the Federal Register and seek public comment and peer review. Following review and consideration of public and peer review comments our final decision is announced in the Federal Register.

Our genetic recovery criteria provide a target that articulates the number of Mexican wolves that need to be released and incorporated into the wild populations to achieve the desired gene diversity in the wild populations. Regarding "breeding in the wild", the PVA model treats released individuals that survive 1-2 years and reach breeding age the same as other wolves in the population. Thus, not all of the 22 or 37 individuals released and incorporated into the U.S. and Mexico populations, respectively, are expected to reproduce to achieve 90% of the gene diversity of the captive population.

In the Biological Report, we provide an explanation of why we consider a resilient population to be one that is able to maintain approximately 90% or greater likelihood of persistence over a 100-year period. Like many species, the Mexican wolf will be managed after it is recovered. However, we do not anticipate that "expensive management interventions" or "recurring management to control the threats of extinction" will be required after delisting. For example, releases, translocations, and cross-fostering necessary to achieve the gene diversity recovery criteria will be achieved prior to delisting. After delisting, occasional management may be needed to maintain gene diversity, but should not be needed on a frequent basis. It is true that the recovery plan "set the goals of the recovery program beyond the control and jurisdiction of the USFWS" (i.e., the recovery plan includes criteria in Mexico); however, nothing in the ESA limits us to recovery actions that are easy or within our jurisdiction. We often prescribe aspirational recovery actions which may be challenging for a variety of reasons (technical, legal, etc). More generally, the entirety of a recovery plan is a guidance document that is not binding and enforceable regardless of the geography in question. As explained in the recovery plan, our goal of having Mexican wolves distributed across large portions of their range (in the U.S. and Mexico) ensures ecological representation.

Resolution: We made the following changes/revisions to the final recovery plan:

- We added that the recovery goal is to conserve and protect the Mexican wolf and its habitat so that its long-term survival is secured, populations are capable of enduring threats, and it can be removed from the list of threatened and endangered species (delisted).
- We changed the first downlisting option to include only the U.S. population and removed the option for downlisting if only the Mexico population was performing as expected.
- In the Explanation of Downlisting Criteria section, we added further explanation that the PVA model predicts that a population abundance of 150 Mexican wolves confers a level of genetic and demographic stability (i.e., a low extinction risk) that meets the definition of a threatened species.
- We revised delisting criterion #2 so that it no longer includes the language regarding Mexico's "track record" or "viable populations." It now reads: States and Tribes will ensure regulatory mechanisms are in place to prohibit or regulate human-caused mortality of Mexican wolves in those areas necessary for recovery such that the Service determines at least 320 Mexican wolves are likely to be maintained in the U.S. in the absence of Federal ESA protections. In addition, Mexico will ensure regulatory mechanisms are in place to protect Mexican wolves from human-caused mortality, such that the Service determines at least 200 Mexican wolves are likely to be maintained in Mexico.
- We added a paragraph in Section III. Recovery Strategy of the recovery plan to clarify our role in recovering species outside of the United States.

4. ***Comments on the lack of specific objectives and site-specific actions included as part of the recovery strategy for the U.S. population of Mexican wolves:***

Many comments addressed the need for specific objectives and site- specific actions to be included in the recovery strategy for the U.S. population of Mexican wolves outlined in the draft recovery plan. These comments recommended the inclusion of specific measurable objectives and actions to be taken should those objectives not be met. They recommended more frequent review and evaluation of progress toward these objectives and the provision of specific guidance to the state wildlife agencies and the land management agencies. Excerpts from these comments include:

- ...the plan does not state what will happen if minimum wolf recovery numbers are not met.
- The plan needs to specify actual results. The wild wolf population must mirror the genetics of the captive one no matter what efforts are expended to achieve this. That is a measurable and observable outcome without which all other action is meaningless.
- … more frequent review and evaluation (is needed) especially in the early years of the plan as increasing genetic diversity by releases is essential when the population is still small.
- Provide greater guidance to land management agencies regarding management strategies that increase habitat security for wolves and further enhance recovery objectives.
- …the Department would like further clarification from the Service on the Departments role in determining the timing, location and circumstances of releases of wolves into the wild within their respective states...
- (the DRP)... is not nearly specific enough to guide actions on the ground. For the most part, it does not name places, specify timing, nor describe the means of accomplishing its generalized objectives.
- …The recovery plan should call for all federal and state agencies that lease lands for cattle grazing to require seasonal calving and should call for promulgation of regulations to ensure that the Forest Service and BLM write such requirements into grazing permits and annual operating instructions.
- …the plan ...does not provide site-specific management actions. ...should provide proposed site specific management actions at each wolf release site in order to achieve the goal of delisting the species.
- ...the plan discusses ...several strategies for reducing the likelihood and number of depredation incidents ... needs to go into a lot more detail; outlining who is responsible for each technique and who is responsible for covering the cost.
- ...the site-specific actions identified in the first column of the table (Table 1) need to be explained in the body of the plan.
- ….NMDA requests that … the Recovery Plan provide site specific and actionable recommendations to proactively address this identified issue (lack of adequate habitat availability/suitability, and excessive human caused mortality) .
- This plan does not provide specific details on the numbers of wolves, locations ...and time tables for releasing and managing wolves to reaching their delisting goal of 320 to 380 animals or achieving their 5-year and 10-year goals.
- … this would be the ideal section to provide details on how, when and quantity of wolves the USFWS would envision for a specific areas within the MWEPA.
- NMDA believes that the elements of site specific management actions and estimates of time and costs are lacking in detail and accuracy...Without an accurate assessment of what site specific management actions are to be taken, it is impossible to make even a reasonable estimate of time and cost.
- Manage and monitor wolves on other tribal land is earmarked $17,500,000 but there is no mention of this in the plan. 17 million dollars and no plan on how it will be spent! This is gross mismanagement of public funds.
- The…Draft Plan does not include these site-specific conservation actions or measureable, science-based criteria necessary for delisting.
- Provide(s) little regulatory certainty to affected citizens due to the fact there are no actionable

items found in the plan.

Our response: Estimated costs of recovery actions are not earmarks, as a commenter noted, but rather estimates of the cost required to implement actions recommended to achieve the recovery criteria. The estimated cost of monitoring wolves on tribal lands has been revised (see the Recovery Action Table in the recovery plan) and activities to implement that action will be planned, implemented, and updated, as needed, annually, with tribal partners contributing to wolf recovery. With regard to grazing, changes in livestock management are not required for recovery of Mexican wolves; however, recommendations to reduce wolf-livestock interactions and avoid management removals (e.g. the use of range riders, fencing, fladry, hazing, diversionary feeding, translocations) are now included in the Recovery Action Table and Implementation Schedule Table. Miller (2017) includes a release table which we intend to use to inform our annual plan for Mexican wolf releases, cross-fostering, and translocations, which are necessary for the wild population to achieve 90 percent of the gene diversity in the captive population. The development and implementation of the annual initial release and translocation plan is now included as a recovery action in the plan.

Resolution: In response to comments, in the recovery plan we added a goal (i.e., recovery and delisting) and objectives that will lead to achieving the goal. Additionally, the plan features objective, measurable recovery criteria to assist us in determining when the Mexican wolf has recovered to the point that it may be downlisted to threatened, or delisted, as well as recovery actions recommended to achieve the recovery criteria. These criteria were in the draft plan, and have been revised in the final plan. We added more actions and details to the Recovery Action Table, and additionally developed an Implementation Schedule Table with more detailed activities (stepped-down from the Recovery Action Table) needed to fully implement the actions. Among others, actions include maintaining habitat and reducing human-caused mortality of Mexican wolves. Recommended activities provide land management agencies with information to further enhance recovery objectives. Additionally, we will meet at least annually with agencies contributing to wolf recovery to assess progress in implementing recovery activities, as well as update, as needed, activities to achieve recovery. We have revised the language on the states' role in releases to provide clarity. We revised the language on how we may change our strategy if we determine the current strategy is not effective.

5. ***Comments on the need to fund or provide adequate or additional funding for various aspects of the recovery strategy:***

Various comments were received stressing the need to fund, or provide adequate or additional funding, for implementation of different aspects of the recovery strategy. The need to provide adequate funds for depredation compensation and for grazing allotment permit retirement were often included in comments that addressed the socioeconomic impacts of wolf recovery. Other recommendations included increased funding for law enforcement, for genetic analyses/testing and for financial assistance to wolf recovery efforts in Mexico. Excerpts from the comments addressing funding include:

- … with the … McKittrick policy reversal , … there will likely the need for an increased and improved law enforcement presence and prosecution measures, and an adequate budget needed for both.
- The recovery plan should also provide funding for compensated voluntary permit retirement of public lands grazing allotments in an effort to reduce livestock conflicts and improve natural prey base.
- Provide (funding for) more law enforcement to fully investigate every wolf death and actually prosecute!
- … the draft recovery plan fails to include any provisions encouraging the retirement of grazing permits, nor does the recovery budget provide dollars to support purchasing and retiring leases. … Permanent voluntary retirement of grazing permits offers an effective resolution of wolf-livestock conflicts. … Seeking and supporting permit retirement, and including plan guidance for the land management agencies for accepting such transactions, would significantly reduce wolf-

livestock conflict.

- Laboratory costs to assess wolf heritage are a miniscule fraction of the anticipated … exorbitant, 262 million dollars that the draft recovery plan proposes spending. Why not simply commit to genetic testing of a sufficiently large fraction of the population to ascertain to what extent genetic objectives are achieved?
- The assignment of (funding) priorities reflects a disregard for the importance to recovery of genetic analyses and other research. [Items 21 & 22]. Each should be elevated to the next higher priority.
- The Department recommends the Service provide financial assistance to the country of Mexico, especially in the early stages of wolf recovery, to ensure that wolf populations in Mexico reach recovery objectives sooner.

Our response: We recognize the importance of addressing the potential economic effects of Mexican wolves on ranching activities and livestock production to the success of the recovery strategy for the Mexican wolf. Our multi-faceted approach has, during the course of the reintroduction of the experimental population of Mexican wolves into the MWEPA, evolved to include compensation for depredation losses, "payment for presence", and cooperative pro-active measures designed to improve animal husbandry and minimize livestock losses. We will continue this approach as part of the wider recovery strategy for the Mexican wolf. All cases of suspected illegal take of Mexican wolves in the United States are investigated by the Service's Office of Law Enforcement Special Agents. Personnel involved in preventing illegal take and apprehending those who commit illegal take include Service Special Agents, state wildlife agency Wardens and Conservation Officers and Law Enforcement Officers (LEOs) from the U.S. Forest Service and Tribes. Additionally, the Service recently hired a Conservation Law Enforcement Officer, which is included as an activity in the Recovery Action Table and Implementation Schedule Table. This position will help us address law enforcement issues and conduct outreach on wolf conservation. The management measures as described in the 2015 ROD and the 2015 Final 10(j) Rule for the reintroduction of the nonessential experimental population of Mexican wolves will continue as part of the recovery strategy as outlined in the Recovery Plan. As noted in the Recovery Action Table and Implementation Schedule Table, funding is provided to conduct research and collect information, including genetic analysis of all collected biological samples from the wild population of Mexican wolves. Funded activities of the Interagency Field Team (IFT) include collection of biological data (blood, feces, physical measurements and examination) and collaboration with researchers for data collection and analysis on approved projects. The Service has provided funding to Mexico for Mexican wolf recovery efforts through our Wildlife Without Borders-Mexico program. We and our partners will continue to support Mexico as funding allows.

Resolution: We included an activity in the Recovery Action Table and Implementation Schedule Table to increase law enforcement presence, which includes funding a Conservation Law Enforcement Officer to assist in educating the public, in particular hunters and recreationists, assist with investigations of wolf mortalities, and coordinate with law enforcement from other agencies. We included an action in the Recovery Action Table to reduce human-caused mortality of Mexican wolves and added other activities to the Implementation Schedule Table to reduce illegal killing (such as education and outreach).

6. *Comments on the potential beneficial impact on the ecosystem that could occur as a result of Mexican wolf recovery:*

A number of comments pointed out the potential beneficial impact on the ecosystem that would be expected to occur in the areas where wolf populations would be reestablished under the draft Mexican wolf recovery plan. These comments enumerated the important role wolves play as apex predators to maintaining the diversity, integrity and balance of ecosystems and felt that the draft recovery plan and/or the draft biological report should have better addressed the expected ecological benefits of wolf recovery. Excerpts from comments on the ecological benefits expected from Mexican wolf recovery include:

- … the reason for keeping a species population from going extinct is not being addressed in this

plan. As shown in Yellowstone, the reason for keeping a species from going extinct, is that nature is better at keeping a balance in the wild, than humans are.

- Wolves are an important part of the trophic cascade; their contributions are pivotal in maintaining the integrity and balance of ecosystems. With extinction rates soaring across the globe, we cannot afford any more losses in species diversity…
- Predators are a vital part of the natural landscape. Many studies have documented adverse effects upon ecosystems that can be caused by removal of predators …and … have demonstrated the benefits of predators… (from reintroduction)... We suggest the recovery plan briefly address the ecological benefits of predators.
- We have to stop killing off our predators! With the risk of Wasting Disease possibly transferring to humans, we need our predators more than ever to clear out these sick animals! … What happens when wasting disease transfers to cattle? ..
- … The Yellowstone results since reintroduction (of wolves) have been greatly improved watersheds. New Mexico and Arizona need as much help as possible with maintaining, and if possible, improving our watersheds.
- I recognize the unique importance to ecosystem balance provided by top predators such as wolves, which regulate both the number of smaller predators and the number of herbivores grazing the range. Overgrazing by livestock has radically altered ecosystems worldwide and has seriously reduced biodiversity both of native plants and wildlife, while also causing soil and water degradation.
- …the wolf is an essential component of the local ecosystem: It manages mule deer populations better than humans can, by selectively removing the sick and elderly, and those carrying the very contagious CWD prion. By preying on rabbits, it controls the transmission of tuleremia to humans and livestock; and by eating deer mice it protects humans from the Black Death virus, still endemic in the Southwest. And by controlling the elk population, the wolves protect the
- Without your wolves, deer and other plant eating species will multiply, denuding what little vegetation there is in place. That in turn creates a dryer atmosphere and streams and even rivers begin to dry up. Pretty soon, only wasteland exists...
- … the draft recovery plans summary of Middleton et al's (2013) findings overstated the case (findings that failed to support the existence of behaviorally mediated trophic cascades operating in Yellowstone National Park)… in fact, these scientists qualified their statement by reporting that … trophic cascades from declines in elk productivity … were largely explained by direct predation and drought... in other words trophic cascades due to direct predation, as opposed to the fear of predation, was indeed occurring.
- Unlike hunters, the wolves prey on the weak, the sick, and the newborn which actually helps the overall health of wild ungulate (deer, elk, etc.) populations, whereas the hunters are aiming to kill the best buck/doe they can find … I object to the hunter's false claim that the wolves are decreasing the population of deer and elk. Wolves keep the populations balanced as nature intended and I believe that hunters simply do not want to compete.

Our response: The Biological Report briefly describes the biology and ecology of the Mexican wolf, its abundance, distribution and population trends, and stressors to recovery. It then considers the concepts of resiliency, redundancy, and representation as they apply to the recovery of the Mexican wolf. Our 2014 FEIS examined the potential environmental impacts from a population of from 300-325 wolves in the MWEPA, including the effects to vegetation that could result from trophic cascades and to wild ungulate populations that could occur from wolf predation. The analysis concluded that "over the broader landscape of each proposed management zone (in the MWEPA) we do not expect significant reductions in ungulate population and density from the re-establishment of wolf packs in areas of suitable habitat with adequate wild ungulate prey base. While it is possible that at some future point in time wolves in some areas may achieve the ecologically effective density needed to initiate a trophic cascade in localized areas, we assess the possibility of trophic cascades that might affect vegetation over the broader landscape

of the MWEPA as unlikely (USFWS 2014)." The analysis of the 2014 FEIS noted that "Identifying the factors that drive changes in prey populations and predator-prey interactions is extremely difficult. More than one factor is usually involved, and multiple factors may interact with one another to further complicate efforts to understand their significance" (USFWS 2014). Therefore, although we agree that wolves play an important role in ecosystems, we are also cognizant of the dynamic and complex relationship of wolves to their prey, and of the many other factors, including anthropogenic influences on prey, weather patterns, hydrologic changes, and vegetation that must be taken into account before attribution of a direct or indirect causal effect from wolf restoration can made. Therefore, we caution against accepting at face value blanket assertions that there will always be beneficial impacts to vegetation when wolves return to an area or that there will always be a negative (or a positive) effect on wild ungulate populations from wolf predation.

Resolution: No further action.

7. ***Comments on the recovery implementation strategy and the lack of details for the recovery actions identified in the draft recovery plan:***

A number of comments thought that the Recovery Implementation Strategy for the Mexican wolf should have been provided for review in conjunction with the draft Recovery Plan. These comments argued that meaningful review of the draft recovery plan was precluded without the implementation strategy and that the site-specific activities necessary for implementation of the actions identified in the recovery plan were lacking. Comments also emphasized the need for consultation with state and local governments and affected stakeholders in the development of the implementation strategy. Excerpts from comments on the recovery implementation strategy include:

- ... the draft recovery plan merely suggests the outlines of measures to achieve supposed recovery and does not spell them out promising instead to reveal such measures in a so called Implementation Strategy at some future, unspecified date. That is unacceptable. ..., implementation measures must be spelled out precisely in the recovery plan and its draft available for public comment...
- ..we are concerned about the vagueness with which the implementation strategy is referenced. Of chief concern is how the recovery strategy will be developed and if the Service will consult key stakeholders in the process...NMDA strongly encourages the Service to consult local and state governments and local citizens, including ranchers, in the MWEPA during the development of the implementation strategies.
- ...By separating the implementation strategy from the recovery plan, the recovery plan as presented is incomplete and hollow. It lacks information and action items needed for the reader to make meaningful comments and suggestions regarding Mexican wolf management and recovery...
- The DMWRP states that they will conduct ongoing annual monitoring to track Mexican wolf population performance (line 731), without any specificity or delineation on what, when, where, or how this monitoring is to be accomplished. Its impossible to provide input on this action without knowing the specifics of monitoring methodology or timing…
- …proactive management techniques ...please describe the effectiveness of each of these management techniques and when they may be effectively used? ... law enforcement activities; investigating and compensating livestock depredation incidents; conducting outreach, education, and research activities; and managing the captive breeding program…. there are no specific actions or activities presented…
- ...request that USFWS change tactics and open the Recovery Implementation Strategy process to include meaningful participation by local governments and the stakeholders they represent.

Our response: The Recovery Plan was prepared in accordance with the requirements of Recovery Planning and Implementation (RPI) which is a revised recovery planning process adopted by the Service in 2016. It contains the required recovery plan elements specified by the Endangered Species Act (ESA)

(section 4(f)(1)). We developed the Implementation Strategy Table with partner agencies including the U.S. Forest Service, Bureau of Land Management, and National Park Service; the Arizona Game and Fish Department and New Mexico Department of Game and Fish; Tribes; County representatives; and the Mexican government and field staff. While the Recovery Implementation Strategy provides additional detailed, near-term activities that are needed to implement the actions identified in the recovery plan, there are no site-specific management actions in the Recovery Implementation Strategy that are not in the recovery plan. Therefore, the public was given the opportunity to comment on the entire recovery plan, including the site-specific management actions, and comment on the Recovery Implementation Strategy is not required.

Resolution: We added objectives and more detailed actions to the recovery plan. We will review the Implementation Strategy Table on an annual basis to ensure that recovery activities are implemented to achieve recovery objectives that lead to the recovery goal. The Recovery Implementation Strategy, which includes the Implementation Schedule Table, has been posted to our website.

8. *Comments on the estimated cost of recovery actions for the Mexican wolf.*

Comments received on the estimated cost of recovery actions for the Mexican wolf took issue with high overall cost tabulated in Table 1 of the draft Recovery Plan and with what was viewed as unrealistic calculations that did not take into account the projected growth of the U.S. population of Mexican wolves nor inflation over the span of 25-35 years. Excerpts from comments on the estimated cost of recovery actions for the Mexican wolf include:

- It is wasteful and spurious to consider spending $262,575,000 or more to burden one segment of society with the "recovery" of a species with no suitable habitat.
- …concerned that (Table 1) is woefully unrealistic...All costs included in the table ...are constant across the projected population growth from ... (the current) 113 Mexican wolves, to the planned maximum number of 380 Mexican wolves... For example, the cost of Depredation Compensation and Payments for Presence United States ... is estimated at $1 million per year for 35 years, regardless of population growth...(it) is unrealistic to expect that this cost will remain constant at $1 million per year as the wolf population triples.
- …(Table 1) (must)… be entirely recalculated, using appropriately increasing annual costs as the population triples, and using inflation-adjusted costs, in order to project a realistic total estimated cost for the recovery plan.
- The projected costs for future recovery work ($262M+) should not be burdened by the American taxpayer alone!...Spending what amounts to more than a million dollars per animal is patently absurd!
- ...$262 plus million dollars over 25-35 years is astounding added to the hundreds of millions spent over the last 35 years.
- $262,575,000 seems appropriate for a possible 35 year timeframe. I would even think more would be suitable if it related to the continued success of the species.

Our response: Subjective comments judging the estimated cost of Mexican wolf recovery to be wasteful, adequate or inadequate are noted. The estimated cost for recovery actions calculated in Table 1 of the draft Recovery Plan includes costs not only to the United States government but also to the government of Mexico and to bi-national institutions that manage the Mexican wolf captive population under the auspices of the Mexican Wolf Species Survival Plan (SSP), administered by the Association of Zoos and Aquariums. These institutions provide captive breeding facilities for the husbandry and care of Mexican wolves *pro bono*. Estimated costs are calculated in constant 2017 dollars and are not adjusted for inflation.

Resolution: We have completed the Implementation Schedule Table (IST) of the Recovery Implementation Strategy (RIS) with more specific activities (stepped down from the Recovery Action

Table) that will be implemented to achieve recovery, and we recalculated the estimated cost of recovery summarized in Table 1 of the Recovery Plan. The RIS is provided on the website.

Social Tolerance

1. ***Comments on actions to improve social tolerance including support and funding to reduce wolf-livestock and wolf-human conflict:***

Many comments recommended actions for inclusion in the draft Recovery Plan to improve social tolerance of wolves. . These comments focused on the need to support and fund programs to reduce the economic impact of wolves on rural ranching communities. Commenters felt that the focus should be on holistic and progressive plans and partnerships with local ranchers and non-lethal measures to reduce wolf-livestock and wolf-human conflicts. Excerpts from these comments include:

- ...To achieve social tolerance however, there must be commitment and accountability to preventative as well as response-oriented non-lethal programs and tools...with on-going support and funding must be secured so that ranchers feel they have the means to be able to implement individualized, holistic and progressive plans in partnership to reduce wolf-livestock conflict.
- ...the department's choice to focus on artificially managing the population in order to increase social tolerance is disappointing. To successfully achieve social tolerance, U.S. Fish & Wildlife Service must commit to proactive nonlethal programs and tools…
- Secur(e) funding ...Creat(e) and implement… individualized, holistic and progressive plans through partnership with local ranchers to reduce wolf-livestock conflict while supporting healthy habitats, viable wildlife populations and sustainable working landscapes.
- ...lethal control and removal of wolves cannot be the solution offered. It does not create a sustainable infrastructure of support for rural communities and ranchers which will in turn never create true social tolerance.
- This plan does not have allowances for increased needs of those most affected by the wolves.
- …the Services' Biological Report ... leaves out the human element. ... It is a major flaw to dismiss and ignore the human dimension and causes the wolf recovery program to be opposed by those in the MWEPA.
- .. we have observed first-hand how the lack of public support ... in many local communities has contributed to lack of successful recovery.
- .. facilitated participatory processes can lead to more enduring conservation of species and buy-in from stakeholders. ...We therefore recommend that initiating this type of process for the Mexican gray wolf recovery program be identified in the recovery plan as an implementation item.

Our response: We recognize the importance of addressing the potential economic effects of Mexican wolves on ranching activities and livestock production to the success of the recovery strategy for the Mexican wolf. Our multi-faceted approach has, during the course of the reintroduction of the experimental population of Mexican wolves into the MWEPA, evolved to include compensation for depredation losses, “payment for presence”, and cooperative pro-active measures designed to improve animal husbandry and minimize livestock losses. We will continue this approach as part of the wider recovery strategy for the Mexican wolf. In 2011, the Service appointed the Mexican Wolf/Livestock Council (Council), which is an 11-member volunteer group of livestock producers, tribes, environmental groups, and county representatives that directs disbursement of the Mexican Wolf/Livestock Interdiction Trust Fund (Trust Fund) to qualified applicants. The Trust Fund is administered by the non-profit National Fish and Wildlife Foundation. The intent in forming the Council was to gather a broad cross-section of members with divergent views on Mexican wolf reintroduction to develop a strategic plan to address Mexican wolf-livestock conflicts that accompany Mexican wolf reintroduction in Arizona and New Mexico. The Council developed the Mexican Wolf/Livestock Strategic Plan (Plan), which provides the basis for the disbursement of these funds. The Plan is an innovative program to reduce wolf/livestock conflicts and the need for management removals of depredating or nuisance wolves. The Council’s program creates incentives for ranching in ways that promote self-sustaining Mexican wolf populations,

viable ranching operations, and healthy western landscapes. The Plan provides the basis for disbursement of funds from the Trust Fund and is comprised of three core strategies: payments for wolf presence, funding for conflict avoidance measures, and funding for depredation compensation. Payments for wolf presence are based on a formula that considers a variety of factors to determine allocation of the annual funding for each applicant, including whether the applicant's land or grazing lease overlaps a wolf territory or core area (e.g., den or rendezvous area) and the number of wolf pups annually surviving to December 31 in the territory, recognizing that survival of wolf pups is not dependent upon the livestock producer. The formula also considers the number of livestock exposed to wolves and the applicant's participation in proactive conflict avoidance measures. The information for application of the formula to calculate a particular livestock producer's share of the Council funding will be obtained from the Mexican Wolf Interagency Field Team, which manages the Mexican wolf project in Arizona and New Mexico, and the landowner or appropriate land management agency. The amount of money available each year through the Council's program depends on private and public funding directed to support the Trust Fund, with available Fund balances being divided among eligible livestock producers who have applied to participate in the program. Applications to participate are due by May 1 of each year. The funding granted through the Livestock Demonstration Program requires a 50:50 non-Federal match, which is provided by the Mexican Wolf Fund and Defenders of Wildlife working directly with livestock producers to implement proactive conflict avoidance measures to reduce conflicts between Mexican wolves and livestock. As stated in the draft Recovery Plan we consider it not only possible, but preferable, to achieve recovery while addressing the economic concerns of local communities. We are focusing our recovery in the U.S. south of Interstate 40, which is the area designated as the MWEPA (as defined in the 2015 Final 10(j) Rule). Based on current published research (Miller 2017), this population objective is large enough to achieve our goal of delisting and recovery while also addressing concerns regarding the potential adverse impacts from wolf predation on wild ungulates, specifically elk and wolf depredation of livestock, specifically cattle. The management measures as described in the 2015 ROD and the 2015 Final 10(j) Rule will continue as part of the recovery strategy as outlined in the Recovery Plan. Therefore, we will employ management actions to reduce wolf-livestock and wolf-human conflict through the implementation of pro-active measures to avoid and minimize depredation; facilitate the provision of compensation for the economic impact of wolves on rural ranching communities; employ a phased management approach in Arizona to minimize or avoid possible adverse impacts to wild ungulate populations (specifically elk); allow take of Mexican wolves under specific circumstances, and continue to work collaboratively with state and local governments, tribes, livestock producers, state wildlife agencies, and stakeholder organizations to achieve the social tolerance for wolves in rural communities necessary to achieve Mexican wolf recovery.

Resolution: No further action.

2. ***Comments on the impacts of Mexican wolf recovery that reduce social tolerance including the unequal burden of wolf recovery and economic impacts:***

We received many comments that charged that the Service had failed to balance wolf recovery and the impacts that wolves have on people. These comments felt that the burden of wolf recovery is (and will be) borne by the few rural residents of the MWEPA (U.S. Recovery Area), not the society at large, and that this inequality and the lack of recognition of the very real economic loss, fear for the safety of humans, pets and livestock, and negative effect on hunters/sportsmen would continue to erode social tolerance for wolves under the draft Recovery Plan as written. Excerpts from these comments include:

- …the ... recovery effort is designed to sustain ecological diversity as an asset to society at large, but remains ... as a socio-economic liability to a tiny fraction of society, namely the rural (ranching) residents of the counties of the MWEPA...
- ... why have USFWS personnel failed to balance wolves and people?
- .. .avoid needless economic dislocation produced by agency officials zealously but unintelligently pursuing their environmental objective ...
- Implementation of the Recovery Plan as written would cause economic dislocation of additional

ranchers...

- (look at)…how many wolves they have …(planned to be)… out there... This high number poses a significant problem for NM / AZ ranchers for several reasons. With current wolf populations, the financial impact on our ranchers is significant: thousands of dollars are lost each year through livestock kills and property damage.
- (we)… are concerned about their lack of fear of humans; therefore, we are very concerned about the safety of our residents, especially children, …(and)… about our livestock. Not only a sad loss of an animal, but a loss of income.
- Our livestock mean something to us… (not just)… money to replace the loss… we have a hardship of the financial loss and the emotional loss as well.
- The constant oversight and threat of punishment for wolf losses ... are disincentives for ranchers to continue participating in an industry that represents Arizona's highest-grossing agricultural commodity... the program poses a real threat to Arizona's ranching industry.
- Elk and deer herds are being impacted to the point that sportsmen are being affected as well.
- (we are)…concerned with the public health and safety due to the wolf!...People currently are afraid of these wolves in our county and have expressed their lack of interest in camping in these affected areas due to their safety and the safety of their children or grandchildren.
- ... the current populations in BRRA has already reached habitat saturation...will be an unacceptable negative impact to our native ungulate and livestock populations...the number of wolves required for recovery in the draft recovery criteria may not be supported with the ungulate biomass present at equilibrium.
- The Martínez-Meyer et al. (2017) habitat suitability analysis is therefore inadequate.... The analysis misrepresents four hypotheses as "conclusions without presenting supporting data... the agency is pursuing an agenda to deliberately reduce cattle numbers in Arizona, New Mexico and the Sierra Madre Occidental to some undefined level of "low density"...threatens to insidiously destroy Arizona's $1.7 billion beef cattle industry.
- … depredation indemnity payments should be based on the actual effect on a ranchers long term revenue when it involves producing a cow. .. the loss of revenue resulting from a cow being killed includes… loss of a ranch asset… the wolf-killed cow… the need to save a replacement heifer… two-year production delay… Plus the time the rancher spent finding the wolf kill… completing the onerous paper work… in today's market, a rancher should be compensated for loss of one cow in the amount of $4,200 since that is the realistic direct, near-term cost and long term loss suffered due to the direct culpability of agents of the government who knowingly inflict economic and social harm and regard it as minor.

Our response: The Service has been engaged in efforts to conserve and ensure the survival of the Mexican wolf for over three decades. In 1998 we began reintroducing captive-bred Mexican wolves into the wild in the Blue Range Wolf Recovery Area in Arizona and New Mexico as part of our strategy to recover the Mexican wolf. In 2015 the area available for the reintroduction was expanded to the larger Mexican Wolf Experimental Population Area (MWEPA) under the authority of our 2015 Final 10(j) Rule for the experimental population (Revision to the Regulations for the Nonessential Experimental Population of the Mexican Wolf, 80 FR 2512, January16, 2015). Throughout the course of the reintroduction of Mexican wolves, we have sought to balance the needs of the local affected communities with our mandate under the ESA to recover the subspecies. The environmental effects of the reintroduction of Mexican wolves were examined in detail in two EISs completed in 1996 (Final EIS for the Reintroduction of the Mexican Wolf with its Historic Range in the Southwestern United States) and 2014 (Final EIS for the Proposed Revision to the Regulations for the Nonessential Experimental Population of the Mexican Wolf [*Canis lupus baileyi*]). These EISs were completed in accordance with the requirements of the NEPA. Our 2014 FEIS examined the potential environmental impacts from a population of from 300-325 wolves in the MWEPA, including the potential socioeconomic impacts to ranching activities/livestock production and big game hunting activities, as well as land use, human

health/public safety and environmental justice. We concluded in the 2014 FEIS and in the Record of Decision (ROD) (USFWS January 6, 2015) that, while direct adverse impacts to individual small ranch operations could be significant and these adverse impacts could be suffered disproportionately by focus minority groups, overall there would be either no significant or less than significant, impacts to any of these resource areas (ranching activities/livestock production, big game hunting activities, land use, human health/public safety, environmental justice) from implementation of Alternative One (the Proposed Action and Preferred Alternative). The 2014 FEIS and the 2015 ROD provide a comprehensive description of the affected environment and analysis of potential impacts. They are both available for review on the "NEPA Planning" page of the Mexican Wolf Recovery Program's website: https://www.fws.gov/southwest/es/mexicanwolf/NEPA.cfm .

We are focusing our recovery in the U.S. south of Interstate 40, which is the area designated as the MWEPA (as defined in the 2015 Final 10(j) Rule. Based on current published research (Miller 2017), we believe this population objective is large enough to achieve our goal of delisting and recovery while also addressing concerns regarding the potential adverse impacts from wolf predation on wild ungulates, specifically elk, and wolf depredation of livestock, specifically cattle. The management measures as described in the 2015 ROD and the 2015 Final 10(j) Rule will continue as part of the recovery strategy as outlined in the Recovery Plan. Therefore, we will employ management actions to reduce wolf-livestock and wolf-human conflict through the implementation of pro-active measures to avoid and minimize depredation; facilitate the provision of compensation for the economic impact of wolves on rural ranching communities; employ a phased management approach in Arizona to minimize or avoid possible adverse impacts to wild ungulate populations (specifically elk); allow take of Mexican wolves under specific criteria, and continue to work collaboratively with state and local governments, tribes, livestock producers, state game and fish departments, and stakeholder organizations to achieve the social tolerance for wolves in rural communities necessary to achieve Mexican wolf recovery.

Resolution: No further action.

3. ***Comments on actions to improve social tolerance including the use of public lands and habitat models that account for the human element:***

A range of comments were received on the proper use of public lands and the use of habitat models which account for the human element to reduce the potential for nuisance behavior and depredation. Some commenters felt that public lands should be multiple use including species preservation/ecosystem health and that ranchers using public lands should adapt and be responsible for coexistence with predators. Other commenters felt that public lands should not be used for wolf recovery because of the hazard posed by their presence to livestock, pets and human safety. Comments also thought that a habitat analysis that did not address cattle densities when modeling habitat suitability was inherently flawed. Excerpts from these comments include:

- ...ranchers don't want to share the public lands they lease and an ever decreasing number of hunters don't want competition for the elk and deer they hunt on lands. And to hell with species preservation or ecosystem health…
- .. if ranchers are using public lands then they should be required to use co-existence methods and to be responsible for their animals.
- Ranchers pay for the privilege of grazing their livestock on the public land and should share the land with the natural wildlife the land supports...
- The Services' Biological Report...leaves out the human element. ... It is a major flaw to dismiss and ignore the human dimension and causes the wolf recovery program to be opposed by those in the MWEPA.
- … the release of wolves on public land is detrimental to the wildlife.. .and to Ranchers who lease the land ... I am totally against the placement of wolves in our national forest!..
- … (the)Draft Biological Report states that "low cattle densities" are "one of the most important habitat attributes" for Mexican wolves...It lacks, however, any analysis of available cattle density

data both historically and today. It also lacks theoretical habitat modeling at any number of arbitrary cattle densities. ..The absence of cattle densities in the analysis makes no sense...social tolerance of Mexican wolves wanes with each new under-compensated depredation and every nuisance report.

- the most obvious proactive conflict avoidance measure, avoiding allowing wolves onto cattle ranches where the native ungulate base is inadequate to support new predators, was carefully avoided by ignoring all available scientific and commercial information on cattle densities.

Our response: We generally consider the most important habitat attributes needed for wolves to persist and succeed in pack formation to be forest cover, public land, high native ungulate density, and low livestock density. High quality wolf habitat also has minimal roads and human development, as human access to areas inhabited by wolves can result in increased wolf mortality. The anthropogenic variables that were considered in the habitat suitability modeling supporting analysis of the draft Biological Report (Martínez-Meyer et al. April 2017) were human population density and road density. Data on livestock densities are not available across the study area at the scale needed for inclusion in the model. Recovery plans for wide-ranging species typically assume that the primary responsibility for species conservation will fall on public lands, with additional activities occurring on private lands when these measures are also necessary for recovery. Public lands such as national forests are considered to have more appropriate conditions for wolf reintroduction and recovery efforts than other land ownership types because they typically have minimal human development and habitat degradation. Approximately 21 percent of the total land area of the MWEPA (U.S. Recovery Area) is classified as suitable habitat for Mexican wolves. Sixty-three percent of this habitat occurs on land owned by the Federal government. Of this federally managed suitable wolf habitat, 91 percent occurs on U.S. Forest Service land and 7 percent on Bureau of Land Management (BLM) land. Public lands managed by the Forest Service and BLM are generally managed under the principals of multiple-use and sustained yield, providing for a variety of activities to occur on the land. There are nine national forests in the MWEPA that contain suitable habitat for the Mexican wolf. Forest Service land is primarily managed for multiple-use with emphasis on ecosystem management. Traditional land uses including grazing, wilderness, recreation, motorized recreation, and fire and timber management dominate forest activity. Under the multiple use mandate, the majority of BLM land in the MWEPA is managed for livestock grazing, mineral exploration and development, energy production, wildlife habitat improvement, and outdoor recreation, including hunting/trapping and fishing and off highway vehicle use. The wolf habitat in the large blocks of public land (in particular the National Forests) that dominate much of the MWEPA in Arizona and New Mexico is mostly contiguous. This habitat also encompasses a number of wilderness areas and other areas of limited human use. Therefore, we expect that the majority of the projected population growth of the United States population of Mexican wolves will be supported by the available suitable habitat on Federal land.

Based on current published research (Miller 2017), the population objective for this area is large enough to achieve our goal of delisting and recovery while also addressing concerns regarding the potential adverse impacts from wolf predation on wild ungulates, specifically elk, and wolf depredation of livestock, specifically cattle. The management measures described in the 2015 ROD and the 2015 Final 10(j) Rule will continue as part of the recovery strategy as outlined in the Recovery Plan. Therefore, we will employ management actions to reduce wolf-livestock and wolf-human conflict through the implementation of pro-active measures to avoid and minimize depredation; facilitate the provision of compensation for the economic impact of wolves on rural ranching communities; employ a phased management approach in Arizona to minimize or avoid possible adverse impacts to wild ungulate populations (specifically elk); allow take of Mexican wolves under specific criteria, and continue to work collaboratively with state and local governments, tribes, livestock producers, state wildlife agencies, and stakeholder organizations to achieve the social tolerance for wolves in rural communities necessary to achieve Mexican wolf recovery.

Resolution: No further action

4. Comments on the link between social tolerance and illegal killing of Mexican wolves:

We received comments that doubted the connection between measures to improve social tolerance and reduction in the number of illegal killings. Comments also challenged the basis for the expectation that a U.S. Mexican wolf population of between 320 and 380 wolves would maintain an acceptable level of social tolerance while a population that grew above those numbers would not. Excerpts from these comments include:

- .. Is your bland and unsubstantiated statement that you will "improve Mexican wolf tolerance on the landscape" a pledge to address gunshot-related mortality?
- The record number of illegally killed wolves in 2015 and 2016 are an indication that the people in the field are angry and they are not going to take further abuses from USFWS "wolf cops" without enacting negative repercussions on the wolf.
- …none of which suggests the need for a population cap enforced through traps and bullets....Contrary to the Services implication that a cap on the number of wolves, and persecution of these endangered animals even before they reach the 320 to 380 population level, is required to garner widespread and critically important participation by other institutional entities, the record shows that this is a convenient untruth…
- ..The Service also seeks to link attitudes toward wolves with wolf survival ...Despite having removed (alive and lethal) ..., the Service can point to no ... sign that tolerance of wolves has been enhanced through this counterproductive and cruel strategy...
- Moreover, there is no basis for linking a wolf population between the range of 320 and 380 to any particular level of social tolerance...

Our response: Illegal killing has been the biggest source of Mexican wolf mortality since the U.S. reintroduction began in 1998. Approximately 55 percent of total documented mortality between 1998 and 2013 is attributed to illegal killing. In Mexico, illegal killing of Mexican wolves released to the wild has been a continuous source of mortality over the course of the reintroduction project. We have incorporated Mexican wolf mortality from all sources, including illegal killing, in our Population Viability Analysis and population growth rate estimates for reintroduced wild populations of Mexican wolves in both the United States and Mexico. All cases of suspected illegal take of Mexican wolves in the United States are investigated by the Service's Office of Law Enforcement Special Agents. Personnel involved in preventing illegal take and apprehending those who commit illegal take include Service Special Agents, state wildlife agencies Wardens and Conservation Officers and Law Enforcement Officers (LEOs) from the U.S. Forest Service and Tribes. Additionally, the Service recently hired a Conservation Law Enforcement Officer, which is included as an activity in the Implementation Schedule Table. This position will help us address law enforcement issues and conduct outreach on wolf conservation. While law enforcement and regulatory protections to prohibit and penalize illegal killings are important mechanisms, we recognize that illegal killing will likely continue to occur and may possibly increase as the wolf population increases in size. In areas where humans are tolerant of the presences of wolves, wolves demonstrate an ability to persist in the presence of a wide range of human activities (e.g. near cities and congested areas) (Fritts et al. 2003). We therefore view efforts to improve social tolerance to wolves as vital to the success of the Mexican wolf recovery strategy. We are focusing our recovery in the U.S. south of Interstate 40, which is the area designated as the MWEPA (as defined in the 2015 Final 10(j) Rule). Based on current published research (Miller 2017) this population objective is large enough to achieve our goal of delisting and recovery while also addressing concerns regarding the potential adverse impacts from wolf predation on wild ungulates, specifically elk and wolf depredation of livestock, specifically cattle. The management measures described in the 2015 ROD and the 2015 Final 10(j) Rule will continue as part of the recovery strategy as outlined in the Recovery Plan. Therefore, we will employ management actions to: reduce wolf-livestock and wolf-human conflict through the implementation of pro-active measures to avoid and minimize depredation; facilitate the provision of compensation for the economic impact of wolves on rural ranching communities; employ a phased management approach in Arizona to minimize or avoid possible adverse impacts to wild ungulate

populations (specifically elk); allow take of Mexican wolves under specific criteria, and continue to work collaboratively with state and local governments, tribes, livestock producers, state wildlife agencies, and stakeholder organizations to achieve the social tolerance for wolves in rural communities necessary to achieve Mexican wolf recovery.

Resolution: We clarified the language regarding the management targets in the Rationale for Recovery Criteria.

5. Comments on beneficial economic impacts that could improve social tolerance:

Some comments we received postulated that beneficial impacts on local economies from tourism and visitors to wolf recovery areas could serve to increase social tolerance for the Mexican wolf in rural communities. Excerpts from these comments include:

- Economic studies have shown that Mexican wolves could bring upwards of $25 million a year in revenue to local communities in and around the Blue Range Wolf Recovery Area.

Our response: We are unaware of any economic studies predicting an economic benefit of more than $25 million a year in revenues to local economies in the BRWRA from tourists and visitors focused on the presence of Mexican wolves. The environmental effects of the reintroduction of Mexican wolves were examined in detail in two EISs completed in 1996 (Final EIS for the Reintroduction of the Mexican Wolf with its Historic Range in the Southwestern United States) and 2014 (Final EIS for the Proposed Revision to the Regulations for the Nonessential Experimental Population of the Mexican Wolf [*Canis lupus baileyi*]). These EISs were completed in accordance with the requirements of (NEPA and are available for review on the "NEPA Planning" page of the Mexican Wolf Recovery Program's website: https://www.fws.gov/southwest/es/mexicanwolf/NEPA.cfm. Our 2014 FEIS examined the potential for beneficial economic effects from Mexican wolf tourism that would result from increased visitation and visitor expenditures in the local communities proximate to the national forests which are the focus of the reintroduction. The FEIS concluded that "that the reintroduction of the Mexican wolf has not had any significant impact on tourism and that the forecasted increase in wolves …will not likely result in any significant change from the baseline. Therefore, we predict no significant beneficial (economic) effect … (from) tourism (USFWS 2014). Although some economic benefit to local communities in the MWEPA, with a concurrent increase in social tolerance for wolves, might occur as a result of Mexican wolf recovery, we remain committed to the recovery strategy as presented in the Recovery Plan as the best means to improve social tolerance in the communities most directly affected by the presence of Mexican wolves.

Resolution: No further action.

Appendices- Population Viability Analysis for the Mexican Wolf, June 13, 2017 version

Comment: Wolf mortality #513.

Estimates of human caused mortality fail to acknowledge recent research which demonstrates that mortality of wolves from poaching is systematically underestimated by government agency biologists and policy makers (Treves et al. 2017). They found that the risk of mortality of Mexican wolves due to poaching was 0.07-0.21 higher than estimated by agency managers. Indeed, for every wolf population examined by Treves et al. (2017), which included Mexican wolves, they found poaching was the greatest threat to wolf survival. The Vortex PVA model fails to acknowledge or incorporate these important new findings. Given the high sensitivity of the model to different mortality rates, this could result in significant underestimates of population sizes needed for recovery.

Our response: Treves et al. (2017) acknowledges in the results section that: "Because the USFWS reported mortality risks for Mexican wolves after excluding most legal causes (*citation omitted*), their proportions are not directly comparable to ours". Nevertheless, Treves et al. (2017) goes on to compare the incomparable and estimates that "the official estimate of risk of mortality from other human causes for Mexican wolves was 0.07 – 0.21 lower than ours." Rather than depend on literature, assumptions, or

incomparable proportions, we directly estimated cryptic mortality based on intensive field data and methods described in Appendix D of Miller (2017), which was incorporated into overall survival/mortality rates.

Resolution: No changes.

Comment: Population Abundance #259.
Limiting populations to a goal of 320 in the United States and 170 in Mexico results in a total population of 490 wolves. This may not be large enough. Studies elsewhere have set minimum viable populations (MVP) for wolves (*Canis lupus*) at 1,403 adults (Reed et al. 2002). Even this population may be low. When the above MVP was corrected to 40 generations, it resulted in a MVP of 6,332 wolves (Reed et al. 2002). Reed et al. (2002) found that a doubling of study duration increased the estimated MVP by approximately 67%. This effect could mean that the present MVP model numbers may be too low. Applying the 67% to the modeled population goal of 490, results in a total population of 818 (490 x 1.67) wolves or a target in the United States of 534 and in Mexico 284.

Our response: We appreciated the general guidelines of Reed et al. (2002) for mammals. However, the results of Miller (2017), which included Mexican wolf specific data and rely on more sophisticated modeling efforts, illustrate the viability of the populations for 100 years (25 generations). Nevertheless, we slightly adjusted the recovery criteria, such that the populations demonstrated stability over time under certain conditions (e.g., adult mortality rates of 20.9, Mexico management target of 300). How well these conditions are met will be dependent on future performance of the populations and management of the population. These types of uncertainties are inherent in any recovery criteria. The 5- and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised.

Resolution: We ran additional simulations and adjusted recovery criteria accordingly.

Comment: Population Abundance #261.
Different studies have proposed MVP for various vertebrates, including wolves. Reed et al. (2002) found minimum population sizes ranging from 2,000 to 5,500 in 6 studies. Reed et al. (2002) calculated a mean MVP of 7,316 individuals for 102 vertebrate species. He recommends... conservation programs, for wild populations, need to be designed to conserve habitat capable of supporting approximately 7,000 adult vertebrates in order to ensure long term persistence". Flather et al. (2011) stated that long term persistence requires greater than or equal to 5,000 adult individuals. Flather et al. (2011) calculated a *Canis lupus* MVP corrected to 40 generations as suggested by Reed et al. (2002). Reed et al. (2002) found that computer runs of short data sets (less than 40 generations) consistently underestimated the MVP. Flather et al. (2011) calculations, from at least 4 references, resulted in a range from 248 to 6,332 adult *Canis lupus* wolves. In summary, vertebrate MVPs ranged from 2,000 to 7, 316 individuals and *Canis lu*pus MVPs ranged from 248 to 6,332 adults. The previous examples do not specifically address the Mexican Wolf (*Canis lupus baileyi*) but indicate a MVP for wolf species (*Canis lupus*) may require thousands of individuals for a minimum population. Even though there are many higher population targets as described above, it seems reasonable and prudent to attach more weight to the model that Miller (2017) used since 1) it uses data from the recovery area, 2) it was developed with reliable input from many professionals and 3) the information, the computer model, and expertise is current, year 2017. One concern is the short data set, 18 years (years 1998 through 2015 for modeling). According to the Biological Report (USFWS 2017), the Mexican wolf life span is about 4.5 years (4 to 5 years). To calculate the number of generations the data represents, 18 years divided by 4.5 years, results in 4.0 generations for extant data. Since most MVP calculations suggest modeling 40 generations, we suggest the model output be corrected based on Reed et al. (2002). Reed et al. (2002) found that when field survey duration doubled, MVPs increased by 67%. Therefore, we recommend the predicted MVPs be increased from 490 total individuals, to a total population of 818 (490 x 1.67) wolves. This would translate to a target in the United States of 534 and in Mexico 284.

Our response: See Population Abundance comment #259

Resolution: See Population Abundance comment #259

Comment: Population Abundance #269.
Not one word of scientific evidence or justification is provided in the draft plan or biological report for the numbers inserted into the model as management targets. This clearly violates the best science standard set forth in the ESA. We request a full analysis of the scientific evidence and justification for the numbers chosen as management targets for input to the Vortex PVA model. The numbers arbitrarily chosen for testing in the model as the management target for the MWEPA were 300, 340, and 379. The source and justification for these numbers is not disclosed. Inexplicably, the model settled on 320 as the minimum number of Mexican wolves needed in the MWEPA, and in the entire United States, to meet recovery objectives for the critically endangered and genetically impoverished Mexican gray wolves.

Our response: We explored a range of population abundance targets for the United States population based on previous analyses, including wolf:elk ratios in which impacts to ungulates have been observed in the northern Rocky Mountain wolf population. Miller (2017) shows that a population in the United States with an average annual population abundance above 320 has a greater than 90% probability of persisting for 100 years and a sufficiently high level of retention of gene diversity represented in the SSP population, which taken together we consider to be diagnostic of a viable population. The 5- and 10year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised.

Resolution: We clarified language in the Rationale for Recovery Criteria regarding use of management targets in the model.

Comment: Population Abundance #270.
The harmonic convergence of the cap of 325 Mexican wolves imposed by the 2015 revised rule and the management target of 320 wolves derived through the Vortex PVA modeling exercise seems highly unlikely to have happened by chance. In fact, both numbers were arbitrarily and unscientifically decided by the states and the Service as the number of wolves that would be allowed to occupy the MWEPA. The convergence is convenient for the Service, as it will not force a revision of the 2015 rule to accommodate a final recovery plan that calls for more than 325 wolves in the United States. This created a problem for the recovery planners because the Vortex PVA model needed more than 320 Mexican wolves in the wild to achieve full recovery and avoid a high risk of extinction. The solution was to insert additional management targets for wolves in one or two populations of wolves that would be established in the country of Mexico. That management target was determined to be 170 wolves.

Our response: See also response Population Abundance #269. Both the EIS/10j rule and this recovery planning process used Carroll et al (2014) as a starting point in determining the appropriate abundance target for the given effort. Thus, the similarities are not surprising. For this recovery plan, as modeled in Miller (2017), the United States population with an average annual population abundance above 320 has a greater than 90% probability of persisting for 100 years and a sufficiently high level of retention of gene diversity represented in the SSP population, which taken together we consider to be diagnostic of a viable population. Similarly, the Mexico population achieves these targets with an average annual population abundance above 200. The establishment of two independently viable populations provides redundancy – security against extinction from catastrophic events that impact a single population. The 5-and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised.

Resolution: The population abundance target for Mexico was changed to 200 Mexican wolves.

Comment: Population Abundance #271.
The draft plan doesn't take a long enough perspective on extinction risk. Instead of projecting out to 100 years, modelers should assess risk out to 200 years, because inbreeding resulting from this plan might

ultimately doom the Mexican wolf even if some wolves do survive after a century. A longer view would shed more light on the flaws in this plan.

Our response: It is indeed possible that population extinction risks will be greater when considering a longer time frame such as 200 years; this is essentially a universal feature of stochastic population dynamics of endangered species. The choice of a 100-year timeframe for Mexican wolf population analysis is in accord with the application of predictive risk models to recovery planning as informed by the ESA. Moreover, international authorities such as the IUCN Red List for assessing the status of biodiversity around the world typically use a timeframe of 100 years as a reasonable duration for predicting impacts of threatening processes on endangered wildlife populations. Predicting outcomes over longer timeframes becomes unmanageable through the continued propagation of our lack of information on the biology of species and how those species respond to anthropogenic threats.

Resolution: No further action.

Comment: Population Abundance #287.
Different studies have proposed MVP for various vertebrates, including wolves. Reed et al. (2002) found minimum population sizes ranging from 2,000 to 5,500 in 6 studies. Reed et al. (2002) calculated a mean MVP of 7,316 individuals for 102 vertebrate species. He recommends "... conservation programs, for wild populations, need to be designed to conserve habitat capable of supporting approximately 7,000 adult vertebrates in order to ensure long-term persistence. Flather et al. (2011) stated that long-term persistence requires greater than or equal to 5,000 adult individuals. Flather et al. (2011) calculated a *Canis lupus* MVP corrected to 40 generations as suggested by Reed et al. (2002). Reed et al. (2002) found that computer runs of short data sets (less than 40 generations) consistently underestimated the MVP. Flather et al. (2011) calculations from at least 4 references, resulted in a range from 248 to 6,332 adult *Canis lupus* wolves. In summary, vertebrate MVPs ranged from 2,000 to 7, 316 individuals and *Canis lupus* MVPs ranged from 248 to 6,332 adults. The previous examples do not specifically address the Mexican Wolf (*Canis lupus baileyi*) but indicate a MVP for wolf species (Canis lupus) may require thousands of individuals for a minimum population.

Our response: See Population Abundance comment #259

Resolution: See Population Abundance comment #259

Comment: Population Abundance #288.
The draft recovery plan relies heavily upon a MVP computer model. Should recovery be based upon the minimum viable population? Should population targets be based on minimum populations to prevent extinction? If these targets are correct, then Mexican wolves will still be subject to future extinction since we are keeping their numbers close to the minimum necessary. The Service should ensure that populations are well above the minimum and strive to let a wild population establish itself.

Our response: See Population Abundance #184. Miller (2017) shows that a population in the United States with an average annual population abundance above 320 has a greater than 90% probability of persisting for 100 years and a sufficiently high level of retention of gene diversity represented in the SSP population, which taken together we consider to be diagnostic of a viable population.

Resolution: No further action.

Comment: Population Abundance #295.
A commonly accepted definition of a minimum viable population is a 99% probability of persistence for 40 generations" (Reed et al. 2002). Does your definition encompass this definition? Given that the recovery plan indicates 4.5 years as the generation time for a Mexican wolf, it seems that the definition of resilience could be modified to be at least a 180 year period per Reed et al. 2002.

Our response: The definition proposed by Reed et al. (2002) is not a commonly accepted definition that is applied to recovery plans, which are generally between 90-95% probability of persistence for 100

years. Also, we consider 4 years as the generation time.

Resolution: No further action.

Comment: Population Abundance #303.
One of the inputs into the model is called the management target (Miller 2017:9): The wolf population abundance deemed both biologically viable (according to identified recovery criteria) and socially acceptable in light of the expected ongoing issues around livestock depredation and other forms of wolf-human conflict (Emphasis added). The report continues: if a given population exceeds its management target abundance in a given year, both adults and pups are harvested from the population in equal numbers until the target abundance is reached (Miller 2017:9). The model is capped at whatever management target population size is chosen for the MWEPA population, apparently negating all the science-based inputs due to the complete overriding effect of the management target on the outcome of the model. Because the model harvests all wolves above the population size chosen as the management target, the output of the model for the MWEPA population is guaranteed to be the same as the arbitrarily chosen management target. This is egregiously and unacceptably unscientific, to say the least. At any rate, this provision violates the best science standard set forth in the ESA.

Our response: We used the Vortex model to explore viability of populations that were not allowed to increase over 380 Mexican wolves in the United States to simulate management response to problem wolves and unacceptable impacts to native ungulate herds (Miller 2017). While 380 Mexican wolves functioned as a population cap in the model, it was not intended as a limit on the number of Mexican wolves in the wild. However, if population growth is causing management concerns, we will consider any and all management options, including allowing mortality rates to increase through permitted take or other mechanisms, provided at least 320 Mexican wolves are likely to be maintained. Post delisting, State and Tribal governments will manage Mexican wolves to maintain at least 320 Mexican wolves in the U.S.
Resolution: We have increased the population abundance target for the population in Mexico to 200. In addition, we clarified language regarding the management target in the Rationale for Recovery Criteria for *resiliency*.

Comment: Population Abundance #512.
Mortality rates used in the Vortex PVA model are unrealistically low. The plan justifies use of lower mortality rates by assuming that future human-caused mortality rates will be lower than those observed in the past for Mexican wolves. However, unlike in the SPS draft plan, no recovery criteria have been proposed that would ensure that mortality rates are as low or lower than the rate assumed in PVA. Additionally, mortality rates in the PVA are affected by assumptions regarding the extent and number of years in which supplemental feeding of the wild population occurs. Due to expected future resource limitations on agencies conducting supplemental feeding, the PVAs assumptions regarding such feeding are likely unrealistic. Therefore, the PVA paints an optimistic picture of the success of future interventions to reduce human-caused mortality. No scientific basis for such optimism is presented.

Our response: In response to comments, we explored new PVA scenarios that eliminate diversionary feeding in both populations. The results from these new analyses, which indicate that populations can remain viable in the absence of diversionary feeding with reduced wolf mortality, were used to modify the recovery criteria in the plan. While diversionary feeding is not necessary to achieve viable wolf populations, it may be used as a tool to reduce wolf-livestock interactions. Additionally, diversionary feeding will be addressed in the Implementation Schedule Table. We have not documented any negative consequences of diversionary feeding. Miller (2017) adequately explores environmental and demographic stochastic events in the presence of minor levels of diversionary feeding (15% of the population) and higher mortality than demonstrated from 2009-2015. A mortality rate of 25% (6% higher than the rate observed from 2009-2015) is adequate to allow for population growth towards recovery goals with minor levels of diversionary feeding. If we reduce diversionary feeding, we recognize the need to reduce the mortality rate to compensate for lower pup production in the absence of feeding.

Resolution: No further action.

Comment: Population Abundance #517.
Biological report - page 45- line 1439 - mortality data - Right now mortality for adult wolves is 51%, but the plan's assumption is that they will be able to maintain delisting with numbers of 300+ over 100 years with a mortality rate of 25%. Where in the plan do they address reducing the mortality rate by 1/2, especially considering the genetic depression often seen in such a limited number as 300?

Our response: The mortality rate of wild adult wolves (Miller 2017, Appendix D) is approximately 18.9%. Thus, the mortality rate of 25% is 6% higher than that observed from 2009-2015 in the United States. The population in Mexico is experiencing higher mortality rates currently because of the high proportion of animals that are released from captivity and their associated higher mortality rate (Miller 2017)

Resolution: No further action.

Comment: Population Abundance #543.
While the Draft Plan, and supplemental Biological Report, relies on the PVA as justification for its determinations, the PVA does not represent the best available science, and therefore, fails to provide a rational foundation from which the Service bases its conclusions. In fact, the PVA plainly ignores and fails to adequately refute the best available science. For example, the PVA limited its analysis to the predetermined population cap at the outset. It is inappropriate for the Service to first state its desired outcome and then conduct a technical analysis to support what it wants to achieve. The science should guide the Service's decision, not the other way around. The PVA itself acknowledges that the carrying capacity for Mexican wolves in the United States is nearly 1,000 and in Mexico is 650 individuals. Yet, it limited its analysis to management targets of only 300, 340 and 379 in the United States and only 150, 200, and 250 in Mexico. Thus, the PVAs analysis is flawed from the start, and thereby cannot be said to constitute the best available science.

Our response: See Population Abundance comment #269 and 270.

Resolution: See Population Abundance comment #269 and 270

Comment: Population Abundance #183.
…I conclude based on the information presented above that the draft plan and its recovery criteria are based on a population viability analysis (PVA) which incorporates overly optimistic and inaccurate parameters which are unlikely to accurately represent dynamics of wild Mexican wolf populations. There is always some uncertainty regarding demographic parameter values for even well studied species. However, it appears that the PVA authors have erred consistently in the direction of selecting the parameter value that provides the most optimistic outcome in terms of species viability. This results in a suite of parameter values which is strongly biased towards under predicting extinction risk. The PVA's predictions regarding extinction risk (and hence the draft plans criteria) are not robust or precautionary because they become invalid if even one or two of these overoptimistic parameter estimates is incorrect (Figure 1). All previous Mexican wolf PVAs (Seal 1990, IUCN 1996, Carroll et al. 2014a) have included a sensitivity analysis to evaluate the robustness of conclusions to uncertain parameters. The fact that no sensitivity analysis is provided with the current PVA in itself makes the PVA conclusions of limited value in devising science based recovery criteria. Even if one accepts the parameters used, the PVA results, if examined in detail, do not support the adequacy of the proposed criteria in ensuring recovery in the context of how the ESA defines the term. In combination, the use of overoptimistic parameters and a minimal set of criteria do not meet the ESAs mandate to comprehensively address threats and ensure population resilience.

Our response: It is true that the current PVA does not include an explicit uncertainty analysis. This was also the case in the Carroll et al. (2014) publication that describes the previous Mexican Wolf PVA used

to inform recovery. A full statistical uncertainty analysis would not alter the conclusions used to derive robust, evidence-based recovery criteria, but can inform future research needs to improve management toward recovery. The sensitivity analysis of Carroll et al. (2014) was used to identify critical demographic parameters that influence growth of the population toward recovery, in particular adult mortality. This information was used as a central element of the current PVA to help identify critical mortality thresholds for management of wolf populations toward recovery. Sensitivity analyses of other parameters including disease frequency and severity, female pairing rate and density dependence in mortality were also crucial in refining PVA model structure and implementation but are not reported in detail in the final document.

Resolution: No further action.

Comment: Population Abundance #202.
The PVA model inexplicably and unreasonably quadrupled the causal power of age of dam in order to reduce the causal explanation from inbreeding in its analysis of whether a wolf pair would breed, thus arriving at the equivocal and less alarming sounding statement that [o]ur data suggest that probability of an adult pair producing pups in the wild is a function of age of the dam and relationship of the paired female to her mate (i.e., the predicted inbreeding coefficient of the pups).

Our response: As explained in Appendix B of the PVA report, the probability of an adult pair producing pups in the wild is influenced by the age of the dam and her relationship to her mate (equivalent to the inbreeding coefficient of pups in the resulting litter). The factor (Age^4) does not appear in the PVA model function used to derive this breeding parameter. Instead, it appears as one of a set of factors used to derive the size of a litter in the captive SSP population.

Resolution: No further action.

Comment: Population Abundance #210.
All in all, one could fairly conclude that the required frequency of release of captive animals to MWEPA (28 adults and 42 pups) and SMOCC-N (20 adults and 30 pups) and the transfer of wild wolves from MWEPA to SMOCC-N (20 adults and 30 pups) and the resulting myriad of assumptions about survival rates and subsequent reproduction probabilities (78%of adult females in any given year breed with a male) makes the Vortex model highly optimistic if not an outright fantasy.

Our response: The most difficult part of the release and translocation scenarios is the approximately 100 wolves in 10 years that would be placed in Mexico. During the first 10 years of the Mexican wolf project in the United States, we initially released 91 animals and translocated 87 Mexican wolves. Thus, these numbers are practical and possible and we have a demonstrated track record of achieving greater numbers of releases and translocations in the United States. However, Mexico has unique constraints that were not a factor in the United States (e.g. needing private landowner approval for releases, and lower prey biomass). Thus, we will need to monitor the number of releases and translocations in both the United States and Mexico and adjust strategies (e.g. cross-fostering), as appropriate. As explained in detail in the PVA model input text, the probability of "breeding" in the simulations describes the probability that an adult female will be paired with an adult male in a given year, based in part on her paired status from the previous year. Once a female is paired (78% of the time), she then has a probability of producing a detectable litter in that year of approximately 70%. Taken together, the probability of a given adult female pairing and producing pups in a year is about 50%, which is the same value used in the previous Carroll et al. (2014) analysis.

Resolution: No further action.

Comment: Population Abundance #217.
Parameterization of the PVA simulations was also problematic. The proportion of adult females pairing is known to be a parameter that has large effects on the outcomes of simulated wolf populations (Carroll et al. 2014). The value of this parameter was based on the mean between two estimates using data from the

Arizona-New Mexico population. Although both ways of estimating this parameter may be biased, one was likely more biased than the other. As a result, the value for this parameter used in the simulations was likely biased high. A review of the literature on the proportion of adult females breeding among wolves strongly suggests this parameter is density dependent when prey density is high or wolf density is low, the proportion of adult females paired is high. And when the opposite occurs, the proportion of adult females pairing is low (Fredrickson unpublished). In the simulations, however, only a single, constant value was considered. In part, this was likely due to the very high carrying capacity (K = 1000 wolves) set for the MWEPA which would render density dependent functions largely inconsequential, given that this population was constrained to 320 wolves. The MWEPA, however, is a large area with discontinuous habitat spread across two states. And the existing wolves are concentrated in a single portion of the area. It is likely that wolves respond based on the conditions in their neighborhood rather than mean conditions across a two state area. Thus density dependence could be operating. And this is suggested by the data from the MWEPA (Figure 1). In addition, inbreeding depression documented in the SSP population for the probability of a female giving live birth was not incorporated into the simulation model (Fredrickson unpublished). And it is unclear whether inbreeding depression in the wild populations was fully accounted for.

Our response: See Population Abundance comment #210. Because of the carrying capacity values, the Recovery Planning Workshop participants did not see value in utilizing limited evidence to develop a density-dependent function for breeding rate in the PVA model. Regarding the factors influencing reproductive success among SSP wolves – detailed statistical analysis of studbook data by Fredrickson during the PVA model development phase (report dated 22 September 2016) generated results for probability of live birth that were not agreed upon by the Recovery Planning Workshop participants. In contrast, statistical analysis of factors affecting litter size among SSP wolves was incorporated into the PVA model structure via other analyses (Input Data for PVA Simulations: SSP Population in Miller (2017)). The Recovery Planning Workshop participants used the best available scientific information and statistical analyses to derive functional relationships for wolf demographic parameters for use as input to the full suite of PVA models.

Resolution: No further action.

Comment: Population Abundance #218.
The PVA also assumes that a substantial proportion of Mexican wolf pairs will be fed annually for the next 100 years. Data from the MWEPA indicate that fed pairs produce greater numbers of pups that emerge from the den. Assuming that intensive feeding will continue in both populations for the next 100 years is unrealistic and inflates the viability of the simulated populations.

Our response: The section in model input titled “Dynamic diversionary feeding” explains that the level of diversionary feeding declines from 70% of adult females to 15% within 20 years (MWEPA population) or 25 years (the SMOCC-N population) from today. This low level of diversionary was retained in the models to simulate its occasional use as a management tool for denning packs that were targeting cattle. Miller (2017) constructed additional model scenarios to explore the long-term demographic and genetic impact of eliminating diversionary. These new scenarios are discussed in the Addendum to the final PVA report.

Resolution: Miller (2107) constructed additional model scenarios to explore the impact of elimination of diversionary feeding. See addendum to Miller (2017).

Comment: Population Abundance #235.
The downlisting recovery criteria in the recovery plan (pages 9, 10, 26) is confusing. First, it lists a population target for the United States population of wolves or 370 wolves for the population in Mexico. The plan later states, wolves in both the United States and Mexico would be a sufficient alternative, assuming both populations are demonstrating positive growth. A small population size of 150 is not justified by the computer model. The addition of the words "positive growth" does not add confidence

since any growth, even extremely low growth could satisfy this requirement.

Our response: The first downlisting option was changed to include only the United States population. Therefore, the species will not be considered for downlisting if only the Mexico population meets its abundance and downlisting criteria. Regarding the second downlisting option, the PVA model predicts that a population abundance of 150 confers a level of genetic and demographic stability (i.e., a low extinction risk). Therefore, at 150 animals (in each population), the Mexican wolf would no longer meet the definition of an endangered species (i.e., in danger of extinction throughout all or a significant portion of its range), but would qualify for consideration as a threatened species (i.e., any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range).

Resolution: We revised the downlisting criteria. We clarified language in the Explanation of Downlisting Criteria. We also changed "a positive growth trajectory" in the second downlisting option to "an annual positive growth rate."

Comment: Population Abundance #244.
Finally, the sensitivity analysis considered variation only in adult mortality rates, the sizes of populations triggering harvest, and population augmentation strategies. While these are all important, the modeling appendix did not include a thorough sensitivity analysis. Because few parameters were considered in the sensitivity analysis, I ran simulations to further examine the effects of alternate parameterizations on the probabilities of extinction, quasi extinction, and population sizes. In particular, I considered a small reduction in the percentage of adult females pairing, small increases in the adult mortality rate, and the effect of ending diversionary feeding once populations reach their targeted census population sizes. For these simulations | reduced the percentage of adult females pairing from 77.6 % used in the PVA to 73.2% based on the analyses in Appendix A (Oakleaf, Estimation of mean pairing rate among wild Mexican wolves). In this appendix this parameter was estimated using data from the MWEPA using two methods: the "direct observation" and "indirect estimation." Oakleaf arrived at 77.6% by taking the mean of these two estimates. But because the direct observation method is likely more biased than the indirect estimation method, I used the mean between 77.6% and the indirect estimation method for the simulations below. Modestly reducing the percentage of adult females pairing to 73.2 and ending diversionary feeding had large effects on census population sizes. Table 1 presents the % of iterations becoming extinct, attaining the numerical delisting criterion, and two levels of quasi extinction for the MEWPA and SMOCCN populations. In all scenarios considered, 99% of iterations met the numerical criterion for delisting (eight year moving average of 320 wolves for MWEPA; eight year average of 170 wolves for SMOCCN). But the eight year moving average dropped below 300 wolves in 80% of the 1,000 iterations when diversionary feeding was stopped and adult mortality was increased to 25.4% (Table 1). When the percentage of adult females pairing was reduced to 73.2% and diversionary feeding was stopped, the eight year average for the MWEPA dropped below 213 wolves in 67% of iterations, and dropped below 113 wolves in SMOCCN in 81% of iterations. Mean population abundance for the scenario in which diversionary feeding is ended and adult mortality is increased from 24.9% to 25.4% is shown in Figure 2. Mean population abundance for the scenario in which the % of adult females pairing is reduced to 73.2% and diversionary feeding is ended is shown in Figure 3. These simulations illustrate that relatively small changes in parameterization can have large negative effects on outcomes. It also calls into question whether the recovery criteria proposed in the draft plan will be adequate to ensure a viable and resilient metapopulation of Mexican wolves.

Our response: The observation that "…relatively small changes in parameterization can have large negative effects on outcomes" is a key feature of the PVA used in the Mexican Wolf Recovery Plan. The simulations use the best available scientific information to characterize the population biology and ecology of the Mexican wolf, and evaluate wolf population dynamics across a range of adult mortality rates and population management targets. These are the same two input parameters that the analysis published in Carroll et al. (2014) target as sensitive input data for their PVA. As in the analysis by Miller

(2017), Carroll et al. (2014) did not explore appropriate population-size and connectivity criteria under a range of adult breeding rates, focusing instead on adult mortality and population abundance as the key factors influencing recovery of the species in the wild. As an extension of the analyses reported in the draft PVA report, the revised final report now includes analysis of the impact of eliminating diversionary feeding as a management tool. This added component is discussed in the Appendix of Miller (2017). Miller (2017) identifies 24.9% annual adult mortality as a threshold rate, and recommends that this rate should not exceed this threshold value if wolf populations are to continue to grow and progress toward recovery. In that light, the choice of using 25.4% annual adult mortality in additional exploratory PVA models is not consistent with the insights gained from Miller (2017). The 5- and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised, including potential revision of model inputs with additional data.

Resolution: Miller (2107) constructed additional model scenarios to explore the impact of elimination of diversionary feeding. See addendum to Miller (2017).

Comment: Population Abundance #249.
What are the threshold levels mentioned on line 738? Line 736 says the focus will remain on population growth with a focus on mortality rate. The monitoring is for population size (abundance?). Growth is assessed later. Thus, the focus should be on changes in population size [abundance?] that trigger management actions, especially changes due to mortality.

Our response: The line numbers identified in the comment do not correspond to the comment. We interpret this comment to relate to lines 1204-1206 of the draft biological report, which read "For populations to grow or maintain themselves at demographic recovery targets, mortality rates will need to stay below threshold levels (Miller 2017)." Miller (2017) identifies adult mortality rates of $\leq$ 24.9 as required to allow the population to grow. Thus, we cannot expect the population to grow in years with a greater than 24.9 mortality level. Simply put, growth and adult mortality rates are linked.

Resolution: No further action.

Comment: Population Abundance #184.
Vortex only incorporates an extremely simplified representation of the spatial, behavioral, and other factors influencing the dynamics of real world populations. Due to these limitations, Vortex results should be seen as information that can assist in devising effective recovery strategies, rather than as accurate predictions of the future status of the population. This has strong implications for the adequacy of the draft plans proposed genetic criteria as detailed below. In particular, the search for an exact number that represents a minimum viable population (MVP) is no longer seen as an informative framework for PVA. The goal is instead to use a comprehensive set of metrics from the PVA results to craft an effective strategy to address threats and grow a population beyond the stage where small population factors such as genetic inbreeding are important. In contrast, the Mexican wolf PVA, rather than use PVA to identify what would be a minimum population size that might afford long term viability, and then use that threshold (with some precautionary buffer) to set recovery goals to be reached and surpassed, seeks to identify a size that is marginally adequate, and then control numbers via offtake so that the populations cannot exceed these minimal levels. This approach turns the modern concept of PVA on its head, harkening back to the now outdated focus on a single MVP threshold..

Our response: No PVA model can make "…accurate predictions of the future status of a population". That said, Miller (2017) – based closely on the preceding analysis published in Carroll et al. (2014) – is probably the most detailed and complex Vortex-based PVA conducted to date for any species. However, even with this level of complexity, this (and any responsible) PVA effort is designed to provide guidance for management authorities in their design of an effective recovery strategy for the Mexican wolf. This analysis seeks to identify a population abundance criterion that provides precisely the level of demographic and genetic stability that is discussed here. The logic used in this PVA is very similar to that

proposed by the published PVA of Carroll et al. (2014) in their derivation of population-size criteria that conferred a desirable level of wolf population viability. It is also important to note that the Carroll et al. (2014) analysis also included a "harvest" of wolves, thereby also simulating the management of wolves in a socially complex environment that required maintaining wolf populations at densities below their ecologically tolerable maximum values. We set management targets above the level of a "minimum viable" and adjusted our recovery criteria based on additional simulations. We never sought to convey a "minimum viable" population, but rather looked for scenarios that would meet our recovery standards (many scenarios exceeded our standard). Further, we recognized that attaining the goal of 90% of the gene diversity retained from the captive population required populations that were larger than required for demographic performance (i.e., 90% probability of persistence over 100 years). Thus, the recovery criteria are conservative relative to the population sizes and can be maintained in the presence of management target, which we felt was appropriate to reflect how wolves would likely be managed over the course of 100 years. Finally, we expect the recovery process to be adaptively managed through the 5 and 10 year status review process.

Resolution: No further action.

Comment: Population Abundance #199.
However, because the approximately 90% persistence probability over 100 years threshold criterion is inadequate, so also is the low average of 320 wild wolves in the U.S. inadequate as a recovery criterion. Furthermore, we demonstrate in the following sections that the biological report and the PVA rely on untenable assumptions that undermine their conclusions. So, even considering the approximately 90% persistence probability over a 100 years criterion to be adequate which we reiterate it is not the PVA and biological report are incorrect in arriving at a (preset) average of 320 wolves that would suffice to meet that threshold. One hundred years is a very short threshold to measure the chances of extinction. Species and subspecies such as the Mexican wolf can be doomed to extinction within a fraction of a century yet still contain some remnant survivors in just 100 years. One hundred years is only 25 Mexican wolf generations, which is a small number of generations in which to assess the effects of inbreeding. In contrast, for example, the isolated population of gray wolves on Isle Royale National Park, with fewer founding and other contributing members (3) than the Mexican wolf subspecies (7), due to inbreeding depression is now after approximately two thirds of a century reduced to two or three surviving animals. Its fate is not in doubt: Without introduction of new wolves, this population will die out. But the fact that it survived so long, with fewer than half the number of founding animals than the number of survivor/founders of all current Mexican wolf populations, shows that even a genetically doomed population can retain a few survivors for exceptionally long period of time.

Our response: A persistence probability of 90% over a 100-year timeframe is a common threshold used in many Service recovery plans, as well as species conservation strategies around the world. The IUCN's Red list mechanism for assessing species endangerment – a system where more than 80,000 species worldwide have been rigorously assessed by taxonomic experts and associated conservation biologists – uses similar thresholds for persistence using established scientific theory. For example, a species that would classify as "Vulnerable" under the Red List classification scheme would be shown to have a probability of extinction of at least 10% over 100 years. Therefore, a taxon whose risk is less than this threshold would not be considered "Vulnerable" but would instead potentially be classified as "Near Threatened" or perhaps even "Least Concern" based on other considerations. In addition, the use of both demographic and genetic criteria for establishing conditions for recovery of Mexican wolves is designed to eliminate the scenario where a population might have a low risk of extinction but would persist for long periods of time at very low population abundance. Under this scenario, the genetic viability of the population would be unacceptably low, requiring larger number of individuals to be part of a growing or demographically stable population to achieve genetic viability. The Isle Royale wolf population was not actively managed to promote genetic variability.

Resolution: No further action.

Comment: Genetics #26.
The Vortex PVA model downplays effects of inbreeding depression. Carroll et al. (2014) found that the strength of inbreeding depression was the fourth most important parameter affecting subpopulation extinction among simulated populations of Mexican wolves. The current PVA incorporates inbreeding effects on the probability of producing a litter, but not as an influence on litter size. This weaker inbreeding effect is based on an unpublished, non-peer reviewed analysis by Clement and Cline (2016). Clement and Cline (2016) assume no litter sizes of zero. And litter size is measured after emergence from the den. This eliminates any inclusion of aborted litters or litters with all pups dying in the den, thus eliminating a potentially important indicator of inbreeding depression from their analysis. Furthermore, the survival of newborn pups is likely increased through the extensive practice of supplemental feeding of reproductively successful packs. If supplemental feeding were eliminated or reduced, as proposed in the draft recovery plan, it is likely that the negative association of inbreeding and litter size would be more easily observed. Peer reviewer 2 offers substantive criticisms of the Clement and Cline analysis of inbreeding effects in the MWEPA population of Mexican wolves. Peer reviewer 2 concludes that the results of Clement and Cline (2016) are quite surprising and unsupportable. Underestimating inputs to the Vortex PVA model creates significant risks for the future survival of Mexican wolves. The accuracy of various inputs to the Vortex PVA model have been questioned by us and other peer reviewers. To many reviewers not directly involved in developing model inputs, it appears that the tendency of those making model input decisions was to choose values on the low side of a range of possible, real-world values for those parameters. We find this to be especially true for expected mortality rates and effects of in breeding. The result is proposed numerical criteria for Mexican wolf recovery that we believe poses unacceptable risks that could just as likely lead to extinction rather than recovery.

Our response: Clement and Cline (2016) removed from their dataset those paired females that were not observed to have a detectable litter because their analysis was focused specifically on an analysis of litter size among observable litters. The data on failed litter production was incorporated into the complementary analysis of Oakleaf and Dwire on the factors influencing the probability of live birth among mated females (Appendix B of Miller (2017)). Oakleaf and Dwire did detect a significant inbreeding effect on this parameter, which was then included in the PVA model structure. The Clement and Cline analysis on factors influencing the size of observed litters included the statistical separation of fed and unfed litters in an attempt to assess the impact of inbreeding depression on the size of wolf litters produced in the wild. As presented in Appendix C of the PVA report, they were unable to detect a significant effect of inbreeding on litter size. This analysis was peer-reviewed by selected population biologists during the PVA model development process and the reviewers determined the analysis to be scientifically sound and defensible. The PVA evaluated population viability across a range of annual adult mortality rates that far exceed the threshold value considered demographically and genetically tolerable in the long-term. Moreover, the threshold value of 24.9% emerging from the analysis is considerably higher than the rates observed from 2009-2014. The goal during the recovery process would be to maintain mortality at a level below this threshold (in the absence of required removals) to facilitate more rapid population growth toward recovery.

Resolution: No further action.

Comment: Genetics #33.
While Service staff express concern for increasing inbreeding depression and decreasing genetic diversity in the wild population, they seem charmed by Resiliency, Redundancy and Representation, and mesmerized by computer models that seemingly predict what can be done with the wolves to maintain 90% of existing genetic diversity for 100 years, and build population numbers to ensure that 90% persistence. This does not address the effects of genetic depression on the population any more than trusting a model-based minimum "safe" population number of 150 encompasses complex wolf behavior. Students of behavior at the wolf/human interface learn that humans often believe they have wonderful

ideas just perfect for the wolves. More often than not, those wolves pee all over our cherished "plans," have thought of 5 or 6 better things, and are ready to act on their own, more wolfly ideas. Predicting wolf behavior with a computer? Maybe "Watson." But, while wolfy ideas work better in a wolfy world, humans can't modify situations really fast. Although wolves surviving a human encounter can modify their behavior, the flexibility of the wolf non-enthusiast in this scenario isn't necessarily reciprocal. Extending this, without knowing the personalities of individual wolves there's little likelihood of divining which two mate, and who will disperse to find that certain someone. Keeping track requires collaring a lot of wolves and DNA testing, maybe by pulling hair follicles rather than drawing blood at the one assessment capture.

Our response: Despite current advances in PVA technology, practitioners remain unable to include detailed data on individual animal behavior and the demographic impacts of individual behavioral choices. Indeed, these types of data on specific species are not available for use in PVA models – even for simple species, much less highly social species such as wolves. Our management of endangered species must use the information we have at our disposal, while repeatedly recognizing that this information is only a piece of the complete puzzle.

Resolution: No further action.

Comment: Genetics #45.
Redefine scheduled releases (pp. 9-10, 26-27, 33) to be effective migrants and adjust the numbers appropriately. We understand from the public information session why scheduled releases were used in the PVA modeling. However, effective migrants are widely recognized and used in a variety of biological research. Further, effective migrants, not just effort-based releases of wolves who happen to survive for a given time, are the appropriate metric for evaluating the core recovery requirement of conserving and enhancing the genetic health in the wild. Redefining genetic infusion in terms of effective migrants would also close a definitional loophole which could permit a claim of genetic success without a captive wolf ever being released into the MWEPA.

Our response: We describe the number of released wolves that need to be incorporated into each population in order to achieve approximately 90% of the gene diversity retained in the captive population. The schedule of releases will be addressed in the Implementation Schedule Table and the number of releases is reflected in our 5- and 10-year status reviews (see section V of the draft recovery plan). The goal of tracking the number of wolves that are released and survive 1-2 years (depending on age) is to find a computational method to track model performance with release performance. We do not expect and the model does not predict that all of these animals will be effective migrants (i.e., breed). We do expect, the model does predict, and we have observed that wolves that survive for 1 to 2 years will behave similarly to wild wolves in their pairing and breeding rates. Thus, the results of the model are consistent with the requirements in the recovery criteria. We plan to convene a genetic management group (this is also included as an activity in Implementation Schedule Table) to assist us with genetic management and recovery of the Mexican wolf, including addressing the most effective approaches to increase gene diversity in the wild populations.

Resolution: No further action.

Comment: Genetics #50.
Clement and Cline at 58 (lines 1834-35) (finding a positive relationship between litter size and supplemental/diversionary feeding). In other words, packs that were fed by FWS had litters larger than those packs that were not fed. This is unsurprising, and the impact of supplemental feeding is likely to have masked any effects of inbreeding. This does not mean that inbreeding depression is not occurring among wild Mexican gray wolves. As one of the peer reviewers explains, At first [it] appears that the only explanations for the statistically significant inbreeding depression from the earlier study of Fredrickson et al. (2007) to have disappeared is that it was a false positive or that purging has occurred, but neither of these explanations appear likely. Another possible explanation for no significant

inbreeding depression effect from 2009 to 2014 is for the environment to have been improved enough due to diversionary feeding that litter size become similar for different inbreeding levels. It is well known that inbreeding depression is environmentally dependent with more inbreeding depression in more harsh environments. If diversionary feeding were eliminated, it is likely that the negative association of inbreeding and litter size, in breeding depression for this trait, would again be observed.

Our response: See Genetics #26. Fredrickson et al. (2007) included litter sizes of 0 in their analyses of pup production, which was included in Miller (2017, Appendix B) as the probability of producing detectable pups. Thus, it is not surprising that Clement and Cline's (2016) results differed from that of Fredrickson et al. (2007). An early analysis by Clement and Cline with interactions estimates that high levels of inbreeding were beneficial under diversionary feeding. Strong positive impacts from inbreeding were deemed an implausible result and therefore the interaction model was not used in the PVA report. The Clement and Cline (2016) analysis on factors influencing the size of observed litters (i.e., 1-7 pups) included the statistical separation of fed and unfed litters in an attempt to assess the impact of inbreeding depression on the size of wolf litters produced in the wild. As presented in Appendix C of Miller (2017), they were unable to detect a significant effect of inbreeding on litter size. This analysis was peer reviewed by selected population biologists during the PVA model development process and the reviewers determined the analysis to be scientifically sound and defensible.

Resolution: No further action.

Comment: Genetics #554.
The best available science suggests that an isolated population of wolves with the genetic composition of the current population shows a "relatively high extinction rate, long- term decline in population size in those populations that did not go extinct, as well as decline in mean heterozygosity and other metrics of genetic viability." Indeed, the Draft Plan fails to apply the best available science and properly analyze and address the questions of probability and certainty (how likely will extinction be?), how long it will take, and what degree of risk is acceptable even if the Draft Plans criteria are met. In the absence of this analysis and information, including proper models and application of the best available science, the Service simply cannot put forth a valid road map to recovery, as required by the ESA.

Our response: We disagree. The model performed by Miller (2017) presents ample information on how likely extinction will be (rare) through the probability of persistence through 100 years and includes the best available information on Mexican wolves. This information was used to inform the recovery criteria.
Resolution: No changes.

Comment: Number of Populations #216.
The PVA is flawed Rather than exploring a range of conditions that might adequately address the threats to Mexican wolves and result in a robust metapopulation, the PVA instead appears to be constructed to affirm the desires of the four corners states, in regards to location and sizes of potential Mexican wolf populations. In practice this is manifested in simulation scenarios that considered only two populations: one wolf population in Arizona and New Mexico with a target population size of 320 wolves and another population in the northern Sierra Madre Occidental of Mexico with a target population size of 170 wolves. Populations in other locations and of greater sizes were not seriously considered. This apparently constrained the PVA into a search to find a management scenario that might be adequate.

Our response: The PVA is not flawed. Miller (2017) explored populations of different sizes and different numbers of populations within the constraints that were placed on the modeling effort by the Service. Specifically, the Service committed to: (1) model the availability of suitable habitat and prey availability from the general vicinity of Interstate 40 south into the Sierra Madre Occidental and Sierra Madre Oriental in Mexico to determine where on the landscape Mexican wolf populations could be established and sustained. Only if we were not successful in finding enough suitable habitat in this area for recovery would we look elsewhere for suitable Mexican wolf habitat with adequate prey and (2) discuss with the Mexican government the number of wolves in the wild that they can contribute toward Mexican wolf

recovery. Only if this number was insufficient to achieve recovery, when combined with the population in the United States, would we look elsewhere for suitable habitat with adequate prey. Miller (2017) describes a variety of scenarios that fit within that framework. In addition, we modified some of the recovery criteria based on additional information from Miller (2017).

Resolution: We added language within the recovery plan (Section I. Introduction and Background) to more clearly articulate how this recovery process was initiated. In addition, we modified recovery criteria based on additional results from Miller (2017).

Comment: Recovery Actions #44.
On a public information conference call on July 7, 2017 and at a public information session (Truth or Consequences, New Mexico) on July 19, 2017, Service representatives candidly admitted that there would have to be more than the 22 scheduled releases in the plan. This welcome clarification is consistent with and compelled by the EIS, as well as the PVA because of the way that scheduled releases was defined in the plan and were modeled in the PVA. By defining a successful release to simply be survival of a pup in the wild until two years and of an adult for a year following release [259-263], the Plan does not incorporate the additional (reduced) probability of the wolf finding a mate and producing pups the actual appropriately complete metric for measuring results in improving the genetic health of the wild population. To its credit, the Service did not wholly ignore these factors. The PVA modeling used 78% as the probability of the marriage-aged wolves finding a mate [193-201] and 80% as a weighed average of the likelihood that various aged wolves, with different degrees of kinship, would actually produce pups [210-227]. Assuming that these factors are correct, the 22 scheduled releases would actually introduce their genes into the population 22 x .78 x .8 = 13.7 times.

Our response: The Plan calls for the survival of released wolves for 1-2 years (dependent on age of the animal) following release, after which time they would be subject to the annual survival rate specified by the appropriate PVA model scenario. Because adults die and/or fail to produce pups in a given year, but may produce pups in the following years, the calculations are more difficult than the review suggests. For example, over their adult lifespan a given wolf would have an approximately 50% probability of producing a litter from one year to the next, contingent on their survival to the next breeding season. Assuming this 50% annual probability of breeding success (derived from PVA model output) and an annual adult survival rate of 0.8 (similar to current rates) following their successful survival after release, a female that just becomes an adult as a new 2-year-old has a $(0.8)^4 = 41\%$ probability of surviving to 6 years of age. If she were to survive to this age, the probability of failing to produce a litter during those five breeding opportunities (age-2 through age-6), simply assuming equal probability of breeding each year, is $(1\text{-}(\text{success}))^5 = (1\text{-}0.5)^5 = (0.5)^5 = 0.0313$. In other words, a newly recruited adult female would have a 97% chance of successfully producing a litter *at least* once by the time she reaches six years of age. It is therefore highly likely that the released wolves that survive to breeding age will have at least one successful opportunity to contribute their genes to the wild population. The PVA model is currently not structured to explicitly track these released animals through their reproductive lifespan and to confirm their breeding success following recruitment into the adult cohort. However, the genetic and demographic consequences of these releases are explicitly tracked, and the model results confirm that appropriate release schedules can improve the genetic and demographic viability of the wild populations through survival and subsequent reproduction of those released animals as dictated by the rules set forth in the PVA model structure. Thus, we felt that the number that survived to reproduction age was the appropriate number to marry model results to real world indices.

Resolution: No further action.

Comment: Recovery Actions #92
A comprehensive set of demographic recovery criteria should include criteria on the size of individual subpopulations, the number of subpopulations, and the degree of metapopulation connectivity. The status of two populations of the same size would differ if one was stable while the other was declining.

Demographic recovery criteria should thus specify both the required state or status and trend over time in population size and demographic rates. The draft plan predicts that at the time of recovery, Mexican wolf populations will be stable or increasing in abundance, well distributed geographically within their range, and genetically diverse. However, this statement is at odds with the results of the PVA, suggesting that the draft plan is internally inconsistent and that the draft plans proposed criteria are inadequate. These aspects of the PVA results are obscured in the draft plans text but become evident once more detailed and comprehensive PVA metrics are evaluated. The draft plan proposes recovery criteria related to population size which are purportedly supported by results of the baseline scenario (379_200_200_249_EISx220_20"). I reran this scenario and explored the output in greater detail than is presented in the PVA report. Although the PVA simulations were run including all 3 populations, I focus primarily here on results for the US (MWEPA) population, because: a) this is the largest population and thus has the highest probability of persistence and retention of genetic diversity (i.e. resilience in the face of known threats), and, b) the FWSs mandate for recovery is strongest for recovery efforts within the US. The baseline scenario resulted in a MWEPA population that was, on average across simulations, in decline after 39 years, due to accumulating effects of genetic and other small population threats. Populations that are projected to be in decline cannot be considered "stable or increasing", and anticipated decline in a population, even if extinction itself is delayed, indicates that threats have not been adequately addressed and that population size criteria are too low. It should be noted that support for the adequacy of the population threshold is highly contingent on assumptions that adult mortality will be <= 24.9%/year, yet, unlike in the earlier draft plan (MWRT SPS 2013), no recovery criterion in the 2017 draft plan addresses the threat of human caused mortality.

Criteria addressing genetic threats. The criteria proposed in the draft plan do not objectively and adequately address known genetic threats to Mexican wolves. The plan proposes that threats to genetic diversity will have been addressed when a cumulative total of releases from the captive population has been reached. This is a metric that measures the history of recovery efforts but says nothing about the actual genetic status of the wild population at the time of delisting. The baseline PVA scenario suggests that a specified number of releases to the MWEPA (70, composed of 28 adults and 42 pups) results in a certain effect on genetic diversity of the wild population in the simulations. However, the PVA uses a highly simplified model of real world wolf populations. It is certain that the individuals actually released into the wild will not be exactly the same genetically as those projected to be released in the simulations, and that subsequent matings and offspring production in the wild population will not match those that occur in the model simulation. FWS recovery guidance correctly concludes that PVA should not be viewed as a replacement for criteria based on threats, but as a supplement to them. The criteria describe the conditions under which it is anticipated the PVA would indicate long term viability" (Interim Recovery Guidance 5.1:18).Therefore, the plan should base the recovery criterion addressing genetic threats on a metric related to the actual genetic status of the wild population at the time of recovery, not a ...

Our response: Additional model scenarios have been included in the PVA that explore the conditions under which wild Mexican wolf populations can achieve long-term demographic and genetic stability – characterized by negligible declines in mean population abundance over time in the absence of diversionary feeding. No PVA model can simulate the full suite of biological, ecological, genetic and behavioral processes that characterize real wildlife populations, and the individuals within them, with complete accuracy. While recognizing this reality, the current Mexican wolf PVA uses what is likely to be at least one of the most complex and detailed Vortex-based model structures yet created for wildlife population risk assessment. This model is itself based on the highly-detailed model discussed in the published work of Carroll et al. (2014). The excellent original model structure has now been expanded to include other aspects of wolf biology and management in order to provide even more insight into management actions required to achieve recovery of the species in the wild. We also plan to convene a genetic management group (this is also included as an activity in Implementation Schedule Table) to assist us with genetic management and recovery of the Mexican wolf, including addressing monitoring

the gene diversity in the wild populations. Thus, assumptions of the model can be monitored and compared with the performance of the wild population through time.

Resolution No further action.

Comment: Recovery Actions #131
SCBNA and ASM assert that a 10% risk of extinction within 100 years is significant and would not represent a recovered species. The Draft Recovery Plan does not present scientific support nor does it cite literature to support this threshold. Shaffer first discussed acceptable extinction risk in 1981, proposing what he acknowledged was an inherently arbitrary threshold for species persistence: A minimum viable population for any given species in any given habitat is the smallest isolated population having a 99% chance of remaining extant for 1000 years despite the foreseeable effects of demographic, environmental, and genetic stochasticity, and natural catastrophes. We must stress the tentative nature of this definition. The critical level for survival probabilities might be set at 95%, or100%, or any other level. Similarly, the time frame of 1000 years might be lengthened to 10,000 or shortened to 100. Even if a 100-year threshold is deemed appropriate for setting acceptable risks of extinction, it is important to note that using the threshold of 90% chance of persistence equates to a risk of extinction risk that the IUCN red list considers vulnerable. At a minimum, the Draft Recovery Plan should include an explanation as to how the proposed level of extinction risk was determined and how it is consistent with the Endangered Species Act.

Our response: See Doak et al. (2015). A persistence probability of 90% over a 100-year timeframe is a common threshold used in many Service recovery plans, as well as species conservation strategies around the world. The IUCN's Red list mechanism for assessing species endangerment – a system where more than 80,000 species worldwide have been rigorously assessed by taxonomic experts and associated conservation biologists – uses similar thresholds for persistence using established scientific theory. For example, a species that would classify as "Vulnerable" under the Red List classification scheme would be shown to have a probability of extinction of at least 10% over 100 years. Therefore, a taxon whose risk is less than this threshold would not be considered "Vulnerable" but would instead potentially be classified as "Near Threatened" or perhaps even "Least Concern" based on other considerations.

Resolution: No further action.

Comment: Recovery Actions #177
Consistent with best practice in recovery planning, point estimates of population viability from the Vortex model should be used as one source of information in a decision support context. Consistent with Congress intent to institutionalize caution in order to avoid uncertainty about a species future status, recovery plans should identify criteria that provide a margin of safety because they resulted in conditions under which the species is unlikely to become threatened or endangered again in the foreseeable future: 1) a low predicted potential for extinction (e.g., <1% over 100 years), and 2) a high likelihood that populations would meet specified size criteria over the long term. Due to the role wolves play in their ecosystems (Estes et al. 2011), such precautionary criteria also increase the probability of conserving ecosystems and ecosystem function (16 U.S.C.Â§1531(a)(5)(b)). The proposed recovery criteria do not meet either of these standards, due to at least two factors. Firstly, the extinction risk threshold proposed in the draft plan (10% extinction risk over 100 years) is unusually high and inconsistent with generally accepted practice. A 10% extinction risk over 100 years is considered by the IUCN red list to place a species in the vulnerable category. Secondly, even using the overoptimistic baseline parameters, PVA results indicate that delisting of the MWEPA population at the proposed size (320) would result in a significant (40%) risk of the population falling below that threshold of 320 in the future and needing to be relisted. This is due to genetic and other risks to small populations, and occurs despite the fact that the proposed threshold at which removal of wolves to cap the population will begin (379) is higher than the delisting threshold of 320.

Our response: See Recovery Actions #131 comment.

Resolution: No further action.

Appendices- Mexican Wolf Habitat Suitability Analysis in Historical Range in Southwestern US and Mexico, April 2017 version

Comment: Mexico #113
Data for assessing the suitability of habitats in Mexico and used in the Vortex PVA model are fraught with uncertainty.

Our response: To accommodate for uncertainty, Martínez-Meyer et al. (2017) provide different scenarios (optimistic, intermediate, pessimistic), as well as provide suitability with and without ungulate biomass information. Martínez-Meyer et al. (2017) appropriately document the uncertainty and provide the best available information relative to prey densities and other parameters used to estimate suitable habitat for Mexican wolves. The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

Resolution: No further action.

Comment: Mexico #340
The data that is used in the habitat analysis to assess factors related to survival (e.g. roads; INEGI 2000) in Mexico has well known limitations. The data is much less comprehensive in representing unpaved roads than are US roads data sets, leading to an overestimate of suitable habitat in Mexico. Additionally, those prey surveys that are available for northern Mexico are primarily from game farms (UMAs) or lack sufficient sample size and cannot be easily generalized beyond the limited area in which surveys have been conducted, so cannot be used to provide a robust landscape scale estimate of prey abundance or wolf carrying capacity. Previous Mexican wolf recovery teams have concluded that, due to alteration by human development and resource use of the historic habitat inhabited by Mexican wolves in Mexico, recovery of wolves in Mexico will be slow and will not contribute demographically to the larger metapopulation in the short and medium term.

Our response: Martínez-Meyer et al. (2017) used the world database open street map (http://www.openstreetmap.org/) for the whole area of analysis. They selected only roads suitable for two-wheel drive vehicles. They then compared this database with the Mexican national network of roads map and complemented the open street map with the Mexican data source for the Mexican portion of the study area because they found dirt roads suitable for two-wheel drive vehicles that were not present in the open street map. In handling the data this way, Martínez-Meyer et al. (2017) layers are comparable in both countries and all roads passible with two-wheel-drive vehicles are included. In addition, the link established in the literature between roads and wolf presence are related to roads passable by two-wheel-drive-vehicles (Thiel 1985, Fuller et al. 1992, Mladenoff et al. 1995, Mladenoff et al. 2009: see Martínez-Meyer et al. (2017) for full citations). It is important to note that roads passable by two-wheel-drive roads includes some upaved roads. Unidades de Manejo para la Conservación de la Vida Silvestre (UMAs) are units of conservation and do not resemble Game Farms. UMAs are established for many species subject to use (plants, butterflies, deer, etc). Even UMAs established primarily for white-tailed deer are not artificially managed deer farms, but rather protected wild lands where ungulate populations thrive naturally. Martínez-Meyer et al. (2017) did not use UMA data for either elk or mule deer modeling, but UMA data was utilized for white-tailed deer modeling in combination with aerial and camera trap surveys. Thus, white-tailed deer ungulate biomass was not explained solely by UMA data. Indeed, the variability in methods for estimating white-tailed deer likely led to the low percent of variance explained by the white-tailed deer models (see Table 8 in Martínez-Meyer et al. 2017). Further, Martínez-Meyer et

al. (2017) appropriately note: "Our estimates of prey density and UBI come with significant uncertainty, mainly for the Mexican portion of the distribution of the wolf. In Mexico the only wild ungulate that is a primary prey for the Mexican wolf is the Coues white-tailed deer and our analysis revealed the density modeling for this species is the weakest.....Nonetheless, it is important to note that our relative ungulate density results for this species do capture the general geographic patterns of density known for this species in the US (J. Heffelfinger [AZGFD] and S. Liley (NMDGF]). Despite this general agreement with known variations in elk, mule deer, and white-tailed density, the UBI values for any given pixel may not accurately represent the actual biomass at that location. Currently, there is no better information available on prey density, so it is clear that an urgent next step is to carry out a coordinated effort to gather updated, systematic field data that fulfills the needs for robust rangewide ungulate density estimations. In the meantime, we present biological carrying capacity estimations for the Mexican wolf in the different areas where suitable habitat exists, according to our geographical analyses."

Resolution: The 5- and 10- year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

Comment: Mexico #357
The report states that [m]ost of high-suitable areas for wolves [in Mexico] are under private lands. The word most implies that the actual value lies somewhere between 51-99%. No quantitative data on land tenure patterns are presented. No assessment of the attitudes of private landowners in areas identified as suitable habitat was conducted. And no survey of landowners willingness to allow wolf recolonization on their property was conducted. Thus, it is impossible to predict, with any acceptable degree of certainty, how many wolves can be supported in Mexico; and it is egregiously unscientific for the USFWS to count highly speculative goals and potential carrying capacity estimates for restoration of wolf populations in Mexico toward the overall recovery goals for the Mexican gray wolf.

Our response: Almost all (95-99%) of the highly suitable areas for wolves in Mexico are privately owned. However, private ownership in Mexico is not equivalent to the United States. For instance, ejidos are communal properties, but privately owned and protected areas are placed on top of existing land ownership patterns in Mexico. Anthropogenic factors, such as human population density, infrastructure (e.g., roads, settlements), land tenure and protection are key factors to consider relative to wolf population establishment. The purpose of the habitat suitability analysis was to identify areas holding favorable conditions for the reintroduction and recovery of the Mexican wolf across its historical range, in order to provide authorities of the two countries with reliable information for decision-making. To that end the anthropogenic variables considered in Martínez- Meyer et al. (2017) were: (1) human population density and (2) road density. The recovery plan has been extensively reviewed by the Mexican government and has been approved through Comisión Nacional de Áreas Naturales Protegidas (CONANP). Attitudes of private landowners and willingness to accept wolves on their property are addressed through local contacts by our Mexican colleagues.

Resolution: The 5- and 10- year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

Comment: Range #336
Do the occurrence locations used to build the model represent the pre-settlement distribution of the

Mexican wolf? The relevance of climatic niche model results is dependent on the quality of the input distributional data. Historical species locations should be representative of the fundamental climatic niche of the species, rather than biased by uneven survey effort or past extirpation of the species from otherwise suitable habitat. Extirpation of wolves, including Mexican wolves, from large portions of their historic range occurred prior to the era when the locations used in the niche model were collected. The conclusions of the habitat analysis regarding the extent of climatically suitable habitat contrast with those of previous niche models (e.g. Hendricks et al. 2016; see Figure 2). This may be partially due to two contrasts between the distributional data used. Firstly, Hendricks et al. (2016) included 7 northerly sample points from areas with historical admixture between Rocky Mountain wolves and Mexican wolves. Secondly, the habitat analysis reviewed here includes many anecdotal reports of wolf occurrence from the southern portions of the range in Durango, Mexico, but does not include similar survey effort in other regions. The sensitivity of results to alternate input data sets suggests caution before excluding northerly areas from consideration as suitable habitat.

Our response: The ecological niche model (ENM) developed by Martínez-Meyer et al. (2017) was based on historical specimens within the historical range as presented in Parsons (1996). These samples were used to create/calibrate the model, while anecdotal reports were only used to validate the model. The 7 northerly sample points utilized in Hendricks et al. (2016) fell outside the range of Parsons (1996). The analyses of Martínez-Meyer et al. (2017) appropriately describe their methods so that other scientist may choose other approaches. In addition, Martínez-Meyer et al. (2017) included all historical records of wolves (irrespective of putative subspecies) found inside the range of Parsons (1996) and excluded those found outside of this range. Thus, determining the "realized niche" was not the goal of the authors.

Resolution: No changes.

Comment: Range #338
Does the final suitability map (here a binary consensus map) accurately represent the aggregate model results? The final binary map of suitable vs. non-suitable habitat produced in the habitat analysis is quite conservative in its bias towards delimiting a less extensive region of suitability. The analysis excludes 4 of the 8 models tested due to their over prediction" (i.e., identification of areas not within the limited set of occurrence data). Next, the analysis further limits the region of suitability to areas where 2 or more of those 4 models simultaneously identified habitat. In contrast, Hendricks et al. (2016) retained information on areas of lower climatic suitability (Figure 2), as such options may be important to planners if other factors such as human caused mortality risk impact areas of higher predicted climatic suitability.

Our response: The ecological niche model developed by Martínez-Meyer et al. (2017) is the model referred to in this comment and does not represent “suitable” habitat, which is developed through the inclusion of additional variables later in the Martínez-Meyer et al. (2017). Martínez-Meyer et al. (2017) state in the methods section that: “We validated each model using a set of metrics based on the model’s performance in correctly predicting presences and absences (Fielding & Bell 1997; Allouche et al. 2006). We selected the best models according to a combination of four metrics: omission and commission errors (i.e., the number of presences predicted as absences and vice versa), True Skill Statistic (TSS), and chi-squared values.” In evaluating the models in this fashion, Martínez-Meyer et al. (2017) produce a reproducible method to evaluate the quality of the models. Over prediction in this case simply means that there were errors of commission (i.e., including points that represented pseudo-absence in the area predicted) in those models. In this case four of the models represented the data in the most appropriate fashion based on these test statistics. Martínez-Meyer et al. (2017) chose to utilize areas where two of the models concurred on climatic suitability (ecological niche), other authors (i.e. Hendricks et al. 2016) may choose differing methods, but neither is right or wrong, per se. Regardless, any model is really just a hypothesis to compare future results to.

Resolution: No changes.

Comment: Range #339

Do secondary variables used to screen areas within the climatic niche accurately represent non-climatic limiting factors? The habitat analysis reviewed here does not adequately consider several major limiting factors for wolf survival and persistence. The primary factor limiting wolf distribution is human caused mortality (Fuller et al. 2003, Mladenoff et al. 2009). The past 20 years of experience from wolf recovery efforts in the US demonstrates that large blocks of public land are key to at least the initial stages of wolf recovery. This is true even in states such as Wisconsin, where territories of recolonizing packs were initially anchored by the few blocks of federal and state forest lands. The habitat analysis provides no data demonstrating that sufficiently large habitat blocks, suitable to support a population of a wide ranging carnivore such as the wolf, currently exist in Mexico. 40% of the US southwestern landscape is federal public land, but these conditions do not exist in Mexico, where >95% of the landscape is in small private landholdings. The FWS conducted an analysis in 2012 that concluded that potential recovery areas in Mexico were not only smaller, but also had far higher livestock density (making conflict with wolves more likely) and lower native prey biomass than areas in the southwestern US (Table 1). The experience with wolf recovery in Mexico to date has reinforced the sense that recovery of a widely ranging carnivore in such a landscape of fragmented private holdings is challenging: wolves must be supplementally fed to discourage them from ranging beyond the site of reintroduction into the broader high risk landscape.

Our response: The purpose of the habitat suitability analysis was to identify areas holding favorable conditions for the reintroduction and recovery of the Mexican wolf across its historical range, in order to provide authorities of the two countries with reliable information for decision-making. To that end the anthropogenic variables considered in Martínez- Meyer et al. (2017) were: (1) human population density and (2) road density. We recognize that recovery in Mexico will face substantial biological, logistical, and legal challenges (e.g., lower quality suitable habitat, lower ungulate biomass, a lack of Federal lands, weaker regulatory protections, multiple forms of human-caused mortality, a wide network of roads increasing wolf human interaction and wolf vulnerability to human caused mortality), and we appreciate that many experts are skeptical recovery can be achieved in Mexico. Failure to show substantial progress at both the 5- and 10-year benchmarks would be evaluated carefully and, depending on the level of progress observed, could be viewed as an indication the standards intended by our 1984 Experimental Population final rule (49 FR 33885, August 27, 1984) and 50 CFR 17.81(a) were met. In other words, if we fail in the best location in Mexico after ten years (17 years after reintroductions began), the habitat may no longer be able to support a recovered population there and it may be necessary to try elsewhere.

Resolution: The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

Comment: Range #344

I appreciate the following text from pages lines 1018 -1025 of the habitat model: "We consider that recovery efforts should focus in areas where conditions" both environmental and social are favorable. This habitat suitability analysis is only the first of a series of steps that should be considered to select specific sites for further releases. Therefore, the scope of this study is to identify those areas in which suitable habitat conditions prevail and thus fieldwork should be initiated to evaluate environmental parameters like prey and cattle density, habitat condition, and social aspects such as land tenure, attitude towards the presence of wolves, and safety conditions for field teams, among others." That the habitat suitability analysis is identified as just the first of many steps is quite interesting, and is the first hint that the analysis is insufficient as the undergirding for the draft recovery plan. The gray wolf is one of the most intensively studied large mammals in the world. The biological requirements for the species are well understood as are the biological and socio-political requirements for population establishment/persistence and eventually recovery. From the work in the US since the early 1970s those requirements have been:

large tracts (millions of acres) of federal public lands, robust populations of widely distributed prey, relative scarcity of livestock (cattle and sheep), and properly constructed and enforced wildlife protection laws (e.g., the ESA). The primary shortcoming of the draft recovery plan is an unjustified reliance on a niche centric habitat model that concluded that Mexico possesses sufficient habitat to support restoration efforts to establish a wolf population (of 170 animals) that counts toward recovery. Indeed, that conclusion is the linchpin of the draft recovery plan.

Our response: Martínez-Meyer et al. (2017) carried out the Mexican wolf habitat suitability analyses in six steps: (1) reconstruct the historical distribution of the Mexican wolf via ecological niche modeling; (2) compilation, organization and standardization of compatible environmental and anthropogenic habitat variables for the two countries; (3) estimate ungulate density across the historic range of the Mexican wolf; (4) model the habitat suitability across the historic range of the Mexican wolf; (5) identify the largest, continuous patches through a landscape fragmentation analysis; and (6) estimate the possible number of wolves in those suitable areas. Martínez-Meyer et al. (2017) demonstrate that there are areas of suitable habitat for Mexican wolves in Mexico, and Mexico is a committed partner in recovery. Therefore, we expect the successful establishment of a population of Mexican wolves in Mexico will contribute to the achievement of our recovery criteria.

Resolution: The 5 and 10-year status reviews, discussed in Section V. of the recovery plan, will assess progress toward recovery and help us determine whether our current strategy is effective or needs to be revised. If we determine the recovery strategy is not proving effective and the expected recovery level is not achieved, we will identify the reasons for such finding and, if necessary, revisit the recovery strategy and work with States and others to identify other areas with suitable habitat and adequate prey to achieve recovery; change techniques used to address gene diversity; or implement other substantive change.

Comment: Range #351
While [habitat niche] models are useful when applied in the appropriate context, they have well known limitations and should not be used in isolation to assess habitat availability for recovery, as they measure only one dimension of a complex habitat niche.

Our response: Climatic suitability (Ecological Niche Model) is just one of the variables the Martínez-Meyer et al. (2017) analysis used to determine suitable habitat for wolves. Martínez-Meyer et al. (2017) carried out the Mexican wolf habitat suitability analyses in six steps: (1) reconstruct the historical distribution of the Mexican wolf via ecological niche modeling; (2) compilation, organization and standardization of compatible environmental and anthropogenic habitat variables for the two countries; (3) estimate ungulate density across the historic range of the Mexican wolf; (4) model the habitat suitability across the historic range of the Mexican wolf; (5) identify the largest, continuous patches through a landscape fragmentation analysis; and (6) estimate the possible number of wolves in those suitable areas.

Resolution: No further action.

Comment: Range #352
Proposed Delisting Rule at 35698; see also Proposed Rule To Revise the List of Endangered and Threatened Wildlife for the Gray Wolf, 76 Fed. Reg. at 260140 (Wolves are highly adaptable habitat generalists, and their primary biological need is an adequate natural prey base of large ungulate). If wolves are habitat generalists who primary need is an adequate prey base, how does the FWS know that wolves will consider areas unsuitable based on factors such as high human density and livestock density? There is no indication in the Recovery Plan that USFWS has assessed prey availability in southern Arizona, or has evaluated any of the other factors that are needed to sustain a population of wolves.

Our response: Mexican wolves historically inhabited montane woodlands and adjacent grasslands in northern Mexico, New Mexico, Arizona, and the Trans-Pecos region of western Texas (Brown 1988) at elevations of 4000-5000 ft. where ungulate prey were numerous (Bailey 1931). The suitability of an area

to sustain wolves is influenced by both biophysical (vegetation cover, water availability and prey abundance) and socioeconomic (human population density, road density and land status) factors. We generally consider the most important habitat attributes needed for wolves to persist and succeed in pack formation to be forest cover, public land, high native ungulate density, and low livestock density, while unsuitable habitat is characterized by low forest cover and high human density and use. Recognizing the wide variation in the amount and location of suitable habitat within the MWEPA, the 2015 Final 10(j) Rule identified three management zones within which different management actions would occur. Prey biomass is particularly difficult to approximate across broad areas. In the absence of international raster layers showing accurate levels of ungulate biomass, Martínez-Meyer et al. (2017) used the best scientific and commercially available data to estimate biomass as accurately as possible by: (a) acquiring all appropriate prey data, (b) developing models that reasonably reflected these estimates across a broad area, and (c) appropriately identifying the inherent weaknesses in the data. Martínez-Meyer et al. (2017) utilized all ungulate density information available to construct the models so validation was based on the r square values of deviance explained by the GLM and Random Forest linear models. Because of uncertainties with prey and the lack of independent validation, Martínez-Meyer et al. (2017) provide Mexican wolf suitability evaluations with and without prey data. The two methods are remarkably similar in where suitable habitat exists, lending credibility to the overall analysis. Martínez-Meyer et al. (2017) used human density to limit the amount of suitable habitat because there is an established link in the literature between human density and wolf occupancy. Livestock density is not used in Martínez-Meyer et al. (2017) because the scale of the data that is available is too broad (e.g., at county levels) to identify quality habitat.

Resolution: No further action.

Comment: Range #353
This long list of admitted uncertainties in the habitat analysis data, especially with regard to habitats in Mexico, raises serious concerns. One of the most important attributes contributing to habitat quality for wolves is the density of wild ungulates. The ungulate biomass index (UBI) data for Mexico are so poor and uncertain that correlations between prey density and expected wolf population density could not be made.

Our response: Martínez-Meyer et al. (2017) referred to the UBI as a less reliable variable compared to the other variables. Martínez-Meyer et al. (2017) note the uncertainty in whether the UBI values accurately estimate ungulate biomass, but also appropriately suggest that the associated layers provide a relative estimate of ungulate biomass across the landscape.

Resolution: No further action.

Comment: Range #355
Since ungulate density (and by extension, the entire prey base including cattle) in Mexico remains un-researched, the writers have no scientific basis for their earlier conclusion that suitable habitat exists in Mexico. All they looked at is vegetation and human density and that information is insufficient to adequately evaluate habitat suitability for what FWS considers the most endangered species on the planet.

Our response:
Prey biomass is particularly difficult to approximate across broad areas. In the absence of international raster layers showing accurate levels of ungulate biomass, Martínez-Meyer et al. (2017) used the best scientific and commercially available data to estimate biomass as accurately as possible by: (a) acquiring all appropriate prey data, (b) developing models that reasonably reflected these estimates across a broad area, and (c) appropriately identifying the inherent weaknesses in the data. Martínez-Meyer et al. (2017) utilized all ungulate density information available to construct the models so validation was based on the r square values of deviance explained by the GLM and Random Forest linear models. Because of uncertainties with prey and the lack of independent validation, Martínez-Meyer et al. (2017) provide Mexican wolf suitability evaluations with and without prey data. The two methods are remarkably

similar in where suitable habitat exists, lending credibility to the overall analysis.

Resolution: No further action.

Comments: Range #101, Range #102, Range #125

- The FWS states in the Draft Biological Report that "low livestock densities" are one of the "most important habitat attributes." Nonetheless, Martínez-Meyer et al. (2017) analyzes potential "habitat" under the false assumption that livestock do not exist, never existed and never will exist in the MWEPA and the Sierra Madre Occidental.
- Martínez-Meyer et al. (2017) serves as a primary example of taxpayer-funded pseudo-science. It fails to consider historical or existing livestock densities after the Draft Biological Report states how important "low livestock densities" are to the suitability of wolf habitat; it fails even to test theoretical habitat models across a range of arbitrary livestock densities; and fails to present sufficient data to support its obviously pre-determined conclusions.
- By omitting any examination of historical and current cattle density estimates, and utterly ignoring depredation statistics, Martínez-Meyer et al. (2017) implicitly concludes that cattle presence is not a significant factor in Mexican wolf habitat suitability. In fact, the report falsely concludes that habitat suitability was appropriately determined without examining available commercial and scientific information on cattle densities. This assumption and unsupported conclusion is self-contradictory and mutually exclusive to the aforementioned quoted statements in the DBR and in Martínez-Meyer et al. (2017).

Our response: Data on livestock densities are not available across the study area at the scale needed for inclusion in the model. Martínez-Meyer et al. (2017) note that the habitat suitability analysis "is only the first of a series of steps that should be considered to select specific sites for further releases" and that "the scope of this study is to identify those areas in which suitable habitat conditions prevail and thus fieldwork should be initiated to evaluate environmental parameters like prey and cattle density, habitat condition, and social aspects such as land tenure, attitude towards the presence of wolves, and safety conditions for field teams, among others" (Martínez-Meyer et al., 2017, lines 1018-1025). We do consider livestock numbers and presence in the evaluation of the suitability of initial release and translocation sites. Previous experience in the reintroduction project in the U.S. has shown that successful initial release sites have a relatively abundant prey base of elk, limited or no livestock calving in the area, and clear separation from established wolf pack territories. As part of the evaluation we assign a "depredation score" based on: a) the number of livestock scheduled to be on allotments within five miles of the initial release or translocation site (either seasonally or year round) (b) whether the initial release or translocation occurs on an active allotment, and (c) the depredation history within one year for wolves initially released or translocated from a particular site.

Resolution: No further action.

Comment: Range #223

Habitat Area. The1982 Recovery Plan determined that there was a lack of suitable habitat at the time for full recovery. What has enhanced the habitat since 1982? Today there are more people, more roads, more cars, and more communities than could have even been imagined in 1982.

Our response: At the time the 1982 Mexican Wolf Recovery Plan was written the Mexican Wolf Recovery Team saw "no possibility for complete delisting of the Mexican wolf." The team felt that "conserving and ensuring the survival of the Mexican wolf is the most that can be achieved today" and recognized that Recovery Plan's prime objective that included the reestablishment "…of at least 100 Mexican wolves in the middle to high elevations of a 5,000-square-mile area within the Mexican wolf's historic range" represented "a working hypothesis" which would be "subject to amendment as more data on the Mexican wolf are acquired." No comprehensive survey or analysis of suitable habitat across Mexican wolf historical range was undertaken in support of the 1982 Recovery Plan objective. As the effort to reintroduce Mexican wolves has progressed there have been a number of efforts to identify and

quantify areas containing suitable wolf habitat both in the U.S. and Mexico. However, as Martínez-Meyer et al. (2017) note these efforts: "used different methodological approaches and … covered only some portions of the historical distribution range of this subspecies, making it impossible to have a comprehensive understanding of where and how much habitat is left for maintaining long-term, viable free-ranging populations of the Mexican wolf". In support of the development of this revised Mexican Wolf Recovery Plan, Martínez-Meyer et al. (2017) carried out a habitat suitability analysis across the whole historical range of the Mexican wolf, from southern Arizona and New Mexico and western Texas, in the US, to central Oaxaca, Mexico, using input information for both countries and under a uniform methodological scheme. The results of this analysis concluded that there is still sufficient habitat remaining in the US and Mexico to support viable populations of the Mexican wolf in the wild.

Resolution: No further action.

Comment: Range #226
This document does not represent a viable wildlife recovery plan. While components of a wildlife recovery plan are addressed, they are often addressed only vaguely and lack specificity or clarity necessary to effectively describe management actions. Large amounts of forested terrain (line 292) with adequate ungulate populations represent the extent to which the plan addresses habitat and prey requirements for Mexican wolves. This falls short of conventional explanations of habitat and prey abundance requirements in standard wildlife management plans by professional organizations. Greater effort was needed in describing and quantifying what constitutes large amounts of forested terrain and adequate prey abundance.

Our response: Land cover/vegetation type and ungulate biomass were two of the natural variables considered in the habitat model developed by Martínez-Meyer et al. (2017). The detail requested by the commenter is available for review in the supporting analyses, Mexican Wolf Habitat Suitability Analysis in Historical Range in Southwestern US and Mexico, April 2017 to the Biological Report (Martínez-Meyer et al. (2017).

Resolution: No further action.

Comment: Range #195
Finally, the USFWSs plan fails to provide any explanation for why it completely disregarded habitat in the recovery plan. The draft plan admits that the Draft Biological Report considers adequate habitat availability/suitability to be one of four stressors (USFWS 2017;18) and then promptly dismisses it as a threat to be considered within the context of the plan (Ibid.) The decision to ignore this stressor entirely and not include habitat expansion, improvement, and diminished habitat threats as important to the recovery strategy (i.e. resiliency, redundancy) is unexplained. There is no reason provided in the plan for omitting this important part of the problem of Mexican wolves (i.e. reducing other land uses that impair conservation/recovery through prey displacement and social intolerance) from the potential actions necessary to achieve the conservation and recovery of the species. There are notably no habitat-based objectives in the plan, such as protecting denning habitat from livestock threats, minimizing the threats of increased predation through carcass disposal, etc.

Our response: We conducted a five factor analysis of threats to the Mexican wolf in our Final Rule listing the Mexican wolf as an endangered subspecies (80 FR 2488, January 16, 2015). We found that the combined threats of illegal shooting, small population size and genetic challenges (inbreeding, loss of heterozygosity and loss of adaptive potential) to be those factors significantly affecting the Mexican wolf. We did not find habitat destruction, curtailment, or modification to be significantly affecting the Mexican wolf or likely to do so in the future. Within the context of the recovery plan, we consider the threats to the Mexican wolf to be excessive human-caused mortality demographic stochasticity associated with small population size, and loss of gene diversity. Our recovery planning describes adequate habitat availability/suitability as a potential stressor and ensuring adequate habitat is available to support a

recovered Mexican wolf population as "central to the recovery effort." To that end we carried out a habitat suitability analysis with the intent to identify areas holding favorable condition for the reintroduction and recovery of the Mexican wolf across its historical range. Martínez-Meyer et al. (2017) describe suitable as areas that are good enough (in terms of human, road density, vegetation types) to support wolves. Habitat with high quality was described as areas within suitable habitat that had the best conditions (e.g., lower densities of roads and humans, and higher UBI) to support a population of wolves. The management measures as described in the 2015 ROD and the 2015 Final 10(j) Rule will continue as part of the recovery strategy as outlined in the Recovery Plan. Therefore, we will employ management actions to: reduce wolf-livestock and wolf-human conflict through the implementation of pro-active measures to avoid and minimize depredation; facilitate the provision of compensation for the economic impact of wolves on rural ranching communities; employ a phased management approach in Arizona to minimize or avoid possible adverse impacts to wild ungulate populations (specifically elk); allow take of Mexican wolves under specific criteria, and continue to work collaboratively with state and local governments, tribes, livestock producers, state game and fish departments, and stakeholder organizations to achieve the social tolerance for wolves in rural communities necessary to achieve Mexican wolf recovery.

Resolution: No further action.

Comment: Range #545
While the Draft Plan, and underlying Biological Report, relies on a recent HSA, the HSA does not constitute the best available science itself. First, it should be noted that the HSA was largely funded by the Arizona Game and Fish Department. As noted earlier, the State of Arizona has been openly hostile to recovering Mexican wolves within their state borders, and has done everything in their power to limit and control the success of the recovery program. This factor alone places an air of bias over the study at the outset.

Our response: The habitat suitability analysis (Martínez-Meyer et al. (2017), included as an appendix to the Biological Report, was authored by a group of independent biologists and scientists from multiple respected institutions and agencies including the Universidad Nacional Autónoma de México, University of Arizona, Universidad Autónoma Metropolitana Unidad Xochimilco, Universidad Autónoma de Querétaro and the Service. A long list of contributors, including the Arizona Game and Fish Department (AZGFD) which provided funding for the study, are recognized on the "Acknowledgements" page of the report. We do not concur with the commenter's statement that the study reflects the bias of any particular institution or agency.

Resolution: No further action.

Comment: Range #546
It is disingenuous for the Service to claim that it is basing the Draft Plan on the best available science when the underlying technical report upon which the Service is making such an assertion does not actually analyze suitable habitat on the whole, but rather only looks at habitat below the international border based on so-called "geopolitical reasons."

Our response: Martínez-Meyer et al. (2017) carried out the Mexican wolf habitat suitability analyses in six steps: 1) reconstruct the historical distribution of the Mexican wolf via ecological niche modeling; (2) compilation, organization and standardization of compatible environmental and anthropogenic habitat variables for the two countries; (3) estimate ungulate density across the historic range of the Mexican wolf; (4) model the habitat suitability across the historic range of the Mexican wolf; (5) identify the largest, continuous patches through a landscape fragmentation analysis; and (6) estimate the possible number of wolves in those suitable areas. We do not concur with the commenter's statement that "geopolitical reasons" were all, or even part, of the analysis of suitable habitat "below the international border."

Resolution: No further action.