Dr. Darin Cramer
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Forest Practices Division
WDNR

Reviews for: (**SRC 09_10_01)**
for WDFW

Jan 26, 2010

Dear Dr. Cramer

Attached with this email you will find 4 files (besides a copy of this letter). One attached pdf file is the summarization by Associate Editor (AE), Dr. Todd Fuller, of the reviews of "**Draft Wolf Conservation and Management Plan for Washington-Alternative 2. Preferred Alternative**" prepared by Gary Wiles and Harriet Allen under the direction of the Washington Department of Fish and Wildlife (WDFW) October 2009. The other three attached pdf files are the three reviewers' comments. WDFW asked for 3 reviewers for this management plan document. This was a one-stage type review (no interaction between reviewers and WDFW). Besides the expertise of the AE contributing to this review as a wildlife conservationist, the reviewers have backgrounds that include carnivore ecology, wildlife habitat, and conservation biology.

The Associate Editor and reviewers have presented their comments related to the standard basic questions of SRC's reviews and those questions presented by WDFW. In synthesizing the reviews the AE said that "overall, the reviewers and I find the plan to be a thoughtful, wide-ranging document that, in order to lay the groundwork for wolf management in Washington State, anticipates the looming controversies, provides a comprehensive review of the literature, and comes to a compromise recommendation that reflects interpretations, opinions, and values of the advisory group authors." But the AE also suggests that there appears to be a good number of shortcomings that need to be addressed. However the Associate Editor believes that "these points can be addressed and resulting plan revised such that the chances for success are high."

If you have any other questions, let me know!

Sincerely

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Reviewer #1 - Comments on "Draft Wolf Conservation and Management Plan for Washington"

First of all, I commend the time, effort, and thoroughness of this management plan. The authors and members of the wolf advisory group put a lot of thought and effort into this plan, and for that I appreciate their dedicated service and brain power to this very ambitious plan. The plan as presented seems to be a compromise of many conflicting interests and likely was not easily achieved. Overall the plan is well written and very comprehensive of the literature. Presentation of the relevant data is clear and the plan appears to be well prepared.

As requested, I will address the 'basic questions' for this review, followed by the 'focus questions'. Some ideas or comments are presented as examples under the basic questions, and then are also presented under the focus questions as they relate to the integrity of the management plan itself. I attempted to be objective and unbiased while reviewing the management plan and hope my suggestions are useful for the state. My comments range from very general suggestions on the language of the overall document, while some comments are related to specific topics. I also reviewed this plan from the view of potential pitfalls of the plan and hope some of my criticisms are viewed in the constructive manner in which they are intended.

BASIC QUESTIONS

B1. Are rigorous, transparent and sound research and statistical methods followed?

(a) Since this is a management plan and not a research document, it is difficult to evaluate this question. Overall, the plan attempts to be rigorous in its approach to wolf recovery. However, the plan has several ambiguous terms or ideas that need defining or criteria for justification and clarification. Some areas or objectives have some background material, but leave the door open for interpretation and potential misinterpretation by other interested parties. For example, throughout the document the term "self-sustaining population" is used. How will self-sustaining be determined? Is this going to be decided using wolf population growth rates, population size, public tolerance, genetic diversity, stable age structure, or stationary numbers of animals? Also, the term "high probability of persisting" is open to interpretation and defining what criteria will be considered is important in order to determine success of recovery. Another term in the plan is a "significant portion of the species' former range" which is open to interpretation. The department may wish to consider defining these terms more clearly or placing criteria or side-bars about these terms to prevent future misinterpretation.

(b) In addition, the plan states that the management plan will be a "fair balance between conservation needs and the needs of the public." Who and how will this balance be determined? What process or procedures will be utilized to determine imbalances when conservation needs and public desires/needs are in conflict? It would be good for the plan to have criteria or stated actions to resolve future conflicts. For example, in Arizona

the recent agreement between the U.S. Fish and Wildlife Service (USFWS) and conservation organizations regarding the "3 strikes" rule for removing problem wolves in the Mexican Wolf Recovery Area had to be settled via a lawsuit. This 3 strikes rule was considered not in the best interests for wolf recovery/conservation, yet had been institutionalized as a public need. It would be better for the department to address these areas of concern or conflict up front in the plan rather than going to court as the USFWS ended up doing.

(c) The management plan has objectives that also states that management will "not negatively impact the recovery or long-term perpetuation" of a sustainable wolf population. How will these negative impacts be measured or determined? What criteria will trigger an adaptation to the current management plan? Who will review these data and make that determination? The plan implies that a review would occur, but how often will this review occur and who will conduct that review? Oftentimes, the public is mistrusting of state and federal agencies, so outside experts are sometimes used to review the data and make recommendations to the agency. Also, any public review will take forever, so a team of unbiased and objective persons would be best for these reviews, either a scientific review or outside review. In other words, will science dictate the direction of adaptive management, or will politics drive the final outcome? On the Red Wolf Recovery Program, the lead agency (USFWS) has worked closely with a scientific implementation team that reviews the service's data and plans. This collaborative approach of scientific suggestions and recommendation made to the service has worked very well for the red wolf recovery program.

(d) The plan states that ungulate herds will be managed to provide an adequate prey base for wolves. How will this be accomplished? What is "adequate prey for wolves"? Again, these objectives are rightly stated, but open to interpretation by either side of wolf recovery. Hunters may claim their harvest opportunities have declined, while conservation organizations may claim hunters are over-harvesting game populations and therefore hunter harvest is detrimental to "adequate prey" for wolves. Whether the state wishes to tackle these prickly questions right now in this plan to up to them, but these are cautionary hints from other wolf recovery programs and the thorny issues that trying to appease all sides is difficult, but the state will need to take the lead on these issues.

(e) The plan states that they sought to "establish a wolf conservation program that is achievable, realistic, fair, flexible….for meeting wolf conservation goals." While I definitely commend the department for stating these ideals, I wonder how the department will address or balance priorities when they are in conflict? As commented previously, these are worthy ideals to state, but some will undoubtedly come into conflict with one another. The department should have some plan of action to address these conflicts, or at least some plan to resolve said conflicts. How will the department set priorities? Will science lead the way, or politics and lawsuits?

B2. Is there sufficient detail in the document to reproduce the study?

Again, since this document is a management plan, the detail provided to reproduce the study is more of a research question, rather than a management question. However, the ambiguity of certain terms and objectives could use a more detailed approach. Several examples follow:

(a) The plan does not clearly state the direction of management following delisting of wolves. The department might wish to consider a conservative approach at first following delisting. The recovery areas in Washington appear to be very disjunctive from one another and are very dependent upon the wolf populations in the surrounding states and Canada. Having the wolf as a state protected species for a few years following delisting would allow for the state to determine baseline population dynamics and mortality rates before subjecting the population to additive mortality from legal harvest (i.e., hunting or trapping). In addition, the average growth rate of wolf populations in adjacent states is about 17% annually. Therefore, if wolves are declared a game animal following delisting, a 15-17% harvest rate seems manageable for a wolf population in this region and would make a good starting point. Continued monitoring of the wolf population would be needed to determine if the population drops below the requisite 15 pairs following delisting.

(b) How will the state determine the wolf must be relisted? The current plan is far too ambiguous about the criteria to trigger relisting. Saying that they will review the issue or plan some meetings is asking for a lawsuit from the environmental groups. A clearer statement within the plan would be useful to detail just what criteria would trigger relisting. Since the stated recovery goal is 15 successful breeding pairs for 3 years for delisting, would less than 15 breeding pairs for 3 years trigger relisting? Will only 1 breeding pair of wolves tilt how the state will classify wolves in WA? This is something that the department may wish to define within the plan.

B3. Were data reasonably interpreted?

The data on wolf numbers, biology, and conflicts with livestock and big game from the surrounding states of Montana, Idaho, and Wyoming are reasonably presented and interpreted. The inclusion of the economic aspects of wolf recovery and the attitudes of WA residents was an important addition to the document.

B4. Do the stated conclusions logically flow from the results?

While there really is no conclusion per se for this document, I believe the ideas and objectives of the management plan do flow logically from the data presented from the other states (MT, ID, WY) currently undergoing wolf recovery. Essentially the “plan” builds on findings from these 3 other states and presents a sound implementation and monitoring plan for wolf recovery.

B5. Do the literature citations include the latest applicable information and represent the current state of scientific understanding on this topic?

I commend the authors for delving thoroughly into the literature on wolf recovery, the potential impacts, and the ecosystem processes that may be affected. The authors used the current literature that is available on this topic.

B6. Are uncertainties and limitations of the work stated and described adequately?

(a) The plan implies that habitat connectivity will be maintained or restored without really addressing how that will be done or even determined. Development in valley bottoms is recognized as a problem, but never addressed as to any management action or recommendation. Maintaining cross-border connections is identified as vital, but how will this be determined or managed, or even restored? The plan has a lot of 'talk' about the important of maintaining "connectivity", but never addresses 'how' that connectivity will actually be maintained or restored. While the ideals of connectivity are nice to read about, some level of substance on how these ideals will be accomplished would really make this document have some teeth.

(b) Connectivity of dispersal corridors will be important during the recovery phase and to maintain sustained population growth and genetic exchange between the 3 recovery areas in Washington. Will human development in those areas be monitored, or will development plans be reviewed to minimize negative impacts? Will developments be curtailed in those corridors similarly to reducing development in winter ranges for deer and elk? Again, this is more of a policy question, but it has biological implications for wolf recovery and maintaining adequate prey populations as well.

(c) The plan states that the recovery goal of 15 successful breeding pairs is below that thought needed for long-term persistence of an isolated population. Yet, then continues to state that 15 breeding pairs is believed to be sufficient to result in the reestablishment of a self-sustaining recovered wolf population. These 2 statements are in conflict of one another. The plan further states that 15 breeding pairs is considered minimal or barely adequate for population viability. With these statements so contradictory of one another, it seems that the plan needs to clearly state how 15 breeding pairs was determined. Since the plan states that biologically 15 breeding pairs are not viable or sustainable, then the choice of 15 pairs must have been a political choice or compromise. If this is indeed the case, then the state should clearly state this as so, and remove language stating they plan to have a self-sustaining viable population when they also state that 15 breeding pairs does not allow for sustainability nor viability. If in fact the state does want to have a self-sustaining and viable wolf population, then the recovery level needs to be higher. The plans objectives and target numbers for recovery are contradictory, and will be opening the state to future lawsuits.

B7. Are assumptions stated and described adequately?

Many of the assumptions are stated from ideas and data collected in the other 3 states undergoing wolf recovery. They are described adequately, but a plan to address these assumptions is lacking in several areas, mainly connectivity and viability of the overall wolf population.

B8. Is the information presented in an accurate, clear, complete, and unbiased manner and in a proper context?

The authors compiled a lot of information and data, and wrote a very clear and comprehensive document. They presented this information in a clear and unbiased manner.

FOCUS QUESTIONS

F1. The conservation/recovery objectives to achieve a recovered, self-sustaining wolf population in a significant portion of its range…..

(a) The plan has several ambiguous terms or ideas that need defining or criteria for justification. Some areas or objectives have some background material, but leave the door open for interpretation and potential misinterpretation. For example, throughout the document the term "self-sustaining population" is used. How will self-sustaining be determined? Also, "high probability of persisting" is open to interpretation and defining what criteria will be considered is important in order to determine success of recovery. Another term in the plan is a "significant portion of the species' former range" which is open to interpretation. The department may wish to consider defining these terms more clearly or placing criteria or side-bars about these terms. In addition, the plan states that it will be a "fair balance between conservation needs and the needs of the public." How will this balance be determined? What process will be utilized to determine imbalances when conservation needs and public desires/needs are in conflict? It would be good for the plan to have criteria or stated actions to resolve future conflicts. For example, in Arizona the recent agreement between the USFWS and conservation organizations regarding the "3 strikes" rule for removing problem wolves in the Mexican Wolf Recovery Area had to be settled via a lawsuit. This 3 strikes rule was considered not in the need for conservation, yet had been institutionalized as a public need. It would be better for the department to address these areas of concern or conflict up front in the plan rather than going to court as the USFWS ended up doing.

(b) The plans objectives also states that management will "not negatively impact the recovery or long-term perpetuation" of a sustainable population. How will these negative impacts be measured or determined? What criteria will trigger an adaptation to the current management plan? Who will review these data and make that determination? The plan implies that a review would occur, but how often will this review occur and who will conduct that review? Oftentimes, the public is mistrusting of state and federal

agencies, so outside experts are sometimes used to review the data and make recommendations to the agency.

(c) The plan gives a thorough review of the current issues surrounding wolf recovery in the west and pays service to the many ideals of connectivity, genetic diversity, population sustainability, viability, etc., but never really addresses those issues as to what the state will actually do. Stating that they will monitor connectivity is only using buzzwords to appease the public, but what will the state actually do if in fact the connectivity is poor and establishment of wolves in the western part of the state, mainly the Olympic peninsula and southern Cascades does not occur. The Seattle/Olympic metropolitan area is a very large bottleneck and barrier for wolves to surmount. How will the state address that issue? The Columbia River basin is also a large barrier for wolf movement from east to west; how will the state address that barrier to genetic exchange? My main concern with these questions or concerns is that the state plan pays 'lip service' to these ideals but is setting themselves up for a lawsuit because the plan does not actually do anything to face or deal with these very real issues. Stating that recovery may take decades to achieve also seems to be an exit strategy of letting the next generation of biologists deal with these issues, but we'll just keep doing business as usual (i.e., human development in ungulate winter ranges and dispersal corridors). WA has a unique opportunity here with this plan, but at times it falls short of its overall theme. I definitely commend the state for putting together this ambitious plan, but felt it needed to go that extra step.

(d) The plan states that the recovery goal of 15 successful breeding pairs is below that thought needed for long-term persistence of an isolated population. Yet, then continues to state that 15 breeding pairs as sufficient to result in the reestablishment of a self-sustaining recovered wolf population. These 2 statements are in conflict of one another. The plan further states that 15 breeding pairs is considered minimal or barely adequate for population viability. With these statements so contradictory of one another, it seems that the plan needs to clearly state how 15 breeding pairs was determined. Since the plan states that biologically 15 breeding pairs are not viable or sustainable, then the choice of 15 pairs must have been a political choice or compromise. If this is indeed the case, then the state should clearly state this as so, and remove language stating they plan to have a self-sustaining viable population when they also state that 15 breeding pairs does not allow for sustainability nor viability. If in fact the state does want to have a self-sustaining and viable wolf population, then the recovery level needs to be higher. The plans objectives and target numbers for recovery are contradictory, and will be opening the state to future lawsuits.

(e) Because of the low connectivity of the recovery areas within the state and the high human population, the lower end of wolf population density estimates (12-25 wolves/1,000 km^2) is most likely to be obtained for the state. Washington does not have the large blocks of wilderness or public lands, nor the high ungulate densities as Idaho and Montana.

Therefore, the conservation estimate would be for about 200-250 wolves in the state. The authors of this plan have stated that about 500 wolves in a population is considered viable, therefore, this lower estimate of population size falls below the "accepted" population size necessary for "viability". If this lower size turns out to be true, how will the state accomplish a sustainable and viable wolf population if the landscape will not support as many as hoped? Again, my main emphasis for this comment is for the state to enter into delisting cautiously because the language used in this document "viable" and "sustainable" have certain contextual undertones for biological systems and opens the door for interpretation as to "how many wolves are needed for viability and sustainability" in Washington. Not only is "population viability" being contested constantly in the courts for endangered species recovery, but it is still debated among population ecologists and population genetics. Perhaps WA should consider how their population of 15 breeding pairs will contribute to the overall recovery of wolves in the northern Rockies. Connectivity between the recovery areas and source populations that have wolves appears to be quite low particularly for the Olympic area and southern Cascades. High rates of illegal take of wolves has occurred in the other Rocky Mountain states, and could be devastating to a small recovering population. During early recovery of wolves in the Great Lakes region, and even in the Mexican wolf and Red wolf recovery areas, mistaken identity between wolves and coyotes has led to a high take of wolves. The common accuse of "I thought it was a coyote" has been generally accepted by law enforcement, but can have a significant impact on population growth. While not addressed in this plan, would state officials consider closing coyote hunting, mainly during the elk and deer hunting seasons, in recovery areas to reduce poaching of wolves? Much of the illegal killing of wolves (10% of the wolves are killed illegally each year) occurs during the deer and elk hunting seasons and simply closing the coyote seasons during those few weeks in just the recovery areas would greatly improve survival rates and reduce disturbance of breeding pairs entering into the breeding season. As delisting occurs or wolf populations increase in these recovery areas, then restrictions on coyote hunting could be relaxed as the impact of illegal take would be less detrimental to wolf population growth. In addition, coyote hunting within dispersal corridors between wolf recovery areas could also significantly reduce the likelihood of a wolf surviving while passing through the dispersal corridor.

(f) Small sized packs with around 5.1 animals per pack are likely the pack size that may establish in Washington given the more deer-based economy available to WA wolves. Therefore, if this is true, than the 15 packs/pairs gives WA about only 75-80 wolves which is not sustainable or viable for the long-term population goal. Does the state have a plan to augment small packs? Department may wish to consider cross-fostering of pups into existing packs if possible or feasible. Perhaps pups from other states from which the adults are being removed could be cross-fostered into wild packs in WA. This could only be done successfully if the pups are <4 weeks of age. The finding that 10 or more wolves

in a pack is needed to increase the likelihood of pup survival also begs the question: can small packs be actually increased or augmented? Or if there are small packs, how might pup survival be increased? All these concerns hinge on the likelihood of low survival and low connectivity on the landscape due to high dispersal distances with high human densities between recovery areas. Also, if pack size is small, will WA consider revamping its 15 pairs as the delisting number and consider more packs and pairs to obtain a sustainable population size of 250-300 wolves in the state.

(g) Plan reports that in Idaho pack territories are about 360 square miles in size. If given the estimated 26,000 square miles of potential suitable habitat in WA, then around 72 packs could persist if all suitable habitat is filled. While one could argue that only 15 pairs or packs would give WA about 75-80 wolves (assuming 5 wolves/pack), there could also be potential space for 72 packs which would produce about 350 wolves in the state. Is WA also willing to allow this number of packs to persist? While this document supports having 15 pairs/packs, more packs (as readily stated in this plan) would be better and give a higher probability of population persistence. Therefore, is the department willing to allow 25-30 packs to persist and give a better chance of population sustainability and genetic viability or diversity. I offer this because this plan really focuses on a minimum population for delisting of 15 pairs, then explicitly recognizes that that number is too low by many scientific standards of sustainability and genetic viability. Therefore, I wonder if the department would accept a higher recovery goal of 25 pairs as an alternative given that they have already stated that 15 pairs is too low. Granted I recognize the political consequences of increasing the recovery goal, but the plan continually states that the goal is a self-sustaining and viable wolf population.

(h) How or will genetic diversity be monitored? The plan states that isolated populations of 100 wolves will lose genetic variation and become inbred. What if the goal of 15 pairs only totals <100 wolves? What will the state do to insure genetic diversity….more wolves, more pairs? If connectivity, and therefore genetic diversity, is negatively impacted by harvest in BC and Idaho, how will the state maintain genetic diversity among the WA wolf population? Is reintroduction a plausible tool at that time? The plan has placed side-bars of no reintroduction of wolves, but why not use it to maintain genetic diversity?

(i) The plan does not clearly state the direction of management following delisting of wolves. The department might wish to consider a conservative approach at first following delisting. The recovery areas in Washington appear to be very disjunctive from one another and are very dependent upon the wolf populations in the surrounding states and Canada. Having the wolf as a state protected species for a few years following delisting would allow for the state to determine baseline population dynamics and mortality rates before subjecting the population to additive mortality from legal harvest (i.e., hunting or trapping). In addition, the average growth rate of wolf populations in

adjacent states is about 17% annually. Therefore, if wolves are declared a game animal following delisting, a 15-17% harvest rate seems manageable for a wolf population in this region and would make a good starting point. Continued monitoring of the wolf population would be needed to determine if the population drops below the requisite 15 pairs following delisting. How will the state determine the wolf must be relisted? The current plan is far too ambiguous about the criteria to trigger relisting. Saying that they will review the issue or plan some meetings is asking for a lawsuit from the environmental groups. A clearer statement within the plan would be useful to detail just what criteria would trigger relisting. Since the stated recovery goal is 15 pairs for 3 years for delisting, would less than 15 pairs for 3 years trigger relisting? Will only 1 pair of wolves tilt how the state will classify wolves in WA? This is something that the department may wish to define within the plan.

(j) The plan states that a population viability analysis (PVA) would not be informative to the state. I would have to argue that the state should consider conducting a population and habitat viability analysis (PHVA). This could actually help the state in recovery planning and lend a level of scientific credibility to determining target objectives for population persistence or sustainability. The PHVA could also allow for examination of different management scenarios within each recovery area given the numbers of humans and livestock surrounding those target areas. It could also assist in determining habitat connectivity and identify potential corridors that need protection from development. Updating the model as data is collected will help refine population goals and allow for more adaptive management actions as recovery proceeds.

(k) While the plan states that translocation of wolves will be used to achieve recovery goals, it seems that with the Olympics and southern Cascades the potential for natural colonization is minimal at best. Rather than translocating WA wolves out of other recovery areas in the state and potentially impacting those local areas (i.e., if there are only 4 pairs in that recovery area, removing even 1 pair constitutes a 25% reduction in that recovery area), why not consider bringing wolves from Canada into those western recovery areas? This would speed recovery and increase genetic diversity.

F2. Assessments and recommendations regarding risks to wolf recovery associated with planned management strategies to address livestock conflicts.

(a) The finding that 75% of WA residents support wolf recovery is an astonishing number, but this can also be used to the states advantage. Because many rural farmer and ranchers will oppose wolves as they will bear the economic costs of a recovering wolf population through livestock depredations, perhaps the state should consider funding their livestock depredation fund with a “wolf depredation” check-off on filing of state income taxes, and/or a “wolf recovery” license plate in which funds from those licenses goes into the compensation fund while urban folks can show their support for wolf recovery by

purchasing these license plates. Tapping into NGO's for funding, similar to Defender's of Wildlife compensation fund would also share or spread the burden/costs of wolf recovery.

(b) One of the non-lethal actions not mentioned in the plan, but the department may wish to consider is the use of reproductive interference, or sterilization. Since WA is a heavily urbanized state, lethal control will likely be very controversial in the state. An alternative is to use sterilization to control population size, but it also can reduce predation on livestock and big game species. Sterilization has been demonstrated to reduce coyote predation on domestic sheep and pronghorn antelope fawns, and has been shown to reduce wolf predation on native ungulates in the Yukon.

(c) Education of livestock producers and having a very short response time when livestock depredations are reported are very important components of the management plan for livestock predation by wolves. Responding in <24 hours is a key element; just having someone there and trying to do something to alleviate damage is paramount. Distribution of materials and tools on non-lethal measures is helpful for producers. Workshops by ranchers already dealing with wolf issues in Idaho and Montana presented in WA would be helpful. Burying and disposal of carcasses can be costly; a program in the Cody area of Wyoming has helped producers with disposal off of their own properties to reduce attracting wolves and bears (a fund helps defray the costs of moving dead livestock). The Range Rider program in Montana looks to be useful, but is very limited in scope. A more mobile response team of volunteer riders would be useful to alleviate losses for producers until a more long-term solution is available.

(d) Compensation programs for livestock losses should definitely be endorsed and implemented. Research in Idaho by John Oakleaf indicated that 7 calves are lost for every 1 calf found depredated by wolves, so the plan to compensate at a higher level (2:1) is commendable for the increased good will of livestock producer. Having some method for the general public to contribute to this compensation fund should be encouraged, either through a tax check-off or perhaps a "Wolf" vehicle license plate to produce revenue. Allowing some level of lethal removal will be needed as wolves recover, but this should be strictly monitored and attempt to be more "surgical" in nature to remove the offending individual wolves, rather than being broad removal of all wolves around the kill site. Confirmation of livestock losses by trained personnel will also be needed to lend credibility to the compensation fund. Covering veterinary costs to injured animals of producers is also commendable, but may wish to expand this to pet owners and houndsmen.

F3. An evaluation or assessment of the recovery and management strategies proposed in the minority report and the preferred alternative draft plan as they relate to the likelihood of achieving recovery.

The preferred alternative presented in this plan has a much higher likelihood of achieving recovery than the strategy presented in the minority report. The recovery objective and strategy outlined in the minority report will not achieve recovery in the state of WA.

F4. The discussion on the potential effects of wolves on ungulate populations in WA and anticipated depredation levels of domestic livestock.

(a) Management of wolves in relation to elk herds should be conservative in approach. For example, the North Cascade elk herd currently numbers 600 elk. The plan indentifies that intensive logging and loss of winter range from urban development and agricultural conversion are the main threats to the herd. If wolves establish in that area and begin preying on the elk herd, lethal measures to control wolves will likely have little or no effect on elk population growth rates. Management actions that actually address the main threats (logging and development) would be more useful and effective.

(b) State game officials may be presented with having to manage the wolf population should the wolves start to significantly impact the Columbian white-tailed deer or Mountain caribou populations. With 2 recovering and threatened species, public relations and good sound data/science will be needed to combat the outcry from both the hunter groups and environmental groups.

(c) Whether or not the state is interested in research examining trophic interactions and ecosystem dynamics outside of protected areas (i.e., national parks) during and following wolf recovery could be very important to demonstrate the wolf can be an asset to ecosystem functions. As stated in the plan, most research on this topic has been restricted to national parks and if the state can partner with university collaborators, it could prove valuable to examine these interactions outside national parks, particularly if areas without wolves can be monitored prior to translocations into that recovery area.

Other comments regarding the management plan:

(a) Education of the general public will be a necessity to reduce human-wolf interactions. Habituation is a real concern, particularly in a heavily urbanized area as western WA. A noted wolf biologist once said that to see wolves up close in Yellowstone was a real treat and a special memory for the public. You could hear the wildlife law enforcement (i.e., the park rangers) give a collective groan at that statement as they will be the ones dealing with humans and wolves in close proximity to one another. It is a fine gradient between having the public tolerate wolves, and wolves becoming too tolerant of humans. Regrettably it is the wolf that ultimately pays the price for human stupidity (e.g., feeding of wildlife in Olympic National Park).

(b) Under the monitoring part of the plan, I would recommend hiring at least 4 wolf specialists to handle the large area that wolves will likely cover as recovery proceeds. If

these specialists are in charge of confirming livestock losses and monitoring wolves during recovery, they will also need technician assistance to keep up with the wolf population monitoring. Also, the state should consider hiring a wolf research biologist to handle the sampling design, data analysis, and oversee the collaborative research projects with universities.

(c) Creation of a scientific review panel that meets annually may be beneficial for the state. This panel would review the data collected and make recommendations to the lead agency for future monitoring efforts to determine the success of the recovery program. A good example of this collaborative approach is between the Red Wolf Recovery Program (USFWS) and the Red Wolf Recovery Implementation Team (a group of ecologists not employed by the USFWS).

Reviewer #2 - Comments on "Draft Wolf Conservation and Management Plan for Washington"

I have completed my review of the Washington Department of Fish and Wildlife's ("Department") Draft Wolf Conservation and Management Plan for Washington ("plan"). This ambitious, comprehensive document seeks to lay the groundwork for wolf management in Washington State just as wolves are recolonizing this portion of their former range. Relative to just about everything humans do, the proactive nature of this plan is remarkable and commendable. Rather than wait for wolves and humans to come into conflict and force capricious and under-thought action, the Department and its advisory Wolf Working Group ("Group") have learned from neighboring states and anticipated where wolves and people will interact and suggest how best to preclude hardship to either species.

Despite the important proactive nature of the plan, I have fundamental concerns about it and believe that the stated recovery targets are insufficient. I expand upon these concerns in my answers to your questions, but summarize my main concern as follows. The resulting plan represents many diverse viewpoints about Washington's wolves and the challenges Washingtonians and wolves will confront as a charismatic and controversial predator regains its place among the State's diverse natural settings. Unfortunately the diversity of human viewpoints, while important and real, compromises the stated intentions of the plan. This plan does not ensure the "reestablishment of a self-sustaining population of gray wolves in Washington", but I believe it does "encourage social tolerance for the species by addressing and reducing conflicts." The inability to meet these twin goals is a reflection of the diverse nature of the group and the stipulation that consensus drive decision making. I believe a better approach would have been to task a scientific group to devise a plan to reestablish a self sustaining population of wolves and simultaneously charge a different group to devise a plan to foster social tolerance and reduce conflicts between that biologically defensible number of wolves and people. By mixing these charges in the present group a compromised plan has been produced that may not meet the full needs of wolves. This is a plan aimed to allow wolves to recolonize the state with as little fuss as possible. This framework and the discussion among group members that produced it are useful, but the State of Washington still needs a plan to guide wolf recovery from a purely biological perspective.

As requested, I have organized my review as answers to your Basic (B1-B8) and Focus (F1-F4) questions.

B1. Are rigorous, transparent and sound research and statistical methods followed? As a review document and plan, rather than a research report this question is largely irrelevant. So, I evaluated the plan as a fact-finding investigation and ask two related questions: 1) is it thorough and unbiased in its presentation and synthesis of factual matter; and 2) are all appropriate analytical approaches utilized. I believe the plan is a through and careful review of wolf biology including population growth after colonization, food and habitat requirements, and potential interactions with people and their resources (livestock, pets, etc.). I saw no bias in how this material was presented, but the interpretation of how wolves will affect people to some extent depends on the people you ask, so some synthesis is biased by who is on the Group (see B7).

Importantly, I do not believe that the Group or Department utilized all appropriate analytical tools. Despite, the plan's claim that population viability analysis (PVA) need not be done at this time, I believe this is a major shortcoming. PVA is an analytical tool that can be used proactively to evaluate how various management options affect the likely persistence of a species and understand what aspects of a population are critical to its growth (see B5). I agree with the plan authors that PVA cannot be used to make precise estimates of wolf sustainability in Washington at this time, but PVA definitely can and should be used to evaluate the relative likelihood that recovery targets will produce self-sustaining wolf populations. PVA could also be used appropriately at this time to understand the sensitivity of wolf population persistence to lethal management of various age cohorts, pack distribution, effective population size, birth and death rates, and prey populations. PVA at this time can provide relative, rather than absolute, answers. It would be an appropriate mechanism to evaluate the likelihood that wolves could continue to persist in Washington if their numbers reached the various thresholds proposed as a consensus or as a minority view (Appendix D). Without this analysis I cannot fully evaluate the biological appropriateness of the plan's downlisting and delisting criteria.

B2. Is there sufficient detail to reproduce the study? Given the nature of the study as a review, yes the detail is there in who was consulted and what publications were cited.

B3. Were data reasonably interpreted? Most of my discussion of this topic will be in focus questions below, but generally the data that are presented are reasonably and thoroughly interpreted.

B4. Do conclusions flow from results? In a general sense yes the conclusions flow from the results of confronting biological data with social reality. But in my opinion this is both a strength and a major weakness of the plan. What is presented, as a plan is really a patchwork quilt of wolf biology and human emotion. In the end, as we have learned in other western states, wolf recovery depends in large part on human values and emotions. But wolf recovery and conservation depends primarily on providing sufficient wild ungulate prey to support a wolf population sufficiently large enough to adapt to what will certainly be a changing environment. This basic assessment, from a purely biological perspective, is missing from the plan. The plan does not provide a clear biological assessment of how many wolves are required to form a self-sustaining population in Washington (especially in isolation from other neighboring populations). Yet the plan concludes that 15 pairs of wolves, reproducing for 3 years, in a variety of geographical locations in the state will in fact be self sustaining (wolves will then no longer need to be managed as a sensitive species). This conclusion does not flow from wolf population biology; it is simply a compromise between what wolves appear to need in other western states and what the Group could tolerate in Washington. So, while it flows from the result of groupthink, it does not flow from the result of scientific evaluation. The conclusion is arbitrary and capricious.

What is needed is a clear, unbiased, wolf-centric analysis of how many wolves are needed, and then a clear, human-centric analysis of how this number can be obtained in Washington. I would be happy to start with the analyses done in Wyoming, Montana, and Idaho that conclude 15 breeding pairs and a mid-winter population of 150 wolves are needed to preclude a reasonable

need to relist the species. And then I would like to see a spatially explicit analysis of Washington ungulate populations that would show where they could and could not support such a wolf population. And finally a spatially explicit analysis of where human needs on private lands would not allow the wolf population that ungulates can support. From that analysis a socially tolerable plan to maintain a biologically sustainable wolf population could be provided. If the derived plan is tolerable and reasonable, then it could justifiably be called a "conservation" plan. If it is not it should be called something else, for example a "tolerance" plan. The general conclusion of this report is that a conservation plan has been developed for wolves in Washington, but I cannot conclude that this is logical because what is presented is only the compromised plan of human tolerance and wolf needs. These two, intertwined aspects of wolf planning need to be unraveled for the conclusions the authors desire (a conservation plan) to flow logically from what is presented.

B5. Does cited literature reflect current scientific understanding? Yes, for wolves and ungulates. No for population viability analysis or recovery planning. The broad uses of PVA are not represented in the current plan. The authors should consult a diverse array of literature on PVA and understand how it can be used at present to inform the current plan. A few relevant and recent studies include:

Population viability analysis of the Florida Grasshopper Sparrow (Ammodramus savannarum floridanus): Testing recovery goals and management options
Author(s): Perkins DW, Vickery PD, Shriver WG
Source: AUK Volume: 125 Issue: 1 Pages: 167-177 Published: JAN 2008

Incorporating catastrophic risk assessments into setting conservation goals for threatened Pacific Salmon
Author(s): Good TP, Davies J, Burke BJ, et al.
Source: ECOLOGICAL APPLICATIONS Volume: 18 Issue: 1 Pages: 246-257 Published: JAN 2008

Defining recovery goals and strategies for endangered species: The wolf as a case study
Author(s): Carroll C, Phillips MK, Lopez-Gonzalez CA, et al.
Source: BIOSCIENCE Volume: 56 Issue: 1 Pages: 25-37 Published: JAN 2006

Risk-based viable population monitoring
Author(s): Staples DF, Taper ML, Shepard BB
Source: CONSERVATION BIOLOGY Volume: 19 Issue: 6 Pages: 1908-1916 Published: DEC 2005

How much is enough? The recurrent problem of setting measurable objectives in conservation
Author(s): Tear TH, Kareiva P, Angermeier PL, et al.
Source: BIOSCIENCE Volume: 55 Issue: 10 Pages: 835-849 Published: OCT 2005

On the use of demographic models of population viability in endangered species management
Author(s): Beissinger SR, Westphal MI

Source: JOURNAL OF WILDLIFE MANAGEMENT Volume: 62 Issue: 3 Pages: 821-841 Published: JUL 1998

Recovery of imperiled species under the Endangered Species Act: the need for a new approach
Author(s): Scott JM, Goble DD, Wiens JA, et al.
Source: FRONTIERS IN ECOLOGY AND THE ENVIRONMENT Volume: 3 Issue: 7 Pages: 383-389 Published: SEP 2005

How much is enough? The recurrent problem of setting measurable objectives in conservation
Author(s): Tear TH, Kareiva P, Angermeier PL, et al.
Source: BIOSCIENCE Volume: 55 Issue: 10 Pages: 835-849 Published: OCT 2005

Prioritizing conservation activities using reserve site selection methods and population viability analysis
Author(s): Newbold SC, Siikamaki J
Source: ECOLOGICAL APPLICATIONS Volume: 19 Issue: 7 Pages: 1774-1790 Published: OCT 2009

Use of Population Viability Analysis to Evaluate CITES Trade-Management Options for Threatened Marine Fishes
Author(s): Curtis JMR, Vincent ACJ
Source: CONSERVATION BIOLOGY Volume: 22 Issue: 5 Pages: 1225-1232 Published: OCT 2008

B6. Are uncertainties and limitations of the work stated and described adequately? In general yes, the authors go to great lengths to state where their conclusions go beyond existing data. This is appropriate for a proactive plan.

But the specific and crucially important context that this plan is a compromise between what wolves need and what people desire is not explicit. I think it is important to make this point early and often in the plan. Again, the plan would gain strength in showing precisely how and where this tradeoff is made. Where in Washington are wolf needs met by the plan and where are wolf needs not met because of human priorities? To do this we first need the wolf-centric plan I described in B4.

B7. Are assumptions stated and described adequately? In many cases, yes. But an extremely important assumption is that the Group is a representative sounding board for crafting a conservation and management plan. I believe that representation and view angles of each Group member should be disclosed in the document. I could not find affiliations of all members listed in Appendix A, and there are no value statements from participants concerning their view about wolves in Washington. This would help me better understand the motivation of the recommendations generally and Appendix D specifically. A potential bias in the plan could also be determined by presentation of the relative composition of the Group. Given that 75% of Washingtonians favor wolf reintroduction, I would expect a similar mix to be used in forming the Group. Reading between the lines of Appendix D, this does not appear to be the case. It seems

closer to 50%, which, relative to State opinion, is skewed against wolf reintroduction. This may be fine for the purpose of the Group's input to WDFW, but it needs to be stated and the possible bias considered in the Plan.

B8. Is information presented accurately, clearly, completely, and in unbiased manner? It is clear and well written, but as I have indicated in my comments above and below it is not entirely accurate (Appendix D), complete (lack of PVA), or unbiased (reflects Group membership and compromise between biological needs of the wolf and Group's assessment of public will to live with the wolf).

F1. Recovery Objectives

The recovery objectives are not based on sound science. Rather they are a compromise of science and public acceptance. This is inconsistent with how recovery objectives should be developed. Federal recovery objectives, for example are required to based on biology only, not fiscal or social concerns. I believe that a panel of biologists would have determined different objectives.

The recovery objectives are not sufficient. I believe more attention needs to be paid to stipulating a total population size, not simply a breeding population size in the recovery objectives. The targets of 6, 12, and 15 pairs of wolves is roughly in line with the numbers of breeding pairs proposed to down- and de-list wolves in other western states. These are certainly minimal numbers, as the plan states. They may be adequate for Washington, but without population viability analysis I am not sure. My opinion is that this may be a suitable minimum breeding population for viability only if Washington's wolves are considered part of larger metapopulation. In addition, I believe that targeting only a minimum breeding population will not assure an evolutionarily sustainable total population. This is especially relevant for Washington because as the plan suggests, the total number of wolves that support 15 pairs in Washington may be smaller than in other states. 15 pairs may translate into as few as 97 individuals. A population of less than a hundred animals with 30 breeders results in an effective population size simply too small to be sustainable. A population that small is more under the influence of random genetic drift than it is under the action of natural (or artificial) selection. I think it is important that the wolves in Washington can evolve to the habitat, climate, and cultural attitudes of Washington. A larger effective population is needed to do so. This ability to track evolutionary and human-cultural challenges has not been adequately addressed. While a smaller population as will likely result if the current targets are maintained will contribute to the overall gray wolf population, but it will not be sustainable without strong inputs from neighboring states.

Washington's plan should produce a population that can survive even if it is not part of a larger effective metapopulation. To me this is what sets a State plan apart from a Federal plan. To do so requires stipulating a minimal total population. PVA can help with this assessment, but even with information provided in the plan I can make a reasonable first estimate. Targets in neighboring states include minimum total populations of 150 wolves in midwinter. And PVA work in Wisconsin suggests 300 individuals are needed for an isolated, self sustaining

population. I suggest a similar target be added for Washington. If we take the historical density of 12-25 wolves / 1000 square miles and the estimate that there are 26,700 square miles of wolf habitat in Washington today, then we might anticipate that the state should support somewhere between 320 and 668 wolves. This range in wolf population size is reasonable, similar to what is needed for a sustainable isolated population, and almost exactly what the range in population size of wolves is for Wyoming, Montana, and Idaho. It makes sense to me to work toward this overall population target (between 150 and 300 individuals), with the added stipulation that at least 15 breeding pairs be geographically distributed and temporally stable (as already included in the plan).

I have no concerns with the proposed geographic distribution of pairs. But I do take issue with the stipulation that pairs be productive for 3 consecutive years. First, generation time, not years may be more reasonable as a temporal metric (Extinction risk scales better to generations than to years Author(s): O'Grady JJ, Reed DH, Brook BW, et al.
Source: ANIMAL CONSERVATION Volume: 11 Issue: 5 Pages: 442-451. 2008). Three is arbitrary. What is needed is a requirement that at no time are fewer than 15 pairs reproductively successful. Committing to sustained productivity may in fact also require the larger total population size I suggest.

F2. Risks to wolf recovery associated with plan to manage livestock conflicts. I have one specific point that I would recommend be reconsidered. The plan calls for Wildlife Services to be involved in much of the lethal control that will be necessary. I have little faith in the agency to appropriately manage predators and pests. Speaking with managers in a variety of States (Montana, Wyoming, Alaska) and consulting the published reports of the agency, it is apparent that Wildlife Services kills many non-target species and does not fully consider what individuals and how many individuals need to be controlled. The plan should consider other options for who will do lethal control, and should detail who, when, and how lethal control decisions will be made. Experiences in Montana and Idaho may inform this discussion.

F3. Will the minority report enable recovery? No. This appendix is a plan for continued persecution of the wolf. It has no biological basis. It is a strong cultural statement, as far as I can tell written by direct genetic or cultural descendents of the Washingtonians that extirpated the wolf from the State. It is a more extreme position than taken by Wyoming, which has been widely criticized. Rather than enable recovery, it puts in writing the continued controversy and difficulty that will confront wolf re-establishment in Washington.

F4. Potential effects of wolves on ungulates and domestic livestock in Washington. This section on conflicts with livestock is extremely comprehensive and very well thought out. Table 7 is excellent. I have no issues with the variety of active and passive strategies.

The plan's consideration of ungulate herds is also adequate. I believe that a more detailed strategy of how ungulate habitat will be managed is needed, however. A key issue that is not discussed is how to make safe habitat, not just habitat. Perhaps new strategies can be developed to provide optimal cover for ungulates so that hunting success of wolves is not overly high.

One issue in ungulate management and an area of possible conflict with wolves is the issue of winter-feeding. I see no biological justification for winter-feeding of ungulates. To do so simply keeps ungulates above the carrying capacity that the land can reasonably sustain. This practice should be abandoned and habitat improvement, foraging easements on private lands, and other strategies should be developed now. Feeding ungulates is incompatible with maintaining natural predator prey dynamics and simply sets the wolf up for a conflict that it does not need.

Rather than feeding ungulates I suggest that all funds from those activities go into supporting incentives for landowners to provide food and cover. The greatest incentives should go toward those landowners who also tolerate wolf predation on their supplemented ungulates.

Other Issues

The issue of how wolves will be managed after they are delisted has not been raised in the present plan. This is something that perhaps can wait a few years, but much is now being learned about how state's manage delisted wolves. The authors should review what is being learned in the upper Midwest, and especially what is being learned in Montana and Idaho with respect to recreational hunting of wolves. It can be argued that building a hunter constituency for wolves will fund wolf management and broaden the base of public support for wolves in Washington. However, this must be done carefully. In Montana, for example, extremely charismatic individual wolves were shot just beyond the NPS boundary this autumn. The negative press resulting from unethical hunting practices will do much to unravel social tolerance for wolf management. Given that 75% of Washingtonians want wolves, the 25% who do not have much to lose if hunting and lethal control after delisting are done without a well reasoned and vetted plan. Based on Montana's experience, I would suggest that as wolves recolonize Washington and particularly valued packs or individuals are identified, that hunting and control management be sensitive to these animals and the strong human bond that is formed with them.

In Summary

We are approaching a turning point in human cultural attitudes towards predators. The majority of citizens want wolves in Washington, but many of them will not directly experience what it means to live with wolves. Many of those who will directly experience wolves expect that their ancestors' fear and hatred of wolves will be vindicated. I suspect neither is correct, but these polarizing views—that wolves are heaven or hell—are evident in the compromise plan put forth by the Washington Wolf Working Group. This plan is commendable in being proactive, but suffers from compromise. A clear, biologically based plan is needed so that the compromise I sense in the current plan can be evaluated in a less biased manner.

The plan could be improved in two major ways.

1. It should include a PVA at present to understand what drives wolf population growth in Washington and evaluate the relative efficacy of control and management strategies. Future PVAs should also be called for to evaluate decisions to down- and de-list wolves when population targets are reached. Rather than simply change listing status when a target is reached, the State should show that the population viability is improved at that time, so that the decision will not have to be quickly reversed.

2. Recovery targets must consider Washington as an isolated entity. Current recovery targets assume Washington's wolves will be part of a functional metapopulation with surrounding states and provinces. But as a State plan, this is not politically reasonable. State plans for other species (Western Gray Squirrel, for example) aim to manage for a sustainable State population. To do so for wolves, would require Washington to set higher recovery targets (closer to 30 packs). In addition, while the plan correctly focuses on breeding pairs, a sustainable State population also requires a robust non-breeding population. Setting total population targets is necessary, as it has been done in all other locations. The current plan needs to set such a target and I suggest that based on the work cited in the plan that Washington's plan should stipulate that between 150 and 300 wolves are needed for a viable population. Current wolf habitat should support between 320 and 668 wolves statewide, making a target sustainable population of 150-300 reasonable.

Reviewer #3 - Comments on "Draft Wolf Conservation and Management Plan for Washington"

BASIC QUESTIONS.

B1. Are rigorous, transparent and sound research and statistical methods followed?

The draft plan does seem to use a rigorous, transparent and sound research. Most of the plan is not original research, but a review of the scientific literature and input from various stakeholders, experts and committee members. The use of statistics is appropriate for the type of data presented. Some of the sections such as Land Management, Information and Education, and Research don't seem to be as fully developed as the earlier sections. These perhaps don't warrant the same level of background evaluation as the earlier sections, but perhaps could have been more fully developed. I have suggested some recommendations below.

B2. Is there sufficient detail in the document to reproduce the study?

As a review of literature, such an effort would be reproducible. The deductions made from the scientific literature and other research seem reasonable, and others examining similar information could come up with similar conclusions.

B3. Were data reasonably interpreted?

For the most part data was reasonably interpreted. The authors used 4 research projects to estimate areas of suitable wolf range and provided a good compromise of the estimated areas of suitable habitat in the state. Potential rates of depredations relied too much on studies in Northern Rocky Mountains, where sheep grazing were relatively more important and data from the Great Lakes region might be more appropriate for Washington.

B4. Do the stated conclusions logically flow from the results?
This question does not really fit well for this kind of draft plan development, but if this refers to population goals and management activity to attempt to achieve those goals, the draft plan provides reasonable background information for justification of the recovery goals. I have made some recommendations below for using population goals instead of numbers of successful breeding pairs, which I believe will be more difficult to measure, is perhaps not necessary, and would eventually result in similar population anyway.

B5. Do the literature citations included the latest applicable information and represent the current state of scientific understanding on this topic?

The literature seemed fairly extensive, but is perhaps more focused on western USA. I have provided some additional citations that could be used, including some that were recently published and were for the most part not available to the authors at the time of the drafting of the plan. Some of the additional citations may provide some different perspectives on management choices and wolf impact, but will likely not change overall management goals.

B6. Are uncertainties and limitations of the work stated and described adequately?

The draft plan does seem to include good discussions of the broad range of possible outcomes. The goals for population growth and distribution are broad enough to allow a broad range of possible outcomes and eventual distribution of wolves. The habitat information does suggest that large core habitat may be lacking in Washington. This may require greater attention be made to protect potential wolf habitat on national forests and parks in the state.

B7. Are assumptions stated and described adequately?

Broad assumptions are explained throughout the draft plan. In many cases the plan relies on models of wolf recovery in the Western USA. While often these are appropriate models, under some circumstances other areas may also provide good models. Washington has a much higher human population than most western US states, has higher percentage forest cover, has low abundance of sheep, and seems to have lower levels of rangeland grazing. Thus other wolf recovery programs in area areas with similar human populations and land use patterns, should also be considered as models to inform on wolf management.

B8. Is the information presented in an accurate clear, complete, and unbiased manner and in a proper context?

The information seems to be presented in clear fashion and I could not detect any specific biases. I have mentioned some missing data above in the overall review of the draft wolf plan. It appears that for the most part the authors have attempted to provide as complete as possible discussions of wolf recovery for Washington.

FOCUS QUESTIONS

F1. The conservation/recovery objectives to achieve a recovered, self-sustaining wolf population "..in a significant portion of its range" in Washington (state law, WAW 232.12.297), including numbers, duration and geographic extent.

The recovery objectives seem reasonable for achieving a recovered and self-sustaining wolf population across significant portions of its range in Washington. I do feel the concept of "successful breeding packs" as used in recovery plans for Northern Rocky Mountain wolves, may not be as easy to use as would direct population goals. While the concept of successful breeding packs relates more directly to effective population size, it can be a difficult characteristic to measure. In heavily forested areas, packs and their pups may not be readily observed during spring, summer and fall, and knowledge of successful breeding pairs at the end of the year, with winter just beginning, may be hard to achieve. With snow cover in mid and late winter, wolves will be more observable, and their tracks can be seen and counted in the snow. Also by urine scent marking behavior, and occasional estrus blood in urine, breeding packs can be readily determined in mid and late winter. Setting population goals at levels that would encompass the level of successful breeding packs, would eliminate the need to obtain summer-fall observational data on wolves and allow focus on estimating wolf numbers and breeding packs in winter when wolves are easiest to census. For distributions, I recommend using

breeding packs of $\geq$ 4 wolves in mid-winter instead of successful breeding packs at the end of December.
I discuss this concept more extensively below.

F2. Assessments and recommendations regarding risk to wolf recovery association with planned management strategies to address livestock conflicts.

Given that extensive areas exist on national forests that are not leased for livestock grazing, and many (most?) livestock are apparently raised on small fenced pastures on private lands, control actions on wolves are likely not to drastically affect population growth. In states such as Wisconsin where grazing of livestock does not occur on public lands, < 10% of packs in the state are involved in depredation on livestock. If similar numbers of packs are involved in depredation on livestock in Washington, control actions on these packs are not likely to have much of an impact on the wolf population. It would be useful in the plan to include figures on the number of livestock raised on public forest land verses those occurring on private pastureland. It may be also useful to apply some restrictions on public forest land to protect den and rendezvous sites, and keep road densities to low levels. Such restrictions could be relaxed once population goals are achieved.

The plan does discuss allowing some levels of lethal controls while wolves are state listed as endangered. Some limited levels of lethal controls may be appropriate if all nonlethal options are exhausted. But if wolves remain federally listed as endangered outside of experimental population areas, lethal controls through federal section 10 permits might not be possible. The USFWS granted section 10 permits in Wisconsin and Michigan in 2005 and 2006 when these states reverted to endangered status, but rescinded the permits after lawsuits were filed against the service for issuing these permits that allowed limited lethal controls. When wolves were again relisted as endangered in these 2 states in 2008 and 2009, section 10 permits with authority to allow lethal controls were not offered.

F3. An evaluation or assessment of the recovery and management strategies proposed in the minority report (Appendix D) and preferred alternative draft plan as they relate to the likelihood of achieving recovery.

The levels of wolves recommended in the minority report does not appear to be a wolf population level that would produce a self-sustaining, viable population of wolves and not likely to spread geographically across major portions of the state. The goal of 8 pairs and expected population of 80 wolves would be suitable only as a small population living close to Idaho border, because it would be highly dependant on regular dispersal from Idaho wolves to maintain population viability and to avoid genetic problems. The authors in the minority report argue for lower population goals because they expect lawsuits to restrict management activity and federal delisting in the region, but if opportunity for managing wolves are being restricted anyway, the low goal does not really matter. Plus low unsuitable population goals make any management plan more susceptible to lawsuit, which will restrict management activity. Wolf populations currently living in Wisconsin and Michigan are at levels of 626+ and 580+ wolves (winter 2009) respectively in states that have human population densities similar to Washington, and have lower levels of livestock depredations then experience by western states. Ironically keeping wolf

numbers at very low levels would more likely restrict wolves to extreme eastern Washington in areas devoted to livestock production, and would not allow wolves to spread more broadly across the state, and settle more areas away from livestock productions. Thus this smaller wolf population restricted to eastern Washington might be more of a problem wolf population, than a larger population that is well spread across the state.

F4. The discussion on potential effects of wolves on ungulate populations in Washington and anticipated levels of domestic livestock.

As stated earlier, levels of depredation on livestock may be lower in Washington than Northern Rocky Mountain states due to lower levels of livestock grazing on public lands. Low numbers of sheep will likely cause lower levels of depredation on this livestock species. Livestock depredation levels in the Great Lakes States (Ruid et al. 2009) might be more appropriate to levels likely to our in Washington.

The authors have done a very through effort examining the complex relationships between wolves and wild ungulates, and the potential impact levels listed seem appropriate for Washington.

COMMENTS ON OVERALL PLAN:

Executive Summary seems complete and provides a good summary of the draft wolf plan.

The **Introduction** section appears to provide good general background to introduce readers into the general topic of wolf management in Washington.

Background

This section does provide extensive factual information and history of observations and presence in Washington. Some comments follow:

P. 23, comments on weight of adult females wolves in Yellowstone NP are not quite accurate. Although adult female wolves do sometimes weigh > 100lbs the typical size is usually 80-100 lbs, and the range of adult females in the park have range from 65 to 121 lbs (Doug Smith personnel comm.).

P. 23, the illustration is poor. The wolf appears too short legged and tracks are too round for wolf and coyote tracks. Coyote tracks are generally very narrow and claws on side toes lay close to the middle toes.

P. 24, line 7 & 8, may want to include statement about characteristics of wolf-dog hybrids that can be used "to help distinguish them from wolves including, curled tail, broader chest, shorter legs, distinct husky mask, and behavioral differences."

P. 25, line 29-34, on pup survival exaggerates high survival rates, but does not give a good sense of range of survival rates that may occur. You may want to include more recent reports that pup survival has been as low as 29% in Yellowstone in 2008 (Smith et al. 2009). You may also want to include a statement such as, " wolf pup survival from birth to midwinter in Wisconsin was estimated to average 29% (range 14 to 58% for 28 year period) (Wydeven et al. 2009)."

P. 28, line 41-42, maximum dispersal distance recorded for wolves have been as high as 678 miles (Wabakkan et al. 2007).

P. 30, lines 13, although wolf populations can tolerate mortality rates as high as 32-50%, normally wolves can tolerate only up to 29% human caused mortality, before impacting wolf populations (Adams et al. 2008).

Wolf Conservation

The section provides good discussions on population viability, genetics, potential wolf distribution and rationale for difference population goals. The literature comparisons are mainly with western wolf populations, and in some areas wolf management from other areas also provide relative comparison.

P. 39, lines 11 & 12, information on Isle Royale may also be relevant where skeletal deformities have also been detected (Vucetich and Peterson 2009).

P. 39, line 34, may want to add line after "…within 60 years." to include "But on Isle Royale a population of wolves that have range from 12 to 50 and averaged about 22 annually has persisted for over 50 years, despite loss of genetic diversity (Vucetich and Peterson 2009)".

P. 48-49. The concept of breeding pairs seemed to have worked well in the Northern Rockies but may be less feasible in areas with dense forest cover. The concept is dependent on detailed knowledge and high observation rates of wolf packs. The Great Lakes States, have not used the concept of breeding pairs as in the Northern Rockies, and have instead relied more on actual wolf numbers in mid to late winter (Wydeven et al. 2009, and articles by Erb & Don Carlos [MN] and Beyer et al. [MI] in the same volume). In densely forested areas it will be difficult seeing pups in spring and summer, and accept for howl surveys and some chance observations, actual numbers of pups present in fall or early winter would be difficult to determine. In the Great Lakes states, wolf numbers are determined in mid- late winter when snow cover allows counting tracks in the snow, and makes wolves more visible from the air. Snow cover also allows determination of breeding activity in packs through observation of urine marking behavior. Pack size may be little smaller by mid- late winter because more mortality and dispersal may have occurred since early winter, but it probably is easier to obtain reasonable counts, and determine knowledge of breeding status in mid-winter.

Although approximation of successful breeding pairs by using breeding packs of $\geq$ 4 wolves, may be variable early in winter (Mitchell et al. 2008), by mid to late winter, it probably would be a reasonable estimate of successful breeding pairs as used in recovery plans for Northern Rockies wolves. If packs remain relatively small as has occurred in Wisconsin, the wolf

population can grow to fairly high levels, even though successful breeding pairs as defined for Northern Rockies region for gray wolves, may remain relative small. The "successful breeding pair" concept may make it more difficult to achieve and measure recovery success, and reduce more flexible management that may be necessary with a growing wolf population.

A possible alternative scenario could be something like this:

1. state downlisting from endangered to threatened, 100+ wolves for 3 yrs.
   - 2 breeding packs of 4+ wolves in E. Wash.
   - 2 breeding packs of 4+ wolves in N. Casc.
   - 2 breeding packs of 4+ wolves in S. Casc./ NW Coast
2. state delist to sensitive species, 200+ wolves for 3 yrs.
   - 2 breeding packs of 4+ wolves in E. Wash.
   - 2 breeding packs of 4+ wolves in N. Casc.
   - 5 breeding packs of 4+ wolves in S. Casc./ NW Coast
   - 3 breeding packs of 4+ wolves to be distributed in any of the 3 regions

3. state delist from sensitive list, 300+ wolves for 3 yrs
   - 2 breeding packs of 4+ wolves in E. Wash.
   - 2 breeding packs of 4+ wolves in N. Casc.
   - 5 breeding packs of 4+ wolves in S. Casc./ NW Coast
   - 6 breeding packs of 4 + wolves to be distributed in any of the 3 regions

P. 52, lines 34-39 discussion on translocation. I think it would be a great idea to consider translocation of wolves into the Olympic Peninsula, but you may want to list some of the negative sides of translocations. Downside of translocations could include, less public support for wolf recovery when wolves are brought in, greater agency blame if introduced wolves cause problems, translocated wolves may suffer higher mortality, translocators sometime display erratic dispersal behavior causing wolves to move out of desired areas and into less desired areas, and it will be costly to monitor translocated wolves.

P. 56, lines 1-17 rate of depredations by wolf packs. If most livestock are raised on small private pastureland and rangeland grazing is much less than occurs in Idaho and Montana, rate of depredation on livestock in Washington may be more similar to rates observed in the Great Lakes region. In Wisconsin through the early 2000s, only about 7% of packs annually depredated on livestock (Wydeven et al. 2004).

P. 56, line 47, Kroeger et al. 2005, should be 2006.

P. 61, lines 32-35. You may want to also mention Great Lakes states. In Minnesota 2-7% of the state wolf population has been removed annually for depredation control purposes, and in recent years about 6% of Wisconsin wolves have been removed by such lethal controls (Ruid et al. 2009).

P. 64, lines 40-46, discussion of translocations. You may want to say more about releases planning whether they will be soft or hard releases, whether all animals will be radio collared, if

VHF collars used will they be monitored by airplane or vehicles, and other techniques to localize translocated wolves such as diversionary feeding ((dropping off road killed ungulates near release sites).

P. 65, table 7, lethal control options. It should be clarified across the top of the table, that these options are for "state" listing. It is possible that for federal listed, for areas outside experimental population status, lethal controls through section 10 permits may not be possible. Although USFWS has authorized section 10, lethal control authority for Montana in areas outside the experimental population areas, for periods when wolves were federally listed as endangered, such authorizations were lost in Wisconsin and Michigan in 2005 and 2006 due to lawsuits, and with recent relistings in 2008 and 2009, the USFWS has not authorized any lethal control authority for managing livestock depredations to Wisconsin or Michigan.

P. 66, table 7, lethal control options. Under compensation, it may need to be clarified that these only pertain to a limited variety of livestock, and does not include dogs, guard animals, poultry or any other domestic animals.

P. 67, line 11, need to clarify these are referring to "state" E & T status.

P. 67, lines 19-27, shooting in the act of attacks may not be possible in areas where wolves are federally listed as threatened or endangered outside of experimental population areas. Even when state and federally delisted, it might not be advisable to grant such authority outside private land or grazing leases. For purpose of protecting dogs on public lands, in Wisconsin, it has been found that wolf attacks on dogs on public land mainly occur for hounds at long distances from the hunters. Authorizations for shooting wolves in the act of are not really needed in these situations, and such authorization would more likely be abused and lead to more illegal kills on wolves.

P. 68, lines 1-6, as stated above, lethal control might not be an option available to areas under federal listing of endangered or threatened.

P. 68, lines 8-11, as stated above, authority to shoot wolves "in the act of" may not be necessary on public land, and granting such authority may result in abuse of the authority and result in higher illegal kill on public lands.

P. 71, lines 25-30, lists a broad range of livestock for which reimbursement would be provided, but the proposed bill on P. 232 only shows a limited number of livestock. Which is correct, and for which species will reimbursements be possible? Will guard animals be covered? Will poultry be covered?

Wolf-Ungulate Interactions.

The section provides an extensive discussion on interactions and impact of wolves on wild ungulate populations. The section does a good job explaining the complexity and variations in these interactions that occur in different places and under different scenarios.

P. 78, lines 38-39. It is not correct to say that the Yellowstone wolf population is continuing to increase. The population peaked in 2003 at 174 wolves, and was down to 124 wolves in 2008 (Smith 2009), and is expected to be at only 103 in 2009 (newspaper accounts).

P. 79, elk populations. It is not clear whether population estimates refer to elk in late summer prior to harvests, overwinter after harvests, or in spring prior to calf production. The time of year when these estimations are made should be clarified.

P. 84, deer populations. It is not clear whether population estimates refer to deer in late summer prior to harvests, overwinter after harvests, or in spring prior to fawn production. The time of year when these estimations are made should be clarified.

P. 90, lines 19-30 effects of wolves at feeding stations. You may want to mention that wolves may help reduce risk of disease spread at feeding stations (Stronen et al. 2007, Weiss et al. 2007).

P. 94, lines 11-18 wolf effects on other predators. In Wisconsin I am aware of at least 1 fisher killed by wolves, and in recent years fisher populations have declined in northern forest areas of MN, WI & MI, but numbers remain high south of the forest in areas of mixed forest/farmland areas. High wolf populations in forested areas have been speculated to possibly be reducing abundance of fishers, similar as the relationship that exists in Scandinavia between European pine marten (*Martes martes)* and red fox (Lindstöm et al. 1995).

P. 96, Lines 3-25, needs definitions of "limitations" vs. "regulations".

Wolf-Human Interactions

The section seems to be a thorough discussion of the pertinent literature and research on wolf interactions with humans.

P. 100, lines 26-27, utility workers would also be group that could encounter wolves.

P. 100-101, lines 38-46 & 1-4, may want to also refer to wolf depredation on dogs in Great Lakes region. During the period 1974-2006, 340 dogs were killed by wolves in the Great Lakes region, and during the period 1986-2006, 123 dogs were killed by wolves in Wisconsin alone (Ruid et al. 2009). In Wisconsin, 90% of dogs killed were in hunting or training situations and were mostly hounds used to hunt bears (Ruid et al. 2009).

P. 101, lines 13-21, again may want to also refer to Great Lakes region where hounds are used to hunt bears in WI & MI, but not in MN. As many as 23 hounds have been killed within a year by wolves in WI (Ruid et al. 2009).

P. 101-102, 46-47 & 1-2, in WI when wolves were delisted for 19 months in 2007 & 2008, 1 wolf was killed in the act of an attack on a dog on private lands (A. P. Wydeven pers. comm.).

Land Management

The section provides a broad overview of land management in Washington, but could use some more information. It would be useful in this section to list public lands and describe total area of the various categories of public land within the state, and include information on percentage of land areas where grazing leases exits. Also information on area of industrial forest land, and there potential for supporting wolf packs would be useful.

Because large core area of wolf habitat seem to be lacking, there may be need to apply some habitat protection for wolves on national forest lands. Reference is made to road closure for elk management on page 119. Such closures might be coordinated with wolf management, to protect den sites, rendezvous sites, and maintain low density of roads. In many of the Great Lakes national forests, gray wolves serve as management indicator species, and area around den sites are generally protected and road densities are maintained at low levels (WDNR 1999).

Information on potential of Indian reservations to support wolves, would also be useful. Wolves are often important to the culture of many Indian tribes, and tribal lands may provide additional habitat for wolves.

P. 104, lines 33-38, the statement is made that WDFW would have no legal authority for any restrictions on private lands, but I would suspect there are some restrictions on avoiding incidental take of state listed E & T species, which would allow the WDFW to protect den sites.

Information and Education

This section provides limited discussion on outreach and educational efforts for wolf recovery. This section does not seem as carefully researched as some of the other sections. The statements are broad and somewhat generic for any I & E program. No discussion is made of potential NGOs and partners that could help in developing messages on educating others on wolves. Some of the social and attitude surveys should perhaps be cited to suggest direction and focus of educational efforts.

Research

The discussions in this section are fairly broad and general, and does not provide much of a perspective on research being planned. Perhaps because research needs were referred to in other sections, this section only provides a very broad overview. As such its usefulness to the plan are somewhat limited.

Reporting and Evaluation

As with the last 2 sections, this section is fairly broad and provides little specific details. It does include discussion of evaluating whether objectives are being met in several areas, including law enforcement. Prior to this there has been little discussion of law enforcement and what objectives might be. Illegal kill was mentioned as a potential important mortality factor. Perhaps the draft wolf plan needs a section on law enforcement to describe, efforts to reduce illegal kill,

conservation officers available for investigations, process for collecting data, laws and fines that will be applied, and any cooperation between agencies to investigate wolf killings.

Goals, Objectives, Strategies, and Tasks

This section does provide an extensive step-down process of listing planned management activity in the state. Some areas could use more details and I will mention those.

P. 109, lines 29-36. How will wolves be trapped, foot-hold traps in spring & summer, aerial net-gun or darting in winter? Will only GPS collars be used? GPS collars can be expensive and reliability can vary greatly. VHF collars are much less expensive and allow wolves to be observed from the air, but will require use of airplanes or helicopters for radio-locating.

P. 111, lines 27-35. Minimizing illegal kill may include aggressive investigation and enforcement of wolf shootings.

P. 115, lines 35-36. It may be useful to produce a single or regional 800 numbers for contacting USDA Wildlife Services for reporting wolf depredations. Pamphlets with advice for dealing with wolves and including USDA-WS numbers could be distributed to farmers throughout areas being colonized by wolves.

P. 119, lines 13-14 discusses road closures being used apparently to manage for elk. These road closures had not previously been discussed. Road densities often are important measure of habitat suitability for wolves (Mladenoff et al. 2009, Oakleaf et al. 2006), and thus road closures would probably benefit wolves. The extent that road closures are used for managing for elk or other resources would be of value to discuss under the section on "Land Management" because such practices likely will benefit wolves and reduce illegal kill on wolves.

P. 120, lines 30-32 should also include utility workers.

P. 122, line 1, is the release of wolf hybrids into the wild currently illegal in Washington? Are there plans to make it illegal?

P. 122, line 13, will the regulations on wolf dog hybrids be for ownership and breeding in captivity or releasing them into the wild, or all of these?

P. 126, line 11, public attitudes surveys should probably also include information on acceptances of various management practices. Surveys will need to be stratified to especially get information from people living with wolves and most likely feeling as if they are being impacted by wolves. Urbanites who don't interact with wolves are more likely to be very accepting of wolves and more protective of them. Rural landowners living close to wolves are more likely to be negative toward wolves and interested in control programs to reduce or minimize numbers of wolves on the landscape.

P. 127, lines 1-8, the section on funding wolf management seems vague. How are other state E & T species being funded in Washington? Would state wildlife grants or Pittman Robertson

funds possibly be available for funding wolf management in the state? Some indications of where funds are likely to come from would be useful.

Implementation Schedule and Costs

This section seems a little vague and seems mostly like a wish list with not a lot of details how funding for wolf management will be secured.

P. 131, line 12, the segment suggests that federal endangered species recovery grants might be available for helping fund wolf management in Washington. While the federal government has provided fairly extensive funding for recovery of wolves in the Northern Rocky Mountains, especially in areas of the experimentally reintroduced population, federal wolf recovery monies have not been made available for the Great Lakes States since 2002, despite remaining listed until 2007, and despite recent relistings in 2008 and 2009. Thus likeliness of federal wolf recovery monies being available for Washington may be very limited. Other federal monies shared with states may be possible for funding wolf management including state wildlife grants or Federal Aid in Wildlife Conservation (Pittman Robertson funds). It might be useful to more thoroughly explore the potential for these funds.

Economical Analysis

This section seems fairly extensive and thorough discussion on costs of wolf recovery to Washington. Some suggestions of additions and modifications follow.

P.138-145, does not include any discussion of poultry, which are also sometimes attacked by wolves.

P. 145, lines 31-36, another potential positive impact of wolves to livestock production would be reduction of ruminant diseases that could spread to livestock from wild ungulates (Stronen et al. 2007, Weiss et al. 2007)

P. 146, lines 27-38, sheep kill in Washington might be more comparable to the Great Lakes region where sheep kill were 65% of cattle kill in Minnesota, and 21% of cattle kill in Wisconsin (Ruid et al. 2009).

P. 149, lines 14-22, along with other factors listed, these physiological factors could also be caused by other predators including coyotes, cougars, bears, and dogs.

P. 161, line 9, may want to list the 3 species that can be hunted with hounds.

P. 161, lines 15-16, may want to include that reimbursement for hounds is provided by the Wisconsin DNR apparently the only US state do so (Ruid et al. 2009).

P. 170, lines 32-33, potentially wolves can have positive effects on forest production by reducing browsing and redistributing ungulates which may enhance forest regeneration and diversity

(Weiss et al. 2007). Although difficult to quantify, this could have positive benefits on the forest products industry over time.

Literature Cited (cited by me above and potential additions to the draft plan**):**

Adams, L.G., R.O. Stephenson, B.W. Dale, R.T. Angook, and D.J. Demma. 2008. Population dynamics and harvest characteristics of wolves in the Central Brooks Range, Alaska. Wildlife Monographs. 170:1-25.

Lindström, E.R., S.M. Brainerd, J.O. Helldin, and K. Overskaug. 1995. Pine marten- red fox interactions: A case of intraguild predation. Annales Zoologica Fennici 32:123-130.

Mladenoff, D.J., M.K. Murray, S.D. Pratt, T.A. Sickley, and A.P. Wydeven. 2009. Changes in occupied wolf habitat in the Northern Great Lakes region. pp. 119-138 in A.P. Wydeven, T.R. Van Deelen, and E. H. Heske, (eds.), Recovery of Gray Wolves in the Great Lakes Region of the United States: An Endangered Species Success Story. Springer, New York, NY, USDA. 350pp.

Oakleaf et al. 2006 (P.182 in draft wolf plan)

Smith, D.W., D.R. Stahler, E. Albers, M. Mertz, L. Williamson, N. Ehlers, K. Cassidy, J. Irving, R. Raymond, E. Almberg, and R. McIntyre. 2009. Yellowstone Wolf Project: Annual Report, 2008. National Park Service, Yellowstone Center for Resources, Yellowstone National Park, Wyoming, YCR-2009-03.

Ruid, D.B., W.J. Paul, B.J. Roell, A.P. Wydeven, R.C. Willging, R.L. Jurewicz, and D.H. Lonsway. 2009. Wolf-human conflicts and management in Minnesota, Wisconsin and Michigan. Pp. 279-295 in A.P. Wydeven, T.R. Van Deelen, and E. H. Heske, (eds.), Recovery of Gray Wolves in the Great Lakes Region of the United States: An Endangered Species Success Story. Springer, New York, NY, USDA. 350pp.

Stronen, A.V., R.K. Brook, P.C. Paquet, and S. Mclachlan. 2007. Farmer attitudes toward wolves: implications for the role of predators. Biological Conservation. 135 (1):

Vucetich and Peterson 2009 (p. 187 in draft wolf plan).

Wabakkan, P., H. Sand, I. Kojola, B. Zimmermann, J.M. Arnemo, H.C. Pedersen, and O. Liberg. 2007. Multistage, long-range natal dispersal, by Global Positioning System-collared Scandinavian wolves. Journal of Wildlife Management 71: 1631-1634.

Weiss, A.E., T. Kroeger, J.C. Haney, and N. Fascione. 2007. Social and ecological benefits of restoring wolf populations. Transactions of the 72th North American Wildlife and Natural Resources Conference. 297-319. The Wildlife Management Institute, Washington, D.C.

Wydeven, A.P., A. Treves, B. Brost, and J.E. Wiedenhoeft. 2004. Characteristics of wolf packs in Wisconsin: Identification of traits influencing depredation. Pp. 28-50 in N. Fascione, A. Delach, and M.E. Smith. (eds.). People and Predators: From Conflict to Coexistence. Defenders of Wildlife . Island Press, Washington, D.C., USDA. 285 pp.

Wydeven, A.P., J.E. Wiedenhoeft, R.N. Schultz, R.P. Thiel, R.L. Jurewicz, B.E. Kuhn, and T. R. Van Deelen. 2009. History, population growth, and management of wolves in Wisconsin. pp. 87-105 in A.P. Wydeven, T.R. Van Deelen, and E. H. Heske, (eds.), Recovery of Gray Wolves in the Great Lakes Region of the United States: An Endangered Species Success Story. Springer, New York, NY, USDA. 350pp.

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Date: 26 January 2010

To: Daniel Vogt, SRC Managing Editor, University of Washington

From: Todd K. Fuller, Associate Editor, University of Massachusetts, Amherst

Subject: Synthesis of expert comments on the "Draft Wolf Conservation and Management Plan for Washington"

The following is a synthesis of the Independent Science Panel review of the Draft Wolf Conservation and Management Plan for Washington; also attached are the individual reviews of the experts on which the synthesis is mostly based. Like the individual reviews, this synthesis addresses the basic and focus questions identified by the Washington Department of Fish and Wildlife (WDFW). In doing so, it touches on the summary chapters of the plan, the step-down outline of the various tasks required to conserve and manage wolves in Washington, as well as the two major issues that were identified by the WDFW: (1) conservation/recovery objectives for down-listing and delisting wolves at the state level, and (2) management strategies to reduce and address wolf-livestock conflicts.

Overall, the reviewers and I find the plan to be a thoughtful, wide-ranging document that, in order to lay the groundwork for wolf management in Washington State, anticipates the looming controversies, provides a comprehensive review of the literature, and comes to a compromise recommendation that reflects interpretations, opinions, and values of the advisory group authors. There are many forward-thinking recommendations in the plan, yet there appears to be a good number of shortcomings that need to be addressed. All of us agree that the recommendations of the minority report concerning wolf numbers are insufficient for wolf recovery in the State, but at least 3 of us also believe that the population recommendations in the Draft plan are not biologically defensible and will not ensure the "reestablishment of a self-sustaining population of gray wolves in Washington". This is due largely to the compromise that has been made between biological data with social reality, an assumption that connectivity with viable wolf populations in other jurisdictions will always be maintained, and a lack of a population viability analysis that would more clearly demonstrate the biologically necessities involved in such an undertaking. Additionally, there are ambiguously defined terms, assumptions that will need to be verified (and a plan to do so), and perhaps an underestimation of the human resources needed in the future to make wolf recovery and management successful. I believe that these points can be addressed and resulting plan revised such that the chances for success are high.

Basic Questions

B1. Are rigorous, transparent and sound research and statistical methods followed?

Although not original research, the plan is thorough and comprehensive in its coverage of important topic areas, and the syntheses of various data sets and their presentation are sound. Reviewer #1 rightly points out that there are very important concepts, terms, and ideas that are not fully clarified or defined, but should be. These include for example, "self-sustaining population", "high probability of persistence", "significant portion of the species' range", and "adequate prey for wolves". In particular, Reviewer #1 notes that it is not clear how assessments of such terms will be accomplished. Providing clarification will certainly help conservation efforts. Reviewer #2 importantly notes that a major analytical method, Population Viability Analysis (PVA), although recognized by the advisory group as a potential tool, was not employed; as a result, biological justification of proposed recovery numbers is inadequate. I agree that these and other identified terms need to be explicitly defined so that results can be measured. Plans to address the acquisition and assessment of these measurements also need to be identified specifically. With respect to the need for a better biological justification of minimum numbers, I agree that a PVA, as speculative as it might be, is worthwhile exercise. More importantly, a reorientation of approach seems necessary here; once a biologically derived minimum is established (by whatever acceptable scientific means), by definition it cannot be compromised by social considerations with a subsequent expectation of success.

B2. Is there sufficient detail in the document to reproduce the study?

The structure of the plan, and in particular the topics identified as important to wolf recovery, could certainly be reproduced. Some ambiguities are noted, but in any such endeavor, even with the review the document has received so far, these are to be expected.

B3. Were data reasonably interpreted?

All reviewers agree that the data used were reasonably interpreted. Reviewer #3 notes that additional information from outside of the western wolf range, if included, may have influenced some interpretations. I agree that there are insights to be gained from other areas where wolf recovery has occurred or is well along, despite some circumstantial differences. For some places, summaries and retrospectives on their recovery processes, management techniques, and solutions to social problems are available; these can provide alternative views and insights that may be worthwhile to consider.

B4. Do the stated conclusions logically flow from the results?

In general, the conclusions do logically flow from the results presented. However, Reviewer #2 points out that by not including a PVA, a major biological perspective was not included or considered, and thus conclusions about population adequacy may not be appropriate. I agree that having this additional analysis would be useful and help make a more complete plan.

B5. Do the literature citations include the latest applicable information and represent the current state of scientific understanding on this topic?

The literature, though sometimes focused on western wolf recovery efforts and not including use of PVAs or some additional perspectives on wolf management and conservation, is thorough and very useful.

B6. Are uncertainties and limitations of the work stated and described adequately?

Many of the uncertainties and limitations of the work, particular where conclusions go beyond existing data, are well presented. Reviewers, however, each identified important areas of uncertainty that should be more clearly addressed. Reviewer #1 sees the issue of maintaining corridors and connectively, both within the State and with other states or Provinces, is not adequately addressed. In addition, the stated recovery goal of 15 successful breeding pairs is poorly justified biologically because it is a socially accepted compromise. Reviewer #2 rightly believes that "the specific and crucially important context that this plan is a compromise between what wolves need and what people desire is not explicit", but should be. The concern of Reviewer #3 is that large core habitat, such as is available for wolves in adjacent western states where recovery is occurring, is not available to the same extent and the consequences of this difference perhaps could use more scrutiny. Each of these concerns is well-founded and should be more completely addressed in the plan.

B7. Are assumptions stated and described adequately?

All of us agree that many assumptions are well-stated and adequately described, and that many of these are based on models of wolf recovery in other western states. Some assumptions may not be fully justified because they don't take into account auxiliary data from other areas (Reviewer #3). Some assumptions are adequately described, but plans needed to confirm them have not been made and should be (Reviewer #1). Finally, Reviewer #2 sees a seemingly unstated assumption that the advisory group was "a representative sounding board for crafting a conservation and management plan." Though there may appear to be some bias with regard to proportional stakeholder participation, I would be as concerned that the group was thought to have provided maximum expert scientific consideration with regard to the biological needs of recovery.

B8. Is the information presented in an accurate, clear, complete, and unbiased manner and in a proper context?

All of us agree that the information is presented in an openly honest, clear, and sincere manner. The report is well organized, clearly written, and unbiased, and was a major task that was well done.

Focus Questions

F1. The conservation/recovery objectives to achieve a recovered, self-sustaining wolf population "...in a significant portion of its range" in Washington (state law, WAC 232.12.297), including numbers, duration and geographic extent.

Reviewer #3 believes that the objectives seem reasonable, but suggests an alternative to counting "successful breeding packs", mainly for logistical reasons. I, along with Reviewers # 1 and # 2, believe that the compromise minimum numbers proposed are inadequate to assure success, especially in light of the lack of a scientific, quantitative assessment of this number and their proposed distribution, an assumption of internal connectivity that may be tenuous, and an assumption on reliance of jurisdictions outside of the state for sustainability (and thus, not "self-sustaining"). Reviewer #1 identifies a number of terms and processes that need definition and clearer delineation of assignment, respectively. These relate to sustainability, distribution aspirations, balancing conservation needs and public desires, negative impacts on recovery or long-term perpetuation, connectivity and genetic diversity, pack sizes, wolf ranges and density, future management, and proposed translocations. Reviewer #2 emphasizes that the biological justification of minimum numbers is not well-justified or documented (e.g., no PVA), and that a justified biological minimum should not be reduced for social/public acceptance reasons; otherwise, the purpose of the conservation action is compromised and its chances of success minimized. Clearly, minimum population sizes required for delisting have been at the heart of many wolf recovery controversies, and it is key that the most thorough analysis for Washington be conducted and vetted ahead of time to avoid costly problems in the future.

F2. Assessments and recommendations regarding risks to wolf recovery associated with planned management strategies to address livestock conflicts.

All agree that this section is well-researched and clearly presented. Additional considerations and options that should be discussed include: Reviewer #1 – additional compensation revenue options, reproduction interference as a non-lethal control action, and timing of depredation response and education; Reviewer #2 – alternatives to federal agency responsibility for lethal control; and Reviewer #3 – regulatory limitations on lethal control.

F3. An evaluation or assessment of the recovery and management strategies proposed in the minority report (Appendix D) and the preferred alternative draft plan as they relate to the likelihood of achieving recovery.

None of us believe that the recovery numbers proposed in Appendix D have much likelihood of achieving recovery.

F4. The discussion on potential effects of wolves on ungulate populations in Washington and anticipated depredation levels of domestic livestock.

This section of the plan is also well researched and clearly presented. It recognizes realistic scenarios regarding wolf effects on ungulates and domestic livestock. Reviewer

#1 emphasizes, as do I, the need to judiciously assess sources-specific changes ungulate populations, to address many stakeholder concerns in some circumstances, and to consider the research opportunities/needs with regards to such interactions. Reviewer #2 has concerns about the role of artificial winter feeding of elk, seemingly in the context of recovering populations of wolves that will interact "naturally" in intact ecosystems. If some circumstances are not very natural (like winter feeding of ungulates), then any expectation by the public that wolf-ungulate interactions might not need as much hands-on management should be lowered.

Additional comments/other issues

Within the appended reports of the expert reviewers, a variety of additional useful questions, thoughts and recommendations are outlined. These are all respectful, helpful, and worthy of consideration. In particular, ongoing, accelerated interactions with the growing wolf population in Washington will require an emphasis on public education. More technical assistance in actually carrying out the recovery objectives should be beneficial. Having available the services of a scientific review panel (including biologists, economists, and social scientists) could greatly help public and managerial confidence. The management of wolves after delisting will benefit from ongoing initiation of such activities on adjacent states, but can also benefit from reviews of post-recovery management elsewhere.

Date: 1 March 2010

To: Daniel Vogt, SRC Managing Editor, University of Washington

From: Todd K. Fuller, Associate Editor, University of Massachusetts, Amherst

Subject: Clarification of reviews of the "Draft Wolf Conservation and Management Plan for Washington" for WDFW.

Original questions for reviewers and Associate Editor are listed at the end of this document.

I have received responses back from all reviewers and these, along with my own response to the five questions submitted by WDFW, are as follows:

1. *Regarding the adequacy of the minority report (Appendix D), the Associate Editor states on page 4 of the summary comments that none of the reviewers or the editor believes that the recovery numbers proposed in Appendix D "have much likelihood of achieving recovery". However, in the comments of each of the reviewers, they indicated that the numbers recommended in Appendix D would not lead to a recovered wolf population as defined under Washington law. We are wondering if the editor might reevaluate his summary of the reviewer statements or explain the difference between his summary and the reviewer statements.*

   In response to original question F3, the Reviewers wrote as follows:

   R1 – "….the recovery objective and strategy outlined in the minority report will not achieve recovery in the state of WA."

   R2 - "No. This appendix is a plan for continued persecution of the wolf. It has no biological basis……"

   R3 – "The levels of wolves recommended in the minority report does not appear to be a wolf population level that would produce a self-sustaining, viable population of wolves and not likely to spread geographically across major portions of the state…."

   I initially stated in the overview that "all of us agree that the recommendations of the minority report concerning wolf numbers are insufficient for wolf recovery in the State….", as well as stating that "None of us believe that the …..numbers…have much likelihood of achieving recovery." Two of the three reviewers state definitively that the Appendix D plan will not result in recovery of wolves in Washington, and the other hedges a bit by using the phrases "does not appear" and "not likely". I believe that the recovery and management strategies outlined in Appendix D will not achieve wolf recovery in Washington.

2. *Reviewer 1 states on page 10 that sterilization has been shown to reduce coyote predation on domestic sheep and pronghorn fawns and to reduce wolf predation on native ungulates in the Yukon. Could Reviewer 1 provide us the citations for this documentation?*

Below are the requested references:

Bromley, C., and E. M. Gese. 2001. Effects of sterilization on territory fidelity and maintenance, pair bonds, and survival rates of free-ranging coyotes. Canadian Journal of Zoology 79:386-392.

Bromley, C., and E. M. Gese. 2001. Surgical sterilization as a method of reducing coyote predation on domestic sheep. Journal of Wildlife Management 65:510-519.

Seidler, R. 2009. Surgical sterilization of coyotes to reduce predation on pronghorn fawns. M.S. degree, Utah State University, Logan, Utah.

Spence, C. E., J. E. Kenyon, D. R. Smith, R. D. Hayes, and A. M. Baer.
1999. Surgical sterilization of free-ranging wolves. Canadian Veterinary Journal 40:118-121.

Hayes, R. D., R. Farnell, R. M. P. Ward, J. Carey, M. Dehn, G. W. Kuzyk, Al. M. Baer, C. L. Gardner and M. O'Donoghue. 2003. Experimental reduction of wolves in the Yukon: ungulate responses and management implications. Wildlife Monographs 152:1-35.

Apparently publications on the reduced rate of predation on caribou by sterile wolves are not out yet, but are implied in the Hayes monograph.
They were quoted in a newspaper article that they did have reduced predation by sterile wolves, but no scientific publications could be found in my search. They may wish to contact Bob Hayes and see if a report is available.

3. *Reviewer 2 states on page 6 that "safe habitat" for ungulates can perhaps be developed to reduce the hunting success of wolves. We are not familiar with this type of management for wolf-ungulate interactions and are wondering if the reviewer could expand on this topic for us. Has this been done successfully or even attempted elsewhere? Are there any documents that we could refer to or other people to contact for more information on this subject?*

I based that comment loosely on the work in the recent Foraging Ecology book (Foraging : Behavior and Ecology; edited by Stephens, Brown, and Ydenberg, 2007, U. Chicago Press) that provides several chapters on the direct, and especially indirect effects of predators on their prey. Safe habitat could be places where ungulates have high visibility, abundant browse/graze so they need to forage less, or easy access to escape terrain/cover. I don't know if the sort of places on the landscape where wolves are less efficient hunters is generally available, but given the extensive studies of wolves I would be surprised if Mech or Smith haven't characterized the landscapes of kill sites and compared them with places where kills are not made. In fact I am heading to Yellowstone in a few weeks to make some of those measurements around wolf kills there just as a class project.

I would suggest that the managers in Washington contact other wolf researchers to determine if there are characteristics of the landscape that appear to be difficult for wolves to hunt

within, and then perhaps these areas could be identified in Washington and given special consideration as places to build ungulate populations.

4. *Reviewer 3 provides an alternative scenario for the objectives of the draft plan on page 6. We would like to have this clarified so that we are completely sure of the reviewer's intent. Under state downlisting from endangered to threatened, for example, is the reviewer saying that a population of 100+ wolves for 3 years AND 2 breeding pairs of 4+ wolves in each of the three recovery regions are needed for this downlisting target?*

   The number was intended to be a statewide numerical goal, and the breeding pack distribution was intended to be a distributional goal.
   Thus in the below scenario the statewide count would be at least 100 wolves that consisted of 2 or > breeding packs in each of the 3 listed regions.

   For 1. state downlisting from endangered to threatened, 100+ wolves for 3 yrs.

   * 2 breeding packs of 4+ wolves in E. Wash.
   * 2 breeding packs of 4+ wolves in N. Casc.
   * 2 breeding packs of 4+ wolves in S. Casc./ NW Coast

5. *Reviewer 3 provides comments about fisher-wolf interactions in Minnesota, Wisconsin, and Michigan on page 6. Could the reviewer provide us with sources (either published accounts or people to contact) for (1) the killing of a fisher by a wolf in Wisconsin, and (2) the decline in fisher numbers in the portions of these states occupied by wolves but not elsewhere?*

   Distribution maps and population trends in fisher & wolves in WI.

   Dhuey, B. and J. Olson. 2009. Fisher harvest. Wisconsin Wildlife Surveys. 19(5): 83-89
   http://www.dnr.state.wi.us/org/land/wildlife/harvest/reports/08fisherharv.pdf
   Rolley, R.E. and M. L. Worland. 2009. Fisher population analysis. Wisconsin Wildlife Surveys. 19(5): 100-103
   http://www.dnr.state.wi.us/org/land/wildlife/harvest/reports/09fisherpop.pdf
   Wydeven, A.P. and J.E. Wiedenhoeft. 2009. Gray wolf population 2008-2009. Wisconsin Wildlife Surveys. 19(5): 141-160
   http://www.dnr.state.wi.us/org/land/wildlife/harvest/reports/09graywolfpop.pdf

   Report of fisher killed by wolves from a colleague:
   "I can't remember if I told you previously about my observations or not so will relay them here in case they are of interest. In 1993 I found a coyote and (later that same summer) a fisher that apparently were killed by wolves in the Truck Trail Pack territory. In both cases the carcasses were left in the middle of gravel roads and were surrounded by many wolf tracks. They had been bitten several times but were not consumed at all.
   These were the only such occurrences I observed during the 8 years I worked on the US Hwy 53 project."

Let me know of additional information is requested. Many thanks for your help.

Best regards,

Todd

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Original Questions for Review

Basic Questions

B1. Are rigorous, transparent and sound research and statistical methods followed?

B2. Is there sufficient detail in the document to reproduce the study?

B3. Were data reasonably interpreted?

B4. Do the stated conclusions logically flow from the results?

B5. Do the literature citations include the latest applicable information and represent the current state of scientific understanding on this topic?

B6. Are uncertainties and limitations of the work stated and described adequately?

B7. Are assumptions stated and described adequately?

B8. Is the information presented in an accurate, clear, complete, and unbiased manner and in a proper context?

Focus Questions

F1. The conservation/recovery objectives to achieve a recovered, self-sustaining wolf population "…in a significant portion of its range" in Washington (state law, WAC 232.12.297), including numbers, duration and geographic extent.

F2. Assessments and recommendations regarding risks to wolf recovery associated with planned management strategies to address livestock conflicts.

F3. An evaluation or assessment of the recovery and management strategies proposed in the minority report (Appendix D) and the preferred alternative draft plan as they relate to the likelihood of achieving recovery.

F4. The discussion on potential effects of wolves on ungulate populations in Washington and anticipated depredation levels of domestic livestock.