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Public Comments Processing
Attn: Docket No. FWS-R6-ES-2016-0042
US Fish and Wildlife Service, MS: BPHC
5275 Leesburg Pike
Falls Church, VA 22041-3803

Dear Messrs.:

I appreciate the opportunity to submit the following comments on the proposal to establish the grizzly bear Distinct Population Segment (DPS), and also to propose the removal of the Yellowstone DPS from the list of threatened and endangered wildlife. I write to oppose the proposal to delist the Yellowstone grizzly bear population for the many reasons discussed in this letter.

I request that this letter be included in the official comment record, and that the issues raised here receive specific responses from US Fish and Wildlife Service (FWS). I incorporate by reference comments previously submitted by myself and on behalf of Natural Resources Defense Council, Sierra Club, and Greater Yellowstone Coalition in reference to the FWS delisting rule, the FWS paper "Reassessing Methods to Estimate Population Size and Sustainable Mortality Limits for the Yellowstone Grizzly Bear", the Forest Plan Amendments for Grizzly Bear Conservation in the Greater Yellowstone Area, the Conservation Strategy (CS), state management plans for Wyoming, Idaho and Montana, Habitat-based Criteria, and the FWS grizzly recovery plan. I further request to be apprised of developments in this process as it moves forward.

Excessive human-caused mortalities still threaten the population. Human killing of grizzly bears has, in fact, increased so sharply over the last ten years that the growth rate has flattened and perhaps has reached a tipping point. With Yellowstone's grizzly bears possibly on the verge of a catastrophic decline, now is not the time to roll back protections, but rather redouble them.

Furthermore, the Yellowstone grizzly bear population is too small and too isolated, and its habitat is still too threatened for protections to be reduced. Regulatory and funding mechanisms are inadequate to ensure protection of the bear from excessive habitat development and human-caused mortality, as well as documented decline in key foods, including whitebark pine, trout and elk, and the anticipated decline of army cutworm moths. The hostility of state governments, especially the Wyoming Game and Fish Commission and four Wyoming counties, which have passed laws prohibiting bears within their borders, demonstrates that federal oversight is still necessary to protect grizzlies from unsustainable mortality -- the problem that lays at the core of the original listing decision.

Given these deficiencies, delisting is inappropriate, and could reverse the progress made since 1975 in the recovery of the grizzly bear in Yellowstone. The grizzly is an especially powerful symbol of the American West, and the essence of what makes Yellowstone unique. Furthermore, because it is so

sensitive to development, the grizzly serves as a key indicator of ecosystem health, Yellowstone's version of the canary in the coal mine. I do not believe it is appropriate to risk the future of such an important animal, which has already been eliminated in almost all of its former range and has nowhere else to go.

The delisting proposal understates the risks associated with proposed strategies, fails to disclose key uncertainties associated with the analysis, and lacks a system to promptly correct problems when they arise. Furthermore, the delisting process defies logic and is unnecessarily Byzantine in its complexity. It makes no sense, for example, to ask the public whether delisting is warranted before key decisions have been made on the management of forest lands in 70% of the ecosystem, and prior to the completion of the state plans.

Furthermore, the delisting plan fails to acknowledge that an alternative approach to grizzly recovery is possible. Habitat is still available to support a much larger vision of recovery, one that will be more durable in the long-term. Lasting success for grizzly bear recovery can be accomplished by expanding and protecting existing grizzly bear populations, reconnecting populations from Yellowstone to Canada, and providing meaningful habitat protections in all occupied and suitable habitat in Greater Yellowstone Ecosystem (GYE)—all necessarily under auspices of Endangered Species Act (ESA) protections.

To achieve this goal, the deficiencies identified in this letter must be corrected. It is also critical to establish more meaningful ways to engage the public in a debate where key decisions have been made behind closed doors, using information that has not been shared with the public – or only in pieces. For the grizzly recovery program to be effective and for the current level of controversy to subside, the following steps should be pursued:

1. The public must be fully involved.
2. Risks must be thoroughly evaluated, with the best available science incorporated.
3. All data must be made available to the public.
4. A precautionary approach must be adopted.

Proposal Concerns:

1. The current grizzly bear population is too small and too isolated to ensure long-term viability; but, long-term recovery is possible under a different management approach. Grizzly bears in the lower-48 states have been extirpated in 99% of their historic range. In Yellowstone, they exist today on an isolated habitat island that is relatively small, comprising 600-700 bears, with an currently genetically effective population size that is much too small to insure long-term persistence—the FWS's protestations to the contrary. Quoting the American Society of Mammalogists and Society for Conservation Biology in their comments on the delisting Rule:

“For the current metapopulation (5 subpopulations) [of grizzly bears in the Northern Rockies], a total census (N_c) of no more than 1800 animals (450 to 990 effective population size, given the range of N_e/N_c estimates cited in the rule) is at least 5-11 times too few individuals to assure long-term persistence, according to widely accepted standards in population genetics (Frankham et al. 2013). Yet, on p. 153 of the proposed delisting rule, USFWS states "The current effective population is more than four times the minimum effective population size suggested in the literature (Miller and Waits 2003, p. 4338)." This is a fundamental misreading of that publication and ignores the consensus among conservation geneticists that, in fact, a minimum of 500-5,000 N_e is required for *long-term* avoidance of inbreeding depression.”

Given this more defensible understanding of N_e , the main derivative point is that there is still room for

more grizzly bears in the Northern Rocky Mountains. According to analysis by Troy Merrill, Carlos Carroll and others, it is still possible to establish a meta- population of 3,000 or more grizzly bears by expanding where bears can live in Yellowstone, recovering grizzlies in the Selway-Bitterroot ecosystem, and connecting grizzly bear ecosystems to source populations in Canada (Merrill and Mattson, 2003). The number of bears within the GYE can be increased by 300 or so animals, if grizzlies could fully recolonize areas such as the Wind Rivers, Wyoming Range, Salt River Range, Southeastern Absarokas, Owl Creeks, Palisades and Gravelly/Centennials.

Specifically, Merrill found that about 6 million acres of additional habitat in the GYE outside the Primary Conservation Area (PCA) are suitable for bear recovery. Over 2 million of these acres - the size of Yellowstone Park - are currently occupied, according to data from the Interagency Grizzly Bear Study Team (IGBST). If the delisting plan allowed bears to continue to expand their range, it could greatly improve prospects for long-term recovery.

2. The delisting rule and CS fails to consider the significance and the pace of habitat change occurring in the region. The plan's invoked strategy for managing habitat security wrongly assumes, practice, that the future will look like the past—again, the FWS's protestations to the contrary. The plan calls for maintaining habitat conditions inside the PCA as of 1998, but, conditions have already changed significantly from 1998, and will continue to do so.

Specifically, the plan fails to substantively consider the effects of rapid human population growth in a region which is among the fastest growing in the country, and where some counties are doubling in population every ten years. This development is occurring most rapidly near the boundaries of public lands in key habitat for bears and other wildlife (Johnson, 1998).

Off-road vehicle use is also increasing on public lands in formally secure grizzly bear habitat. According to the 2006 Forest Service Plan amendments, such use will increase by 9% on national forest lands over the next decade.

The best that the FWS can offer in its plans is unsubstantiated assertions that such changes can be neutralized through unspecified mechanisms by which the US Forest Service of state wildlife management agencies curtail or mitigate private lands development. At the very least, the FWS needs to specify in detail what these mechanisms are, along with a history and prognosis for efficacy or inefficacy of such mechanisms.

The decline of primary foods, especially cutthroat trout, whitebark pine, and elk, has decreased habitat productivity in the core of the ecosystem, significantly changing the habitat conditions that existed in 1998. These reductions have forced the redistribution of bears to lands where they have experienced higher levels of contact and conflict with humans, and will be more vulnerable to the impacts of development and human-caused mortality. Other expected changes relate to climate change and the further loss of other foods, such as berries, and the alpine habitat of army cutworm moths.

All of these trends, barring that for elk, are clearly evident in data presented in the Interagency Grizzly Bear Study Team's Annual Reports. Data on elk trends are freely available from state agencies. The redistribution of bears logically follows from the fact that distribution of the population has increased substantially (Bjornlie et al., 2013) at the same time that population growth has slowed, if not stalled.

The Forest Plan Amendments concede that habitat conditions have changed since 1998 as a result of fires but then fails to consider the full effects of these changes, or evaluate other changes in habitat or the

human environment which could affect the validity of the 1998 benchmark.

Furthermore, FWS's evaluation of future trends is based on a very small period of historical time: 1975-1998. FWS fails to fully account for the significant changes that occurred before that time, and longer term trends that helped contribute to the listing of the species.

A cursory review of the 1992 recovery plan will demonstrate how quickly habitat conditions can change and deteriorate. At that time, off-road vehicle use, white pine blister rust, mountain pine beetle, climate change, and the problems of introduced Lake trout were not recognized as serious issues facing the grizzly. These threats were not evaluated in the recovery plan, but have since had significant impacts on quality and quantity of grizzly bear foods. Future changes will likely result in more people on the landscape, less habitat for grizzlies, more impacts from development and resource extraction, and a much warmer climate. Given historical and foreseeable trends, it is almost certain that the future will hold more surprises and that we will have less secure habitat for grizzly bears, not more.

Looking ahead, there is one nasty surprise worth mentioning that is currently being debated in Congress. Despite claims that secure habitat will remain secure, that may not be so, even inside Yellowstone National Park, which has provided the best and most secure grizzly bear habitat since the time of listing. Congress is now debating whether or not to allow packrafters inside National Parks – even into their most remote corners. This kind of threat was not contemplated by FWS and should be addressed.

FWS should also take advantage of experts in the arena of forecasting, and develop a more realistic view of the future and effects on carrying capacity in the GYE, along with better use of the science it does have access to (e.g., Gude et al. 2007, Schwartz et al., 2012). The agency should also try to ameliorate the effects of future changes by providing more secure habitat, not less. This argues for provisions by the FWS to adequately protect suitable unoccupied habitat outside the recovery zone, and ecological connections to the Selway-Bitterroot and Northern Continental Divide ecosystems.

3. The delisting plan fails to include accurate baseline data on the current human footprint. Exacerbating the problem of managing presumed security habitat at 1998 levels are inaccuracies in the underlying database on roads and development used by the FWS and US Forest Service. When the 1998 benchmark was adopted in the Conservation Strategy, the Forest Service (FS) had not fully defined habitat conditions of relevance to grizzly bears on its jurisdictions. The agency has since conceded that thousands of miles of "ghost roads" exist on the forests that are not part of Forest Plans or the transportation databases used to assess access (Gallatin Forest Plan). This simple fact debars any precise or meaningful mitigations or offsets by the FS to maintain conditions at any benchmark, much less that of 1998.

In addition, although the Forest Service attempted to integrate data on roads and other human infrastructure among Forests in its development of the Cumulative Effects Model (CEM), the agency has acknowledged that errors still remain (M. Cherry, pers. com., 2005). In areas where the 1998 data on bear habitat security was compared to data collected in the field, a Sierra Club report found that: a. the Gallatin Forest significantly underestimated the number of motorized routes that existed in bear habitat; and, b. motorized routes occurred in areas that the agency defined as secure (500 meters from a road), (Sierra Club, 2000). Undoubtedly, similar problems exist on other forests.

The CS also did not include high-use non-motorized trails and non-inventoried motorized trails in its access standards. This is a significant oversight given mounting ATV use in the ecosystem. And, the FS did not evaluate use levels, despite acknowledgments in meetings around the development of the CS (I attended a number of these), and in documents associated with the development of the CEM, that the

effects of roads and trail use on grizzly bears can vary tremendously according to human use levels.

Although the delisting rule and CS discuss impacts of snowmobile use on den sites, they do not take into account the effects of late-season snowmobile use on spring-active grizzly bears. In some areas such as Cooke City, snowmobiles are still active in grizzly habitat in July - three months after den emergence. On top of this, the rule states that they don't have evidence that snowmobile use is affecting the grizzly bear population or even individual bears, while admitting that sample sizes of their referenced studies are so small that nothing can be concluded.

ATVs (and snowmobiles, as a precautionary notion) can have effects similar to those of roads, in terms of disturbance, displacement, habitat fragmentation, and mortality. Without a complete inventory of roads and trails and information about current levels of actual use, including post-denning snowmobile activity, the Forest Service cannot assess compliance with 1998 standards, nor evaluate the impacts of future change.

4. The proposed grizzly bear hunt is wrong, unethical, and could harm the grizzly population. Besides the substantial ethical problems of hunting bears, FWS simply fails to justify the grizzly bear hunt at a time when levels of human-caused mortalities have been excessive.

Further, the rule states that the goal of such a hunting season is to reduce grizzly density in areas of high human-bear conflicts, so that future management actions would be reduced. This reasoning is inconsistent with other parts of the plan that recognize that ongoing conflicts will occur if attractants are not managed properly. Hunting will not resolve conflicts as long as bears are drawn into an area because of available food. As British Columbia Bear Manager Matt Austin said at the 2004 IGBC meeting in Cody, WY, "You would have to depopulate the entire area to eliminate bear conflicts, as long as attractants are available."

In the face of excessive human-caused grizzly bear mortality rates, as well as habitat threats, a hunt is, at best, ill-considered and indefensible. With human population growth in the region, human-caused mortality sinks are likely to expand, and mortality rates rise. FWS did not fully consider these relationships in its assessment of impacts from a trophy hunt. Furthermore, FWS acknowledges the population likely needs artificial augmentation: by removing animals from the gene pool, hunting will only worsen the genetic problems facing the Yellowstone bear.

In addition, FWS failed to incorporate the important work of Robert Wielgus (Wielgus and Bunnell, 2000; Wielgus et al. 2001) and researchers studying Scandinavian brown bears (Bellemain et al., 2006; Bischof et al. 2009; Zedrosser et al. 2009, 2013) who found that the mortality of resident adult males results in: a. increased immigration by potentially infanticidal males, b. increased sexual segregation, and, c. reduced reproduction, population growth and persistence. For a population as vulnerable as that in Yellowstone, these impacts could have significant repercussions on the future of the population.

Furthermore, the prospect of a grizzly bear hunt has already raised enormous political expectations among the states. The draft MOA indicates that as many as 72 bears a year could be killed in a grizzly bear hunt. That would be catastrophic on top of the excessive mortalities already occurring.

4. The delisting proposal relies on habitat management plans which are not yet in place. The Forest Service has not yet revised the Conservation Strategy. FWS admits that the CS must be revised to

comply with the terms of the delisting rule. The CS is critical because it dictates land management on 70% or more of grizzly bear habitat in the GYE. This must be finalized before FWS solicits public comments on the delisting proposal. Otherwise, the public is being asked to comment on whether delisting is appropriate without knowing what specific mechanisms will be in place for protection of habitat in the long-term. This approach is ass backwards, and frustrates public comment.

5. FWS has failed to consult with the Tribes on grizzly bears as part of the lead up to delisting and thereby demonstrate respect for Tribal religious beliefs. I have been witness to the appalling lack of respect for Tribal people who view grizzly bears as relatives and who harbor grave concerns about whether their beliefs have been and will be accounted for in FWS deliberations. I have been witness to FWS spokesmen saying they will consult with, or are consulting with, the Tribes, and then fail to do so altogether, or substitute a charade for any sort of meaningful process. FWS representatives do not seem to be willing to undertake good-faith efforts entailing traveling to the reservations, sitting down with Tribal people, and deeply listening to what they have to say about bears and how any pending decision by the FWS may affect tribal interests. More importantly, there is no indication that the FWS is willing to put sufficient credence in tribal concerns to change course and perhaps put delisting on hold.

The rule contains a hodgepodge of different and contradictory statements regarding whether or not FWS is requiring the Tribes to implement the CS and spend money in the process. Moreover, this self-contradictory amalgam is at variance with clear communications during the last two years from 50 tribes, typically in the form of Tribal Resolutions, making clear that all oppose delisting and that none are willing to implement the CS. This profound disregard by the FWS for official communications from Tribal governments is not only profoundly disrespectful, but also in violation of several laws and presidential executive orders

There is an enormous opportunity for FWS to do things differently with regards to Tribal interests related to grizzly bears. At two million acres, the Wind River Indian Reservation is on a par with Yellowstone Park in terms of size and boasts some of the best remaining whitebark pine habitat in the ecosystem. Other Tribal lands in other ecosystems offer similarly good habitat – some of it is already occupied by grizzlies (e.g., Blackfoot, Confederated Salish Kootenai Tribes), and some of it could soon be colonized. FWS could initiate a sincere conversation with Tribes co-management of grizzly bears--possibly with the states—along with possible evaluation of habitat on tribal lands suitable for grizzly bear occupancy.

But the first step is for FWS to sincerely listen to Tribal concerns, with an attitude of respect for the sovereign rights of Tribal nations.

6. The delisting proposal fails to consider the implications of recently adopted Forest Service policy, which makes Forest Service management plans aspirational rather than binding documents. The delisting document is predicated on the assumption that standards in forest plans will be sufficient to ensure that grizzly bear habitat protocols outlined in the Conservation Strategy will be met. This assumption is not justified, in view of the Forest Service's forest planning regulations that set the standards for the current and next generation of forest plans in the GYE national forests. Some of the forest plans were developed under the old standards, while others (e.g., Beaverhead-Deerlodge and Shoshone) were developed under the recent ones.

These recent regulations lack any mechanisms for enforcing compliance with grizzly bear habitat standards. The Forest Service maintains that forest plans under its recent planning will be "strategic and aspirational in nature," rather than prescriptive. The planning regulations eliminate standards, and

replace them with only guidelines. The Forest Service has stated that "a responsible official has the discretion to act within the range of guidelines, as well as the latitude to depart from guidelines when circumstances warrant it." Under these rules, forest plans cannot qualify as adequate regulatory mechanisms under the Endangered Species Act (ESA).

7. The delisting rule is predicated on the false assumption that Forest Service (FS) roadless areas will likely remain roadless. The delisting plan and Conservation Strategy appear predicated on the assumption that FS roadless lands will remain roadless. This is a particularly important issue affecting the future of habitat outside the PCA.

The delisting rule relies on the roadless rule to protect grizzly bear habitat from increases in motorized use. FWS also includes 2,386 square miles of inventoried roadless areas in its category of lands that will remain secure after delisting.

In the rule, FWS takes solace in the fact that the Clinton Roadless Rule has been upheld in court. It should be noted that this victory, like most of the successes over the past 40 years for grizzly bears, was won by environmental litigators, while bragged about in the rule by FWS, and is not assured of an indefinite legal life.

FWS claims regarding roadless lands fail to account for three problems. First, the rule remains under challenge in a pending case in the U.S. District Court for the District of Columbia. Second, there is mounting unregulated and illegal mountain bike and off-road vehicle use in all GYE forests; the Custer-Gallatin, Bridger-Teton, Shoshone, Caribou-Targhee, and Beaverhead-Deerlodge. Third, as of these comments, the Forest Service and a pliant subset of interest groups are actively engaged in negotiations over future management of the Porcupine-Buffalo Horn portion of the Custer-Gallatin NF, which, if successful, would undo roadless area protections in favor of mountain bike and off-road vehicle play areas in currently secure (and critical) grizzly bear habitat.

FWS cannot bank on the Clinton Roadless Rule to protect grizzly habitat. FWS can and must require protection of roadless areas if it wants them to remain secure for grizzly bears.

8. The delisting plan contains no habitat protections for over 40% of currently occupied grizzly bear habitat and over 4 million acres of suitable, but unoccupied habitat: this habitat is threatened by development. To sustain current population numbers, habitat quality and security must also be maintained. The rule acknowledges that bears today live far outside the PCA. But, the delisting plan only protects lands inside the 9,200 square mile PCA, and otherwise ignores or excludes about 5,060 square miles of habitat occupied by bears as of 2002 (more today).

The delisting proposal fails to disclose the significance of these occupied lands outside the PCA to bears, especially in lean food years and, increasingly, with future habitat changes. Nor does the proposal adequately discuss their vulnerability. The plan relies on state plans in its argument that bears can exist beyond the PCA. This is hardly consolation because state wildlife management agencies lack authority over public lands. They are only in a position to advise land managers.

In addition, there is little assurance that the states, especially Wyoming, have any intention of allowing grizzly bears to expand very far beyond the PCA, much less the DMA. Similarly, Idaho's plan seems unlikely to welcome grizzly bears in the south side of the Centennials and the Palisades and Caribou Ranges.

Today's grizzly bear population relies on a substantial amount of land outside of the PCA boundary. The most recent distribution map is published in Bjornlie et al, 2013 showing substantial increases over distributions delineated in 2000 and 2004 by Schwartz et al. (2002, 2006).

In 2004, Jon Langer of the Natural Resources Defense Council (NRDC) did an analysis of grizzly bear habitat threats in Greater Yellowstone forests, which makes a point that is still relevant today.

Langer used a map of grizzly bear distribution circa 2000 from Schwartz et. al. (2002). This map showed that grizzly bears were present on which showed that approximately 1.8 million acres outside of the PCA. Of that 1.8-million acres, about 470,000 acres, or 26%, is federally protected wilderness. In other words, only one quarter of the land occupied by bears circa 2000 outside the PCA has secure legal protections; and use of unsecured lands outside of the PCA by grizzly bears since then has only increased.

Using data provided by the Forest Service in the fall of 2004 from the Forest Plan Amendments EIS, it is clear that a significant amount of occupied grizzly bear habitat outside of the PCA is open for future development, with resulting predictable diminishment of security and productivity for grizzly bears.

Langer went on to examine all national forest land in occupied habitat (as of circa 2000) that, according to Forest Plan prescriptions, was available for one or more of the following:

- Timber harvest under ASQ,
- Surface occupancy for oil and gas,
- Suspended decision on oil and gas leasing,
- Road construction, and,
- Road effects already present.

The results do not bode well for the future of grizzly bears in the Greater Yellowstone Ecosystem. Approximately 1.2 million acres of occupied habitat outside of the PCA is available for at least one of the above development activities. Fully 65% of the secure habitat that allowed grizzly numbers to reach their 2000 level could be lost under current forest plans. With new forest planning rules that are "aspirational" rather than "prescriptive," the amount of habitat made unavailable for grizzly occupancy could become even smaller. In other words, almost anything that is not officially designated Wilderness is available for one or more types of activities that are known to reduce grizzly habitat security.

Breaking down potential habitat deterioration into its component parts, the results are not any better for the future of the grizzly population. About 458,000 acres (25%) of occupied habitat (year 2000) outside of the PCA are available for surface occupancy, and another 432,000 acres (24%) are currently under a suspended decision, and likely will be developed in the future. Approximately 854,000 acres of occupied habitat as of 2000 (47%) are in the annual saleable quantity of timber. Finally, approximately 620,000 acres of this occupied habitat outside of the PCA (34%) that currently are not affected by roads are available by administrative prescription for roadbuilding.

And, domestic sheep, a major cause of grizzly-human conflicts and grizzly mortality, continue to graze on 127,000 acres of grizzly bear habitat occupied as of 2002.

Of the more extensive suitable but as yet largely unoccupied grizzly habitat (as of 2002) identified by Merrill (2003), roughly 2 million acres are available to oil and gas development, through either suspended decision or surface occupancy. Domestic sheep graze on over 1.3 million acres of suitable grizzly bear habitat, and over 3 million acres are open to timber harvest and roadbuilding. FWS does not adequately address potential habitat loss on currently occupied grizzly bear habitat outside of the PCA in the plan. At

no point in the document is there an adequate comprehensive assessment of cumulative effects of potential roadbuilding, timber projects, and oil and gas development.

At best, the FWS offers a corrective that entails nothing more than monitoring population size and mortality rates using biased and otherwise unreliable methods (Doak & Cutler, 2014a, 2014b), and with application only to the DMA. Aside from intrinsic problems, such monitoring also debars any prospect of anticipating and reversing lagged responses of the population to deteriorating habitat conditions, whether inside or outside of the PCA. Moreover, the FWS's underlying logic is fundamentally flawed. It presumes to monitor population size over the full extent of the DMA as a primary means of judging on-going recovery of Yellowstone's grizzly bear population, while at the same time only explicitly providing for habitat protections within the much smaller PCA.

Removing Endangered Species List protection from the Yellowstone grizzly bear without any assurance that a large portion of their habitat will remain protected for them is negligent, and risks putting grizzly bears back on track for extirpation.

The delisting rule must fully and fairly disclose the level of development allowed in current occupied and suitable habitat and develop protections for all lands within the DMA. Only then can the public assess the appropriateness of delisting.

9. The delisting plan and related documents fail to include a thorough evaluation of habitat conditions outside the PCA, and fail to provide a system to monitor future conditions. The FWS uses a much-reduced surrogate of the Cumulative Effects Model (CEM) as the primary method of monitoring habitat conditions inside the PCA, consisting of little more than monitoring road densities, "secure" habitat as a direct function of road densities, and grazing allotments. Nor does monitoring of these few metrics extend outside the PCA. Further compromising the FWS's approach (as previously discussed), the FS has not attempted to verify the status of roads and trails, or to resolve data discrepancies among forests outside the PCA. By the FS's admission, the roads data on national forests outside the PCA include considerable errors.

In addition, the agencies have not undertaken a detailed and spatially-explicit analysis of vegetation and habitat productivity, such as was done to develop the CEM. Of particular importance is the status of moth sites, the health of whitebark pine, the condition of cutthroat trout spawning streams, and the productivity of elk and bison summer range. Whitebark pine is an especially key issue, since it appears that some of the most robust remaining whitebark pine stands are far outside the PCA, as in the southern Wind Rivers. The only assessment offered by the FWS of all these habitat features, both in the Rule and as a guide to future management, is convoluted argumentation based on a distorted reading of the best available science.

In sum, FWS lacks any assessment of current habitat conditions outside the PCA sufficient to adequately assess the nature and significance of past and future changes. This is an important oversight given the amount of occupied habitat outside the PCA, and its vulnerability to development.

The delisting plan states that in the future, habitat outside the PCA will be monitored, and changes assessed, but FWS provides few details about how this will occur. This must be developed in order to demonstrate that adequate systems are in place to protect the grizzly bear after delisting.

10. FWS reliance on state plans to protect habitat outside the PCA is unjustified and misleading. The delisting proposal attempts to provide assurances that habitat outside the PCA will be protected

under state plans. It cites commitments by the states to maintain habitat, and recommendations for access management provided in Montana's and Wyoming's state plans. But, elsewhere in the delisting proposal, the agency recognizes that states lack management authority over federal lands. The FWS's argument is clearly one of convenience rather one of evidence or internal coherence.

State recommendations are meaningless if federal agencies choose to ignore them. The story of the Brent Creek oil and gas leasing proposal on the Shoshone Forest in 2000 is a good example. Here, Wyoming Game and Fish vigorously objected to a Forest Service energy leasing proposal in habitat used by a minimum of 18 different grizzly bears, but the Forest Service proceeded anyway. Recommendations by state wildlife managers didn't matter, even with the grizzly protected under the ESA; they are likely to matter less after delisting.

If the FWS believes habitat outside the PCA should be protected, it must include protections in the delisting rule, rather than rely on state recommendations which carry no real weight.

11. The Primary Conservation Area is based on historical accident and political compromise, not a scientific analysis of grizzly bear habitat needs. FWS repeatedly claims that the Primary Conservation Area (PCA) alone is sufficient to support a recovered grizzly population, implying that the boundaries of the PCA are the product of scientific analysis. That is simply not the case. The PCA is the product of historical accident and political compromise, not scientific analysis.

The boundaries of the PCA are identical to the boundaries of the Yellowstone Recovery Zone in the 1993 FWS Grizzly Bear Recovery Plan, which were in turn based on the Yellowstone Recovery Zone in the 1982 FWS Recovery Plan. As the 1982 FWS Recovery Plan admits, the original boundaries were based on a crude, inadequately informed, and disputed assessment of the current range of grizzly bears in 1979, with the desired goal of providing habitat for merely 229 bears. At the time, there was "almost no data on state or private lands," as the 1982 states.

The 1982 recovery zone boundaries were flawed because they were drawn with the goal of supporting an untenably small grizzly bear population. In 1982, FWS asserted that the Yellowstone grizzly bear population will be "viable and self-sustaining," and thus "eligible for delisting" when the population reached the "population size documented in Craighead et al.," which FWS specified as "consisting of 229 bears." By any measure, the 1982 goal of 229 bears was set too low.

In designating the 1982 Yellowstone recovery zone, FWS recognized that it must "determine the habitat and space required for the achievement of the grizzly bear population goal." Yet rather than setting a biologically principled population goal and then identifying the habitat needed to achieve that goal, FWS defined its task as merely "stating or determining occupied space and habitat where management considerations for grizzly bears are necessary." FWS has never undertaken a scientific habitat assessment to determine recovery zone boundaries based on the biological needs of a recovered grizzly bear population.

Indeed, FWS failed even in its stated intent to assess the extent of occupied habitat where protective management is necessary. In order to assess occupied grizzly bear habitat in the Yellowstone area for purposes of developing the 1982 recovery plan, FWS convened a workshop in Missoula, Montana December 6-7, 1979. The workshop participants developed a map that purported to depict currently occupied habitat and created a table of lands included in the FWS Yellowstone Recovery Zone. However, FWS conceded that the 1979 assessment of currently occupied habitat was plagued by inadequate data,

differing definitional standards for what constituted "occupied habitat," and continuing proposals for further changes in the occupied habitat delineation, saying that:

NOTE: Persons attending the workshops were not in full agreement with acreages designated for occupied habitat, habitat stratification or areas for resolution. Numerous calls suggesting boundary changes were received during plan formulation, some with apparent justification and some for reasons unknown. Further, there appeared to be a variance in the interpretation of the Criteria for Grizzly Bear Critical Habitat Identification (USFS, 1975) used in the delineation of essential habitat, between forests and between forest districts; and, almost no data on state or private lands. Reconvening the workshops to review each suggested change seemed impractical. Therefore, the acreages presented will have to suffice for a beginning, the refinement of occupied habitat and habitat stratification is a plan element.

Thus, by its very terms, the 1982 FWS Recovery Zone was not only designed to support an unsustainably small population of 229 bears, it was also based on incomplete and inaccurate data and unresolved differences regarding appropriate standards for assessing occupied habitat. While the 1982 recovery plan contemplated further "refinements," the originally drawn recovery zone remains the basis for the 1993 Yellowstone recovery zone boundaries, the PCA, and the delisting proposal.

The proposed PCA is fundamentally the same as the 1982 Yellowstone recovery zone. Table 2 of the 1982 Recovery Plan depicts the recovery zone's acreage, which totals 5,437,736 acres. In the ensuing eleven years leading to the development of the 1993 Recovery Plan and its final fixing of the PCA boundaries, these acreages were modified only slightly. The Conservation Strategy states that the PCA now covers 5,893,760 acres, or 8% more acreage than was originally considered occupied in 1979 and included in the recovery zone in 1982. This minimal difference in acreage is explained almost exclusively by minor changes to the constituent areas of the six National Forests, as depicted in the following table:

National Forest	Acres (1000s) within occupied habitat c. 1979*	Acres (1000s) within PCA c. 2005**	Acreage (1000s) change 1979-2005
Beaverhead	0	69	+69
Bridger-Teton	734	724	-10
Custer	157	114	-43
Gallatin	522	909	+387
Shoshone	1,258	1,223	-35
Targhee	389	475	+86
Total	3060	3514	+454

Neither the 1993 Recovery Plan nor the proposed delisting rule explains how the addition of 454,000 acres of Forest Service land could change the 1979 map from a depiction of occupied habitat for 229 grizzly bears into a map depicting the sufficient habitat for FWS's still-inadequate goal of 500-600 bears. The incorporation of those zones into the PCA merely cements an arbitrary line based on the flawed 1979 assessment of occupied habitat.

Ironically, the population in 1979 was likely at its lowest ebb; the Service notes that contemporary population estimates ranged from 229 to 312 bears. The 1982 FWS Grizzly Bear Recovery Plan suffered from the same flaw that afflicted many FWS recovery plans: FWS set recovery goals at or below the existing population size and below viable recovery levels, thus "managing for extinction. Nowhere does

the Service explain how an area of habitat that was supporting roughly 250 bears in 1979 is expected to support more than twice that many bears "for the foreseeable future."

FWS takes inconsistent positions on the scientific legitimacy of the recovery zone/PCA. In a 1997 supplement to its 1993 Grizzly Bear Recovery Plan, FWS stated unequivocally: "There exists no system to evaluate the amount of habitat necessary to maintain a viable grizzly bear population." Similarly, in the delisting rule FWS incorrectly asserts that "there is no known way to deductively calculate minimum habitat values" for a recovered Yellowstone grizzly bear population. This is demonstrably false; a large body of science of reserve design has developed over the last thirty years (Noss et al., 1999).

Reserve design starts by identifying focal species (like the grizzly bear), determining a viable population level and then evaluating, mapping, designating, and managing habitat necessary to sustain the population over the long term. Numerous regional conservation networks have been designed throughout the world; several have even been proposed for the northern Rockies and the lands encompassing lower-48 states grizzly bear habitat. Invariably, they have proposed the need to reconnect the existing grizzly bear populations in the lower-48 states in order to ensure sufficient habitat for long-term viability of native species, including the grizzly bear. Even the most rudimentary reserve design indicates that Yellowstone grizzly bears need far more habitat than that contained in the PCA. FWS admits that "estimates of grizzly bear densities in the Yellowstone area range from one bear per 50 sq. km (20 sq. mi) to one bear per 80 sq. km (30 sq. mi) (Blanchard and Knight, 1980; Craighead and Mitchell, 1982)." Multiplying these Yellowstone bear densities by FWS's biologically inadequate 500-bear population target results in a reserve of 25,000,000 square kilometers, much larger than the PCA. The upper end of this calculation is very near the conservative estimate of habitat occupied by Yellowstone grizzly bears circa 2004, around 37,258 square kilometers (Schwartz et al., 2006).

FWS seems to recognize the need for reserve design when it promotes connecting corridors between grizzly bear ecosystems because they would enhance species' viability. Instead of using this readily available reserve design science, however, FWS has merely sought to justify continued use of a line drawn with inadequate information nearly forty years ago to provide habitat for 229 bears.

12. FWS Has Continued to Rely on Females-with-Cubs-of-the-Year, a Population Monitoring Method Invalidated by the Fund for Animals Court. In *Fund for Animals v. Babbitt*, 903 F. Supp. 96, 114 (D.D.C. 1995), the D.C. federal district court ruled that the Service's use of the "females with cubs" method of monitoring bears' population status in the 1993 FWS Grizzly Bear Recovery Plan was illegal. Yet, in proposing to delist the Yellowstone grizzly bear, FWS still relies on this legally discredited measure. The district court's ruling is directly applicable here:

"The Plan explains that the "females with cubs" measurement "demonstrates that a known minimum number of adult females are alive to reproduce and offset existing mortality in the ecosystem." The FWS concedes, however, that the methodology will not gauge population "trends or precise population size ..." Plan at 20. Numerous grizzly bear biologists have criticized this monitoring methodology because, despite its own acknowledged limitations, it is being relied on in the Plan as the principal determinant of whether population goals have been met. See, y., Comments from Metzgar to Servheen of January 7, 1990, ("Metzgar Comments"), A.R. Tab 439 at 2. Plaintiffs' foremost objection is that the "females with cubs" methodology is vulnerable to variable observer effort and for that reason has been criticized as unreliable and subjective. See Knight and Blanchard Report, A.R. Tab 258 at 7; Metzgar Comments, Tab 439 at 3. Even a report appended to the Plan acknowledges that "the application of sighting efficiency estimates [which are a base assumption of the monitoring criteria] cannot be substantiated since there is no way to assess their accuracy and they are therefore little better than guesses." Plan at 159 (Appendix

C), Report of the Yellowstone Grizzly Bear Population Task Force (1988).

Here, however, the Plan's own acknowledgement of the limitations of the monitoring methodology and the fact that the methodology is unreliable undermines the decision of the FWS to adopt the methodology incorporated into the Plan. The Court is unable to find in the record a rational reason for the agency's decision.... Accordingly, the FWS must reconsider the available evidence and its decision to adopt the population monitoring methodology that it has incorporated into the Grizzly Bear Recovery Plan. Id. at 114.”

Despite this ruling, FWS has continued to rely on the very same 1993 Grizzly Bear Recovery Plan, and on an only slightly modified version of the very same population monitoring methodology rejected by the Fund for Animals court.

Numerous scientific articles published since 1993 further demonstrate that the females-with-cubs-of-the-year population measure is inherently subjective in identifying grizzly bears in the wild and produces varied results depending on observer effort expended, the number of hours spent conducting aerial overflights, the changing nature of bear behaviors, weather conditions, and the location and availability of grizzly bear foods (Doak and Cutler, 2014a; Keating et al.,2002; Craighead,1998; Craighead et al.,1995; Mattson,1997b).

In stark contrast to the continued reliance on a flawed population monitoring method in the Yellowstone area, FWS and other federal agencies have employed a dramatically more reliable population-monitoring tool – DNA -- in assessing the NCDE grizzly bear ecosystem. Apparently, the only reason this more reliable scientific method has not been employed to assess Yellowstone bear population dynamics is that FWS has been unable to obtain federal funding for the undertaking. In the Reassessing Methods paper of 2006, FWS asserted, without support, that it would cost \$3.5-5.0 million to accurately sample the Yellowstone grizzly bear population. Simply because FWS fails to disclose what was included in this cost estimate, it is impossible to determine why this better scientific method was rejected.

Moreover, the costs associated with current methods for monitoring Yellowstone’s grizzly bear population are little if any different than the unsubstantiated costs offered by the FWS as cause for rejecting the more reliable method based on sampling DNA. The draft Conservation Strategy includes an annual cost estimate of \$262,600 to monitor unduplicated females with cubs, \$124,600 to monitor distribution of family groups, and \$703,200 to maintain 25 adult females with radio-collars for a total of \$854,000 annually. This cost, along with several other categories of grizzly bear monitoring, might be obviated by a properly conducted DNA census of the Yellowstone grizzly bear population. A comparative analysis of the true costs of monitoring population size and trends via DNA sampling versus current methods might suggest that not only are costs similar, but favor the DNA-based method by virtue of greater accuracy and reliability.

The FWS’s conclusion that implementing a DNA monitoring program is prohibitively expensive also directly contradicts an earlier scientific report co-authored by the former FWS Grizzly Bear Recovery Coordinator that concluded that a DNA hair recapture population monitoring method could be implemented in the Northern Continental Divide Grizzly Bear Ecosystem much more cheaply than the radio-collar monitoring approach the agencies continue to employ in Yellowstone (Report on Methods to Determine Population Size and Rate of Change for Grizzly Bears at the Ecosystem Scale at Tables 2-3). It makes no sense to apply a more reliable grizzly bear population monitoring method in the NCDE population, which is not proposed for delisting, while continuing to rely on unreliable population monitoring methods for a population that FWS proposes to delist and subject to a public hunting season.

Nonetheless, FWS has continued to use a population monitoring methodology largely driven by sightings of females with COY that the Service acknowledged from the very start was unreliable, that a federal court has declared illegal, and that has been reconfirmed to produce subjective and highly variable results in subsequent scientific publications. The consequences of these errors have become more profound because FWS continues to set mortality thresholds based on this discredited metric and now uses the metric to estimate total population size, not a minimum population estimate. The Reassessing Methods paper acknowledges that there is: "an increased level of uncertainty in estimating total population size using the methods we propose here." The current delisting proposal is fundamentally flawed because it repeats and even compounds these errors of the past.

The time has come for FWS to give DNA monitoring a fair and honest appraisal, and stop clinging to a biased counting method that involves excessive harm and handling of bears at a time when alternatives are available.

13. FWS has allowed delisting even though state laws would not prevent excessive grizzly bear killing. FWS irrationally ignores the fact that no existing laws in Montana, Wyoming, or Idaho protect grizzly bears from over-hunting and legalized killing to prevent private property damage, including livestock depredation.

Montana: Montana laws allow unlimited numbers of grizzly bears to be killed associated with livestock conflicts. These laws have been previously cited as a "firm impediment" to delisting by FWS but have not been changed. These laws must be change to be compatible with grizzly bear conservation after delisting.

Montana Code § 87-3-130(1) allows any person to kill a grizzly bear if "the grizzly bear is in the act of attacking or killing livestock." This statutory license to kill is incompatible with conserving a recovered grizzly population after delisting. In 1999, FWS stressed that delisting could not go forward absent changes to an earlier version of the same statute, which permitted any person to kill wildlife, including grizzly bears, when discovered "molesting, assaulting, killing, or threatening to kill ... livestock."

Recently retired FWS Grizzly Bear Recovery Coordinator Dr. Servheen informed both the State of Montana and the press that this provision was a firm impediment to delisting because it would allow for excessive grizzly bear mortality. According to a Great Falls Tribune of April 4, 1999, Dr. Servheen said: "since the state law had no limit on the number of grizzly bears that could be killed, Montana officials may be unable to minimize the number of deaths... Anybody could kill a grizzly bear anytime no matter how many have already been killed." On this basis, Dr. Servheen stated that: "We won't propose a status change until that law is changed." In a Bozeman Daily Chronicle, March 23, 1999, "Servheen told the IGBC that Montana will not be able to delist grizzlies for two years-until the next Legislature meets and agrees to change a law regulating grizzlies."

Montana never amended its laws to limit grizzly mortalities associated with livestock conflicts. The Montana Code § 87-3-130(1) still authorizes any person to shoot a bear when it attacks livestock, "no matter how many bears have already been killed" in the Yellowstone DPS. Nevertheless, FWS is proposing to delist Yellowstone grizzly bears without necessary changes to Montana's statutory scheme. Just as the existing regulatory mechanisms in Montana were inadequate in 1999, they are still inadequate to support delisting in 2016.

In addition, Montana, the Fish, Wildlife & Parks Commission has unfettered discretion "to provide open and closed seasons; means of taking; shooting hours; tagging requirements for carcasses, skulls and

hides; possession limits; and requirements for transportation, exportation, and importation of grizzly bears." Mont. Code Ann. § 87-5-302. Under this provision, which applies exclusively to the grizzly bear, there is nothing to prevent the Commission from providing a year-round open season on grizzly bears. Nor is there any prohibition against baiting, trapping and the use of dogs - all "means of taking" that are generally prohibited with respect to game animals. Mont. Code Ann. § 87-3-101(3). Thus, even though Montana recognizes the grizzly bears as a "rare" species, id. § 87-5-30, state law empowers the Fish, Wildlife & Parks Commission to subject grizzly bears to hunting regulations that are less protective than those applicable to elk, deer, black bears, mountain lions, and other far more abundant species.

Wyoming: As in Montana, there are no existing laws in Wyoming to protect bears from excessive human-cause mortality. While Wyoming classifies grizzly bears as "trophy game animals, this classification does not afford meaningful protection from over-hunting and killing associated with livestock conflicts and other private property damage. Indeed, Wyoming law allows for indiscriminate killing of grizzly bears. As Wyoming's grizzly bear management plan explicitly concedes, the Wyoming Game and Fish Commission "has authority to establish zones and areas in which trophy game animals may be taken, in the same manner as predatory animals without a license." In short, the Wyoming Game and Fish Commission is currently empowered to authorize take of grizzly bears as predators "without a license in any manner and at any time" with only a few minor exceptions. Wyo. Stat. Ann. § 23-3-103. 11. Any legal regime that permits unregulated killing of grizzly bears is inherently inadequate to protect the Yellowstone grizzly population post-delisting.

Idaho: Idaho has failed even to classify grizzly bears under its state wildlife regulations. Thus, there are no laws in place that provide any protection whatsoever to grizzly bears in Idaho. In the absence of any regulatory mechanisms to govern grizzly management in Idaho, delisting cannot go forward.

Moreover, even if Idaho were to classify the grizzly bear as a "game animal" in keeping with its grizzly bear management plan, this would not afford bears adequate protection. See Idaho Grizzly Bear Management Plan at 16. As in Montana and Wyoming, the Idaho Fish and Game Commission has broad discretion to "prescribe the number and kind of wildlife that may be taken under authority of the several types of tags and permits." Idaho Code Ann. § 36-408. Thus, there is no guarantee that the Commission will set limits designed to avoid excessive mortality from legalized hunting. Further, Idaho allows livestock owners to kill black bears and mountain lions without a license when they are "molesting livestock." Id. § 36-1107(b). In the event Idaho ever adopts statutory provisions applicable to grizzly bears, they will likely be subject to the same permissive killing regime.

In short, none of the three states within the DPS has a legal framework in place to prevent excessive grizzly bear mortality.

Largely unregulated killing of grizzly bears is currently possible under the laws of all three states. Moreover, the Service's assurance that mortalities count against the mortality limits set in the Conservation Strategy and by state plans is cold comfort. Regardless whether the killings are "counted," they are still legal under state law, and the Service has no means of controlling excessive mortality short of re-listing under the ESA. This cannot satisfy the ESA's requirement that existing regulatory mechanisms be adequate to prevent Yellowstone grizzlies from becoming imperiled again in the foreseeable future.

14. Several Wyoming county ordinances would undermine efforts to protect grizzly bears and habitat after de-delisting. Fatal shortcomings in the state statutes governing grizzly bear management are exacerbated by county ordinances that are manifestly hostile to grizzly bear conservation. County

resolutions also continue anti-bear pressure against FWS; the most recent of these was a resolution to push FWS to expedite delisting by Park County Wyoming in October, 2015.

Several Wyoming counties that collectively contain much of the currently occupied grizzly bear habitat in the GYE-specifically, Park, Fremont, Sublette, and Lincoln counties- have all passed ordinances and resolutions that explicitly state their intolerance of grizzly bears within their borders. For example, Fremont County resolved in 2002 that grizzly bears are an "unacceptable species" that constitutes "a threat to the public health, safety, and livelihood" of the citizens of Fremont County. Fremont County Resolution 2002-04 (March 12, 2002). The county further resolved that it "shall take any and all actions necessary to protect its citizens" from "unacceptable species." Fremont County Resolution 2002-03 (March 12, 2002).

Indeed, these counties have announced their determination to frustrate grizzly bear recovery efforts. For example, Fremont, Sublette, and Lincoln counties all passed resolutions in 2002 prohibiting the Forest Service from implementing the agency's Grizzly Bear Food Storage Orders within the counties' borders. See Fremont County Resolution 2002-06 (March 12, 2002) (resolving that the county "hereby opposes and prohibits the US Forest Service to implement the proposed 'Food Storage Order' within the boundaries of Fremont County"); May 1, 2002 letter from Senator Enzi to USFS Regional Forester Cables (noting that Sublette and Lincoln counties followed suit).

Since 2002, the local governments' hostility to protective grizzly bear management continues unabated. In 2004, Fremont County affirmed the earlier resolutions and declared that the Wyoming Game and Fish Department's proposal for managing grizzly bears post-delisting "is inconsistent with the Fremont County Land Use Plan, which is statutorily required by the

Wyoming Land Use Planning Act of 1975"Fremont County Resolution 2004-20 (December 14, 2004). That resolution concludes with the pronouncement that the commissioners "do hereby prohibit the inclusion of any part of Fremont County to comprise, in whole or in part, any area for the occupation, or proposed occupation, by Grizzly bears." Id.

According to Fremont County, its powers under the state's land use planning legislation trump the bear management responsibilities of Wyoming's Game and Fish Department ("WGFD"). See Fremont County Resolution 2004-20 (December 14, 2004). It is evident that the Wyoming counties that contain the majority of the bear's habitat have determined to do everything in their power to thwart the bear's successful recovery. In light of such hostile, anti- bear county ordinances, there are clearly no "adequate regulatory mechanisms" in place to protect Yellowstone grizzly bears in the event of delisting.

FWS and the state of Wyoming have done nothing to respond to these ordinances or the anti-bear rhetoric among county leadership. Rather, during the time these ordinances were being debated, FWS responded by inviting county commissioners to sit on the grizzly bear managers' committee.

Governor Mead's response to the reforming the ESA is to give county governments an even larger role in endangered species management. Governor Mead leads the Western Governors Association's committee charged with examining the ESA and providing Congress with suggestions for revision. So far these ideas have largely amounted to expanding the role of local governments (including county governments), reducing the role of science, and making it more difficult to list species.

FWS should take these trends into account in its consideration of delisting. For the grizzly bear, devolution of management to counties with the mentality of those Park, Lincoln, Fremont, and Sublette,

would be disastrous.

15. FWS should adopt Montana's approach of downplaying the role of occupancy lines and allowing bears to roam like other wildlife.

Only the State of Montana has questioned the wisdom of the approach adopted by the FWS of managing grizzly bears in accordance with a recovery zone with the effect of rendering any bears that steps over the recovery zone line more vulnerable to sport hunting and other lethal management. Montana took the approach taken with other wildlife: to manage grizzly bears where they are, not according to some artificial, pre-ordained non-rational line. In Montana, this approach was matched with a calm and proactive co-existence effort with the Forest Service and BLM in the Gravelles and Madison areas, where grizzly bear recolonization was underway. The approach worked successfully.

FWS, Wyoming and Idaho should follow Montana's lead in this case, and move away from managing bears using the unhelpful concept of lines, and replacing it with strategic problem-solving efforts where they are needed.

16. FWS recognizes the importance of linkages between ecosystems, but fails to ensure their maintenance. The FWS's approach to connectivity between the Yellowstone ecosystem and the NCDE and Selway-Bitterroot is inconsistent and contradictory. On one hand, the agency recognizes that linkages between ecosystems are important, and it has participated in linkage zone working groups over the years. It has also started, but not completed, an assessment of connectivity between Yellowstone and other ecosystems.

At a 1999 meeting of the Interagency Grizzly Bear Committee (IGBC), FWS Regional Director Ralph Morganwick stated, "The window of opportunity is closing to connect Yellowstone to other grizzly ecosystems. I have about ten years before that window is finally closed." Where is the window now?

In the Forest Service's biological assessment for the 2006 Forest Plan Amendments, the agency also underscores the importance of connectivity: "Human population increase is rapidly affecting many of the remaining possible linkages between ecosystems in the Northern Rockies, and the time for maintaining these connection opportunities is growing short." Lisette Waits, whose work is the foundation for FWS's genetics analysis, underscores the value of natural connectivity between ecosystems. She discusses natural connectivity as a positive alternative to artificial augmentation of grizzly bears.

FWS acknowledged the importance of linkage in its analysis of recovery of the grizzly in the Selway-Bitterroot ecosystem, which concluded that grizzly restoration there would contribute to a meta-population of grizzly bears, and maintain the demographic and genetic health of the populations. Furthermore, retired Recovery Coordinator Chris Servheen stated to the press that recovery of grizzlies in the Selway-Bitterroot was essential to ensure the long-term health of the Yellowstone ecosystem.

FWS has been increasingly involved in efforts to maintain ecological connectivity. The FS has also engaged in efforts to assess ways to connect ecosystems. The lands identified by Claar, et al. (1999) are similar to those found by Craighead, Merrill and others to be potential linkage zones.

In the delisting rule, FWS contradicts the approach it has taken elsewhere, and states that ecological linkage doesn't matter to Yellowstone bears. The agency claims that Yellowstone is a self-sustaining population. Similarly, the Forest Service dismissed the concept of linkages as outside the scope of its plan amendments.

In its delisting rule, FWS is trying to have it both ways on the question of linkage zone protection. Linkage zones cannot be vital and unnecessary at the same time. The agency must pursue a thorough analysis of the prospects of connecting ecosystems. Such analysis, if properly conducted, would clearly demonstrate the importance of ending Yellowstone's 100 year plus isolation from other grizzly bear populations, and outline ways that habitat connections can be achieved and maintained.

17. The delisting plan underestimates the impacts of current human population growth in the region, and fails to provide a system to monitor this growth. After tipping its hat to the problem of private lands development, FWS went on to dismiss one of the biggest threats to the grizzly bear in the Greater Yellowstone Ecosystem. I daresay the omission was politically driven, but there are compelling scientific and legal reasons to tackle this major threat to the future of grizzly bears. Even National Geographic, in its recent 2016 issue on Yellowstone, considers private lands development to be the most serious threat to the Greater Yellowstone Ecosystem.

The delisting plan fails to fully consider the adverse effects on grizzly bears as a result of escalating development on private lands, as well as human population growth in the region. While the plan generally acknowledges the relationship between the number of humans and the level of human-caused mortality, it fails to give a complete picture of the current situation and future trends, and to evaluate implications.

Appendix F that lays out post-delisting monitoring costs for implementing the Conservation Strategy make clear how unimportant the topic of private lands is to FWS. Out of a total of \$5.5 million annually for monitoring post-delisting, just \$13,500 are allocated for private lands monitoring.

The FWS plan acknowledges that a disproportional number of grizzly bear deaths and conflicts occur on private lands – a problem that is likely to worsen as growth increases – but then leaves the problem up to NGO's. FWS also relies on local planning and zoning regulations to protect important private lands, despite evidence that such regulations have had limited impact on growth (Hernandez, 2004).

Human-caused mortality is directly related to the long-term survival of the Yellowstone grizzly bear. Historically, between 85% and 94% of all recorded grizzly bear mortalities in the GYE since listing have been human-caused (Mattson et al., 1996; Schwartz et al. 2006). Increasing numbers of people moving into or nearer to grizzly bear habitat will mean a greater likelihood of human-caused grizzly mortality (Merrill et al., 1999; Merrill and Mattson, 2003; Johnson et al., 2004; Schwartz et al., 2010, 2012). Sheer numbers of people can significantly affect the persistence and survival of grizzly bears.

The recently retired Grizzly Bear Recovery Coordinator, Chris Servheen, recognized the mounting problems to grizzly bears posed by private land development. "There is a considerable disparity between the limited occurrence of private land in grizzly bear range, and the high occurrence of problem bear complaints on these lands...Another possible reason for increase in conflicts is increasing numbers of people in grizzly bear habitat...Without successful resolution of the private land problem in Yellowstone, it is likely that continuing successful management efforts on public lands will be negated." (Servheen, 1989).

Problems on private lands may be exacerbated by declines in key bear foods. Under conditions of food scarcity, bears roam more widely in search of alternatives, bringing them into areas closer to human activity, with resulting substantially increased risk of human-caused mortality (Mattson, et al., 1996; Knight, et al., 1998; Pease and Mattson, 1999; Mattson, et al., 1992). In addition to increasing mortality

risk, private lands development can compromise the quality of adjacent secure habitat on public lands.

Concerns regarding the adverse impacts of growth on the region's landscape and wildlife have been mounting (Clark and Minta, 1994; Glick, et al., 1998; Hansen et al., 2002; Gude et al., 2007). Together the twenty counties encompassing the GYE are among the fastest growing in the nation. (Rasker and Hansen, 2000; Gude et al., 2006).

Since the time when grizzly bears were listed in 1975, human population in the Yellowstone region has dramatically increased, and is expected to even more sharply increase in the future, with enormous import for the future of grizzly bears.

Between 1970 and 2000, a Sonoran Institute report showed that human population in the GYE grew by 141,621 people - an increase of 61%, compared to 38% growth nationally. In her 1998 report, "Rural Residential Development Trends in the Greater Yellowstone Ecosystem, Since the Listing of the Grizzly Bear, 1975-1998," author Vanessa Johnson showed mounting development in the GYE's twenty counties. Both Johnson and Gude et al. (2007) found that development is concentrated in important wildlife habitat, particularly along streams, adjacent to public lands and away from towns.

In addition, data from seven important GYE counties (Gallatin and Madison counties, Montana; Lincoln, Park and Sublette counties, Wyoming; Bear Lake and Fremont counties, Idaho) indicate that a disproportionate amount of private county land, that is not yet developed, has already been approved for development. Johnson notes that "projections for future trends suggest little slowing of present development levels, and a continuation of the economic and demographic conditions spurring such trends."

This assessment is confirmed by 2005 United States Census Bureau data, and a summary of county population growth in the Greater Yellowstone Ecosystem from 1980-2004 ([see attached map](#)). Teton County (Idaho), for example, grew by 150%, while Teton County (Wyoming), grew by 103%, and Gallatin County, Montana grew by 76%. Other Montana counties also showed significant growth: Madison County grew by 30%; Park County, by 23%; and, Stillwater County by 50%. Wyoming showed similar trends: Park County grew by 23%; Sublette County, by 46%; and, Lincoln County by 26%. In Idaho patterns are the same: Madison County grew by 55%; and, Bonneville County by 36%; where growth patterns are expected to continue.

In her Master's thesis, "Rural Residential Development in the Greater Yellowstone: Rates, Drivers, and Alternative Future Scenarios" (2004), Patricia Hernandez demonstrated that rural areas of the GYE will likely experience major changes in land use by 2020. She states that, "In a business as usual scenario of land use change, rural residential development is expected to increase by 82% from 2000 to 2020." Her analysis projects that rural residential development within the GYE will likely continue to be concentrated in areas most important for agriculture and wildlife, including those adjacent to nature reserves. She also found that current zoning regulations had limited impact on the distribution of forecasted homes. Among the counties with the highest forecasted rates of increase are several vital to grizzly bears: Teton, Wyoming; Park and Gallatin, Montana; and, Teton, Idaho.

In "Paving Over Paradise, A Study of Rural Growth in the Border Lands of Yellowstone Park," published in 2002 by Montana State University and Park County Environmental Council, researchers found that between 1969 and 1999 the valley between Livingston and Gardiner, Montana, saw a doubling in the number of housing units every ten years. A similar study by the Sonoran Institute showed human population doubling every seven years in Teton County, Idaho.

Much of this development is occurring through subdividing formerly large tracts of agricultural land. For example, a 1991 survey of subdivisions of 200 acres or less in the GYE found that over one million acres had already been subdivided (Harting and Glick, 1994). Impacts of subdividing large working ranches into smaller "gentleman ranches" of 10 acres or less can have catastrophic effects on habitat quality that far exceeds the footprint of each individual house. Whole valleys can be swallowed up and transformed into nothing more than suburbs with a nice view through the development of a mere twenty houses. The spreading of housing, infrastructure and roads throughout formerly undeveloped river bottoms and valleys creates a minefield of dangers for grizzly bears in land that had relied on or prospectively could rely on for movement and food.

A prime example of subdivision leading to a serious grizzly bear mortality sink is the North Fork of the Shoshone, outside Cody, Wyoming. This narrow river bottom, surrounded on both sides by vast areas of wilderness annually hosts a proportion of human-caused mortalities far greater than almost anywhere else in the ecosystem. In 2004, using data from the Annual Report of the Interagency Study Team, approximately 10% of the human-grizzly bear conflicts occurred in this narrow corridor, comprising certainly less than 10% of the land-mass of the ecosystem. In Gunther et. al. (2004) *Grizzly Bear-Human Conflicts in the Greater Yellowstone Ecosystem 1990-2000*, the North and South Forks of the Shoshone are identified as the area with the second greatest concentration of grizzly-human conflicts, with 26% of all known conflicts occurring in that area.

Not surprisingly, all six major areas of conflict identified occur in the fastest growing counties in the ecosystem: Gallatin and Park counties in Montana; and, Park, Teton, and Sublette Counties in Wyoming. What is alarming about this growth trend is not only the population increase, but also the associated increase in human infrastructure. In each of the three Wyoming counties where population growth is projected to be greatest, half of the new migrants will reside outside of established urban boundaries. That means more people moving into grizzly bear habitat, and slicing up prime habitat with more power lines, roads and houses. The associated problems of grizzly bear-human conflicts will therefore continue to increase. In the northern reaches of the Greater Yellowstone Ecosystem, the populations in Gallatin and Park counties, where Gunther et al. (2004) identified two of the six greatest conflict hot spots for grizzly bears, are expected to grow by 15% and 26%, respectively. Clearly, the problems for grizzly bears associated with human intrusion into grizzly habitat will only increase in the future.

Future trends are alarming. The total population of the 20 GYE counties in 2010 was 450,399. According to data compiled by New West, from 1990 – 2010, these counties increased their population by 137,567 people. If they maintain that rate of population increase, there will be an additional 226,620 people in the 20 counties in 2030.

Gallatin County alone would add 68,441 people from 2010 - 2030, going from 89,616 to 158,057.

The following data, compiled by Headwaters Economics, is related to the ecologically vital High Divide region which connects the GYE to Selway Bitterroot Ecosystem, and includes some GYE counties.

In the past 50 years, the number of single-family homes in the High Divide has close to tripled, from roughly 28,000 homes in 1963 to 75,000 in 2013.

- During that time, just more than half of these new homes were built outside of town centers in unincorporated portions of the High Divide counties. Since 2010, this trend has increased and 63 percent of new homes were built outside of town.

- In the last half century, the number of new homes built in the Wildland-Urban Interface (the area within ½ mile of forested public lands) has increased by more than 300 percent, from more than 2,000 homes in 1963 to 9,000 homes in 2013.
- In the next 10 years, nearly 150 square miles of currently undeveloped private land (an area equal to one half of all private land in Teton County, Idaho) is forecasted to experience low-density “exurban” development.

If development occurs as predicted, the world of the grizzly bear will continue to shrink dramatically. Yet the delisting rule fails to evaluate the available data on human population growth or its consequences on mortality, habitat quality, and security. Instead, the FWS states that existing secure habitat will remain as it was in 1998, but without evaluating the impacts of private lands development that abut secure habitat. Furthermore, despite promises in the CS that private lands development will be monitored inside and outside the PCA, the plan fails to establish a comprehensive system for monitoring of development after delisting, or to resolve conflicts. Without such a system, FWS cannot demonstrate that adequate regulatory mechanisms are in place to ensure habitat protection after delisting.

FWS assumes that private lands development is not a threat based on the fact that the population was growing. But we have raised elsewhere problems with the females with cubs metric as being inherently unreliable. And even using this metric, the Mark-Resight method is showing a slightly declining trend – but more important in an undeniable 15 year spike in human-caused mortality and a decline in 3 key foods, and a likelihood that earlier increases in the population were also driven by an abundance of foods in the 1990’s.

FWS also states that "state and federal agencies will work together to balance impacts from private development." But, the agency fails to define balance or specify how this will occur. The pace of private lands conservation work, easement and habitat acquisition is being outstripped by development. How can "balance" be achieved in the face of runaway development and escalating land prices? And, how can FWS hope to accomplish balance when it or any other federal or state wildlife management agency lacks authority to manage private lands?

FWS also relies on the work of Nongovernmental Organizations (NGOs) to address this issue. FWS cannot rely on the assumption that NGOs will pick up the pieces after delisting occurs. NGO's can help, but they lack the legal authority of FWS under terms of the ESA. Given its current authority over grizzly bear management, the FWS must establish a program to ensure that growth does not threaten the future of the grizzly.

The ESA does provide FWS with clear authority over activities on private lands through provisions to regulate illegal “take”. “Take” has been interpreted to mean habitat destruction as well as killing and harassing endangered animals. It is not clear in the delisting rule how FWS hopes to influence activity on private lands, where historically most mortalities have occurred, once delisting occurs. How will private lands not become, once again, black holes for bears, after delisting?

18. FWS underestimates the potential serious impacts of oil and gas development on grizzly bears.

The FWS fails to fully evaluate the threat of energy development on the future of Yellowstone’s grizzly bears. The adverse effects of oil and gas development on grizzly bears are well documented. In a biological opinion on the Shoshone National Forest oil and gas lease program in 1993, FWS detailed the impacts of drilling operations on the movements, home range and habitat use of grizzlies. Citing Aune (1989) and Aune, et al. (1982, 1983, 1984), FWS described the displacement of grizzlies from the vicinity

around active drill sites. In this study, as well as Harting and Nagy (1980), increased road construction was considered the most serious impact of oil and gas development. Studies also show that bears were displaced and showed reduced use of habitat adjacent to roads regardless of the relative amount of traffic. Even a small amount of traffic was sufficient to displace grizzlies (McLellan and Shackleton, 1988).

In its 1993 Biological Opinion, FWS also cites the increasing mortality risk to bears as a result of increased access from roads. The opinion states that, "In general, the increased access provided by roads, in this case, as a result of oil and gas exploration and development, precipitates increased frequency of encounters between bears and humans, usually eventually resulting in negative consequences for the bear."

Analysis of bear mortality in the Yellowstone ecosystem by Mattson and Knight (1991) showed that areas impacted by secondary roads have roughly five times the mortality rate as backcountry areas, with almost all mortalities being human-caused. In an analysis of the effects of human activity associated with primary roads and developments on grizzly bears in Yellowstone National Park, habitat production sufficient to have supported three to four adult females was estimated to have been lost simply due to displacement effects of roads. Results indicate that grizzly occupancy of habitat was reduced, efficient foraging strategies were disrupted, sub-adults were displaced toward roads and developments by more dominant bears, and that the zone around developments poses an extremely high mortality risk for adult females (Mattson et al., 1987, 1992).

Oil and gas development has an impact well beyond the surface area of the wells that are drilled. While, in appearance and on paper, it may appear that only a few hundred acres are affected by a project, in reality the noise, increased human activity, increased road use, and industrial development associated with a project makes a significantly larger area of land unsuitable for grizzly occupation.

In its discussion in the delisting plan, FWS appears to assume that grizzly bear habitat on National Forest lands will not be affected by development on adjacent private and BLM lands. This is not true. Furthermore, FWS wrongly characterizes the oil and gas lease situation inside the PCA. The plan states that, "there are no oil and gas leases inside the PCA as of 1998." This is not true. According to Forest Service lease data, nine parcels are currently under lease inside the PCA.

What is even more dangerous for the long-term survival of grizzlies, however, are the 1,643 active leases in suitable grizzly habitat. This could pose a significant threat to grizzly bears, especially since the Forest Service has never been known to deny a development request, once a lease is granted. The prospects of stopping full-field oil and gas development on public lands are remote, if industry pursues it.

According to Dr. Brian Horesji (1998), "To my knowledge, there does not exist a grizzly bear population in North America that has been able to sustain its numbers and distribution where moderate to full field oil and gas development has taken place." A wealth of research since 1999 by Gordon Stenhouse focused on such areas in Alberta fully substantiates this statement, and explicitly with regards to grizzly bear demography (Boulanger and Stenhouse, 2009).

FWS appears to take comfort in the presumed fact that oil and gas development impacts will be adequately addressed as part of the developed site monitoring effort. Again, the agency appears to confuse monitoring with management, while ignoring the significant information on the adverse effects of energy development described above.

FWS also places unjustified confidence in the No Surface Occupancy Stipulations (NSO) in certain areas

inside of the PCA. Under current Forest Plans, there are 183,000 acres of national forest inside of the PCA that are designated NSO. Much of this land is concentrated in Shoshone National Forest.

FWS' approach to mitigation of oil and gas and other development in the rule and CS is fundamentally flawed. It maintains that can replace secure grizzly bear habitat with habitat of similar quality if habitat is degraded by industry. Such an approach would require an immense understanding of bear habitat use, and habitat quality of what would be lost. This also assumes that grizzly bear habitat could be improved, and that habitat of comparable quality could be found at the right spatial scale. Habitat security would have to be the scientific metric – through closing of allotments, or roads. Even if comparable habitat security could be made, the Forest Service does not have a history of willingly closing roads except for the provisions of the ESA and mostly as a result of litigation. How can this be expected to be done after delisting under a plan that is voluntary?

The oil and gas industry has long had its eye on exploiting the marginal plays in this area, especially along the edges of the Bighorn Basin. The agency overlooks the fact that such stipulations will be waived if full-field development is pursued. The agency also places unwarranted faith in analysis under the National Environmental Policy Act to address oil and gas threats. A cursory look at the explosion of oil and gas development on BLM lands in the upper Green River area in Wyoming, and the impacts on habitat important to big game and sensitive species, demonstrates the inadequacy of NEPA by itself to curb harmful activities, especially in the face of political pressure to develop.

And, FWS ignores the substantial political pressure under this administration to develop oil and gas resources. The Obama administration's resistance to listing sage grouse despite the overwhelming scientific evidence of the biological threats is a case in point. The recent history of political pressure overwhelming good science is eerily consistent with a 1999 PEER report, "Grizzly Science," which showed the adverse personal consequences to agency employees who took a stand for grizzlies and objected to development proposals.

Exacerbating these problems is the pattern of wildlife law violations found in areas associated with oil and gas boom towns. In an assessment of wildlife law violations among populations varying in growth rates and socio-economic status over an eleven year period, Berger and Daneke (1988) found that the oil and gas boom towns had higher wildlife law violation rates than agrarian or recreation-based populations. Specifically, their reports stated that, "Workers in areas of industrial expansion appear more prone to commit wildlife violations than those in recreation or agrarian-based units." Authors call for a need for "increased action, possibly additional enforcement effort by public agencies and industry, if rates of wildlife violations are to be maintained at levels similar to those found in recreation, boom towns or farming communities."

In its delisting plan, FWS fails to evaluate the potential for increased poaching in grizzly bear habitat as the result of oil and gas development on the periphery in communities, such as around Pinedale. This is a significant oversight, especially given the pace of development in Wyoming, and the proximity of this development to high quality bear habitat.

19. The plan lacks adequate funding mechanisms and fails to demonstrate agency commitment to implement the delisting plan. The delisting plan requires millions of dollars per year to be obligated and spent, in addition to what is already being spent on grizzly bear recovery. Yet, after delisting, ESA Section 6 funding to the states will disappear, reducing available funds to the three states by hundreds of thousands of dollars per year. And nowhere in the proposed Rule itself or in the package of supporting materials is there any substantiation that increased funds will be allocated by state or federal

governments to support post-delisting management of grizzly bears. If anything (as in the Memorandum-of-Agreement among the states of Wyoming, Montana, and Idaho), there is explicit statements to the effect that post-delisting arrangements entail no obligation to allocate funds.

The amount of potential funding shortfalls is unclear, because the rule and appendices say different things in different places. In an appendix, implementation of the rule requires \$5.5 million annually, while in the rule FWS says it costs \$ 3.8 million. Either way, it is a lot more than the \$2.5 million required to support implementation of the 2006 CS. And, according to information I received from FWS through MT Senator Baucus' office in 2008, there was a shortfall of perhaps \$1 million per year following delisting in 2007, after Senator Conrad Burns had procured \$2 million for two years through an appropriations rider in Congress. How will the CS and rule requirements be funded -- and importantly, what will happen if they are not?

Making matters worse, Forest Service funding is seriously declining and expected to further tank. By its own admission, the Forest Service already lacks the necessary funds to implement many of the monitoring provision in its plans; this problem will only worsen in the future. In the draft CS, a footnote states that 70% of the funding for conflict reduction work (or \$455,000 annually) is unfunded. This is an enormous problem given that the lions' share of grizzly bear habitat is on National Forest lands. How will this problem be addressed?

The Park Service's funding is not secure and could decline as well (Cain, pers. com. 2006). Yet, the agency is expected to provide several hundred thousand more per year beyond current funding after delisting. Where will this come from? Given the increase in grizzly bear presence on Grand Teton Park and the importance of managing and monitoring people around roadside bears, this situation is a particular challenge.

In addition, the states have not made a commitment to make up the difference after Section 6 ESA funding is gone, let alone cover the planned increases. Montana is of particular concern, as the delisting plan requires additional funding as well; in 2006, the additional costs were \$188,000 annually and the appendix in the draft CS shows a substantial increase in costs for conflict reduction work in Montana, which is a vital requirement of the delisting plan. Again, the current Memorandum of Agreement (MOA) developed by the states to manage post-delisting management of mortality makes it clear that such agreements DO NOT obligate the involved states in any way to allocate implicated funds.

Uncertainties about future funding have often been discussed at Interagency Grizzly Bear Committee (IGBC). FWS has complained about funding shortfalls, and even the IGBST has had to fight for necessary resources to cover overflights needed to monitor the population.

Necessary funding is essential given the intensive habitat and population monitoring needs, and costly conflict resolution efforts in the delisting plan. To address this challenge, the IGBC and state game and fish directors proposed to create a permanent endowment to generate funds indefinitely. This endowment fund was discussed at nearly each meeting of the IGBC for over two decades with no results. The IGBC framed the fund as an essential part of the delisting strategy. For example, at the spring 1999 IGBC meeting, the IGBC said in the minutes that it needed a corpus of \$40 million to establish the endowment fund. Nonprofit organizations supported this proposal, and wrote letters to generate political interest. The fund was never created, and no alternative proposal to provide necessary support has been made. Meanwhile federal support for agency funding overall has been tanking.

Without hugely expensive life support that the agencies say they need, delisting is inappropriate.

20. Wyoming's Plan does not allow for grizzly bears in the Greater Yellowstone Ecosystem to occupy all suitable habitat and link to other populations or additional suitable habitat in the Selway Bitterroot Ecosystem. Grizzly bears have been extirpated in approximately 99% of their original number in the lower-48 states. While in many areas of the West, it is unlikely that grizzly bears will ever be able to ever survive again, there is a unique opportunity in Greater Yellowstone to achieve meaningful recovery and permit recolonization of their proximal historic range. There is plenty of habitat to support significantly more grizzly bears in Greater Yellowstone than there are today in this ecosystem (see Merrill et al., 1999; Merrill and Mattson, 2003; Johnson et. al., 2004; Schwartz et. al., 2010). By removing "threatened" status at this stage, however, it is unlikely that grizzlies will be allowed to continue expanding into the remaining unoccupied suitable habitat – especially with trophy hunting plans already developed by three states of Montana and Wyoming.

The Wyoming State plan even goes as far as seeming to prohibit grizzlies from occupying habitat in the Wyoming Range and key parts of the Wind Rivers Range. Idaho appears to do the same to grizzly bears in the southern Centennials and Palisades. By accepting the Wyoming and Idaho plans and removing threatened protections at this juncture, FWS is denying the American public the right to have a sufficient population of grizzly bears in and around Yellowstone. The Greater Yellowstone Grizzly population would benefit immensely, and be more assured of long-term survival, if it was afforded protections under the ESA until bear could reoccupy all remaining suitable habitat in the ecosystem, of which even FWS acknowledges there is a considerable extent.

Allowing continued expansion of Yellowstone's grizzly bear population into suitable habitat under continued ESA protections would also facilitate linkage with other ecosystems (Carroll et a;, 2003; Merrill, 2005). To ensure an evolutionarily robust population, capable of surviving for thousands of years, it is critical to establish connections with other ecosystems. Yet, the plan in place does not provide any encouragement for grizzly bears to expand through natural linkages in the Centennials Mountains into the Selway-Bitterroot ecosystem.

If habitat quality were to remain at existing levels in the places where bears live today, and if bears were allowed to expand into additional suitable habitat, a significantly larger number of bears could be sustained in Greater Yellowstone. It is the duty of FWS to do what is necessary to ensure the long-term survival of the Yellowstone grizzly. The best way to do that is to allow for reoccupation of all remaining suitable habitat in the ecosystem. Moreover, this burden should weigh all the heavier if habitat quality is, in fact, declining in the Yellowstone Ecosystem, in which case, the population should be allowed to expand into all suitable habitat as a safeguard against deteriorating conditions.

21. The Wyoming plan could result in the decline of the Yellowstone grizzly bear population. Officials of the Wyoming Game and Fish Department officials have stated in public meetings ostensibly designed to elicit public input that Wyoming plans to manage the grizzly bear population down to 500 bears. The MOA indicates that Wyoming could pursue an aggressive grizzly bear hunt, totaling, with Idaho and Montana, perhaps 72 grizzly bears annually.

In addition, Wyoming officials have also discussed raising mortality limits above the 9% threshold recommended by FWS. Several officials have indicated that Wyoming plans to push for a mortality limit of 12% of the population after delisting, and a reduction of bear densities in the North Fork of the Shoshone and the upper Green River, both areas important to achieving recovery targets. As Wyoming game managers and hunters begin killing bears in these pre-determined parts of the state, without allowing for further grizzly expansion into suitable habitat, the grizzly population in the region risks

slipping into decline. In its statements in the press and at meetings, FWS allowed Wyoming's expectations to be raised by tacitly allowing the state to pursue such a catastrophic course.

FWS appears to take comfort in the fact that Wyoming signed the past CS, and assumes the state would not deliberately violate mortality thresholds. But, statements by the state indicate otherwise. And, after delisting, without a legally binding plan, how will FWS stop violations if they occur other than perhaps, by intervening when the estimated size of the population size drops below 500? That, of course, could occur when the population trajectory is heading steeply downward, and protections, if re-granted, are too little, too late.

22. Idaho's plan is similarly disastrous for grizzly bears. Idaho contains some of the most important habitat for connecting grizzly bears to the Selway Bitterroot Ecosystem and ultimately to Canada. Yet, Idaho has drawn lines in the sand and presumed to prevent grizzly bears from occupying the southern Centennials as well as the Palisades areas. The primary reason for this hostility is the presence of domestic sheep.

FWS wrongly concurs with Idaho that the mere presence of sheep means that the habitat is unsuitable, when it has historically worked to successfully remove domestic sheep through negotiations with livestock producers – thus making the habitat suitable.

The other problem with the Idaho plan is that it is old, dating back to 2002. Wyoming and Montana have had to update their plans – why does FWS let Idaho off the hook? Because its plan has been approved by the dreaded state legislature? That does not satisfy the terms of the ESA. The failure to update the plan is a demonstration that the regulatory mechanisms are inadequate to protect delisted bears.

Further, Idaho's public has changed a lot since 2002 and should be asked their views on grizzly bear recovery and delisting again. It is not appropriate to rely on such an outdated plan, especially one that lacked any scientific basis to begin with. There has been much new information on grizzly bears that should be incorporated in a revised Idaho grizzly bear plan.

23. The delisting plan relies on importation of bears to address genetic problems, even though a more natural and durable alternative is available. The plan requires importation of more than one successfully-reproducing bear every ten years into the GYE to address genetic problems, if natural migration from the Northern Continental Divide Ecosystem (NCDE) does not occur by 2020. This number would need to be at least 3 or more per decade given that, on average, only 1 in 3 bears will successfully pass along genes (a direct function of the difference between N and N_e). Simply put, this is not natural recovery, violates the intent of the ESA to restore wild, self-sustaining populations, and is a project beset by practical problems that affect any augmentation effort transporting animals into unfamiliar habitat. As, grizzly expert Dr. Chuck Jonkel said, "Dropping a bear from Canada into Yellowstone is like dropping a naked man into eastern Turkey. He might be able to survive, but probably not."

Transplanting grizzly bears into Yellowstone from dissimilar ecosystems farther north is problematic simply because intimate knowledge born of formative environments is so critical to the survival of bears, and because competition from resident bears can compound any disadvantage arising from lack of familiarity with foods and habitats

On top of this, the FWS has demonstrated very little success in its previous efforts to augment bear

populations, most notably in the Cabinet Mountains of northwestern Montana. Of four grizzly bears transplanted during 1990-1994 and 13 bears transplanted during 2005-2014 (17 bears during an aggregate period of 15 years), only one has been known to successfully reproduce (Kasworm et al., 2015). This is a demonstrably low rate of success, moreover in a situation where bears were transplanted from habitats similar to those in the target area (from SE British Columbia and the Flathead portion of the NCDE). Given this track record, the FWS and states would need to plan on transplanting a minimum of 11 bears to achieve the goal of infusing the genes of 1 bear every decade.

In its delisting rule, FWS does not assess the likelihood of success of transplanting bears or the consequences of failure. Nor does the FWS evaluate whether the long-term health of the population could, in fact, be achieved without artificial augmentation, by allowing for the natural connection of currently expanding grizzly bear populations in the NCDE and GYE—an approach supported by Miller and Waits (2003) in their seminal paper on the genetic plight of Yellowstone's grizzly bears. The FWS selectively referenced only the portions of this research that supported their argument for artificial augmentation.

Grizzly bears are already demonstrating that they are near to establishing connectivity between the NCDE and GYE through natural movements alone. Grizzly bears are progressively spreading south from the NCDE (Mace and Roberts, 2013), most notably as far south as the Sapphire and Anaconda Mountains. At the same time, grizzly bears are expanding northwest-ward from the GYE, recolonizing the Centennials, Gravellies, and Tobacco Roots (Van Manen et al., 2014, 2015). By their behavior, grizzlies are demonstrating that they will occupy suitable habitat if human populations are low, and people are reasonably tolerant.

There is suitable habitat connecting Yellowstone to other ecosystems: grizzly bears can occupy this habitat if we let them. Not only does natural recovery accomplish the goals of the ESA, but it will be less costly and labor intensive in the long-term, and more likely to succeed.

24. FWS relies almost exclusively on population metrics to assess recovery, rather than including habitat thresholds. FWS's delisting plan is based almost entirely on population numbers, and the assumption that that population is increasing (or at least not declining). Funding allocations in Appendix F reflect these priorities: less than 5% if the \$5.5 million annual budget goes to anything related to habitat.

The primary factor that would prompt a review of the status of the population or change in management is if population or mortality thresholds were transgressed. The plan contains no specific habitat impairment standards that would prompt a management response.

The plan contains a discussion on this issue. It states that a biology and monitoring review could be triggered by "failure to meet any of the habitat standards described in the CS." But, it fails to disclose the fact that these are only monitoring, not habitat management standards. This problem is exacerbated by the fact that the FWS has not identified any triggers or thresholds for habitat metrics with known explicit relations to demography. Even so, the search for such triggers would not be onerous. Johnson et al. (2004) and Schwartz et al. (2010, 2012) present research that relates survival rates to the nature and extent of landscape features, including road densities, and thus constitute a ready basis for developing provisional triggers or standards that integrate conditions for the full extent of the PCA and even DMA..

Scientists have demonstrated that significant lag-times exist between habitat loss and responses in death rates and growth of grizzly bear populations. Research has also shown threshold population effects, which could mean that by the time the problem is detected, it may be too late to fix it. Estimates of lag-

times between habitat degradation and detectable effects on the Yellowstone grizzly bear population were found to be 8-13 years (Doak, 1995). According to Doak: "Long lag-times can exist between critical levels of habitat degradation and any detectable change in population sizes, even when monitoring data are excellent."

In comments on the Conservation Strategy and other related delisting documents, a number of suggestions were made to FWS about habitat metrics that could be used to establish triggers or standards, including: a. abundance of whitebark pine, cutthroat trout, bison and other key foods, b. human population sizes and numbers of recreational visitors, and, c. levels of human-related development and activities, such as off-road vehicle use. These suggestions have been ignored by FWS.

25. The delisting plan lacks binding motorized access management standards, and adequate access monitoring and enforcement mechanisms. The 1993 Grizzly Bear Recovery Plan and a significant body of scientific research, cited elsewhere in these comments, have demonstrated that roads kill bears by increasing human-caused conflicts. Forest access standards that limit motor vehicle access have significantly benefited grizzly bear recovery. Specifically, in the Targhee National Forest, the institution of road-density standards in 1993 resulted in the recolonization of the Plateau and Henry's Lake bear management units by adult females, where they had been virtually eliminated because of excessive clear-cutting and road building.

Unfortunately, the delisting plan downgrades current access management standards on national forest lands from what had been a binding management standard in earlier drafts, to a monitoring tool only. If the current forest road standards were only monitoring tools and bears were delisted, the improvements in the Targhee would not have been made. This proposed change exacerbates the problem, discussed elsewhere in these comments, of enforceability of habitat standards on national forest lands. Given what is known about the significant serious impacts of roads on bears, this approach is inadequate to maintain grizzly bear habitat and ensure recovery.

FWS should adopt the proven approach of the Targhee National Forest, summarized in the 1993 FWS Biological Option and FS Biological Assessment on the Plateau BMU. Using information on habitat quality, roads and their impacts, female foraging patterns and home range size, as well as, topography and cover, the FS developed a sound management and restoration plan which has proven successful. This approach should be expanded to all forests in the GYE, and should include occupied and suitable habitat outside the PCA. (This can be accomplished by establishing approximate home ranges.)

26. The delisting plan and related documents lack necessary standards for protecting grizzly bears from the impacts of increasing ATV use on top of other forms of access and human contact. All Terrain Vehicles (ATV's) are motorized vehicles capable of running on trails. Their use is of particular concern because it is exploding on national forest and BLM lands. They effectively transform trails into roads, and make previously remote wild country accessible to an increasing number of people. Approximately 75% of the occupied habitat (as per Schwartz 2002) outside the recovery zone is open to ATV use under current forest plans.

Inadequately regulated ATV use can increase rates of human-caused conflicts and mortalities. It can turn low use trails into high use trails. It can turn secure habitat into insecure habitat.

ATV use allows more people to get further into the backcountry faster. Grizzly bears have survived in those few areas where they have been able to find security from human-grizzly bear conflict. As more people are able to motor into formerly secure grizzly bear habitat, increased grizzly mortality is known to follow.

In the case of ATV use, many users are known to flaunt the law and ride off trail. That further compromises backcountry secure habitat. They are also known to break other laws, such as gun and litter laws. These can be the kind of people, in fact, who are more likely to poach grizzly bears. FWS needs to take this into account.

FWS approach in the rule and CS is centered on protecting secure habitat and managing roads access. The approach was developed in the early 2000's before the explosion of ATV use took place. The FS is ill equipped, due to lack of funds and resources, to deal with the problem of monitoring ATV use on national forest lands. Their funding problems are getting worse.

FWS has the burden to assess and ameliorate the impacts of all reasonable foreseeable threats to the future of the grizzly bear. In the case of ATV use, it has utterly failed this challenge.

Escalating ATV use in the Northern Rockies is a top issue of concern for managers and public alike. For example, a 1999 report by the White House Council on Environmental Policy, "Off-road Vehicles on Public Lands," found that ATVs have damaged every kind of ecosystem in the United States. According to the FS, ATV use in the US increased by more than 150% between 1991 and 1998. During this time, the number of state-registered ATVs and motorcycles in Montana more than doubled to 18,953. And the number of ATVs in use in America continues to increase. According to the motorcycle industry council, a trade organization, ATV sales increased 89% from 1998 to 2002.

In a 2001 speech in Missoula, then Forest Service Chief Mike Dombeck drew a parallel between today's recreation industry and the timber industry of 20 years ago. He said, "On public lands, off-road vehicles will be the issue of the decade. We seem to have this attitude that we can go anywhere with anything at anytime."

In grizzly habitat, the problem of ATV use is exacerbated by:

- a. The growing trend in late season snowmobile use (as late as July in some areas),
- b. The increased sophistication of snowmobiles and ATV's that allows them to penetrate further into wild country, and,
- c. The growing number of violations by ATV users of access standards.

In the Greater Yellowstone region, the FS concedes that ATV use needs to be much better regulated, but has been slow to revise management plans in response. Although data on use is hard to find, what data does exist is disturbing. A 2014 report released by the state of Montana Bureau of Business, Economic Research and the University of Montana, shows an increase in registered off road vehicles in southwest Montana, from roughly 50,000 in 2006 to 77,200 in 2013. The same report shows Southwest Montana, which includes grizzly bear habitat, to be one of three major off road vehicle hubs in the state.

Meaningful regulations that limit ATV to designated areas, away from core grizzly habitat in each national forest in the Greater Yellowstone Ecosystem, are a necessary prerequisite for FWS to consider delisting the Yellowstone grizzly bear population.

Problems associated with growing ATV use must be addressed with a comprehensive management, monitoring and law enforcement program in regards to motorized access in national forests lands.

27. The plan fails to address the rising issue of mountain bike use in grizzly bear habitat. FWS says nothing about the issue of growing mountain bike use in backcountry habitat in the GYE, including in habitat that FWS is assuming will remain secure for grizzly bears. We know that bike use is increasing in grizzly bear habitat in the Gallatin Range, Taylor's Fork, Teton Range, Wyoming Range, and Mt. Leidy Highlands.

The FS seems to know little about what is happening in the backcountry, as resources decline. But that does not let FWS off the hook to address the problem and to demonstrate that adequate regulatory mechanisms are in place after delisting.

28. The plan contains a confusing and inadequate discussion of the degraded bear management sub-units on the Gallatin and Caribou-Targhee National Forests. The Gallatin and Caribou-Targhee National Forests have excessively low levels of secure habitat in several bear management sub-units due to high levels of motorized access. Excessive road densities are of particular concern in three sub-units that were identified in the 2006 Conservation Strategy as needing road closures and habitat rehabilitation. These sub-units are: Gallatin #3, with 55% secure habitat; Madison #2, with 67% secure habitat; and, Henry's Lake #2, with a startlingly low 46% secure habitat. The draft rule claims that these subunits have shown an average of 7.5% increase in secure habitat and that these improved levels will serve as new baseline for these three subunits with continued implementation of the 2006 Gallatin Forest Travel Plan. The FWS then goes on to claim that one of the 2016 Conservation Strategy's goals is a no net decrease in habitat security inside the PCA, and if achieved that Yellowstone's grizzly bears will no longer be threatened.

This is a logical non sequitur. These subunits are still below par. FWS has a duty to fix the problem, not just keep it from getting any worse.

Further, using an averaging approach is inadequate and confusing. One of the subunits is not even next to the other two. FWS must be clear about how secure each subunit is, what challenges face restoration efforts, and how they are going to be improved to meet 70% compliance.

It is clear that one problem in these subunits is the presence of private lands. But here, the Gallatin National Forest could re-double efforts to close roads on federal lands, to compensate for the excessive access on adjacent private land. This approach has been discussed in the past with Marion Cherry and others on the Gallatin National Forest.

Such an approach has been pursued elsewhere by the Forest Service. For example, on the Lolo Forest, the Forest Service increased efforts to close roads to restore security for elk habitat, due to excessive habitat degradation on adjacent Plum Creek lands. Similarly, the Swan Conservation Agreement established a policy for the FS to do less in light of excessive clearcutting on nearby Plum Creek lands. The Gallatin should adopt a similar approach.

29. The delisting plan allows harmful degradation of habitat inside the PCA. The delisting proposal allows the Forest Service to degrade one percent of each bear management sub-unit, as long as this impact is mitigated by road closures and restorations elsewhere in the same BMU. FWS underestimates the potential significance of this change, which would allow 29,500 acres of development activities per year in perpetuity within the PCA.

FWS allowed this loophole to degrade habitat under pressure from the Forest Service. The FWS appears blind to the Obama administration's efforts to promote "healthy forests", which are aimed at perpetuating unsustainable timber harvest on public lands. From participating in meetings where this "1%" loophole was established, the motivation was clear: certain forests, especially the Caribou-Targhee, were insisting on having more "management flexibility," so as to be able to harvest more trees and build more roads. Under current forest plans, 744,000 acres inside the PCA are in the annual saleable quantity for timber harvest. An additional 271,000 acres could be logged for "ecological purposes." Timber harvests, and the roads that accompany them, are a very real threat to maintaining habitat quality for grizzly bears inside the PCA.

In addition, the proposal is built on the questionable assumption that habitat quality can be reduced in one area and improved in another without adversely affecting bears. This assumes that grizzlies can effectively respond to these management changes. In his study of grizzly bears in the South Fork of the Flathead, Rick Mace (1993) found that there can be a significant delay between the time that roads are closed and the time that bears, especially females with cubs, respond by utilizing the habitat again. And, in its 1993 biological opinion on Shoshone oil and gas development, FWS also recognized that road closures may not compensate for construction of new roads, depending on the value of the habitat to bears.

Roads and motorized access could erode away at habitat quality inside of the PCA. Unregulated ATV use throughout the ecosystem is damaging secure habitat for grizzly bears. What is more, there are approximately 329,000 acres inside of the PCA that currently are roadless, but where the management prescription allows road construction. Increasing the density of roads anywhere in the PCA will erode habitat quality and potentially lead to a decrease in the grizzly bear population of the GYE.

30. Sensitive species designation on national forest lands does not give any protection to grizzly bears. FWS makes a big deal in the rule about sensitive species designation for grizzly bears on National Forest lands, as if that does something meaningful for grizzly bears in terms of habitat protections. Sensitive species designation has no teeth as far as restricting habitat management. FWS essentially concedes the point its claim that National Environmental Policy Act reviews would be required involving grizzly bears, as it would be a sensitive species post-delisting. That goes without saying of any major habitat altering activity on National Forest lands. If FWS intends to give grizzly bear habitat protection, it must make it an iron-clad requirement, through standards.

31. FWS fails to acknowledge that recovery targets have not been met. FWS has repeatedly stated in the press and public presentations that all of the recovery plan targets for grizzly bears have been met. This is not true. In seven years out of the last 11 years since 2004, IGBST annual report data show grizzly bear mortality thresholds were violated for allowable mortality. Female mortality limits were violated in 2004, 2005, 2006, 2008, and 2015. Independent male mortality limits were violated in 2008, 2010, 2011, and 2015. With 61 mortalities in 2015 (59 of them human-caused), the death count was off the chart.

FWS is required to publicly announce violations of mortality limits, which, according to the FWS, happens when mortality limits are exceeded for a given sex two years in a row, as defined in the 2012 Reassessing Methods paper, and as calculated annually by the IGBST. In 2010 and 2011, IGBST calculated that independent male thresholds had been violated. In 2010, the thresholds had been violated by a margin of 10 bears (the limit was 24, and 34 bears had died). In 2011, the threshold was violated again. Yet the violation was never acknowledged nor addressed by the FWS.

In press coverage on the delisting issue as well as in the proposed Rule, the FWS continues to give the

false impression that targets have consistently been met. Further, at IGBC meetings, the FWS failed to sound the alarm so as to initiate a meaningful response among other agencies. Rather, FWS has used the meetings as an opportunity to promote delisting in the press. If such violations of the public trust and of the FWS's own standards are happening now, how can the public be assured that it will be informed of violations after delisting – or that any meaningful response will be initiated?

32. The delisting plan fails to address issues associated with high ongoing human-caused grizzly bear mortalities in a meaningful way. Most of the grizzly bears that die in the GYE die of human causes and, according to FWS, most are avoidable. But, the plan does not address this issue in a way that will likely be effective. It scarcely mentions the importance of hunter-related and livestock related mortality, which are two of the three leading causes of grizzly mortality in the GYE.

FWS adopts a one-size-fits-all strategy to address human-caused mortality. In the delisting rule, it appears to almost exclusively rely on information and education efforts, despite acknowledgements that for certain kinds of offenses, effective law enforcement efforts are essential. To develop management strategies with a high probability of successfully reducing human-caused mortality, FWS should conduct an explicit geographical analysis of individual human-caused mortalities, including gender and age, according to: a. the availability of attractants, b. roads and developments, and, c. attractive natural foods. It should consider the likelihood of future changes in each of these factors, and their effects on mortality rates. Using this information, the agency can develop necessary steps to avoid excessive mortality by developing strategies that are most likely to work in different circumstances.

Careful management of food and game meat around camps can also alleviate problems. Information collected by the Forest Service on the status of hunter camps in the Thorofare indicates that much more can, and should, be done to ensure compliance with food storage rules. In addition, requiring hunters in the GYE to carry and use bear pepper spray could contribute to fewer bear injuries and mortalities.

Adequate field personnel and law enforcement capability are critical ingredients to reducing unnecessary human-bear conflicts and bear mortalities in places like the Thorofare and Teton Wilderness, where conflicts are chronic, and illegal killing is rife. In its 2003 and 2009 reports on mortality, FWS acknowledges that more law enforcement efforts are needed. This is consistent with the findings of a hunter-related mortality group convened by the Bridger-Teton Forest in 1999 to address increasing hunter-caused grizzly bear mortality. The group, of which I was a member, concluded that more law enforcement and field personnel were needed to alleviate the problems. These recommendations have not been implemented, and are not reflected in the delisting plan. FWS should implement its own recommendations to reduce avoidable mortalities before delisting.

FWS can do more to reduce the number of grizzly bears killed because they are mistaken for black bears. These account for about one dead grizzly a year. The delisting proposal failed to disclose this important fact, or require reasonable precautions against mistaken identity kills in the future. Such steps include: a. barring black bear baiting on all Yellowstone national forests in the Wyoming and Idaho, not just on lands inside the PCA; b. prohibiting black bear hunting where grizzly densities are high; and, c. ensuring that hunters can tell the difference between a black bear and a grizzly by a mandatory test.

Sanitation also remains a significant challenge for bear recovery. While Yellowstone Park and some communities outside the park have gone to enormous lengths to remove grizzly bear attractants and reduce conflicts, others have not. Conflicts have been mounting on the periphery of the ecosystem, especially in Wyoming, where sanitation and education efforts are less common or well-developed. According to FWS data, a disproportionate and increasing number of mortalities and conflicts are

occurring outside the PCA, and are related to the availability of attractants.

Communities repeatedly cite the lack of necessary resources for management of attractants. The problem of unnecessary human-caused mortality as a result of food-habituation will only get worse after delisting, when allowable mortality levels are raised, resources for conflict resolution decline, and prohibitions on “take” are removed.

FWS should redouble its efforts to reduce anticipated human-caused mortalities associated with attractants. It only makes sense to resolve remaining sanitation problems in the ecosystem before delisting, especially since problem grizzly bears pose a human safety risk. Primary areas of focus should be those where sanitation related conflicts are occurring or the potential for such conflicts is high, such as the North and South Forks of the Shoshone, Dubois, Moran/Buffalo Valley, West Yellowstone, Gardiner, Cooke City and Island Park.

33. The delisting analysis lacks a meaningful assessment of population viability and future risk for the grizzly bear population. The 1993 Grizzly Bear Recovery Plan calls for assessing the long-term viability of Yellowstone’s grizzly bear population. In his 2001 summary of various PVA models, Dr. Mark Boyce said that these models were limited because they were not linked to habitat data, and thereby assumed constant habitat conditions. There has been no attempt in any of the delisting-related documents to explicitly link demographic and habitat data to produce a habitat-based population viability assessment. Such an assessment should include projections of different scenarios specified in terms of varied birth and death rates and habitat conditions.

A number of studies have demonstrated that it is possible to link demographic and habitat data to establish reserve designs to ensure the survival of wildlife populations (Noss et al., 1996). For example, Carroll et al. (2003) used SITES and PATCH algorithms to explicitly forecast habitat-driven changes in viability for large carnivores in the Northern Rocky Mountains. They projected a 15% decline in carrying capacity and related impairment of viability specific to grizzly bears.

A different, but complimentary, analysis has been conducted for grizzly bears by Boyce, et al. (2005). In this study of grizzly bears in the Alberta foothills, the authors developed spatial predictions of survival relative to different habitats and human-related landscape features. They used empirical models, current animal occurrence and risk of human-caused mortality specific to certain habitat conditions. The resulting map and assessment of source and sink habitats for adult females and relative mortality risk allowed the authors to assess priorities for conservation.

Such an approach could be developed by FWS specific to conditions in the Yellowstone ecosystem using existing data on grizzly bear locations and current and projected future habitat conditions. It could be used to develop various future scenarios that reflect different rates of mortality, habitat development, reductions in whitebark pine, and other factors. In this way, FWS could allow the public to make informed choices about preferred risk levels in management of Yellowstone bears.

This type of approach could also be used to set thresholds and standards to trigger management responses to future changes in human-bear conflicts, mortalities and habitat conditions. Before pursuing delisting, FWS must complete a population viability analysis that includes habitat conditions and trends.

34. The timeframe for the delisting plan is too short to ensure long-term grizzly bear survival. FWS uses

the timeframe of one hundred years in assessing long-term viability. Such a timeframe is far too short for such a long-lived species that is so vulnerable to habitat change. Indeed, as Boyce said (1999), "We found that the customary time horizon of one hundred years too brief. For a long-lived species such as the grizzly bear, one hundred years is only three to four times their maximum lifespan...We believe that a longer time target for persistence (e.g., 200-500 years) should be used." In addition, current recovery plan goals fail to meet standards for recovery of evolutionarily robust population over longer time horizons.

35. The FWS rule and Conservation Strategy ignore the concept of cumulative effects, which lies at the heart of understanding impacts of human activities on grizzly bears. At the time of listing of the grizzly bear, scientists had a rudimentary understanding of how grizzly bear habitat could be nickel and dimed to death. In the early 1980's, grizzly bears managers and scientists agreed that a model to understand the cumulative effects of human activities on bears at the scale of bear home ranges was a critical part of the recovery effort. While this understanding has been partially incorporated in the roads standards in the CS, FWS has rejected the Cumulative Effects Model apparently for political, not scientific, reasons. The root cause was that the FS wanted to preserve "management flexibility" (read: ability to build roads and otherwise intrusively manage within its jurisdictions).

Not only was this decision not justified, FWS has not replaced this concept with a defensible tool to address the problem of habitat fragmentation at scales meaningful to grizzly bear habitat use. This is especially a problem outside the PCA.

There is merit to the rationale behind the model, which should in fact be expanded to include all occupied and suitable habitat.

36. A "no net loss" policy for grizzly bear habitat on private lands development should be applied in occupied grizzly bear habitat, as in the Northern Continental Divide Ecosystem. In the Northern Continental Divide Ecosystem, the FWS has established a policy of "no net loss" of grizzly bear habitat on private lands, as in the Swan Valley Conservation Agreement with Plum Creek Timber. This makes sense and should be applied in private inholdings in occupied grizzly bear habitat in the GYE. This would be a strong incentive to private landowners to protect the integrity of inholdings in grizzly bear habitat that are surrounded by public lands.

37. FWS should establish a policy in the CS for the FS to compensate for private development by doing less development on adjacent public lands. FWS should look to positive historic examples in the Northern Rockies, in which the FS compensated for overdevelopment of private lands by allowing less development on adjacent public lands. For example, in the 1980's, Lolo Forest Supervisor Orville Daniels famously stopped logging a drainage over-logged by a private timber company because of harmful impacts on wildlife.

Given the amount of private lands development anticipated in the GYE and the problem of cumulative effects on grizzly bears, it stands to reason that something has to give -- and that may be public lands development.

38. The FWS rule underestimates the mounting problem of cattle-grizzly conflicts, which is now outstripping sheep as a problem for grizzly bear recovery. The FWS rule demonstrates an inconsistent and illogical approach to the issue of cattle-grizzly conflicts and cattle allotments. On one hand FWS dismisses the problem of cattle, saying that "grizzly bears frequently coexist with cattle without depredating on them," making the case that sheep are the bigger problem. On the other hand, FWS cites

new, yet unpublished work by Mark Haroldsen of IGBST that shows that 33% of the human-caused grizzly bear mortalities in the GYE between 2002 and 2014 were related to cattle conflicts. A number of these mortalities occurred near or outside the PCA.

Despite this fact, FWS makes this astonishing claim: “ We do not expect livestock allotments or developed sites in suitable habitat outside the PCA to reach densities that are likely to be a threat to the GYE grizzly bear DPS in the future.” It may not be densities per se that pose the problem, but the lethality of the operators. These facts presented in the rule provide ample reason to reexamine this issue.

39. FWS fails to disclose and justify standards of evidence for reaching the conclusions about status and trends of the Yellowstone grizzly. In the rule, FWS fails to articulate what standards of evidence were used in assessing the status of the grizzly bear population. The standards of evidence appear to vary in an ad hoc manner throughout the document. At the very least, FWS should adopt a weight of evidence standard. Given the high profile nature of the grizzly bear in Yellowstone and the importance of the animal to the public, a precautionary standard would be far better. FWS should evaluate both precautionary and weight of evidence standards, and the implications of the use of these standards on management decisions.

A precautionary approach would entail using the most conservative bounds of any uncertainty attached to demographic estimates, with a resulting reduction in risk for the grizzly bear population. At the very least the FWS needs to articulate and justify the approach it has adopted for dealing with uncertainty in the information it has deployed in developing this rule.

40. The proposed grizzly bear hunt is wrong, unethical, and could harm the grizzly population. Besides the substantial ethical problems of hunting bears, FWS simply fails to justify the grizzly bear hunt at a time when levels of human-caused mortalities have been excessive.

Further, the rule states that the goal of such a hunting season is to reduce grizzly density in areas of high human-bear conflicts, so that future management actions would be reduced. This reasoning is inconsistent with other parts of the plan that recognize that ongoing conflicts will occur if attractants are not managed properly. Hunting will not resolve conflicts as long as bears are drawn into an area because of available food. As British Columbia Bear Manager Matt Austin said at the 2004 IGBC meeting in Cody, WY, "You would have to depopulate the entire area to eliminate bear conflicts, as long as attractants are available."

In the face of excessive human-caused grizzly bear mortality rates, as well as habitat threats, a hunt is, at best, ill-considered and indefensible. With human population growth in the region, human-caused mortality sinks are likely to expand, and mortality rates rise. FWS did not fully consider these relationships in its assessment of impacts from a trophy hunt. Furthermore, FWS acknowledges the population likely needs artificial augmentation: by removing animals from the gene pool, hunting will only worsen the genetic problems facing the Yellowstone bear.

In addition, FWS failed to incorporate the important work of Robert Wielgus (Wielgus and Bunnell, 2000; Wielgus et al. 2001) and researchers studying Scandinavian brown bears (Bellemain et al., 2006; Bischof et al. 2009; Zedrosser et al. 2009, 2013) who found that the mortality of resident adult males results in: a. increased immigration by potentially infanticidal males, b. increased sexual segregation, and, c. reduced reproduction, population growth and persistence. For a population as vulnerable as that in

Yellowstone, these impacts could have significant repercussions on the future of the population.

Furthermore, the prospect of a grizzly bear hunt has already raised enormous political expectations among the states. The draft MOA indicates that as many as 72 bears a year could be killed in a grizzly bear hunt. That would be catastrophic on top of the excessive mortalities already occurring.

41. FWS fails to consider options for improving habitat quality outside the PCA by closing livestock allotments. FWS states that the Wyoming, Salt River, Palisades and pockets of the Wind River ranges will be excluded from grizzly bear occupancy because of high mortality risk and incompatibility with domestic sheep. In this assessment, FWS fails to evaluate the option of phasing out domestic sheep allotments. This approach is inconsistent with current FWS and Forest Service policies and practices in Greater Yellowstone.

In fact, FWS and the Forest Service have been working closely over a number of years to close allotments in key habitat. On the Caribou-Targhee National Forest, for example, over 20,000 sheep have been removed from priority grizzly bear habitat since the time of listing. The delisting rule cites these changes as part of its summary of management improvements. Other allotments were closed in recent years on the Bridger Teton, Shoshone, Absaroka/Beartooth Wilderness, and in the northern end of the Wyoming range. With similar effort, sheep could largely be eliminated in suitable habitat in the Wind River, Palisades, Centennial and Wyoming ranges over time.

One area of particular concern is the Sheep Experiment Station, which is located in the middle of the Centennials, the best connecting habitat to the Central Idaho wildlands complex and Canada. This federally owned facility is a black hole for grizzly bears and other predators, as well as taxpayer dollars. The summer allotments are closed for now, but the Agricultural Research Service is pressing to graze sheep again. FWS should prohibit grazing in this key piece of connecting habitat for grizzly bears, wolves and other wildlife.

The rationale for disqualifying these areas from grizzly occupancy is inconsistent with other parts of the plan. Just because there is a mortality risk for grizzly bears in a particular area does not, in and of itself, mean that bears should not be allowed there. Elsewhere in the plan, in habitat degraded by excessive roads for example, FWS requires restoration through road closures. FWS should take the same approach with sheep: restoring habitat through allotment closures, which have been proven to work, as described with great pride in the rule.

Sheep are not an endangered species, and can live almost anywhere in the United States. Grizzlies, on the other hand, have a very limited range in just four states in the Northern Rockies. In areas where grizzly bears are native, and where they have a reasonable chance of surviving, redoubled efforts should be made to accommodate them on that habitat.

It is clear that preventing grizzlies from accessing certain unoccupied areas beyond the PCA is driven by political pressure, rather than rational thinking or an analysis of bear needs and a longer term view of what is possible.

42. The delisting plan gives the misleading impression that Information and Education (I&E) efforts by state and federal agencies will be adequate to solve human-bear conflicts. The plan touts the successes and effectiveness of I&E efforts by state and federal agencies in reducing mortalities, and presumes to make the case that such efforts will be enough to save bears after delisting.

FWS is ignoring the reality that human-caused mortalities have been skyrocketing over the last ten years (while the population has remained static) and that information and education efforts have been horribly inadequate. Indeed, FWS own data on chronic and excessive mortalities show that current I&E efforts are not adequate to address the problem. In its 2003 and 2009 reports on human-caused mortalities, FWS conceded this very point; in fact, it placed as much weight on law enforcement efforts as on I&E efforts. The story of Yellowstone Park, which has more effectively reduced human-bear conflicts than any other agency, is a classic example of the extent to which an approach that combines regulation, law enforcement and adequate resources can be effective. (Gunther et. al., 1994)

By omitting critical law enforcement, regulatory and funding factors that have contributed to reducing human-bear conflicts, the delisting plan is likely to allow mortalities to escalate further.

43. The delisting plans assumptions that the Information and Education efforts by the state and federal agencies will be implemented are unjustified. I wholeheartedly support the Information and Education (I&E) efforts of state and federal agencies in the GYE. For decades I served as a member of the I&E Committee, helping to produce radio and television public service announcements designed to educate the public about how to avoid conflicts. I am also acutely aware that the agencies lack commitment to I&E efforts, despite the efforts of a few committed individuals.

The delisting plan states that the I&E team would continue to coordinate the development, implementation and dissemination of programs and materials to aid in preventative management of human-bear conflicts. Yet, there are not resources to accomplish this. In the face of a reduced sense of urgency after delisting, as well as fewer funds, I&E efforts will almost surely decline.

44. FWS mistakenly assumes that the delisting of the Yellowstone Grizzly Bear will build social support and tolerance for grizzly bear recovery and the ESA. FWS maintains that people will be more supportive of grizzly bears if they are no longer federally protected, and if more emphasis is placed on allowing human uses of public land. FWS mischaracterizes several papers by Dr. Steven Kellert to justify this point. Kellert (1994) states, "Some general conclusions can be drawn regarding public attitudes toward bears and their implications for bear policy and management. The various results broadly suggest very positive views among most North Americans toward bears and their general conservation...This overwhelming impression leads one to conclude that most wildlife managers have been far too conservative in acknowledging the public's highly favorable attitudes toward bears and their population enhancement and recovery."

Kellert continues, "Richard Taber suggests in the case of the grizzly, 'The public tolerates the grizzly more than the biologists think.' The current neglect of non-biological factors in bear policy and management has resulted in a gross under-estimation of public support for bear population enhancement and recovery. It would be ironic, given the current plight of the bear and valiant efforts to ameliorate this animal's condition, if ignoring and intuitively assessing public attitudes had unwittingly contributed to the bears decline and precarious future."

FWS misinterprets another core message in Kellert's 1996 paper. Among those who harbor negative views about grizzly bears, including some rural residents and livestock producers, Kellert notes resistance to government regulations, such as access. But, the delisting rule maintains that it will continue access standards and other restrictions on development. Thus, delisting does not address the factors most often cited for opposing grizzly recovery. Its efforts to placate bear opponents by promoting delisting will likely fail.

In its delisting rule, FWS appears to be concerned primarily with the interests of the Forest Service and the states, rather than the general public. Some officials have even expressed concerns that if bears are not delisted, states may start killing more bears out of frustration. If FWS buckles to the bullying of states now, one can only guess what will happen after delisting when the state has primary management authority.

Recent research published by Adrian Treves empirically addresses for the first time whether deregulation, delisting, and institution of hunting garnered any more support among those inclined to be hostile towards large carnivores. His 2013 longitudinal study of attitudes (Treves et al., 2013) found, in fact, that hostility towards wolves increased—not decreased—among those who lived in areas occupied by wolves. More recently yet, he and his co-author Guillaume Chapron found evidence that poaching increased rather than decreased with liberalized management of wolves (Chapron and Treves, 2016). In other words, the only available empirical evidence shows the opposite of what the FWS claims, which makes these claims arbitrary.

Moreover, there has been no attempt to comprehensively assess public attitudes toward Yellowstone grizzlies, grizzly bear management, or, more importantly, prospective changes in perspective should bears be delisted and hunted. As is, the FWS simply relies upon bald assertions about this all-important matter. In short, additional research on attitudes, perspectives, and behavioral intentions needs to be done before delisting advances any farther.

A 2016 poll by the Humane Society of the United States and Wyoming Wildlife Advocates give some insight as to public sentiment regarding delisting and hunting grizzly bears. It shows strong opposition to grizzly bear hunting, even among those who self-identify as hunters. FWS appears to be grossly misreading public sentiment in its delisting decision.

If FWS was correct that high-positioned political opponents would soften their view of bears if delisting occurs, then Wyoming Governor Matt Mead would have greeted the announcement of the delisting proposal in November with support for the ESA. Mead would have said, "Delisting demonstrates that the ESA works." He did not. Instead, he used the opportunity to call for weakening the ESA. This shows that political and social forces opposed to endangered species recovery will likely be opposed, no matter what the listed or delisted status of the grizzly bear is. Delisting will not build support among bear opponents.

In addition, FWS claims that compensation programs improve public attitudes toward bears, despite evidence to the contrary. FWS discusses state and NGO compensation programs for livestock losses to grizzly bears. The agency appears to assume that such programs improve public acceptance of bears. This is not the case. For example, in a review of Defenders of Wildlife's compensation program, the organization found that public values of grizzly bears did not improve with compensation.

Experience in the GYE and elsewhere has shown that successes involving resolving grizzly bear conflicts do build social support. Examples include West Yellowstone, Cooke City and Big Sky, Montana, where conflict rates have declined as a result of community efforts to resolve sanitation problems. These successes have occurred because of the ESA requirements which force parties to come to the table to solve problems, and provide needed resources for their resolution. FWS should build on these experiences and incorporate these lessons into the grizzly recovery program.

44. The delisting proposal runs counter to overwhelming support for stronger protections for grizzlies, expressed in numerous delisting documents. Since 1997, federal land state agencies have undertaken

seven public processes to facilitate delisting and develop policies for management of grizzlies after delisting. In each public comment period, the public has expressed overwhelming support for grizzlies, including expansion of their current range, as well as, opposition to premature delisting and support for additional habitat protections. These comments are consistent with the strong pro-bear sentiment discussed by Kellert above.

The pro-bear comments go back twenty years and are summarized here. Over 97% of the comments received by FWS on its 1997 draft Habitat-based Criteria document supported strengthening conservation habitat standards in the plan. In 2000, over 99% of the public expressed support to FWS on its draft conservation strategy, asking for increased grizzly and habitat protections. In 2001, over 95% of the public comments received by the State of Wyoming in its draft plan supported additional protections for bears. Also in 2001, as part of a Wyoming grizzly planning effort, a telephone survey of Wyoming citizens was conducted on grizzlies by Wyoming's Game and Fish Department. Of the 1,500 citizens interviewed, 87% agreed that grizzlies are an important component of their ecosystem, and 74% agreed that grizzlies are a great benefit to Wyoming. And, a majority of respondents supported grizzly expansion into all suitable habitats in Wyoming, including the Wyoming and Wind River ranges.

In comments submitted to the State of Idaho in 2001, over 80% of the comments supported stronger protections of the grizzly. In 2002, the vast majority of the comments submitted to the State of Montana on its grizzly plan supported additional protections. In 2003-04, on the scoping process for the Forest Service EIS and forest plan amendments, as well as the draft EIS, over 99% of the comments supported greater protections for the grizzly.

Finally, in 2006, over 99.9% of the 213,000 comments received by FWS on the delisting rule opposed delisting. In choosing a course with a development bias, FWS has chosen to ignore nearly twenty of overwhelming public support for a more conservative approach to managing and protecting grizzly bears.

45. FWS fails to establish an adequate and clear process for managing grizzlies after delisting, including relisting grizzly bears should it be necessary. The discussion about relisting is confusing and incomplete, and the criteria to prompt change are unclear.

In the rule, FWS makes it clear that adequate funding is essential to implementing the CS and meeting the terms of the delisting rule. On p. 14 of the draft Conservation Strategy (CS), FWS states: "the adequacy of regulatory mechanisms demonstrated by this CS are dependent upon funding being available to fully implement the management and monitoring actions detailed in this document."

On p. 13225 of the rule, FWS states that a "Biology and Monitoring Review could occur if funding becomes inadequate to the implementation of the Draft 2016 Conservation Strategy to such an extent that it has compromised the recovered status of the grizzly bear population."

FWS then says the exact opposite. In appendix A of the Draft Supplement to the Recovery Plan, FWS says that actions outlined in the CS, including funding are voluntary. On p. 15, FWS lays out the roughly \$5.04 million needed annually to implement the actions discussed in the CS, and states: "this neither obligates nor implies a requirement for the identified party to implement the action(s) or secure funding for implementing the action(s)". So, which is it? If funding is voluntary, how can failure to provide adequate funding be a trigger for relisting?

Throughout the rule, FWS speaks out of both sides of its mouth on the topic of whether or not the

standards relied on in the CS and state plans are binding. In many places, FWS frames the CS and state plans as binding documents.

For example, on P. 3 of the CS, one of four purposes of the CS and state plans is to “specify the population, habitat, and nuisance bear standards to maintain a recovered grizzly bear population for the foreseeable future.” The footnote states that: “standards are management actions that are required in this Conservation Strategy.”

FWS frames the CS as a binding document because of how it treats deviations. For example, on p. 13225, FWS says that “any change in Federal, State or Tribal laws, rules, regulations or management plans that depart significantly from the specifics of the population or habitat management detailed in this proposed rule and significantly increase the threat to the population” would trigger a revision in the CS. And, in a footnote on p. 3 of the CS, FWS states that “a deviation from a standard would occur only with a revision or amendment to the Conservation Strategy.”

Yet, in a telling response to a comment on the 2006 delisting rule, FWS admits: “we do not have the authority to compel the states to enact laws, nor do we believe it is necessary.... the strategy cannot legally compel any of the signators to implement management policies or obligate funding.”

If FWS cannot make any agency do anything, as this admission and others in the rule suggest, it must come clean. That fact has a major impact on the question of whether or not regulations post delisting are adequate. If FWS can make agencies implement policies, that must make that clear. This is a fundamental question that cannot be fudged as it is in the draft rule.

Another issue that must be clarified is how agencies will address deviations from habitat or other standards. We have seen significant changes – loss of trout, elk, bison in the central herd, whitebark pine – and no note of the cumulative effects of these changes. So how are we to have confidence in FWS’ system to track and make sense of future changes, let alone signal meaningful and timely adaptations?

46. The post-delisting oversight committee is biased and pro-development. I am particularly concerned about the lack of objectivity of the pro-development, pro-delisting Yellowstone Grizzly Bear Coordinating Committee (YGCC) which will be assembled after delisting to oversee grizzly bear management. The committee will be comprised of people committed to the delisting agenda. No independent outside parties or representatives of national interests have been included. Their process will also be politicized, in part because three county commissioners are involved. The current commissioners are vigorously pressing for delisting, and their replacements will likely oppose every effort to relist.

In addition, there is also very little opportunity for the public to be involved in this process in any meaningful way. For example, the delisting plan does not provide a way for the public to comment on proposed actions or petition for a response if significant concerns arise. In the past, the public has only been given a token role, 3 minutes at best, to comment and go away. That does not constitute meaningful involvement. This is discussed more below.

In the past, the committee has made decisions by consensus. The CS states that after delisting, the committee will strive for consensus, but when consensus cannot be achieved, decisions will be determined by a majority vote. It is hard to imagine a scenario where this will occur, since: a. the committee has operated by consensus over the last 20 years, b. there will be a reduced sense of urgency after delisting, and c. FWS has so far failed to reclassify the Selkirk/Cabinet Yaak populations as

endangered species despite their seriously impaired status.

The timing of the biological and monitoring review in the process is also not clear. The plan states that, a "biology monitoring review will examine habitat management, population management or monitoring efforts of participating agencies, with an objective of identifying the source or cause of failing to meet a habitat or demographic goal." The plan also states that this review will be made to the public within six months of initiation. But, when does the initiation begin, and what precisely prompts the process? And, what happens if the agency responsible for the problem fails to address it adequately?

If the committee fails to take corrective actions, it is unclear at what point FWS would intervene. FWS states that it could relist at any time; but, that hardly provides reassurance, especially given: a. the politically charged nature of this issue, and, b. the track record of the Obama administration, with its abysmal handling of species wolverine and sage grouse. The high profile role of Wyoming Governor Matt Mead hardly raises confidence in the issue that the agency will be fair and responsive.

Even if the problems facing the grizzly become so severe that FWS pursues relisting, there is no guarantee that the protection would be granted. The experience with FWS' granting of "warranted but precluded" status of the Cabinet-Yaak bear indicates that the grizzly could fall into this regulatory black hole. If bears are not given full ESA protection when the population totals only 20-30 animals, what is the likelihood that FWS will do so if the Yellowstone population drops below 500?

The delisting rule should provide clear thresholds and corrective mechanisms to fix problems, rather than rely on the promises of a relisting petition, in what will be a highly politically charged atmosphere. Specifically, it should provide an open and transparent process that: a. ensures timely action and limits time lags that arise from administrative review; b. includes an opportunity for public involvement in proposed actions, and; c. establishes a policy of rejecting proposed actions, if not supported by the best available science.

47. The delisting decision process gives precedence to pro-development interests, and fails to provide a meaningful way to involve citizens with differing perspectives. Concerns about biases in the public involvement in the delisting decision process have been raised without meaningful response for the last 30 years. Although conservation organizations and individuals have a tremendous amount of experience and expertise that is relevant to the future of grizzlies, they have not been effectively involved in the delisting decision-making process.

Delisting and divestiture of authority to the states will essentially disenfranchise all of these people who have a stake in Yellowstone's iconic grizzly bear population. Without representatives of the national conservation community at the table, the discussion will be dominated by local hunting interests, which have typically expressed more anti-bear perspectives and who, more unequivocally, drive the decisions of state wildlife managers. Moreover, state wildlife commissions, most notably in Idaho and Wyoming, are under the thumb of development-oriented interests, including those of energy and agriculture.

Despite repeated requests to managers, citizens representing conservation interests have not been allowed to participate in the Yellowstone Grizzly Sub-committee. By contrast, county commissioners have been included in the committee, with subsequent expressions of almost exclusively anti-bear attitudes rooted in patent ignorance of either the history or ecology of Yellowstone's grizzly bear population. These local politicians have clearly functioned merely as standard bearers for the energy and agriculture industries and spokespeople for regressive ideologies and attitudes. And county commissioners will have even more influence after delisting.

In the delisting plan, FWS assumes that NGOs and others will carry out important aspects of the grizzly program (private lands protection, conflict reduction, information and education), but then fails to give them a meaningful role. To improve the involvement of the public, the agency has the responsibility to:

- make provisions for public access to all data supporting current and future decision-making, so that the public can review and comment on the validity of both the data and derivative analyses;
- disclose exactly what the information means so that the average person can understand it; and
- specify means of public involvement, now and in the future, that will allow for a civil exchange of ideas and information.

It is time for FWS to rethink the engagement of the public, and develop new and creative approaches. One positive example is the approach taken initially by the State of Montana in developing its 2002 state grizzly bear management plan. In that process, citizens with widely different perspectives were able to sit down at the same table productively and hash out differences. It should be noted that it took the commitment of Arnie Dood of the MT Department of Fish Wildlife and Parks to shepherd that process. Arnie had a great idea that was never implemented and should be: community based co-existence projects. NGO's are pursuing such work now on a piecemeal basis, but lack the needed resources and the required staying power, legal authority and resources of the government. A commitment to providing venues that include those representing all valid public interests, such as Arnie pursued, can go a long way to building trust in the process and resolve controversy.

48. The FWS assumption that grizzly bear recovery is due exclusively to self-motivated management actions is not justified. In the delisting proposal, FWS claims that the guidelines for managing grizzly bears, adopted in 1986, were the primary factor responsible for increasing grizzly numbers. I agree that the steps outlined to reduce conflicts and improve security were positive, but, there are alternative theories to explain the increase in population size, and they are perhaps better supported by the weight of available evidence.

One hypothesis that FWS did not evaluate is the increase in key bear foods since the mid-1980's. For example, Yellowstone cutthroat trout populations rebounded after fishing regulations were instituted in the mid-1970's. Buffalo and elk numbers increased after the slaughter on the northern range was terminated. These years were dominated by good whitebark pine seed crops. And, in the early 1980's, Yellowstone bears were discovered to be using army cutworm moths, another high-quality food source. The increasing abundance of these foods was very likely driving growth of the population. More to the point, though, the FWS has failed to even consider these drivers in its assessment of past causes of population growth and decline.

If foods were a major cause of past changes in size of the Yellowstone grizzly bear population, then on-going and future threats to key foods is particularly problematic, as discussed elsewhere in this letter. In its analysis, FWS must evaluate alternative hypotheses, including the relationship between increased bear numbers and foods.

Another hypothesis pertains to the role of NGO's. NGO's were a key agent of positive change through litigation. The FS would never have closed hundreds of miles of roads as required by scientific evidence were it not for litigation brought by NGO's. FWS stood silently by, well aware of the problem, leaving it up to NGO's to deal with. But what will happen after delisting without the backup of the ESA is anybody's guess.

Examining assumptions about how the causes of past progress matters because it provides important context for FWS to examine the role of declining foods and removal of provisions for litigation under

federal law.

49. FWS underestimates the significance of the poaching threat in Yellowstone and the Northern Rockies, and fails to provide adequate preventative measures. The delisting proposal assumes that state laws will be adequate to prevent poaching, and that law enforcement capability will be sufficient to respond to poaching incidents. However, law enforcement capability at the state level is much more limited than at the federal level. And, state penalties for violations of grizzly management rules are far less severe than federal penalties.

For example, in recent years in Wyoming, in response to several poaching incidents, the state was not even willing to take them on as poaching violations, but rather as killing animals out of season. The fine was \$750 per incident, hardly a deterrent, especially given the known hostility of certain individuals in Wyoming, as well as a history of poaching in the state. This compares with a \$15,000 fine levied by the federal government in one incident for killing a grizzly bear in Island Park, ID, about ten years ago.

In the delisting plan, FWS fails to evaluate the result of lighter penalties on poaching rates. Most believe that the prospect of heavy fines and jail sentences have resulted in fewer instances of poaching than would have occurred with ESA protections. It is certainly true that human lethality (i.e., human-caused mortality rates) declined after listing (Mattson and Merrill, 2002).

FWS also fails to seriously consider the recent spike in poaching incidents in the GYE. FWS acknowledges that 22 bears were poached between 2002 and 2014. Only one of these bears was prosecuted by the federal government. The poaching problem is not likely to improve after delisting; rather, given attitudes in states like WY, it is likely to worsen.

In addition, since 2007, an astonishing 32 grizzly bear deaths are still reported as under investigation by FWS for possible illegal killing. (In making this claim, I carefully subtracted all bear investigations that are reported as resolved in subsequent IGBST annual reports). This includes, of course, the famous Scarface. At least a few of these bears are likely to be dead from being poached as well, when the dust settles. The trend occurred at a time when whitebark pine was collapsing and bears were turning increasingly to meat, and getting tangled up with big game hunters at ever increasing rates.

Furthermore, since 2007, a shocking 38 grizzly bears were killed in incidents reported as “self defense” in IGBST reports. This does not mean that grizzly bears are getting more aggressive; rather, it means that hunters know how to get off possible poaching charges by claiming that they killed bears in self defense. A classic example of this occurred in Paint Creek on the Shoshone Forest in 2003 when a group on hunters killed an elk, which then attracted some grizzly bears; the hunters, watching at a safe distance and with many minutes to watch, according to court reports, shot into the group of foraging bears, and killed one. They claimed self defense and got off.

Since 1987, over 21 known mortalities have been designated illegal kills, and it is very likely that the actual number of poached grizzlies is much higher. In fact, this recognition underlies some part of the adjustment made using the Cherry et al. (2002) method to account for “unknown/unrecorded” mortalities—which can result in a third more deaths than were actually recorded.

The logic invoked by FWS to dismiss poaching as a problem in the delisting rule is stunning. The agency concedes that the 22 bears known to be poached from 2002-2014 constitute 7% of known grizzly bear

mortality during that time, when poaching was enforceable by federal prosecution. FWS goes on to say that is not predicted to increase because it will still be illegal under state and Tribal law. The argument is illogical. Poaching has been increasing and it is FWS' job to do something about it, not pawn the job off to the states and Tribes.

Further, state laws have never been used to prosecute grizzly bear poaching incidents in 40 years of protections, even though state laws could have been applied. FWS has no evidence to justify claims that the states will prosecute poachers after delisting.

Although FWS concedes that federal regulation is one way of addressing the poaching problem, it opts instead for an approach that relies almost entirely on voluntary I&E efforts. Human-caused mortalities have been increasing for the last ten years with information and education work, proving that they are not enough, especially with the kind of people involved in poaching incidents.

FWS also relies on untested theories to argue that hunting bears may lessen the threat of poaching. FWS Director Dan Ashe said in an October, 2015 conference sponsored by the Humane Society regarding grizzly bear delisting: "We need to reestablish a hunt and reground hunting as part of an ethical tradition." What? Why? The agency fails to provide evidence of any direct relationship between attitudes toward bears and hunting. Furthermore, at the many public meetings on the delisting issue, there was very little expression of public interest in hunting grizzly bears. Almost all the interest has come from the state agencies. Whose ethics is Ashe talking about? Not the public who live out here, and certainly not the broader public who are going crazy about Scarface and fearful for the fate of 399 and her clan.

Moreover, as I describe more fully below, there is emerging evidence that lessening protections of large carnivores can actually increase rates of poaching (Chapron and Treves; 2016) and, at the very least, does not change attitudes amongst those who are most likely to poach animals such as wolves and bears (Treves et al., 2013). More certainly, the FWS gives no indication that it has made any attempt to access, upload, and make sense of the literature that pertains to human attitudes driving poaching, especially in response to lessened protections (e.g., Treves, 2009).

50. FWS fails to specify how adaptive management will occur. FWS maintains that its plan will "allow for adaptive management as environmental conditions change." But the FWS demonstrates little if any understanding of the theory and practice of adaptive management nor makes any reference to the extensive literature on this topic. In fact, adaptive management requires rigor, not only in monitoring, and the articulation of desired future conditions, but also in framing and testing explicit hypotheses through management actions deliberately designed to achieve certain effects (Holling, 1978; Walters 1986). There is probably no better example of adaptive management in practice than that underway in connection with the Glen Canyon Dam Adaptive Management Program (e.g., Melis et al., 2015). The FWS would be well-advised to not only look to this example for lessons but also consult the basic literature on adaptive management.

Among other things, the success of adaptive management depends on: a. a clear and comprehensive understanding of changing conditions, and, b. specific triggers that would prompt timely management action. As previously discussed, the FWS program is sorely lacking in this area. Moreover, the history of FWS actions provides little or no evidence of any "adaptive management" by intentional plan other than perhaps as a consequence of coercion by courts, politicians, or public pressure—which, in fact, does not pass muster as adaptive management.

A good example of the inadequacy of the FWS's current "adaptive management" is its approach to defining the recovery zone. The zone was defined in an ad hoc manner for primarily political reasons with little allowance for changed delineations in light of either changing conditions or the results of a tested hypothesis. In fact, FWS has demonstrated that, while bears may have lived inside this zone in the early 1980s, 40% of occupied habitat now lies outside this zone. Yet, the agency never evaluated their earlier actions nor adaptively acted in response to new evidence emerging from its monitoring programs. How can the public be assured that future management will be adaptive, when it has been unwilling to make a simple and logical adjustment such as this one in the past?

And, as a practical matter, what is FWS's plan for adaptation if, for example, funds are not available to complete monitoring procedures such as whitebark pine assessments or overflights? How can adaptation occur if information is not available? And, how will the plan adapt to a significant loss of habitat from private lands development or whitebark pine loss? Will it make more habitat available on public lands? If so, how will FWS overcome the resistance of state agencies and the Forest Service to such a course?

The delisting plan must do more to ensure that management is truly adaptive. Otherwise, FWS is asking the public to place blind faith in the ability and willingness of future managers to respond to changing conditions.

51. FWS fails to disclose and justify standards of evidence for reaching the conclusions about status and trends of the Yellowstone grizzly. In the rule, FWS fails to articulate what standards of evidence were used in assessing the status of the grizzly bear population. The standards of evidence appear to vary in an ad hoc manner throughout the document. At the very least, FWS should adopt a weight of evidence standard. Given the high profile nature of the grizzly bear in Yellowstone and the importance of the animal to the public, a precautionary standard would be far better. FWS should evaluate both precautionary and weight of evidence standards, and the implications of the use of these standards on management decisions.

A precautionary approach would entail using the most conservative bounds of any uncertainty attached to demographic estimates, with a resulting reduction in risk for the grizzly bear population. At the very least the FWS needs to articulate and justify the approach it has adopted for dealing with uncertainty in the information it has deployed in developing this rule.

52. FWS has failed to provide important information on which the delisting decision was based. Despite repeated requests, FWS has failed to release important raw data that it used as the basis for its conclusions in the delisting rule. This response by the FWS in this case is inconsistent with that of the agency in other endangered species cases. Furthermore, this approach runs counter to the spirit of scientific inquiry and a more objective reading of ESA provisions for withholding data to protect endangered species (Fischman and Meretsky, 2001). The customary scientific process (once research has been completed, peer-reviewed and published) is to allow other scientists to access to raw data held by public agencies. This is particularly important given: a. the high profile nature of the grizzly bear issue; b. significant scientific uncertainties appertaining to existing analyses; and, c. the fact that taxpayers have paid millions of dollars for the underlying research.

By failing to provide key information, the agency frustrates public comment, and unnecessarily raises suspicion about the integrity of the underlying science and scientific process involved in delisting. FWS

should release this information - a step which could go a long way to rebuilding confidence in the process.

52. FWS fails to address the role of Wildlife Services and their handling of grizzly bears. Nowhere in the delisting rule does FWS discuss the important role of USDA Wildlife Services. Their activities can and have resulted in incidental take of grizzly bears in Greater Yellowstone. In fact, four bears have been taken by Wildlife Services activities since 1991, with possibly others. One involved the use of an M-44 cyanide device near Cody, WY, in a snare set for wolves. One was killed by a Wyoming trapper in the Salt Valley. One was killed in a trap when it was misidentified by the Wildlife Service's agent as a black bear. One cub was caught in a trap on the Shoshone NF in the summer of 2015.

The critical role of Wildlife Services must be discussed and mitigations identified by FWS, because of the lethal practices used by Wildlife Services, their record of killing grizzly bears purposely or inadvertently, the acculturated anti-carnivore attitudes held by the agency, and the likelihood of an expanded role for Wildlife Services after delisting.

53. FWS appears to assume that the proposed post-delisting review process will provide the same results as consultation under Section 7. In the steps outlining the conditions for biological and monitoring review after delisting, FWS appears to assume that the proposed review process will be as effective at prompting change as the reviews currently conducted under Section 7 of the ESA. This is not likely to be the case because: a. there is no requirement for public lands agencies to use the best available science; b. as the FWS admits, the CS is a handshake agreement only and not legally binding; c. delisting would also remove the Section 9 take prohibition, which coupled with Section 7, has significantly contributed to habitat protection and restoration in the GYE; and d. citizens lack direct access to the process. If violations occur under the ESA, citizens can challenge the decision. This will not be the case after delisting.

The roading and clear-cutting debacle on the Targhee National Forest in the 1980s and early 1990s provides a clear example of why citizen access to the courts is important. In that case, citizens were able to prompt FWS to conduct a comprehensive Section 7 evaluation, at the appropriate scale. Using the best available science, the agency concluded that further clearcutting was not appropriate, and that the agency must begin to restore grizzly habitat. The successful restoration efforts on the Targhee would not have occurred but for the combined effects of: a. citizen access under the ESA, b. Section 7 consultation requirements, and, c. Section 9 take prohibitions.

The delisting plan proposes a vague, discretionary, unproven and non-binding report requirement as a substitute for a system that has effectively worked to change management, when needed, to conserve the grizzly bear.

54. FWS failed to consider a range of options for conservation of grizzly bears. The agency did not consider the option of providing improved protection for the Yellowstone grizzly bear by decreasing allowable mortality levels and increasing habitat protections. There was no reason not to evaluate a more conservative approach than what has been proposed by FWS.

Consideration of a range of options would require an Environmental Impact Statement. But, this would give the public a better sense of choices, so as to match up with their own values.

The approach adopted was the result of a highly political discussion among agency personnel, and

reflected interagency negotiations over mortality limits and habitat protections. The process used to develop the plan was significantly influenced by state, county and FS officials seeking delisting of the grizzly bear. FWS should have provided another approach: one that was more conservative in terms of evaluating and avoiding risks to the long-term future survival and abundance of the grizzly bear. At the very least, FWS should have disclosed several options, and given the public a choice.

55. FWS fails to justify its definition of a Distinct Population Segment (DPS). In the delisting rule, FWS's definition of the Yellowstone bear DPS was not based on analysis of how much habitat the bear population will need to insure viability, especially in the face of future changes. Rather, it was drawn around existing highway systems. FWS never explained how this area related to the future of the bear, or how this area could be affected by loss of food and human encroachment. Nor, did it evaluate the area in the context of the Yellowstone grizzlies' former range.

The plan states that the DPS includes habitat unsuitable for grizzlies (24% of the area). But, FWS fails to evaluate in detail how important this so called "unsuitable" habitat is to grizzlies. The agency failed to reveal: a. how many bears spend a portion or all of their time in "unsuitable" habitat, and why (e.g., key foods); b. how much time was spent to look for bears in so-called "unsuitable" habitat; and, c. the extent to which this "unsuitable" habitat could be needed by bears to move between areas of suitable habitat.

Some of the unsuitable habitat is in, or near, areas where human population growth is high. Continued growth will increase "edge effects" and compromise suitable habitat adjacent to areas that are currently unsuitable (Stringham, 2005). The effect would be to further reduce the quality of suitable habitat inside the DPS, and increase mortality levels. FWS' assumption that suitable habitat in the DPS will remain as it is in the future is not justified, based on data on human population growth in the region. The agency must evaluate the effects of growth on the suitability of habitat, and use this information in the establishment of biologically sound DPS.

56. FWS fails to honestly evaluate the effects of management on key grizzly bear foods and direct a more conservative pro-bear approach. FWS seems to take that approach that what happens with key bear foods is out of manager's control. This is not true. In light of escalating mortalities and the need for a precautionary approach and the application of the best science, FWS must examine a more reasoned cautious way to managing bear foods.

First, bison is a premier grizzly bear food. Yellowstone is the last place on earth where the unique relationship of bears and bison still exists. With powerful claws and teeth, grizzly bears are specially equipped to use the carcasses, after which other species are able to make use of this meat resource.

There is absolutely no rational reason for the FWS to stand silent and allow Yellowstone's bison to be slaughtered and hazed as they leave Yellowstone Park for a disease that they have never transmitted to livestock. FWS is not a neutral party. It bears responsibility here, allowing bears to be harmed by doing nothing, at a time when other foods are collapsing due to climate change.

Second, in the wake of the loss of whitebark pine, cutthroat trout and significant numbers of elk, grizzly bears on the east side have been turning increasingly to moths for nutrition. Yet, six moth sites lie unprotected from unregulated recreational access, outside the PCA. We are seeing increased interest from film crews, photographers and outfitters in visiting moth sites. Given the increasing value of moths to grizzly bear, every effort must be made to protect these sites from human disturbance.

Third, FWS has an important role in reframing the discussion about elk as they relate to grizzly bears as

well. FWS should undertake an analysis of what is happening to elk in the GYE and why. The public generally seems not to appreciate that elk numbers have declined significantly and that this decline has had effects on recovery of grizzly bears. While nothing probably can be done here to reverse the effects of deteriorating summer forage conditions or predation, changes can be made in the numbers of elk available for sport harvest, and the ways that disease threats such as chronic wasting disease are handled. FWS can at least elucidate the additive effects that hunting has on these other problematic factors.

Fourth, FWS reinforces FS arguments that planting of blister rust resistant whitebark pine trees can result in a healthy forest again. This is patently false. FWS must put the planting of these blister rust resistant trees in the context of larger-scale dynamics of disturbance ecology. The agency must frame current restoration activities at the appropriate scale, which is paltry compared to what has been lost and what will never be recovered. If FWS wants to be useful in the arena of whitebark pine restoration, there is much to do, including evaluating treeline krummholz whitebark pine ecology, Clark's nutcracker-whitebark pine relations, and possible chemical resistance in whitebark pine.

57. FWS fails to weigh the social and political costs of delisting against any putative benefits. FWS fails to analyze the benefits of delisting against the costs. In various places in the proposed rule, FWS seems to assume that improved social acceptance of bears will be a primary benefit. Yet nowhere does FWS justify this assumption. Which publics are to benefit from this decision? By catering to the interests of the state politicians and wildlife managers, FWS appears to be serving the interests of a minority or hunters, rather than the broad national public who care about natural resources and wildlife. In fact, through promoting delisting at this juncture, the FWS is advocating the disenfranchisement of 99% of the American public that cares about Yellowstone's grizzly bear population. From the perspective of governance alone this has to be considered a huge cost, especially in contrast to the benefits accrued by a few-thousand regional hunters and, of those, a few dozen who would actually be motivated to hunt grizzly bears for a trophy.

Further, FWS seems to be tacitly worried that if delisting does not occur, some may take the law into their own hands and start poaching bears. Yet, according to recent research published by Dr. Adrian Treves and others, delisting and hunting wolves did not contribute to reducing poaching but rather did the opposite (Treves et al., 2013; Chapron and Treves, 2016). Catering to thuggish behavior cannot be expected to curb it; nor it is appropriate for the FWS to be tacitly condoning criminality by catering to would be criminals.

The FWS tacitly seems to construe a benefit of delisting as "saving the ESA" against possible gutting by conservative Congressional politicians. The FWS should be explicit about this consideration as a putative benefit and critically examine the rationale behind it. Similarly, FWS seems to frame a primary benefit of its decision as placating state officials. Again, FWS needs to come clean about the extent to which this consideration is in the balance and then rigorously evaluate the plausibility of any as any sort of benefit to Yellowstone's grizzly bears as well as the American public, along with all of the potential costs to the same.

In short, the FWS also does not fully examine the social and political costs of delisting. Recent history certainly highlights some of the costs attached to the more permissive and lethal management environment that would come with delisting. Emblematic of these costs: the public outcry over the killing grizzly bears, such as the "Elephant Hill" grizzly last summer in Yellowstone Park, and the ongoing protest

over the killing of Scarface by a hunter last fall. The point here is that there are social costs to agency decisions, sometimes painful ones, which ultimately lead to a diminishment of the credibility of and public trust in federal (and even state) wildlife managers. In the new social media world, post Cecil the lion, FWS must consider these.

58. A more conservative, comprehensive, and expansive approach to grizzly bear recovery is possible and consistent with the Endangered Species Act. An alternative, more conservative, approach to grizzly recovery and management is consistent with the intent of the ESA. It is vital to consider whether grizzly bears have been recovered in a significant portion of their former range, as the ESA prescribes. In fact, a significant body of scientific research shows that grizzlies could be restored to substantially more habitat, over the near full extent of the grizzly bear’s pre-extirpation distribution, than has been considered so far by the FWS. Figure 1, below, summarizes the results of these various studies along with the considerable potential for grizzly bear recovery that has been more-or-less completely disregarded by the FWS.

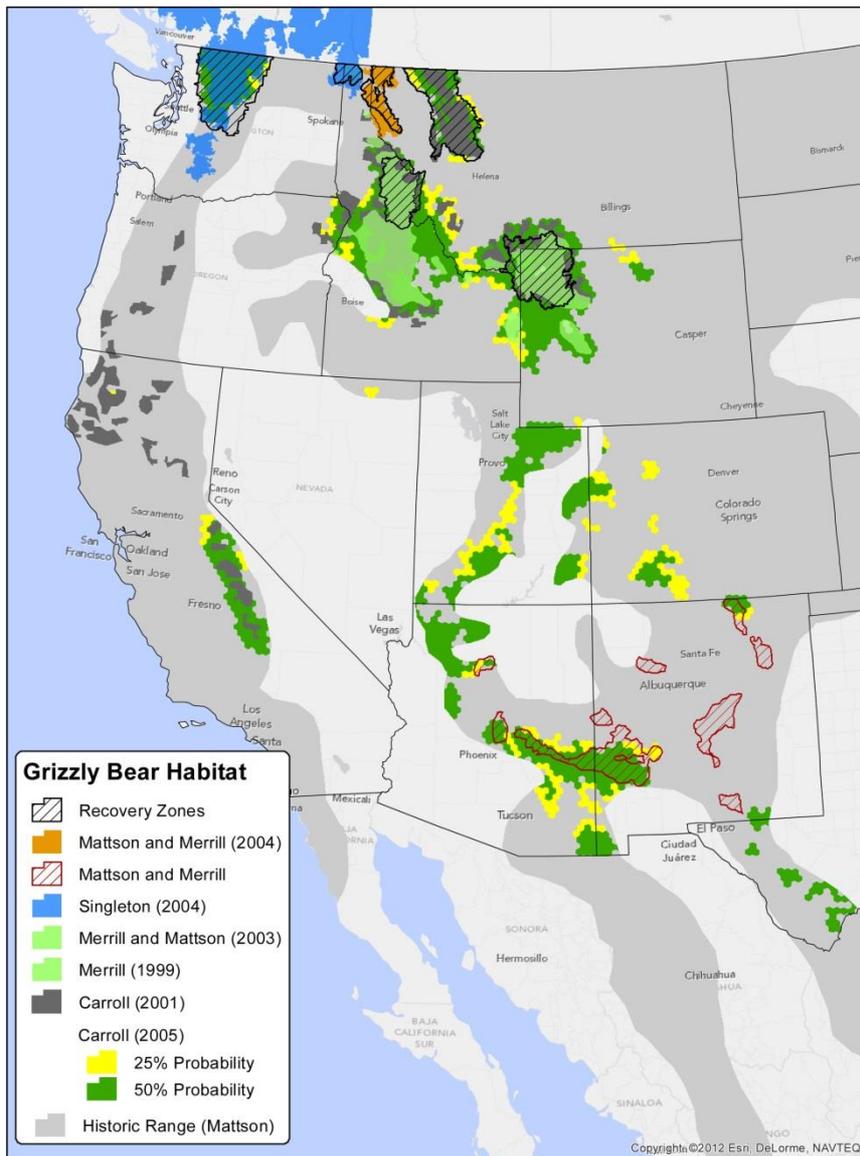


Figure 1. The extent and location of areas in the western US identified in various studies as being biologically suitable for grizzly bears. The various shades of green, yellow, orange, blue, dark gray along with red cross-hatching denote the results of various studies identified in the map legend. The light gray area corresponds with the estimated historical distribution of grizzly bears.

Restoring grizzly bears to potentially all of biologically suitable habitat would serve multiple purposes prescribed by the ESA, in keeping with the best available current science. By distributing grizzly bears over a larger area comprised of more diverse habitats, subject to uncorrelated changes in environmental conditions, the FWS would have a better chance of ensuring the future of the grizzly bear in the face of vagaries of future events. Moreover, a wider and more diverse distribution would fulfill the representation mandate of the ESA; for example, restoring grizzly bears in the western US to areas where acorns are likely to be a staple food (Storer and Tevis, 1996).

In addition to the studies identified in figure 1, there are several other studies which arrived at similar conclusions about areas suitable for restoration of grizzly bears. For example, analyses based on least-cost path models suggest the feasibility of restoring linkages between grizzly bear ecosystems in Yellowstone and central Idaho (Walker and Craighead, 1997). Using a spatially explicit population model, PATCH, Carroll (2005; as per figure 1) evaluated recovery potential for grizzly bears in the Western United States. He found that 51% of the Western US still had sufficient food resources to support grizzly bears. Under current habitat conditions, 23% of that habitat had more than 50% probability that it could be occupied by grizzlies. Carroll concluded that the potential size of the grizzly bear population in the western US could be close to 5,300 under current conditions. This is still a tiny fraction of the 50,000-100,000 that have been estimated to have lived in the lower-48 states prior to European settlement (Craighead et al., 1995).

In its current approach to recovery and delisting, FWS appears dominated by its vision of the status quo, and focused on the area occupied by grizzly bears when populations were at an all-time low. Given new compelling scientific information, and the importance of the grizzly bear in the Northern Rockies—ecologically and socially—a precautionary approach is reasonable, appropriate and consistent with the intent of the ESA to recover imperiled species.

59. The delisting rule fails to evaluate the ecological function of grizzly bears. Grizzlies are a keystone species with historically significant influences on the functioning of the Northern Rockies ecosystem. Most of these influences on the health of ecosystems are mediated through predation or physical effects.

As examples: example, Berger (1999, 2007) and Berger et al. (2001) showed that moose avoided browsing in areas where the risk of ambush was high to avoid predation by grizzly bears, with resulting recovery of riparian vegetation and associated avian species. Baer and Butler (2000), Doak and Loso (2003), and Tardiff and Standford (1998) demonstrated that grizzly bears play an important role as geomorphic agents, enriching soils and vegetation biodiversity as a result of bear-caused mechanical disturbances. And a combination of studies have suggested that, as subsidized predators, grizzly bears can limit populations of elk and moose through predation on neonates, with subsequent potential beneficial biodiversity effects at a landscape scale.

The ESA requires the consideration of the conservation of ecosystems. To accomplish this goal, several researchers have suggested using the principle of ecological effectiveness to judge species recovery (Pyare and Berger, 2003; Soule et al., 2003, 2005). An ecologically effective population is of sufficient density and geographical extent to re-establish a species' role in the ecosystem. FWS should adopt this concept as one of the parameters to defining grizzly bear recovery.

60. Instead of delisting, FWS should be revising the Grizzly Bear Recovery Plan. FWS admits that the 1992 Recovery Plan is sorely out of date and lacks the best available scientific information, according to its 2011 status review. Wayne Kasworm of FWS remarked in the press that “once the alligator of delisting

GYE and NCDE grizzly bears has stopped biting FWS in the butt, the agency will get around to revising the recovery plan." That is too late. That would leave perhaps 100 grizzly bears total in three completely isolated populations (Selkirks, Cabinet-Yaak, and Bitterroot), without any coherent vision for recovery of this species as a metapopulation in the Northern Rocky Mountains. Comprehensive recovery of grizzly bears would then be utterly be impossible, with hunting and killing of more grizzly bears in and around NCDE and GYE rendering all those populations isolated in some measure forever.

Recovery plan revisions are required by the ESA every 15 years. It is long overdue. Delisting as it has been approached now, has been ass backwards.

In one of the cites in the attached, Dr. David Mattson articulates why the recovery plan needs to be updated now from a scientific standpoint. Further, he gives FWS a heads start on the revised recovery plan, by doing a lot of home work for them. There is no reason for any delay as the clock is ticking on the grizzly bear.

Conclusion:

I recognize the considerable work and dedication of many in the agencies and outside government who have contributed to maintaining the grizzly bear in Yellowstone. These comments are made in the spirit of constructive criticism, with the aim of improving prospects for the bear and the climate that surrounds the debate. I look forward to an opportunity for a thorough and open discussion of the issues raised in this letter.

I close with a quote from John Craighead, Sr., who's pioneering work with his brother has shaped what I know about the grizzly today: "Delisting, if it occurs at all, must await population recovery throughout the Northern Rockies. Current delisting efforts may serve bureaucratic and political agendas, but a rational biological agenda should require no deadlines, no near-term declarations of accomplishment, and no change in protected status." (Craighead, 1998). I could not agree more.

There is much important work left to do to ensure a sound future for the grizzly in Yellowstone. By focusing on the priority areas described in this letter, and by working together, we stand a chance of accomplishing this goal.

I appreciate the opportunity to submit these comments.

Sincerely,

Louisa L. Willcox