BEFORE THE OBJECTION REVIEWING OFFICER, SOUTHWEST REGION OF THE UNITED STATES FOREST SERVICE

In Re: Objection to Four-Forest	)
Restoration Initiative Coconino &	)
Kaibab National Forests Final	)
Environmental Impact Statement and	)
Draft Record Of Decision	)

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DATED this 20th day of January, 2015

By _____________________________

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on behalf of Objector

Introduction

NOTICE IS HEREBY GIVEN that WildEarth Guardians ("Guardians", "we") objects pursuant to 36 CFR § 218.7 to the objection reviewing officer from the Final Environmental Impact Statement (FEIS) and Draft Record of Decision (ROD) prepared for the Four-Forest Restoration Initiative Project on the Coconino and Kaibab Forests. The Responsible Officials are Coconino National Forest Supervisor M. Earl Stewart and Kaibab National Forest Supervisor Michael Williams.

Legal notice of this objection period was published on December 4, 2014 in the Arizona Daily Sun, the stated Newspaper of Record. It states the ROD and FEIS are subject to predecisional objection procedures and 36 CFR § 218 subparts A and B.

WildEarth Guardians is a non-profit organization dedicated to maintaining, protecting, and restoring the native ecosystems of Utah and the American West. Guardians has an organizational interest in the proper and lawful management of these National Forests. Our members, staff, and board members participate in a wide range of hunting, fishing and other recreational activities on these National Forests, including the areas proposed for logging and other treatments. Guardians represents approximately 43,000 total members and e-activists.

Guardians claims standing, additionally, to participate in the public land decision-making process on the grounds that we have been involved in National Forest management issues since our founding, with a particular emphasis on this region. Our members have hiked, fished, hunted and photographed these National Forests, including the portions of the huge project area that would be affected. Our collective membership includes professional photography businesses and freelance photographers that make their living in part by photographing National Forests in Arizona, including the Coconino and Kaibab National Forests.

The procedural harm and direct physical impacts associated with this project detract from the ability of our members to be involved in the decision-making process of our public lands, and impact the outstanding natural beauty and biodiversity that makes the lands in and adjacent to the challenged project so appealing and desirable to our members who are professional photographers, anglers, hunters, and recreationists who utilize and find enjoyment from these lands.

In addition, our members are taxpayers that are required to pay for the logging and roading activities being proposed. The irretrievable commitments of financial resources associated with this project are also borne by the American people as a whole. Guardians claims partial ownership of the public lands covered by this project and consequently has legal standing to participate in the process and object to those projects it finds unacceptable and inconsistent with applicable laws and regulations.

Guardians participated in the comment process associated with this project and our comments shall be in the project file or record. Guardians objects to this project on the grounds the EIS and decision document are legally indefensible. Objector contends that with this project the Forest Service violates the National Environmental Policy Act (NEPA), the National Forest Management Act (NFMA), the Forest Plans (LRMP), the NFMA implementing regulations and rules, the Endangered Species Act (ESA), USFS TES species policy, as well as the Administrative Procedures Act (APA).

Relief Requested

Due to the violations of federal law and regulation cited above that have occurred or that are pending, objector Guardians requests relief in the form of instruction to the line officers that they withdraw the draft ROD, pending development of a new iteration of the (S)EIS for the project that addresses inadequacies raised individually below in this objection.

Statement of Facts and Arguments
(Combined for Clarity)

Failure to Meet NEPA Policy and Duties for Site-Specific Environmental Analysis

The FEIS and ROD are, at a foundational level, programmatic in nature. They lack minimum requisite site-specific analysis and decision-making expected by the NEPA, the CEQ's NEPA regulations, as well as USFS NEPA Policy at 36 CFR 218 and FSH 1909.15. Implementation of the project without subsequent site specific NEPA (e.g. EAs, CEs) constitutes arbitrary and capricious failure to meet duties imposed by the NEPA and the APA.

One example of how this is so is that the FEIS and ROD assume a minimum implementation horizon of a decade or more (e.g. "or until objectives are met", ROD p. 13) for: (1) almost a half million acres of logging units, (2) over a half million acres of prescribed fires, (3) over 500 miles of road (re)construction, as well as (4) three so-called site-specific LRMP amendments that will also be in effect for 10 years or longer ("until objectives are met") that will enable logging in sensitive archeological resource areas and occupied TES species' habitats across the majority of an entire National Forest. The LRMP amendments will be in effect at least as long as the prescribed duration of an entire LRMP planning period.

A parallel example of how the EIS is programmatic (not site-specific) in nature is that chapter 2 of the EIS could include maps that are no more than conceptual and diagrammatic in nature. While not stated-as one would expect in a conceptual diagram, they may approach 1:1 million in scale. This may not even be adequate even for an EIS supporting a typical modern Revised LRMP anticipated to last 10-15 years, let alone a site-specific project implementing such kinds planning-level decision documents.

The actions subject this objection span millions of acres across multiple national forests, and map-like schematics in the EIS do no more than merely approach the minimum level of specificity and usefulness demanded than even the most generic and programmatic mapping included in modern LRMPs and their supporting programmatic EISes.

If the point is not yet made, please consider the fact that the generic and conceptual maps in the EIS that prescribe what shall or shall not be logged (for example) in the alternative the ROD selects are at points the lines on the maps ae so wide that they themselves technically could include logging-created openings that exceed acreage limits imposed by the ESA, the NFMA, the LRMPs, and related agency policies limiting the size of logging created openings. The EIS presents and considers a range of action alternatives that are nothing more than geographically and temporally programmatic and conceptual, not site-specific.

An argument might be made that the FEIS would stand if treated as if a programmatic EIS, such as what may commonly be done for a typical USFS 10+ year USFS oil/gas field development EIS and ROD authorizing the BLM to proceed with hundreds of oil/gas well approvals over a decade or more. But for each subsequent site-specific Application for Permit to Drill (APD) there must be site-specific NEPA analyses (such as EAs). The Ashley N.F. EIS and ROD that authorized such approvals are enclosed as an example.[1] However in the case at hand we have a programmatic EIS with no expectation of subsequent site-specific NEPA.

In summary, implementation of the draft ROD based on this FEIS absent subsequent site-specific NEPA analysis in Environmental Documents (e.g. EAs and FONSIs), or even less rigorous site-specific environmental analysis supporting Decision Memos (aka USFS CEs) … the decision subject this objection constitutes failure to demonstrate compliance with NEPA rules and policies that require major federal actions be supported by meaningful site-specific environmental analysis under NEPA.

Assuming arguendo the agency responds administratively to the above in an adverse way, consider this argument to be an additional challenge under NEPA's "hard look" standards, as well as planning duties imposed by the NFMA, and government policy implementing each.

Selected Alternative and its LRMP Amendments do Not Meet Duties imposed by the NFMA & Controlling LRMPs, NEPA & USFS NEPA Policy, ESA, and APA Due to Failure to Use/Consider New and/or Best Available Science[2]

This will be demonstrated below in subparts a through d.

Issue a.

New scientific evidence corroborates previously published findings that historical mixed- and high-severity fires significantly structured the dry-forest landscapes on the Coconino Plateau and Mogollon Plateau that are the focus of Restoration in 4FRI Phase 1.

Key implications of law, policy and substantive outcomes include that the 4FRI goal of reducing these fires is fire suppression and not ecological restoration. This triggers failures to meet NEPA, NFMA, and ESA policies requiring disclosure, consideration, and use of the best science/scientific information in implementation and amendment of LRMPS.

Of particular and importance is that perhaps the most important part of the purpose and need cannot be achieved by any action alternative. "There is a need to increase forest resiliency and sustainability" … "Resiliency increases the ability of the ponderosa pine forest to survive natural disturbances such as fire, insect and disease, and climate change (FSM 2020.5)". ROD, p. 4. Evidence in this section 2 of the objection shows that this key part of the purpose and need is not going to be met by the selected alternative nor could it be met by any other action alternatives studied in detail. The range of alternatives is therefore inadequate. As is the case with the issues

[1] Use of the Berry 400 oil/gas well EIS and ROD on the Ashley N.F.is nothing more than an example. It is never to be viewed as WildEarth Guardians' endorsement of said EIS/ROD, or as a suggestion that unrelated legal claims against it are anything other than meritorious.

[2] With his permission, this section of the objection incorporates Professor William Baker's administrative objection to the draft ROD and FEIS. As such, and via enclosure, his objection claims are incorporated into this objection. This is done in the interest of clarity. It is also done so that different language in this part of the objection, typically intended to condense and/or explicitly connect relationships to environmental laws and policies, is understood to reflect Guardians' views and not necessarily those of Professor Baker.

below, this claim was raised in comments. It is only further supported by additional new published scientific research arbitrarily dismissed in this ROD and EIS

For the Coconino Plateau, new evidence from tree-ring reconstructions (Dugan and Baker, in press) corroborates published General Land Office-survey reconstructions (Williams and Baker 2013), which showed that mixed-severity fire was a significant component of historical fires that structured the Coconino's dry-forest landscapes. Of total area burned historically, about 22% burned in mixed-severity fires on the South rim of Grand Canyon National park (Dugan and Baker, in press) and about 39% of the larger Coconino Plateau, including the South Rim, burned in mixed-severity fires (Williams and Baker 2013). Only about 3% of historical burned area on the Coconino Plateau was from high-severity fire.

For the Mogollon Plateau, Williams and Baker's (2012) reconstructions from General Land Office surveys showed that: (1) mean tree densities were 141.5 trees/ha, median = 124.3 trees/ha, s = 75.9 trees/ha, range = 22.2-534.1 trees/ha, (2) only about 33% of the Mogollon had open forests with < 100 trees/ha, while 17.7% of the Mogollon forests had > 200 trees/ha and 8.4% had > 250 trees/ha, (3) fire severity was 14.5% high-severity, 23.1% mixed-severity, and 62.4% low-severity, and (4) recent fires such as the 2002 Rodeo-Chediski and 2011 Wallow had similar to lower proportions of high-severity fire than occurred in nearby reconstructed landscapes, suggesting that the recent fraction of high-severity fire in these large fires is not unprecedented and has not increased relative to the historical record.

The Final EIS demonstrates arbitrary, capricious, and generally derogatory bias in treatment of this and related peer reviewed research. For example the FEIS said that published findings of Williams and Baker (2012) were refuted by Fulé et al. (2014), but did not present these actual findings of Williams and Baker (2012). Furthermore, it failed to cite or review the rebuttal of Fulé et al. (2014) by Williams and Baker (2014) published at the same time.

This means explaining the central findings of Williams and Baker (2012) listed above, and what Williams and Baker (2014) say in rebuttal about: (1) serious problems with the Fulé et al. (2014) article itself, (2) the Fulé et al. critique that the Williams and Baker (2012) fire-severity reconstruction methods are not valid, and (3) the Fulé et al. critique that the Williams and Baker (2012) reconstructions are not corroborated by other scientific evidence. NFMA, NEPA, the ESA as well as the APA each impose parallel or similar policy standards mandating that responsible opposing scientific views be equally disclosed and considered. However this case is about much more than refusal to fairly consider mere responsible opposing views. This is more akin to the tired story of byzantine bureaucratic resistance to afford even just equal consideration to newer (and now more robustly supported) scientific paradigms. A few specific examples are below.

First, regarding the Fulé et al. (2014) article itself, Williams and Baker (2014) showed that Fulé et al. (2014) "extensively misquote our article, mistake our methods and say it addressed topics and made conclusions that were not made...FE substantially misleads readers about W&B's findings." (Williams and Baker 2014 p. 831). Fulé et al. (2014) created three new false narratives that overlook and misuse other available scientific evidence about high-severity fire in and near the 4FRI project area, including misuse of Aldo Leopold.

Second, Williams and Baker (2014) explained that the fire-severity reconstruction methods that Fulé critiqued were also used by three authors of Fulé et al. (2014) in other published articles without any concerns when they used them. Also, unlike these earlier uses by authors of Fulé et al. (2014), the Williams and Baker (2012) fire-severity reconstructions were calibrated and validated against published tree-ring-based fire-severity reconstructions. The Williams and Baker (2012) fire-severity reconstructions were calibrated using 64 tree-ring reconstructions of fire severity, and the reconstructions correctly predicted fire severity for 63 of the 64 tree-ring reconstructions (Williams and Baker 2012). The 54 tree-ring reconstructions of fire severity in the Southwest used to calibrate the model were *all* correctly classified by the fire-severity reconstructions. The Final EIS treated this in an arbitrary and capricious manner by inaccurately misleading even professional reviewers (and therefore the Responsible Officials) such that they incorrectly understand that fire-severity reconstructions do not match the extensive tree-ring research done in the past, when in fact the reconstructions do completely match them at the actual sites of those tree-ring reconstructions.

Third, in response to the Fulé et al. (2014) critique that other scientific corroboration (e.g., early scientific observation) is lacking for the fire-severity reconstructions, Williams and Baker (2014) explained that Fulé et al. (2014) completely missed Appendix S1 in Williams and Baker (2012), which presented this substantial corroborating evidence.

Also, Williams and Baker (2014) presented two new significant sources of corroboration for the original findings of Williams and Baker (2012) on the Mogollon Plateau. New corroboration has also appeared (Dugan and Baker, in press) since the Final EIS for the Williams and Baker (2013) reconstructions on the Coconino Plateau. And, a new source of corroboration for both the Mogollon and Coconino reconstructions was published in Odion et al. (2014) since the Final EIS.

Here are the three new sources of corroboration:

1. Williams and Baker (2014) presented new evidence of early scientific observation of extensive high-severity fire on the Mogollon Plateau. John Leiberg (Leiberg et al. 1904) was a highly trained and experienced government forester who spent 2 years completing a timber cruise and making systematic scientific observations across the Mogollon Plateau. Leiberg et al. (1904 p. 23) said:

> "The light stands in many cases represent tracts which were burned clear, or nearly so, one hundred or one hundred and twenty years ago, and now are chiefly stocked with sapling growths, ranging in age from 35 to 90 years"

This is a direct early scientific observation of extensive high-severity fire in dry forests in the 4FRI project area on the Mogollon Plateau between about A.D. 1815 and 1865. The Leiberg et al. data suggest that these light stands that regenerated after high-severity fires covered about 17% of the ponderosa pine area in the San Francisco Mountains Forest Reserve (Table S2 in Williams and Baker 2014), representing a historical high-severity fire rotation of about 600-700 years (100-120 years/0.17). These are similar to Williams and Baker's (2014) estimates of 14.5% of area burned at high severity in an overlapping pre-1880 period, and a historical high- severity rotation of 828 years.

2. Paleoecological reconstruction also corroborates the rate and extent of high-severity fire (Jenkins *et al.*, 2011) found by Williams and Baker (2012) on the Mogollon Plateau. Fulé et al. (2014) acknowledged that this study on the Mogollon Plateau corroborates the historical occurrence of high-severity fire in the dry forests of the 4FRI study area, but they suggested that these fires were not as spatially extensive as found by the Williams and Baker (2012) reconstructions. However, the Final EIS should explain that this was speculation, as Fulé et al. (2014) presented no actual evidence about the spatial extent of historical high-severity fires.

In fact, Jenkins et al. (2011) found evidence of high-severity fires at roughly 200-400 year intervals over the last 1000 years, a higher rate of burning than the 828-year fire rotation found by Williams and Baker (2012) for the whole Mogollon Plateau. extensive dense, young forests from high-severity fires, corroborating the findings of Williams and Baker (2012). With a mean interval between high-severity fires of 200 years, about half the Plateau would, on average, be generally <100 years old, with corresponding dense, young forests across about half of the Plateau. Even with a mean interval of 400 years, about 25% of the Plateau would have been <100 years old. The Jenkins et al. high-severity rates suggest that the Plateau would have had extensive dense, young forests from hing-severity fires, corroborating the findings of Williams and baker (2012),

3. Odion et al. (2014) presented new and independent corroborating evidence of historical mixed- and high-severity fire in the 4FRI project area. The independent evidence is from a large dataset of tree ages collected by the Forest Inventory and Analysis (FIA) program from the 4FRI project area and similar nearby areas in unmanaged dry forests. For the Southwest, 319 plots representing 492,000 ha of FIA sampling were used, including substantial data from the Mogollon Plateau, Coconino Plateau, and nearby parts of the Kaibab Plateau.

These data show that unmanaged dry forests in the 4FRI project area, and the Southwest as a whole, had dominant overstory trees that were not old as expected if low-severity fire had historically dominated fire regimes, but instead were young to intermediate in age, between 80-199 years old (Odion et al. Figure 2F), having originated between about 1815-1930 in mixed- and high-severity fires. The earliest date of about 1815 corresponds with the earliest date of stands burned in high-severity fires noted by Leiberg et al. (1904) on the Mogollon Plateau, cited above. Leiberg et al. observed extensive stands 35-90 years old in 1904 that originated from high-severity fires–the year 1904 minus 90 years is 1814, almost identical to the earliest date from the Odion et al. data. The Leiberg et al. (1904) observations thus strongly corroborate the finding of extensive historical mixed- and high-severity fire from FIA data for the 4FRI project area and the Southwest in general (Odion et al. 2014).

<u>*Summary and Suggested Remedies*</u>:

To be candid: WildEarth Guardians' Kevin Mueller is more accustomed to living in and being involved in forest science and management in ponderosa pine, mixed conifer and aspen forests typical of the middle rocky mountains north of Arizona; they're overwhelmingly dominated my infrequent mixed severity fires that my definition includes a landscape-scale patchwork of high severity stand replacing fire. Forest science is a lifelong passion, and he was willing to give a fresh consideration of the very different paradigm of cool 5+ year grassland/savanna like fire regimes said requisite to regulate the Ponderosa and dry mixed conifer around Flagstaff. He reviewed the unflinchingly confident presentation of the state of modern forest science in the

FEIS backing up almost a half million acres of the proposed action's logging-created, even-aged "openings" as cutting-edge ecological restoration. He then learned that a newer dominant scientific paradigm (that's robustly supported) shows infrequent mixed severity fires were also historically key regulating ecological process for ponderosa in central AZ. And it made sense given there's also so much aspen and other mixed conifer species scattered across the project area. However, the derogatory treatment in the EIS of the newer SW paradigm based on less frequent mixed severity fires is frustrating to infuriating. Most high-operating well educated community leaders, educators, decision makers, and elected officials don't have time or capacity to read more than the nearly 1,000 page FEIS. And they'd need to dig deeper to learn that it is systematically biased and stale due to unquestioning adherence to an old (the old) scientific paradigm.

WildEarth Guardians concludes that in light of this issue and the few to follow, the requisite remedy is direction to proceed with either: (1) a Supplemental EIS with expanded alternatives (including at least one adopting mixed severity fire regimes) and supporting analysis that is revised accordingly from the bottom up, or (2) the equivalent via a similarly revised FEIS supported by a FEIS comment period on new alternatives and analysis prior to a new administrative objection period.

Because the exceptionally large FEIS is built from the bottom-up based on unquestioning acceptance on an older scientific paradigm that would have much of America's western dry mixed conifer-aspen forest converted almost to grassland savannah with incidental clumps of pines has been successfully challenged by a newer

Guardians supports Bakers recommendations that a new EIS incorporate new science including at least:(1) Williams and Baker (2012, 2013) fire-severity reconstructions from General Land Office surveys, (2) Jenkins et al. (2011) fire-severity reconstructions from charcoal in sediments, (3) Odion et al. (2014) fire-severity reconstructions from Forest Inventory and Analysis data, (4) Dugan and Baker (in press) fire-severity reconstructions from tree rings, (5) early corroborating scientific evidence in Williams and Baker (2012 Table S1), (6) early scientific observations of extensive high-severity fire by Leopold et al. (1904). A Supplemental or revised Final EIS needs to present the details of the rebuttal of Fulé et al. (2014) by Williams and Baker (2014) and explain in detail the findings of these six sources of scientific evidence that together agree on the historical importance of mixed- and high-severity fire in the 4FRI project area.

References:

Dugan, A. J. and W. L. Baker (In press). Sequentially contingent fires, droughts and pluvials structured a historical dry forest landscape and suggest future contingencies. Journal of Vegetation Science, in press.

Fulé, P. Z. et al. 2014. Unsupported inferences of high severity fire in historical western United States dry forests: response to Williams and Baker. Global Ecology and Biogeography 23:825-830.

Jenkins, S. E., C. H. Sieg, D. E. Anderson, D. S. Kaufman, and P. A. Peartree. 2011. Late Holocene geomorphic record of fire in ponderosa pine and mixed-conifer forests, Kendrick Mountain, northern Arizona, USA. International Journal of Wildland Fire 20:125-141.

Leiberg, J. B., T. F. Rixon, and A. Dodwell. 1904. Forest conditions in the San Francisco Mountains Forest Reserve, Arizona. US Geological Survey Professional Paper No. 22. US Government Printing Office, Washington, D.C.

Odion, D. C., C.T. Hanson, A. Arsenault, W. L. Baker, D. A. DellaSala, R. L. Hutto, W. Klenner,

M. A. Moritz, R. L. Sherriff, T. T. Veblen, and M. A. Williams. 2014. Examining historical and current mixed-severity fire regimes in ponderosa pine and mixed-conifer forests of western North America. PloS One 9(2), article e87852.

Williams, M. A. and W. L. Baker. 2012. Spatially extensive reconstructions show variable-severity fire and heterogeneous structure in historical western United States dry forests. Global Ecology and Biogeography 21:1042-1052.

Williams, M. A. and W. L. Baker. 2013. Variability of historical forest structure and fire across ponderosa pine landscapes of the Coconino Plateau and south rim of Grand Canyon National Park, Arizona. Landscape Ecology 28:297-310.

Williams, M. A. and W. L. Baker. 2014. High-severity fire corroborated in historical dry forests of the western United States: response to Fulé *et al.* Global Ecol. and Biogeogr. 23: 831-835.

Issue b:

New scientific evidence shows that historical dry forests in the 4FRI project area were dominated by small trees. The 4FRI goal of removing most small trees would not be ecological restoration and would likely reduce the resilience of these forests to insect outbreaks and droughts that are the most serious disturbance threats to 4FRI forests. Noted in section a above, not only were the duties to disclose, consider, and use the best available science imposed by the ESA, NEPA, and the NFMA not met, this indicates the fundamentally inadequate range of alternatives (an issue raised before) forces the ROD to choose from a range of ineffective and inadequate alternatives. The remedy recommended is a Supplemental EIS (or functional equivalent) that has an expanded range of alternatives that includes action alternatives prescribing less logging and/or perhaps mixed severity fire (including high severity patches) across the landscape.

Baker and Williams (2015) presented new evidence from seven study areas covering about 1.7 million ha of dry forests across the western USA, including much of the 4FRI project area, that dry forests were historically dominated by small trees, rather than just large trees in open park-like stands as had been widely thought in the past. This finding is based on direct measurements of 45,171 bearing trees and direct records along 22,206 km of section lines by General Land Office surveyors in the late-1800s. These data are not reconstructions, but instead direct systematic records made by highly trained surveyors. These direct records are from historical forests, as they were collected before widespread logging and other land-use changes that later substantially altered these forests.

Three of the seven study areas were in and near the 4FRI project area. The 41,214 ha Coconino Plateau study area, the 405,214 ha Mogollon Plateau study area, and the 151,080 ha Black Mesa study area together include evidence from 15,232 bearing trees and 6,084 km of section lines.

Small trees, defined as < 40 cm (about 16 inches) diameter, made up 69.5%, 51.8%, and 81.1% of total trees in these three study areas, respectively. The Mogollon Plateau study area, where 4FRI Phase 1 is located, had a higher percentage of large trees than the other two study areas, but even on the Mogollon more than half the trees were small. The abundance of small trees likely was fostered by episodic mixed- and high-severity fires, insect outbreaks, droughts and other disturbances (Williams and Baker 2013, Dugan and Baker, in press).

The key role of small trees in providing resilience to these forests over the long-term is that they provide advance recruitment that differentially survives insect outbreaks and droughts.

The Baker and Williams (2015) study also showed, using government fire and insect data, that rates of insect outbreaks over the period from 1999-2012 were 4.5 times the rates of mixed- and high-severity fires across ponderosa pine forests in the western USA. Droughts have also recently led to substantial tree mortality in dry forests. Large trees are especially susceptible to drought mortality, and small trees have a higher probability of surviving droughts.

Removing most small trees, as proposed in the Final EIS and ROD, across the 4FRI project area to reduce fire risk thus would not restore the historical structure of these forests and instead would substantially reduce the resilience of these forests to insect outbreaks and droughts that are currently the most significant disturbance threats to these forests.

Summary and Suggested Remedies: Forests in the 4FRI project area were shown in Baker and Williams (2015) to have been historically dominated by small trees (< 40 cm diameter) that particularly conferred resilience to insect outbreaks and droughts that today are shown to be a much more significant threats to 4FRI forests than are wildfires. The general proposed 4FRI goal of removing most small trees would not be ecological restoration, but could be modified to be restorative via at least one more action alternative and a revised/supplemental EIS.

Retaining and increasing large trees until they are again at historical levels, since they are definitely in deficit, is certainly restorative. Removing small trees to a lesser extent than proposed in the Final EIS and ROD, so that small trees remain numerically dominant across dry-forest landscapes would match the new evidence. Also compatible would be to restore the percentages found for the Mogollon and Coconino (52-81% of trees < 40 cm) study areas of Williams and Baker (2012, 2013), while retaining the goal of restoring historical heterogeneity in tree density, basal area, and other key features of historical forest structure.

References:

Baker, W. L. and M. A. Williams. 2015. Bet-hedging dry-forest resilience to climate-change threats in the western USA based on historical forest structure. Frontiers in Ecology and Evolution, in press.

Dugan, A. J. and W. L. Baker (In press). Sequentially contingent fires, droughts and pluvials structured a historical dry forest landscape and suggest future contingencies. Journal of Vegetation Science, in press.

Williams, M. A. and W. L. Baker. 2013. Variability of historical forest structure and fire across ponderosa pine landscapes of the Coconino Plateau and south rim of Grand Canyon National Park, Arizona. Landscape Ecology 28:297-310.

Issue c.

New scientific evidence shows that rates of historical low-severity fire were lower than previously thought, and 4FRI is consequently proposing too much prescribed burning during the 10-year project period.

New evidence in Dugan and Baker (2014, in press) showed that typical estimates of mean fire-return intervals in dry forests in and near the 4FRI project area that suggest historical fires burned at very short intervals substantially underestimate the length of historical fire intervals.

The traditional composite fire-interval (CFI) method used to estimate mean fire-return interval calculates mean intervals between fires in a pooled composite list of fires found anywhere in a sampling area. Mean CFI represents how often a fire was found on a scarred tree or a few scarred trees somewhere in the sampling area, not how often fire burned across the whole sampling area or across points. Thus, tradition estimates are not appropriate to use to guide prescribed burning programs, which generally blacken much of each burn unit.

Mean CFI also has multiple limitations documented by simulation analysis, analytical studies, empirical comparisons, and the new modern calibration at Grand Canyon (Dugan and Baker 2014). Mean CFI is typically strongly related to sample size and sample area, more than being a property of the fire regime (Baker and Ehle 2001, Dugan and Baker 2014). Mean CFI declines toward 1.0 years as sampling area increases, a highly undesirable property. Since most fires are small, burning only a few trees, mean CFI nearly always underestimates how long fire intervals were on average across the sampling area, which is the population mean fire interval (Baker and Ehle 2001). The population mean fire interval is the measure that is congruent with prescribed burning programs that generally blacken burn units.

The discrepancy between traditional CFI estimates and the population mean fire interval can be seen, for example, in the Grandview part of the Dugan and Baker (2014) study area on the South rim of Grand Canyon National Park. In this area, Fulé et al. (2003) found the historical mean CFI (25% scarred) to have been 9.5 years. In contrast, the fire rotation and population mean fire interval reconstructed using validated spatial methods (Farris et al. 2010) were 25.7 years (Dugan and Baker 2014), thus 2.7 times as long as estimated by the traditional mean CFI. Thus, 2.7 is an appropriate multiplier to correct mean CFI estimates so they roughly approximate the population mean fire interval in the 4FRI project area, which is the measure that is scaled appropriately for use in guiding prescribed burning programs.

Valid new scientific methods are available to accurately reconstruct population mean fire interval for use in prescribed burning programs, including a method for small plots (Dugan and Baker 2014) and for spatial reconstruction across landscapes (Farris et al. 2010, Dugan and Baker, in press). Until these new methods are widely applied, it is essential to use the available valid new estimates or correct known deficiencies of the CFI method by using multipliers (Baker and Ehle

2001). As an interim estimator of the population mean fire interval, traditional estimates of fire-return intervals in the 4FRI project area should be multiplied by 2.7, as this is the multiplier shown to be appropriate in the comparison, described above, by Dugan and Baker (2014) on the Coconino Plateau.

Summary and Suggested Remedies:

Do not use traditional estimates of mean fire-return interval because of the documented problems with these measures. If they are used in some way in 4FRI, the significant deficiency in traditional estimates of historical rates of burning need to be fully discussed and disclosed to the public, as their use will likely lead to too much fire, which has significant adverse effects on the environment.

Too much fire has known adverse impacts that include: (1) increasing the spread of invasive species, such as cheatgrass (*Bromus tectorum*), a known concern in the 4FRI project area, (2) adversely affecting native understory plants (Laughlin and Grace 2006), and (3) killing large trees that are already in deficit (van Mantgem et al. 2011). For example, the DROD reported on p. 31 that one prescribed fire "showed an 8 percent loss of trees greater than 18 inches d.b.h."

The proposed 10-year interval of burning and up to two fires during the 10-year project period is too much prescribed burning: (1) relative to historical fire rotations and population mean fire intervals, which likely were 25-30 years or more, based on the analysis by Dugan and Baker (2014) on the Coconino Plateau, and (2) is likely to lead to too much mortality of large trees, too much expansion of cheatgrass and other invasive plants, and adverse impacts on native plants. Since a major focus of the project is to restore large trees, and considerable effort has been made to devise a method to retain large trees during restoration, it is contrary to this effort to have potentially two successive losses of 8% of large trees (as in the example cited above) within the 10-year project period.

Certainly a single burn across the project area, to reduce activity fuels after mechanical treatments, during the project period of 10 years is likely to be generally restorative and an essential step, but to minimize adverse impacts, another prescribed burn should not be generally done until 25-30+ years after the initial burn. Although this may not reduce fuels as much as two successive fires within 10 years, the goal of the 4FRI project is not fuel reduction, it is ecological restoration. A 25-30 year period would give damaged trees and native understory plants time to partially or fully recover before the next fire, and increase the chances that large trees will survive and native plants will be able to compete with invasives.

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Issue d.

New scientific evidence shows that Mexican spotted owls (MSOs) benefit from historical mixed- and high-severity fires, that the habitat of related spotted owls was created and maintained by mixed- and high-severity fires, that MSO PACs are being affected in some areas by human-set fires but not at high rates and actual effects on MSO habitat and occupancy are unknown, and proposed thinning in MSO habitat is likely to adversely affect future habitat of the MSO.

This new scientific evidence is documented in published peer-reviewed scientific papers that were not cited or used in the draft or final EIS or Record of Decision and were published in 2014-2015 after the comment period on the draft EIS had ended. Copies of the 2014-2015 publications that are the basis for this objection are in the project record (see enclosures to Professor Baker's objection). To facilitate USFS review, Professor Baker included selected pre-2014 papers that are cited for clarity.

First, a just-published study (Ganey et al. 2014) shows that wintering MSO moved to moderate- and high-severity burned areas, that provided greater prey biomass and prey diversity, rather than to lower-elevation areas with milder weather. This shows that the 4FRI goal of reducing mixed- and high-severity fire to protect MSO habitat would likely instead have adverse effects on the MSO by reducing favored habitat during the stressful winter season.

Second, a newly-published study (Baker, in press) shows that the main historical habitat components of the Northern spotted owl in the Eastern Cascades of Oregon were preferentially found in areas with preceding mixed-severity wildfires. These wildfires produced early-successional post-fire habitat favorable for spotted owl foraging and roosting and mid- to late-successional habitat favorable for nesting, which also can be created by high-severity fires. The study shows that a focus on reducing short-term loss of spotted owl nest sites to mixed- and high-severity fires by thinning and fuel reduction, if successful, will lead to reduced future spotted owl habitat.

Third, the 2012 MSO Recovery Plan and a new master's thesis (Normandin 2014) purport to show that the risk of high-severity fire to MSO is high and thinning is needed to reduce what Normandin calls uncharacteristic high-severity fires. However, the 2012 Recover Plan and the

Normandin thesis actually both show that the rate of high-severity fire is not high and is confined almost entirely to arson/accidental fires.

This issue, raised in comments, is not new as Guardians has already raised comments and concerns that the action proposed does not comply with the 2012 plan. Guardians has, additionally, raised (and does so again here) arguments that the 2012 plan is legally inadequate under standards imposed by the ESA, NEPA, NFMA, and USFS TES species policy.[3] See enclosed. To the extent this ROD applies the 2012 plan, consider this an applied challenge to said plan.

Here are additional problems with the Recovery Plan and Normandin's findings and with the treatment of risk of high-severity fire to MSO habitat inthe Final EIS:

1. Normandin did not cite or use the evidence presented with issue 1 above that shows that high-severity fires were a natural component of historical fire regimes in MSO habitat and that spotted owl habitat in other areas was created and maintained by mixed- and high-severity fires (Baker, in press). In this latter case, the publication just came out, but it is germane. The 2012 Recovery Plan was developed before the appearance of Williams and Baker (2012), and thus perhaps had no reason to comprehensively review evidence about historical high-severity fire in MSO habitat, but this evidence is now available.

2. Normandin also did not cite or use new evidence that MSO winter habitat is favored in moderate and high-severity burned areas (Ganey et al. 2014), likely also because this paper was just published. This new information, however, is also germane to the analysis.

3. The 2012 Recovery Plan did not study or document an increasing trend in high-severity fire in NSO habitat. The increase in high-severity fire that Normandin showed is nearly all due to the 2002 Rodeo-Chediski fire and the 2011 Wallow fire (Normandin Figure 2 shows this). Both fires were accident/arson fires. If people had not set these fires, there almost certainly would be no increased high-severity fire in the 4FRI MSO habitat area. This shows that fuels and forest structure in MSO forests are not leading to increased high-severity fire. The causal problem is almost entirely arson/accidental ignitions by people.

4. Neither the 2012 Recovery Plan nor Normandin calculated fire rotation for recent high-severity fires, but this measure is essential to evaluate fire risk, as it estimates the expected time to burn across a study area and also the expected mean interval between fires at any point in the study area. The calculation of fire rotation is given by: Observation period / fraction of area burned (Baker 2009).

[3] WildEarth Guardians believes that the 2012 Recovery Plan for the Mexican spotted owl is inadequate in many ways to assure the conservation and recovery of the owl. WildEarth Guardians' concerns regarding the substance of the 2012 Recovery Plan were set out in its August 23, 2011 comments on the draft of that Plan, which comments were submitted to the Fish and Wildlife Service during the period of plan development. See attached. WildEarth Guardians' comments on the Four-Forests Restoration Initiative – and the various ways in which the Initiative fail to adhere to the framework set out in the 2012 Recovery Plan – do not constitute any waiver of WildEarth Guardians' to challenge the substance of that Plan in the future and do not constitute any sort of tacit endorsement of the provisions of that Plan.

For the 2012 Recovery Plan, which studied about 89% of total PAC area, the observation period is 14 years (1995-2008). the cumulative PAC hectares burned by high-severity fire are given in Box B.2, Table 1, p. 198 as 12,675 ha across the total study area, and total hectares in designated PACs are given in this same table as 329,054 ha. Thus, the high-severity fire rotation from 1995-2008 is: 14 years / (12,675 ha / 329,054 ha) = 363.5 years. Similar calculations for individual EMUs show that the Upper Gila Mountains EMU had a high-severity fire rotation of 307.9 years during this same period.

For Normandin (2014), the observation period is 20 years (1992-2011), the cumulative PAC hectares burned by high-severity fire are given in Table 3, p. 30 in Normandin (2014) as 8,402.5 ha and total hectares in designated PACs are given as 101,380.2 ha in the same table. Thus, the high-severity fire rotation from 1992-2011 is: 20 years / (8,402.5 ha / 101,380.2 ha) = 241.3 years.

Fire rotation is also the expected mean interval between high-severity fires at any point in the landscape (Baker 2009). Thus, using Normandin's data, even if the two unprecedented human- set fires were to recur as they did between 1992-2011, it is expected that high-severity fires would not recur for 241 years on average in each MSO PAC, which is ample time for recovery and redevelopment of mature forests favored for MSO. Similarly, using the 2012 Recovery Plan data, the expected mean interval between high-severity fires in a PAC would be 363.5 years across all the PACs studied and 307.9 years across PACs in the Upper Gila Mountains. These also are ample periods for recovery and redevelopment of mature forests favored for MSO.

Normandin reports (his Figure 6) that the human-set 2011 Wallow fire alone added 3,830 ha of high-severity fire. If that fire had not occurred, the high-severity fire rotation would have been 443 years, not 241 years, showing that this human-set fire is the primary source of a somewhat reduced high-severity fire rotation. The 2012 Recovery Plan suggested that the 2011 Wallow fire might add concern, but comparing the fire rotation from the 2012 Recovery Plan to that of Normandin shows that the 2011 Wallow fire had only modest effect, reducing the fire rotation by about 22%, from 307.9 years to 241.3 years. This comparison illustrates the large buffering capacity of the PAC system, which is likely quite resistant and resilient to very significant rapid changes in high-severity fire.

Neither the 2012 Recovery Plan nor Normandin make projections of future fire risk to MSO that are grounded in published scientific projections of future climate and fire. The 2012 Recovery Plan uses arbitrary exponential rate increases that are not linked to any of the several published projections of increased fire that use global climate models and emissions scenarios.

Normandin simply extrapolates from his study period, effectively assuming that events like the 2002 Rodeo-Chediski and 2011 Wallow fires will recur as they occurred during his study period. This is certainly not a testament to faith in our public fire services to be able to prevent future arson/accidental fires from spreading over such large areas.

5. Normandin does not consider, in his risk calculation for MSO, the rate at which forest succession is producing new MSO habitat, only the rate of loss to fire, even though it is also a fundamental component of analysis of fire risk to spotted owls to include both the rates of loss of habitat and the rates at which new habitat is being produced by forest succession (Hanson et al.

2009). The 2012 Recovery Plan says: "the amount of habitat affected by high severity burns was not offset by restored or newly developed habitat over this analysis period," (p. 197), but presents no data (so far as I could find) showing the hectares of restored or newly developed habitat.

6. Finally and most fundamental, neither the 2012 Recovery Plan nor Normandin's (2014) analysis gathered data on MSO occupancy and use of post-fire areas that were studied, but instead simply assumed that high-severity fire equates to lost habitat and no occupancy. It is now well know, from studies cited in the Final EIS (e.g., Bond et al. 2002, Lee et al. 2012) that this is not a valid assumption for spotted owls. Thus, neither analysis provides adequate evidence that there is any actual risk to MSO from high-severity fire.

Fourth, a new study in related spotted-owl habitat in the Pacific Northwest shows that thinning directly degrades and reduces spotted owl habitat much more than thinning reduces habitat loss to wildfire, leading to a net loss of spotted owl habitat from thinning (Odion et al. 2014).

Thinning reduced 3.4 to 6.0 times more dense, late-successional forest than would be prevented from burning by a thinning approach, thus a no-thinning approach would provide much more future spotted owl habitat. Although the numbers would be slightly different if this analysis were completed for MSO habitat, the outcome would likely be similar.

In summary, Normandin's study and the Final EIS do not correctly analyze the risks and benefits of high-severity fire to MSO habitat. No evidence was presented that showed that high- severity fire actually reduced MSO habitat or MSO occupancy. As shown above, if mature forest was reduced by high-severity fire, it would not be prevented from redeveloping before another high-severity fire even with future events like the 2011 Wallow fire, which is not likely to recur. The effects of the 2011 Wallow fire on the PAC network also were not very large, reducing fire rotation to PACs by only about 22%, demonstrating the large buffering capacity of the PAC network. These concerns further demonstrate failures in this project and the recovery plan (to the extent it is applied) under the ESA, NEPA, NFMA, and USFS TES species policy.

Needed analyses include: (1) actual effects of high-severity fire on MSO habitat and occupancy, (2) comparison of rates of loss versus creation of MSO habitat, (3) potential treatment effects on future habitat (Odion et al. 2014), and (4) response of MSO to the spectrum of treatments. Proposed treatments have little scientific basis until these analyses are completed, and thus proposed treatments should be suspended until results are available.

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Odion, D. C., C. T. Hanson, D. A. DellaSala, W. L. Baker, and M. L. Bond. 2014. Effects of fire and commercial thinning on future habitat of the Northern spotted owl. Open Ecology Journal 7: 37-51.

Selected Alternative Fails to Meet USFS TES Species Policy, NFMA Viability Duties, and LRMP TES Species Standards and Guidelines.

The Sensitive Species Program was developed to meet obligations under the ESA, the NFMA and Forest Service national policy direction as stated in the FSM Section 2670, and the USDA Regulation 9500-4. The Sensitive Species Program is supposed to be a proactive approach to conserving species to prevent a trend toward listing under the ESA and assist in providing for a diversity of plant and animal communities [16 USC 1604(g) (3) (B)] as part of the multiple use mandate and to maintain "viable populations of existing native and desired non-native species in the planning area "as required by NFMA" (36 CFR 219.19).[4]

This project fails to meet any of this direction and will directly and indirectly harm sensitive species such as goshawk and flammulated owl to such an extent that it constitutes a failure to meet USFS Sensitive species policy.

FSM 2670.22 - Sensitive Species:

1. Develop and implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions.

[4] The ROD and EIS opt to apply the 1982 NFMA rules in the analysis of the selected alternative. See for example ROD at page 7.

2. Maintain viable populations of all native and desired nonnative wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands.
3. Develop and implement management objectives for populations and/or habitat of sensitive species.

The habitat remaining after treatment in goshawk post-fledging family areas (PFAs) would be too open to support goshawk. Under the approved action, cuts in PFAs would leave extensive logging created even aged openings and inadequate canopy closure in residual clumps of trees. LRMP amendments in the selected alternative constitute additional failures to meet law and policy requirements for TES species including goshawk.

Note that a previous study on the Kaibab National Forest showed that even large nest buffers of 16 to 200 hectares (39.5 to 494 acres) did not protect goshawks if the area around them was cut, as preoccupancy of nest sites surrounded by cut areas was 75-80 percent lower, and nestling production was 94 percent lower, compared to uncut areas. Crocker-Bedford, 1990. In this study, areas within nest buffers were not cut (though some may have been cut previously), and in areas outside the buffers, one third of the live volume in trees greater than 23 cm (9.05 inches) in diameter was removed. In the approved alternative, the basal area would drop below minimum requirements. The treatments approved will reduce goshawk nesting. This would trigger failures to meet NFMA and LRMP species viability and related duties.

Down dead remaining material after treatment would be too low. There is little if any doubt that down woody material is important for goshawk habitat. Reynolds et al, 1992 noted that "…snags, downed logs, and woody debris are critical PFA attributes". Id. at 6. Also, "Snags, downed logs, and woody debris should be present throughout the PFA". Ibid. Under the proposed treatment in PFAs and nest areas, woody debris would be reduced to less than minimum habitat requirements for this TES species, as well as its primary prey.

This would occur in goshawk foraging areas as well. Note also that Reynolds et al state the need for both downed logs (those 12 inches and greater in diameter) and woody debris (three inches and greater in diameter) in foraging areas to provide for goshawk prey. Id. at 16-17. Nothing in the design features requires retaining woody debris sufficient to guarantee minimum habitat requirements. For example, the Forests involved are already in violation of snag as well as coarse down woody debris minimum standards for this TES species, and the action approved would admittedly move the conditions farther than minimum habitat requirements in the short and long term for structure needed by goshawk prey.

Burning would likely hurt nesting goshawks and goshawks using other habitats to a degree that moves conditions farther away from minimum standards, not closer.

Arguments Above Trigger Related NEPA ROD level mitigation measures assurance violation

The LRMP RODs explicitly applies the 1982 36 CFR 219.27 to projects implementing the plan; this is consistent with explicit application of the same NFMA regulations in the FEIS as well as the draft ROD for this project. That the LRMP ROD explicitly treats such duties as ROD-level mitigation measures, this constitutes specific additional failure to meet NEPA's duties for ROD implementation, including those found at 36 CFR 1505.2 through 36 CFR 1505.3.

REFERENCES

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ENCLOSURE:

MARC BOSH-US Forest Service Washington Office MARCH 2002

Some Statutory, Regulatory and Policy Authorities on Selected Topics: Diversity, Viability, Management Indicator Species, and Information and Data

USDA Forest Service

Diversity

Specific direction concerning **diversity** is given in both the 1976 NFMA statute and implementing regulations of 1982. The NFMA provides statutory direction for managing the National Forest System to provide for diversity of plant and animal communities. Section 6(g)(3)(B) of the NFMA states:

> The [planning] regulations shall include, but not be limited to . . . (3) specifying guidelines for land management plans developed to achieve the goals of the [RPA] Program which ... (B) provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives, and within the multiple-use objectives of a land management plan adopted pursuant to this section, provide, where appropriate, to the degree practicable, for steps to be taken to preserve the diversity of tree species similar to that existing in the region controlled by the plan.

To ensure an adequate consideration of diversity, the NFMA planning regulations (36 CFR 219) address diversity at several points. First, the regulations provide a definition of diversity to guide land and resource management planning:

> 36 CFR 219.3 Definitions and terminology. "Diversity: The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan."

Other sections of the NFMA regulations that specifically use the term "diversity" are:

> 36 CFR 219.26 Diversity . "Forest planning shall provide for diversity of plant and animal communities and tree species consistent with the overall multiple-use objectives of the planning area. **Such diversity shall be considered throughout the planning process. Inventories shall include quantitative data making possible the evaluation of diversity in terms of its prior and present conditio**n. For each planning alternative, the interdisciplinary team shall consider how diversity win be affected by various mixes of resource outputs and uses, **including proposed management practices.**"

> 36 CFR 219.27 Management Requirements. "(a) Resource Protection. All management prescriptions shall-- . . . (5) Provide for and maintain diversity of plant and animal communities to meet overall multiple use objectives, as provided in paragraph (g) of this section; ... (g) Diversity. Management prescriptions, where appropriate and to the extent practicable, shall preserve and enhance the diversity of plant and animal communities, including endemic and desirable naturalized plant and animal species, so that it is at least as great as that which would be expected in a natural forest and the diversity of tree species similar to that existing in the planning area. Reduction in diversity of plant and animal communities and tree species from that which would be expected in a natural forest, or from that similar to the existing diversity in the planning area, may be prescribed only where needed to meet overall multiple use objectives. . . "

FSM 2620 includes direction regarding habitat planning and evaluation, including specific forest planning direction for meeting biological diversity requirements: "A forest plan must address biological diversity through consideration of the distribution and abundance of plant and animal species, and communities to meet overall multiple-use objectives." (FSM 2622.01)

Viability

Specific direction concerning **viability** is provided in the 1982 NFMA implementing regulations at 36 CFR 219.19:

> "Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area. For planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area. In order to insure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area." (36 CFR 219.19)

The 1983 USDA Departmental Regulation 9500-4 provides further direction to the Forest Service, expanding the viability requirements to include plant species:

> "Habitats for **all existing native and desired non-native plants, fish, and wildlife species will be managed to maintain at least viable populations of such species.** In achieving this objective, habitat must be provided for the number and distribution of reproductive individuals to ensure the continued existence of a species throughout its geographic

range ... **Monitoring activities will be conducted to determine results in meeting population and habitat goals."**

Specific FSM direction, from 1986, concerning viability of plant and animal species includes:

> "Management of habitat provides for the maintenance of viable populations of existing native and desired non-native wildlife, fish, and plant species, generally well-distributed throughout their current geographic range" (FSM 2622.01(2))
>
> "**Maintain viable populations of all native and desired non-native wildlife, fish and plant species** in habitats distributed throughout their geographic range on National Forest System lands."' (FSM 2670.22(2))

Management Indicator Species

Specific management requirements and direction concerning **management indicator species** is provided in the 1982 NMFA implementing regulations at 36 CFR 219.19, and in the Forest Service Manual 2600:

> "Each alternative shall establish objectives for the maintenance and improvement of habitat for management indicator species selected under paragraph (g) [sic) (1) of this section, to the degree consistent with overall multiple use objectives of the alternative. To meet this goal, management planning for the fish and wildlife resource shall meet the requirements set forth in paragraphs (a)(1) through (a)(7) of this section." (36 CFR 219.19(a)
>
> "In order to estimate the effects of each alternative on fish and wildlife populations, certain **vertebrate and/or invertebrate species present in the area shall be identified and selected as management indicator species** and the reasons for their selection will be stated. These species shall be selected because their population changes are believed to **indicate the effects of management activities**. In the selection of management indicator species, the following categories shall be represented where appropriate: Endangered and threatened plant and animal species identified on State and Federal lists for the planning area; species with special habitat needs that may be influenced significantly by planned management programs; species commonly hunted, fished, or trapped; non-game species of special interest; and additional plant or animal species selected because their population changes are believed to indicate the effects of management activities on other species of selected major biological communities or on water quality, . ." (36 CFR 219.19(a)(1))
>
> "Planning alternatives shall be stated and evaluated in terms of both amount and quality of habitat and of animal population trends of the management indicator species". (36 CFR 219.19(a)(2))

"**Population trends of the management indicator species will be monitored** and relationships to habitat changes determined. This monitoring will be done in

cooperation with State fish and wildlife agencies, to the extent practical." (36 CFR 219.19(a)(6))

"Habitat determined to be critical for threatened and endangered species shall be identified, and measures shall be prescribed to prevent the destruction or adverse modification of such habitat. Objectives shall be determined for threatened and endangered species that shall provide for, where possible, their removal from listing as threatened and endangered species through appropriate conservation measures, including the designation of special areas to meet the protection and management needs of such species." (36 CFR 219.19(a)(7))

Forest Service Manual direction concerning habitat planning is contained in 2620.
"I. Management Indicators. Plant and animal species, communities, or special habitats selected for emphasis in planning, and **which are monitored during forest plan implementation** in order to assess the **effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent.**" (FSM 2620.5)

"**Select management indicators for a forest plan or project that best represent** the issues, concerns, and opportunities to support recovery of Federally-listed species, provide continued viability of sensitive species, and enhance management of wildlife and fish for commercial, recreational, scientific, subsistence, or aesthetic values or uses. **Management indicators representing overall objectives for wildlife, fish, and plants may include species, groups of species** with similar habitat relationships, or habitats that are of high concern." (FSM 262 1. 1)

"**Select ecological indicators (species or groups) only if scientific evidence exists** confirming that measurable changes **in these species or groups** would indicate trends in the abundance of other species or conditions of biological communities they are selected to represent". (FSM 2621.1(3)).

"Document, in the permanent planning records for a forest plan, the rationale, assumptions, and procedures used in selecting management indicators" (FSM 2621.1(4))

"Document, **within the forest or project plan**, how management indicators collectively address issues, concerns, and opportunities for meeting overall wildlife and fish, including endangered, threatened, and sensitive species goals **for the plan or project area**". (FSM 2621.1(5))

"To preclude trends toward endangerment that would result in the need for Federal listing, units must develop conservation strategies for those sensitive species whose continued existence may be negatively affected by **the forest plan or a proposed project**. To devise conservation strategies, first conduct biological assessments of identified sensitive species. In each assessment, meet these requirements:

> 1. Base tile assessment on the current geographic range of the species and the area affected by the plan or project. If the entire range of the species is contained within the plan or project area, limit the area of analysis to the immediate plan or project area. If the geographic range of the species is beyond the plan or project area, expand the area of analysis accordingly.
>
> 2. Identify and consider, as appropriate for the species and area, factors that may affect the continued downward trend of the population, including such factors as: distribution of habitats, genetics, demographics, habitat fragmentation, and risk associated with catastrophic events."
>
> 3. Display findings under the various management alternatives considered in the plan or project (including the no-action alternative). Biological assessments may also be needed for endangered or threatened species for which recovery plans are not available. See FSM 2670 for direction on biological assessments for endangered and threatened species." (FSM 2621.2)
>
> "In analyzing the effects of proposed actions, conduct habitat analyses to determine the cumulative effects of each alternative on management indicators selected in the plan or project area. . . " (FSM 2621.3)
>
> "The forest plan must identify habitat components required by management indicators; determine goals and objectives for management indicators; specify standards, guidelines, and prescriptions needed to meet management requirements, goals, and objectives for management indicators. Prescribe mitigation measures, as appropriate, to ensure that requirements, goals, and objectives for each management indicator will be sufficiently met during plan implementation at the project level." (FSM 2621.4)
>
> "**Conduct monitoring of plans and projects** to determine whether standards, guidelines, and management prescriptions for management indicators are being met and are effective in achieving expected results. Use monitoring and evaluation to guide adjustments in management and to revise or refine habitat relationships information and analysis tools used in planning". (FSM 2621.5)

Data

Specific direction concerning use of **best available data** is provided in the **1982 NFMA** implementing regulations at 36 CFR 219.12(d): "Each Forest Supervisor shall obtain and keep current inventory data appropriate for planning and managing the resources under his or her administrative jurisdiction. The Supervisor will assure that the interdisciplinary team has access to the best available data. **This may require that special inventories or studies be prepared.** The interdisciplinary team shall collect, assemble, and use data, maps, graphic material, and explanatory aids, of a kind, character, and quality, and to the detail appropriate for the management decisions to be made!'

Specific direction concerning use of **information and scientific data** is also provided in the NEPA implementing regulations at 40 CFR 1502.24: "Agencies shall insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements. They shall identify any methodologies used and shall make explicit reference by footnote to the scientific and other sources relied upon for conclusions in the statement. An agency may place discussion of methodology in an appendix."

Specific direction concerning use of the **best available scientific and commercial data available.** in fulfilling federal agency responsibilities to insure that any action authorized, funded or carried out is not likely to jeopardize the continued existence of listed species, or result in the destruction or adverse modification of habitat of such species which has been determined to be critical, is given in the **Endangered Species Act,** 1973 (as amended) at Section 7(a)(2): "In fulfilling the requirements of this paragraph each agency shall use the best scientific and commercial data available."