USDA

United States Department of Agriculture

Record of Decision for the Four-Forest Restoration Initiative

Coconino and Kaibab National Forests
Coconino County, Arizona

Forest Service Southwestern Region MB-R3-04-28 April 2015

Printed on recycled paper – April 2015

Record of Decision for the Four-Forest Restoration Initiative

Coconino and Kaibab National Forests
Coconino County, Arizona

Lead Agency:	U.S. Forest Service
Cooperating Agencies:	Arizona Game and Fish Department
Responsible Officials:	M. Earl Stewart Coconino National Forest Forest Supervisor 1824 South Thompson Street Flagstaff, AZ 86001 Michael R. Williams Kaibab National Forest Forest Supervisor 800 South Sixth Street Williams, AZ 86046
For Information Contact:	Annette Fredette, Project Team Leader 1824 South Thompson Street Flagstaff, AZ 86001 (928) 226-4684

List of Acronyms

4FRI	Four-Forest Restoration Initiative
ADEQ	Arizona Department of Environmental Quality
AGFD	Arizona Game and Fish Department
BA	Basal area (square feet per acre)
BMP	Best management practice
CFLRA	Collaborative Forest Landscape Restoration Act
CFR	Code of Federal Regulations
d.b.h.	Diameter at breast height
DEIS	Draft environmental impact statement
dPFA	Dispersal post-fledging area
EIS	Environmental impact statement
EPA	Environmental Protection Agency
EIS	Environmental impact statement
FEIS	Final Environmental Impact Statement
FSM	Forest Service Manual
FWS	United States Fish and Wildlife Service
HUC	Hydrologic unit code
LOPFA	Landscape outside post-fledging family area
LTIP	Large tree implementation plan
LTRS	Large tree retention strategy
MSO	Mexican spotted owl
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NF	National Forest
NFMA	National Forest Management Act
NHPA	National Historic Preservation Act
NRV	Natural Range of Variability
PAC	Protected activity center
PFA	Northern goshawk post-fledging family area
RU	Restoration unit
SDI	Stand density index
SHPO	State Historic Preservation Office
TMDL	Total maximum daily load
TPA	Trees per acre
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
VSS	Vegetation structural stages

Contents

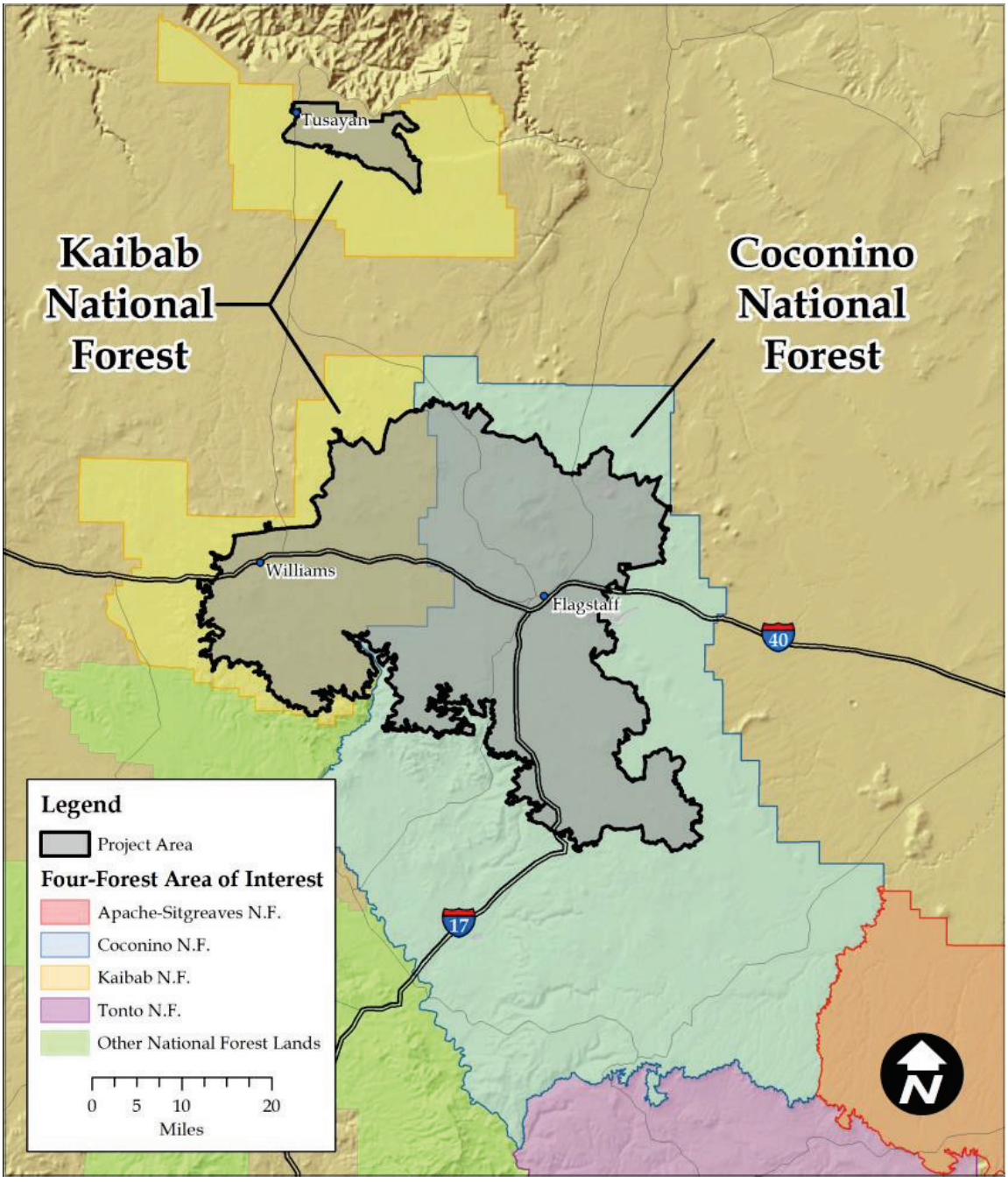


Figure 1. Four-Forest Restoration Initiative (4FRI) project area

Introduction

This is the record of decision for the Four-Forest Restoration Initiative on the Coconino and Kaibab National Forests (figure 1). An environmental impact statement was developed to analyze the potential effects of the project. The final environmental impact statement (FEIS) for this project has been prepared pursuant to the requirements of the National Environmental Policy Act (NEPA, 40 CFR 1500-1508), the National Forest Management Act and its implementing regulations, the Coconino National Forest Plan, as amended (USDA Forest Service 1987) and the revised Kaibab National Forest Land and Resource Management Plan (USDA Forest Service 2014). The decision presented in this document addresses activities proposed on lands administered by the Forest Service for which Federal decisions are required. On March 11, 2011, the Arizona Game and Fish Department (AGFD) was designated a cooperating agency.

The FEIS documents the analysis of environmental effects associated with a suite of restoration treatments on approximately 586,110 acres of National Forest System lands. The project would be implemented over a 10-year period or until objectives are met. The area affected by this decision includes approximately 355,707 acres on the Flagstaff, Mogollon, and Red Rock Ranger Districts of the Coconino NF and approximately 230,402 acres on the Williams and Tusayan Ranger Districts of the Kaibab NF.

This decision documents the analysis of five alternatives including a “no action” alternative. It presents our decision along with the rationale and alternatives considered in reaching the decision.

Background

This decision is a result of several years of planning and collaboration among interested parties, groups and organizations, and Federal, State and local government agencies. In 2010, stakeholders developed a comprehensive landscape restoration strategy for the national forests that documented existing conditions, potential treatment areas, and desired post-treatment conditions (4FRI Stakeholders 2010). In 2011, the stakeholders developed a Large Tree Retention and Old Growth Protection Strategy (4FRI Stakeholders 2011). The Forest Service used the stakeholder’s Landscape Restoration Strategy to inform the purpose and need and proposed action for this project. The large tree and old growth strategy was used to develop alternatives and the implementation plan. This project received Collaborative Forest Landscape Restoration Act (CFLRA) funding. The CFLRA supports landscape restoration on National Forest System lands.

Public Involvement

The 4FRI Project has been published in the Coconino and Kaibab NFs’ Schedule of Proposed Actions since January of 2011. The notice of intent to prepare an environmental impact statement was published in the Federal Register on January 25, 2011 (76 FR 4279–4281). A draft proposed action was sent to the project mailing list (paper copies and electronic mail), consisting of 1,331 individuals, local governments, State governments, Federal and State agencies, and organizations that encompassed both national forests. Fifty-four (54) scoping responses (emails and letters) were received through May 5, 2011. A scoping report that included a summary of the scoping process was posted on the 4FRI website on June 29, 2011. On March 11, 2011, the Arizona Game and Fish Department (AGFD) was designated a cooperating agency. The agency provided a

habitat specialist to serve as an interdisciplinary team member and to assist with the wildlife analysis.

From January to June, 2011, seven public meetings were held for the purposes of receiving comments that would be used to develop a revised proposed action. On average, meeting/workshop attendance ranged from 10 to 20 participants. Details on all meetings can be found in the project record.

A revised proposed action was sent to a refined mailing list (based on scoping responses) of 213 parties (169 electronic mail and 44 paper copy recipients), and a second 14-day informal scoping period began with the publication of a second revised notice of intent in the Federal Register on August 19, 2011 (76 FR 51936–51938). Not counting duplicates, 42 scoping responses (emails and letters) were addressed in content analysis (for the revised proposed action).

In the fall of 2011, meetings were held with commenters to clarify comments received on the revised proposed action. This included hosting meetings to discuss comments on large trees on October 14, 2011 and on canopy cover (in relation to forest plan goshawk guidelines) on December 15, 2011 (Coconino NF Supervisor's Office).

In 2012, monthly public meetings were hosted from March through July to discuss the status of the environmental analysis. Draft (working) documents were shared at the public meetings and made available on the 4FRI website at http://www.fs.usda.gov/main/4fri/planning. Documents posted included: issues, alternatives, draft forest plan amendments, cumulative effects, the scoping report (August 2011 scoping period), and version 5 of the modified Large Tree Retention Implementation Strategy (alternative C). Only a sampling of the public involvement effort is included here. See the project record for complete documentation. The project has been continuously posted on the Coconino and Kaibab NFs Schedule of Proposed Actions since January of 2011 and public involvement and analysis-related documents have been posted on the project's website since January, 2011.

Four issues including issue 1: prescribed fire emissions, issue 2: conservation of large trees, issue 3: post-treatment canopy cover and landscape openness; and issue 4: increased research and restoration focused the analysis or drove alternative development. The team also identified other comments and concerns. Many of these concerns were considered and incorporated in the draft environmental impact statement (DEIS) as design features, mitigations, and best management practices (DEIS, Appendix C). Many comments resulted in the development of the implementation plan (DEIS, Appendix D) and the monitoring and adaptive management plan (DEIS, Appendix E). See Chapter 1 of the FEIS for information on how other public concerns and recommendations were addressed.

On February 26, 2013, a preview of the DEIS was posted on the project's website at http://www.fs.usda.gov/main/4fri/planning, and interested parties were notified via email, phone call, or letter. On March 29, 2013 a notice of availability was published in the Federal Register (78 FR 19261). The notice of availability began a 60-day public comment period.

Documentation of the formal DEIS comment process is contained in the project record. A legal notice announcing the availability of the DEIS for review and comment was published in the Arizona Daily Sun on April 4, 2013 and posted on the project's website.

Comments on the DEIS were provided by individuals; tribal governments; Federal, State, and local agencies; organized interest groups; and businesses. Approximately 213 letters and emails

were received on the DEIS. About 1,000 individual comments were received. All comments were made available on the project's web-based public reading room (https://cara.ecosystem-management.org/Public/ReadingRoom?project=34857).

The Forest Service analyzed comments to identify issues that required further or updated analysis and to identify analyses that required further clarification. Issues 1 to 4 were edited to reflect public comments on the DEIS related to canopy cover, post-treatment openness and the conservation of old and large trees. Two procedural concerns were added to the FEIS as a result of public comments. In summary, the FEIS responded to four issues, two procedural concerns, and evaluated five alternatives. Alternatives include the no action alternative (alternative A) required by regulations, the proposed action (alternative B), and three alternatives (alternatives C, D, and E) to provide sharp contrast and comparison to the proposed action.

Appendix I of the FEIS contains comment letters received from government agencies in their entirety in accordance with Forest Service Handbook 1909.15. Per 40 CFR 1503.4, summarized responses to comments received on the draft EIS are included in this appendix. They have been organized by topic. The complete comment analysis and response document is located in the project record and is available on the project's website.[1]

Tribal Consultation

The following tribes and tribal chapters who have historic ties and an interest in the Coconino and Kaibab National Forests were consulted and include: Hopi, Kaibab Band of Paiute Indians, Navajo Nation including Coppermine, Coalmine, Naness, Lechee, Leupp, Bodaway, Cameron, Tuba City, Dilkon and Tolani Lake Chapters, San Juan Southern Paiute, White Mountain Apache, Yavapai-Apache Nation, San Carlos Apache, Hualapai, Yavapai- Prescott Indian Tribe, Havasupai, Tonto Apache, Pueblo of Zuni, Pueblo of Acoma, and Fort McDowell Yavapai Nation.

Consultation began September 10, 2009 with the Kaibab NF forest supervisor sending an invitation to seven federally recognized tribes to discuss 4FRI and other national forest projects. On January 27, 2011, the Forest Service sent a letter to tribes and tribal chapters providing information and seeking involvement and comments. Two written scoping responses were received. The White Mountain Apache responded on February 17, 2011 and indicated no concern with the project. A response from the Havasupai Tribe on March 7, 2011 asked for additional information on what the expected outcome of the proposals would be. The Hopi Tribe provided comments on treatments and the heritage survey strategy on March 21, 2011. On August 22, 2011, a second scoping letter was sent to the tribes. The tribes responded and provided additional input and voiced concerns during consultation meetings including:

- Traditional cultural properties are at risk to catastrophic fire.
- Springs and plant collection areas are at risk to catastrophic fire.
- Overstocked stands are reducing the sunlight available for cultural and medicinal plants.
- Springs that are important to tribal ceremonies are drying up.
- A lack of low-intensity fire is reducing regeneration of plant collection areas.
- Smoke may affect some tribal communities.
- Tribes need access to sites for ceremonies and traditional gathering.
- Preservation of cultural resources.

[1] http://www.fs.usda.gov/main/4fri/planning

One written comment was received from the Hopi Tribe in response to the DEIS (see Appendix I of the FEIS). Since consultation began in 2011, continuous updates on the project have been provided to tribes. The Tribal Relations section in Chapter 3 of the FEIS and the tribal relations specialist report provides complete consultation documentation.

Tribes that did not participate in tribal consultation continued to receive information via email and hand-delivered mail. Information will continue to be shared unless a tribe asks specifically to not be informed.

Pre-decisional Administrative Review Process (Objection Process)

The FEIS and the draft ROD were subject to review and objection pursuant to 36 CFR 218 regulations. Nine objections were received. One objection was set aside as the objector had not submitted any comments during a designated opportunity to comment as required by the regulation at 36 CFR 218.5. More than 100 individual issues were identified in the objections and each was considered in the review. The review focused on ensuring that the FEIS and decision meet current NEPA and NFMA requirements and determining whether changes were warranted to improve the analysis and decision.

Objection issues included use of the best available science, mechanical treatments and monitoring in MSO PACS, goshawk viability, grazing-related mitigation and monitoring, emissions from prescribed fire, and NEPA procedural requirements. See the project record for documentation of the objection process. Overall, objectors were concerned that the FEIS and draft ROD did not appropriately address public interests and violated the National Environmental Policy Act (NEPA), National Forest Management Act (NFMA), and the Endangered Species Act (ESA).

After a deliberative and extensive review of the concerns raised by objectors involving both regulatory and management issues, the objection review period was extended and multiple objection resolution meetings were held to continue discussions and attempt to resolve issues. As a result of our continued dialog, proposals for changes to the ROD and FEIS were developed and an agreement was reached with WildEarth Guardians to resolve their issues. The reviewing officer responded to all the objectors in writing, relating those changes agreed to. This decision fully incorporates the instructions from the reviewing officer to document these modifications and clarifications to the FEIS and supporting documents in an appendix to this ROD (see Appendix 1).

Purpose and Need

The purpose of this project is to reestablish and restore forest structure and pattern, forest health, and vegetation composition and diversity. There is a need to increase forest resiliency and sustainability, protect soil productivity, and improve soil and watershed function. 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). This action is needed because:

- Over 50 percent of the ponderosa pine is even-aged and lacks age-class diversity. The single-age forest structure has reduced the health of the ponderosa pine forest. Large, old ponderosa pine trees are rare across the landscape. The remaining old pines are at risk of dying from the increased overcrowding of trees (stand density-related mortality) and the potential for severe fire effects.

- In contrast to having a ponderosa pine ecosystem consisting of groups of trees mixed with interspaces, approximately 74 percent of the ponderosa pine forest type within the project area is departed from historical reference conditions. Non-forested openings have been invaded by ponderosa pine since fire exclusion and this has changed the natural (and desired) spatial pattern.
- The dense, single-age forest structure combined with the lack of nonforested openings has affected function related to the presence of grass, forbs, and shrubs (vegetation composition and diversity). There is reduced understory productivity and function throughout the forest and within grasslands and meadows where trees have grown in. Ephemeral stream function has been affected by reduced ground cover, the presence of noxious weeds, increased numbers of trees, and the lack of fire. Spring function has been affected by drought, the lack of fire, and closed forest canopies, which increase evapotranspiration.
- The existing forest structure is in poor forest health. This has affected resiliency, or the ability of ponderosa pine to withstand natural disturbances including fire, insects and disease, and changing climatic conditions, such as drought. About 191,000 acres (38 percent) are at risk from crown fire. Additional acres, primarily within or next to Mexican spotted owl habitat are at risk from high-intensity surface fire that can result in high-severity effects.
- Approximately 72 percent of the ponderosa pine in the project area has a high hazard rating for bark beetle. About 34 percent of the ponderosa pine is moderately to heavily infected with dwarf mistletoe (see silviculture report). The current deficiency in resiliency is attributed to closed forest conditions and the associated buildup of forest fuels.

Issues Addressed

The final environmental impact statement responded to four issues and evaluated five alternatives: the no action alternative (alternative A) required by the regulations, the proposed action (alternative B), and three alternatives (alternatives C, D, and E) to provide sharp contrast and comparison to the proposed action.

Two procedural concerns related to the range of alternatives and plan amendments were added to Chapter 1 to highlight concerns raised by the public. Public concerns that are routine disclosures (see Chapter 3) were not considered to be key issues. For example, consultation with the U.S. Fish and Wildlife Service on endangered species is a requirement. Therefore, comments that stated consultation needed to occur were not considered an issue. Many public comments submitted during the scoping period suggested alternatives that were either considered in detail or eliminated from detailed analysis (see Chapter 2).

Some comments were determined to be outside the scope of this analysis for one or more of the following reasons: they did not reflect a cause-and-effect relationship supported by scientific evidence; they were not relevant to the decision to be made; they were outside the Forest Service's authority; or they were already decided by law, regulation, or policy. The issues raised in these comments were dismissed from further consideration. Appendix I of the FEIS provides a summary of comments (organized by topic) received on the DEIS.

Each specialist analyzed: (1) issues raised by the public (next section), (2) how the proposed alternatives address the purpose and need, (3) topics required by law, regulation or policy, and, (4) additional resource topics and concerns they felt were important for their resource (see specialist reports).

Issue 1: Prescribed Fire Emissions

This issue relates to the emissions from prescribed fire activities and the impact on air and water quality, public health, quality of life, and the economy of northern Arizona. In response to comments on the DEIS, emissions include, but are not limited to, radionuclide particles and mercury.

An alternative that would eliminate all prescribed fire was considered but eliminated from detailed study as it did not adequately meet the purpose and need for restoring the fire-adapted southwestern ponderosa pine ecosystem. Alternatives B, C, and E propose using prescribed fire across the entire project area and alternative C adds acres on which prescribed fire would be used to restore additional acres of grasslands. Alternative D was developed to respond to the emissions/smoke issue by decreasing the acres proposed for prescribed fire by 69 percent (when compared to alternative B). This equates to removing fire on about 404, 889 acres. All action alternatives include design criteria aimed at reducing impacts to air quality (as practicable) and increasing coordination efforts amongst neighboring forests.

Issue 2: Conservation of Large Trees

This issue focuses on the conservation of large trees and the inclusion into the action alternatives of a strategy produced by the 4FRI stakeholders, the "Old Growth Protection and Large Tree Retention Strategy"[2] (also referred to as the "Large Tree Retention Strategy" or the "Old Tree Retention Strategy"). Large post-settlement trees, as defined by a socio-political process, are those greater than 16 inches d.b.h.

Commenters stated alternatives B (proposed action alternative) and D do not incorporate the Large Tree Retention Strategy. Alternative C and E respond to this issue by incorporating key components of the strategy and focusing on ecological desired conditions. In response, an implementation plan that is integral to all action alternatives was developed. The plan identifies ecological conditions where large, post-settlement trees may be removed to move toward or meet desired conditions. The intent of the Large Tree Retention Strategy has been incorporated into alternative C and E's design criteria, the monitoring and adaptive management plan, and the project implementation plan. All resource reports have analyzed and disclosed how the modified Large Tree Retention Strategy (the Large Tree Implementation Plan) has been addressed in the environmental consequences section of the FEIS.

Issue 3: Post-treatment Canopy Cover and Landscape Openness

This issue focuses on retaining closed canopy conditions for species including, but not limited to, goshawk and Mexican spotted owl. Commenters stated measuring canopy cover in goshawk habitat at the group level would not meet forest plan stand-scale canopy requirements. Commenters stated a reduction in canopy and large tree densities have never been analyzed under the National Environmental Policy Act and National Forest Management Act and could have deleterious effects to goshawk, its prey species, and those wildlife species that are dependent on that cover. Because natural openings would no longer be included within the vegetation structural stage (VSS) classification, it would result in significantly more lands being in an open condition or outside of the VSS 4 to 6 classifications. This could substantially increase the logging of mature and old trees and negatively affect wildlife, including goshawk and its prey species.

[2] 4FRI Stakeholders 2011

Alternatives B through E are designed to provide closed canopy conditions and comply with the forest plans. The vegetation analysis addresses the interrelationship between canopy cover and old and large trees. To address post-treatment openness and canopy cover, a nonsignificant forest plan amendment for the Coconino NF was developed for alternatives B, C, and D. Alternative E does not propose a forest plan amendment.

Issue 4: Increased Restoration and Research

This issue focuses on recommendations to increase the acres and type of restoration treatments. Commenters recommended including additional acres of grassland restoration. The U.S. Fish and Wildlife Service recommended increasing prescribed fire and mechanical treatments within Mexican spotted owl habitat (to improve the quality of the habitat and be in alignment with the revised Mexican Spotted Owl Recovery Plan (USDI FWS 2012)). Commenters recommended including a paired watershed study and small mammal research to evaluate the impact of landscape-scale restoration. Alternative C was developed to respond to this issue.

Procedural Concerns

Range of Alternatives and Comparison of Alternatives

This procedural concern was raised in comments to the DEIS. There is a concern that the action alternatives proposed in the DEIS were virtually identical except for the variation in acreages. Some commenters stated there is no (action) alternative where a plan amendment would not take place. Commenters stated it is not possible to understand the environmental effects and tradeoffs for resources that result from the amendments themselves.

Alternative E may address this concern. In alternative E, no forest plan amendment would occur and treatments would comply with the current Coconino NF forest plan. In summary, the FEIS includes 11 alternatives including no action, 4 action alternatives, and 6 alternatives that were considered but eliminated from detailed study.

Significant Forest Plan Amendments

This procedural concern is based on comments on the DEIS. Commenters stated the plan amendments are significant because they may bring about changes that may have an important effect on the entire land management plan (or affect land and resources throughout a large portion of the planning area) see FSM 1926.52 (Jan. 31, 2006). Some commenters stated the plan amendments are significant because the two national forests are including identical plan amendments in similar projects.

In the FEIS, the analysis has been updated to clarify methodology and data used for the significance evaluation. Alternative E, which proposes no forest plan amendments, provides a point of comparison to alternatives B, C and D which do include plan amendments.

In the DEIS, three forest plan amendments were proposed for the Kaibab NF. The forest plan was revised in 2014. As a result, all forest plan amendments were removed in the FEIS. No forest plan amendments are needed on the Kaibab NF because the proposed actions are consistent with forest plan objectives, desired conditions, and standards and guidelines (see FEIS, Chapter 2, Forest Plan Consistency).

Three nonsignificant amendments for the Coconino NF were evaluated in the FEIS. The amendments are authorized by the Forest Service Planning Rule (36 CFR 219). Section

219.17(b)(3) of the Rule provides the transition language that allows this project to propose amendments to the Coconino NF forest plan using the provisions of the 1982 Planning Rule. The significance of each amendment was evaluated in accordance with Forest Service Manual (FSM) 1926.51 and FSM 1926.52.

The purpose of amendment 1 is to bring the selected alternative in alignment with the revised Mexican Spotted Owl Recovery Plan and defer monitoring to the U.S. Fish and Wildlife Service biological opinion that is specific to this project. Amendment 2 clarifies existing direction related to managing canopy cover and interspace in the forest plan. The purpose of amendment 2 is to bring the project into alignment with the best available science (Reynolds et al. 2013) that provides desired conditions for restoring fire-adapted ponderosa pine in the Southwest. Amendment 3 resolves a forest plan error related to the management of heritage resources and is specific to this project. See page 16 of this document for more information about each amendment. The detailed significance analysis for each amendment is located in Appendix B of the FEIS.

No amendment alters multiple-use forest plan goals and objectives, adjusts management area boundaries or management prescriptions. The changes in standards and guidelines are considered to be minor because they reflect the latest, best available science (Reynolds et al. 2013). The amendments bring the alternatives into alignment with the revised Mexican Spotted Owl Recovery Plan, although the degree of alignment varies by alternative. No amendment would alter the long-term relationship between levels of multiple-use goods and services originally projected for the Coconino NF. These outputs were specific to a planning period ranging from 10 to 15 years (as identified in 1987).

- Amendment 1: In alternative C the amendment would affect 6,942 acres or 18 percent of Mexican spotted owl protected activity center habitat on the Coconino NF.
- Amendment 2 is a clarification amendment. The amendment would affect about 165,216 acres (19 percent) of all goshawk habitat on the Coconino NF. The canopy cover portion of the amendment would affect approximately 139,674 acres (16 percent) of all goshawk habitat on the Coconino NF. Managing 25,841 acres of ponderosa pine for an open reference condition would affect approximately 3 percent of all suitable goshawk habitats on the Coconino NF.
- Amendment 3 is specific to the 355,707 acres of proposed treatments in this project. In alternative C this would affect about 20 percent of the Coconino NF (which totals 1,821,495 acres).

For these reasons, the amendments would not result in an important effect to the entire land management planning area. Each amendment is a specific, one-time variance for this restoration project. The best available science for management in southwestern forests (Reynolds et al. 2013), and the Coconino NF forest plan revision process are affecting ongoing and future analyses. The plan amendments that are specific to this project do not impose direction on ongoing or future analyses.

Some commenters stated the plan amendments are significant because the two national forests are including identical plan amendments in similar vegetation projects and therefore, are providing direction that must be followed by other projects. The list of vegetation projects that were included in comments on the DEIS were reviewed. Overall, the forest plan amendments that have been proposed in other vegetation projects reflect the ongoing Coconino NF forest plan revision process, using the best available scientific information (Reynolds et al. 2013), and they are

compliant with the revised Mexican Spotted Owl Recovery Plan (USDI FWS 2012). A complete analysis of other proposed forest plan amendments by project is located in the project record.

Six alternatives were considered but eliminated from detailed study for reasons described in depth in Chapter 2 of the FEIS and summarized in this decision:

Alternatives Considered But Eliminated From Detailed Study

The FEIS included six alternatives that were considered but eliminated from detailed study. These are summarized in the following pages. All alternatives were evaluated to determine how well the proposal would accomplish the purpose and need for action. Further details can be found in Chapter 2 of the FEIS.

Limit Mechanical Treatments to 8 Inches d.b.h.

This alternative was based on the assertion that crown fire can be effectively addressed with mechanical treatments that do not cut trees larger than 8 inches d.b.h. Small diameter mechanical tree cutting would be used to establish tree groups, nonforested openings (interspaces), and move toward a balance of tree age and size classes. Prescribed fire would be used to reduce litter and other surface fuels, stimulate herbaceous understory vegetation, prepare sites for natural ponderosa pine regeneration, and maintain interspaces.

This alternative would partially address Issue 2, conservation of large trees, since mechanical treatments would be curtailed at 8 inches d.b.h. It would not achieve restoration desired conditions. It would resolve Issue 3, post-treatment canopy cover and landscape openness, since only small-diameter trees would be removed. However, approximately 73 percent of the 507,839 acres of ponderosa pine within the project area would not move toward forest structure and pattern desired conditions. Of all the even-aged stands, 47 percent (VSS 4), 8 percent (VSS 5), and 1 percent (VSS 6) would remain even-aged. There would be 0 percent movement toward desired conditions in uneven-aged VSS 4 through VSS 6 stands. For these reasons, this alternative was considered but eliminated from detailed study.

Use Prescribed Fire as the Sole Treatment Method

In response to public comments and recommendations received during scoping, an alternative which only uses prescribed fire to move toward restoration desired conditions was considered. The recommendations are based on the assertion that the current high-intensity fire rotation in southwestern forests is 625 years and/or that the forests should be predominantly managed as self-regulating through the use of natural processes such as fire.

This alternative was considered but eliminated from detailed study because: (1) the potential for uncharacteristically severe fire effects would remain high and there would be no improvement in terms of resiliency in and around Mexican spotted owl protected activity centers; (2) treatment on 192,819 acres or 33 percent of the treatment area would likely be deferred in order to avoid a further reduction in pre-settlement trees; (3) movement toward having a sustainable forest structure with age and size class diversity would not be met as there would be continued overrepresentation in the VSS 3 and 4 age classes and continued underrepresentation in the VSS 5 and VSS 6 age classes; (4) forest structure and pattern and overall function would not be restored on 11,230 acres of grasslands (equates to 9,435 acres of grassland in VSS 3+) and 45,142 acres of historic mollic-integrade savanna (equates to 42,009 acres in VSS 3+) ; and (5) movement

toward the desired condition of restoring the historic pattern within the pine-sage mosaic would not be achieved in areas where treatment was deferred.

Eliminate the Use of Prescribed Fire

Some public comments recommended eliminating all prescribed fire to remove project nuisance smoke and its resulting emissions. Recommendations include using livestock (cattle, goats) in lieu of prescribed fire to reduce fuels. This alternative assumes that approximately 90 percent of all treatment-related slash (biomass) would be moved offsite and considers grazing and a variety of mechanical treatment methods to reduce fuels.

Without the ability to use prescribed fire it is estimated the project area would begin to move away from forest structure and pattern and resiliency desired conditions within 10 years of the mechanical treatment. The use of alternative fuels treatment methods in lieu of prescribed fire could provide reductions in some surface fuels but would not meet the ecological need of a fire-adapted landscape. In the case of grazing, the level that would be needed to maintain the project area without fire would exceed forest plan allowable thresholds. Using grazing as a surrogate for prescribed fire would be contrary to the purpose and need which is designed to increase vegetation composition and diversity, and move toward improved soil productivity and watershed function. For these reasons it was considered but eliminated from detailed study.

Incorporate the Original Large Tree Retention Strategy (LTRS)

Comments recommended incorporating the LTRS as written by the 4FRI stakeholders. It was determined that incorporating and implementing the original LTRS would not meet various elements of the purpose and need. A modified version of the original strategy, the Large Tree Implementation Plan (LTIP), was included in alternatives C and E. The “background” section in the FEIS summarizes how the original LTRS was modified. Table 15 in the DEIS (and FEIS) displays a few excerpts from the original LTRS, the location of the excerpts in the LTRS, a crosswalk to the modified LTIP, and rationale why the original language was not accepted as written. For these reasons it was considered but eliminated from detailed study.

Limit Mechanical Treatments to 16 Inches d.b.h. as a Means to Preserve Large Trees

This alternative originated over the impression that there are relatively few large trees remaining on the landscape and that the removal of large trees is a return to commercially-focused forest management. An alternative limiting mechanical harvest to trees less than 16 inches d.b.h. was not analyzed in detail for two reasons:

1. The 4FRI collaborative group developed and submitted to the Forest Service for consideration a large tree retention strategy (LTRS). The LTRS identifies situations where removing post-settlement trees larger than 16 inches d.b.h. would be ecologically beneficial. Key components from the 4FRI stakeholder strategy have been incorporated into alternative C’s implementation plan.
2. Land managers and researchers throughout the Southwest have concerns that such a policy is unsustainable, and that constraining restoration treatments to trees 16 inches d.b.h. and smaller would limit achievement and maintenance of desired conditions for long-term forest structure, composition, and forest dynamics unique to the open tree canopy/multistoried conditions in the frequent fire forests of Arizona and New Mexico.

Evidence-Based Full Restoration Alternative

This alternative was considered as a result of comments on the DEIS. Commenters stated the DEIS did not include an evidence-based, full-restoration alternative, which looks at the outcomes and impacts of applying science-based ecological restoration on this landscape. Science that supports ecological restoration includes (but is not limited to) Woolsey (1911), Cooper (1960), White (1985), Pearson (1950), Covington et al. (1997), and Abella and Denton (2009).

This alternative would meet the objective of increasing forest resiliency and sustainability. It would address Issue 4. However, the full restoration alternative would compromise closed and moderately-closed forest structure in Mexican spotted owl and goshawk habitat. The alternative would remove much of the closed canopy (bridge) habitat for wildlife (Appendix G) thereby removing refugia for closed canopy-dependent species. Desired conditions and forest plan direction specific to vegetation composition and diversity in Gambel oak, Mexican spotted owl and goshawk habitat would not be achieved (see FEIS, Chapter 1). The desired condition of a having moderate-to-closed canopy conditions widely distributed on the landscape would not be achieved. There would be insufficient moderate-to-closed conditions that would provide habitat connectivity. For these reasons, the alternative was considered but eliminated from detailed study. For additional details, see the project record.

Alternatives Considered in Detail

The FEIS displayed the effects of five alternatives (FEIS, Chapter 2).

Alternative A – No Action

Alternative A is the no action alternative as required by 40 CFR 1502.14(c). There would be no changes in current management and the forest plans would continue to be implemented. Approximately 166,897 acres of current and ongoing vegetation treatments and 195,076 acres of prescribed fire projects would continue to be implemented within and next to the project area. Approximately 43,041 acres of vegetation treatments and 58,714 acres of prescribed fire and maintenance burning would be implemented next to the project area by the Coconino and Kaibab NFs in the foreseeable future (within 5 years). Activities such as road maintenance, recreation, firewood gathering and authorized livestock grazing would continue. Activities that have been authorized in separate decisions such as the control of non-native invasive plants and implementation of travel management would continue. Alternative A is the point of reference for assessing alternatives B through E.

Alternative B – Proposed Action

Alternative B is the proposed action. It incorporates comments and recommendations received during eight months of collaboration with individuals, agencies, and organizations. This alternative would mechanically treat 384,966 acres of vegetation and use prescribed fire on 583,330 acres. It proposes mechanically treating trees up to 16 inches in diameter (d.b.h.) in 18 Mexican spotted owl protected activity centers and includes low-severity prescribed fire within 70 Mexican spotted owl protected activity centers, excluding 54 core areas. Three non-significant forest plan amendments on the Coconino NF would be required. No forest plan amendments are proposed on the Kaibab NF. See Chapter 2 of the FEIS for additional details.

Alternative C – Preferred Alternative

Alternative C is the preferred alternative. This alternative would mechanically treat 431,049 acres of vegetation and use prescribed fire on 586,110 acres. It responds to Issue 2 (conservation of large trees), and Issue 4 (increased restoration and research). It adds acres of grassland treatments on the Kaibab NF and incorporates wildlife and paired watershed research on both national forests. It proposes to mechanically treat trees up to 17.9 inches d.b.h. in 18 Mexican spotted owl protected activity centers and includes low-severity prescribed fire within 70 Mexican spotted owl protected activity centers, including 54 core areas. Key components of the stakeholder-created Large Tree Retention Strategy are incorporated into the alternative's implementation plan. Three non-significant forest plan amendments on the Coconino NF would be required. No forest plan amendments are proposed on the Kaibab NF. See Chapter 2 of the FEIS for additional details.

Alternative D

This alternative would mechanically treat 384,966 acres of vegetation and use prescribed fire on 178,441 acres. This alternative was developed in response to Issue 1 (prescribed fire emissions). It decreases the acres that would receive prescribed fire by 69 percent (when compared to alternative B, the proposed action). This equates to removing fire on about 404,889 acres. It proposes mechanically treating trees up to 16 inches d.b.h. in 18 Mexican spotted owl protected activity centers, but the protected activity centers would not be treated with prescribed fire. Three non-significant forest plan amendments on the Coconino NF would be required. No forest plan amendments are proposed on the Kaibab NF. See Chapter 2 of the FEIS for additional details.

Alternative E

Alternative E was developed in response to comments on the DEIS. This alternative would mechanically treat 403,218 acres of vegetation and use prescribed fire on 581,020 acres. Alternative E responds to Issue 3 (post-treatment landscape openness and canopy cover), and may resolve concerns the public had related to the range of alternatives and forest plan amendments. It is similar to alternative C in that it adds acres of grassland treatments on the Kaibab NF and incorporates a paired watershed study and small mammal research. It proposes to mechanically treat trees up to 9 inches d.b.h. in 18 Mexican spotted owl protected activity centers and includes low-severity prescribed fire within 70 Mexican spotted owl protected activity centers, excluding 54 core areas. Key components of the stakeholder-created Large Tree Retention Strategy are incorporated into the alternative's implementation plan. No forest plan amendments are proposed on either forest. See Chapter 2 of the FEIS for additional details.

Actions Common to Alternatives B, C, D, and E

- Alternatives B through E propose additional actions including restoring springs and ephemeral channels, constructing protective fencing in select aspen stands, constructing (and decommissioning) temporary roads, reconstructing and improving roads, relocating a minimal number of road miles, and decommissioning existing roads and unauthorized routes (FEIS, Table 1).
- On those acres proposed for prescribed fire, at least two fires would be conducted over the 10-year period.
- Design features, best management practices (BMPs), and mitigation to be used as part of alternatives B through E are located in Volume 2, Appendix C of the FEIS.

- All action alternatives include adaptive management actions that would be taken as needed to restore springs, ephemeral channels, and naturalize decommissioned and unauthorized roads (FEIS, Table 16). Temporary roads would be decommissioned by the purchaser/contractor immediately after use using adaptive management actions (FEIS, Chapter 2) and BMPs for the rehabilitation of ground-disturbed sites (FEIS, Appendix C).

All these alternatives incorporate into each alternative's design features key components of the Old Tree Retention Strategy (FEIS volume 2, Appendix C), the implementation plan (FEIS volume 2, Appendix D), and the adaptive management, biophysical and socioeconomic monitoring plan (FEIS volume 2, Appendix E). The Forest Service worked collaboratively with stakeholders to develop the final monitoring and adaptive management and implementation plan. Appendix E also includes the Mexican spotted owl and Arizona bugbane monitoring plan as approved (through formal consultation) by the U.S. Fish and Wildlife Service.

Decision

Based on our review of the environmental analysis disclosed in the Four-Forest Restoration Initiative Coconino and Kaibab National Forests FEIS, forest plans, the project record, and in consideration of public comments received on the draft environmental impact statement, we have decided to implement alternative C (the "selected alternative"). One change to this alternative will be how approximately 3,300 acres of grasslands, savannas, and meadows are proposed for savanna treatments. These acres will instead be treated as described in alternative E, as analyzed in the FEIS (see the project record for additional information) with one exception.

In the selected alternative, the Coconino and Kaibab NFs will conduct restoration activities on approximately 586,110 acres over a period of 10 years or until objectives are met. On average, 45,000 acres of vegetation will be mechanically treated annually. On average, 40,000 to 60,000 acres of prescribed fire will be implemented annually across the Forests (within the treatment area). Up to two prescribed fires[3] will be conducted on all acres proposed for treatment for at least 10-years. Whether prescribed fire maintenance burns will continue to be authorized under this decision will be determined by following Forest Service policy in FSH 1909.15, Chapter 10, Section 18, which addresses evaluating new information or changed circumstances when older NEPA decisions and analysis are involved. While this decision does not include or provide any direction for managing unplanned ignitions, treatments are expected to increase the decision space for line officers deciding how to manage lightning-caused fires wildfires. Table 1 displays treatment types and acres. Restoration activities will:

- Mechanically cut trees on approximately 430,261 acres. This includes: (1) mechanically treating trees up to 17.9 inches d.b.h. within 18 Mexican spotted owl protected activity centers, and (2) using low-severity prescribed fire within 70 Mexican spotted owl protected activity centers (including 54 core areas).
- In 18 protected activity centers, trees up to 17.9 inches d.b.h. may be cut; however, trees over 14 inches d.b.h. will not be removed. These select trees between14-17.9 d.b.h. may be felled and left onsite as logs, converted into snags, or burned. Coarse woody debris and surface fuels in treated protected activity centers will be retained at levels compliant with forest plans. Four PACs will initially be selected from the pool of 18 for combined treatment, and at

[3] A single prescribed fire may include burning piles and a follow-up broadcast burn. Prescribed fire will be implemented as indicated by monitoring data to augment wildfire acres, with the expectation that desired conditions will require a fire return interval of about 10 years.

least 4 reference PACs will be selected for comparison. Treatment of the remaining 14 PACs will be contingent upon the results of monitoring during this initial phase of PAC treatments. Of the 18 candidate PACs, those dominated by stands proposed for 9 inch d.b.h. cutting limits will be prioritized for treatment and monitoring, provided that they are currently occupied.

- Monitor MSO protected activity centers as outlined in Appendix E.
- Apply prescribed fire on approximately 430,261 acres where mechanical treatment occurs.
- Use prescribed fire only (no mechanical treatment) on approximately 155,849 acres.
- Construct approximately 520 miles of temporary roads for haul access and decommission the roads when treatments are complete (no new permanent roads will be constructed).
- Reconstruct up to 40 miles of existing, open roads for resource and safety concerns (no new permanent roads will be constructed). Of these miles, approximately 30 miles will be improved to allow for haul (primarily widening corners to improve turn radiuses) and about 10 miles of road would be relocated out of stream bottoms. Relocated roads will include rehabilitation of the moved road segment.
- Decommission 726 miles of existing system and unauthorized roads on the Coconino NF.
- Decommission 134 miles of unauthorized roads on the Kaibab NF.
- Restore 74 springs and construct up to 4 miles of protective fencing.
- Restore 39 miles of ephemeral channels.
- Construct up to 82 miles of protective (aspen) fencing.
- Construct up to 12 flumes and 12 weather stations and associated instrumentation (up to 3 total acres of soil disturbance) to support the paired watershed study research.
- Allocate and manage as old growth 40 percent of ponderosa pine and 77 percent of pinyon-juniper woodland on the Coconino NF.
- Manage and develop uneven-aged stands with a representation of old growth components across most of the project area on the Kaibab NF.

Table 1. Selected Alternative mechanical and prescribed fire treatment description and acres

Treatment Type	Treatment Description/Objective	Acres
Aspen	Mechanical treatment that removes post-settlement conifers within 100 feet of aspen clone; stimulates suckering. Accompanied by prescribed fire.	1,227
Prescribed Fire Only	Prescribed fire would be applied exclusively to move treated areas towards desired vegetation conditions.	155,849
AZ Game & Fish Research	Mechanical treatment designed to create groups of various sizes ranging from 1 to 15 acres in size. Accompanied by prescribed fire.	4,837
Grassland Restoration	Mechanical treatment that removes encroaching post-settlement conifers and manages for up to 90 percent of the treatment area as grass/forb/shrub using pre-settlement tree evidence as guidance. Accompanied by prescribed fire.	11,230
Grassland Mechanical	Mechanical treatment in grassland vegetation types. Accompanied by prescribed fire.	48,161
Intermediate Thin (IT) 10 (10 to 25% interspace) IT 25 25 to 40% interspace) IT 40 (40 to 55% interspace)	Mechanical treatment that thins tree groups and establishes interspace adjacent to tree groups to an average of 70 to 90 square feet of basal area and manages for improved tree vigor and growth by retaining the best growing dominant and co-dominant trees with the least amount of mistletoe; Interspace would occupy 10 to 55 percent of the treatment area, respectively. Accompanied by prescribed fire.	7,565 11,871 38,642
Mexican spotted owl (MSO) Threshold	Same as MSO Target (below)	1,892
MSO Target	Intermediate thinning designed to improve forest health, reduce fire risk, and meet forest density, structure, and species composition requirements. Accompanied by prescribed fire.	6,495
MSO Restricted	Uneven-aged mechanical treatment designed to develop uneven-aged structure, irregular tree spacing, a mosaic of interspaces and tree groups of varying sizes. Accompanied by prescribed fire.	62,785
MSO PAC	Mechanical treatment designed to increase tree vigor and health and create canopy gaps to reduce fire risk. Accompanied by prescribed fire.	10,284
MSO PAC Grassland Mechanical	Mechanical treatment designed to reestablish the historic meadow edge as defined by the current forest structure of young trees encroaching around the meadow edge; Retain large trees with long-lived characteristics. Accompanied by prescribed fire.	35
Pine-sage	Mechanical treatment that restores pre-settlement tree density and pattern using pre-settlement tree evidence as guidance. Accompanied by prescribed fire.	5,261
Savanna (70 to 90% interspace)	Mechanical treatment that restores presettlement tree density and pattern, and manages for a range of 70 to 90 percent of the treatment area as interspace (grass/forb) between tree groups or individual trees using pre-settlement tree evidence as guidance. Treatment would be accompanied by prescribed fire.	41,839

Treatment Type	Treatment Description/Objective	Acres
Stand Improvement (SI) 10 (10 to 25% interspace) SI 25 (25 to 40% interspace) SI 40 (40 to 55% interspace)	Mechanical treatment that establishes tree groups and interspace adjacent to tree groups and manages for improved tree vigor and growth by retaining the best growing dominant and co-dominant trees within each group; Interspace would occupy 10 to 55 percent of the treatment area, respectively. Treatments would be accompanied by prescribed fire.	1,914 6,618 12,270
Uneven-aged (UEA) 10 (10 to 25% interspace)	Uneven-aged mechanical treatment designed to develop uneven-aged structure, and a mosaic of interspaces and tree groups of varying sizes. Interspace would occupy 10 to 25 percent of the treatment area. Accompanied by prescribed fire.	17,865
UEA 25 (25 to 40% interspace)	Uneven-aged mechanical treatment designed to develop uneven-aged structure, and a mosaic of interspaces and tree groups of varying sizes. Interspace would occupy 25 to 40 percent of the treatment area. Accompanied by prescribed fire.	38,492
UEA 40 (40 to 55% interspace)	Uneven-aged mechanical treatment designed to develop uneven-aged structure, and a mosaic of interspaces and tree groups of varying sizes. Interspace would occupy 40 to 55 percent of the treatment area. Accompanied by prescribed fire.	98,219
Wildland Urban Interface Pinyon-juniper	Mechanical treatment around the community of Tusayan designed to reduce fire risk and meet Community Wildfire Protection Plan objectives. Accompanied by prescribed fire.	535
Wildland-urban Interface (55 to 70% interspace)	Uneven-aged mechanical treatment designed to develop uneven-aged structure, and a mosaic of interspaces and tree groups of varying sizes. Interspace would occupy 55 to 70 percent of the treatment area. Accompanied by prescribed fire.	2,224
Paired Watershed Study	2,300 acres of control watersheds and infrastructure (50 ft. high towers with no guy lines, snow pillows, 12 flumes and 12 weather stations and associated instrumentation) to evaluate how restoration affects water yield and carbon. No fire treatments for 5 to 7 years in control watersheds.	Up to 3

No forest plan amendments will be needed on the Kaibab NF. The proposed actions are consistent with forest plan objectives, desired conditions, and standards and guidelines (FEIS, Chapter 2, Forest Plan Consistency). Three nonsignificant forest plan amendments will be required on the Coconino NF to implement the selected alternative.

Amendment 1: The purpose of amendment 1 is to bring the selected alternative in alignment with the revised Mexican spotted owl Recovery Plan and defer monitoring to the U.S. Fish and Wildlife Service biological opinion that is specific to this project.

Amendment 1 will allow mechanical treatments up to 17.9 inches d.b.h. to improve habitat structure (nesting and roosting habitat) in 18 Mexican spotted owl protected activity centers (PACs). Trees up to 17.9 inches d.b.h. may be cut; however, trees over 14 inches d.b.h. will not be removed. These select trees between 14-17.9 d.b.h. may be felled and left onsite as logs, converted into snags, or burned. Coarse woody debris and surface fuels in treated PACs will be

retained at levels compliant with forest plans. These PACs will be managed for a minimum basal area of 110.

These PACs will be managed for a minimum basal area of 110. Low-intensity prescribed fire will be allowed within 54 Mexican spotted owl PAC core areas. The amendment removes language that limits PAC treatments in the recovery unit to 10 percent increments, and the selection of an equal number of untreated PACs as controls. Language referencing pre- and post-treatment population and habitat monitoring will be removed. The language has been removed because it is direction from the former (1995) Mexican Spotted Owl Recovery Plan and is not consistent with the 2012 revised Recovery Plan. Monitoring requirements from the U.S. Fish and Wildlife Service biological opinion that is specific to this project is in Appendix E of the FEIS. Definitions of target and threshold habitat will be added, and approximately 6,299 acres of restricted target and threshold habitat will be managed for a minimum range of 110 to 150 basal area for the purposes of being in alignment with the revised Mexican Spotted Owl Recovery Plan (USDI FWS 2012), and to improve Mexican spotted owl habitat.

Amendment 2 clarifies existing Coconino NF forest plan direction related to managing canopy cover and interspace. The purpose of the amendment is to bring the project into alignment with the best available science (Reynolds et al. 2013) that provides desired conditions for restoring fire-adapted ponderosa pine in the Southwest. The forest plan directs projects to measure "vertical crown projection on average across the landscape" (see Coconino National Forest plan, page 65-9). Whereas the forest plan clearly provides direction for meeting minimum canopy cover percentages in vegetation structural stage (VSS) 4 to 6, the plans lack explicit language for measuring canopy cover. Although the forest plan provides direction and desired conditions for the vegetation structural stages, the forest plan does not describe the relationship between non-forested areas (interspace) and natural openings across the landscape.

Amendment 2 will add the desired percentage of interspace within uneven-aged stands to facilitate restoration on 165,216 acres of goshawk habitat (excluding nest areas), add the interspace distance between tree groups, add language clarifying where canopy cover is and is not measured, allow 28,653 acres to be managed for open reference conditions, and add a definition to the forest plan glossary for the terms "interspaces," "open reference condition," and "stands."

An exception to this amendment applies to 46,090 acres (29,027 acres on the Coconino) of goshawk habitat where there is a preponderance of VSS 4, 5 and 6. In response to feedback and comments received on the DEIS and to help resolve objection issues about treating less aggressively and leaving more large trees, canopy cover will be measured using both ground-based and remote sensing methods to compare the two methods and ensure consistency with expected canopy cover levels. The area included in this exception has been increased by about 7,385 acres.

This 46,090 acres includes about 2,750 acres of wildlife corridor (1,146 acres on the Coconino). Corridor treatments will be implemented as outlined by Rosenstock and Gist (2014). In these areas. VSS 5 and 6 tree groups will be retained on the 2,750 acres designated for corridor treatments. The Coconino NF portion of the corridor will be deferred from forest plan canopy cover retention requirements (see updated FEIS, Appendix B, Forest Plan Amendments).

Amendment 3 resolves a forest plan error related to the management of heritage resources and is specific to this project. Amendment 3 will remove the cultural resource standard that requires achieving a "no effect" determination and will add the words "or no adverse effect" to the

remaining standard. In effect, management will strive to achieve a “no effect” or “no adverse effect” determination.

As the deciding official for the Coconino National Forest, I, M. Earl Stewart, have decided to amend the Coconino NF forest plan as described above and in Appendix B of the FEIS. The amendments update the forest plan with best available science related to the composition, structure, landscape pattern and characteristic natural disturbances in ponderosa pine in southwestern forests (Reynolds et al. 2013).

We have decided that appendices A through E are integral to the selected alternative. They will be edited to only reflect the selected alternative (as needed) and posted to the project website with the final ROD and FEIS. The content of the appendices include the following:

Appendix A: **Map Packet**

Appendix B: Coconino NF Forest Plan Amendments (described above).

Appendix C: **Design Features, Mitigation Measures and Best Management Practices**. All project design features, mitigation measures, and best management practices that apply to this decision are included in the final Appendix C of this decision. These features are intended to avoid, minimize, reduce, and eliminate project impacts. As a result of the objection resolution process, design features have been added that address pre-treatment occupancy surveys in all goshawk habitat on both forests and grazing.

Appendix D: **Implementation Plan**. The process described in this appendix describes the linkage from the FEIS to the project-specific work without the need for additional NEPA analysis (above and beyond this environmental analysis). It must be considered in conjunction with Appendix B, which provides the design criteria, best management practices, and mitigation measures. The implementation plan is comprised of several checklists including the Annual Implementation Checklist; Planned Acres by Treatment Type and Restoration Unit (RU); compliance evaluation with the National Environmental Policy Act, National Forest Management Act, Endangered Species Act, and Collaborative Forest Landscape Restoration Act; and Supporting Documentation. The implementation plan includes several sections designed to guide project implementation:

> **Section A** includes existing forest plan management direction, desired conditions, and treatment specific silvicultural design. It is designed to be used by the project silviculturist and implementation team. As a result of the objection resolution process, Section A has been updated to clarify that 46,090 acres will be monitored using both ground-based and remote sensing methods to compare the methods and ensure consistency with expected canopy cover levels. The implementation checklist in Section A has been updated to include grazing-related and Mexican spotted owl monitoring questions. Appendix D has also been updated with language to retain VSS 5 and 6 tree groups within the 2,750 acres of corridor treatments outlined in Rosenstock and Gist (2014).
>
> **Section B** is a decision matrix to be used by the project silviculturist and implementation team to facilitate establishing tree groups, interspace, and regeneration openings as appropriate for each individual treatment.

Section C provides old tree descriptions, illustrations, and guidance used to implement the old tree implementation plan.

Section D includes guidance and the "Modified Large Tree Implementation Plan." The guidance is designed to be reviewed by the project's silviculturist during the development of prescriptions and during implementation.

Section E describes the relationship between treatment intensity, tree group density, and overall average density. It includes density management and stocking guidelines. It is designed to be used by the project silviculturist (in the design of prescriptions) and implementation team.

Section F includes a map and stand list for the stands identified as having a preponderance of large trees (46,090 acres) with the subset occurring within grassland corridors requiring coordination with AZGFD at implementation (up to 2,750 acres).

Appendix E: **Four-Forest Initiative Adaptive Management, Biophysical and Socioeconomic Monitoring Plan.** We considered input from the 4FRI stakeholders and public comments when developing this monitoring and adaptive management plan, with the intent of integrating it into this decision and implementing it within the entire 4FRI project. Appendix E also includes the monitoring plan for Mexican spotted owl, Arizona bugbane, and the adaptive management plan for roads, springs and ephemeral channels. As a result of the objection resolution process, the Mexican spotted owl monitoring plan has been updated and grazing has been added as a co-variable (covariate) that will be considered during monitoring.

Rationale for Our Decision

Our decision is based on compliance with law, regulation and policy, consultation with cooperating and regulatory agencies, consultation with interested tribes, and review of the project record. We have thoroughly examined relevant scientific information and acknowledge incomplete or unavailable information (such as mercury in prescribed fire emissions), scientific uncertainty, and risk (to species such as the Mexican spotted owl). We have considered input from stakeholders, groups, and individuals (including opposing views) and summarized their comments (by topic) in the FEIS, Appendix I, "Response to Comments on the Draft Environmental Impact Statement." Complete, individual responses are located in the project record.

We believe the selected alternative best meets the purpose and need of the project by identifying a combination of restoration treatments that will put almost 600,000 acres on a trajectory toward increased resiliency and sustainability. The key difference in the selected alternative when compared to the other alternatives is the ability to restore ecosystem function on over 50,000 acres of encroached and historic grasslands and ponderosa pine to create an open reference condition. The selected alternative treats Mexican spotted owl habitat in alignment with the revised 2012 Mexican Spotted Owl Recovery Plan. In this analysis, all ponderosa pine is managed as habitat for either Mexican spotted owl or goshawk and their prey species. With the exception of specific Mexican spotted owl habitat types (nest cores, protected activity centers, and forested recovery habitat managed as nest/roost habitat), the selected alternative moves the landscape towards the natural range of variability for ponderosa pine on all sites where mechanical and prescribed fire treatments will occur. The selected alternative incorporates old tree and large young tree direction that will guide implementation. This decision authorizes two important research studies that will inform future restoration projects. We expect these studies to

yield valuable information on how small mammals, songbirds, and water storage can be affected by landscape-scale treatments.

There is mutual recognition of the need to evaluate the impacts of vegetation treatments on Mexican Spotted Owl (MSO) and its habitat at a broad scale. There is also a mutual understanding that the desired evaluation is beyond the scope of a single project such as the Four-Forest Restoration Initiative. We have agreed to convene a working group that will design such a study. We anticipate that this effort will bring together subject matter experts, including representatives of the Forest Service, the U.S. Fish and Wildlife Service, the Rocky Mountain Research Station and other research stations, and the MSO Recovery Team, in cooperation with the Center for Biological Diversity and other stakeholders as appropriate.

The primary objective of the first meeting will be to bring forward the key questions related to characterizing the effects of vegetation treatments on MSO and its habitat and to identify the resources needed to rigorously evaluate these effects at the appropriate scale. The group will review the best available science and develop a consistent monitoring approach across multiple administrative units, expanding upon existing monitoring efforts where appropriate.

Throughout this analysis, the issue of conserving large trees has been recognized. A Large and Old Tree Implementation Plan was developed (FEIS, Appendix D) that will conserve these features on the landscape. This decision responds to feedback and comments received on treating less aggressively and leaving more large trees, and modifies how canopy cover is measured on about 46,090 acres of goshawk habitat where there is a preponderance of large trees (upper VSS 4, 5, 6). On these acres, both ground-based and remote sensing monitoring will occur to document and ensure sufficient canopy cover remains (in the identified stands with a preponderance of large trees), and to compare the two methods. This will add about 7,835 acres to the 38,260 acres that were included in the FEIS and draft ROD.

The total acres (46,090) of less intensive treatments include about 2,750 acres of wildlife corridor. VSS 5 and 6 tree groups will be retained within these acres designated for corridor treatments which will be implemented as outlined by Rosenstock and Gist (2014). The wildlife corridor will be designed in alignment with the Large and Old Tree Implementation Plans (see the Implementation Plan in Appendix D). The Coconino NF portion of the corridor will be deferred from forest plan canopy cover retention (see Appendix B, Forest Plan Amendments).

Treatment design criteria include managing residual stand structure at the upper end of the natural range of variation by varying the intensity of treatments in these stands. This modification remains consistent with the implementation plan that displays the need for heterogeneity in group sizes and treatment intensity (FEIS, Appendix D) and is consistent with the desired conditions to retain large trees currently underrepresented on the landscape (FEIS, Chapter 2). The decision to treat approximately 46,090 acres less intensively is based upon clarified comments from stakeholders and objection issues concerning large tree retention, the heterogeneity of group sizes, and canopy cover. The process of assessing options and analyzing comments took approximately seven months, due to the difficulty in finding the balance between various treatment options that supply additional canopy cover and set the stands on a trajectory toward forest resiliency, in addition to retaining forest canopy cover and additional larger diameter trees. The acres considered for less intensive treatments were reduced, following data review and on-the-ground assessments, to those areas outside of the wildland-urban interface (one-half-mile buffer on private land; see project record).

During the objection resolution meetings, there were many discussions on how best to measure canopy cover. The Coconino NF forest plan contains canopy cover requirements for VSS 4 to VSS 6 in goshawk habitat. The revised Kaibab NF forest plan requires 10-20 percent higher basal area in goshawk post-fledging family areas than in foraging areas, and requires interlocking crowns in nest areas. Obtaining consistent and repeatable measurements from the ground is difficult. Using numerous different methods, multiple observers have difficulty agreeing on the density of canopy cover. Measuring canopy cover with remote sensing has its challenges as well. To address these challenges, the 4FRI Multi-party Monitoring Board will facilitate a process that will review and compare methods for measuring canopy cover.

Public comments and dialogue on the modified treatment strategy originally included topics such as the implications of temporary road construction, road placement, treatment type, treatment intensity, treatment locations, and overall treatment acreage. Dialogue with stakeholders clarified that the principal issue was the retention of canopy cover for goshawk habitat and the retention of more large-diameter trees, especially in areas where human populations and infrastructure were less likely to be harmed or damaged by high-severity fire. Although the original area of concern spanned more than 74,000 acres, geographic data review and on-site assessments led to a reduction of this area to approximately 46,090 acres. The method used to determine the resultant 46,090 acres is described in the project record.

In response to issues as presented in the DEIS, a design feature was included in the FEIS to address temporary road decommissioning (FEIS Appendix C, p. 668, T9). As a condition of approval for use of a temporary road for a timber sale or stewardship contract, temporary roads will be decommissioned by the purchaser or contractor when mechanical treatments are completed. This makes use of adaptive management actions in Appendix E that are incorporated into this decision. This decision also incorporates all design features and mitigation in Appendix C.

In response to issues about how grazing would be managed during restoration activities, we revised design features and developed new design features (Appendix C, Design Features, Best Management Practices and Mitigation). We added range monitoring elements to the Implementation Plan checklist in Appendix D, and added grazing as a co-variable (covariate) that will be considered during monitoring in Appendix E (Monitoring Plan). We recognize the complexity of ongoing grazing activity while restoration occurs. The allotment management plan (AMP) and annual operating instructions (AOI) process is the mechanism used to decrease or increase grazing numbers, rather than site-specific projects. We are confident that the monitoring authorized in this decision, combined with the monitoring that occurs as part of the grazing authorization process, will detect any need for changes in livestock management such as resting pastures or temporarily decreasing livestock numbers. Data gathered from implementation monitoring will also help inform future grazing analyses.

This decision includes changes to the selected alternative's treatment of about 3,300 acres of grasslands, savannas, and meadows, also in response to public comment. These acres were proposed and analyzed for savanna treatments in alternative C, managed for 70 to 90 percent interspace with mechanical treatments and prescribed fire. These acres will instead be treated as proposed and analyzed in alternative E, with mechanical treatments designed to preserve VSS 4, 5, and 6 trees and to maintain 70 to 90 square feet of basal area, and using prescribed fire.

The change on 3,300 acres affects approximately 1 percent of acres that will be mechanically treated in this project and is consistent with the implementation plan (FEIS, Appendix D) and the desired conditions to retain large trees that are currently underrepresented on the landscape (FEIS,

Chapter 1). These stands will still move toward the desired conditions for savanna, particularly with the use of prescribed fire, but at a slower pace than originally proposed. Changing the treatments in these stands will result in:

- An increase in stand density, an increase in canopy cover, a reduction in grass/forb response around groups, movement from a very open structure to an open or moderately closed structure, and an increase in group size.
- Leaving more closed canopy conditions on these 3,300 acres, which will increase the potential for future crown fire on approximately 100 acres.
- No likely increase in old growth, as existing design features call for retaining all presettlement trees (FEIS, Appendix C and D). Moving these acres of savanna habitat towards desired conditions rather than attaining pre-settlement conditions could affect individual species in these stands, but would not make a difference to wildlife populations at the landscape scale.

How Well the Selected Alternative Responds to Issues, Concerns and the Project Purpose and Need

Prescribed Fire Emissions (Issue 1): This issue relates to the emissions from prescribed fire activities and the impact on air and water quality, public health, quality of life, and the economy of northern Arizona.

In response to the concern over emissions from prescribed fire, alternative D was developed. Alternative D decreased the acres that would receive prescribed fire by 69 percent or 404,889 acres when compared to alternative B, the proposed action (FEIS, Chapter 2). An alternative that would eliminate all prescribed fire was considered but eliminated from detailed study as it would not adequately meet the purpose and need for restoring the fire-adapted southwestern ponderosa pine ecosystem (FEIS, Chapter 2).

In response to comments on the DEIS, discussion on potential emissions was expanded to include radionuclide particles and mercury. Emission experts at the Environmental Protection Agency (EPA, Region 9), the Forest Service liaison to the Arizona Department of Environmental Quality (ADEQ), and the Agency's Washington Office were contacted to consider the best available information (see the Fire Ecology Report and the project record).

Communication with the EPA subject matter experts and studies that address radioactive isotope emissions (Schollnberger et al. 2002) indicate that radioactive isotopes and other undesirable chemicals will be present in wildfire emissions. Some are naturally occurring chemicals that have always been present at some level in wildfire smoke and some have resulted from the weapons testing that occurred in the mid-20th century. At the level of exposure the public is subjected to, radionuclides do not pose as great a risk from wildfire. Radioactive material that may be carried in the smoke plume carries a risk of human health concerns of less than 1 chance in 10 million (NMED 2002, Graham 2012a) and the greatest health risk is from breathing high concentrations of particulate matter in the smoke.

After reviewing available literature and consulting with subject matter experts on the potential for mercury emissions from prescribed fire, we have concluded there is incomplete and unavailable information relevant to determining reasonably foreseeable adverse impacts to the human environment as directed by CEQ Sec. 1502.22 (b). (See FEIS, air quality analysis).

The water quality analysis evaluated the potential for mercury to affect the Lake Mary watershed. The Lake Mary total maximum daily load (TMDL) indicates the major source of mercury in the Lake Mary Region is atmospheric deposition, with some mercury originating from natural geologic materials (primarily from volcanic activity). The analysis concludes that best management practices (see FEIS Appendix B, fire ecology, soil and water and transportation design criteria) will minimize or mitigate potential for mercury to be mobilized in sediment and delivered to water bodies (see the Water Quality and Riparian Areas Report).

From a quality of life perspective, smoke emissions will be inevitable, whether from prescribed burns that will result from this decision or from wildfire. The air quality analysis finds the selected alternative will result in the least emissions (approximately 31,000 pounds per acre) when compared to the no action alternative where emissions from wildfire would approach 80,000 pounds per acre. Once treatments are complete, the emissions from wildfire are projected to be slightly greater than 50,000 pounds per acre, a significant reduction when compared to the no treatment scenario (FEIS, Chapter 3, Air Quality).

Although emissions will occur as a result of this decision, the degree (intensity and duration) of emissions will be variable. The selected alternative includes design features and ADEQ emission reduction techniques (FEIS, Appendix B, FE3, FE8, FE9, and FE15) to minimize adverse effects to quality of life in nearby communities. We will work with ADEQ to ensure that smoke impacts to human health are avoided or minimized to the degree possible.

Alternative A does not respond to the purpose and need or resolve this issue (see previous discussion). Although alternatives B and E would reduce prescribed fire emissions, it comes at an unacceptable tradeoff. The alternatives do not maximize the restoration of historic grasslands and pine with an open reference condition. Alternative D would partially address the issue and reduce prescribed fire emissions but it does not meet the objective of returning fire to the fire-adapted ponderosa pine ecosystem. Approximately 69 percent of the project area would not receive prescribed fire benefits that are necessary to increase resiliency, function and sustainability in ponderosa pine.

Issue 1 remains unresolved in that a segment of the public does not support the use of prescribed fire.

Conservation of Large Trees (Issue 2): This issue focuses on the conservation of large trees and the inclusion of the large tree retention strategy (LTRS), which was developed by the 4FRI stakeholders (4FRI stakeholders 2011).

We carefully considered comments received on the DEIS and developed additional guidance in the FEIS to document how restoration activities will emphasize large tree retention and meet desired conditions. In response to comments on the DEIS, the purpose and need was revised to include a large tree section (FEIS, Chapter 1). The large tree section discloses that large trees (VSS 5 and 6) are currently underrepresented within the project area and the desired condition is to balance community, wildlife, and forest restoration into treatment design.

The selected alternative includes a Large Tree Implementation Plan (FEIS, Appendix D). Overall, the selected alternative will increase large tree size classes. The silvicultural analysis indicates Mexican spotted owl habitat will meet or exceed desired minimums in trees in the 18- to 24-inch size classes by 2020 (FEIS, Chapter 3, Vegetation). In the mechanically treated PACs, trees greater than 24 inches d.b.h. will show consistent improvement (FEIS, Chapter 3, Mexican spotted owl analysis). Because treatments in the mechanically treated PACs are site-specific and

target the release of big trees from competition with young trees, the ability to retain existing large trees through time will also increase (FEIS, Chapter 3, and the Wildlife Report).

This decision modifies how we prioritize and monitor mechanical treatments in PACs (see Decision section). PAC treatments will maximize benefits to future forest structure by increasing growth rates and the number of trees in the largest size classes. Treatments are designed to retain mid-sized trees for future large tree recruitment. Surface fuels will be managed to limit the risk of surface fire transitioning into crown fire. This may require pile burning to manage down wood in compliance with the forest plans. In these cases, larger size logs will be retained (see Appendix E for treatment details).

In the short term, Mexican spotted owl restricted-other habitat trees greater than 24 inches d.b.h. would be well represented. In target/threshold habitat, this size class would continue to be underrepresented. By 2050 this size class will exceed the desired minimum in Mexican spotted owl restricted other habitat (FEIS, Chapter 3, Vegetation).

The goshawk analysis (FEIS, Chapter 3, Vegetation) indicates the largest size classes (VSS 6) will still be underrepresented in all goshawk habitats. There will be good representation of VSS 5 in all landscapes outside of post-fledging family area (LOPFA) habitats but VSS 5 will be under-represented in post-family fledging areas (PFAs). The silvicultural analysis concludes the project has been designed to manage for old age trees in order to have and sustain as much large tree and old forest structure as possible across the landscape.

We acknowledge that while some large trees may be removed to accomplish ecological objectives or public safety objectives around communities, there is a need to retain as many large trees (larger than 16 inches d.b.h.) as possible. The FEIS and this decision acknowledge that large trees (VSS 5 and VSS 6) are underrepresented within the project area. The FEIS (Chapter 1) acknowledges the need to recognize the rarity and ecological and socio-political importance of large trees in the Southwest. This decision includes a process (FEIS, Appendix D) that addresses large tree retention during project implementation. The implementation plan provides guidance on how to conserve and promote large (young) trees in order to increase age classes that are underrepresented (while moving towards the desired condition of having uneven-aged forest conditions).

In addition, the implementation plan (FEIS, Appendix D) now emphasizes that when outside of the wildland-urban interface, restoration treatments in goshawk habitat (approximately 46,090 acres) will focus on the removal of small-diameter trees and will emphasize retaining large trees where applicable to move toward deficit stand structure. This will be accomplished by placing an emphasis on creating regeneration openings and interspace in areas where smaller VSS 3 and VSS 4 trees dominate. The placement of tree groups to be retained will focus on areas where the largest trees are already aggregated. These groups will generally range between 0.25 and 1 acre in size. This will result in stands being composed of groups of larger trees intermixed with relatively small openings. In stands with a preponderance of large young trees the treatment intensity will be managed to the lower end of the available spectrum. Management in these stands still recognizes the need to create regeneration openings to be able to promote uneven-aged stand conditions.

The selected alternative also recognizes that, within the savanna treatment acres, there are some stands that contain a preponderance of large, young trees. On the 3,300 acres where this occurs, we have decided to use the treatments proposed in alternative E that will retain large trees and not implement savanna treatments on these acres.

Alternative A was not selected because it does not respond to the purpose and need. Without increasing resiliency and function, moving into the larger tree classes and protecting those larger tree classes would not be possible. In the 18 Mexican spotted owl PACS that are mechanically treated, alternatives B, D, and E would move toward desired conditions in the larger tree size classes, but not to the degree as the selected alternative (see the Wildlife Report, Table 136). In addition, in alternative D only 18 of 70 PACs would have habitat improvements and only 2 percent of protected habitat would see a reduction of surface fuels as a result of prescribed fire in protected (steep slope) habitat. In alternative D the risk to nesting and roosting habitat (including large trees) would remain high given the limited changes in fire behavior within protected habitat and outside Mexican spotted owl habitat. In alternative E, although PAC treatments would be site-specific to target the release of big trees from competition with young trees, the inability to treat trees 9 to 18 inches d.b.h. would limit treatment effectiveness. Therefore, no response would be evident in trees greater than 24 inches d.b.h. (see Wildlife Report, Environmental Consequences).

In goshawk habitat, movement toward desired conditions in the larger tree size classes in alternatives B and E would be similar to the selected alternative. However, in goshawk PFA and dispersal PFA (dPFA) habitat, alternative E would increase the percent of trees in trees greater than 18 inches but not to the degree that the selected alternative will (see FEIS, Table 35, even-aged LOPFA VSS 6, 2050). In alternative D there would be slightly less increase in VSS 5 and 6, or acres of large trees, due to the continued dense conditions of VSS 3 and 4 size trees occupying the majority of the area due to the lack of prescribed burning in alternative D.

Although this decision provides guidance on how to conserve and promote large, young trees during implementation, any cutting of large, young trees is likely to be controversial with those people who believe no large, young trees should be cut.

Post-treatment Canopy Cover and Landscape Openness (Issue 3): This issue focuses on retaining closed canopy conditions for species including, but not limited to, goshawk and Mexican spotted owl.

Goshawk: Commenters stated measuring canopy cover in goshawk habitat at the group level would not meet forest plan stand-scale canopy requirements. This issue was addressed in the selected alternative through treatment design in PFA and dPFAs, and in LOPFA.

In PFA and dPFA habitat, we find that the heterogeneity (percent of openness) of the habitat will increase while maintaining interlocking or nearly interlocking tree crowns. Approximately 44 percent of PFA and dPFA habitat will have closed to moderately closed canopies (FEIS, Table 35, and the Wildlife Report, Table 161). In LOPFA, 26 percent of the habitat will have closed to moderately closed canopies (FEIS, Table 35, and the Wildlife Report, Table 161). In all habitats, the silvicultural analysis (FEIS, Chapter 3) found that residual tree group density will meet and exceed the canopy cover requirements in VSS 4 to VSS 6 (Coconino NF forest plan) and desired conditions (revised Kaibab NF forest plan).

In PFA/dPFA prey habitat, the selected alternative provides the most increase in the average pounds per acre of understory biomass. Biomass increases from the current condition of 58 average pounds per acre to 113 average pounds per acre aby 2020 (FEIS, Table 35). In goshawk LOPFA prey habitat, the selected alternative attains an average understory biomass index of 149 pounds per acre by 2020. This will improve cover and food for birds and mammals preyed upon by goshawks as well as the invertebrates that are an important food source for goshawk prey. The

understory response favor conditions conducive to the spread of low severity fire rather than crown fire. In all alternatives, understory response decreases as regrowth occurs.

In all goshawk habitat, the primary benefits from the changes in forest structure are that the risks of large scale loss of habitat from disturbances such uncharacteristic fire, bark beetles, and density-related mortality will be reduced. The selected alternative reduces fire risks, increases openness, and decreases risks from insects and diseases over longer periods. The selected alternative maintains composition, form, and structure as natural fire occurrences are reintroduced (FEIS, Chapter 3, Goshawk Analysis).

Treatments in goshawk habitat will be implemented using stocking guidelines that will maintain interlocking or nearly interlocking tree crowns. Tree group density will meet and exceed the canopy cover requirements (Coconino NF only) and desired conditions (Kaibab NF). In response to questions raised and comments made on the DEIS about treating less aggressively and leaving more large trees, canopy cover will be measured at the stand level on about 46,090 acres where there is a preponderance of VSS 4, 5, and 6. The environmental analysis (FEIS, Chapter 3) indicates that this modification will result in movement towards desired conditions. On these acres, canopy cover will be measured using both ground-based and remote sensing methods. Although canopy cover desired conditions and requirements will be met, the retention of adequate canopy cover and closed canopies likely remains controversial with those publics who believe the post-treatment condition will be too open.

There may be some changes to goshawk habitat due to the changes in treatment on about 3,300 acres of savanna. With the focus on retaining all VSS 4, 5 and 6 (except where public health and safety issues exist), these stands will retain components of goshawk habitat but will decrease food and cover for many goshawk prey species. These changes will affect about 1 percent of the total goshawk habitat being treated in the project area. Overall, these combined effects will not affect goshawk populations in the project area (see project record).

Alternative A was not selected because it would not improve habitat quality, resiliency and sustainability. In all goshawk habitat, no action results in the habitat being at highest risk of increasing densities, increased fire risk, and increased to insect and disease risk. These results are contrary to forest structure, forest health, and resiliency and function desired conditions (FEIS, Chapter 3, goshawk analysis). See the Conservation of Large Trees (Issue 2) section on page 6 for the discussion on how the alternatives move towards large tree desired conditions.

Of all the alternatives besides no action, alternative D provides the least movement towards vegetation composition and diversity, resiliency, and sustainability desired conditions. In all goshawk PFA/dPFA, this alternative would result in a higher stand density index (SDI) when compared to the selected alternative and will approach the “extremely high density” category by 2050. In goshawk LOPFA, the SDI remains in the “high density” category throughout the short term whereas the selected alternative moves to the high end of “moderate density”. This means the habitat, particularly PFA/dPFA, would continue to lack resiliency and sustainability, contrary to desired conditions for forest structure, forest health, and resiliency and function (FEIS, Table 35).

Alternative D also provides the least improvement to understory biomass in goshawk PFA and dPFA by 2050 (57 pounds per acre average) and degrades it below the current condition (58 pounds per acre average), contrary to the purpose and need for vegetation composition and diversity. In LOPFA habitat, average understory biomass of 75 pounds per acre by 2050 is comparable to the other alternatives but is still much less than the selected alternative (89 pounds

per acre average). Alternative D is the only action alternative where at least 30 percent of the habitat would return to fire regime condition class 3, contrary to the purpose and need (FEIS, Table 35).

Alternative E provides less movement towards vegetation composition and diversity, resiliency, and sustainability desired conditions in comparison to the selected alternative. In PFA/dPFA, alternative E provides less improvement to understory biomass (forage) in both the short term (109 pounds per acre) and long term (66 pounds per acre). In LOPFA, the trend is similar. In goshawk LOPFA, the SDI in the selected alternative will decrease to the high end of "moderate density" in the short term whereas in alternative E the SDI would remain in the "high density" category (FEIS, Table 35).

Although canopy cover desired conditions and requirements will be met, the retention of adequate canopy cover and closed canopies likely remains controversial with those people who believe the post-treatment condition will be too open.

Mexican spotted owl: There was a concern that treatments would reduce or remove closed canopy conditions and leave Mexican spotted owl habitat too open. In Mexican spotted owl protected habitat, treatments were specifically designed to improve habitat while retaining the closed overstory structure**.** This issue will be addressed through final treatment design (see the Decision section of this ROD) and through monitoring (see Appendix E).

Implementation of the selected alternative will result in over 90 percent of Mexican spotted owl protected habitat having canopy that is closed or moderately closed. By 2020 the selected alternative will reduce the potential for stand density-related mortality (FEIS, Chapter 3, Vegetation and Mexican Spotted Owl analyses). Although protected habitat will remain in the "extreme high [tree] density" category, the stand density index (SDI max) nearly achieves a "high density" ranking. While the change in overstory is limited, site-specific implementation will emphasize releasing[4] large old pine and oak trees. Modeling to the year 2050 illustrates an increase in tree growth rates for the largest d.b.h. size classes (also see the issue 2 discussion). In restricted habitat, current nesting and roosting habitat characteristics will be maintained, and future nesting and roosting habitat will be developed. There will also be an increase in the quality of foraging habitat.

The Mexican spotted owl analysis found that the selected alternative will best restore and enhance prey habitat. This is expected to benefit Mexican spotted owl and their prey in the short and long-term (Kalies et al. 2012, Ganey et al. 2011). After treatment, Mexican spotted owl protected habitat will still have the highest surface fuel loading within the project area. This reflects the low-intensity nature of the treatments. However, the risk of having crown fire enter PACs will be reduced. The fire analysis indicates the potential for crown fire outside of Mexican spotted owl protected habitat will be less than 10 percent (FEIS, Chapter 3, Fire Ecology). However, if a fire starts within the PAC, it may still result in high severity effects within the PAC. We find that treatments that are part of the selected alternative are most aligned with objectives in the revised Mexican Spotted Owl Recovery Plan (USDI FWS 2012). Overall, there is potential for short-term adverse effects to owls, primarily from disturbance to individual birds. However, long-term effects of the project should be beneficial to the Mexican spotted owl population by enhancing key habitat components for them (especially the improved stand characteristics and resiliency in nesting and roosting habitat) and their prey (e.g., canopy gap openings, aspen, meadows, springs). The likelihood of maintaining Mexican spotted owl habitat into the future is also enhanced by

[4] Cutting trees around a tree to reduce competition for water, nutrients and sunlight.

reducing the predicted risks from climate change-induced changes to temperature and precipitation patterns and their synergistic effects with insects, disease, and risk of high-severity fire (Noble 2014).

Alternative A was not selected because it would not improve the quality or quantity of Mexican spotted owl protected habitat. At the landscape scale, alternative A moves the project area away from desired conditions. It would be at highest risk of increased densities, increased fire risk, increased insects and diseases, and increased risks to PACs. While alternative B would reduce densities, reduce fire risks, increase openness, and decrease risks from insects and diseases over longer periods, it is not as aligned with the revised Mexican Spotted Owl Recovery Plan as the selected alternative is. Alternative D would move the project towards the desired condition but would leave treated areas at higher risks to high severity fire, contrary to the purpose and need. Alternative D is the only alternative besides no action where at least 30 percent of the habitat would return to fire regime condition class 3, contrary to the purpose and need. In the long term (2050), residual basal areas would be excessive (165 basal area).

In alternative E, without the ability to apply a forest plan amendment, treatment effectiveness would be constrained by following direction from the former Mexican Spotted Owl Recovery Plan on the Coconino NF and residual basal areas would remain much higher (153 to 172) than recommended, resembling no action and its inability to maintain Mexican spotted owl habitat in the long term. Alternative E would result in the least increase in trees 24 inches d.b.h. and greater. This is contrary to the purpose and need. The lack of mechanical treatments in PACs would maintain current conditions in nesting and roosting habitat and result in the loss of large trees and habitat heterogeneity. The selected alternative will allow effective treatments to occur in all Mexican spotted owl habitats. Habitat diversity benefits include sustaining Gambel oak, re-creating meadows, releasing and regenerating aspen, restoring springs, and increasing grass and forb cover. Also see the Conservation of Large Trees (Issue 2) section for more discussion on how the alternatives move towards large tree desired conditions.

Resiliency, Function and Sustainability (Purpose and Need, Issue 4, Increased Restoration and Research): The objective of the project is to restore forest structure, pattern, composition, diversity, and landscape heterogeneity within the ponderosa pine (*Pinus ponderosa*) ecosystem that will lead to increased forest resiliency and function and restore the historical fire regime (FEIS, Chapter 1). The intent of the 4FRI project is to obtain a high level of vegetative responses that will increase ecosystem diversity by increasing horizontal and vertical heterogeneity. Restoration initiates or accelerates ecosystem recovery with respect to ecological health, integrity, and sustainability (Reynolds et al 2013). Resiliency increases the ability of the ponderosa pine forest to survive natural disturbances such as insects, diseases, fire, and climate change (FSM 2020.5) without changing its inherent function (SER 200). Restoration activities proposed with this project are expected to put the project area on a trajectory towards comprehensive, landscape-scale restoration, with benefits that include improved vegetation biodiversity, wildlife habitat, soil productivity, and watershed function, as well as increased forest structure heterogeneity. To ensure that the project will maintain and restore historical forest structure, the restored landscapes of the project area are projected to have an average of at least 65 trees/acre over 4” diameter, 29% of forest area with > 81 trees/acre, and 90% of forest stands with > 52% of the trees < 16” diameter as documented by scientific reconstructions of historical forest structure. Restoration treatments will expand burn windows for both planned and unplanned ignitions, so that the proportion of the project area with restored historical levels of low, mixed, and high-severity fires is maximized. While the 4FRI does not provide any direction for managing unplanned ignitions, treatments are expected to increase the decision space for line officers deciding how

to manage lightning caused fires wildfires. This can be expected to increase the area that can be managed for historic fire regimes, including low, mixed, and high-severity fire.

The question of whether the selected alternative will result in enough movement towards the natural range of variability (NRV) was considered throughout the analysis. The selected alternative responded to issue 4 by substantially increasing the acres of grassland and savanna treatments, increasing the type and acres of treatment in Mexican spotted owl habitat, and supporting small mammal, songbird (AGFD treatments) and watershed research.

In response to comments on the DEIS, an analysis of how each alternative moves towards NRV was included in the FEIS. In the selected alternative, forest attributes (e.g., trees per acre, basal area) will be within the NRV except for Mexican spotted owl PACs, goshawk nest areas, and Mexican spotted owl target threshold habitats. As the intensity of treatments increase, the habitats will be structured most closely to the lower (denser) end of the NRV. All basal areas increase as other non-pine components increase in size (i.e., Gambel oak), with one exception. Some of the treatments designed for small mammal and songbird research will trend away from the NRV (see the Silviculture Report).

The silvicultural analysis concluded that the 431,049 acres of mechanical treatments and 586,110[5] acres of prescribed fire will be more effective than fire alone. Fire is the essential element needed to effectively move towards desired conditions in this fire-adapted landscape. At the landscape scale, the difference in *modeled* crown fire potential between alternatives B though E is minimal because the vertical and horizontal continuity of canopy fuels is broken up by mechanical treatments. Under alternative E, there would likely be greater potential for crown fire than under alternative B because, without a Coconino NF forest plan amendment, the forest plan would require less interspace and result in more contiguous canopy fuels.

We find that the selected alternative meets the purpose and need by decreasing the potential for crown fire from 38 percent (on about 191,000 acres) to less than 10 percent. Mexican spotted owl habitat would continue to have high surface fuel loadings due to the conservative nature of the treatments. Overall, the selected alternative meets the objective of increasing resiliency and function by returning fire to this fire-adapted landscape (FEIS, Chapter 3, Fire Ecology).

In the selected alternative, we find that soil productivity and watershed function will be maintained and improved on 23 percent at-risk and 42 percent impaired watersheds (FEIS, Table 35). Short-term impacts from soil disturbances will range (watershed average) from 2.9 percent (lowest in alternative D) to 3.5 percent (highest in the selected alternative). In the selected alternative, no individual watershed will have soil disturbance average above 11.5 percent (3.5 percent below the 15 percent soil productivity threshold). Therefore, soil productivity and watershed function should be maintained.

Alternatives B through E would produce similar results for soil productivity, watershed function and soil disturbance. However, alternative B and the selected alternative would be expected to maintain, improve and protect long-term soil productivity and watershed function better than alternative D because the vast majority of that alternative does not follow mechanical treatments with prescribed fire. Prescribed fire is necessary to maintain soil productivity and watershed function processes.

[5] Total acres include 431,049 acres of prescribed fire where mechanical treatment occurs and 155,061 acres of prescribed-fire only.

In the selected alternative, soil disturbance includes temporary road construction, decommissioning, reconstruction, and improvement or relocation. Temporary road construction will create short-term soil disturbance on about 520 miles of road (950 acres). Of these roads, a vast majority are located on soils with slight or moderate erosion hazard. About 22 miles of temporary road construction (about 40 acres) would occur on severe erosion hazard soils.

Road decommissioning will create about 1,645 acres of disturbance in the short term and remove approximately 860 miles of roads, or about 1,645 acres of road from future disturbance in the long-term. About 38 miles (roughly 70 acres) are on severe erosion hazard soils. BMPs (FEIS, Appendix C) are designed to minimize impacts from decommissioning efforts. After decommissioning, there will be a reduction of roads on soils with severe erosion hazard (see Soils Report, Temporary Road Construction and Decommissioning).

Road relocation will occur on just less than 10 miles (about 17 acres of disturbance) of road across the project area. Of these miles, about 0.3 miles are severe erosion sites (about .7 acres). Road improvements will occur on about 30 miles, and may affect up to 75-150 acres, depending on the extent of the road improvement. Vegetation will likely be removed with these activities. These activities may occur on about 10-20 acres of soils with severe erosion hazard. Specific best management practices (BMPs; see FEIS Appendix C and the Soils Report) will mitigate effects on severe erosion sites.

Overall, road decommissioning and temporary road construction results in less than 0.1 percent soil disturbance in the treatment area and much less at the 6th HUC watershed scale. Implementation of BMPs is expected to mitigate accelerated erosion, and possible elevated sediment transport to connected streamcourses to reduce risk to downstream water quality.

Although the analysis indicates soil productivity and watershed function will be maintained, the disturbance related to the development and decommission of temporary roads is likely to be remain controversial with some people.

Overall, we find that the selected alternative moves the project area closest to desired conditions in terms of: (1) increasing species composition, (2) increasing groups of trees, (3) maintaining scattered individual trees, (4) increasing grass-forb-shrub interspaces, (5) increasing snags, logs, and woody debris, (6) increasing variation in the arrangements of these elements in space and time, and (7) establishing ecosystem processes, functions, and fire return intervals that are within the natural range of variability.

Alternative A would move the project area the farthest away from resiliency, function and sustainability desired conditions (see Mexican spotted owl and goshawk analyses). Alternatives B, D, and E would not increase Mexican spotted owl and goshawk habitat resiliency to natural disturbances to the extent the selected alternative does (see Issue 1-3 discussion on the previous pages).

Because the selected alternative significantly affects fire behavior, forest structure, and forest health, we find this project meets objectives and increases resilience to natural disturbances associated with climate change in both the short and long term.

Range of Alternatives and Comparison of Alternatives (Procedural Concern): In response to comments received on the DEIS, another alternative that would propose no forest plan amendment was analyzed in the FEIS. This increased the number of fully analyzed alternatives to five (four action alternatives and the no action alternative), and increased the number of

alternatives considered but eliminated from detailed study to six. More importantly than the sheer number of alternatives is whether unresolved issues were addressed through alternative development or environmental analysis. This is consistent with Council for Environmental Quality regulations for implementing the National Environmental Policy Act (40 CFR Sections 1501.2(c) and 1502.14, and 36 CFR 220.5(e), 40 CFR Section 1502.14).

We find that based on the relevant issues raised, reasonable alternatives were developed. We find that the rationale for considering but eliminating six alternatives from detailed study is documented and is based on meeting the purpose and need (moving towards desired conditions) for this landscape-scale restoration project.

Significant Forest Plan Amendments (Procedural Concern): Some commenters stated the DEIS (alternatives B through D) failed to support a finding that the plan amendments are nonsignificant. Some commenters stated the public cannot use the data in the analysis to determine the acres affected and to understand how these acres are related to other anticipated uses. Some commenters stated the proposed amendments are significant because they may bring about changes that may have an important effect on the entire land management plan or affect land and resources throughout a large portion of the planning area; see FSM 1926.52 (Jan. 31, 2006).

The environmental cause-and-effect relationship is the perceived dramatic change in management for Mexican spotted owl that may result in harm to the species. On the Coconino NF, the amendments authorized (alternatives B, C, and D) mechanical treatments in Mexican spotted owl PACs that exceed 9 inches d.b.h. and authorize the use of prescribed fire in Mexican spotted owl PAC core areas (alternative C). In alternatives B through D, all Mexican spotted owl existing monitoring requirements were removed and specific monitoring requirements were deferred to the U.S. Fish and Wildlife Service biological opinion. For goshawk, the amendments on the Coconino NF authorized managing acres for an open reference condition (up to 90 percent open) and clarified how and where canopy cover would be measured.

Some commenters stated the plan amendments are significant because the Coconino NF is including identical plan amendments in similar vegetation projects; therefore, providing direction that must be followed by other projects. Some commenters asked for examples of other projects with nonsignificant plan amendments. Some commenters suggested wording to improve clarity.

The detailed significance analysis for each amendment is located in Appendix B of the FEIS. No amendment alters multiple use forest plan goals and objectives, adjusts management area boundaries. The changes in standards and guidelines are considered to be minor because they reflect the latest, best available science including the revised Mexican Spotted Owl Recovery Plan. The amendments do not alter the long-term relationship between levels of multiple-use goods and services originally projected for the Coconino NF. These outputs were specific to a planning period ranging from 10 to 15 years:

- Amendment 1: The amendment will affect 6,942 acres or 18 percent of Mexican spotted owl protected activity center habitat on the Coconino NF.
- Amendment 2 is a clarification amendment. The amendment will affect 165,216 acres (19 percent) of all goshawk habitat on the Coconino NF. The canopy cover portion of the amendment will affect 139,674 acres (16 percent) of all goshawk habitat on the Coconino NF. Managing 25,841 acres of ponderosa pine for an open reference condition will affect approximately 3 percent of all suitable goshawk habitats on the Coconino NF.

- Amendment 3 is specific to the 355,707 acres of treatments in this project. About 20 percent of the Coconino NF (which totals 1,821,495 acres) will be affected.

For these reasons, the amendments will not result in an important effect to the entire land management planning area.

The list of vegetation projects that were included in comments on the DEIS was reviewed. The forest plan amendments that have been proposed in other vegetation projects reflect the ongoing Coconino NF forest plan revision process, using the best available scientific information (Reynolds et al. 2013), and they are compliant with the revised Mexican Spotted Owl Recovery Plan (USDI FWS 2012). A complete analysis of other proposed forest plan amendments by project is located in the project record.

The amendments are consistent with the nonsignificance criteria found in FSH 1926.51. Each amendment is a specific, one-time variance for this restoration project. The best available science for management in southwestern forests, the (Coconino NF) forest plan revision process, and revised Mexican Spotted Owl Recovery Plan objectives are affecting ongoing and future analyses. This decision will not impose direction on ongoing or future analyses.

Forest Structure and the Conservation of Old (Presettlement) Trees (Purpose and Need): A desired condition on the Coconino NF is to allocate old growth sites (current forest plan direction). On the Kaibab NF the desired condition is to manage for old growth components. As noted above in the discussion on large trees, the selected alternative includes an implementation plan designed to move towards the desired condition of uneven-aged forest conditions. Key to this is the need to conserve and promote old (presettlement) trees and improve age classes that are underrepresented. Early in the analysis process, the stakeholder-developed Old Tree Protection Strategy was used to inform the Old Tree Implementation Plan (FEIS, Chapter 1). In response to comments on the DEIS, we edited the Old Tree Implementation Plan (FEIS, Chapter 1) and added additional design features related to temporary road development (FEIS, Appendix B, design feature T12) to clarify the intent to conserve and protect old trees during project implementation. The silvicultural analysis concludes that the selected alternative will improve the sustainability of the old tree component across the landscape (FEIS, Chapter 3, Vegetation).

Alternative A would not move the project area towards desired conditions. The silvicultural analysis found that the sustainability of the large/old tree component across the landscape may be impaired by density-related mortality and forest health issues (FEIS, Chapter 3, Vegetation). Alternatives B through E included design features and mitigation to protect old trees. In this regard there is no difference between the selected alternative and alternatives B, D and E.

Forest Health (Purpose and Need): The selected alternative addresses the purpose and need by reducing the moderate/high bark beetle hazard rating from 72 percent to 22 percent by 2020. Hazard ratings will increase in the long-term due to vegetation regrowth. Dwarf mistletoe infection will be reduced as a result of being able to selectively remove lightly infected trees. The percent of the area with moderate/high dwarf mistletoe will not decrease because the intent of the treatments was not to eradicate mistletoe but to manage it at endemic levels (FEIS, Chapter 3, Vegetation; Chapter 2, Table 35). The selected alternative decreases the potential for stand density-related mortality although tree density remains high in Mexican spotted owl and goshawk habitat (see previous discussion).

Alternative A would move the project area farther away from forest health desired conditions. It increases the potential for stand density-related mortality in all habitats. It increases the potential

for insect and disease outbreaks. It results in no movement towards improved resiliency, function and sustainability in ponderosa pine. The selected alternative best reduces the potential for stand density-related mortality in Mexican spotted owl PACs and decreases the potential for crown fire in PACs by having two prescribed fire entries in PACS (including core areas).

Vegetation Composition and Diversity (Purpose and Need): A key component of the purpose and need was to improve vegetation composition and diversity. We find the selected alternative meets the purpose and need by improving composition and diversity in aspen, large oak (an increase of 7 percent in long term), grasslands, pine-oak and pine-sage. In Mexican spotted owl habitat, the benefits were more pronounced in restricted versus protected habitat.

The selected alternative restores over 50,000 acres of historic grasslands and pine with an open reference condition. The selected alternative enhances grassland inclusions on 286,543 acres in goshawk PFA/dPFA, LOPFA, and Mexican spotted owl pine-oak habitat.

Alternative A does not respond to the purpose and need. Ponderosa pine tree canopy would continue to increase, shading out understory herbaceous vegetation and further reducing forage production and species diversity. Oak and aspen growth and vigor would continue to be stagnated due to competition with pine resulting in lowered resistance to insects and disease and eventual mortality. Oak and aspen regeneration ability would continue to be impaired. Pine would continue shading out understory sage further reducing the sage component and the historic pattern within the pine sage mosaic (see Silviculture Report, Alternative A-No Action, Vegetation Diversity and Composition).

Alternatives B and D would not restore as many acres of historic grasslands and pine savanna. Alternative D would not meet function and resiliency desired conditions. It removes the use of fire from over 60 percent of the landscape and results in 30 percent of the landscape returning to a fire regime condition class 3. Alternative E restores no acres of historic grassland or pine savanna.

Socio-economics: Although social and economic impacts from the project were not included in the purpose and need, we considered them a key output. No effects are presented under alternative A, as these reflect current conditions. The changes in employment and income under alternatives B through E reflect an increase in employment and income due to project harvesting and processing activities as well as the potential for a temporary reduction of 60 jobs and $2 million in labor income due to recreation displacement. Over the 10-year treatment period, the selected alternative will save between $156 and $232 million of cost to the taxpayer as a result of using stewardship contracts (see the Socioeconomic Report, Summary of Effects, Avoided Treatment Costs).

Consideration of Unavoidable Adverse Effects

Overall, the selected alternative considers the tradeoffs between short-term adverse effects (i.e., environmental harm) and long-term benefits. Implementation of the selected alternative will result in some unavoidable short-term adverse effects on threatened and endangered species and critical habitat, short term adverse effects on candidate species, proposed species and their critical habitat, sensitive species (individuals), soils and water quality (short term), air quality (short term, during prescribed fire activities), and recreation settings and scenery (short term). However, the selected alternative includes design features, mitigation measures, and best management practices (FEIS, Appendix C) that will reduce these adverse effects to the extent practicable while still achieving project objectives.

Our decision considered all comments received during scoping periods, workshops, public meetings, field trips, and the formal notice and comment period. The selected alternative considers the input received from stakeholders throughout the process. We recognize that there is a range of public opinion regarding the variety of treatments identified in the selected alternative, particularly the use of prescribed fire. However, we have concluded that our decision is an informed one that best meets the project's purpose and need, moves the project area toward desired conditions, and considers the environmental consequences(both positive and negative) of the selected restoration actions. Monitoring, evaluation and the use of adaptive management during implementation will continue to inform us of the effects of this decision.

Uncertainty and Risk for Mexican Spotted Owl

The practice of prescribed fire has evolved over time and it is commonly used as a tool to reduce surface fuels while also maintaining forest structure and wildlife habitat components such as snags, logs, and other coarse woody debris. However, prescribed fire is not a precise tool and there is inherent uncertainty and so potential risk with fire management. There is also risk and uncertainty in not addressing uncharacteristic surface fuel loads in fire-adapted ecosystems.

Randall-Parker and Miller (2002) reported up to one-third of snags and almost half of all logs were lost following prescribed burning. This was largely an observational study based on five plots. They were experimenting with methodologies and their data collection techniques changed during the course of the study. As the authors point out, the results are not statistically sound. Therefore it was published in conference proceedings and not in the referred literature.

Saab et al. (2006) addressed similar concerns, yielding more rigorous results. Although they also reported loss of nearly half the logs from prescribed fire, treatments were conducted during drought conditions with low fuel moistures. Prescribed fire did successfully remove live ladder fuels. However, most of the results were not statistically significant.

Monitoring data from the Coconino NF has documented loss of key habitat components from prescribed fire. Microhabitat monitoring from burns implemented on the Happy Jack Urban Interface Project on the Mogollon Rim Ranger District through late 2004 showed an 8 percent loss of trees greater than 18 inches d.b.h., a 21 percent loss of snags, a 71 percent loss of logs, and a 47 percent loss of Gambel oak trees greater than five inches d.b.h. In addition, prescribed burns conducted along Highway 87 and Forest Highway 3 (2005-2006) appear to have had loss of canopy cover and basal area. These projects did not include PACs and did not have the list of design features developed to minimize loss of key habitat components. Perhaps most important is that the projects being compared had a fuels reduction emphasis different from the restoration emphasis in the 4FRI.

Prescribed burning is expected to reduce the risk of future high-severity fire by reducing accumulations of fuels and raising canopy base height, both of which can benefit Mexican spotted owl habitat in both the short and long term. However, it can also modify or destroy key habitat components that comprise Mexican spotted owl habitat. Based upon the sheer number of acres proposed for burning each year, and because the intention is to apply prescribed fire to all PACs and nest/roost replacement/target-threshold acres, there is a likelihood that more key habitat components could be unintentionally lost to fire than modeling indicates. Some degree of unintended fire behavior could improve Mexican spotted owl habitat by creating canopy gaps and enriching soils. However, impacts to Mexican spotted owl habitat could also create adverse effects (see the U.S. Fish and Wildlife Service biological opinion).

Environmentally Preferable Alternative

We believe alternative C (selected alternative, as modified) is the environmentally preferable alternative. Although this alternative treats the most acres to move toward desired conditions, it also provides the most long-term benefits for multiple resources. Approximately 586,110 acres of ponderosa pine will be on a trajectory towards long-term resiliency and sustainability (see discussion in Decision Rationale section). While all action alternatives included restorative actions for streams, springs, roads and unauthorized routes, only alternative C adequately addresses grassland restoration and only alternative C adequately affects the quality and quantity of Mexican spotted owl and goshawk habitat (see Rationale for the Decision on page 19).

Unavailable Information

After reviewing available literature and consulting with subject matter experts on the potential for mercury emissions from prescribed fire, we have concluded there is incomplete and unavailable information relevant to determining reasonably foreseeable adverse impacts to the human environment as directed by CEQ Sec. 1502.22 (b). (See FEIS, air quality analysis).

Compatibility with Goals of Other Local, State, and Federal Governments

As part of the collaborative effort, the Coconino and Kaibab NFs have engaged other local, State, Federal and tribal governments since 2011. At a local governmental level, the project is not in conflict with City of Flagstaff, Williams, Tusayan and Sedona goals or plans. The cities have received project updates since 2011 (see project record). Community wildfire protection plans for Flagstaff, Williams and Tusayan informed the project's purpose and need for action. Treatments were designed to align with community wildfire protection plans objectives. The project aligns with the goals of Coconino County which seeks to reduce the risk of high-severity fire and protect community watersheds.

Coconino County has expressed support for the project since 2011 (see project record). Since 2011 the Coconino Natural Resource Conservation District (DEIS CARA 176) and Flagstaff Fire Department (DEIS CARA 40) have been stakeholders and have provided comments. Although not directly affected by the project, eastern Arizona counties have commented on the project since 2011. Counties including Navajo, Apache, Graham, Greenlee and Gila commented on the DEIS and provided a review of how the project aligns with county goals and plans (DEIS CARA 76, 89, 158, 163, 164, 158,174, 184). The counties had specific comments and recommendations but overall concluded the project was not in conflict with county goals and objectives.

At the State level, the Arizona Department of Game and Fish was designated as a cooperating agency for the project in 2011 and has continued to support the project (DEIS CARA 113). The Arizona State Forestry Division has been a stakeholder since 2011 and has provided comments and recommendations since scoping (DEIS, CARA 166).

Federal agencies including the Bureau of Land Management (scoping comment) and the National Park Service (DEIS, CARA 118) and neither identified conflicts. Tribal consultation was initiated in 2011. No conflicts with tribal plans or goals have been identified (see the Tribal Relations Report).

Findings Required by Other Laws and Authorities

After consideration of the discussion of environmental consequences (FEIS, Chapter 3), we have determined that the selected alternative is consistent with the Land and Resource Management Plan for the Kaibab National Forest, the Coconino National Forest Plan, as amended, and agency directives. We have also determined that the selected alternative is consistent with applicable Federal laws, Executive Orders, and regulations. The following is not an all-inclusive listing, but summarized conformance with the laws and regulations most relevant to this decision.

National Forest Management Act

The project was reviewed against the direction in the current "Coconino National Forest Plan" (forest plan), as amended (USDA 1987), the "Land and Resource Management Plan for the Kaibab National Forest" (USDA 2014) and 36 CFR 219.17(b)(3). Consistency evaluations are included in each resource report. A consolidated evaluation is located in the project record.

Forest Plan Consistency

Our decision was reviewed for consistency with the direction in the current "Coconino National Forest Plan" (forest plan), as amended (USDA FS 1987), the "Land and Resource Management Plan for the Kaibab National Forest, as revised" (USDA FS 2014) and 36 CFR 219.17(b)(3).

Coconino NF

Three nonsignificant amendments for the Coconino NF were evaluated in the FEIS. The proposed forest plan amendments are authorized via 36 CFR 219, the Forest Service Planning Rule. Section 219.17(b)(3) of the Rule provides the transition language that allows this project to propose amendments to the Coconino NF forest plan using the provisions of the 1982 Planning Rule. Please refer to pages 7 and 16 for detailed information on the amendments.

No amendment will alter multiple-use forest plan goals and objectives or adjust management area boundaries. The changes in standards and guidelines are considered to be minor because they reflect the latest, best available science (Reynolds et al. 2013). The amendments bring the selected alternative into alignment with the revised Mexican Spotted Owl Recovery Plan. No amendment will alter the long-term relationship between levels of multiple-use goods and services originally projected for the Coconino NF. These outputs were specific to a planning period ranging from 10 to 15 years (as identified in 1987). The amendments will not result in an important effect to the entire land management planning area. Each amendment is a specific, one-time variance for this restoration project and decision. The best available science for management in Southwestern forests (Reynolds et al. 2013), the (Coconino NF) forest plan revision process, is affecting ongoing and future analyses. The silviculture analysis documents the project will not alter timber suitability. The plan amendments that are specific to this decision will not impose direction on ongoing or future analyses. I have also determined that the amendments provide the most effective way for achieving the desired ecological conditions described in the forest plan for northern goshawk and Mexican spotted owl habitats as well as the purpose and need.

The Coconino NF is revising its forest plan. This project has generally been designed to be consistent with the revised forest plan, as currently drafted. This decision includes about 250 acres of mechanical and prescribed fire treatments in an area that may be recommended for wilderness in the revised forest plan. The proposed 250 acres of treatments will need to be deferred from treatment if they are included in recommended wilderness.

Kaibab NF

The revised forest plan for the Kaibab NF became effective in April of 2014. The project's desired conditions were based on the best available science for the restoration of southwestern fire-adapted ecosystems (Reynolds et al. 2013).

The project is consistent with the revised forest plan in that a guideline for threatened, endangered and sensitive species directs projects to integrate management objectives and protection measures from approved recovery plans (revised KNF forest plan, p. 51). The revised Mexican Spotted Owl Recovery Plan (USDI FWS 2012) does not limit tree removal from within protected activity centers to a specific d.b.h., nor does it require a specific method for habitat monitoring. Although restricted habitat is referred to as "recovery habitat" and "nest/roost habitats" in the 2012 revised recovery plan (USDI FWS 2012, pp. 3-4), the project's desired conditions for nesting and roosting habitat is consistent with the revised recovery plan. The revised recovery plan still recommends that a percentage (10 to 25 percent) of recovery habitat be managed as nesting and roosting habitat (USDI FWS 2012, p. VIII). Designating habitat in the project area with the best potential would move toward desired percentages in recovery habitat. Also see Appendix D in the FEIS (Implementation Plan).

Forest plan desired conditions for ponderosa pine, a major vegetation type, would be achieved because the project (1) at the fine scale provides for managing crowns of trees within the mid-aged to old groups as interlocking or nearly interlocking (revised Kaibab NF forest plan, p. 17); (2) at the mid-scale manages forest conditions in some areas contain 10 to 20 percent higher basal area in mid-aged to old tree groups than in the general forest (e.g. goshawk post-fledging family areas (PFAs), Mexican spotted owl nesting/roosting habitat, drainages, and steep north-facing slopes) (revised Kaibab NF forest plan p. 18); and, (3) at the landscape scale the ponderosa pine forest is a mosaic of conditions composed of structural stages that range from young to old trees. The forest is generally uneven-aged and open, and old growth occurs throughout the landscape (revised Kaibab NF forest plan, p. 18). Treatment design in ponderosa pine also meets the wildlife guideline of having goshawk nest areas that are multi-aged and dominated by large trees with interlocking crowns and are generally denser than the surrounding forest (Kaibab NF forest plan, p. 51). See Appendix D in the FEIS (Implementation Plan), which provides specific treatment design for alternatives.

The project's use of the term "interspaces" with treatment design is consistent with the forest plan's desired condition at the midscale for interspace (revised Kaibab NF forest plan, p.17). Treatments and site-specific analysis indicate interspace would typically range from 10 to 70 percent and be based on site productivity (see silviculture forest plan consistency evaluations).

The project is consistent with soil and watershed desired conditions and guidelines of the revised Kaibab NF forest plan (pp. 44-46) in that the project is designed to maintain or improve water quality and quantity. The project incorporates best management practices and design features that would control erosion and protect and improve watershed condition (see Appendix C). The project would improve stream channel stability and spring function and move water levels and flow rates towards reference conditions (see FEIS, Chapter 3). The project is consistent with the desired conditions for fire behavior (risk) and fire regime in ponderosa pine by promoting the return of low-severity fire into the landscape (revised Kaibab NF forest plan, p. 18). The project is consistent with narrow and rare endemic species guidelines in that it incorporates measures to protect and provide for rare and narrow endemic species where they are likely to occur (revised Kaibab NF forest plan, p. 52). The silviculture analysis documents the project will not alter timber suitability.

Findings Related to the National Forest Management Act

I, M. Earl Stewart, find the selected alternative, with the inclusion of the nonsignificant amendments to the Coconino National Forest, as amended, is consistent with the goals and objectives of the forest plan. This decision complies with the management direction and standards and guidelines for all relevant management areas described in the plan. I find that the nonsignificant amendments that are part of this decision are consistent with 36 CFR 219, the Forest Service Planning Rule. Section 219.17(b)(3) of the Rule provides the transition language that allows this project to propose amendments to the Coconino NF forest plan using the provisions of the 1982 Planning Rule. The significant of each amendment was evaluated in accordance with FSH 1926.51 and FSH 1926.52. Opportunities for public participation and notification was provided as required in § 219.4 and § 219.16.

I, Michael R. Williams, find the selected alternative is consistent with the revised Kaibab National Forest Land and Resource Management Plan components including goals, objectives, desired conditions, standards, guidelines, and management area guidance. Consistency evaluations are included in each resource report. A consolidated evaluation is located in the project record.

Consultation with the Fish and Wildlife Service

A biological assessment was prepared to evaluate the potential effects of the project on federally listed species, and where appropriate, their critical habitat (Noble 2014). The biological assessment analyzed the potential effects on federally listed species in the project area and on the Coconino and Kaibab NFs including Mexican spotted owls (threatened), California condors (experimental population[6]), narrow-headed garter snakes (threatened), spikedace (endangered), loach minnow (endangered) and roundtail chub (candidate). The biological assessment was submitted to the U.S. Fish and Wildlife Service on February 14, 2014.

This analysis found the selected alternative “may affect, but is not likely to adversely affect”, the threatened narrow-headed garter snake (*Thamnophis rufipunctatus*) and its proposed critical habitat, spikedace (*Meda fulgida*) critical habitat, loach minnow (*Tiaroga cobitis*) critical habitat , and the candidate roundtail chub (*Gila robusta*). The botanical analysis found the selected alternative “may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability” for the Arizona bugbane (*Cimicifuag airzonica*), a sensitive species, covered under a conservation agreement.

The analysis for Mexican spotted owl (*Strix occidentalis lucida*) and its critical habitat concluded there is potential for short-term adverse effects to owls. Long-term effects of the project should be beneficial to Mexican spotted owls by enhancing key habitat components for Mexican spotted owl and their prey. The selected alternative may effect, and is likely to adversely affect the Mexican spotted owl and its critical habitat (Noble 2014).

The biological opinion (AESO/SE 22140-2011-F-0145) for the project was signed on October 20, 2014 (USDI FWS 2014). The FWS provided technical assistance as requested for bald eagles and golden eagles. The U.S. Fish and Wildlife Service concurred with the determinations presented in the biological assessment for narrow-headed garter snake and its proposed critical habitat, spikedace critical habitat, loach minnow critical habitat, roundtail chub, and Arizona bugbane.

[6] section (10)(j) of the ESA

The U.S. Fish and Wildlife Service found the selected alternative will not jeopardize the continued existence of the Mexican spotted owl, and will not destroy or adversely modify its designated critical habitat (USDI FWS 2014, page 33).

Incidental take for Mexican spotted owl (per Section 9 of the Endangered Species Act) was assigned at the PAC level. The amount of take tiers to (is included within) the amount of take anticipated under the 2012 biological opinion for the Coconino NF forest plan and the 2013 biological opinion for the Kaibab NF Land and Resource Management Plan (USDI FWS 2014, pp. 33-36). Nondiscretionary terms and conditions associated with the incidental take were included. These terms and conditions can be found in the project record.

Bald and Golden Eagle Protection Act

All golden and bald eagles are protected under the Bald and Golden Eagle Protection Act. Technical assistance was requested from the FWS to ensure the intent of the Bald and Golden Eagle Protection Act was met while implementing the actions associated this decision. With design features and mitigation (FEIS, Appendix C) this decision will not result in take for either species (USDI FWS 2014). This decision aligns with the direction recommended by the U.S. Fish and Wildlife Service to follow the direction provided in the "Conservation Assessment and Strategy for Bald eagles in Arizona" (Driscoll et. al. 2006) and the "Bald Eagle National Guidelines" (USDI FWS 2007). This decision is also in alignment with the U.S. Fish and Wildlife Service-issued "Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocols and Other Recommendations in Support of Golden Eagle Management and Permit Issuance" (Pagel et al. 2010).

Collaborative Forest Landscape Restoration Act

We find this decision is compliant with the Collaborative Forest Landscape Restoration Act. The purpose and need in the FEIS was revised from the DEIS to the FEIS to emphasize the need to comply with Omnibus Public Land Management Act criteria for landscape-scale restoration (FEIS, Chapter 1). The Large Tree section of the Purpose and Need discloses that large trees (VSS 5 and 6) are currently underrepresented within the project area and the desired condition is to balance community, wildlife and forest restoration into treatment design. This decision acknowledges that while some large trees may be removed to accomplish ecological objectives or public safety objectives around communities, there is a need to retain as many large trees (larger than 16 inches d.b.h.) as possible. The FEIS and this decision acknowledge the rarity and ecological and socio-political importance of large trees in the Southwest. This decision includes a process (Appendix D) that addresses large tree retention during project implementation. This decision is consistent with the Collaborative Forest Landscape Restoration Act direction regarding the prohibition of building permanent roads. Only temporary roads, as dictated by Appendix C design features, mitigation measures, and best management practices, will be authorized in this project (FEIS, Appendix C).

National Environmental Policy Act (NEPA)

The National Environmental Policy Act requires Federal agencies to consider and disclose the effects of proposed actions that significantly affect the quality of the human environment. The Four-Forest Restoration Initiative, Coconino and Kaibab National Forests FEIS analyzes the alternatives and displays the effects in conformance with the Act (40 CFR 1500 to 1508 and FSH 1909.15).

Endangered Species Act

This decision is compliant with the legal requirements set forth under Section 7 of the Endangered Species Act (16 U.S.C. 1536 (c)). The selected alternative follows the guidance of section 7(a)(1) and the direction provided in section 7(a)(2).Federally-listed species in the project area and on the Coconino and Kaibab NFs include Mexican spotted owl (threatened), California Condor (Experimental population (Section (10)(j) of the Act), narrow-headed garter snake (threatened), spikedace (endangered), loach minnow (endangered) and roundtail chub (candidate). The FEIS discloses potential impacts to the federally listed, proposed, and candidate species as displayed below in the summary of determination table (table 2).

There will be no effects to several federally listed species. There will be no direct, indirect or cumulative effects to black-footed ferret. Prairie dog surveys are required before treatments occur in their habitat to assess the status and extent of this black-footed ferret prey species. The selected alternative will have no measureable direct, indirect, or cumulative effects to California condors. Design features have been developed to protect condors in the event they are detected during project implementation (FEIS, Appendix C, W39 to W43). Gila chub, razorback sucker or Colorado pikeminnow were eliminated from further analysis because these species does not have occupied habitat in the analysis area.

The analysis (biological assessment) for Mexican spotted owl concluded there is potential for short-term adverse effects to owls (also see the Uncertainty and Risk for Mexican Spotted Owl section on pp. 34-35). However, long term effects of the project should be beneficial to Mexican spotted owls by enhancing key habitat components for the owl and their prey. The likelihood of maintaining Mexican spotted owl habitat into the future is also enhanced by reducing the predicted risks from climate change-induced changes to temperature and precipitation patterns and their synergistic effects with insects, disease, and risk of high-severity fire (Noble 2014). The biological opinion (AESO/SE 22140-2011-F-0145) for the project was signed on October 20, 2014. The U.S. Fish and Wildlife Service found that the effects of the proposed action and the cumulative effects, will not jeopardize the continued existence of the Mexican spotted owl, and will not destroy or adversely modify its designated critical habitat (USDI FWS 2014, p. 33).

The narrow-headed garter snake, which occurs on the Coconino NF, was recently listed as a threatened species (effective August 7, 2014) and the U.S. Fish and Wildlife Service has proposed critical habitat (USDI FWS 2014, 2013, respectively). This analysis considered a recent change in condition as a result of wildfire (Noble et al. 2014). The selected alternative may affect but is not likely to adversely affect the species, nor is it likely to adversely affect the snake's habitat. Considering direct, indirect, and cumulative effects, the selected alternative may affect but is not likely to adversely affect proposed narrow-headed garter snake critical habitat (biological assessment 2014). The U.S. Fish and Wildlife Service concurred with this determination (USDI FWS 2014, p. 46).

The analysis for spikedace (endangered) and loach minnow (endangered) concludes that these species are not currently present. The selected alternative will result in no effect to these species. There may be short-term increases in sedimentation and/or ash flow into critical habitat from prescribed fire actions. Long-term benefits would result from restored hydrologic function at spring sources, reduced potential for severe flooding in restored ephemeral channels, and reduced erosion and runoff resulting from properly decommissioned and/or relocated roads. For these reasons, the selected alternative may affect but is not likely to adversely affect spikedace or loach minnow critical habitat (see Aquatics Report, Species Effects). The U.S. Fish and Wildlife Service concurred with this determination (USDI FWS 2014, p. 47).

The only candidate species that may become federally listed within the life of this project is the roundtail chub (Coconino NF). The analysis for the chub concludes that BMPs will mitigate the short-term impacts from increases in soil movement and sedimentation as a result of spring and stream restoration and road decommissioning. Long-term benefits are the same as described for spikedace and loach minnow. The selected alternative may affect but is not likely to adversely affect roundtail chub or its habitat (see Aquatics Report, Candidate Species). The U.S. Fish and Wildlife Service concurred with this determination (USDI FWS 2014, p. 47).

The analysis for Arizona bugbane (Forest Service sensitive species with a conservation agreement) concludes that the selected alternative may result in a loss of plants and shade but effects will be mitigated to protect the shady environment needed by Arizona bugbane. The project may impact individuals but is not likely to result in a trend toward federal listing or loss of viability. The U.S. Fish and Wildlife Service concurred with this determination (USDI FWS 2014, p. 48).

Table 2. Effects determination for federally listed and candidate species

Common Name	Status	Effects Determination
Mexican Spotted Owl (*Strix occidentalis lucida)* and critical habitat	Threatened	May Effect and is Likely to Adversely Affect Mexican spotted owls and their habitat. May Effect and is Likely to Adversely Affect Mexican spotted owl critical habitat
California Condor *(Gymnogyps californianus)*	Experimental population (Section (10)(j) of the ESA)	No measureable direct, indirect or cumulative effects
Black-footed Ferret (*Mustela nigripes*)	Endangered	No direct, indirect or cumulative effects
Narrow-headed Garter Snake (*Thamnophis rufipunctatus*) and proposed critical habitat	Threatened	May Affect but is Not Likely to Adversely Affect the species, nor is it likely to adversely affect the snake's habitat.. May Affect but is Not Likely to Adversely Affect proposed narrow-headed garter snake critical habitat
Spikedace (*Meda fulgida)*	Endangered	May Affect but is Not Likely to Adversely Affect" spikedace critical habitat
Loach minnow (*Tiaroga cobitis)*	Endangered	May Affect but is Not Likely to Adversely Affect" loach minnow critical habitat
Roundtail chub (*Gila robusta)*	Candidate	May Affect but is Not Likely to Adversely Affect" roundtail chub or its habitat
Arizona bugbane (*(Cimicifuga arizonica)*	Forest Service sensitive species with a conservation agreement, included in FWS consultation	May impact individuals but is not likely to result in a trend toward federal listing or loss of viability.

Forest Service Sensitive Species

Federal law and direction applicable to Forest Service sensitive species are included in the National Forest Management Act and the Forest Service Manual (2670). The Regional Forester has developed the sensitive species list for plants and animals for which population viability is a concern. The most recent list was transmitted to us on September 18, 2013. We prepared a biological evaluation on species designated as sensitive by the Regional Forester.

The selected alternative will have no effect on western burrowing owl (*Athene cunicularia hypugaea)*. No burrowing owls have been documented in the project area. However, potential nesting habitat does exist and the analysis focuses on owl prey habitat conditions. The selected alternative will improve potential future habitat. There will be no effect to Cliff fleabane (*Erigeron saxatilis)*. The habitat is on steep canyon walls and is not likely to be affected by management actions.

The selected alternative may affect individuals, but will not cause a trend toward federal listing for the following sensitive species: northern goshawk (*Accipiter gentilis)*, northern leopard frog (*Lithobates pipiens)*, bald eagle (*Haliaeetus leucocephalus)*, American peregrine falcon (*Falco peregrinus anatum)*, Navajo Mogollon vole (*Microtus mogollonensis Navaho)*, western red bat (*Lasiurus blossevillii)*, Allen's lappet-browed bat (*Euderma maculatum)*, pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens)* and spotted bat (*Euderma maculatum*) (see the Wildlife Report, Forest Service Sensitive Species).

Plant species include: Arizona bugbane (*Cimicifuga arizonica*), rusby milkvetch (*Astragalus rusbyi*), Arizona leatherflower (*Clematis hirsutissima var. hirsutissima*), Flagstaff pennyroyal (*Hedeoma diffusum*), Arizona sneezeweed (*Helenium arizonicum*), Sunset Crater beardstongue (*Penstemon clutei*), Arizona phlox (*Phlox amabilis*), Blumer's dock (*Rumex orthoneurus*) and Bebb's willow (*Salix bebbiana*).

Aquatic species include roundtail chub (*Gila robusta*), desert sucker (*Catostomus clarki*), Sonora sucker (*Catostomus insignis*), California floater (*Anodonta californiensis*) and A Caddisfly (*Lepidostoma knulli*) and A Mayfly (*Moribaetis mimbresaurus)* (see the Aquatics Report, Candidate Species and Forest Service Sensitive Species).

Management Indicator Species

Effects on management indicator species are disclosed in the FEIS (Chapter 3). Since the DEIS was made available for comment in 2013, a new forestwide Coconino NF management indicator species report was produced and the Kaibab NF developed a new management indicator species list as part of the revised (2014) forest plan.

On the Coconino NF, terrestrial management indicator species within the project area include northern goshawk, pygmy nuthatch and wild turkey (late seral ponderosa pine), elk, Abert's squirrel (early seral ponderosa pine), hairy woodpecker (snags in ponderosa pine), red-naped sapsucker (late seral aspen and snags in aspen), mule deer (early seral aspen and pinyon juniper), juniper titmouse (late seral pinyon juniper and snags in pinyon juniper), and pronghorn (early and late seral grasslands).

Effects to habitat trends range from no change (due to minimal percentage of habitat treated) to a stable or increasing change in habitat trend in both the short and long term. The selected alternative results in population trends that: do not change due to the minimal acres affected (juniper titmouse), change from decreasing to stable (mule deer), or increase in the long term.

Only Abert's squirrel may experience a short term disturbance that may cause the population trend to decrease before it increases in the long term (see the Wildlife Report, MIS for the Coconino NF).

On the Coconino NF, the potential impacts from the selected alternative would not affect the forestwide trends for macroinvertebrate populations or the quality of their habitat. In the long term, the selected alternative would maintain or improve the current forestwide trends in riparian habitat (stable to improving) and in macroinvertebrate populations (stable) (see the Aquatics Report, Management Indicator Species).

I, M. Earl Stewart, find that the selected alternative is consistent with the standards and guidelines pertaining to management indicator species. Additionally, based on the limited effects to any management indicator species, the selected alternative does not result in a long-term reduction in the number of acres of available habitat for any of the management indicator species, and does not contribute towards a negative trend in viability on the Coconino National Forest.

On the Kaibab NF, management indicator species within the project area include Grace's warbler and the western bluebird for ponderosa pine and pronghorn for grasslands. Effects to habitat trends range from stable to increasing in the short term and all habitats show an increasing in the long term. Population trends range from stable to increasing both in the short and long term (see the Wildlife Report, "Management Indicator Species for the Kaibab NF"). I, Michael R. Williams, find that the selected alternative is consistent with management indicator species forest plan components. The selected alternative does not result in a reduction in the number of acres of available habitat for management indicator species, and does not contribute towards a negative population or habitat trend on the Kaibab National Forest.

Migratory Bird Treaty Act and Executive Order 13186

The selected alternative, with the design features, mitigation measures, and best management practices described in Appendix C of the FEIS provides for restoration of specific habitat features in the Anderson Mesa Important Bird Area. The multiple habitats within the Important Bird Area are expected to benefit migratory species. The migratory bird analysis discloses that thinning and broadcast burning operations activities may lead to loss of egg viability or injury or death to nestlings. Overall, unintentional take of some individual birds may occur. However, no measurable negative effect to any of the bird populations is associated with the selected alternative. No effects to local populations are expected (FEIS, Chapter 3, Migratory Birds).

National Historic Preservation Act

The National Historic Preservation Act and the NEPA both require that consideration be given to the potential effects of Federal undertakings on historic resources (including historic and prehistoric cultural resource sites).

Initial concurrence on a heritage implementation strategy was received from Arizona State Historic Preservation Office (AZ SHPO) in accordance with Section 106 of the National Historic Preservation Act in 2011. Implementation will be phased over several years as allowed by Appendix J of the Southwestern Region Heritage Programmatic Agreement (for the phasing of Section 106 compliance evaluations). Appendix J, the heritage strategy, and the project's Section 106 report methods will be used to achieve a no adverse effect determination for the selected alternative.

Individual task orders or specific project areas will be evaluated by a forest heritage staff for inventory needs and then surveyed to the appropriate level as defined in the heritage (implementation) strategy. A Section 106 report will be produced for each project area as they are identified. Consultation with the AZ SHPO and tribes will be completed prior to implementing each task order.

The cultural resource analysis (FEIS, Chapter 3) concluded potential effects to cultural resources will be avoided using the protection measures in the heritage protocol and Section 106 clearance report, or the adverse effects will be mitigated.

Per the Programmatic Agreement with AZ SHPO, there will be continued coordination and clearances conducted for each action proposed during implementation. Per agreement with affected tribes, coordination will occur prior to initiating project-specific task orders to identify traditional use areas and, if necessary, develop project-specific mitigation measures to accommodate traditional use of the forest. As part of ongoing tribal consultation, we will inform tribes on the timing, type, and amount of smoke tribes may experience during implementation. We find the selected alternative is in compliance with National Historic Preservation Act.

Clean Water Act

Public Law 92-500, as amended in 1977 (Public Law 95-217) and 1987 (Public Law 100-4) (also known as the Federal Clean Water Act provides the structure for regulating pollutant discharges to waters of the United States. In Arizona, the designated agency for enforcement of the Clean Water Act is the Arizona Department of Environmental Quality (ADEQ).

The selected alternative is expected to result in minor, short term adverse effects to water quality in water bodies within and adjacent to mechanical vegetation and grassland restoration treatment area. Best Management Practices and soil and water conservation practices will be applied to the selected alternative. These resource protection measures will minimize nonpoint source pollution as outlined in Memorandum of Understanding between the Arizona Department of Environmental Quality and the Forest Service Southwestern Region (ADEQ 2013). These measures will minimize or mitigate most adverse effects to water quality or riparian areas at the site-specific or localized scale. Based on the water quality and riparian analysis (see the Water Quality and Riparian Areas Report), we find the selected alternative is consistent with the Clean Water Act.

Clean Air Act

The FEIS (Chapter 3, Fire Ecology) addresses and discloses impacts from prescribed fire as required by the Clean Air Act. Under the selected alternative, air quality impacts will be most likely to those portions of the Little Colorado River Airshed east and northeast of Flagstaff; the Colorado River Airshed north of Williams and including all of the treatment area in RU 6; and the Verde River Airshed. There is a small chance that there could be some impact to the northern portions of the Lower Salt River Airshed. In the short term, there will be air quality impacts during implementation of the selected alternative. However, National Ambient Air Quality Standards (NAAQS) will not be exceeded. In the long term, there will be less fuel and a lower emission potential once an area has received one burn. The combination of lower fuel loads and larger burn units will allow more acres to be burned without exceeding NAAQS (see the Fire Ecology and Air Quality Report). We find this decision is compliant with the Clean Air Act.

Executive Orders 11990 and 11988 - Wetlands and Floodplain Management

The water quality analysis concludes that there will likely be some minor, short-term, localized adverse effects to water quality from selected alternative activities. Best management practices and soil and water conservation practices (FEIS, Appendix C) will minimize or mitigate most adverse effects to water quality or riparian areas at the site-specific or localized scale (see the Water Quality and Riparian Areas Report). In the long term, riparian and wetland function (as evaluated as soil erosion above tolerance and areas of high severity fire) are expected to improve. The selected alternative protects floodplains and water quality adjacent to wetlands and is consistent with executive order direction.

Executive Order 12898 - Environmental Justice

In response to a comment from the June 2012 NEPA update public meeting, the possibility of smoke-related environmental justice consequences in Snowflake, Arizona were evaluated. The community does not have a meaningfully greater percentage of minority residents than the state and Snowflake has a smaller proportion of individuals living in poverty than either the state or nation (U.S. Census Bureau 2010). In addition, the community is geographically distant from the project area, and therefore unlikely to experience acute smoke effects. As a result, Snowflake is not considered an environmental justice community in this analysis.

The selected alternative will not reduce employment and income relative to current conditions, therefore, no disproportionate adverse economic effects will occur. The mill in Cameron, which is on the Navajo Nation, may benefit from increased wood supply from 4FRI. However, any effect to the mill is likely to be small. Changes in employment and income associated with the mill are more likely to be affected by activities unrelated to 4FRI, such as potential growth in Tuba City.

Smoke emissions resulting from wildfires and prescribed burns can have health and quality of life consequences. Smoke is most likely to affect vulnerable populations, such as children, the elderly, and individuals in poor health. Limited communications technology, language barriers, and cultural differences may also limit the effectiveness of informing nearby residents of upcoming prescribed burns. These conditions would occur in all alternatives evaluated, including the no action alternative. Burn plans will be written for implementation of the proposed prescribed fires. The burn plans will include modeling to determine the most appropriate conditions under which to burn in order to minimize smoke impacts. Traditional and sacred forest uses will continue under the selected alternative (see the Socioeconomic Report, Social Consequences Environmental Justice).

Wild and Scenic Rivers Act

No designated wild and scenic rivers will be affected by this decision. The Coconino NF revised forest plan (as currently written) has identified West Fork of Oak Creek (within Red Rock-Secret Mountain Wilderness) as an eligible wild and scenic river. There will be short-term effects associated with mechanical treatment and prescribed fire. The areas that overlap the proposed wild and scenic river boundary with the project have mitigation measures to protect soil and watershed, scenery, and other resources. The activities approved in this decision will help to protect potential values of the eligible wild and scenic river from the effects of wildfire (see the Recreation Report).

Inventoried Roadless Areas

The 2001 Roadless Area Final Rule (36 CFR Part 294) established protections for inventoried roadless areas. The rule prohibits road construction, reconstruction, and timber harvest except for other than stewardship purposes. This decision does not include treatments within inventoried roadless areas.

Permits, Licenses, and Authorizations Needed to Implement the Decision

- Section 404 of the Clean Water Act outlines the permitting process for dredging or discharging fill material into waters of the U.S., including wetlands. Section 401 of the Act allows States and tribes to review and approve, set conditions on, or deny Federal permits (such as 404 permits) that may result in a discharge to state or tribal waters, including wetlands. When required to implement springs, streams, and temporary road construction and decommissioning, obtain a 404/401 permit from the U.S. Army Corps of Engineers.
- The Forest Service will coordinate with ADEQ and obtain water quality certification from ADEQ as needed prior to project implementation.
- In accordance with the legal requirements set forth under Section 7 of the Endangered Species Act (16 U.S.C. 1536 (c)), formal consultation was conducted with FWS and a biological opinion was received on October 20, 2014. The U.S. Fish and Wildlife Service found that there would be no jeopardy to any species or adverse modification to any designated critical habitat. Coordination will continue with the Fish and Wildlife Service throughout project implementation as treatments are completed and effects monitored.
- Initial concurrence from Arizona State Historic Preservation Office (AZ SHPO) was received in accordance with Section 106 of the National Historic Preservation Act. Per the Programmatic Agreement with AZ SHPO, there will be continued coordination and clearances conducted for each action proposed during implementation.
- Per agreement with affected tribes, coordination with federally recognized tribes will occur prior to initiating project-specific task orders to identify traditional use areas and, if necessary, develop project-specific mitigation measures to accommodate traditional use of the forest by tribal members.
- All burning will be coordinated daily with ADEQ. Burning will not take place on any portion of the project without prior approval from ADEQ.

Implementation

The project implementation plan (Appendix D) describes the linkage from the FEIS to the project specific work without the need for additional NEPA analysis (above and beyond this environmental analysis). It must be considered in conjunction with Appendix C which provides the design criteria, best management practices, and mitigation measures. The implementation plan is comprised of several checklists including the Annual Implementation Checklist (FEIS, Table 117), Planned Acres by Treatment Type and Restoration unit (RU) (FEIS, Table 118), NEPA, NFMA, ESA, CFLR Act Compliance Evaluation (FEIS, Table 119), and Supporting Documentation (FEIS, Table 120).

The implementation plan includes several sections designed to guide project implementation. See page 18 for a description of each section.

Monitoring

Input from the 4FRI stakeholders and the public was used to develop the monitoring and adaptive management plan included in Appendix E of the FEIS. Appendix E also includes the monitoring plan for Mexican spotted owl, Arizona bugbane, and the adaptive management plan for roads, springs and ephemeral channels. As a result of the objection resolution process, Appendix E has been updated to address MSO PAC monitoring and grazing.

Effective Date

Per 36 CFR 218.11 (b), the ROD may be signed when all concerns and instructions identified by the reviewing officer in the objection response letter have been addressed (see Appendix 1). Implementation may begin immediately following the date of this final decision.

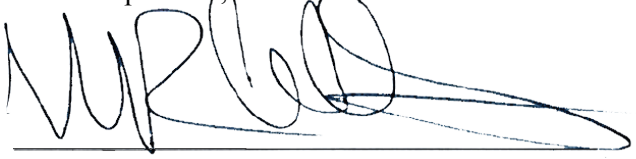
Contact

For additional information concerning this decision and the final environmental impact statement, please contact Annette Fredette, Four-Forest Restoration Initiative team leader, by telephone at 928-226-4684 or by email at: afredette@fs.fed.us. Additional information is also available on the project website at: http://www.fs.usda.gov/main/4fri/planning.

Responsible Official Signatures

17 April 2015

M. EARL STEWART
Forest Supervisor, Coconino National Forest



4/17/2015

MICHAEL R. WILLIAMS
Forest Supervisor, Kaibab National Forest

Appendix 1. Objection Resolutions

Table 3. Objection issues and changes made per resolution meetings

<table>
<tr><th>Objector Issue</th><th>Changes Per Resolution Meetings</th><th>Where Changes Made</th></tr>
<tr><td colspan="3">Chad Hanson, John Muir Project (0007)</td></tr>
<tr><td>Issue 1. Key scientific sources regarding historical forest structure and fire regimes, and Mexican spotted owl responses to fire are missing from the record.</td><td>

Add language and references to the Silviculture Report outlining the forest density structure of Williams and Baker, et.al as follows:
The forest structure described in various literature (Reynolds et, al. 2013; Williams and Baker 2012; William and Baker 2013; Woolsey 1911; Pearson 1950; Covington and Moore 1994; Swetnam and Baisan 1996; Covington et. al. 1997) is very similar to that described in this project. While the individual metrics used in the literature to describe the desired stand structure vary slightly, it is clear that almost all of the stand densities in the 4FRI EIS fall within the natural range of variability described in the relevant literature.
Compare the forest structure indicated in the literature to what is being proposed by the 1st 4FRI EIS (the forest densities are very similar).

<table>
<tr><th>Literature-indicated Forest Structure</th><th>What the Silviculture Report/FEIS Propose (language can be added where needed)</th></tr>
<tr><td>Defined small trees as > 10cm up to 40 cm (3.9” up to 15.7” d.b.h.).

Defines high density forests with approximately 141-145 trees/ha (57-59 trees per acre), and 17.3% of the forest exceeded 200 trees per hectare (81 trees per acre), and 4.2% of the area exceeding 300 trees per acre (122 trees per acre).

58 TPA over 4” d.b.h.
16-18% of forest areas >81 TPA
52-81% of trees under 16” d.b.h.</td><td>In Alternative C, 4FRI proposes mechanical treatment on 431,049 acres.

Post-treatment structure is:
VSS 2 (4.0-4.9”) = 18.24 TPA (0-604) (28.1%)
VSS 3 (5.0-11.9”) = 24.39 TPA (0-639) (37.5%)
VSS 4 (12.0-17.9”) =12.7 TPA (0-84) (19.5%)
VSS 5 (18-23.9” = 6.89 TPA (0-53) (10.6%)
VSS 6 (24”+) = 2.83 TPA (0-18) (4.3%)
Total Trees Per Acre = 65.05
Projections for post-treatment density figures are:[7]
65.05 TPA across the treatment stands (4.0”+ d.b.h.)
29.3% of stands are > 81TPA
90.3% of the stands have >52% of the trees <16” d.b.h.
The range of TPA is approximately 0-639 TPA</td></tr>
</table>
</td><td>Silviculture Report, Addendum and Errata</td></tr>
</table>

[7] Refer to Project Record #954, Summary of Projected Post-Treatment conditions by Type.

Objector Issue	Changes Per Resolution Meetings	Where Changes Made
Issue 1, continued.	• Add language and reference to Fire Ecology Report (Introduction, p. 1, 5th paragraph)**:** Landscape scale analyses are important for understanding how ecosystems responded historically to climate change or disturbances across environmental gradients (White and Jentsch 2001). Fire is a keystone process in healthy ponderosa pine ecosystems as well as grasslands, aspen, and other ecosystems within the analysis area. Fire ecology is the study of the symbiotic relationship of fire with all spatial and temporal components of an ecosystem. • In both the Fire Ecology Report and the Fire Ecology section of the FEIS, change "Opposing Science" heading to "**Other Science Reviewed**" and modify language in this section: Commenters also cited publications (Williams and Baker 2013; Williams and Baker 2012) to support their comments. **Over the last several years, there has been a series of publications with differing conclusions about the role of fire in ponderosa pine forests in Arizona.** Williams and Baker compiled a large set of historical data that consists of records made by land surveyors for the General Land Office (GLO) in the late 1800s and early 1900s. Surveyors marked trees around corner points that delineated square miles and quarter-miles, sometimes making additional comments about the country they were walking through. This research provided new data in the form of estimates of forest density, species, and diameters of trees at the time of the survey **(Williams and Baker 2012). Based on the density and size-class data, they devised a method for determining past fire regimes, concluding** that the **proportion of high-severity fire in recent fires was less than or similar to the proportion of high-severity fire in recent fires was less than or similar to the proportion in historical fires (Williams and Baker 2012)**. They also concluded that, **historically,** high severity fire was more prevalent across the ponderosa pine in Arizona than had been indicated by previous research **(cited elsewhere in this report). Fulé et. al. (2013) responded with concerns about Williams and Baker's (2012) methods and conclusions about high severity fire.** **In evaluating the available research that is specific to fire regimes in ponderosa pine in Arizona and the project area, many people feel that ecological, social and economic values are not consistent with the pre-restoration disturbance regime of large, high-severity fires, especially under changing climate. However, ecological restoration in the project area will lead to a restored fire regime with historical levels of low, mixed, and high-severity fire, even if the details of the historical levels remain under ongoing study.**	Fire Ecology Report, Addendum and Errata
Issue 1, continued	• Add paragraph and modify language in Affected Environment, Historic conditions affecting the 4FRI analysis: **The 4FRI project area lies between Grand Canyon National Park's South Rim and the southern boundary of the Coconino National Forest. This area is dominated by ponderosa pine that is intermixed with pinyon pine, juniper, Gambel oak, aspen, grassland, and shrubland vegetation. Across the landscape, this mosaic of vegetation supported, and was supported by, a mosaic of fire regimes, ranging from low to high severity (Williams and Baker 2013). The driest part of the**	FEIS, Chapter 1

Objector Issue	Changes Per Resolution Meetings	Where Changes Made
	project area is on the Coconino Plateau, where ponderosa pine forests may have been less continuous, with significant portions of the landscape being pinyon/juniper or grass and shrubs, and more of the ponderosa pine is intermixed with shrubs (such as sage), or pinyon/juniper. Studies done in this area showed that, particularly where pinyon/juniper and mixed conifer intermixed with ponderosa pine, low-severity fire likely structured the majority of the forest while roughly a third was structured by mixed-severity fire, probably including small, patchy crown fires (Williams and Baker 2013; Huffman et al. 2008). Historically, both lightning and human-caused fires, once started, could burn until extinguished by rain, or until they ran out of fuel (typically when they reached an area that had recently burned). Fires could burn for months and cover thousands of acres (Swetnam 1990, Swetnam and Baisan 1996). Effects from these long burning fires would vary as conditions changed over the weeks they burned. As a result, most ponderosa pine in the southwest burned every 2 to 22 years as **mostly** low-severity, often area-wide fires (Weaver 1951, Cooper 1960, Dieterich 1980, Swetnam et al. 1990, Swetnam 1990, Swetnam and Baisan 1996, Fulé et al. 1997a, Fulé et al. 2003, Covington et al. 1997, Heinlein et al. 2005). Across the treatment area, the desired condition would allow the use of prescribed fires to supplement unplanned ignitions, producing an average annual Fire Return Interval (FRI) in the ponderosa pine of no more than 20 years, with a 10 year FRI being preferred unless monitoring indicates a change is warranted. The FRI on the southern end of the project would average less than 10 years because the higher precipitation produces faster regeneration and growth (Puhlick et al. 2012), while the northern, drier portion of the project area could go for 20 – 30 years, depending on environmental conditions affecting fuel accumulations, regeneration, and initial condition (Fulé and Laughlin 2007). Across the treatment area, forest conditions would allow for the use of fire as addressed in the land and resource management plan. Frequent surface fires would rarely move up into tree crowns and, when crown fire did occur, it would **mostly** be passive crown fire, limited to the tree or the group within which it started, **or small patchy areas of crown fires**. Restored sustainable fire regimes, from a combination of planned and unplanned ignitions, would regulate landscape structure, pattern, and composition, aligning forest changes with climate changes. **While researchers generally agree that there was some mixed and/or high-severity fire in ponderosa pine (Williams and Baker 2013, Roccaforte et al. 2008), there are some unresolved questions about the amount, pattern, and distribution of these fires. Some studies on the rates of these fires suggest they were relatively infrequent (Williams and Baker 2012). This is corroborated by Jenkins et al. (2011), whose paleoecological reconstruction found high-severity fires in transitional ponderosa and dry mixed-conifer forests at 200-600 year intervals over the last 1000 years.** **Some science indicates the size and extent of high-severity fires are much larger than historic data indicates was typical of ponderosa pine in the southwest (Swetnam 1990, Covington and Moore 1994, Swetnam and Betancourt 1998, Westerling et al. 2006, Climate Central 2012, Miller and Safford 2012) and, while the number of fires reported in and adjacent to the project area has**	

Objector Issue	Changes Per Resolution Meetings	Where Changes Made
	decreased over the last 40 years, the average size has increased.	
Issue 2. Concerns regarding heterogeneity across the landscape.	• Add the following language to promote heterogeneity to the Final ROD: **The objective of the project is to restore forest structure, pattern, composition, diversity and landscape heterogeneity, within the ponderosa pine (*Pinus ponderosa*) ecosystem that will lead to increased forest resiliency and function and restore the historical fire regime. The intent of the 4FRI project is to obtain a high level of vegetative responses that will increase ecosystem diversity by increasing horizontal and vertical heterogeneity. Restoration initiates or accelerates ecosystem recovery with respect to ecological health, integrity, and sustainability (Reynolds et al 2013). Resiliency increases the ability of the ponderosa pine forest to survive natural disturbances such as insects, diseases, fire, and climate change (FSM 2020.5) without changing its inherent function (SER 2004). Restoration activities proposed with this project are expected to put the project area on a trajectory towards comprehensive, landscape-scale restoration, with benefits that include improved vegetation biodiversity, wildlife habitat, soil productivity, and watershed function, as well as increased forest structure heterogeneity. Restoration treatments are expected to expand burn windows for both planned and unplanned ignitions. Decision space for managing unplanned ignitions will be expanded as projects are implemented, increasing areas with restored historical levels of low, mixed, and high-severity fires as directed by forest plans.**	Record of Decision, How Well the Selected Alternative Responds to Issues, Concerns and the Project Purpose and Need
Issue 2, continued	• This language in the Final ROD will be supported in the FEIS, Silviculture Report, and Fire Report by adding the following language to those documents: **Alternative C includes treatments on 431,049 acres.** **The post-treatment tree density (trees per acre, TPA), after mechanical treatments and prescribed fires, across the 431,049 acres, is projected to be no less than 65 TPA (mean).** **In the post-treatment landscape, across the 431,049 acres, it is projected that more than 16% of stands will have no less than 81 TPA (mean).** **The post-treatment landscape, across the 431,049 acres, is projected to be dominated by small trees, with more than 51.8% of the trees smaller than 15.7" d.b.h.**	FEIS Chapter 3, Silviculture FEIS Chapter 3, Fire Ecology
Issue 2, continued	• Discussion and explanation of other scientific references, published prior to the completion of the 4FRI EIS analysis, will be added or expanded upon in the FEIS, Silviculture Report, and Fire Report for the following literature and findings: Williams and Baker (2013) found the mean density of historical forests was 142-144 trees/ha (57-59 TPA), and 16-18% of forest area was dense, with > 200 trees/ha (81 TPA). Leiberg et al. (1904): "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 stocked chiefly with sapling growths, ranging in age from 35 to 90 years."	FEIS, Chapter 3, Silviculture FEIS, Chapter 3, Fire Ecology

Objector Issue	Changes Per Resolution Meetings	Where Changes Made
	Jenkins et al. (2011 p. 138-139): "…the evidence indicates that severe wildfire was an important influence on the pre-European-settlement landscape in transitional PIPO and PIPO-MC…Fires are recorded in our study area with a frequency of several centuries, ranging from 600 to 200 years for multiple-basin events." Williams and Baker (2012): This study found that the historical fire regime in ponderosa pine forests on the Mogollon Plateau included 62.4% of the area with evidence of only low-severity fire, 23.1% of the area with mixed-severity fire, and 14.5% of the area with high-severity fire (Williams and Baker 2012, Table 2). Also, the historical fire rotation for high-severity fire was 828 years across the Mogollon Plateau, thus these fires were infrequent, as also found by Jenkins et al. Williams and Baker (2013): This study found that the historical fire regime in ponderosa pine forests on the Coconino Plateau included 58.8% of the area with evidence of only low-severity fire, 38.7% of area with mixed-severity fire, and 2.5% of area with high-severity fire (Williams and Baker 2013, Table 2).	
Sandy Bahr, Sierra Club; also represented by Alicyn Gitlin Objection 0009		
Issue 1. Link tree density to historic grazing and associated removal of understory (mention is made of reduced grasses and forbs; but link not made to increased tree density, inability to carry fire, or reduced competition of seedlings with understory plants).	• Modify FEIS Appendix F (Cumulative Effects) to include a discussion on how historic grazing influenced the existing condition. Add references such as Drake (1910), Belsky and Blumenthal (1997), and Bakker et al. (2010) to the discussion.	FEIS, Appendix F
Issue 2. Mention interaction of grazing with fire suppression to degrade forests, including old growth forests.	• Add grazing presence/absence and grazing intensity as indicators to the Monitoring Plan (Appendix E). Add grazing as a monitored covariable of the existing indicators in Appendix E (Monitoring Plan) and add range readiness language to Appendix C (Design Features, Best Management Practices, and Mitigation) and Appendix D (Implementation Plan).	FEIS, Appendix E FEIS, Appendix C FEIS, Appendix D
Issue 3. Noxious weeds/cheatgrass; mention reduced competitive and reproductive capacities of native species in grazed areas, and that actions associated with grazing can	• Add the Belsky and Blumenthal (1997) reference to the discussion on the historical impact of livestock grazing to grasslands in Appendix F (Cumulative Effects).	FEIS, Appendix F

Objector Issue	Changes Per Resolution Meetings	Where Changes Made
spread exotic plant seed.		
Issue 4: Grazing contributes to aspen decline/detrimental to aspen recruitment and survival.	• Modify the design features in Appendix C (Design Features, Best Management Practices, and Mitigation) to include measures that would be taken to protect aspen. • Modify the Fire effects analysis to include language on deterrents used to protect aspen from ungulate grazing. • Add to the Purpose and Need section of the FEIS and Appendix F (Cumulative Effects) citations from Ripple and Beschta 2007, 2011 and Hebblewhite et al. 2005. • Incorporate language from the Range Report specific to grazing and impacts to aspen into the Water Quality and Riparian analysis section of Chapter 3 of the FEIS and Appendix F (Cumulative Effects).	FEIS Appendix C, FEIS Chapter 3, Fire Ecology FEIS, Appendix F FEIS, Chapter 3, Range FEIS, Chapter 3, Water Quality and Riparian
Issue 5. Grazing impacts springs/riparian areas; interaction with OHV use.	• Incorporate language from the Range Report specific to grazing and impacts to aspen into the Water Quality and Riparian analysis section of Chapter 3 of the FEIS and Appendix F (Cumulative Effects).	FEIS, Chapter 3, Range FEIS, Chapter 3, Soils and Watershed, Springs, Riparian and Wetland Function FEIS, Appendix F
Issue 6. Add the following references to peer-reviewed literature: Kerns et al. 2011 (which describes USDA research: "understory release from a long history of cattle grazing caused a greater degree of change than the initial reintroduction of fire."), Belsky and Blumenthal 1997, Cooper 1960, Madany and West 1983, Savage and Swetnam 1990,	• Add a discussion on how historic grazing influenced existing condition to Appendix F (Cumulative Effects). Add Belsky and Blumenthal 1997, Cooper 1960, Madany and West 1983, Savage and Swetnam 1990, Arnold 1950 references to this discussion.	FEIS, Appendix F Range Report, Addendum and Errata

Objector Issue	Changes Per Resolution Meetings	Where Changes Made
Arnold 1950.		
Issue 7. Explain how future livestock management would differ from the past practices that helped lead to unhealthy forests in the first place.	• Clarify how range readiness is assessed in the Range Report and clearly link range readiness to the Implementation Plan (Appendix D) and the Monitoring Plan (Appendix E). • Add range readiness to the project design features (Appendix C). • Clarify in the Range Report that allotment management monitoring occurs in addition to 4FRI monitoring. • Add language to the cumulative effects discussion in Appendix F that directs readers to the Range Report for information on grazing program-related requirements that set the sideboards on utilization, pasture use, etc.	FEIS, Appendix C FEIS, Appendix D FEIS, Appendix E FEIS, Appendix F Range Report, Addendum and Errata
Issue 8. Explain how monitoring will detect problems and what changes might be made to grazing practices in the future, including changes to timing, duration, stocking rates, or availability of pastures.	• Add language to the ROD that describes the complexity of grazing activity occurring concurrently with restoration treatments. Clarify that the allotment management plan (AMP) and annual operating instructions (AOI) process is the mechanism used to decrease or increase grazing numbers (not site-specific projects). Explain that monitoring for 4FRI will help inform future grazing analyses.	ROD, Rationale for Our Decision
Issue 9. Acknowledge that removal of livestock after treatment (fire, cutting, or seeding/planting/mulching) may be necessary for a period of years. Only fire is mentioned as potentially impacting the availability of pastures to livestock, but if forests are returning to an unhealthy state (i.e., reduced understory, dense regeneration, altered fire regimes, noxious weeds) then livestock utilization may have to be altered.	• Modify the Range section in Chapter 3 of the FEIS to include vegetation treatments as a ground-disturbing action that will be considered along with fire. • Clarify in Appendix C (Design Features, Best Management Practices, and Mitigations) and the Range Report that restrictions in grazing of livestock will occur after significant burns in pastures, that livestock pasture rest after ground-disturbing treatments (i.e., thinning, seeding, and aspen restoration) may occur, and that line officers will evaluate, at a minimum, annual monitoring of range readiness to determine when grazing may resume within a pasture. • Clarify in Appendix C and the Range Report that annual monitoring includes measures for forage production, precipitation, forage utilization, livestock numbers, and livestock season of use. • Clarify in Appendix C and the Range Report that condition and trend monitoring every five to 10 years measures plant canopy cover, plant frequency, and ground cover. • Modify a design feature in Appendix C (Design Features, Best Management Practices, and Mitigation) to clarify the process of evaluating range readiness after ground-disturbing treatments.	FEIS, Chapter 3, Range FEIS, Appendix C FEIS, Appendix D Range Report, Addendum and Errata

<table>
<tr><th>Objector Issue</th><th>Changes Per Resolution Meetings</th><th>Where Changes Made</th></tr>
<tr><td colspan="3">Stephen Dewhurst, Objection 0010</td></tr>
<tr><td>Issue 1. The FEIS failed to develop and analyze a full ecological restoration alternative, resulting in an inadequate range of alternatives.</td><td>• Send Mr. Dewhurst the full restoration alternative evaluation paper which includes rationale for eliminating the alternative from detailed analysis for his review.</td><td>Sent to Mr. Dewhurst on 4/2/2015</td></tr>
<tr><td>Issue 2. The FEIS revised the purpose and need after the analysis was complete by changing the desired conditions in the Fire Regime Condition Class (FRCC) section of the purpose and need.</td><td>• Correct the FRCC table, modify the table description, and add a statement in this section to define FRCC and clarify that FRCC 1 is within the historic range and 2 and 3 are departed.

Table 13. Existing and desired conditions for vegetation condition classes/fire regime condition classes in ponderosa pine
<table>
<tr><th>Condition Classes</th><th>Existing Condition (% of total area)</th><th>Desired Condition (% of total area)</th></tr>
<tr><td>Vegetation Condition Class 1</td><td>14</td><td>85 – 95</td></tr>
<tr><td>Vegetation Condition Class 2</td><td>25</td><td>5 – 15</td></tr>
<tr><td>Vegetation Condition Class 3</td><td>61</td><td>0</td></tr>
<tr><td>Fire Regime Condition Class of Treatment Area</td><td>3*</td><td>1*</td></tr>
</table>
*Habitat requirements for MSO and goshawk in the ponderosa pine type will limit the intensity of vegetation treatments in some areas. The number of acres this applies to may vary over the life of this project.

The desired condition is to have a range of 85 to 95 percent of the ponderosa pine in vegetation condition class 1 (see table 13). There would be a range of 5 to 15 percent vegetation condition class 2. There would be zero percent in the vegetation condition class 3. The desired condition for the ponderosa pine is FRCC 1; however, habitat requirements for MSO and goshawk in the ponderosa pine will limit the intensity of vegetation treatments in some areas. The number of acres this applies to may vary over the life of this project.

Fire regime condition class assessments determine how departed a landscape's fire regime is from its historic fire regime. It is scaled from 1 to 3, with 3 being the most departed and 1 being the least departed. The fire regime is significantly departed from historical ranges on about 66 percent of the project area. The project area is classified as FRCC 3 (table 13). In FRCC 3, the risk of losing key ecosystem components is high. Approximately 25 percent of the project area is in FRCC 2, indicating the ecosystem is moderately departed from its historical range.</td><td>FEIS, Chapter 1</td></tr>
</table>

Objector Issue	Changes Per Resolution Meetings	Where Changes Made
Center for Biological Diversity, Objection 0011		
Issue 1. The FEIS uses the word "intent" throughout the implementation plan in relation to retaining canopy cover at the existing forest plan standard level in "high" VSS, and VSS 5 and 6 stands. The FEIS needs to be unequivocal in following the existing standards and guidelines.	• Modify Appendix D (implementation plan) to change the language from “intend to” to “will” on 38,260 acres. This modification will also be incorporated into the ROD.	FEIS, Appendix D ROD, Decision, Rationale for Our Decision, How Well the Selected Alternative Responds to Issues, Concerns and the Project Purpose and Need
Issue 2. The FEIS is only clear about using the landscape canopy standard from existing (Coconino) and previous (Kaibab) forest plans in stands that were slated for higher intensity treatments. The assumption was that the upper 4's, 5's and 6's that were under lighter prescriptions would not go below the plan canopy cover standards. But the way the ROD and the FEIS are written there isn't explicit guidance for this nor is there any clear mechanism for monitoring this.	• Add language to the implementation plan (Appendix D), FEIS, silviculture report, and ROD that includes less intensive treatments on about 46,090 total acres where there is a preponderance of large trees (upper VSS 4, 5, 6). This will add about 7,835 acres to the 38,260 acres that were included in the FEIS and draft ROD. The language for these additional acres will be modified in Appendix D (Implementation Plan) as described in the Issue1 response. Modified language will state that, on approximately 46,090 acres, both ground-based and remote sensing monitoring will occur to document and ensure sufficient canopy cover remains (in the identified stands with a preponderance of large trees), and to compare the two methods. • Modify existing language in the ROD to note that approximately 46,090 acres (total) will be treated less intensively. Assure Appendix D (implementation plan) and the ROD are consistent. • It was noted that the monitoring plan already provides various methods for monitoring, including remote sensing and field (ground-based) validation. No change is needed to the monitoring plan.	FEIS, Appendix D ROD, Decision, Rationale for Our Decision, How Well the Selected Alternative Responds to Issues, Concerns and the Project Purpose and Need Silviculture Report, Addendum and Errata

Objector Issue	Changes Per Resolution Meetings	Where Changes Made
Issue 3. Adopt design features and/or Implementation Plan components to ensure that vertical crown projection is measured using ground-based methods throughout the project area.	• Add language to the Decision Rationale section of the ROD to explain that there is unresolved conflict related to measuring canopy cover. • Clarify in the Implementation Plan (Appendix D), FEIS, Silviculture Report, and ROD that canopy cover measurements on an additional 7,835 acres where there is a preponderance of large trees (for a total of 46,090 acres) will use both ground-based and remote sensing methods to ensure and compare consistency with expected canopy cover levels. • Clarify in the ROD that both CBD and the Forest Service considered resolution of this issue larger than 4FRI, requiring involvement from multiple resources, including research. The Multi-party Monitoring Board will facilitate the process and develop a way to compare methods.	FEIS, Appendix D ROD, Rationale for Our Decision FEIS, Appendix E
Issue 4. Include in Amendment 2 up to 2,500 acres recommended by the Arizona Game and Fish Department ("AGFD") as corridors for grassland wildlife (Rosenstock and Gist 2014). Apply conservation measures for old growth and large trees within grassland corridors, such as a diameter cap. We request an addition to wildlife corridor deferral from forest plan canopy cover retention.	• Modify the ROD and Appendix D (Implementation Plan) to address the inclusion of approximately 2,750 acres of wildlife corridor, explaining that VSS 5 and 6 tree groups will be retained within the 2,750 acres designated for corridor treatments as outlined in Rosenstock and Gist (2014)." • Modify the Implementation Plan (Appendix D) to add: The wildlife corridor will be designed in alignment with the Large and Old Tree Implementation Plans. If there is potential for the corridor to affect VSS 5 and 6, adjustments (avoidance) will be made. • Modify the Forest Plan Amendment 2 section of Appendix B (FEIS Forest Plan Amendments) to explain that the Coconino NF portion of the corridor will be deferred from forest plan canopy cover retention.	ROD, Decision, Rationale for Our Decision FEIS, Appendix D FEIS, Appendix B
Issue 5. Monitoring of Mexican spotted owl	• To resolve CBD's issues around monitoring and implementation of combined (Mechanical/Fire) treatments in Mexican spotted owl (MSO) Protected Activity Centers (PACs), the Forest Supervisors agree to make the following changes (in **bold**) to the MSO Monitoring Plan (FEIS, Appendix E): ▪ **Four** PACs will initially be selected from the pool of 18 for combined treatment, and at **least 4 reference PACs** will be selected for comparison. ▪ **Treatment of the remaining 14 PACs will be contingent upon the results of monitoring during this initial phase of PAC treatments.** ▪ **Of the 18 candidate PACs, those dominated by stands proposed for 9 inch d.b.h. cutting limits will be prioritized for treatment and monitoring, provided that they are currently occupied.**	FEIS, Appendix E

Objector Issue	Changes Per Resolution Meetings	Where Changes Made
Issue 5, continued	▪ **In the 18 combined treatment PACs, trees up to 17.9 inches d.b.h. may be cut; however, trees over 14 inches d.b.h. will not be removed. These select trees between 14-17.9 d.b.h. may be felled and left onsite as logs, converted into snags, or burned. Coarse woody debris / surface fuels in treated PACs will be retained at levels compliant with forest plans.** ▪ **Pending U.S. Fish and Wildlife Service (FWS) approval and to the extent possible, all MSO residing in treated and reference PACs will be banded with unique color-coded leg bands to allow for individual identification and monitoring before, during, and after treatments have been implemented.** ▪ Surveys for occupancy and reproductive success will be conducted for two seasons before any PACs where MSO are detected receive combined treatments. ▪ **In the event that any of the 18 aforementioned PACs are surveyed for MSO occupancy for 3 consecutive seasons and no MSO are detected, treatment within those PACs may commence to retain and improve MSO habitat components (in addition to the 4 PACs discussed above). Monitoring within these PACs will remain consistent with occupied PACs.** ▪ Surveys for occupancy and reproductive success will be conducted in consecutive years post-treatment starting with the year of mechanical treatment and continuing until two years post-prescribed fire treatments. ▪ Vegetation data will be collected prior to treatment, then one year post-mechanical treatment and two years post-fire treatment for a total of three visits per PAC. ▪ Vegetation and spotted owl survey protocols will remain consistent across treatment groups and throughout the monitoring period. ▪ **If any of the 18 PACs being monitored burn at mixed or high severity, the monitoring will continue for 3 consecutive seasons.** ▪ **In the event that a mixed- or high-severity fire burns in any of the 117 PACs within the analysis area, MSO monitoring will be initiated and will continue for at least three consecutive years in all burned PACs. However, no more than 6 PACs affected in this way will be monitored during any given year. If monitoring objectives other than post-fire occupancy are included in this monitoring plan then there will be reductions in sample size to offset increasing expense per PAC. If the number of PACs burned as described exceeds the number to be monitored then there will be a preference to continue monitoring PACs for which baseline (pre-burn) data exist.** ▪ **A summary of the data collected during PAC monitoring will be made publically available and presented to the stakeholder group on an annual basis.** ▪ **The Multi-Party Monitoring Board will evaluate monitoring outcomes and other relevant science to develop and provide recommendations regarding future treatments in MSO PACs.**	

Objector Issue	Changes Per Resolution Meetings	Where Changes Made
	▪ **Funds for the MSO monitoring will be established and demonstrated to the Multi-Party Monitoring Board prior to any treatments occurring in the 18 PACs.**	
Issue 5, continued	• The following language will be added to the ROD and Attachment 1, MSO Project Monitoring, of the Monitoring Plan (Appendix E): There is mutual recognition of the need to evaluate the impacts of vegetation treatments on Mexican Spotted Owl (MSO) and its habitat at a broad scale. There is also a mutual understanding that the desired evaluation is beyond the scope of a single project such as the Four Forest Restoration Initiative. We have agreed to convene a working group that will design such a study. We anticipate that this effort will bring together subject matter experts, including representatives of the Forest Service, the U.S. Fish and Wildlife Service, the Rocky Mountain Research Station and other research stations, and the MSO Recovery Team, in cooperation with the Center for Biological Diversity and other stakeholders as appropriate. The primary objective of the first meeting will be to bring forward the key questions related to characterizing the effects of vegetation treatments on MSO and its habitat and to identify the resources needed to rigorously evaluate these effects at the appropriate scale. The group will review the best available science and develop a consistent monitoring approach across multiple administrative units, expanding upon existing monitoring efforts where appropriate.	ROD, Rationale for Our Decision FEIS, Appendix E, Attachment 1
Issue 6. Concerns regarding requirements for northern goshawk surveys on both the Coconino and Kaibab National Forest.	• Add language in the ROD, Appendix C (Design Features, Best Management Practices, and Mitigation), Appendix E (Monitoring Plan), and the Wildlife Report to clarify that pre-treatment goshawk occupancy surveys will be conducted in goshawk habitat on both forests.	ROD, Decision FEIS, Appendix C FEIS, Appendix E Wildlife Report, Addendum and Errata
Wild Earth Guardians, Objection Resolution Agreement		
Issue 1. Concerns regarding monitoring and implementation of combined treatments in Mexican spotted owl (MSO) Protected Activity Centers (PACs)	• To resolve WildEarth Guardians' issues around monitoring and implementation of combined (Mechanical/Fire) treatments in MSO PACs, the Forest Supervisors agree to make the following changes (in **bold**) to the MSO Monitoring Plan (FEIS, Appendix E): ▪ **Four** PACs will initially be selected from the pool of 18 for combined treatment, and at **least 4 reference PACs** will be selected for comparison. ▪ **Treatment of the remaining 14 PACs will be contingent upon the results of monitoring during this initial phase of PAC treatments.** ▪ **Of the 18 candidate PACs, those dominated by stands proposed for 9 inch d.b.h. cutting limits will**	FEIS, Appendix E, Attachment 1

Objector Issue	Changes Per Resolution Meetings	Where Changes Made
	be prioritized for treatment and monitoring, provided that they are currently occupied. ▪ **In the 18 combined treatment PACs, trees up to 17.9 inches d.b.h. may be cut; however, trees over 14 inches d.b.h. will not be removed. These select trees between 14-17.9 d.b.h. may be felled and left onsite as logs, converted into snags, or burned. Coarse woody debris / surface fuels in treated PACs will be retained at levels compliant with forest plans.** ▪ **Pending U.S. Fish and Wildlife Service (FWS) approval and to the extent possible, all MSO residing in treated and reference PACs will be banded with unique color-coded leg bands to allow for individual identification and monitoring before, during, and after treatments have been implemented.** ▪ Surveys for occupancy and reproductive success will be conducted for two seasons before any PACs where MSO are detected receive combined treatments. ▪ **In the event that any of the 18 aforementioned PACs are surveyed for MSO occupancy for 3 consecutive seasons and no MSO are detected, treatment within those PACs may commence to retain and improve MSO habitat components (in addition to the 4 PACs discussed above). Monitoring within these PACs will remain consistent with occupied PACs.** ▪ Surveys for occupancy and reproductive success will be conducted in consecutive years post-treatment starting with the year of mechanical treatment and continuing until two years post-prescribed fire treatments. ▪ Vegetation data will be collected prior to treatment, then one year post-mechanical treatment and two years post-fire treatment for a total of three visits per PAC. ▪ Vegetation and spotted owl survey protocols will remain consistent across treatment groups and throughout the monitoring period. ▪ **If any of the 18 PACs being monitored burn at mixed or high severity, the monitoring will continue for 3 consecutive seasons.** ▪ **In the event that a mixed- or high-severity fire burns in any of the 117 PACs within the analysis area, MSO monitoring will be initiated and will continue for at least three consecutive years in all burned PACs. However, no more than 6 PACs affected in this way will be monitored during any given year. If monitoring objectives other than post-fire occupancy are included in this monitoring plan then there will be reductions in sample size to offset increasing expense per PAC. If the number of PACs burned as described exceeds the number to be monitored then there will be a preference to continue monitoring PACs for which baseline (pre-burn) data exist.** ▪ **A summary of the data collected during PAC monitoring will be made publically available and presented to the stakeholder group on an annual basis.** ▪ **The Multi-Party Monitoring Board will evaluate monitoring outcomes and other relevant science to**	

<table>
<tr><th>Objector Issue</th><th>Changes Per Resolution Meetings</th><th>Where Changes Made</th></tr>
<tr><td></td><td>develop and provide recommendations regarding future treatments in MSO PACs.
▪ Funds for the MSO monitoring will be established and demonstrated to the Multi-Party Monitoring Board prior to any treatments occurring in the 18 PACs.</td><td></td></tr>
<tr><td>Issue 2. To resolve WildEarth Guardians' concern that findings of key scientific sources regarding historical forest structure and fire regimes, and Mexican spotted owl responses to fire are currently missing from the record, the Forest Supervisors agreed to modify (in bold) the FEIS, Silviculture Report, and Fire Report:</td><td>• Add language and references to the Silviculture Report outlining the forest density structure of Williams and Baker, et.al:
The forest structure described in various literature (Reynolds, et, al. 2013; Williams and Baker 2012; William and Baker 2013; Woolsey 1911; Pearson. 1950; Covington and Moore 1994; Swetnam and Baisan 1996; Covington, et. al. 1997) is very similar to that described in this project. While the individual metrics used in the literature to describe the desired stand structure vary slightly, it is clear that almost all of the stand densities in the 4FRI EIS fall within the Natural Range of Variability described in the relevant literature.</td><td>Silviculture Report, Addendum and Errata</td></tr>
<tr><td>Issue 2, continued</td><td>• Compare the forest structure indicated in the literature to what is being proposed by the 1st 4FRI EIS (the forest densities are very similar).
<table>
<tr><th>Literature-indicated Forest Structure</th><th>What the Silviculture Report/FEIS Propose (language can be added where needed)</th></tr>
<tr><td>Defined small trees as > 10cm up to 40 cm (3.9" up to 15.7" d.b.h.).
Defines high density forests with approximately 141-145 trees/ha (57-59 trees per acre), and 17.3% of the forest exceeded 200 trees per hectare (81 trees per acre), and 4.2% of the area exceeding 300 trees per acre (122 trees per acre).
58 TPA over 4" d.b.h.
16-18% of forest areas >81 TPA
52-81% of trees under 16" d.b.h.</td><td>In Alternative C, 4FRI proposes mechanical treatment on 431,049 acres.
Post-treatment structure is:
VSS 2 (4.0-4.9") = 18.24 TPA (0-604) (28.1%)
VSS 3 (5.0-11.9") = 24.39 TPA (0-639) (37.5%)
VSS 4 (12.0-17.9") =12.7 TPA (0-84) (19.5%)
VSS 5 (18-23.9" = 6.89 TPA (0-53) (10.6%)
VSS 6 (24"+) = 2.83 TPA (0-18) (4.3%)
Total Trees Per Acre = 65.05
Projections for post-treatment density figures are:[8]
65.05 TPA across the treatment stands (4.0"+ d.b.h.)</td></tr>
</table></td><td>FEIS, Chapter 3, Silviculture
Silviculture Report, Addendum and Errata
Fire Ecology Report, Addendum and Errata</td></tr>
</table>

[8] Refer to Project Record #954, Summary of Projected Post-Treatment conditions by Type.

Objector Issue	Changes Per Resolution Meetings	Where Changes Made
	29.3% of stands are > 81TPA **90.3% of the stands have >52% of the trees <16" d.b.h.** **The range of TPA is approximately 0-639 TPA**	
Issue 2, continued	• Add language and reference to Fire Ecology Report (Introduction, p. 1, 5th paragraph)**:** Landscape scale analyses are important for understanding how ecosystems responded historically to climate change or disturbances across environmental gradients (White and Jentsch 2001). **Fire is a keystone process in healthy ponderosa pine ecosystems as well as grasslands, aspen, and other ecosystems within the analysis area. Fire ecology is the study of the symbiotic relationship of fire with all spatial and temporal components of an ecosystem…**	Fire Ecology Report, Addendum and Errata
Issue 2, continued	• In both the Fire Ecology Report and the Fire Ecology section of the FEIS, change "Opposing Science" heading to "**Other Science Reviewed**" and modify language in this section: Commenters also cited publications (Williams and Baker 2013; Williams and Baker 2012) to support their comments. **Over the last several years, there has been a series of publications with differing conclusions about the role of fire in ponderosa pine forests in Arizona.** Williams and Baker compiled a large set of historical data that consists of records made by land surveyors for the General Land Office (GLO) in the late 1800s and early 1900s. Surveyors marked trees around corner points that delineated square miles and quarter-miles, sometimes making additional comments about the country they were walking through. This research provided new data in the form of estimates of forest density, species, and diameters of trees at the time of the survey **(Williams and Baker 2012). Based on the density and size-class data, they devised a method for determining past fire regimes, concluding that the proportion of high-severity fire in recent fires was less than or similar to the proportion in historical fires (Williams and Baker 2012).** They also concluded that, **historically,** high severity fire was more prevalent across the ponderosa pine in Arizona than had been indicated by previous research **(cited elsewhere in this report). Fulé et. al. (2013) responded with concerns about Williams and Baker's (2012) methods and conclusions about high-severity fire.** **In evaluating the available research that is specific to fire regimes in ponderosa pine in Arizona and the project area, many people feel that ecological, social, and economic values are not consistent with the pre-restoration disturbance regime of large, high severity fires, especially under changing climate. However, ecological restoration in the project area will lead to a restored fire regime with historical levels of low, mixed, and high-severity fire, even if the details of the historical levels remain under ongoing study.**	Fire Ecology Report, Addendum and Errata FEIS, Chapter 3, Fire Ecology
Issue 2, continued	• Add paragraph and modify language in Affected Environment, Historic conditions affecting the 4FRI analysis, section: **The 4FRI project area lies between Grand Canyon National Park's South Rim and the southern boundary of the Coconino National Forest. This area is dominated by ponderosa pine that is**	FEIS, Chapter 1

Objector Issue	Changes Per Resolution Meetings	Where Changes Made
	intermixed with pinyon pine, juniper, Gambel oak, aspen, grassland, and shrubland vegetation. Across the landscape, this mosaic of vegetation supported, and was supported by, a mosaic of fire regimes, ranging from low to high severity (Williams and Baker 2013). The driest part of the project area is on the Coconino Plateau, where ponderosa pine forests may have been less continuous, with significant portions of the landscape being pinyon/juniper or grass and shrubs, and more of the ponderosa pine is intermixed with shrubs (such as sage), or pinyon/juniper. Studies done in this area showed that, particularly where pinyon/juniper and mixed conifer intermixed with ponderosa pine, low-severity fire likely structured the majority of the forest while roughly a third was structured by mixed-severity fire, probably including small, patchy crown fires (Williams and Baker 2013; Huffman et. al. 2008). Historically, both lightning and human-caused fires, once started, could burn until extinguished by rain, or until they ran out of fuel (typically when they reached an area that had recently burned). Fires could burn for months and cover thousands of acres (Swetnam 1990, Swetnam and Baisan 1996). Effects from these long burning fires would vary as conditions changed over the weeks they burned. As a result, most ponderosa pine in the southwest burned every 2 to 22 years as **mostly** low-severity, often area-wide fires (Weaver 1951, Cooper 1960, Dieterich 1980, Swetnam et al. 1990, Swetnam 1990, Swetnam and Baisan 1996, Fulé et al. 1997a, Fulé et al. 2003, Covington et al. 1997, Heinlein et al. 2005). Across the treatment area, the desired condition would allow the use of prescribed fires to supplement unplanned ignitions, producing an average annual Fire Return Interval (FRI) in the ponderosa pine of no more than 20 years, with a 10 year FRI being preferred unless monitoring indicates a change is warranted. The FRI on the southern end of the project would average less than 10 years because the higher precipitation produces faster regeneration and growth (Puhlick et al. 2012), while the northern, drier portion of the project area could go for 20 – 30 years, depending on environmental conditions affecting fuel accumulations, regeneration, and initial condition (Fulé and Laughlin 2007). Across the treatment area, forest conditions would allow for the use of fire as addressed in the land and resource management plan. Frequent surface fires would rarely move up into tree crowns and, when crown fire did occur, it would **mostly** be passive crown fire, limited to the tree or the group within which it started, **or small patchy areas of crown fire**. Restored sustainable fire regimes, from a combination of planned and unplanned ignitions, would regulate landscape structure, pattern, and composition, aligning forest changes with climate changes**.** **While researchers generally agree that there was mixed and/or high-severity fire in ponderosa pine (Williams and Baker 2013, Roccaforte et al. 2008), there are some unresolved questions about the amount, pattern, and distribution of these fires. Some studies on the rates of these fires suggest they were relatively infrequent (Williams and Baker 2012). This is corroborated by Jenkins et al. (2011), whose paleoecological reconstruction found high-severity fires in transitional ponderosa and dry mixed-conifer forests at 200-600 year intervals over the last 1000 years**. Some science indicates the size and extent of high severity fires are much larger than historic data indicates was typical of ponderosa pine in the southwest (Swetnam 1990, Covington and Moore 1994; Swetnam and Betancourt 1998, Westerling et al. 2006, Climate Central 2012, Miller and Safford 2012) and, while the number of fires reported in and	

Objector Issue	Changes Per Resolution Meetings	Where Changes Made
	adjacent to the project area has decreased over the last 40 years, the average size has increased**.**	
Issue 3. To resolve WildEarth Guardians' concerns regarding heterogeneity across the landscape, the Forest Supervisors agree to modify (in bold) the ROD, FEIS, Silviculture Report and Fire Report as follows:	• Add the following language to promote heterogeneity to the Final ROD: **The objective of the project is to restore forest structure, pattern, composition, diversity and landscape heterogeneity, within the ponderosa pine (Pinus ponderosa) ecosystem that will lead to increased forest resiliency and function and restore the historical fire regime. The intent of the 4FRI project is to obtain a high level of vegetative responses that will increase ecosystem diversity by increasing horizontal and vertical heterogeneity. Restoration initiates or accelerates ecosystem recovery with respect to ecological health, integrity, and sustainability (Reynolds et al 2013). Resiliency increases the ability of the ponderosa pine forest to survive natural disturbances such as insects, diseases, fire, and climate change (FSM 2020.5) without changing its inherent function (SER 2004). Restoration activities proposed with this project are expected to put the project area on a trajectory towards comprehensive, landscape-scale restoration, with benefits that include improved vegetation biodiversity, wildlife habitat, soil productivity, and watershed function, as well as increased forest structure heterogeneity. To ensure that the project will maintain and restore historical forest structure, the restored landscapes of the project area are projected to have an average of at least 65 trees/acre over 4" diameter, 29% of forest area with > 81 trees/acre, and 90% of forest stands with > 52% of the trees < 16" diameter as documented by scientific reconstructions of historical forest structure. Restoration treatments will expand burn windows for both planned and unplanned ignitions, so that the proportion of the project area with restored historical levels of low, mixed, and high-severity fires is maximized. While the 4FRI does not provide any direction for managing unplanned ignitions, treatments are expected to increase the decision space for line officers deciding how to manage lightning caused fires wildfires. This can be expected to increase the area that can be managed for historic fire regimes, including low, mixed, and high severity fire.**	ROD, How Well the Selected Alternative Responds to Issues, Concerns and the Project Purpose and Need, Resiliency, Function and Sustainability
Issue 3, continued	• **This language in the Final ROD will be supported in the FEIS, Silviculture Report, and Fire Report by adding the following language to those documents:** ▪ **Alternative C includes treatments on 431,049 acres.** ▪ **The post-treatment tree density (trees per acre, TPA), after mechanical treatments and prescribed fires, across the 431,049 acres, is projected to be no less than 65 TPA (mean).** ▪ **In the post-treatment landscape, across the 431,049 acres, it is projected that more than 16% of stands will have no less than 81 TPA (mean).** ▪ **The post-treatment landscape, across the 431,049 acres, is expected to be dominated by small trees, with more than 51.8% of the trees smaller than 15.7 inches d.b.h.**	FEIS Chapter 3, Silviculture FEIS Chapter 3, Fire Ecology

Objector Issue	Changes Per Resolution Meetings	Where Changes Made
Issue 3, continued	• Discussion and explanation of other scientific references, published prior to the completion of the 4FRI EIS analysis, will be added or expanded upon in the FEIS, Silviculture Report, and Fire Report for the following literature and findings: ▪ Williams and Baker (2013) found the mean density of historical forests was 142-144 trees/ha (57-59 TPA), and 16-18% of forest area was dense, with > 200 trees/ha (81 TPA). ▪ Leiberg et al. (1904): "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 stocked chiefly with sapling growths, ranging in age from 35 to 90 years." ▪ Jenkins et al. (2011 p. 138-139): "…the evidence indicates that severe wildfire was an important influence on the pre-European-settlement landscape in transitional PIPO and PIPO-MC…Fires are recorded in our study area with a frequency of several centuries, ranging from 600 to 200 years for multiple-basin events." ▪ Williams and Baker (2012): This study found that the historical fire regime in ponderosa pine forests on the Mogollon Plateau included 62.4% of the area with evidence of only low-severity fire, 23.1% of the area with mixed-severity fire, and 14.5% of the area with high-severity fire (Williams and Baker 2012, Table 2). Also, the historical fire rotation for high-severity fire was 828 years across the Mogollon Plateau, thus these fires were infrequent, as also found by Jenkins et al. ▪ Williams and Baker (2013): This study found that the historical fire regime in ponderosa pine forests on the Coconino Plateau included 58.8% of the area with evidence of only low-severity fire, 38.7% of area with mixed-severity fire, and 2.5% of area with high-severity fire (Williams and Baker 2013, Table 2).	FEIS Chapter 3, Silviculture FEIS Chapter 3, Fire Ecology Silviculture Report Addendum and Errata Fire Ecology Report Addendum and Errata