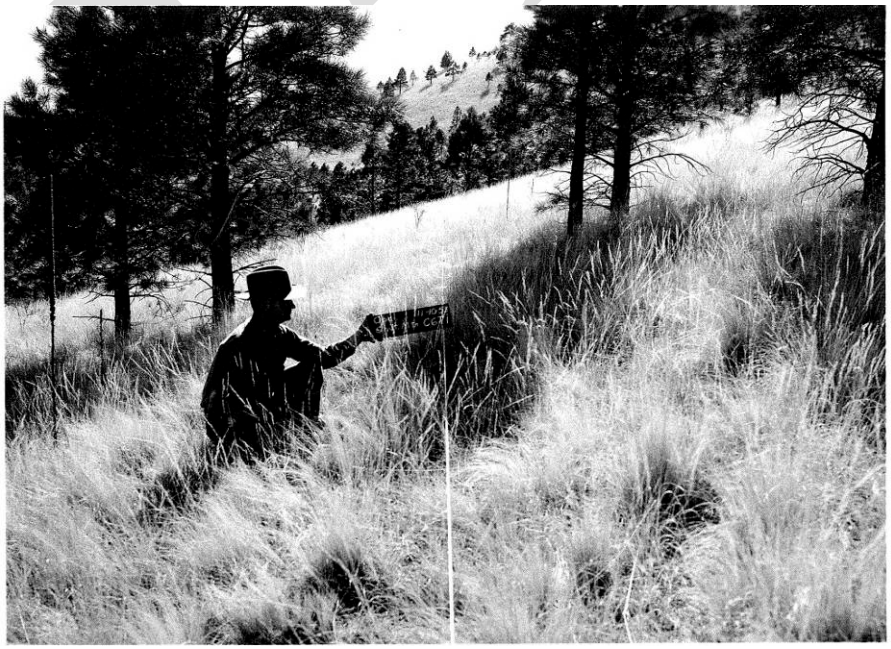
United States Department of Agriculture

Forest Service

Southwestern Region

Draft Environmental Impact Statement for Four-Forest Restoration Initiative

Coconino and Kaibab National Forests, Coconino County, Arizona



Draft Environmental Impact Statement Four-Forest Restoration Initiative, Coconino and Kaibab National Forests

Coconino County, Arizona

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Abstract: The Coconino and Kaibab National Forests (NFs) are proposing to conduct a suite of restoration activities on approximately 587,923 acres. The project objective is to re-establish forest structure, pattern, and composition, which would lead to increased forest resiliency and function. Restoration activities 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.

Restoration activities include mechanically cutting trees, enhancing and protecting aspen, prescribed burning, and restoring springs and ephemeral streams. The project tiers to recent travel management decisions on both forests and proposes to decommission un-needed roads and unauthorized roads. Motorized access to the project would be provided through the construction of temporary roads, the reconstruction of existing, open roads, and the construction (opening) of existing, closed roads. Both temporary and closed roads would be decommissioned or returned to a closed status when project implementation is complete.

This draft environmental impact statement (DEIS) documents the analysis of three alternatives considered but eliminated from detailed study and four alternatives considered in detail. Alternative A proposes no action. Alternative B, the proposed action alternative, would mechanically treat 388, 489 acres and utilize prescribed fire on 587,923 acres. Alternative B incorporates 8 months of public involvement and collaboration. Alternative C restoration activities include mechanical treatment on 434,001 acres and prescribed fire on approximately 593,211 acres. Alternative C responds to issue 2, conservation of large trees, (see chapter 1, page 60) and incorporates key components from the stakeholder-created Large Tree Retention Strategy. The alternative responds to comments and recommendations received during scoping by increasing the acres that would receive prescribed fire (for grassland restoration purposes) and

incorporating watershed and wildlife research opportunities. Alternative D would mechanically treat 388,489 acres and utilize prescribed fire on 178,790 acres. This alternative was developed to respond to Issue 1, prescribed fire emissions (see chapter 1, page 60) by decreasing the acres that would receive prescribed fire. All action alternatives include a suite of restoration activities including springs and ephemeral channel restoration, aspen maintenance and enhancement, temporary road construction, and road decommission.

All action alternatives propose mechanical treatment in 18 select Mexican spotted owl (MSO) protected activity areas (PACs) to improve the quality of the nesting and roosting habitat. In addition to mechanical treatment, alternative B would apply prescribed fire in 72 PACs excluding core areas. Alternative C would use prescribed fire in 72 PACs and within 56 core areas. No prescribed fire would occur in MSO PACs in alternative D. All action alternatives require non-significant forest plan amendments in order to be compliant with the Coconino NF and Kaibab NF Land and Resource Management Plans.

It is important that reviewers provide their comments at such times and in such a way that they are useful to the Agency's preparation of the environmental impact statement (EIS). Therefore, comments should be provided prior to the close of the comment period and should clearly articulate the reviewer's concerns and contentions. The submission of timely and specific comments can affect a reviewer's ability to participate in subsequent administrative review or judicial review.

Comments received in response to this solicitation, including names and addresses of those who comment, will be part of the public record for this proposed action. Comments submitted anonymously will be accepted and considered; however, anonymous comments will not provide the respondent with standing to participate in subsequent administrative review or judicial review.

Send Comments to:

Henry Provencio, 4FRI Team Leader
1824 S. Thompson Street
Flagstaff, AZ 869001

Date by which Comments Must Be Received: [Date]

Summary

The Coconino and Kaibab National Forests (NFs) are proposing to conduct a suite of restoration activities on approximately 587,923 acres over a period of 10 years. Of this total, approximately 356,115 acres would be treated on the Flagstaff, Mogollon, and Red Rock districts of the Coconino NF and 231,809 acres would be treated on the Williams and Tusayan district of the Kaibab NF (figure 3).

Restoration activities include mechanically cutting trees, enhancing and protecting aspen, utilizing prescribed fire, and restoring springs and ephemeral streams. The project tiers to recent travel management decisions on both forests and proposes to decommission un-needed roads and unauthorized roads. Motorized access to the project would be provided through the construction of temporary roads, the reconstruction of existing, open roads, and the construction (opening) of existing, closed roads. Both temporary and closed roads would be decommissioned or returned to a closed status when project implementation is complete.

The project objective is to re-establish forest structure, pattern, and composition, which would lead to increased forest resiliency and function. Restoration activities 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.

Restoration actions are needed because forest function and resiliency within the project area is highly departed from reference conditions. At the project (landscape) scale, over 50 percent of the ponderosa pine is even-aged and lacks age class diversity. Excessive tree seedlings have regenerated canopy openings and replaced the open, multiple-age class structure with a single-age class structure. The single-age forest structure has reduced the health of the forests. The remaining large, old ponderosa pines are at risk from having increased mortality rates as a result of competition with small trees. Reduced forest health has affected resiliency or the ability of ponderosa pine to withstand natural disturbances including fire, insect and disease, and changing climatic conditions - such as drought. At the project (landscape) scale, approximately 34 percent of the area is at risk from crown fire and 64 percent is at risk from high-intensity surface fire that can result in severe effects. The risk of crown fire increases up to 55 percent in habitats for threatened and endangered species, specifically Mexican spotted owl. Approximately 35 percent of the ponderosa pine in the project area is at risk from increased insect and disease attack due to closed forest conditions and lack of low-severity fire.

Forest structure has affected function related to vegetation composition and diversity. The dense, single-age forest structure has reduced understory herbaceous productivity and function within grasslands and meadows. Functioning grasslands and meadows provide key habitat components for wildlife and their prey species. Spring function has been have affected by drought, the lack of fire and closed forest canopies which increase evapotranspiration. Ephemeral stream function has been affected by reduced ground cover, the presence e of noxious weeds, tree encroachment, and the lack of fire. There is a need to move towards improved function in springs and ephemeral streams. There is an opportunity to move vegetation and soils on un-needed roads towards their natural condition.

The project was posted in the Coconino and Kaibab NFs Schedule of Proposed Actions (SOPA) in January of 2011 and the Notice of Intent (NOI) to prepare an environmental impact statement was published in the Federal Register on January 25, 2011 (FR Doc.2011-1444). A draft proposed action was sent to a mailing list (hard copy and electronic mail) of 1,331 individuals, local

government, State government, federal and State agencies and organizations. Fifty-four (54) responses 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 (http://www.fs.usda.gov/4fri). In 2011, five public workshops were held during the comment period and two public meetings were held after the close of the comment period.

On March 11, 2011 the Arizona Department of Game and Fish was designated as a cooperating agency. The agency provided a habitat specialist to serve as an interdisciplinary team member and assist with the wildlife analysis.

A revised proposed action was sent to a mailing list of 213 parties (169 electronic mail and 44 hard copy recipients) and a second 14-day public comment period began with the publication of a second revised NOI in the Federal Register on August 19, 2011 [FR. Doc. 2011-20496]. Thirty-four comments were received during the two-week comment period and two comments were received after the close of the comment period (September 4 to September 6, 2011). These comments, in addition to the eight comments received from May 12 to July 26, 2011, were accepted as part of the public involvement process. Less duplicates, 42 comments were addressed in content analysis.

Two open houses were held while the comment period was underway and project updates were provided to local governments and potentially affected residents from September to December 2011. To address emerging issues and clarify scoping comments, a meeting was held with commenters to discuss the conservation of large trees on October 14, 2011. A meeting to discuss forest plan requirements for goshawk and canopy cover was held with interested parties on December 15, 2011. Please refer to the public involvement section in chapter 1 of the DEIS or the project record for additional details on all public involvement references.

The interdisciplinary team (IDT) reviewed and evaluated comments from September 2011 to March 2012. Three key issues that focused the analysis or drove alternative development include: Issue 1, Prescribed Fire Emissions, Issue 2, Conservation of Large Trees, and Issue 3, Post-treatment Canopy Cover and Landscape Openness (see chapter 1 of the DEIS, page 60 through 62 for additional details).

Three alternatives were considered but eliminated from detailed study (see chapter 2, pages 70 to 84) and four alternatives were evaluated in detail (see chapter 2, pages 84 to 111). The alternatives evaluated in detail include:

- Alternative A (no action) – The no action alternative is required by 40 CFR 1502.14(c). It has been analyzed to contrast the impacts of the action alternatives with the current condition and expected future condition if the proposed action were not implemented. This alternative proposes no restoration treatments.
- Alternative B (proposed action) – This alternative would mechanically treat 388,489 acres of vegetation and utilize prescribed fire on 587, 923 acres. It incorporates comments and recommendations received during an eight-month public involvement period. The alternative incorporates the key components of the stakeholder-created Old Tree Retention Strategy but does not include the stakeholder-created Large Tree Retention Strategy. The alternative includes mechanically treating and using prescribed fire within a select number of Mexican spotted owl (MSO) protected activity centers (PAC), excluding core areas. Two non-significant forest plan

amendments on the Coconino NF and one non-significant forest plan amendment on the Kaibab NF would be required to be in compliance with the Plans.

- Alternative C – This alternative would mechanically treat 434,001 acres of vegetation and utilize prescribed fire on 593,211 acres. This alternative was developed in response to comments received to the August, 2011 revised proposed action, including Issue #2, Conservation of Large Trees. The key components of the stakeholder-created Large Tree Retention Strategy and Old Tree Retention Strategy are incorporated into the alternative's design features, monitoring and adaptive management, and implementation plan. The alternative incorporates wildlife and watershed yield research. The alternative increases the acres to be mechanically treated and prescribed burned and increases the number of select Mexican spotted owl protected activity centers where prescribed fire would be used, including core areas. Other actions (springs, ephemeral streams, aspen protective fencing, and roads) are similar to alternative B. Two non-significant forest plan amendments on the Coconino NF and two non-significant amendments on the Kaibab NF would be required to be in compliance with the Plans.
- Alternative D – This alternative would mechanically treat 388,489 acres of vegetation and utilize prescribed fire on 178,790 acres. This alternative was developed in response to Issue #1, Prescribed Fire Emissions. A select number of Mexican spotted owl protected activity centers would be mechanically treated but no prescribed burned. Other actions (springs, ephemeral streams, aspen protective fencing, and roads) are similar to alternative B. Two non-significant forest plan amendments on the Coconino NF and one amendment on the Kaibab NF would be required to be in compliance with the plans.

Table 1. Summary of Alternatives Analyzed in Detail

Proposed Activity	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D
Vegetation Mechanical Treatment (acres)	0	388,489	434,001	388,489
Prescribed Fire (acres)	0	587,923	593,211	178,790
MSO PAC Habitat Treatments	N/A	Mechanically treat up to 16-inch dbh in 18 PACs (excluding core areas), Utilize prescribed fire in 72 MSO PACs (excluding core areas	Mechanically treat up to 18-inch dbh in 18 PACs, Utilize prescribed fire in 56 MSO PACs including core areas, Utilize prescribed fire in 16 MSO PACs excluding core areas	Mechanically treat up to 16-inch dbh in 18 PACs (excluding core areas)
Springs Restored (number)	0	74	Same as alternative B	

Proposed Activity	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D
Springs Protective Fence Construction (miles)	0	Up to 4	Same as alternative B	
Aspen Protective Fencing (miles)		Up to 82	Same as alternative B	
Ephemeral Stream Restoration (miles)	0	39	Same as alternative B	
Road and Route Decommission* (miles)	0	904	Same as alternative B	
Temporary Road Construction and Decommission **(miles)	0	525	Same as alternative B	
Road Reconstruction (miles)	0	10	Same as alternative B	

*This category combines existing roads and unauthorized roads proposed for decommissioning.
**This category includes temporary roads and previously decommissioned roads that are proposed for temporary construction and decommission when the project is complete.

Major Conclusions

All action alternatives meet forest structure, pattern, and composition elements of purpose and need by: (1) trending toward a balance of structural age classes, (2) creating landscape heterogeneity with alternative C having the highest percentage (17 percent) of closed canopy conditions, (3) moving towards forest health desired conditions in all action alternatives with alternative B and C reducing the percentage of high hazard rating from 83 (alternative A) to 26 and alternative C reducing the percentage of high hazard to 45, (4) improving forest health by reducing stand density (SDI) below the density-related mortality zone (less than 56 SDI) in all goshawk habitat and in MSO restricted habitat, (5) promoting vegetation composition and diversity with alternatives B and D releasing the most large oak (84,177 acres), all action alternatives creating grassland inclusions in over 300,00 acres of MSO and goshawk habitat, and alternative C moving the most grassland acreage (11, 230 acres) towards historic conditions.

In alternative A, 34 percent of the area would have the potential for high-severity fire effects from crown fire. In alternatives B, C, and D, the potential for high-severity effects ranges from 4 to 7 percent across the landscape. In the short term (2020), all action alternatives move towards FRCC desired conditions. However, in the long term (2050), over 50 percent of the landscape in alternative D reverts back to FRCC 3, resembling no action and exceeding desired conditions. All action alternatives have erosion and disturbance rates below tolerance level; therefore, soil

productivity and function move towards desired conditions and the risk of severe soil effects associated with alternative A is reduced. All action alternatives propose prescribed burning at different levels and would comply with ADEQ requirements. Emissions from the action alternatives are lower than predicted with wildfire in alternative A.

All action alternatives provide and sustain long-term Mexican spotted owl nesting and roosting habitat and reduce the risk of high-severity wildland fire and other stochastic events. All action alternatives may affect, but are not likely to adversely affect, Mexican spotted owl. No action alternative would result in Forest Service sensitive species trending towards listing.

For MIS, all action alternatives (both forests) result in static or increasing habitat quantity and quality. MIS population trends would be static (stable) to positive (increasing) for all species with the exception of tassel-eared/Abert's squirrel. There may be short term decreases but long term increases. There would be no measurable negative effects to migratory bird populations and habitats for which Important Bird Areas (IBA) were established would benefit from alternatives B, C, and D.

Overall, alternative A does not prevent, delay, or ameliorate predicted effects of climate change. The dense forest conditions resulting from the no action remain at high risk of density related and bark beetle mortality. There would be limited resilience to survive and recover from potential large-scale impacts. Alternatives B, C, an D affect fire behavior, forest structure, and forest health which puts over 500,000 acres on a trajectory of increased resilience to natural disturbances.

Decision Framework

The Coconino and Kaibab NF Supervisors are the Forest Service officials responsible for deciding whether or not to select the actions as proposed (alternative B), select one of the other action alternatives including alternative C and alternative D, or select no action (alternative A). Their decision includes determining: (1) the location and treatment methods for all restoration activities, (2) design criteria, mitigation and monitoring requirements, (3) the components that will be included in the adaptive management plan, (4) the components that will be included in the implementation checklist and plan, (5) the estimated products or timber volume to make available from the project, and (6) whether the forest plans will be amended.

Content

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**Note italicized table and page numbers are approximated pending formatting of chapter 3 after internal review.*

Chapter 1 – Purpose of and Need for Action

Introduction

We have prepared this draft environmental impact statement (DEIS) to comply with the National Environmental Policy Act (NEPA), National Forest Management Act (NFMA), and other relevant Federal and State laws and regulations. This DEIS discloses the potential direct, indirect and cumulative environmental impacts that would result from the proposed restoration activities to the biological, physical and social resources of the Coconino and Kaibab National Forests and alternatives to that proposal.

This document is organized into four chapters:

Chapter 1. Purpose and Need for Action: The chapter includes information on the history of the project proposal, the purpose of and need for the project and our proposal for achieving that purpose and need. This section also details how we informed the public of the proposal and how the public responded.

Chapter 2. Alternatives, Including the Proposed Action: This chapter provides a more detailed description of our proposed action, how the action alternatives were developed, as well as alternative methods considered for achieving the stated purpose. It references forest plan amendments (appendix C) project design criteria, best management practices, and mitigation (appendix D), the implementation plan (appendix E), and, the monitoring and adaptive management plan (appendix F), and cumulative effects (appendix G). Finally, this section provides a summary table of the environmental consequences associated with each alternative.

Chapter 3. Affected Environment and Environmental Consequences: This chapter describes the predicted environmental effects of accomplishing the proposed action and other alternatives. This analysis is organized by resource area.

Chapter 4. Consultation and Coordination: This chapter provides a list of preparers and agencies consulted during development of the environmental impact statement.

References. This section provides a list of scientific literature used to inform the analysis.

Appendix A-G: The appendices provide more detailed information to support the analysis including: the project record index (appendix A), a placeholder for a map packet (appendix B), proposed forest plan amendments (appendix C) project design criteria, best management practices, and mitigation (appendix D), the implementation plan (appendix E), the monitoring and adaptive management plan (appendix F), cumulative effects (appendix G), and a glossary of terms (appendix H).

Index: The index provides page numbers by document topic.

Additional documentation, including the complete analysis for each resource, may be found in the project record located at the Coconino National Forest Supervisor's Office, 1824 South Thompson Street, Flagstaff, Arizona. All

specialist reports are also posted on the 4FRI website at: http://www.fs.usda.gov/4fri.

Overview

The Four-Forest Restoration Initiative (4FRI) is a planning effort designed to restore forest resiliency and function across four National Forests in Arizona including the Coconino, Kaibab, Apache-Sitgreaves, and Tonto (figure 1). This analysis focuses on the Coconino National Forest (hereafter referred to as Coconino NF) and Kaibab National Forest (hereafter referred to as Kaibab NF) with an analysis area totaling approximately 988,764 acres.

Within the 988,764 acre analysis area, the Forest Service is preparing an environmental impact statement (EIS) that proposes to conduct restoration activities on approximately 587,923 acres on the Coconino NF and Kaibab NF. Of this total, approximately 361,550 acres would be treated on the Coconino NF and 231,809 acres would be treated on the Kaibab NF. Restoration actions would be focused on the Flagstaff district with fewer acres included on the Mogollon Rim and Red Rock districts of the Coconino NF. On the Kaibab NF, activities would occur on the Williams and Tusayan districts (figure 3).

The objective of the project is to re-establish forest structure, pattern, and composition, which will lead to increased forest resiliency and function. Resiliency increases the ability of the ponderosa pine forest to survive natural disturbances such as insect and disease, fire, and climate change (FSM 2020.5). This project is 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.

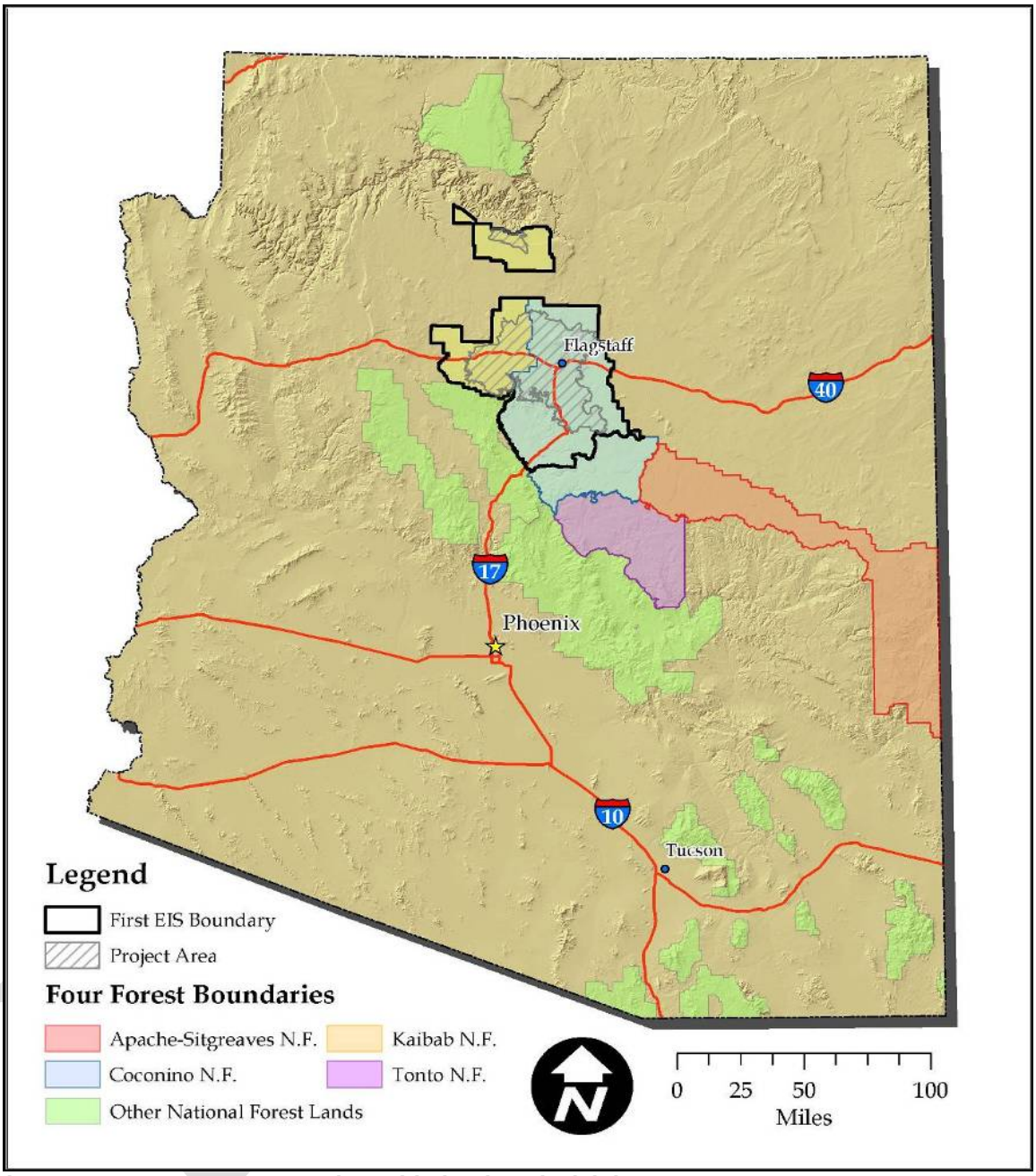

Figure 1. Four-Forest Restoration Initiative (4FRI) Vicinity Map

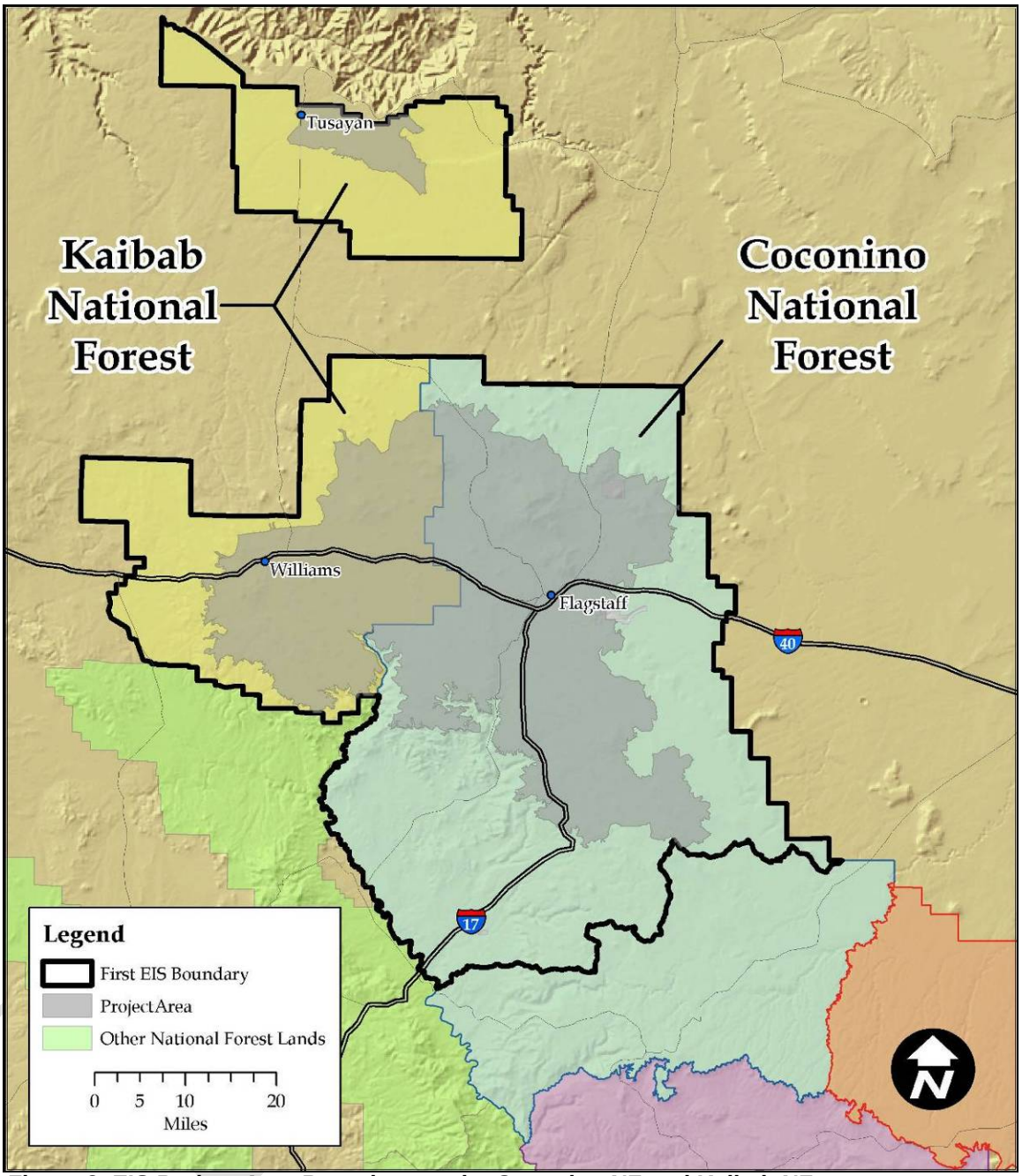

Figure 2. EIS Project Area Boundary on the Coconino NF and Kaibab NFs

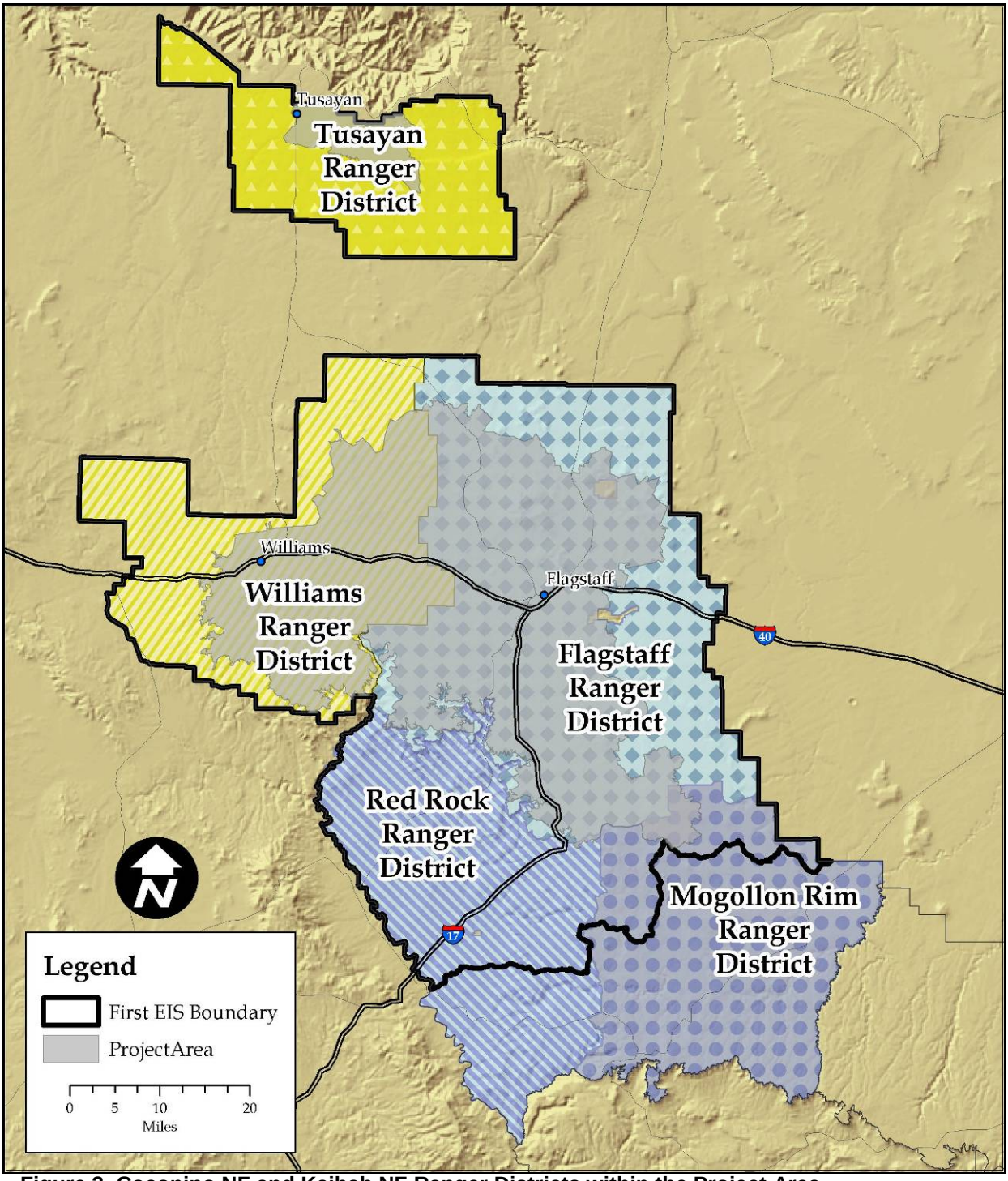

Figure 3. Coconino NF and Kaibab NF Ranger Districts within the Project Area

Background

Extensive research has demonstrated that current ponderosa pine forests of the Southwest are greatly altered in terms of forest structure, density, and ecological function. Most pine forests in the Southwest are at much higher risk of high intensity and severe fire than they were prior to European settlement (Covington 1993, Moore et al. 1999). A century ago the pine forests had widely-spaced large trees with a more open, herbaceous forest floor (Cooper 1960). These conditions were maintained by fairly frequent low-severity surface fires that did not kill the large trees (Fiedler et al. 1996). These fires occurred every 2 to 21 years and maintained an open canopy structure (Moir et al. 1997). Typical historic tree group/patch size ranged from 0.1 to 0.75 acres in size, (2 to 40 + trees) (White 1985). The herbaceous understory fueled frequent fires started by lightning and thinned and/or eliminated thickets of small trees keeping the forest open and park-like (Allen et al. 2002).

Fire suppression, cattle grazing, timber production, and general human habitation in and near the forests over the last 100 years interrupted fire's natural role in these fire-adapted ponderosa pine forests. As a result, the forests have shifted from naturally open conditions to high densities of small diameter trees (Covington and Moore 1994) dramatically increasing the size and severity of wildland fires (Swetnam and Betancourt 1998). The forests have become less resilient to natural disturbances and are vulnerable to large-scale disturbances such as changing climatic conditions (drought), fire, insect, and disease. In response to this, the 4FRI was created.

The 4FRI is a result of several years of planning and collaboration among interested parties, groups and organizations, state and local governments, and state and federal agencies. In 2007, the Arizona Forest Health Council completed the Statewide Strategy to Restore Arizona's Forests. The strategy's vision is to integrate knowledge and experience from science, community collaboration, and economics to identify the necessary steps to increase the rate and effectiveness of forest restoration across Arizona.

In February 2008, based on recommendations within the statewide strategy, the Analysis of Small Diameter Wood Supply in Northern Arizona (USDA et al. 2008) report was completed. This process demonstrated a level of "social agreement" on how much, where and under what basic parameters mechanical treatment, as one restoration tool, could be used to accelerate restoration of the 2.4 million-acre ecosystem. In 2008, the Kaibab NF launched the Kaibab Forest Health Focus, a science-based, collaborative effort to guide future landscape-level forest restoration efforts.

In 2009, Title IV of the Omnibus Public Land Management Act authorized funding for the Collaborative Forest Landscape Restoration Fund (CFLR) to support landscape-scale restoration on National Forest System lands. CFLR objectives include reducing uncharacteristic wildfire and the associated management costs, supporting local and collaborative partnerships, supporting monitoring of restoration efforts, and supporting efforts that utilize forest products that benefit communities and offset treatment costs.

In an effort to further advance collaborative efforts and secure the necessary assistance, the Forest Service created a task force to work with the Forest Health Council. The purpose of the task force was to identify alternative approaches to accelerating forest restoration in northern Arizona. In an effort to move into on-the-ground implementation as quickly as possible, stakeholders representing individuals, state and federal agencies, local governments, the four National Forests in northern Arizona and the Forest Service's Southwestern Regional Office moved forward with the four-forest initiative. The initiative received funding via CFLR Act in 2010.

In 2010, stakeholders and the Forest Service began refining the vision for ponderosa pine forest restoration across 2.4 million acres on four National Forests in northern Arizona: the Apache-Sitgreaves, Coconino, Kaibab, and Tonto National Forests. Stakeholders developed a comprehensive landscape restoration strategy for the Coconino NF and Kaibab NF which documented existing conditions, potential treatment areas and desired post-treatment conditions. The Forest Service used the stakeholder's landscape restoration strategy to inform the purpose and need and proposed action for this project.

4FRI History

Statewide Strategy to Restore Arizona's Forests (2007)

Analysis of Small Diameter Wood Supply in Northern Arizona (2008)

Kaibab Forest Health Focus (2008)

Collaborative Forest Landscape Restoration Fund (CFLR) (2009)

Landscape Restoration Strategy For The First Analysis Area (2010)

Location

The 988,764-acre project area is located on the Williams and Tusayan districts of the Kaibab NF and on the Flagstaff, Mogollon Rim, and Red Rock districts of the Coconino NF (figure 3). Of the 988,764 acre total, approximately 380,000 acres have been excluded from this proposal as approximately 204, 957 acres are being analyzed in separate environmental analyses; about 30,000 acres are located in special areas that include designated wilderness; and over 145,000 acres are non-Forest Service administered lands. The project area is entirely located within Coconino County.

Due to the size of the project area, the 4FRI team utilized a strategy developed by the 4FRI stakeholders and stratified the landscape into six restoration units (figure 4). A restoration unit (RU) is a contiguous geographic area that ranges from about 46,000 acres to 333,000 acres in size. A need for change (vegetation structure, pattern, spatial arrangement, potential for destructive fire behavior and effects) was identified for each RU.

RU 1 includes portions of the Flagstaff, Mogollon, and Red Rock districts (Coconino NF). RU 1 is generally located south of I-40 and east of I-17. RU 3 includes portions of the Williams district (Kaibab NF), Flagstaff and Red Rock districts (Coconino NF) and is generally located south of I-40 and west of I-17. RU 4 includes portions of the Flagstaff district and the Williams district. It is generally located north of I-40 and west of Highway 180. Communities in the vicinity of proposed treatments include Flagstaff, Munds Park, Mormon Lake, Tusayan and Williams, Arizona. RU 2, located west of I-17 and south of the Mogollon Rim (see figure 4), has been removed from this analysis as the vegetation in this unit is not contiguous ponderosa pine. Therefore, no treatments are proposed in this RU.

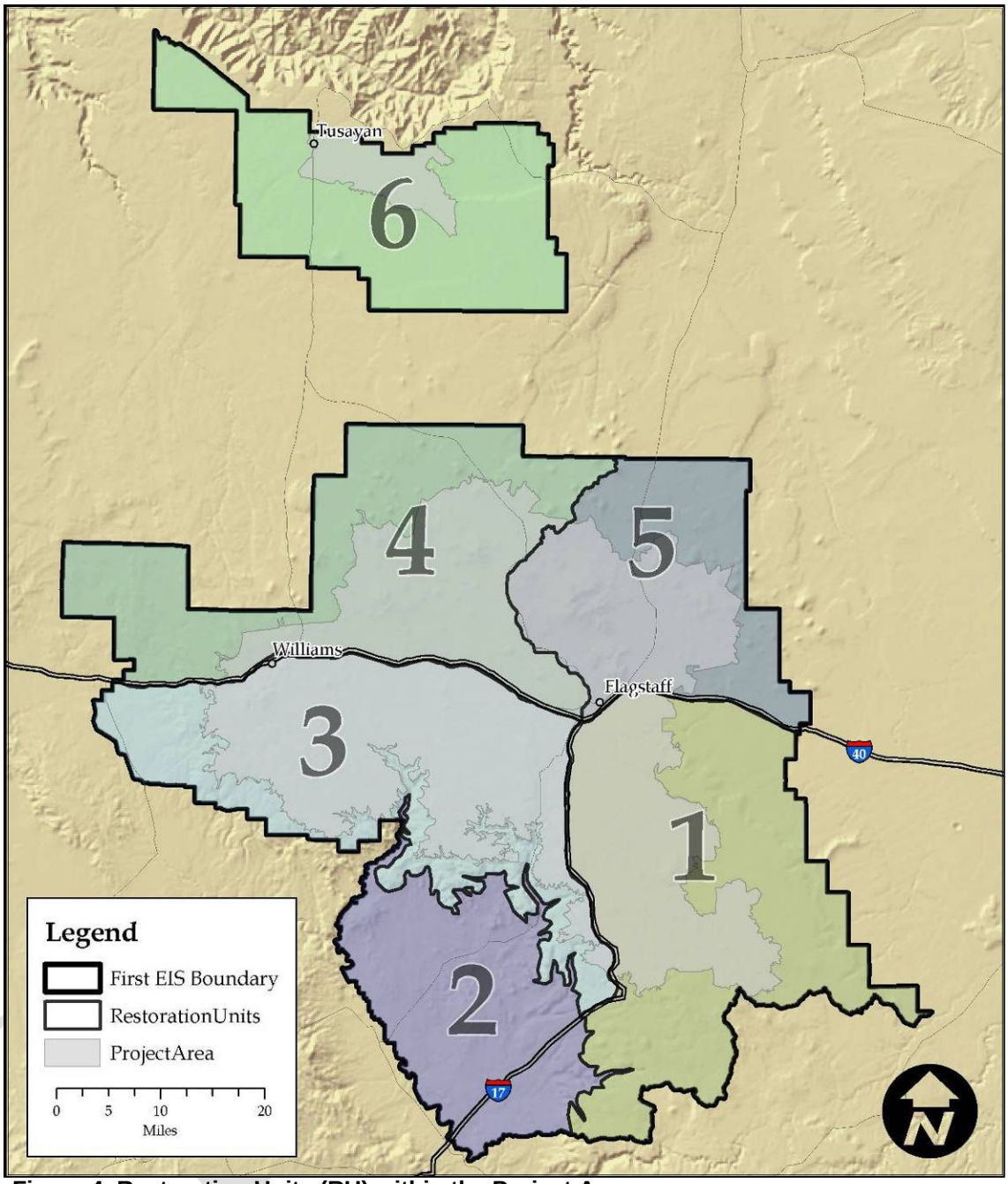

Figure 4. Restoration Units (RU) within the Project Area

The project area was further stratified into several sub-units that range from 4,000 to 109,000 acres in size. Both units (RU and sub-units) are based on 6th code watershed boundaries, state and forest transportation systems, and the forest's administrative boundaries (figure 5). How restoration units and subunits may have been used to evaluate environmental consequences was determined by each resource specialist. Some analysis scales were selected to meet forest plan requirements (see individual resource sections in chapter 3).

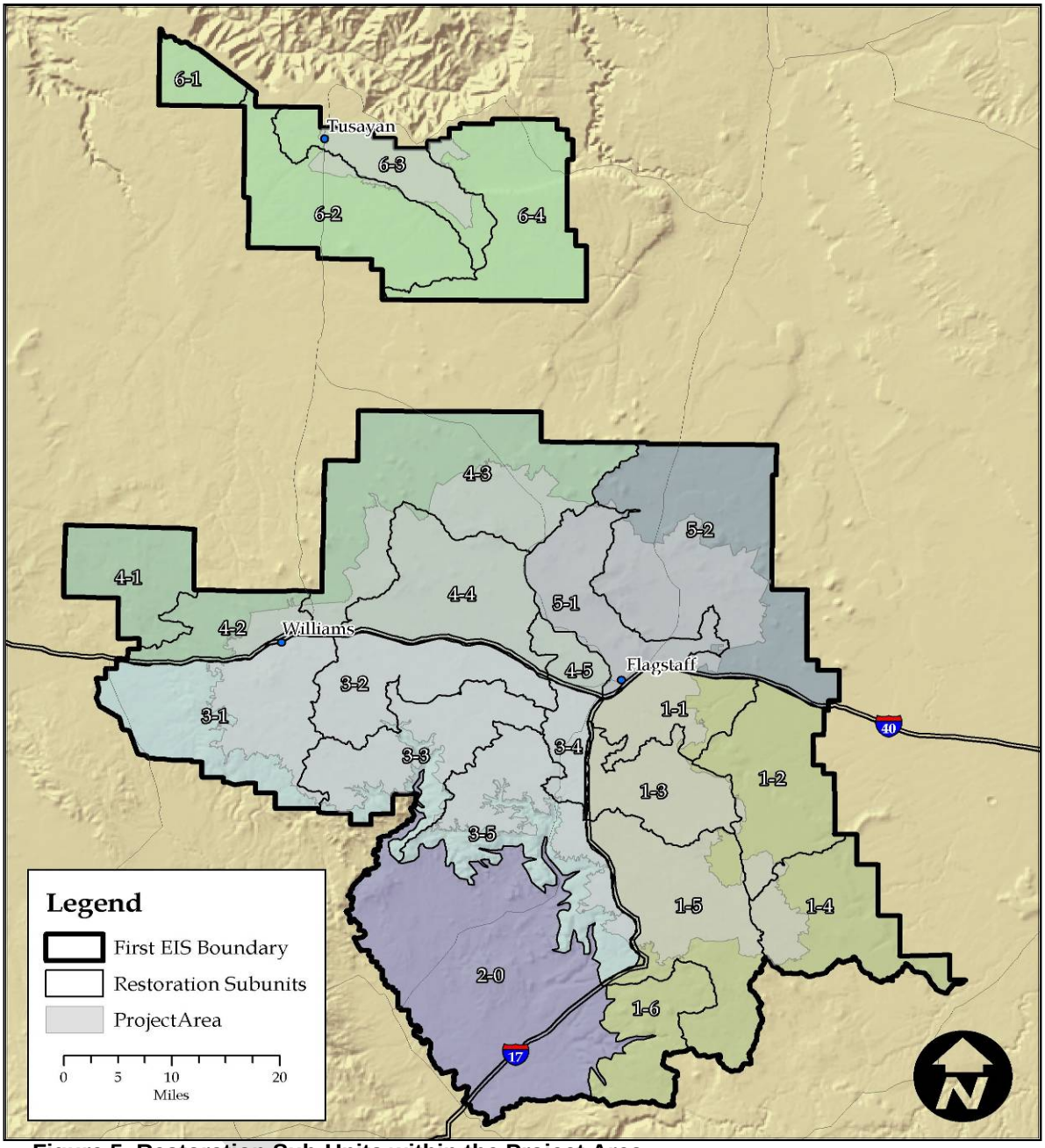

Figure 5. Restoration Sub-Units within the Project Area

Project Record

All documents used in the decision-making process for this project are in the project record located at the Coconino National Forest Supervisor's Office and are available to the public pursuant to the provisions of the Freedom of Information Act (40 CFR 1506.6(f)).

Purpose and Need for Action

The purpose and need for proposing an action was determined by comparing the objectives and desired conditions in the Coconino NF and Kaibab NF Land Resource and Management Plans (forest plans) to the existing conditions related to forest resiliency and forest function. Where plan information was dated or not explicit, local research and the best available science were utilized. The results of the comparison are displayed in narrative, tables, and photographs. In summary, there is a need for:

- moving vegetation structure and diversity towards desired conditions by creating a mosaic of interspaces and tree groups of varying sizes and shapes
- moving towards a forest structure with all age and size classes represented as identified in the 1996 forest plan amendment for northern goshawk and Mexican spotted owl habitat
- managing for old age (pre-settlement) trees such that old forest structure is sustained over time across the landscape by moving towards forest plan old growth standards of 20 percent at a forest EMA scale
- improving forest health by reducing the potential for stand density-related mortality and by reducing the level of dwarf mistletoe infection
- moving towards desired conditions for vegetation diversity and composition by maintaining and promoting Gambel oak, aspen, grasslands and pine-sage
- moving towards the desired condition of having a resilient forest by reducing the potential for undesirable fire behavior and its effects
- moving towards the desired condition of maintaining the mosaic of tree groups and interspaces with frequent, low-severity fire by having a forest structure that does not support wide-spread crown fire
- moving toward desired conditions in riparian ecosystems by having springs function at, or near, potential
- moving towards desired conditions for degraded ephemeral channels by restoring channel function
- moving towards restoring select closed and unauthorized roads to their natural condition by restoring soil function and understory species

Existing and Desired Conditions

Forest Structure

A century ago the pine forests were dominated by widely-spaced large trees with a more open, herbaceous forest floor (Cooper 1960). Typical historic tree group/patch size ranged from 0.1 to

0.75 acres in size, (2 to 40+ trees) (White 1985). This historic range of variability[1] condition for trees per acre on the Fort Valley Experimental Forest, near Flagstaff, Arizona, is estimated to average 23 to 56 trees per acre (Covington 1993).

Fires burned on a frequency ranging from 2 to 21 years (Weaver 1951, Cooper 1960, Fule 2003, Heinlein et al. 2005, Diggins 2010, Swnetnam and Baisan 1996, Fulé et al. 1997), with the majority of acres burning with low-to-moderate severity surface fire. The herbaceous understory fueled frequent fires started by lightning, and thinned and/or eliminated thickets of small trees keeping the forest open and park-like (Allen et al. 2002). This created a mosaic of grass, forbs, shrubs, and trees. Under these conditions, the forest maintained its diversity and resiliency to fire and other natural disturbances. Today, human factors have led to a lack of re-occurring fire, which has resulted in a landscape that is highly departed from historic reference conditions. The desired condition is to restore tree density and pattern to the natural range of variability, while meeting forest plan requirements for Mexican spotted owl (hereafter referred to as MSO) protected and target/threshold habitat and goshawk nest stands. There is a need to move towards the forest structural reference conditions that were typical when natural disturbances were intact.

Canopy Openings

The ponderosa pine forests on the Kaibab are much denser than historic conditions, with 79 percent of the stands in a “closed” state (greater than 32 percent canopy cover). Historically there were spaces between clumps of trees that are now either smaller or nonexistent. Only 19 percent of the ponderosa potential natural vegetation type (PNVT) is currently in the historic condition, which was all a mature to old forest with various-sized patches of young regenerating forest (USDA 2008). Likewise on the Coconino NF, there have been significant shifts to a closed medium aged forest with loss of herbaceous understory and tree age diversity with a trend away from reference conditions. Currently 76 percent of young and young to mid aged forests have cover greater than 30 percent (USDA 2009).

As noted earlier, a century ago the pine forests had widely-spaced large trees with a more open, herbaceous forest floor (Cooper 1960). Typical historic tree group/patch size ranged from 0.5 to 0.75 acres in size, (2 to 40+ trees) (Cooper 1961, White 1985, Pearson 1950). In contrast to having a ponderosa pine ecosystem consisting of groups of trees with an open tree canopy density mixed with interspaces (Woolsey 1911), approximately 75 percent of the ponderosa pine forest type within the project area has a moderately closed to closed tree canopy density.

Table 2 displays the departure from the historic range of variability across the project area using canopy density as the analysis metric to estimate the continuity of the tree canopy. Figure 6 displays a continuous tree canopy with few canopy gaps and openings and figure 7 displays Mexican spotted owl and goshawk habitat that exceeds forest plan desired conditions for canopy density. Stand density index and basal area where used to calculate the existing canopy density within these habitats.

[1] For every biophysical environment, natural disturbance processes such as fire, insects, disease, wind, etc. have measurable patterns of frequency, intensity and spatial scale. The pattern of variability over time constitutes the historical range of variation (HRV). This variability in disturbance regimes, over time defines the range of forest species composition, structure and functions. The ability of an ecosystem to absorb and recover from disturbances without drastic alteration of their inherent function is central to the concept of HRV. In the southwestern US, fire is a primary disturbance agent and fire regimes are central to understanding HRV as it relates to various forest types (Fulé et al. 2003).

An open tree canopy mixed with interspaces which mimic historical spatial patterns and provide for tree regeneration and the development of grass and forbs are lacking. There is a direct relationship between canopy openings and understory vegetation. About 99 percent of the vegetation diversity in Southwest ponderosa pine forests occurs as understory species (Laughlin and Abella 2007). Abella and Springer (2008) concluded that tree thinning was a viable management technique for increasing the vigor and richness of understory.

At the fine scale, the desired condition is a ponderosa pine ecosystem consisting of groups of trees that typically range in size from 0.1 acre to 1.0 acre in size. Tree group size exceeds 1-acre in size as needed to respond to site-specific conditions such as the presence of pre-settlement trees or mature, young trees that are developing old-tree characteristics. Tree groups in the mid-age and older VSS classes have canopies that provide moderate-to-closed conditions and connectivity for wildlife that are dependent on this type of habitat. These conditions are widely distributed on the landscape. At the landscape scale (extent of ponderosa pine vegetation), all canopy density conditions exist and provide for heterogeneity.

Moderate-to-closed canopy conditions (and the connectivity between groups supporting these conditions) are met in a variety of ways: habitat for goshawk and MSO, steep slopes, buffers for several resources including bald eagle roosts, other raptor nests, caves, and special designations that would not be treated (including wilderness and most research natural areas). There is a need to use management strategies that: (1) promote tree regeneration and understory vegetation, (2) move tree canopy density, tree group pattern and interspaces towards the historic range of variability, and, (3) provide a mix of open, moderately-closed, and closed canopy conditions at the fine (group) to landscape (ponderosa pine vegetation) scale.

Table 2. Current Percent of Ponderosa Pine in Project Area by Tree Canopy Density Classification

Tree Canopy Density Classification (%)	Percent of Project Area (%)
Open: 10 to 39	22
Moderately Closed: 40 to 59	30
Closed: 60+	45
Unknown	3

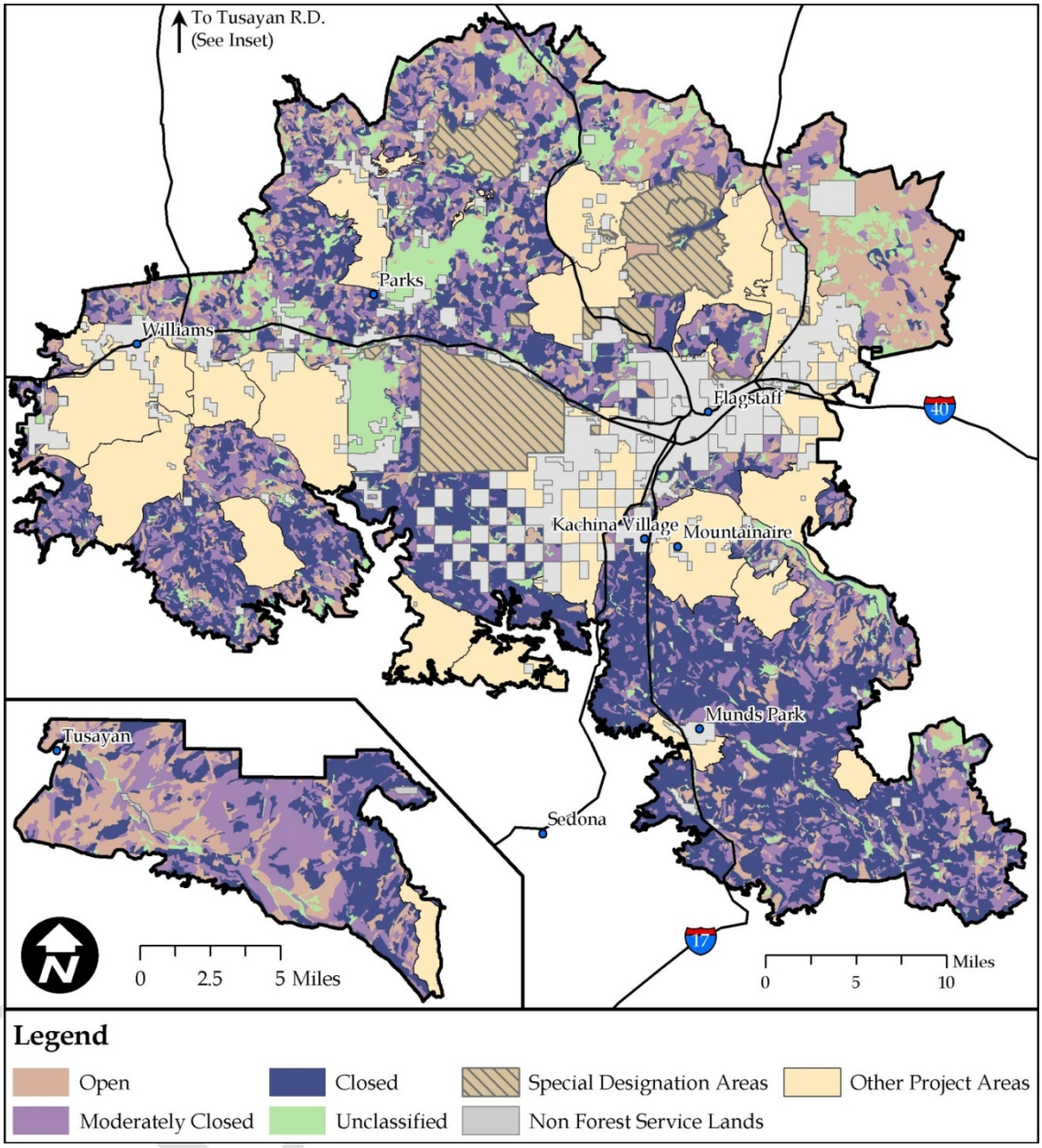

Figure 6. Existing Canopy Density within the Project Area

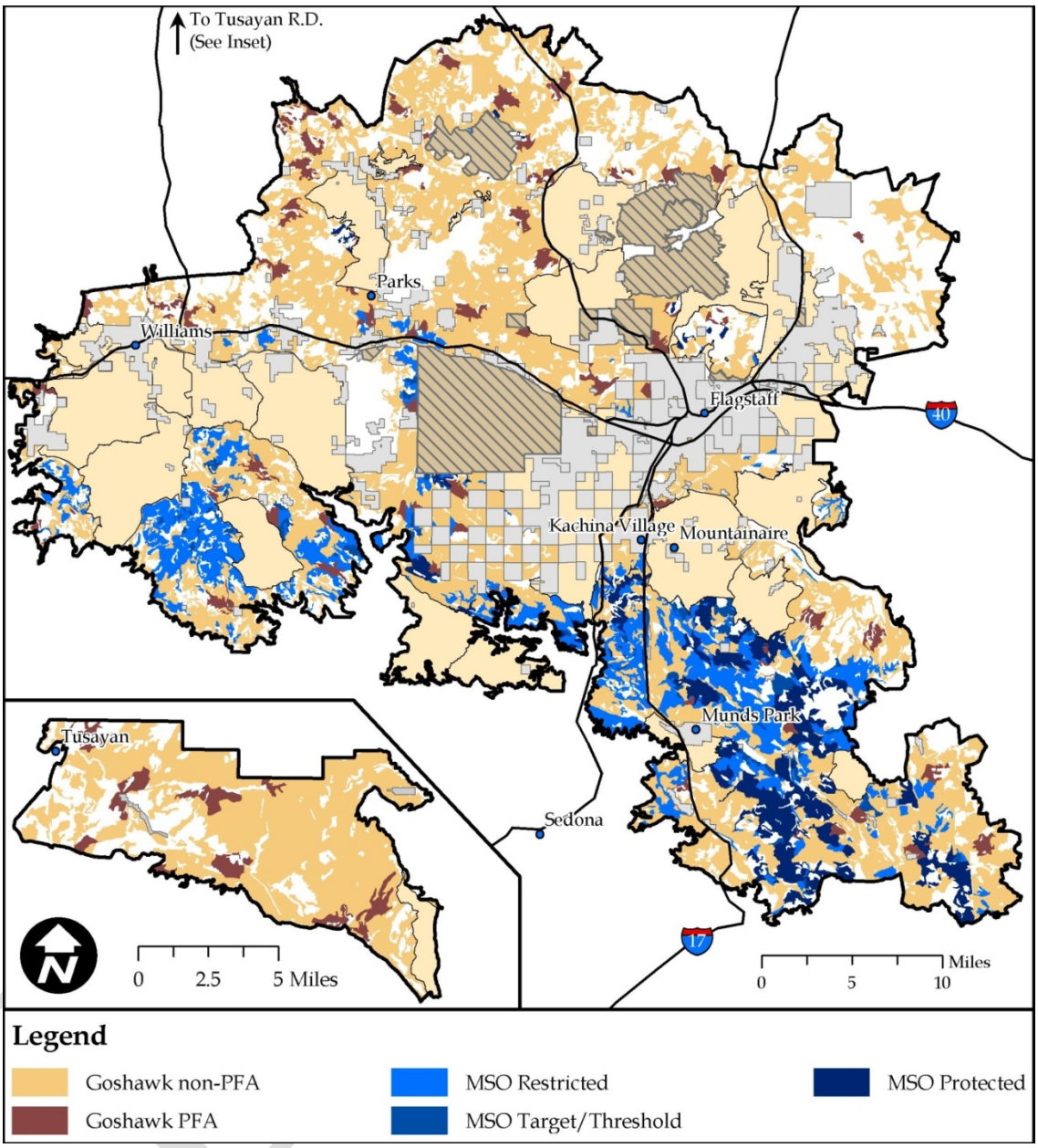

Figure 7. Canopy Density within Goshawk and MSO Habitat that Exceeds Forest Plan Desired Conditions

Figure 8 and figure 9 compare the change in the ponderosa pine herbaceous understory in the Government Mountain area on the Kaibab NF in 1953 and 2010, a span of 57 years. At the time the photo in figure 8 was taken, there was still a healthy, contiguous herbaceous understory with a matrix of bunchgrass with little needle litter. A fire burning through this system would not have been able to move from crown to crown in the trees, but would have been a surface fire. Occasional and isolated torching of individual trees or clumps of trees would have occurred.

It is important to note that by 1953, the area had already experienced the impacts of approximately 70 years of varying degrees of livestock grazing and 43 years of fire suppression. This likely contributed to the number and size of trees present in figure 9. Note that the size of trees in figure 8 is small. There is no evidence of logging or evidence of high stumps that would indicates trees were cut by hand. This indicates that the area was much more open than in figure 9. In figure 9, the five trees in the foreground have matured. Younger trees now occupy what had been a meadow behind them. The needle litter at the surface has increased. Needle litter combined with the increasing shade from the matured trees caused a significant decrease in the surface vegetation. A fire moving through this system could move from tree crown to tree crown, potentially killing most of the trees in one fire.

The desired condition is to restore tree density and pattern to the natural range of variability, while meeting forest plan requirements for MSO protected and target/threshold habitat and goshawk nest stands. Canopy gaps and interspaces would provide adequate space for the development of rooting zones for tree groups and an increase in the grass/forb understory. Canopy gaps and interspaces between tree groups or individuals, based on site productivity and soil type, would range from 10 percent on highly productive sites to as high as 90 percent on those soil types that have an open reference condition. Pre-settlement tree evidence would be used to help determine the historic range of variability in tree densities.

Figure 8. Government Mountain Monitoring Transect Circa 1953

Figure 9. Government Mountain Monitoring Transect in 2010

Age and Size Class Diversity

Forest resiliency and diversity is dependent on the distribution of age and size classes. A balance of age and size classes across the landscape allows for a sustainable balance of regeneration, growth, mortality, and decomposition (Oliver and Larsen 1990, Franklin et al. 2002, Thomas et al. 1979). Currently, over 50 percent of the project area lacks age and size class diversity and is in an even-aged structure. A lack of age and size class diversity results in a homogenous landscape with reduced resiliency (i.e. much higher risk of high intensity and severity fire, density-related mortality and dwarf mistletoe spread and intensification) and diversity (i.e. reduced herbaceous productivity and tree-related wildlife habitat). The desired condition is to have a forest structure that represents all age classes necessary for a sustainable balance of regeneration, growth, mortality, and decomposition (USDA 1987, as amended; USDA 1988, as amended). There is a need to implement un-even aged management strategies where appropriate.[2] Figure 10 displays a dense, even-aged forest structure that is common throughout the project area.

Figure 10. Example of a Mid-Aged, Dense Forest with Trees that are the Same Age and Size (Even-Aged), which is Common Throughout the Project Area

[2] Mexican spotted owl (MSO) protected/threshold habitats and goshawk nest habitats are managed for high-density, relatively uneven-aged stands.

Figure 11 displays a recently thinned stand that will progress towards the desired condition of having a ponderosa pine forest structure that is uneven-aged. This stand consists of groups of trees with an open tree canopy density mixed with interspaces and a robust herbaceous understory. Note the difference in the stand structure and understory vegetation displayed in figure 11when compared to figure 10.

Figure 11. Ponderosa Pine with Groups, Gaps, and Open Canopies on the Coconino NF (Mountainaire Project, Approximately 1 Year Post-Treatment)

Forest Structure in Goshawk and MSO Habitat

The Coconino NF and Kaibab NF forest plans include standards and guidelines that, once implemented, will move treated areas towards a forest structure with all age and size classes represented for all goshawk and MSO habitat types (USDA 1987, as amended; USDA 1988, as amended). Vegetation Structural Stage (VSS) is the metric used to describe existing and desired age and size classes. Table 3 and figure 12 display the acres of goshawk and MSO habitat within the project area. Figure 12 also provides relative locations of other non-ponderosa pine vegetation (cover types) and areas not proposed for treatment.

Table 3. Goshawk and MSO Habitat within Project Area

Habitat Type	Acres
Goshawk Protected Fledgling Family Area (PFA), dispersal PFA and nest stands	30,600
Goshawk non-PFA	369,033
Goshawk Habitat Total Acres	399,633
MSO Protected Activity Area (PAC)	36,455
MSO Restricted	67,378
MSO Target/Threshold	8,713
MSO Habitat Total	112,546
Total Acres of goshawk and MSO habitat	512,178

Northern Goshawk

Specific to the northern goshawk, forest plan guidelines incorporate direction for maximizing sustainable landscapes of old forest (USDA 1987, as amended; USDA 1988, as amended). The guidelines were designed to sustain a long-term (250 years or more) intermix of VSS, ranging from newly regenerated to old-aged trees and forests. Reynolds et al. (1992) determined this is best accomplished with about 20 percent of a landscape in VSS 1 and VSS 2 (grass/forb, seedlings/saplings), 20 percent in VSS 3 (young forest), 20 percent in VSS 4 (mid-aged forest), 20 percent in VSS 5 (mature forest), and 20 percent in VSS 6 (old forest). Each VSS can vary by 3 percent (plus or minus). These proportions reflect forest development from cohort establishment through canopy closure to old forests.

Reynolds et al. (1992) based the VSS recommendations on the needs of goshawks and 14 key prey species. No single prey species is likely to be abundant enough to support goshawks, especially during winter and extreme weather. Providing the habitat conditions necessary to support 14 key species is expected to provide for goshawks regardless of what may be happening to any one individual prey species at any given time. Prey populations within goshawk non-post fledgling areas (PFAs) are expected to be abundant and sustainable when the mix of VSS classes is achieved along with interspaces, understory vegetation development, and the maintenance of snags and logs.

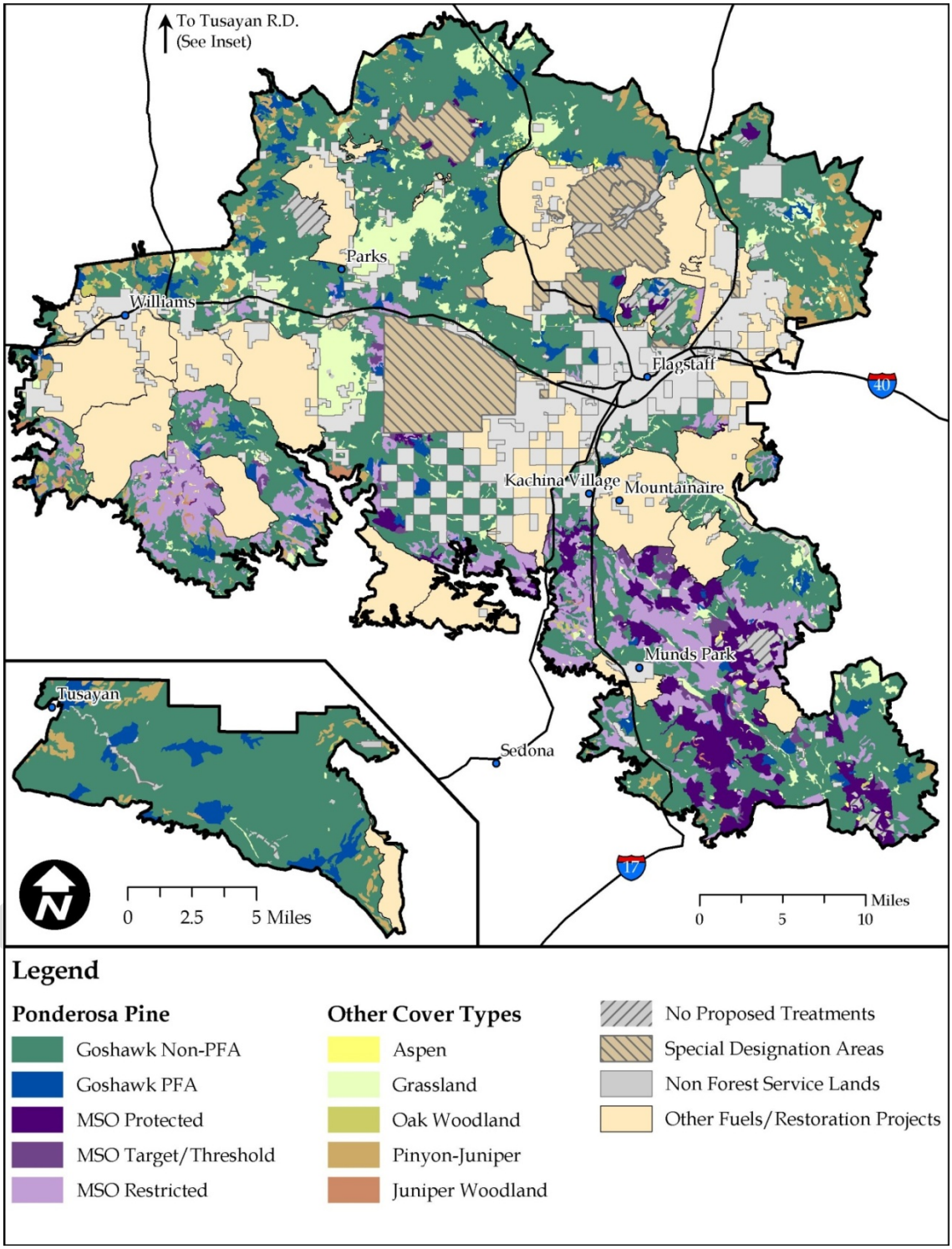

Figure 12. Goshawk and MSO habitat Relative to Other Vegetation (Cover Types) and Areas with No Treatment

Table 4 and table 5 (based on 2010 data) display the existing and desired forest structure within goshawk non-PFA habitat. The project area has approximately 369,033 acres of goshawk non-PFA habitat. Even-aged stand conditions (table 3) apply to 56 percent of then non-PFA habitat within the project area. This condition is only desirable in nesting stands. Approximately 44 percent of the foraging habitat is an uneven-aged stand condition (table 4). Of the even-aged stands, 56 percent is mid-aged to mature (VSS 4+) and 36 percent is categorized as young (VSS 3). Approximately 76 percent of all ponderosa pine stands in goshawk non-PFA habitat are VSS 3 and VSS 4. This means the project area is deficit of mature and old forest (VSS 5 and 6) as well as seedlings and saplings (VSS 2).

The Coconino NF and Kaibab NF forest plans do not describe desired even-aged stand conditions for goshawk non-PFA habitat. The desired condition is to convert all even-aged habitats outside of PFAs (table 4) to the uneven-aged structural conditions shown in table 5 and convert all goshawk PFA/nest stands to the desired uneven-aged structural conditions shown in table 6.

Table 4. Goshawk Non-PFA Habitat Even-Aged Stands in the Project Area

Vegetation Structural Stage (VSS)	Tree Diameter (dbh*)	Even-Aged Existing % of Area	Forest Plan Desired % Distribution
1 – Grass/Forb/Shrubs	0.0 – 0.9”	8	Uneven-aged in all VSS classes
2 – Seedling/Sapling	1.0 – 4.9”	0	
3 – Young Forest	5.0 – 12”	36	
4 – Mid-age Forest	12.0 – 17.9”	47	
5 – Mature Forest	18.0 – 23.9”	8	
6 – Old Forest	24”+	1	

*dbh is diameter at breast height

Table 5 compares the existing VSS to the desired condition of 20 percent of a landscape in VSS 1 and VSS 2 (grass/forb, seedlings/saplings), 20 percent in VSS 3 (young forest), 20 percent in VSS 4 (mid-aged forest), 20 percent in VSS 5 (mature forest), and 20 percent in VSS 6 (old forest). The table illustrates that the existing uneven-aged forest structure does not represent a balance of VSS classes. As a result, habitat components such as an intermix of vegetation structural stages are lacking or limited in most stands. VSS 3 (35 percent) and VSS 4 (32 percent) are over-represented and VSS 1 (0 percent), VSS 2 (2 percent), VSS 5 (14 percent), and VSS 6 (17 percent) are deficit relative to a balanced age/structure uneven-aged condition.

Table 5. Goshawk Non-PFA habitat Uneven-Aged Stands in the Project Area

Vegetation Structural Stage (VSS)	Tree Diameter (diameter at breast height or dbh)	Existing % of Area	Forest Plan Desired % Distribution
1 – Grass/Forb/Shrubs	0.0 – 0.9”	0	10
2 – Seedling/Sapling	1.0 – 4.9”	2	10
3 – Young Forest	5.0 – 12”	35	20
4 – Mid-age Forest	12.0 – 17.9”	32	20
5 – Mature Forest	18.0 – 23.9”	14	20
6 – Old Forest	24”+	17	20

In sum, approximately 32 to 76 percent of all ponderosa pine stands in goshawk non-PFA habitat are VSS 3 and VSS 4. This means the project area is deficit of mature and old forest (VSS 5 and 6) as well as seedlings and saplings (VSS 1 and VSS 2).

Within the project area there is approximately 30,600 acres of goshawk PFA, dispersal PFA (dPFA) and nest (includes replacement nest stands) habitat. The forest plan desired distribution of VSS in PFAs is the same as described above (table 5) for forging habitat. The desired conditions for goshawk nest and replacement nest stands is to have a forest structure dominated by mature and old forest structure (VSS 5 and VSS 6) with a canopy cover of 50 percent or higher. Table 6 displays conditions similar to those found in foraging habitat. VSS 3 and 4 are over-represented and VSS 1, 2, 5 and 6 are deficit relative to a balanced age/structure uneven-aged condition. In terms of landscape ecology, these elements represent specific habitat components that are needed for goshawk prey species. An imbalance in these habitat components potentially decreases the ability of goshawks to maintain their numbers over time. There is a need to manage for a balanced interspersion of age classes in goshawk non-PFA and PFA/nest stand habitat.

Table 6. Forest Structure in Goshawk PFA/Nest Stands in the Project Area

Vegetation Structural Stage (VSS)	Tree Diameter (dbh)	Existing % of Area	Forest Plan Desired % Distribution
1 – Grass/Forb/Shrubs	0.0 – 0.9”	2	10
2 – Seedling/Sapling	1.0 – 4.9”	1	10
3 – Young Forest	5.0 – 12”	34	20
4 – Mid-age Forest	12.0 – 17.9”	46	20
5 – Mature Forest	18.0 – 23.9”	11	20
6 – Old Forest	24”+	6	20

Mexican spotted owl (MSO)

Forest structure for MSO pine-oak habitat was evaluated using 2010 data. The existing percent stand density index (SDI) was compared to the desired percent of SDI by size class. SDI is a metric used to rate the potential for density related tree mortality. Table 7 displays that MSO restricted habitat has an excess of the smaller size classes (12 inch to 18 inch) and is deficit in the largest size class (24 inch dbh). Also see figure 7 (page 14) which displays MSO habitat that

exceeds canopy density desired conditions. The density conditions were calculated using SDI and basal area. There is a need to implement uneven-aged management strategies and manage for high-density, relatively uneven-aged stands in MSO restricted habitat, including target/threshold habitats to meet forest plan and MSO Recovery Plan requirements.

Table 7. Percent of the Total Existing Stand Density Index (SDI) and Trees per Acre in MSO Restricted Habitat

SDI by dbh and Trees per Acre ≥18" dbh class	Existing Percent (%) of Total SDI in MSO Restricted Habitat		Desired Percent (%) of Total SDI and Trees Per Acre ≥ 18" dbh class
	Target/Threshold	Restricted (Non-target/threshold)	
SDI – 12" to 18"	28	29	15
SDI – 18" to 24"	15	13	15
SDI – 24"+	7	7	15
TPA ≥ 18"	16.3	11.5	20

Habitat Function and Resiliency

In addition to the need to improve habitat quality, both goshawk and MSO habitats are at risk from passive and active crown fire and the severe effects that accompany crown fire. Approximately 47 percent of MSO restricted habitat is at risk of crown fire. This increases to 50 percent in protected habitat and to 51 percent in target/threshold habitat. In goshawk habitat, 39 percent of post-fledgling family areas (PFA), dispersal PFA, and nest stands are at risk. The risk in landscapes outside of PFAs is 36 percent. There is a need to reduce the risk of crown fire which can impair or remove habitat, function, and move towards habitat conditions that are resilient to disturbances such as fire.

Old Growth

The forest plans define old growth as a condition of the forest having structural attributes based on the number of large trees per acre, basal area, canopy cover percent, dead standing trees and down logs (USDA 1987, as amended; USDA 1988, as amended). Ponderosa pine and pinyon-juniper are the species identified for allocating old growth in this analysis.

Forest plan old growth standards state, "Until the forest plan is revised, allocate no less than 20 percent of each forested EMA to old growth" and "Allocations will consist of landscape percentages meeting old growth conditions and not specific acres". Old growth guidelines for both forests state, "All analyses should be at multiple scales - one scale above and one scale below the ecosystem management areas" (USDA 1987, as amended; USDA 1988, as amended).

Four scales of analysis have been developed given the size of this project. The smallest scale represented is stands or contiguous groups of like-stands averaging 100 acres in size. The equivalent to the EMA is the restoration sub-unit with sub-units ranging in size from 4,000 to 109,000 acres. The scale above the EMA is the restoration unit which ranges in size from 46,000 to 333,000 acres. The fourth scale for the ponderosa pine type is the 512,179 acres of ponderosa pine within the project area. For pinyon-juniper type, it is the 23,316 acres of pinyon-juniper within the project area.

Allocations to old growth consist of landscape percentages meeting old growth conditions and not specific areas. The allocations for this project are independent of previous allocations that were part of other projects/analyses that overlap this project area. This is due to changes in forest conditions since the previous analyses and updates to the MSO and goshawk habitat classifications.

A review of stand data and habitat classifications within the project area indicates there are approximately 512,179[3] acres of ponderosa pine in the project area. Of this total, 194,804 acres meet old growth conditions. Old growth allocations are based on current conditions within the project area along with forest plan specific management direction. Currently, all restoration units meet or exceed the 20 percent minimum percentage forest plan requirement. Table 8 displays existing ponderosa pine old growth allocations by restoration unit and forest. Figure 13 displays the general locations of ponderosa pine and pinyon-juniper (in the project area) that currently meet old growth conditions.

For ponderosa pine, the old growth allocation acreage/percentage includes: 100 percent of MSO protected habitat, 100 percent of MSO target/threshold, 40 percent of MSO restricted habitat that is uneven-aged with low dwarf mistletoe infection, 80 percent of MSO restricted habitat that is even-aged and mid-aged to old with low dwarf mistletoe infection, 100 percent of goshawk nest stands, 40 percent of goshawk PFA and foraging areas that are uneven-aged with low dwarf mistletoe infection, and 80 percent of goshawk PFA and foraging areas that are even-aged and mid-aged to old with low dwarf mistletoe infection. Most sites currently do not fully meet the minimum criteria for ponderosa pine old growth conditions as listed in the forest plans. However, the habitat types noted above are closest to meeting old growth conditions. This approach is consistent with forest plan direction which states: "strive to create or sustain as much old growth compositional, structural, and functional flow as possible over time at multiple-area scales…and seek to develop or retain old-growth function on at least 20 percent of the naturally forested area by forest type in any landscape" (USDA 1987, USDA 1988). Where management occurs within the ponderosa pine cover type, there is a need to maintain the old growth characteristics within the sites allocated as old growth.

Table 8. Ponderosa Pine Old Growth Allocation Acres and Percent by Forest and Restoration Unit

Restoration Unit	Ponderosa Pine Total Acres		Ponderosa Pine Old Growth Acres		Old Growth Percent (%)	
	Coconino NF	Kaibab NF	Coconino NF	Kaibab NF	Coconino NF	Kaibab NF
1	145,793	0	65,189	0	45	0
3	58,327	70,898	21,341	25,177	37	36
4	56,981	77,320	17,718	30,342	31	39
5	61,671	0	24,745	0	40	0
6	0	41,188	0	10,291	0	25
Total	**322,772**	**189,407**	**128,994**	**65,810**	**40**	**35**

[3] Number was rounded up from 512,178 acres.

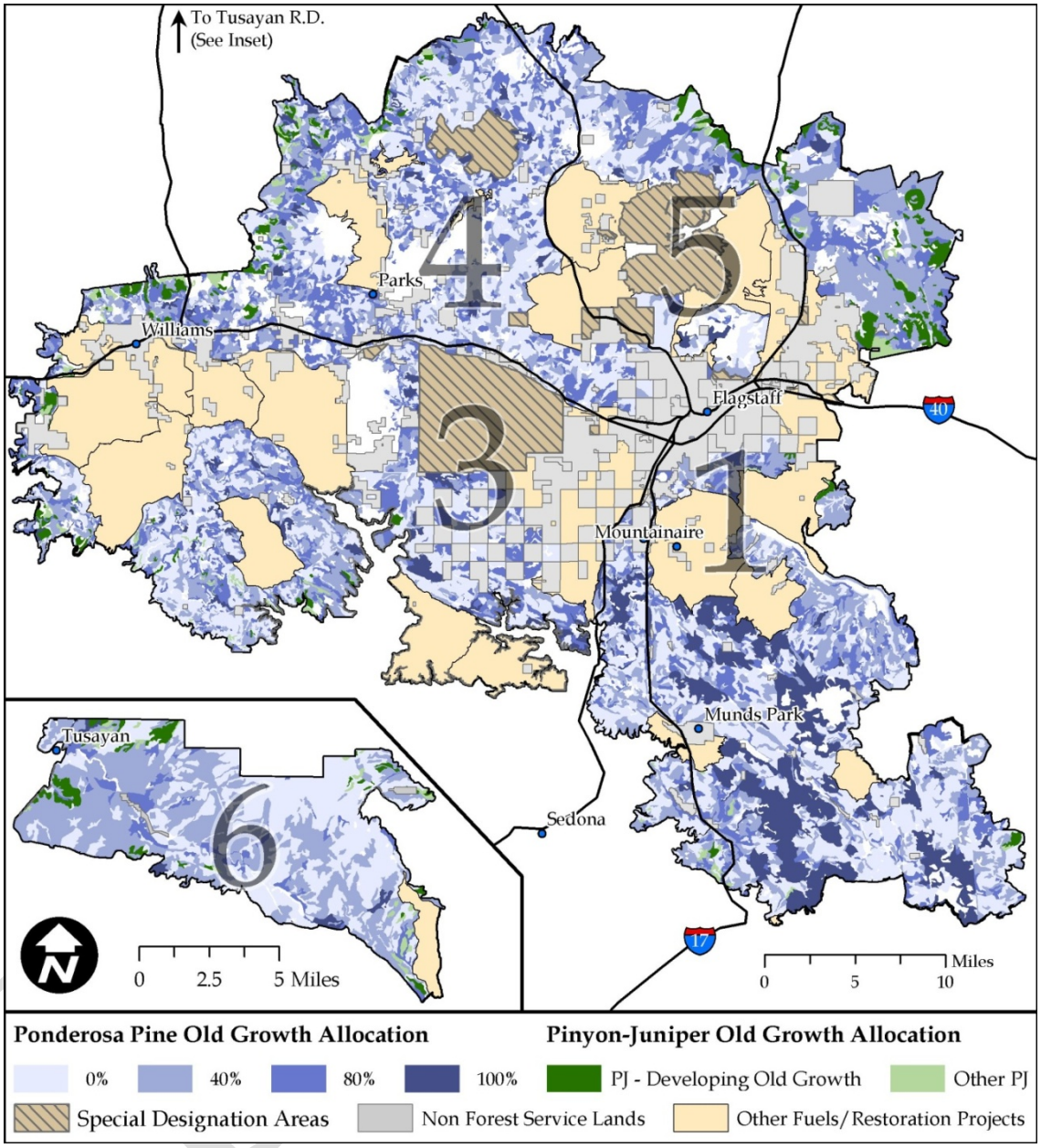

Figure 13. General Location of Ponderosa Pine and Pinyon-Juniper Meeting Old Growth Conditions (In the Project Area)

There are approximately 23,316 acres of pinyon-juniper within the project area. Table 9 displays the old growth allocation by acres, percent, and forest. These acres were selected because they best meet the minimum criteria for old growth conditions (per the forest plans). The old growth allocation includes all sites that are classified within the mid-aged to old vegetation structural stages. Most sites currently do not fully meet the minimum criteria. Where management occurs within the pinyon-juniper cover type, there is a need to maintain the old growth characteristics within the sites allocated as old growth. See the vegetation section in chapter 3 for the old growth analysis at the required scales.

Table 9. Pinyon-juniper Old Growth Allocation Acres and Percent by Forest

Restoration Unit	Pinyon-Juniper Total Acres		Pinyon-Juniper Old Growth Acres		Pinyon-Juniper Old Growth Percent (%)	
	Coconino NF	Kaibab NF	Coconino NF	Kaibab NF	Coconino NF	Kaibab NF
1	1,141	0	611	0	54	0
3	832	3,201	356	1,747	43	55
4	42	7,123	42	4,116	100	58
5	8,771	0	7,302	0	83	0
6	0	2,206	0	1,452	0	66
Total	**10,786**	**12,530**	**8,311**	**7,315**	**77**	**58**

Forest Health - Stand Density

Forest health is defined by the vigor and condition of the forest stands and the presence of insects and disease that affect the sustainability of the forest. In the project area, dense stands of young to mid-aged trees (see table 4 and table 5) have reduced tree growth and health to the point there is a high risk of tree mortality in the larger size classes. The potential for density-related mortality is measured through stand density index (SDI) (Long 1985) and basal area (BA). Table 10 displays the existing and desired percent maximum SDI and BA within goshawk and MSO habitat in the project area. The table also displays existing and desired conditions for snags and course woody debris, two key components of wildlife habitat. Also see figure 6 and figure 7 which display canopy density within the project area and within goshawk and MSO habitats.

Table 10 displays that the desired density conditions are not being met in a majority of the project area[4]. In goshawk habitat, stand conditions are on a trajectory towards density-related mortality. In MSO habitat, the existing stand density is well above desired conditions. In all habitat types, large (greater than 18 inches dbh) snags are deficit from forest plan desired conditions[5].

[4] SDI calculation excludes MSO protected and restricted threshold and target threshold habitat for a total of 45,387 acres where SDI is not applicable.

[5]No specific desired conditions exist for snags in the 12-inch to 18-inch category in MSO habitat.

Table 10. Existing and Desired Condition for Stand Density, Snags, and Course Woody Debris (CWD) by Habitat Type

Habitat Type	Existing Acres	Existing Condition BA Average	Desired Condition BA Range	Existing Condition SDI % of Maximum	Desired Condition SDI % of Maximum	Existing Snags 12"-18" per Acre[5]	Existing Snags 18"+ per Acre	Desired Snags 18" + per Acre	Existing CWD Tons per Acre	Desired CWD Tons per Acre
Goshawk										
PFA (including nest stands)	30,600	124	70-80	52	25-40	N/A	0.42	2.0	4.20	5-7
Non-PFA	369,033	116	50-70	51	15-35	N/A	0.35	2.0	3.30	5-7
MSO Pine-Oak										
Protected	36,455	156	NA	76	NA	2.91	0.62	2.0+	5.48	5-7
Target/ Threshold	8,713	161	150-170	84	NA	2.37	0.59	2.0+	5.39	5-7
Restricted	67,378	137	70-90	70	25-40	1.85	0.43	2.0	3.92	5-7

These are key elements necessary to maintain a suite of prey species for MSO. In addition, over 75 species of birds, mammals, reptiles, amphibians and many invertebrate species use snags and course woody debris as nesting, rooting, feeding, loafing and catching sites. The desired condition is to improve forest health by reducing the potential for density related mortality and move towards forest plan desired conditions for snags and course woody debris. There is a need to reduce stand densities in all habitats except MSO restricted and target threshold.

Insect and Disease

Ponderosa pine is attacked and killed by several different bark beetles in the genera *Dendroctonus* and *Ips*. It can be difficult to discern what species initiated the attack. In the project area, bark beetle activity in ponderosa pine currently appears to be at endemic levels.

Dwarf mistletoe infection in ponderosa pine is common throughout the project area. Mistletoe infected trees slowly weaken, experience growth loss and eventually die (Lynch et al. 2008). Inventory data and previous incidence reviews (Hessburg and Beatty 1985) indicates approximately 25 to 35 percent of the project area has some level of infection ranging from light to extreme. The desired condition is to move towards forest composition, structure, and pattern historic reference conditions that would allow dwarf mistletoe and beetles to function at endemic or historic levels. There is a need to manage insect and disease in a manner that reduces but does not eliminate dwarf mistletoe in order to provide nesting, resting, foraging, and catching sites for birds and mammals including Abert's squirrels.

Vegetation Diversity and Composition

Vegetation diversity throughout the project area has declined (USDA 2009a, USDA 2009b). Gambel oak, a sub-type within ponderosa pine, is important to many wildlife species as it provides important nesting and foraging habitat. A lack of fire, which ultimately caused increased stand densities, has allowed Gambel oak to become overtopped by fast growing ponderosa pine (figure 14) (Abella and Fule 2008).The desired condition is to develop and maintain a variety of oak size classes and forms, where they occur. Oak should range from shrubby thickets and pole-sized clumps to large trees across the landscape in order to provide habitat for a large number and variety of wildlife species (Brown 1958, Kruse 1992, Rosenstock 1998, Abella and Springer 2008, Abella 2008a, Neff and others 1979). There is a need to stimulate new growth and maintain growth in large-diameter trees and use management strategies that provide for a variety of shapes and sizes across the landscape.

Figure 14. Ponderosa Pine Overtopping of Gambel Oak in the Bar-M (Coconino NF) Portion of the Project Area

There are approximately 7,744 acres of aspen in the project area. Aspen is an early seral component of the ponderosa pine ecosystem and a species that provides for habitat diversity. Aspen is dying or rapidly declining on both forests due to the combined effects of conifer encroachment, browsing, insect, disease, severe weather events and lack of fire disturbance (Lynch 2008, USDA 2009) (USDA 2008, USDA 2009). A study by Fairweather et al. (2007) on the Coconino NF indicates that aspen on low-elevation dry sites (less than 7,500 feet) has sustained 95 percent mortality since 2000. Mortality on these sites is expected to continue as many live trees currently have only 10 to 30 percent of their original crown. The desired condition is to maintain and/or regenerate aspen. Where possible, there is a need to stimulate growth and increase individual recruitment of aspen. Figure 15 portrays an unhealthy aspen stand within the project area.

Figure 15. Existing Condition of Aspen in the Vicinity of Government Prairie, Kaibab NF

There are approximately 72,106 acres of grasslands within the project area. This includes the grass cover type, grass within ponderosa pine, wet meadows and dry meadows. Grasslands provide valuable habitat to many wildlife species including pronghorn antelope, birds, and small mammals. Historically (late 1800s), grassland communities had less than 10 percent tree cover until past actions such as grazing, logging and fire suppression reduced or eliminated the vegetation necessary to carry low intensity fires. This altered the natural fire regimes and allowed uncharacteristically high invasion by conifers to take place (USDA 2008).

Many grassland acres across the Coconino and Kaibab NFs have become encroached with trees and converted to forest. An ecological sustainability assessment completed in 2009 found that grasslands on the Coconino NF have decreased. Historically, only 2 percent of the Great Basin grasslands were comprised of very large shrubs, closed canopy and some very large trees. Since reference conditions, this percentage has increased by 17 percent. Within montane subalpine

grasslands, the percentage has increased from 0 to 33 percent (USDA 2009). On the Kaibab NF, the ecological sustainability assessment found that at least 8 percent of the montane, subalpine and Great Basin grasslands have been invaded by conifers (USDA 2008). Figure 16 and figure 17 compare grassland conditions in the Fern Mountain (Hart Prairie) area from 1880 to 1980 (USDA Forest Service, unpublished data). The desired condition is to move towards the historic range of variability. Tree canopy cover would range from 0 to 9 percent and grasses and forbs would dominate. The fire return interval would be less than 35 years (USDA 2008). Fire would function as a natural disturbance across the landscape without causing loss to ecosystem function or to human safety, lives, and values. When fire did occur, vegetation would return close to pre-fire conditions within a few years (Johnson 1998) and would typically replace less than 75 percent of the dominant vegetation type (USDA 2009). There is a need to reduce (and in some cases remove) tree encroachment which has reduced the size and function of landscapes that were historically grasslands.

Figure 16. Fern Mountain (Hart Prairie) Grassland Circa 1880s

Figure 17. Fern Mountain (Hart Prairie) Grassland Encroachment Circa 1980s

Big sage and ponderosa pine co-occur on approximately 16,000 acres of the Tusayan District (Kaibab NF, RU 6) portion of the project area. Pine-sage provides valuable habitat for several species of wildlife including migratory birds. Shrub species that occur with sage and provide further diversity include Fendler's ceanothus, mountain mahogany, snakeweed, bitter brush, Oregon boxleaf, and Gambel oak. Sage cover under ponderosa pine varies from 0 to over 35 percent. In areas where cover is about 0 percent, fire had burned with moderate to high intensity surface fire or the pine had overtopped and shaded out the sage. In areas where cover is over 35 percent, fire had been excluded or the pine density was more open. The desired condition for the sage component of the pine/sage community is to have a shifting mosaic of sagebrush with a mix of age classes. The mosaic pattern would be largely regulated by fire.

Figure 18. Pine Encroachment in Big Sage on the Tusayan District (Kaibab NF)

Figure 18 displays the existing condition in which saplings and mid-aged trees are encroaching on big sage. The cover of big sage is many times greater than the desired condition. There is a lack of fine, herbaceous fuels that should be found within the sagebrush clumps. These herbaceous fuels help minimize the effects of fire (Tisdale and Hironaka 1981 in McArthur and Taylor 2004). Figure 19 displays a post-treatment desired condition approximately 6 years after a low intensity prescribed fire. This area is just south of the town of Tusayan, Arizona. Sagebrush and pine are both present in various age classes, along with a diversity of other vegetation and an herbaceous layer.

Figure 19. Post-Treatment Condition in Pine-Sage on the Tusayan District (Kaibab NF)

Fire Ecology

The potential for crown fire and high-intensity surface fires from unnaturally high surface fuel loads is the trajectory of most of the project area. Wildland Urban Interface (WUI) areas are spread across the project area and include the communities of Flagstaff (RU 1, 3,4,5), Williams (RU 3,4), Tusayan (RU 6), Parks (RU 3,4), Belmont (RU 3,4) and scattered developments such as Doney Park (RU 5), Munds Park (RU 1), and Kachina Village (RU 3) that are within or adjacent to the project area (see figure 4). Although fuel treatments have been implemented in WUI closest to the major population centers, much of the landscape is still vulnerable to fire or to second order fire effects such as flooding, erosion, weed infestations, and, damaged infrastructure. In addition to WUI, areas at risk include water resources, such as the Lake Mary watershed. The Lake Mary watershed is a source of water for the city of Flagstaff. Other resources at risk from crown fire include a diverse assemblage of wildlife that are known to occur or have habitat within or adjacent to the project area.

At the project (landscape) scale, approximately 34 percent of the area has the potential to sustain crown fire. Of the 34 percent, 25 percent would be active crown fire and 9 percent would be passive crown fire. Given the amount of duff and litter (surface fuels) present, about 64 percent of the project area has the potential for high-intensity surface fire and 2 percent has no fire potential (table 11, figure 22). At the restoration unit (RU) scale, the risk of crown fire varies, ranging from

19 percent RU 6 (Tusayan District, Kaibab NF) to 42 percent in RU 1. At a finer scale that reflects habitats for threatened and endangered species such as Mexican spotted owl, crown fire risk increases up to 55 percent.

The lack of fire or mechanical treatment has produced overly dense stands (Covington et al. 2001), which are out of the historic range of variability (HRV) for the pine systems in the project area. Modeling used to display existing potential fire behavior utilized weather and fuel parameters that occurred during the Schultz Fire (Coconino NF 2010). These weather conditions, while capable of supporting extreme fire behavior, are not unusual and were used to identify those areas which are at greatest risk of undesirable fire behavior and effects.

Crown fire generally produces 100 percent mortality in ponderosa pine by consuming the crowns of trees. Crown fire can be active or passive. Active crown fire advances from crown to crown in the tops of trees or shrubs (NWCG 2008). A passive crown fire is a fire in the crowns of trees, but only individual trees or groups of trees torch. Passive crown fire that is ignited in forests with interlocking crowns and/or low crown base heights may readily become active crown fire in more extreme weather situations. With a delay of more than 20 years between fires or treatments (a delay in the fire-return interval), areas of passive crown fire may transition to having the potential for active crown fire. The current fire-return interval is approximately 40 years, almost two times longer than the (maximum) desired historic fire-return interval which ranges between 2 and 22 years (Weaver 1951, Cooper 1960, Fulé 2003, Heinlein et al.2005).

Even without crown fire, a high-intensity surface fire (64 percent of the project area) burning though this area could scorch the canopy sufficiently to cause widespread mortality (Van Wagner 1973). A high intensity surface fire has high flame lengths and, particularly when combined with closed, dense canopy fuels, can produce sufficient damage to kill trees with a combination of needle scorch, root damage, and cambium damage.

Figure 20 displays dense forest conditions (numerous trees with interlocking crowns) that are common within the project area. This densely-forested condition would support active crown fire.

Figure 20. Dense Forested Condition on the Coconino NF with High Crown Fire Potential

Figure 21(below) shows a duff cone, which is a build-up of needles, bark, and other litter that has accumulated around the base of a large tree due to a lack of fire. Such cones may smolder for extended periods of time and damage the cambium of the tree. This would make the tree more vulnerable to other stressors (drought, insects, and disease).

Figure 21. Accumulated Duff and Litter under a Large Tree near Elk Park (Coconino NF)

Canopy bulk density and canopy base height are forest structure parameters used to measure the potential for crown fire. Canopy bulk density is defined as the mass of available canopy fuel per unit volume (Scott and Reinhardt 2001). The harder it is to see the sky though the canopy when you are looking up through it, the denser (higher) the canopy bulk density. Higher canopy bulk densities means that fire can easily move through the crowns of trees. In addition, higher canopy bulk densities mean there are more fuels to burn. With more fuels, fire intensity would be influenced. Currently, canopy bulk density in the ponderosa pine of the project area averages .061 kilograms per cubic meter (kg/m3). Approximately 61 percent of the pine has a canopy bulk density rating greater than 0.05 kg/m3. The desired condition is to have canopy bulk density below .05 kilograms per cubic meter in ponderosa pine to reduce the potential for crown fire.

The canopy base height of a stand is the lowest height above the ground at which there is a sufficient amount of canopy fuel to propagate fire vertically into the canopy (Scott and Reinhardt, 2001). The lower the canopy base height, the easier is for crown fire to initiate (Van Wagner 1977). Currently, canopy base heights in the project area average approximately 15 feet. The desired condition is to have average stand canopy base height above 18 feet because it takes only one tree with a low crown base height to initiate a crown fire in a stand.

Overall, the desired condition is to have fire, as a disturbance process, maintain a mosaic of diverse native plant communities. No more than 10 percent of the project area should be prone to crown fire, with contiguous areas of high severity less than 30 acres (Swetnam and Baison 1996, Roccaforte et al. 2008). When crown fire does occur, it should be mostly passive crown fire, occurring in single trees, groups, clumps, or areas where there had been mortality (wind throw, insects, etc.) Fire would function as a natural disturbance within the ecosystem without causing loss to ecosystem function or to human safety, lives, and values. Overtime, conditions would allow managers to use wildfire and prescribed fire to maintain the area as a functioning ecosystem. There is a need to reduce canopy bulk density and raise canopy base height in order to reduce the potential for crown fire and the potential for high intensity surface fire (in the more productive forested areas where canopy bulk density will be greater). Figure 22 displays the current crown and surface fire potential within the project area and table 11 summarizes existing and desired conditions for fire risk.

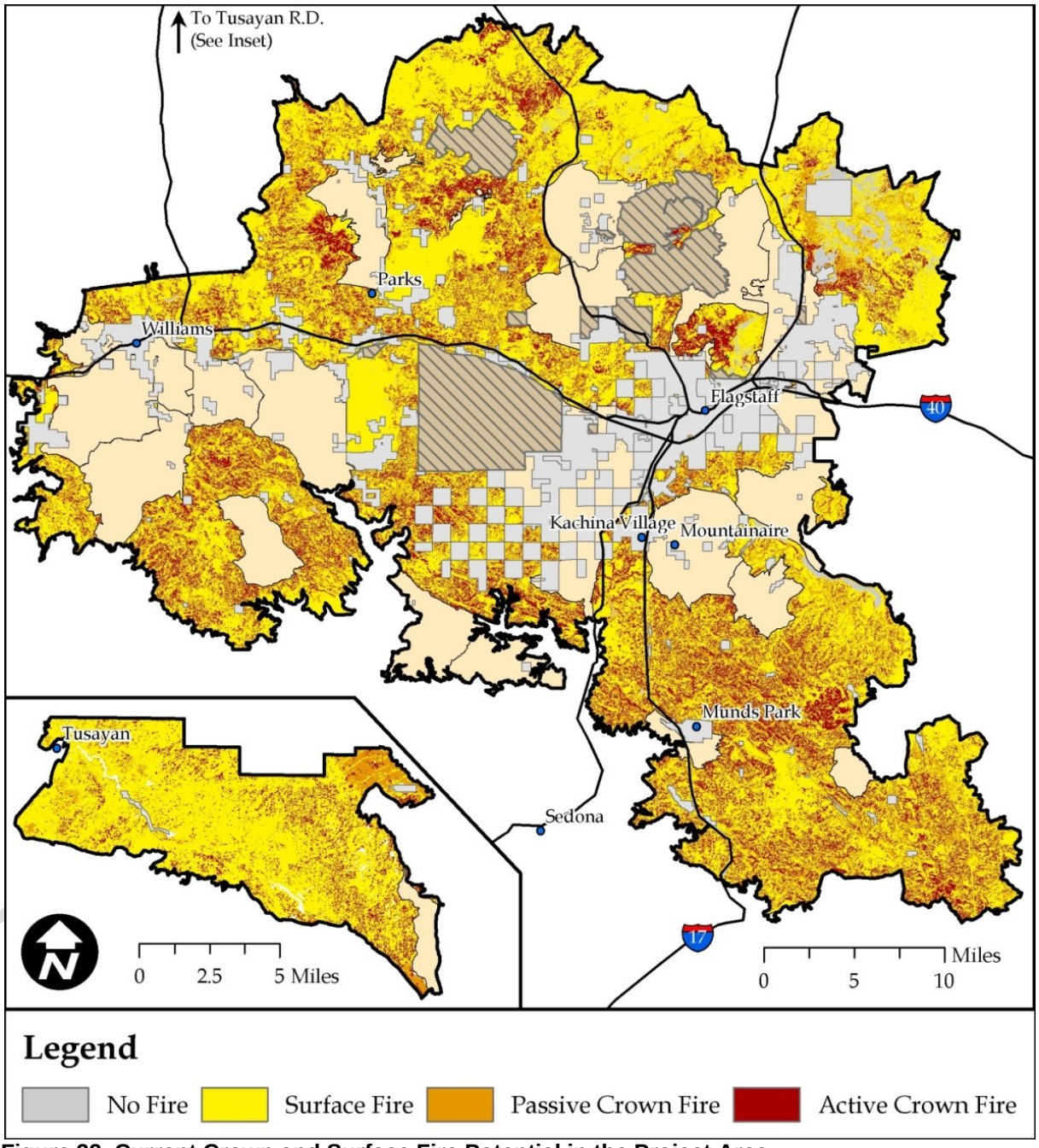

Figure 22. Current Crown and Surface Fire Potential in the Project Area

Table 11. Existing and Desired Fire Potential in Ponderosa Pine in the Project Area

Evaluation Criteria	Existing Condition	Desired Conditions
Potential crown fire (%)	34	Up to 10
Canopy Base Height (ft.)	15	>18
Canopy Bulk Density (kg/m3)	0.061 (average)	<.05
Potential surface fire (%)	64	Up to 90

Fire Regime Condition Class

Regime/Condition Class (FRCC) is a coarse-scale evaluation protocol that was developed to support planning and risk assessments (Schmidt et al. 2002, Hann et al. 2004). FRCC assessments determine how departed a landscape's fire regime is from its historic fire regime. Across the entire analysis area, 59 percent is currently rated as in condition class 3. This indicates the fire regime is significantly departed from historical ranges (table 12). In a condition class 3, the risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals resulting in dramatic alterations to fire size, intensity, severity, landscape patterns and/or vegetation attributes. The desired condition is to have 99 percent of the project area in FRCC 1. The remaining 1 percent of the area is represented by parking areas, administrative sites, road rights-of-ways, and other features which can be in FRCC 3. In FRCC 1, fire regimes would be within historical ranges, and the risk of losing key ecosystem components would be low. Vegetation, fuels, and natural disturbances would be intact and functioning within historical ranges. There is a need to reduce the percent of the ponderosa pine and grassland vegetation in FRCC 3 and move the fire regimes towards FRCC 1.

Table 12. Existing and Desired Fire Regime/Condition Class

Fire Regime Condition Class (FRCC)	Existing Condition (% of total area) Ponderosa Pine	Desired Condition (% of total area)
FRCC 1	14	99
FRCC 2	27	0
FRCC 3	59	1

Ecological Processes and Function

Springs

Springs play an important role on the landscape for hydrological function of watersheds and they are very important for wildlife and plant diversity. They are natural water features that existed prior to Euro-American settlement and were probably functional due to lack of human disturbances (USDA 2009).

On the Coconino NF, reference conditions are largely unknown. However, springs are well represented throughout all the major watersheds on the forest. Most springs in the project area have reduced function from drought, lack of fire and closed forest canopies which increase

evapotranspiration. Diversions and other flow modifications have affected spring function as well. Excessive disturbance can result in these features becoming non-functional (USDA 2009). Forty-seven (47) developed springs on the Coconino NF are not functioning at or near potential. On the Kaibab NF, 27 springs on the Kaibab NF have reduced function (USDA 2008).

Figure 23 is a photo of Babbitt Spring which has an impaired function. Babbitt Spring is located in the Lake Mary watershed on the Flagstaff District (Coconino NF). The impaired function is displayed by the headcut in the spring outflow, the encroachment of ponderosa pine into the spring site and the lack of riparian vegetation normally associated with a functioning riparian site.

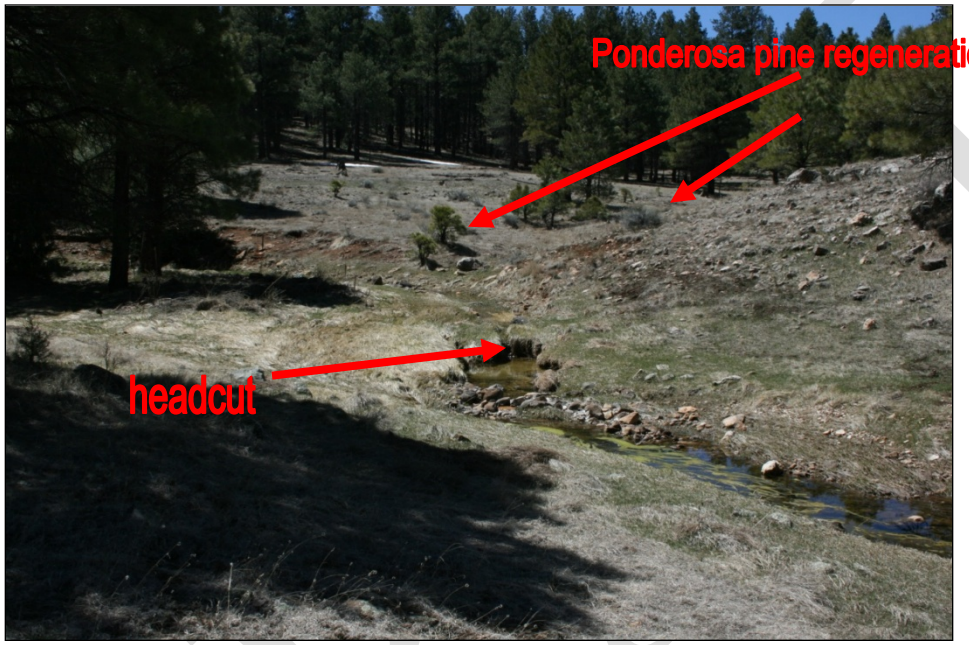

Figure 23. Degraded Babbitt Spring on the Coconino NF

Figure 24. Restored Hoxworth Spring (Coconino NF)

Figure 25. Hoxworth Spring Restoration with Protective Fencing (Coconino NF)

Figure 24 displays Hoxworth Spring that is located approximately 3 miles upstream from Babbitt Spring in a restored condition. This site was restored and fencing was used to protect the restored area from wild ungulates. Note the difference in vegetative composition, the overhanging banks in the springs outflow, the lack of headcutting at the site and the lack of trees in the meadow/spring site that provide for a functioning spring site. Figure 25 displays a fenceline contrast between the grazed and ungrazed portion of Hoxworth Spring.

The desired condition for springs is to have the necessary soil, water and vegetation attributes to be healthy and functioning at or near potential. Water flow patterns, recharge rates, and geochemistry are similar to historic levels and persist over time. Water quality and quantity maintain native aquatic and riparian habitat and water for wildlife and designated beneficial uses, consistent with water rights and site capability. Plant distribution and occurrence are resilient to natural disturbances (USDA 1986, USDA 1987, USDA 2008, USDA 2009). Figure 24 and figure 25 are examples of restoration treatment desired conditions. There is a need to improve the condition and function of 74 springs in order to sustain these features on the landscape. On some springs this means maintaining and promoting existing vegetation. On others there is a need to reduce tree encroachment, reduce the presence of noxious weeds, and limit the potential for future disturbance. On all springs there is a need to return fire, a natural disturbance process, to the system.

Ephemeral Streams

Ephemeral streams are important for hydrological function of watersheds and provide important seasonal habitat for a variety of wildlife, in particular, migratory birds and dispersing amphibians. Ephemeral streams can be categorized being riparian or non-riparian. On the Coconino NF, approximately 32 miles of ephemeral streams are heavily eroded with excessive bare ground,

denuded vegetation and head cuts. Of the total miles, approximately 6 miles are riparian streams and 26 miles are non-riparian streams. The Kaibab NF has approximately 7 miles of degraded non-riparian streams.

Figure 26 and figure 27 contrast the pre-treatment and post-treatment condition of an ephemeral/riparian stream in the project area. Figure 26 displays the Hoxworth Spring drainage. The site below the spring is where the degraded stream is located. The photo shows an active headcut and lateral bank cutting that resulted in accelerated erosion rates. The left-hand side of Figure 27 shows the channel immediately after re-contouring. Restoration treatments removed the headcut and lateral bank cutting. The tan strips in the photo are erosion mat that were applied to limit sediment production and provide mulch to aid native seed establishment. The ungulate-proof fence was put in place to protect vegetation. The right-hand side of the figure displays the channel 1 year after treatment. New vegetation is already occupying the site.

The desired condition is to restore the functionality of ephemeral streams (USDA 1986, USDA 1987, USDA 2008, USDA 2009). On some streams, there is a need to maintain and promote existing vegetation. On others there is a need to reduce tree encroachment, the presence of noxious weeds and limit the potential for future disturbance. On all ephemeral streams, there is a need to return fire, a natural disturbance process, to the system.

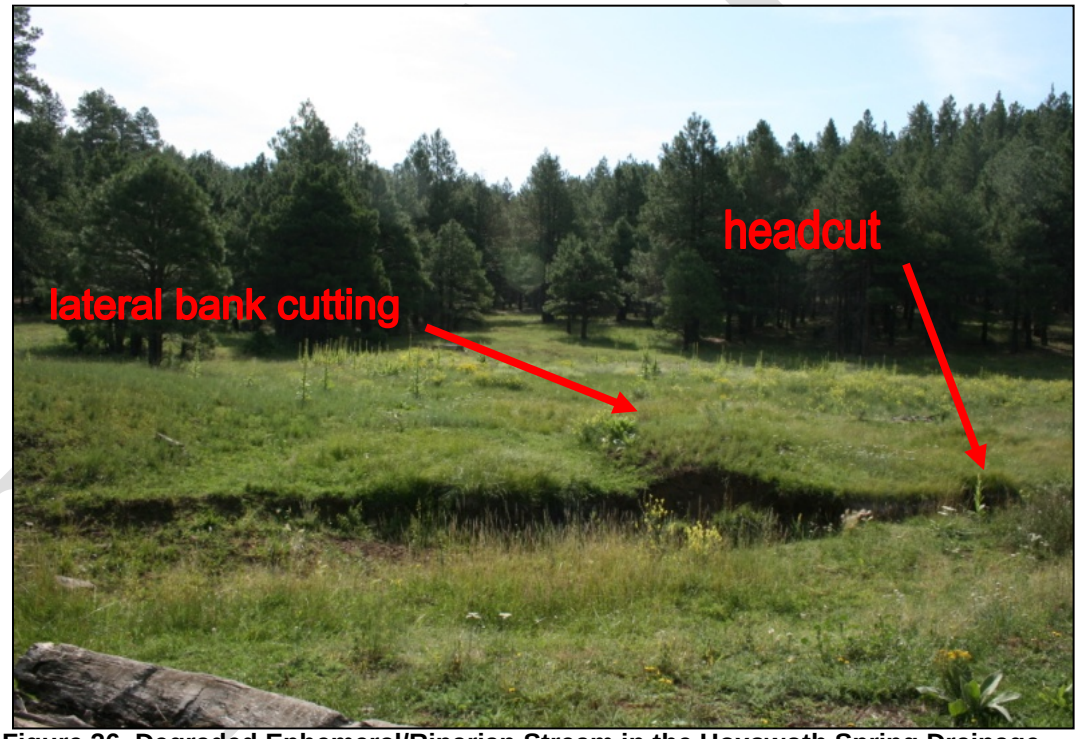

Figure 26. Degraded Ephemeral/Riparian Stream in the Hoxswoth Spring Drainage (Coconino NF)

Figure 27. Restored Hoxworth Spring Drainage Immediately Post Treatment (Photo on Left) and 1 Year Post-Treatment (Photo on the Right)

Roads and Unauthorized Routes

Both forests have identified the needed road system for public and administrative motorized use through the Travel Management Rule (TMR) process. As a precursor to the TMR process, the Coconino NF conducted four formal Roads Analysis Processes (RAPs) including the forest-wide RAP for Passenger Car Roads (maintenance level 3, 4 and 5), the East Clear Creek, Anderson Mesa and Mountainaire RAPs (see project record). The RAPs identified resource risks and access benefits associated with all roads. Resource risk included impacts to soil and water resources and watershed function from roads that are eroding and contributing sediment. As part of the risk/benefit evaluation process, the RAPs identified roads that should be closed to public travel, decommissioned, or considered for other uses because they were no longer needed to meet resource management objectives. A review of 2010 data indicated there is a need to decommission approximately 904 miles of existing system and unauthorized roads. These roads are not proposed for designation for public motorized use or currently needed for administrative use on the Coconino NF (USDA 2010).

As a precursor to the TMR process, the Kaibab NF completed a travel analysis process (TAP) report on the Tusayan District in 2008 (USDA 2008) and on the Williams District in 2010 (USDA 2010). Similar to the Coconino process, the TAPs identified resource risks and access benefits associated with all roads. A review of Kaibab NF data indicates approximately 134 miles of unauthorized roads (often referred to as user-created routes) are recommended for decommissioning.

The desired condition is to restore road prisms to their natural condition (USDA 1986, USDA 1987). Soils would be in satisfactory condition so that the soil can resist erosion, recycle nutrients, and absorb water. Understory species (e.g., grasses, forbs, and shrubs) diversity would be consistent with site potential and provide for infiltration of water and reduction of accelerated erosion. The understory would have a variety of heights of cool and warm season vegetation. Impacts to wildlife and habitat would be minimized. Decommission includes restoring road prisms to their natural condition. There is a need to decommission roads that have been identified by the forests as unneeded.

To implement the project, about 2,820 miles of road are needed. Of this total, approximately 2,295 miles are existing, open roads. However, portions of these existing roads have resource or safety concerns which require maintenance prior to utilizing. In some parts of the project area there are no existing roads that could provide access to treatments or records and field review indicate the roads have been decommissioned in previous projects. For additional information, see the transportation inventory in the project record.

There is a need to have adequate access to the project area for implementation. Adequate access includes existing utilizing roads that have no resource or health and human safety concerns and temporarily creating roads that can be returned to their natural state at the completion of project activities. Road maintenance techniques include restoring (re-establishing) drainage features. Maintenance and restoration actions are designed to meet the site-specific condition as possible and practicable.

Decision Framework

The Coconino and Kaibab NFs Supervisors are the Forest Service officials responsible for deciding whether or not to select the actions as proposed (alternative B), select one of the other action alternatives including alternative C or alternative D, or select no action (alternative A). Their decision includes determining: (1) the location and treatment methods for all restoration activities, (2) design criteria, mitigation and monitoring requirements, (3) the components that will be included in the adaptive management plan, (4) the components that will be included in the implementation checklist and plan, (5) the estimated products or timber volume to make available from the project, and (6) whether the forest plans will be amended as proposed.

Other Related Efforts Influencing the Decision to be Made

On both the Coconino and Kaibab NF, forest plan revision is underway. These decisions will provide new resource management direction for the forests. A consistency analysis, which describes how this analysis (which uses management direction from the existing forest plans) aligns with the proposed management direction, will be disclosed in the FEIS/ROD. Other restoration activities (actions on private, State, and other non-FS federal lands) that influence/are complementary to this analysis are addressed in cumulative effects.

Relationship to the Forest Plans

The Coconino NF and Kaibab NF forest plans set forth in detail the direction for managing the land and resources of the forests. The desired conditions for the project are based on forest plan objectives, goals, standards and guidelines. Desired conditions also reflect the use of the best available science that is being used to inform forest plan revision. The analysis tiers to each forest's final EIS (USDA 1987) (USDA 1988), as encouraged by 40 CFR 1502.20.

Management Direction

The project area includes 23 management areas (MA) as described in the Coconino National Forest Plan (pages 46 to 206-113). The MAs located within the project area, forest plan MA emphasis and the relationship between MA total acreage to the project are displayed in table 13 (for the proposed action). Because the FLEA MA incorporates 10 MAs, the location-specific direction in the various MAs has been utilized (per forest plan direction).

On the Kaibab NF, the project area includes five geographic areas (GAs) and one land use zone (LUZ). Approximately 183, 729 acres of GA 2 (Williams forestland) and 41,012 acres of GA 10, (Tusayan forestland) are proposed for treatment in the project area. About 8,353 acres of treatment are proposed within GA 1 (Western Williams Woodland), 3 (North Williams Woodland) and GA 8 (Tusayan Woodland). Treatments are proposed within about 1,049 acres of LUZ 21, existing developed recreation sites. Table 13 displays the acreage associated with the MAs and GAs in the project area where the majority of restoration actions are proposed. Figure 28 displays the general location of the management areas (MAs) and geographic areas (GAs) in the project area.

For additional information, see chapter 4 of the forest plans (Coconino National Forest Plan, pages 21 to 206-118; Kaibab National Forest Plan, pages 16 to 114) where detailed descriptions of forest-wide resource direction specific to the management or geographic areas can be found.

Table 13. Predominant Forest Plan Management Areas (MA) and Geographic Areas (GA) within the Project Area

Forest Plan Management Areas (MA) and Geographic Areas (GA) within the Project Area*	Description	Forest Plan Emphasis	Forest-wide MA and GA Acres	MA and GA Acres within Project Area	Acres/Percent (%) of Forest-wide MA/GA Proposed for Treatment
Coconino National Forest					
MA 3	Ponderosa pine and mixed conifer on less than 40% slope	sustained yield of timber and firewood, wildlife habitat, grazing, high quality water, dispersed recreation	511,015	236,245	190,763/37
MA 35	Lake Mary Watershed	maintenance and/or improvement of soil condition and watershed function, reduced fire risk in urban/rural influence zone	62,536	59,301	37,801/60
MA 38	West	reduced fire risk in urban/rural influence zone, recreation, scenic quality	36,298	36,134	19,538/54
MA 33	Doney	reduced fire risk in urban/rural influence zone, recreation, grasslands, scenic quality	40,530	25,779	14,023/35
MA 36	Schultz	reduce wildfire risk, maintain watershed health and water quality	21,289	21,130	7,069/33
MA 37	Walnut Canyon	reduce fire risk in urban/rural interface zone, progress towards desired forest structure including MSO and goshawk habitats	20,566	18,030	6,420/31
MA 13	Cinder Hills	OHV recreation opportunities and amenities, scenic integrity, geologic features	13,711	13,732	13,670/99
MA 6	Unproductive timber lands	wildlife habitat, watershed condition, grazing	67,146	12,115	11,628/17
MA 4	Ponderosa pine and MC above 40%	wildlife habitat, watershed condition, and dispersed recreation	46,382	11,793	8,107/18
MA 32	Deadman Wash	grasslands, un-roaded landscape, grazing, hunting	58,133	11,659	11,380/20

Forest Plan Management Areas (MA) and Geographic Areas (GA) within the Project Area*	Description	Forest Plan Emphasis	Forest-wide MA and GA Acres	MA and GA Acres within Project Area	Acres/Percent (%) of Forest-wide MA/GA Proposed for Treatment
MA 31	Craters	Restore natural grasslands, re-establish or maintain fire in pinyon-juniper woodland	29,940	8,969	8,969/15
MA 10	Transition Grassland/Sparse PJ above Mogollon Rim	range management, watershed condition, and wildlife habitat	160,494	8,544	8,012/5
MA 9	Mountain Grasslands	livestock grazing, visual quality, wildlife habitat	9,049	7,102	5,385/60
MA 20	Highway 180 Corridor	scenic attraction, access to year-round recreation and Grand Canyon NP	7,608	6,213	4,237/56
MA 7	PJ Woodlands < 40%	firewood production, watershed condition, wildlife habitat, grazing	273,815	3,206	3,203/1
MA 5	Aspen	Wildlife habitat, visual quality, sustain yield of firewood production, watershed condition, dispersed recreation	3,450	2,761	695/20
MA 28	Schnebly Rim	Seasonal gateway, conserve winter range for deer, elk, turkey	5,090	2,455	2,455/48
MA 34	Flagstaff	Reduce risk of catastrophic wildfire, recreation, scenic quality	1,781	1,675	1,460/82
MA 18	Elden Environmental Study Area	visual resource management, watershed condition, manage for low fire potential with fire re-established	1,577	1,611	337/21
MA 12	Riparian and Open Water	wildlife habitat, visual quality, fish habitat, watershed condition on the wetlands, riparian forest, and riparian scrub, dispersed recreation on the open water portions	20,490	653	609/3

Forest Plan Management Areas (MA) and Geographic Areas (GA) within the Project Area*	Description	Forest Plan Emphasis	Forest-wide MA and GA Acres	MA and GA Acres within Project Area	Acres/Percent (%) of Forest-wide MA/GA Proposed for Treatment
MA 7	PJ Woodlands > 40 %	firewood production, watershed condition, wildlife habitat, and livestock grazing	273,815	451	248/<1
MA 15	Developed Recreation Sites	developed recreation	874	805	48/6
MA 14	Oak Creek Canyon	scenery, recreation, wildlife habitat, healthy streams, clean air and water, manage fire hazards and risk	5,388	7	7/<1
Kaibab National Forest					
GA 2	Williams Forestland	suitable timberland, recreation, grazing, wildlife habitat	308,394	299,842	181,371/59
GA 10	Tusayan Forestland	wildlife habitat, recreation, grazing	86,250	43,559	41,012/48
GA 1	Western Williams Woodland	wildlife habitat, sandstone products, scenic routes and features, grazing, wild burro territory	169,041	4,807	3,360/2
GA 3	Northern Williams Woodland	winter wildlife habitat, scenic routes and features, grazing	65,533	3,485	3,475/5
GA 8	Tusayan Woodland	wildlife habitat, scenic routes and features, grasslands, grazing	195,118	1,518	1,518/1
LUZ 21	Existing Developed Recreation Sites	existing public and private sector developed recreation sites and other smaller sites (trailheads, interpretive sites, etc.)	1,556	1,049	1,049/67

*Acres and percentages are approximate as many mapping inconsistencies were found when we compared the management area boundary maps to vegetation stand data. Forest plan management area mapping was conducted at a very coarse scale whereas the numbers associated with our vegetation stand data is much more precise. The FLEA MA on the Coconino NF is addressed through the various MAs that make up FLEA.

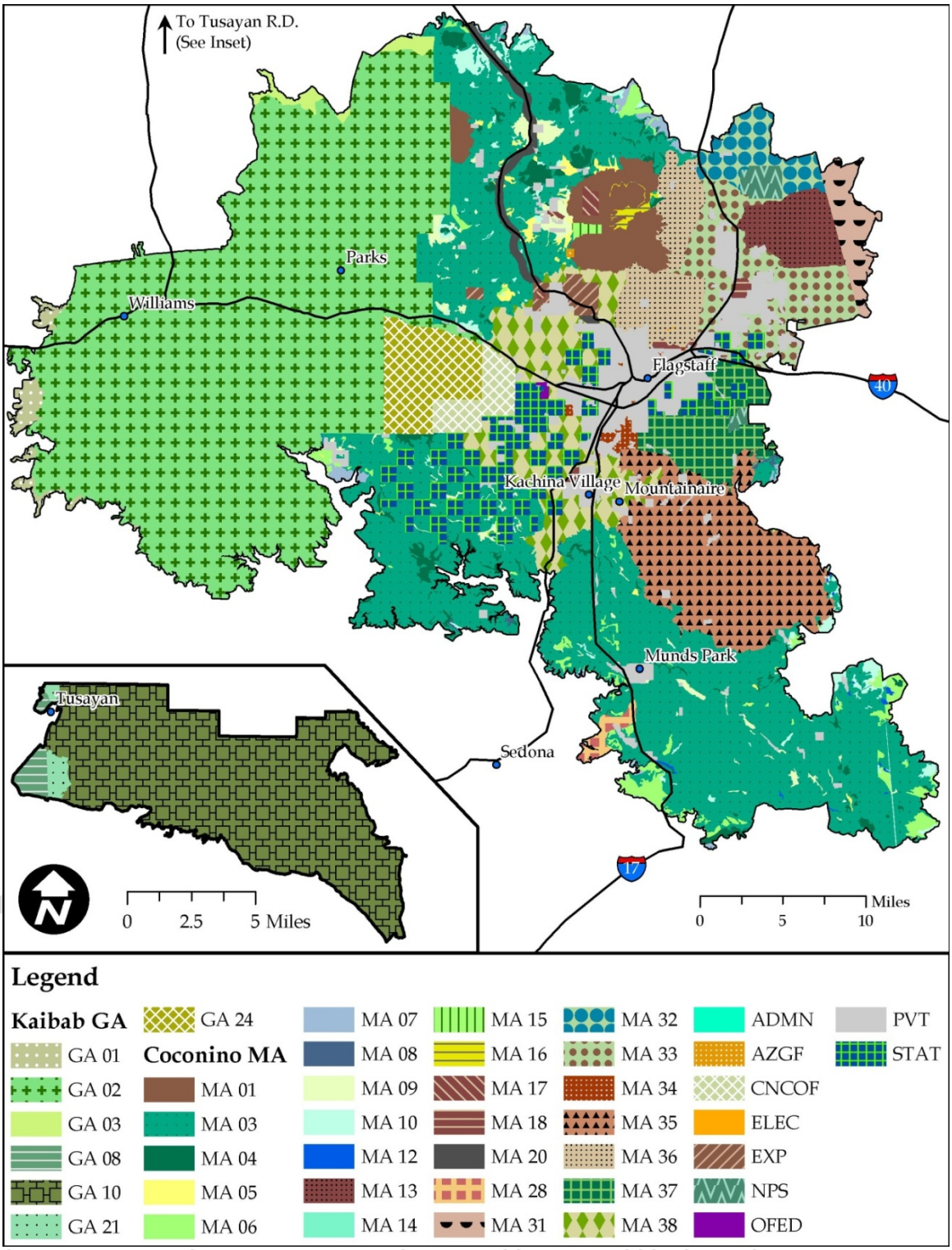

Figure 28. Forest Plan Management and Geographic Areas within the Project Area

Public Involvement

Collaboration

Collaboration has been integral to moving forward with a landscape restoration proposal. In 2010, stakeholders and the Forest Service began refining the vision for ponderosa pine forest restoration across 2.4 million acres on four National Forests in Arizona including the Apache-Sitgreaves, Coconino, Kaibab, and Tonto. The 4FRI stakeholders developed a comprehensive restoration strategy for the Coconino and Kaibab NFs. The landscape strategy documented existing conditions, identified potential treatment areas, and desired post-treatment conditions. The Forest Service used the stakeholder's landscape strategy to inform the purpose and need and proposed action.

Scoping

The project was posted in the Coconino and Kaibab NF's Schedule of Proposed Actions (SOPA) in January of 2011 and the Notice of Intent (NOI) to prepare an EIS was published in the Federal Register on January 25, 2011 [FR Doc.2011-1444].

A draft proposed action was sent to a mailing list (hard copy and electronic mail) of 1,331 individuals, local government, State government, federal and State agencies, and organizations. Fifty-four (54) responses 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 (http://www.fs.usda.gov/4fri).

In addition to a pre-scoping public meeting/workshop held on January 20, 2011, meetings/workshops were held on the Coconino NF on February 2, 2011, February 16, 2011, and February 24, 2011. A meeting/workshop was held on Kaibab NF on February 9, 2011. The purpose of these meetings was to receive comments that would be used to develop a revised proposed action. The sixth public meeting was held at the Coconino NF Supervisor's Office on April 27, 2011 for the purposes of providing a project update. A public meeting was held on June 7, 2011 for the purposes of receiving comments on edits made to the proposed action. On average, meeting/workshop attendance ranged from 10 to 20 participants.

A revised proposed action was sent to a mailing list of 213 parties (169 electronic mail and 44 hard copy recipients) and a second 14-day public comment period began with the publication of a second revised NOI in the Federal Register on August 19, 2011 [FR. Doc. 2011-20496]. Thirty-four comments were received during this informal two-week comment period. Eight comments received prior to the informal comment period (May 12, 2011 to July 26, 2011) and three comments received after the close of the comment period (September 4 to September 8, 2011) were accepted as part of the public involvement process. In sum, 45 comments were received from May 12, 2011 to September 8, 2011.

Prior to the onset of the August 19, 2011 comment period, an open house was held on August 17, 2011 at the Coconino NF Supervisor's Office. Six people attended the open house. During the comment period, an open house was held on August 25, 2011 at the Williams Ranger District (Kaibab NF). Eleven Forest Service personnel from the Kaibab NF attended the open house. As part of coordination with local governments and residents, project updates were provided to the Coconino City Council and City of Flagstaff on September 12, 201l and again on December 5,

2011. Project updates were provided to the to the Tusayan and Camp Verde City Council on October 5, 2011 and to the Sedona and Williams City Council on October 25, 2011.Updates to local residents and communities was provided at the Mountainaire Community Picnic (at the invitation of the Coconino County Supervisor) on September 17, 2011 and via an educational booth at the Flagstaff Festival of Science on September 24, 2011.

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 forest plan goshawk guidelines) on December 15, 2011 (Coconino NF Supervisor's Office).

In 2012, monthly public meetings were held at the Coconino NF Supervisor's Office from March 2012 to July 2012 for the purpose of updating interested parties on the status of the environmental analysis. Draft (working) documents included: issues, alternatives, cumulative effects, scoping report (August 2011 scoping period), and, version 5 of the modified large tree retention implementation strategy (alternative C) were shared at the public meetings and made available on the 4FRI website: http://www.fs.fed.usda.gov/main/4fri/planning.

All meeting documentation is located in the project record. The project has been posted on the Coconino and Kaibab NFs' SOPA since January of 2011 and public involvement and analysis-related documents have been posted on the 4FRI website, http://www.fs.usda.gov/4fri since January, 2011.

Cooperating Agencies

On March 11, 2011, the Arizona Department of Game and Fish (ADGF) were designated as a cooperating agency. ADGF provided a habitat specialist to assist with the wildlife management indicator species (MIS) effects analysis.

Tribal Consultation

On January 28, 2011 the forests sent a consultation letter providing information and seeking involvement and comments to 20 Tribes and Tribe chapters including the Navajo Nation, Navajo Nation To'Naness' Chapter, Navajo Nation Tuba City Chapter, Navajo Nation Dilkon Chapter Tolani Lake Chapter, Navajo Nation Cameron Chapter, Kaibab Band of Paiute Indians, 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, Hopi Tribe and Fort McDowell Yavapai Nation who all have historic ties and an interest in the Coconino and Kaibab NFs. Two written responses were received. The White Mountain Apache responded on February 17, 2011 and indicated no concern. A response from the Havasupai Tribe on March 7, 2011 asked for additional information on what the expected outcome of the proposals would be. As a follow-up, a meeting was held with the Havasupai Tribal Council and Tribal Elders on March 7, 2011 to discuss the analysis proposal. On June 6, 2011, a meeting was held with the Hopi to discuss heritage surveys.

On August 22, 2011 the second scoping letter was sent to 20 Tribal leaders including the Navajo Nation, Navajo Coalmine Canyon Chapter, Navajo Bodaway/Gap Chapter, Navajo To'Naness' Chapter, Navajo Leupp Chapter, Navajo Lechee Chapter, Coppermine Chapter, Navajo Nation Cameron Chapter, Kaibab Band of Paiute Indians, White Mountain Apache, Yavapai-Apache

Nation, San Carlos Apache, Hualapai Tribe, Yavapai-Prescott Indian Tribe, Havasupai, Tonto Apache, Pueblo of Zuni, Pueblo of Acoma, Hopi Tribe and Fort McDowell Yavapai Nation . No additional comments were received. In summary, no Tribes identified specific concerns with the project or specific traditional cultural properties that would be affected by the proposed activities.

On April 6, 2012, all Tribes were sent a list of projects (including 4FRI) being analyzed under NEPA. On May 5, 2012, a meeting was held with the Hopi Tribal staff for the purposes of discussing ongoing consultation projects, including 4FRI. No follow-up assignments for the forests specifically addressed 4FRI.

Issues

Issues serve to highlight effects or unintended consequences that may occur from the proposed action, giving opportunities during the analysis to reduce adverse effects and compare trade-offs for the decision-maker and public to understand. The interdisciplinary team (IDT) reviewed and considered all comments during the both phases of the public involvement period. How comments were addressed and were used to inform the analysis can be viewed in the final scoping report that is posted on the 4FRI website or in the project record. The following key issues focused the analysis or drove alternative development:

Issue 1. **Prescribed Fire Emissions**: Emissions from the project's use of prescribed fire would occur continuously over a 10-year period. Project emissions would degrade air quality and the health of northern Arizona residents, particularly residents of the Verde Valley and Snowflake, Arizona. This project, when combined with prescribed burning that other forests conduct, would negatively impact northern Arizona residents. Residents would experience constant smoke (an emission) over a long period of time. Reduced visibility and air quality from smoke would negatively affect the quality of life for residents and would reduce tourism in the area. The reduction of tourism would result in long term impacts to the local and regional economy of northern Arizona. The volume of smoke and the emissions that are part of smoke could affect public health. An alternative that: (1) eliminates all use of prescribed fire, (2) eliminates most prescribed fire use and relies on other methods to dispose of biomass, and (3) improves coordination amongst all forests that conduct prescribed burning in the vicinity of the Verde Valley and Snowflake is needed. There needs to be smoke-free periods for residents downwind of the project.

Response: 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. Alternative B and C propose using prescribed fire across the entire project area and alternative C adds acres that would be prescribed burned to restore additional acres of grasslands. Alternative D was developed to respond to the emissions/smoke issue by decreasing the acres to be prescribed burned. All action alternatives include design criteria aimed at reducing the potential for excessive smoke (as practicable) and increase coordination efforts amongst neighboring forests. The fire ecology, air quality, recreation and social-economics environmental consequences disclose the potential impacts to air quality, quality of life, the local and regional economy, and public health and safety. The indicators used to evaluate this issue are:

- Quantitative emission modeling and qualitative interpretation to evaluate the potential for emissions within communities that are within, or in close proximity to, the project;
- Modeling of principal pollutants including carbon monoxide (CO), nitrogen dioxide (NO2), particulate matter less than 10 microns in size (PM 10), particulate matter less than 2.5 microns in size (PM 2.5), ozone (O2) and sulfur dioxide (SO2) pollutants that pose potential health hazards to evaluate compliance with the Clean Air Act as regulated by Arizona Department of Environmental Quality (ADEQ); and
- Social and economic evaluation of impacts to quality of life and tourism.

Issue 2. Conservation of Large Trees: The large tree retention strategy (LTRS) which was developed by the 4FRI stakeholders was not included in the proposed action. Large post-settlement trees, as defined by a socio-political process, are those greater than 16-inch dbh. The intention of the exception process within the LTRS was to increase landscape heterogeneity and conserve biodiversity. The LTRS represents social agreement between parties that greatly enhances the chance for landscape restoration to succeed and reduces the risk of conflict. If the LTRS is not incorporated, the current social support for landscape-scale restoration may be withdrawn. In addition, it may result in the removal of key ecosystem components that include nesting and roosting habitat and large woody debris that is important for wildlife.

Response: The vegetation analysis will evaluate how proposed treatments affect vegetation structural stages (VSS), including those trees that would be 16 inches dbh or larger. This analysis will be used to inform the wildlife effects analysis. Alternatives B (proposed action alternative) and D do not incorporate the LTRS. However, alternative C responds to this issue by incorporating the key components of the LTRS and focusing on ecological desired conditions. It identifies circumstances where large, post-settlement trees may be removed to move towards or meet desired conditions. The intent of the LTRS has been incorporated into the alternative's design criteria, the monitoring and adaptive management plan, and the project implementation plan.

The indicators used to evaluate this issue are:

- Quantitative pre-treatment and post-treatment three-level analysis for Mexican spotted owl, goshawk, old growth, and vegetation structural stage (VSS) for goshawk habitat at the landscape scale (ponderosa pine vegetation type) to gauge movement towards restoration desired conditions, and,
- Qualitative analysis of pre-treatment and post-treatment non-market social values that include large trees, public safety, and other biodiversity objectives that may conflict with the protection of large trees.

Issue 3. Post-treatment Canopy Cover and Landscape Openness: Measuring canopy cover in goshawk habitat at the group level will not meet forest plan stand-scale canopy requirements. A reduction in canopy and large tree densities have never been analyzed under NEPA and NFMA 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 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.

Response: All action alternatives (B, C, and D) are designed to meet canopy cover in VSS 4 to VSS 6 in compliance with the forest plans. The analysis will describe how canopy cover will be measured and met at the group level. It will address the inter-relationship between the canopy cover and old and large trees, and disclose plan consistency. Language will be added to define/describe interspace and the relationship between interspaces, openings, and vegetation structural stage (VSS) classes.

To address post-treatment openness and canopy cover where the desired condition is to move towards an open ponderosa pine (savanna/grassland) reference condition, non-significant forest plan amendments were developed for alternatives B, C, and D. The amendments would allow select acres to be managed for less than 40 percent canopy cover in VSS 4 to VSS 6 and less than 3 to 5 reserve trees per acre.

The indicators used to evaluate this issue are:

- Pre-treatment and post-treatment distribution of habitat structure within goshawk habitat evaluated at four scales: ponderosa pine extent, restoration unit, restoration subunit, and strata (groups of like stands with like treatments),
- Overall habitat structure (VSS class) and forest density metrics (basal area, stand density index and trees per acre) averaged to a per-acre basis with averages including interspaces, canopy gaps, and all forest structural stages,
- Openness analysis to convey the percentage of the forested area that would be managed as interspace,
- Tree group density stocking guides that will be used to meet the tree group canopy cover requirements within goshawk LOPFA and PFA habitat, and,
- Percent change in herbaceous understory (expressed as pounds of biomass) and a qualitative analysis of impacts to individuals and groups of species.

Proposed Action Development

During the initial phase of scoping (January 2011 to June 2011), meetings, and workshops were held for the purpose of refining the draft proposed action. We recorded many comments requesting additional detail on what vegetation and prescribed fire treatments would look like once implemented. In response, a summary of design criteria complete with visuals was developed and included in the revised proposed action. Many commenters provided input and recommendations on identifying and prioritizing resources and infrastructure at risk from high severity fire. This input was used to develop the initial prioritization and treatment location assessment matrix which can be found in the project record.

Another topic that emerged was the conservation of old trees. In response to recommendations, key concepts from the stakeholder-developed Old Tree Retention Strategy (OTRS) were incorporated into the purpose and need. Vegetation treatment design criteria and mitigation, which were consistent with the OTRS, were developed and made of the proposed vegetation treatments; and the OTRS was made integral to the revised proposed action as an attachment (appendix E, August 2011 proposed action document).

To respond to public comments regarding the conservation of large trees, the LTRS was included for comment in the August 2011 scoping packet as an appendix. The conservation of large trees issue is also addressed in alternative C (see chapter 2, alternative C).

As the analysis progressed, the need to better describe treatments within MSO protected activity centers (PACs) was raised by the U.S. Fish and Wildlife Service. In response, the language in the proposed action was revised to clarify that mechanical treatment was proposed in 18 select PACs and the use of prescribed fire was proposed in 72 PACs, excluding core areas.

As the proposed action was refined, adaptive management was incorporated into the analysis to provide flexibility to account for inaccurate initial assumptions, to adapt to changes in environmental conditions, and/ or to respond to subsequent monitoring information that indicates that desired conditions are not being met (USDA Forest Service 2010). With this objective in mind, vegetation treatments were designed to have a range of treatment types and intensities. Having a range of treatment options facilitates implementing a treatment that best responds to the site-specific resource condition and most effectively allows movement towards desired conditions. Related documents that were made part of the final proposed action alternative include the monitoring and adaptive management plan (developed in collaboration with the 4FRI stakeholders, see appendix F) and the implementation plan (appendix E). The purpose of the implementation plan is to ensure that adaptive actions are within the scope of predicted effects and the decision.

Changes to the proposed action after the August 17, 2011 scoping period

After public scoping comments were reviewed and more intensive analysis was performed by resource specialists, the Coconino and Kaibab NF Supervisors approved modifications to the proposed action, as allowed by 36 CFR 220.7(b)(2)(iii). A summary of key changes includes:

- Incorporating the Old Tree Retention Strategy into the final proposed action, implementation plan, and monitoring/adaptive management plan.
- Correcting acreages in vegetation types, goshawk and MSO habitats, and, old growth allocations.
- Finalizing forest plan amendments, and,
- Clarifying and finalizing treatments in MSO and goshawk habitats.

A detailed list of changes made to the proposed action is located in the project record.

Final Proposed Action

The Coconino and Kaibab NFs propose to conduct approximately 587,923 acres of restoration activities over approximately 10 years or until objectives are met. Approximately 20,000 to 30,000 acres of vegetation would be treated annually and up to 40,000 acres would be prescribed burned annually across the forests. Restoration activities would:

- Mechanically cut trees on approximately 388,489 acres, including mechanically treating up to 16-inch dbh within 18 MSO PACs and cutting 99 acres of trees by hand on slopes greater than 40 percent
- Utilize mechanical treatment and prescribed fire on approximately 388,489 acres, including prescribed burning within 72 MSO PACs (excluding core areas) and on 99 acres of slopes greater than 40 percent
- Utilize prescribed fire-only on approximately 199,435 acres
- Decommission 770 miles of existing system and unauthorized roads on the Coconino NF

- Decommission 134 miles of unauthorized roads on the Kaibab NF
- Construct 245 miles of temporary roads for haul access and decommission when treatments are complete
- Open (construct) approximately 272 miles of existing, decommissioned road and return to decommissioned status when treatments are complete
- Reconstruct up to 10 miles of existing, open roads for resource and safety concerns
- 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
- Allocate as old growth 40 percent of ponderosa pine and 77 percent of pinyon-juniper woodland on the Coconino NF and 35 percent of ponderosa pine and 58 percent of pinyon-juniper on the Kaibab NF

Two non-significant forest plan amendments (see appendix C, alternative B) would be required on the Coconino NF to implement the proposed action. A variance would be provided to: (1) use mechanical treatments to improve habitat structure and treat up to 16 inch dbh within 18 MSO PACs, (2) clarify that canopy cover would be measured and met at the group level, add language to define/describe interspace, describe the relationship between interspaces, openings, and vegetation structural stage (VSS) classes, and, manage 29,017 acres of goshawk non-PFA habitat for less than 40 percent canopy cover and less than 3 to 5 reserve trees per acre.

One non-significant forest plan amendment (see appendix C, alternative B) would be required on the Kaibab NF to implement the proposed action. A variance would be provided to: (1) clarify that canopy cover would be measured and met at the group level, add language to define/describe interspace, describe the relationship between interspaces, openings, and vegetation structural stage (VSS) classes, and, manage 27,637 acres of goshawk non-PFA habitat for less than 40 percent canopy cover in VSS 4 to 6 and less than 3 to 5 trees per acre.

Figure 29 through figure 31 provide a course-scale overview of restoration treatment locations. Please refer to the description of alternative B (proposed action alternative) in chapter 2 for details that include tables and maps that display proposed treatments.

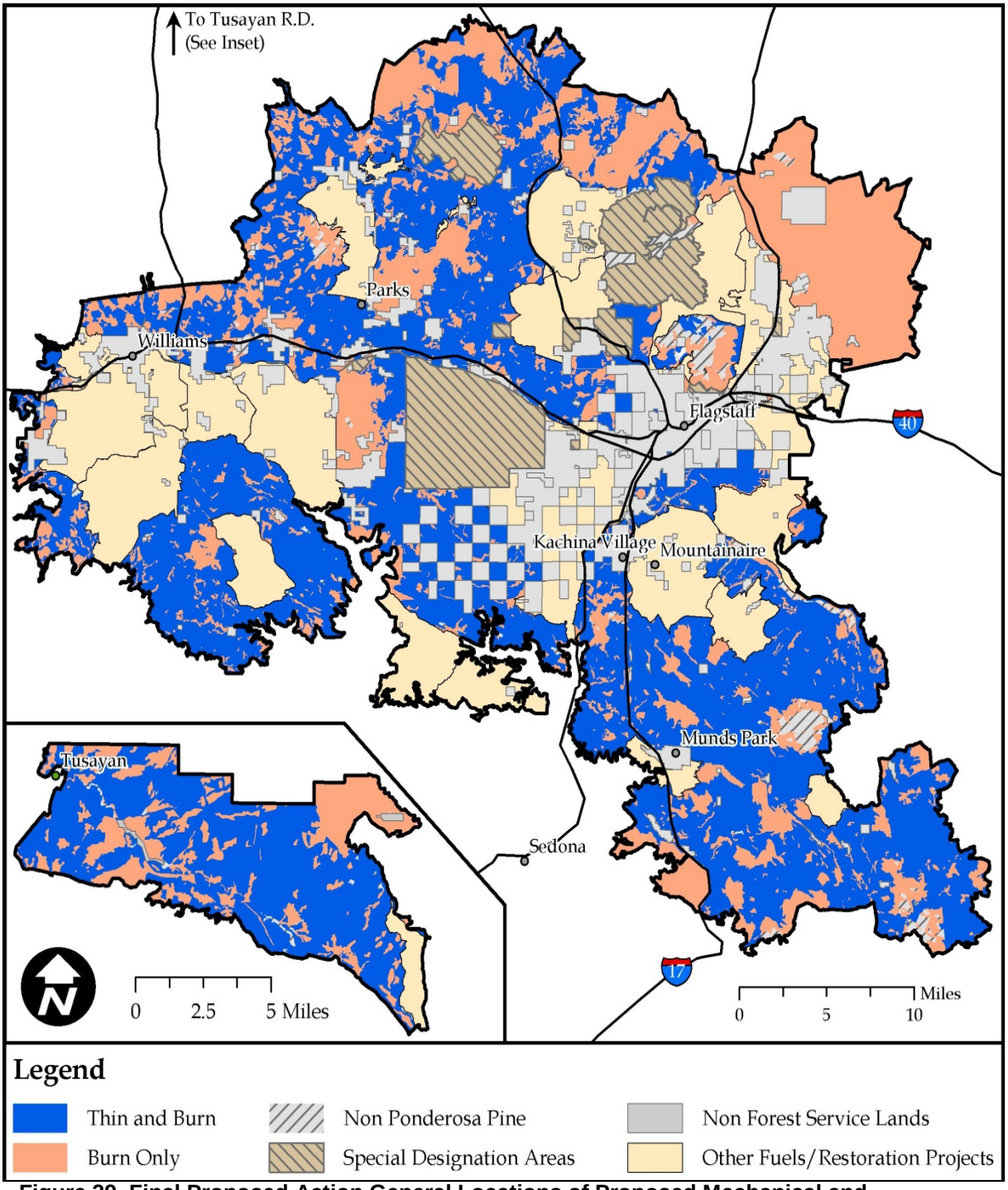

Figure 29. Final Proposed Action General Locations of Proposed Mechanical and Prescribed Fire Treatments

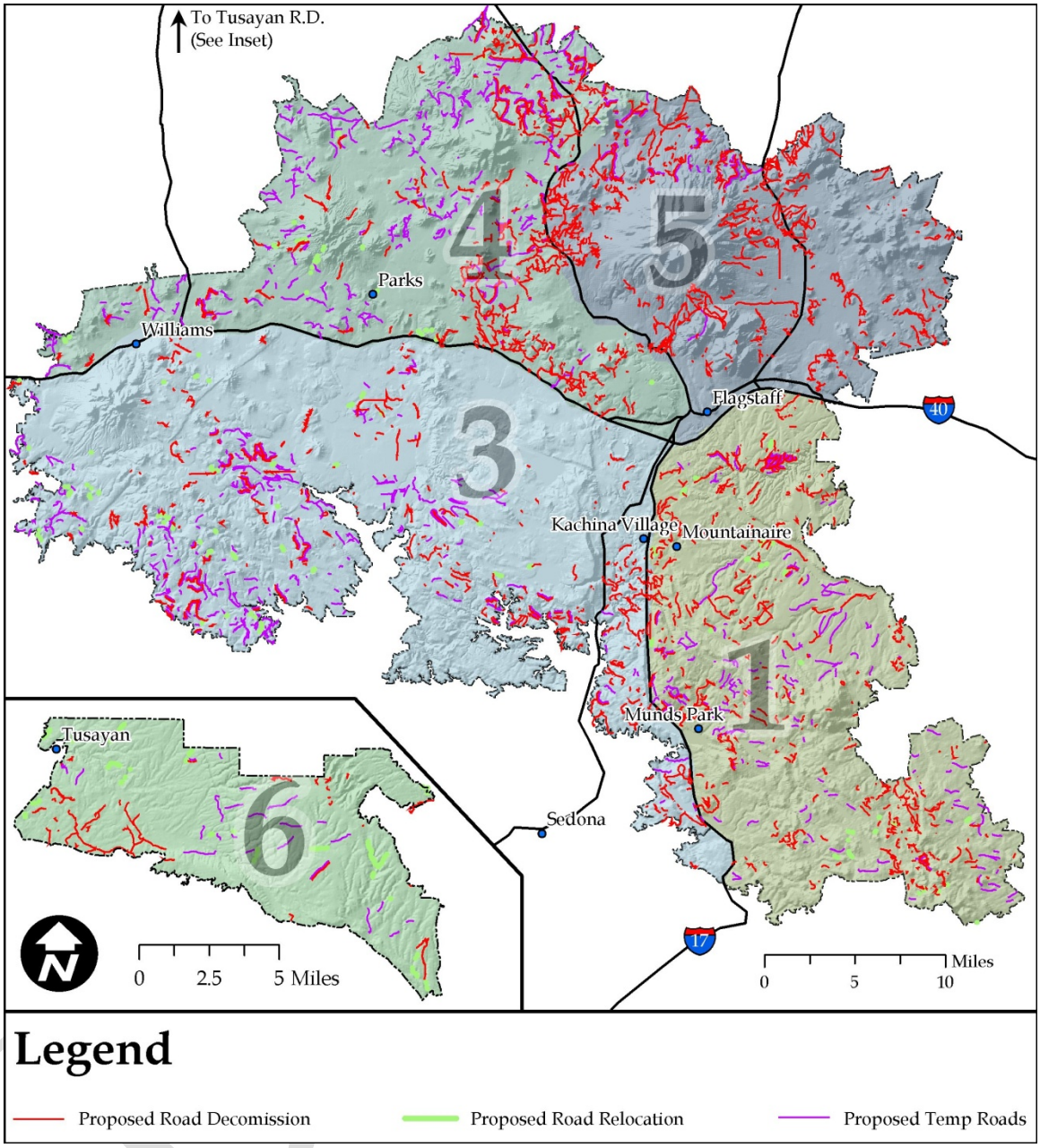

Figure 30. Final Proposed Action General Locations of Road Activities by Restoration Unit

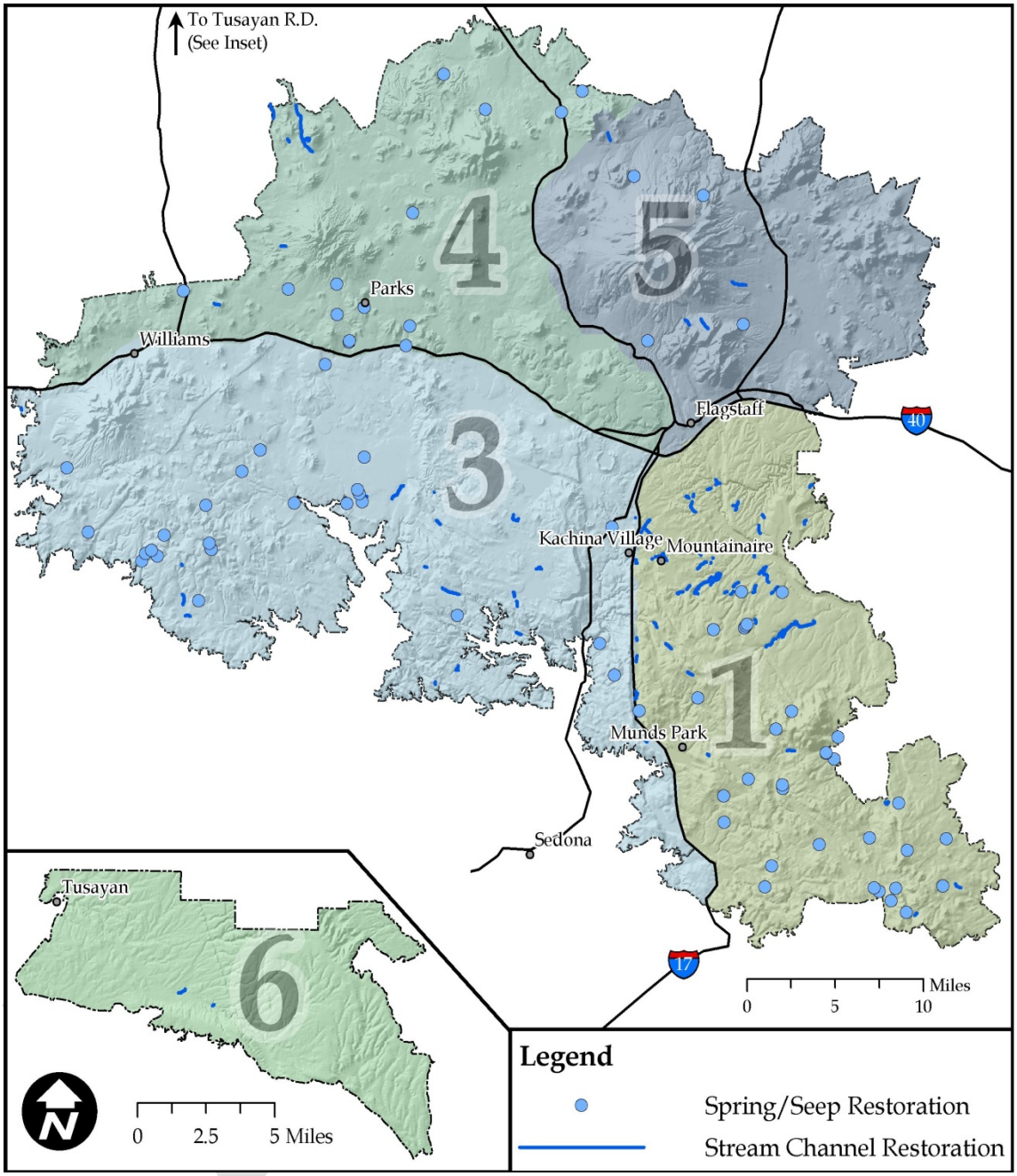

Figure 31. Final Proposed Action General Location of Proposed Spring and Ephemeral Channel Restoration Actions by Restoration Unit (RU)