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. The direct, indirect, and cumulative environmental impacts to the biological, physical, and social resources that may occur from implementing restoration activities are disclosed in this DEIS.

This document is organized as follows:

Chapter 1. Purpose of 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 the purpose and need. This section also details how we informed the public, how the public responded, and how collaboration was used to develop the proposal.

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. This section also provides a summary table of the environmental consequences associated with each alternative.

Chapter 3. Affected Environment and Environmental Consequences: This chapter describes the current condition and 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, individuals, and agencies consulted during development of the environmental impact statement.

Glossary: This section provides an explanation of terms and acronyms used in the document.

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

Appendix: The appendix consists of multiple parts and provides detailed information to support the analysis: a placeholder for a map packet (appendix A); proposed forest plan amendments (appendix B); project design features, best management practices (BMPs), and mitigation (appendix C); the implementation plan (appendix D); the monitoring and adaptive management plan (appendix E); cumulative effects (appendix F); and wildlife bridge habitat analysis (appendix G).

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 Web site at: http://www.fs.usda.gov/4fri.

Project Overview

The Four-Forest Restoration Initiative (4FRI) is a planning effort designed to restore ponderosa pine forest resiliency and function across four national forests in Arizona including the Coconino, Kaibab, Apache-Sitgreaves, and Tonto (figure 1).

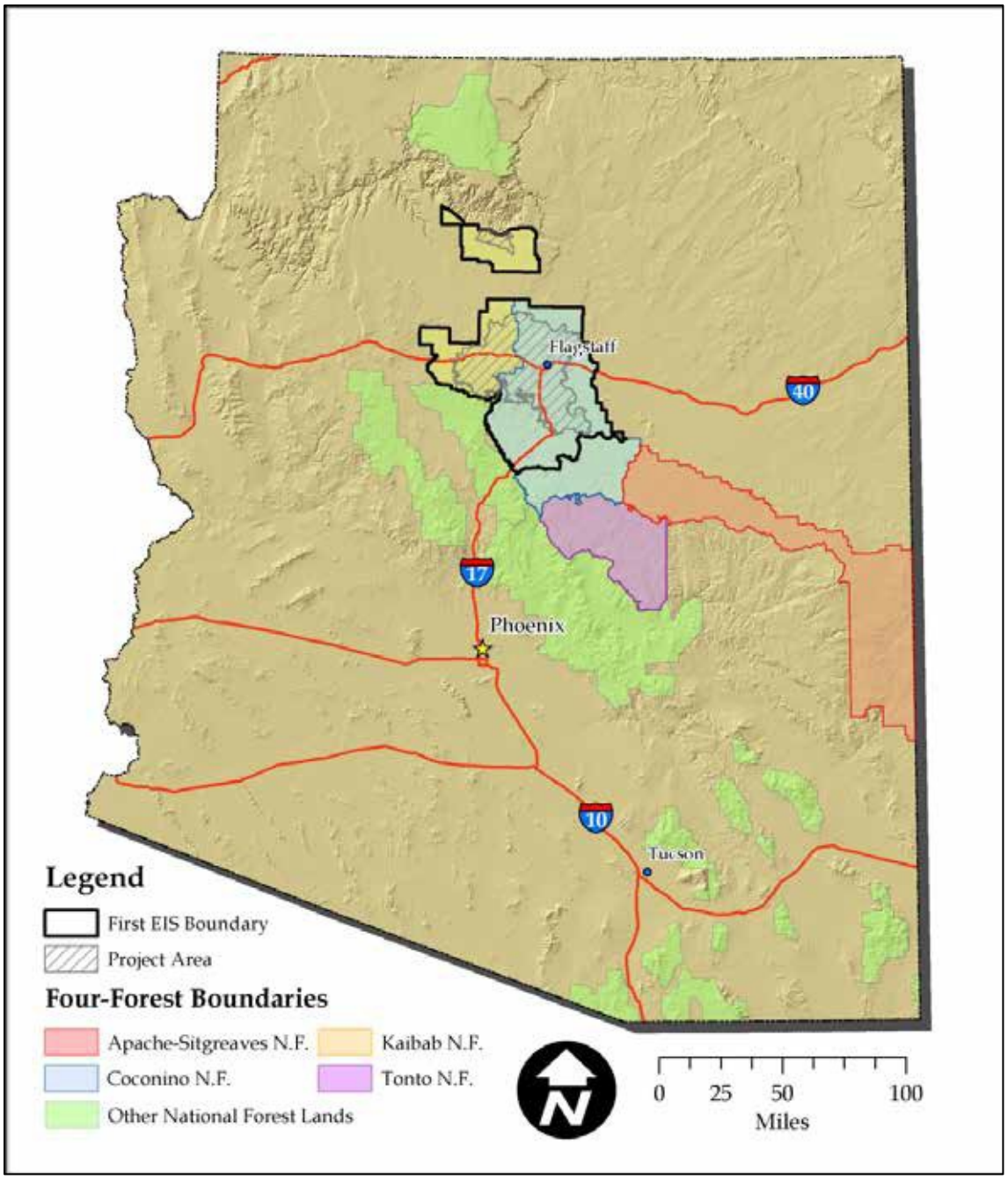

Figure 1. Four-Forest Restoration Initiative (4FRI) vicinity map

The EIS project boundary is approximately 988,674 acres and includes the Coconino National Forest (hereafter referred to as Coconino NF) and Kaibab National Forest (hereafter referred to as Kaibab NF) (figure 2). This analysis is independent of any preceding or subsequent environmental analysis that may occur across northern Arizona.

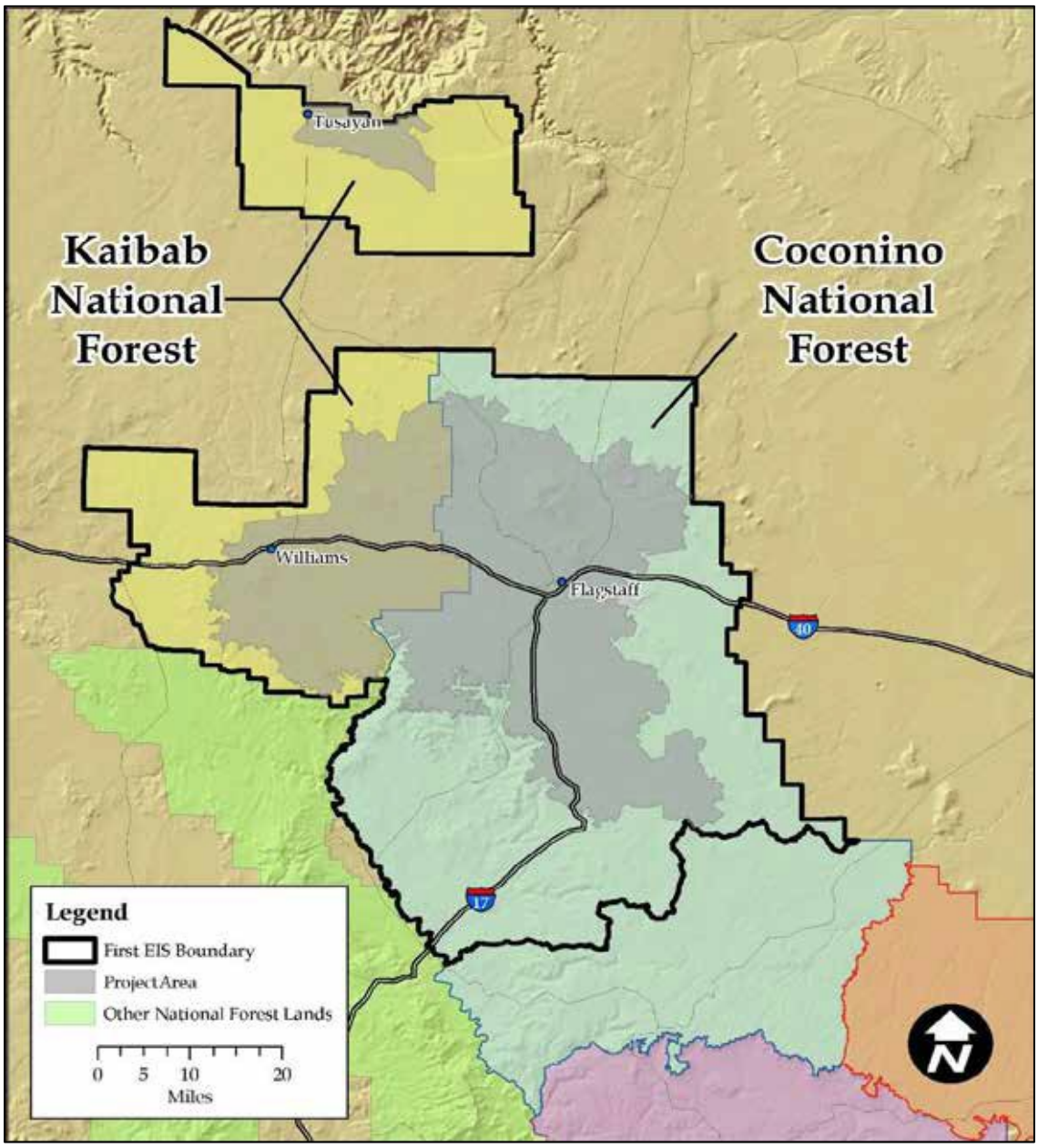

Figure 2. EIS project boundary on the Coconino and Kaibab National Forests

The Forest Service is proposing to conduct restoration activities on approximately 587,923 acres of the Coconino NF and Kaibab NF. Of this total, approximately 356,115 acres would be treated on the Coconino NF and 231,809 acres would be treated on the Kaibab NF. Restoration actions would focus 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).

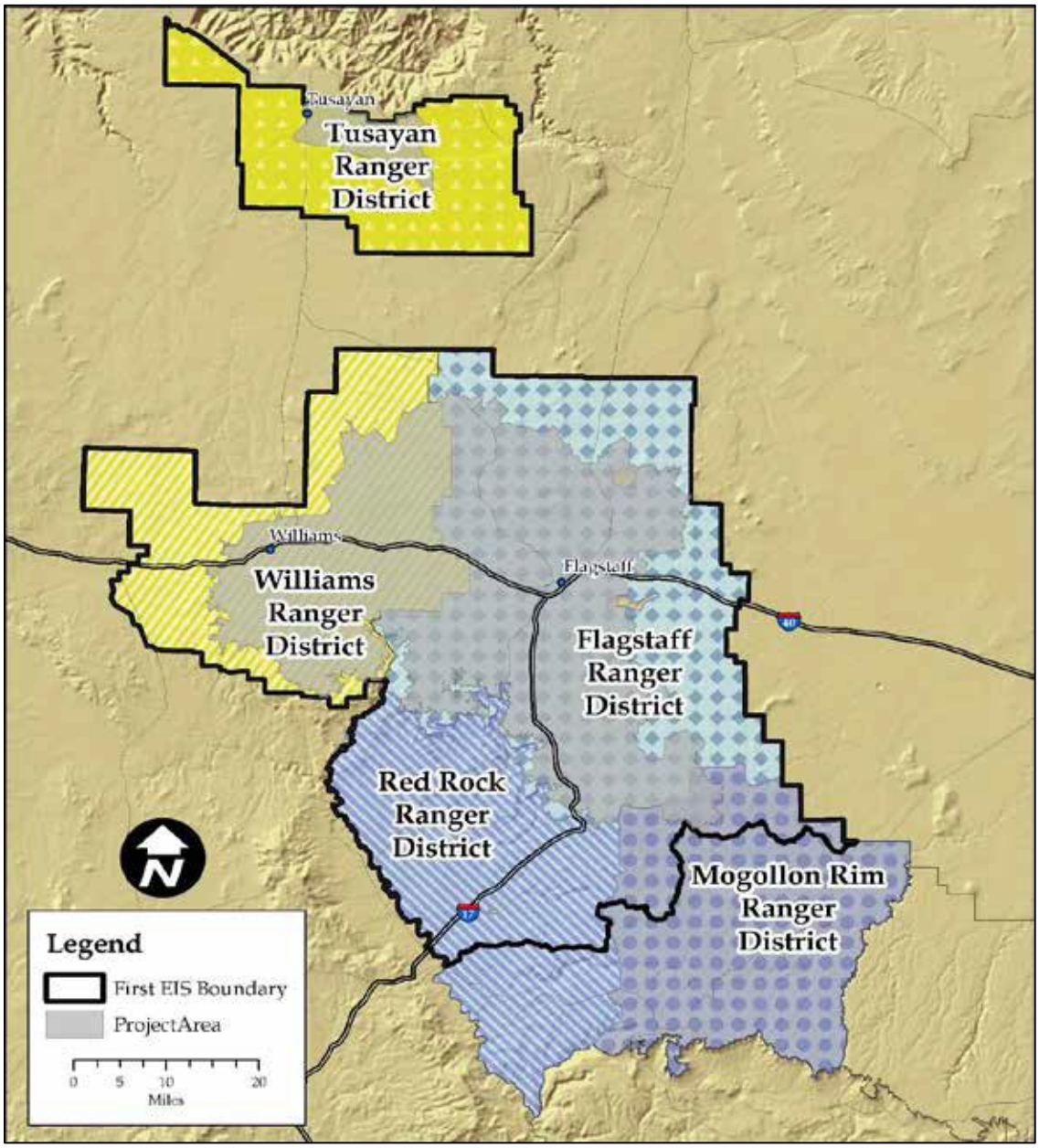

Figure 3. Coconino NF and Kaibab NF ranger districts within the project area

Project Location

Within the 988,764-acre project area, approximately 380,000 acres were excluded from this proposal. Excluded areas include about 204, 957 acres that are being analyzed in separate environmental analyses; approximately 30,000 acres that are located in special areas that include designated wilderness, inventoried roadless areas, wild and scenic rivers, and wilderness study

areas; and over 145,000 acres that are non–Forest Service administered lands. The project area is entirely located within Coconino County.

Due to the size of the project area, the Forest Service 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.

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 Williams district. It is generally located north of I-40 and west of Highway 180.

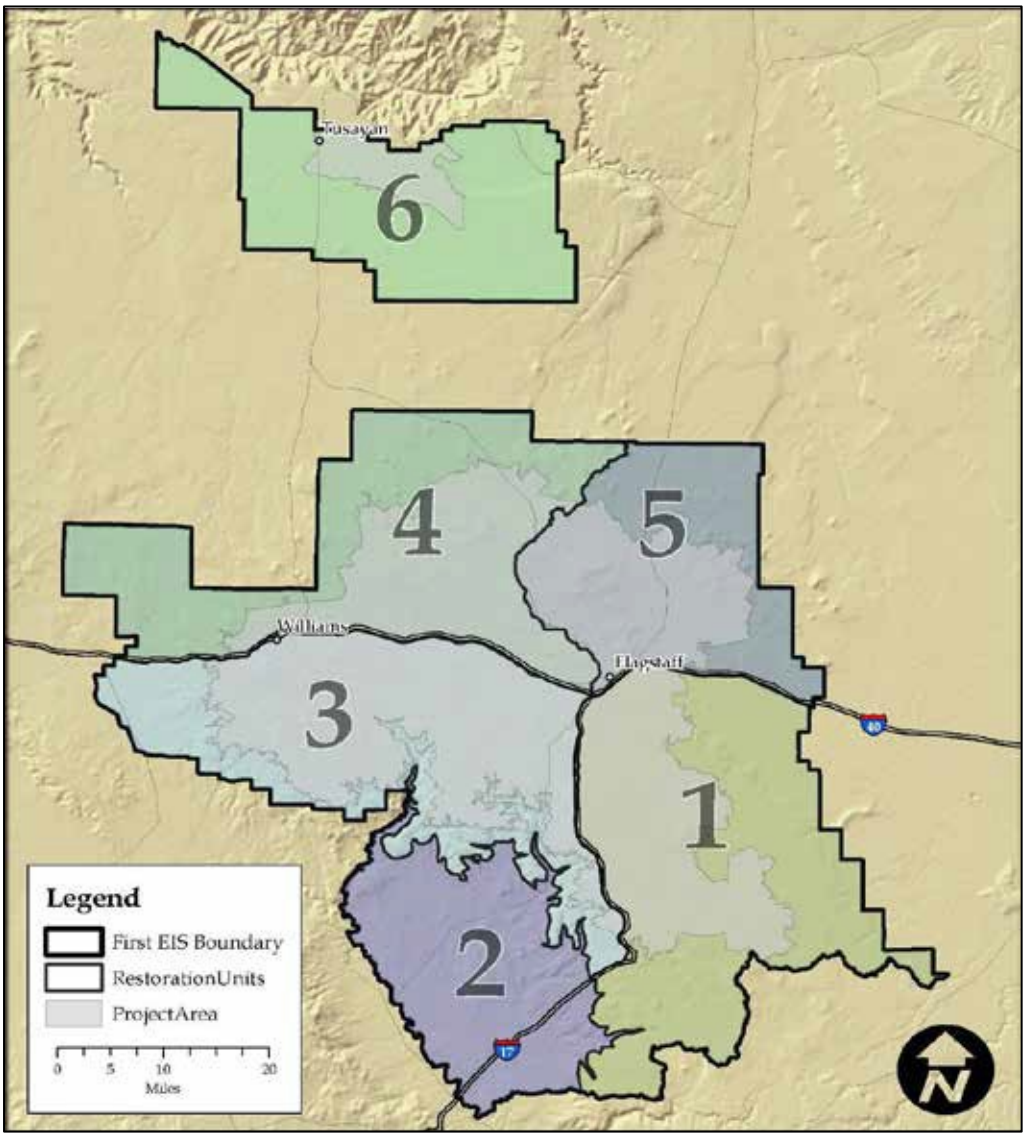

Figure 4. Restoration units (RU) within the project area

Communities in the vicinity of the proposed treatments include Flagstaff, Munds Park, Mormon Lake, Tusayan, and Williams, Arizona. RU 5 is located north of I-40 and east of Highway 180 and includes landmarks such as Mount Elden. RU 6 lies immediately south of, and adjacent to, Grand Canyon National Park. RU 6 entirely encompasses the Tusayan district on the Kaibab NF. RU 2 is located west of I-17 and south of the Mogollon Rim (see figure 4). RU 2 was removed from this analysis because the vegetation is not contiguous pine.

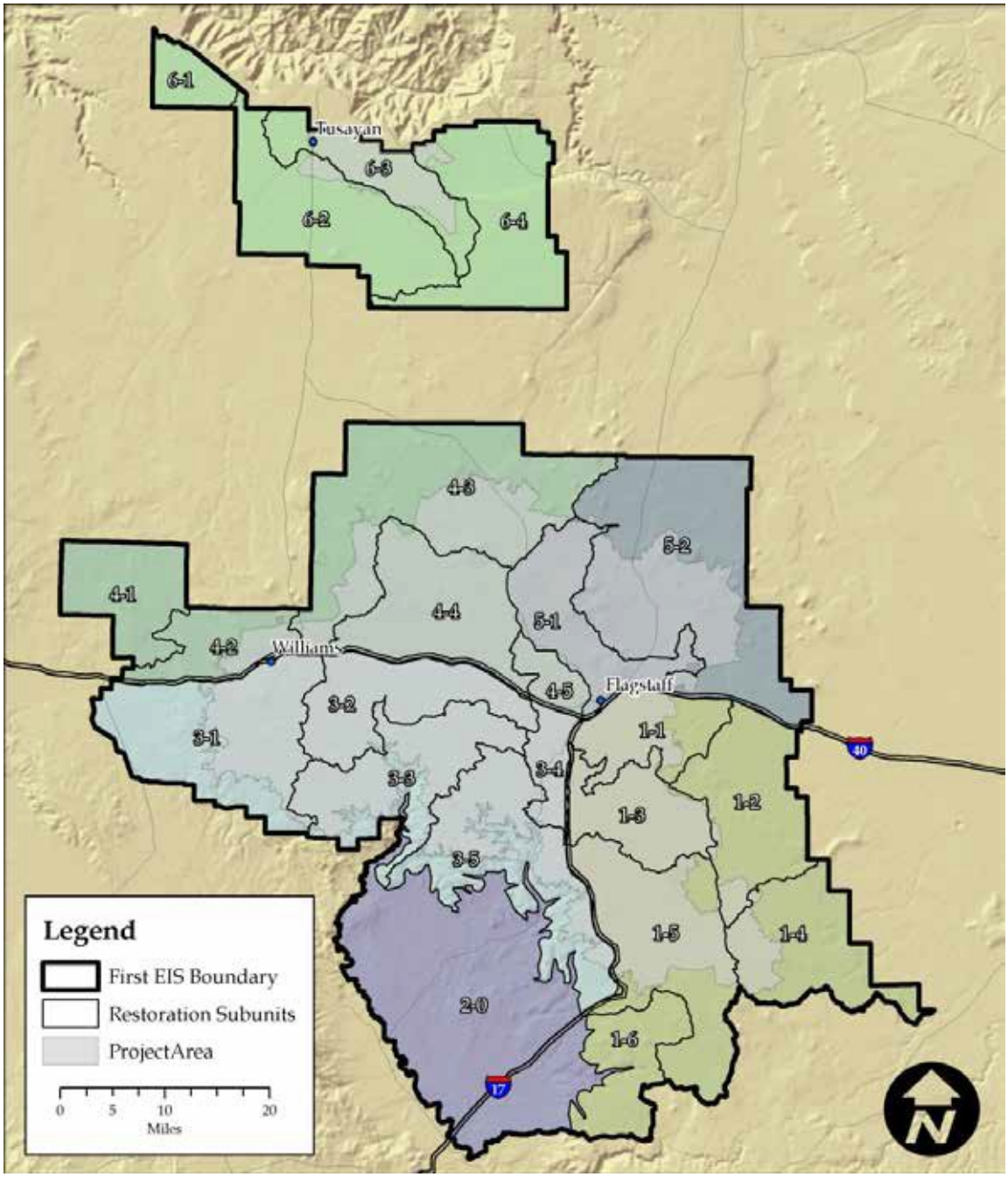

Figure 5. Restoration subunits within the project area

The project area was further stratified into several subunits that range from 4,000 to 109,000 acres in size (figure 5). Both units (RU and subunits) are based on 6th code watershed boundaries, State and forest transportation systems, and the forest's administrative boundaries. Each resource specialist determined how best to use the restoration units and subunits in their analysis. Some analysis scales were selected to meet forest plan requirements (see individual resource sections in chapter 3).

4FRI Background

The 4FRI proposal is a result of several years of planning and collaboration among interested parties, groups and organizations, and Federal, State, and local government agencies. The focus has been to restore forest landscapes and reduce the potential for severe fire effects in a manner that benefits the local economy. In 2007, the Arizona Forest Health Council completed the "Statewide Strategy to Restore Arizona's Forests." The strategy's vision integrates 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.

The communities that surround the four national forests engaged in the 4FRI project are economically and social diverse. Apache, Coconino, Gila, Graham, Navajo, and Yavapai Counties have economic bases in consumptive industries, agriculture, tourism, and services to retirees. With this diversity has come an increasingly divergent vision of how to manage public lands and how to respond to the threat of uncharacteristic wildland fires. While the stakeholders may not always agree, there is strength in having stakeholders who can provide a wide range of potential solutions when working with the Forest Service.

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)

In February 2008, based on recommendations within the statewide strategy, the "Analysis of Small Diameter Wood Supply in Northern Arizona" (Hampton 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 order 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 order 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 the CFLR Act in 2010.

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.

Also in 2010, stakeholders began refining their vision for ponderosa pine forest restoration. 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 for the First Analysis Area" report (4FRI Stakeholders 2010) to inform the purpose and need and proposed action for this project.

While the 4FRI analysis has been in development, other broad-scale planning efforts have been underway. The Forest Service requires that forest plans for individual forests be revised every 10 to 15 years. The Coconino NF forest plan was issued in 1987 and the Kaibab NF forest plan was issued in 1988. Although the plans are 24 to 25 years old, Congress has provided exemptions for older plans. The efforts to revise these plans began in 2006. The Kaibab NF issued their draft EIS and forest plan in April of 2012, with a final revised plan expected in late spring of 2013. The Coconino NF is scheduled to release their draft documents in the spring of 2013, with an expected final to follow a year later. This 4FRI draft EIS is consistent with the current forest plans as amended, including the project specific amendments proposed in appendix B of this document. Since the draft 4FRI and plan revision documents have been developed essentially concurrently, consistent coordination and a great deal of alignment exists between the desired conditions and drivers of the three efforts. The timing of the release of the final documents will determine the description of how the 4FRI will achieve the consistency requirements. To the extent there is any inconsistency with a current or revised plan adopted prior to the final decision on the 4FRI project, appropriate project specific plan amendments consistent with those proposed in appendix B of this document will be made at the time of the final decision.

Likewise, the Mexican spotted owl (MSO) recovery plan has been undergoing revision. The original MSO recovery plan was issued in 1995. After years of experience with implementation, the need to improve the MSO recovery plan was recognized by the FWS. The "Mexican Spotted Owl Recovery Plan, First Revision" (USDI 2012) was released in December 2012. While the current DEIS addresses the recommendations of the 1995 MSO recovery plan, it also has been developed with continuous coordination with the FWS and is in alignment with the final MSO recovery plan.

Project Record

All documents used in the decisionmaking process for this project are in the project record located at the Coconino National Forest Supervisor's Office and most are available for public review.

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 and resource 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 this chapter.

The purpose of the project is to reestablish and restore forest structure and pattern, forest health, and vegetation composition and diversity. There is a need to increase forest resiliency and sustainability, protect soil productivity, and improve soil and watershed function. Resiliency increases the ability of the ponderosa pine forest to survive natural disturbances such as fire, insect and disease, and climate change (FSM 2020.5). The project is expected to move almost 600,000 acres toward comprehensive, landscape-scale restoration with benefits that include improved forest function and health, vegetation biodiversity, wildlife habitat, soil productivity, watershed function, and reduced risk of severe fire effects.

Existing and Desired Conditions

Forest Structure and Spatial Pattern

This analysis utilizes canopy density and openness, the relationship of vegetation structural stage (VSS) to age/size class and diversity, stand density and key habitat components, and old growth as criteria to describe existing and desired conditions for forest structure and spatial pattern in the project area.

Tree Density and Canopy Openness

A characteristic of historic Southwest ponderosa pine forests was the grass/forb/shrub (interspace) interspersed among small groups of trees. This interspace typically comprised a large portion of the landscape (Woolsey 1911, Cooper 1960, White 1985, Pearson 1950, Covington et a1. 1997, Abella and Denton 2009). Low-severity fires occurred every 2 to 22 years and maintained an open canopy structure (Weaver 1951, Cooper 1960, Swetnam 1990, Swetnam and Baison 1990, Fulé et al. 1997a, Covington et al. 1997, Heinlein et al. 2005, Fulé et al. 2003). Typical historical tree groups ranged from 0.1 to 0.75 acre in size and comprised 2 to 40 plus trees per group (White 1985, Fulé et al. 2003, Covington et al. 1997). Others have described historical ponderosa pine forests as having low tree density, open, savanna-like stands consisting of groups of pine trees interspersed with grassy or shrubby openings (White 1985). For this analysis, the term "openness" is used to convey the percentage of the forested area that is grass/forb/shrub interspace. It is often used interchangeably with the term "canopy density.".

In contrast to having a ponderosa pine ecosystem consisting of groups of trees mixed with interspaces, approximately 74 percent of the ponderosa pine forest type within the project area is departed from historical reference conditions[1]. Table 3 displays the existing percent of interspace (openness) in the project area by restoration unit[2]. Openness (percent of interspace) ranges from very open/open to closed. Stand data was used to generate figure 6.

[1] Reference condition is defined as the condition due to site, ecology, and natural disturbance regime.

[2] Determining openness is best accomplished thru aerial imagery analysis. At present, this sort of analysis is only available for a small portion of the project area. In the absence of a detailed aerial imagery analysis, we determined that stand data was an appropriate substitute to classify the continuous canopy conditions that currently exist within the project area. Therefore, the current openness within the project area was determined using the canopy density measurements described in the silviculture specialist report (see page 33 and table 10).

Table 3. Canopy openness (classification percent of interspace) by restoration unit

Restoration Unit	Acres	Very Open/Open (%)	Moderately Closed (%)	Closed (%)	Unknown (%)
1	145,793	14	28	58	1
3	129,225	13	25	60	2
4	134,301	22	34	39	4
5	61,671	55	24	10	11
6	41,188	30	40	29	2
All ponderosa pine	**512,178**	**22**	**29**	**45**	**3**

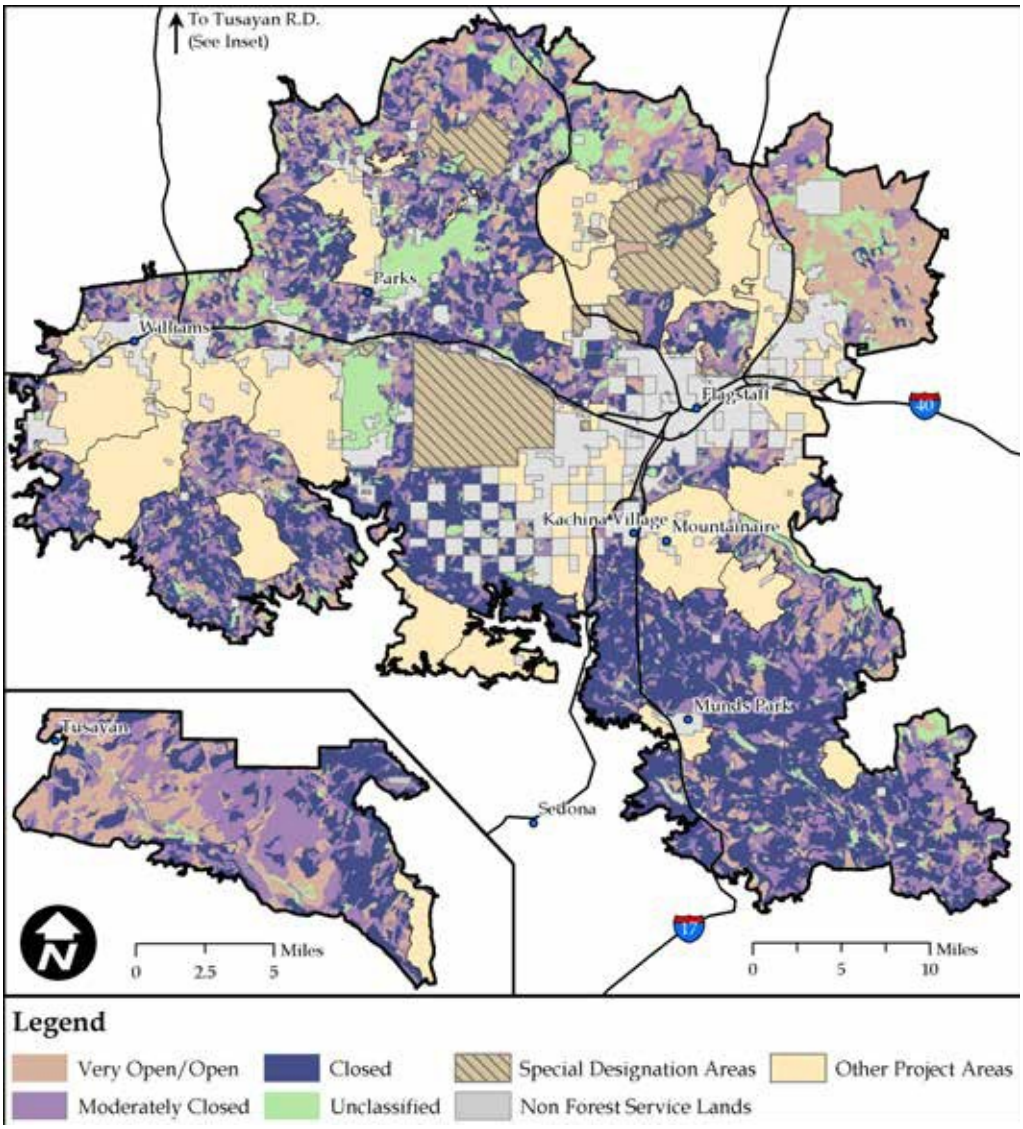

Figure 6. Existing canopy openness within the project area

Overall, the desired condition is to reestablish non-forested openings that have been invaded by ponderosa pine since fire exclusion and reconfigure the forests toward their natural spatial pattern. At the fine scale, groups of trees would typically range from 0.1 acre to 1.0 acre in size. Tree group size would exceed 1 acre as needed to respond to site-specific conditions including the presence of presettlement trees or mature and mid-aged trees that are developing old tree characteristics. Tree groups in the mid-age and older structural stages (VSS 4, 5, and 6) would have canopies that provide moderate to closed conditions and where canopies are touching, or nearly touching, in order to provide connectivity for wildlife that are dependent on this type of habitat.

There would be a mix of very open, open, moderately closed, and closed canopy conditions at the landscape (ponderosa pine vegetation) scale. Moderate to closed canopy conditions would be widely distributed on the landscape. Habitat for goshawk and MSO, steep slopes, and buffers for resources such as bald eagle roosts, other raptor nests, caves, and special designations that would not be treated (including wilderness and most research natural areas) provide connectivity with moderate to closed canopy conditions. At the landscape scale (extent of ponderosa pine vegetation), openness would range from very open (up to 90 percent) within the savanna and grassland matrix to closed (as low as 10 percent) on the highly productive forest areas to achieve a heterogeneous condition across the landscape.

There is a need to use management strategies that move tree group pattern, interspaces, and canopy density toward the natural range of variability (sum of reference conditions) and provide a mix of open, moderately closed, and closed canopy conditions at the fine (group) to landscape (ponderosa pine vegetation) scale. There is a need to amend the forest plans to provide for grass/forb/shrubs (interspace) interspersed among tree groups.

Vegetation Structural Stage (VSS) – Age and Size Class Diversity

Vegetation structural stage (VSS) is a method of describing forest age and tree size from seedling to old forests. The VSS classification is based on the tree size class with the highest square foot of basal area and is an indication of the dominant tree diameter distribution. A group of trees with a single age class is considered even-aged while a group of trees with multiple age classes is uneven-aged.

Figure 7. Even-aged forest structure common throughout the project area

Forest resiliency and diversity is dependent on the distribution of age and size classes and the capacity of an area. Currently, over 50 percent of the forested acres in the project area lacks age and size class diversity and is in an even-aged structure. This has resulted in a homogenous landscape with reduced resiliency. Reduced resiliency is expressed as the increased potential for severe effects from wildfire, increased stand density related mortality, reduced resiliency to bark beetle attack, increased dwarf mistletoe spread, and reduced understory productivity. Figure 7 displays a dense, even-aged forest structure that is common throughout the project area.

Goshawk Habitat

The project area has approximately 369,033 acres of goshawk habitat outside of post-fledgling family areas (PFA). Forest plan direction for lands outside post-fledgling family areas (LOPFA) is to have uneven-aged conditions with a diversity of VSS distributed across the landscape (see table 4). Diversity in age and size classes (VSS) represents specific habitat components that are needed for goshawk prey species. An imbalance potentially decreases the ability of goshawks to maintain their numbers over time.

Even-aged stand conditions occur on approximately 46 percent of the LOPFA habitat with approximately 54 percent in uneven-aged stand conditions (see silviculture report, table 80). Although the uneven-aged stand condition partially meets forest plan direction, the desired balance of VSS classes is lacking as displayed in table 4. In all stands, the young and mid-aged forest structural stages are surplus, and the grass/forb/shrub, seedling/sapling, mature, and old forest stages are deficit relative to forest plan direction. The desired condition is to move even-aged stands to an uneven-aged structure and move all stands toward the forest plan's VSS percent distribution.

Table 4. Existing VSS distribution within goshawk LOPFA

Vegetation Structural Stage (VSS)	Tree Diameter (d.b.h.*)	Even-Aged Stands Existing Percent of Area	Un-even Aged Stands Existing Percent of Area	Forest Plan Desired VSS Percent Distribution
1 – Grass/Forb/Shrubs	0.0 – 0.9″	8	0	10
2 – Seedling/Sapling	1.0 – 4.9″	0	2	10
3 – Young Forest	**5.0 – 12″**	**36**	**35**	20
4 – Mid-age Forest	**12.0 – 17.9″**	**47**	**32**	20
5 – Mature Forest	18.0 – 23.9″	8	14	20
6 – Old Forest	24″+	1	17	20

*diameter at breast height

Forest Structure – Post-fledgling Family Areas (PFA)

There is approximately 30,600 acres of goshawk PFA habitat in the project area. PFAs consist of nest sites and adjacent habitat most likely to be used by fledglings during their early development. This category also includes dispersal PFAs (or dPFA) which is unoccupied suitable habitat within a 2 to 2.5-mile range of a PFA.

Almost 90 percent of PFAs are even-aged stands dominated by the young and mid-aged forest structural stages with very little representation of the other structural stages. VSS 3 and 4 are overrepresented and VSS 1, 2, 5, and 6 are deficit (table 5). Outside of nest stands, the desired condition is to have an uneven-aged forest structure that represents all age classes (USDA 1987, USDA 1988).

Table 5. VSS distribution within goshawk PFA habitat

Vegetation Structural Stage (VSS)	Tree Diameter (d.b.h.*)	Even-Aged Stands Percent of Area	Uneven-aged Stands Percent of Area	Forest Plan Desired Percent Distribution
1 – Grass/Forb/Shrubs	0.0 – 0.9″	3	0	10
2 – Seedling/Sapling	1.0 – 4.9″	1	1	10
3 – Young Forest	**5.0 – 12″**	**35**	**34**	20
4 – Mid-age Forest	**12.0 – 17.9″**	**52**	**39**	20
5 – Mature Forest	18.0 – 23.9″	8	15	20
6 – Old Forest	24″+	1	11	20

*d.b.h. is diameter at breast height

Stand Density and Key Habitat Components

One of the major factors affecting forest structure and development is inter-tree competition. High forest densities result in increased inter-tree competition. Measures of forest density include basal area, trees per acre, and stand density index (SDI). Basal area (BA) is the cross-sectional area of all trees, measured in square feet per acre, and trees per acre (TPA) are simply a count of the total number of trees on an acre. SDI is a relative measure of stand density based on the number of trees per acre and the mean diameter (Reineke 1933). It is a good indicator of tree competition. Based upon established forest density/vigor relationships, density-related mortality from competition begins to occur once the forest reaches 45 to 50 percent of maximum stand density. Mortality is likely to occur at density levels over 60 percent of maximum stand density (Long 1985).

Table 6 displays that both SDI and BA are above the desired condition, which means much of the goshawk habitat is currently at risk from density-related mortality. The table also displays existing and desired conditions for snags and coarse woody debris (CWD), two key components of wildlife habitat. The project area is deficit in snags and does not meet desired conditions for CWD. The desired condition is to reduce the potential for density-related mortality and have stand densities at levels that facilitate forest health. Stand densities allow for overall forest development, tree vigor, and resilience to characteristic disturbances. In addition to stand density, there is a need to move toward forest plan desired conditions for snags and coarse woody debris.

Table 6. Existing and desired conditions for goshawk habitat components

Habitat Type and Acres	BA Average		SDI % of Maximum		Snags >18″ d.b.h. per Acre		CWD Total Tons per Acre	
	Existing	Desired	Existing	Desired	Existing	Desired	Existing	Desired
PFA (30,600)	107	70–80	45	25–40	0.4	2.0	3.9	5–7
LOPFA (369,033)	96	50–70	40	15–35	0.4	2.0	3.5	5–7

Mexican Spotted Owl (MSO) Habitat

Forest Structure, Stand Density, and Key Habitat Components

Table 7 displays the existing and desired conditions for structural attributes and habitat components within MSO habitats. The components (which include SDI, TPA, CWD, and snags) are indicators of nest/roost characteristics as outlined in the forest plans. These components are necessary to maintain a suite of prey species for MSO.

Based upon established forest density/vigor relationships, density related mortality begins to occur once the forest reaches 45 to 50 percent of maximum stand density, and mortality is likely at density levels over 60 percent of maximum stand density (Long 1985). Table 7 displays that all MSO habitats exceed the 60 percent-plus maximum stand density. In all MSO habitats, trees greater than 18-inch d.b.h. and large snags are deficit from forest plan and MSO recovery plan desired conditions[3] and CWD requirements are met on less than 10 percent of the habitat.

The desired condition is to improve the quality of MSO nesting and roosting habitat by reducing the potential for density related mortality and moving toward forest plan desired conditions for trees greater than 18-inch d.b.h., snags, and CWD. There is a need to implement uneven-aged management strategies that improve nesting and roosting habitat and reduce the potential loss of habitat. There is a need to amend the Coconino NF forest plan to allow treatments that would most effectively improve nesting and roosting habitat.

Table 7. Existing and desired habitat components within MSO habitats

Habitat Type	A		SDI (% of Maximum)		Trees 18″+ (per Acre)		Snags 18″+ (per Acre)		CWD >12″[4] (Tons per Acre)	
	Existing	Desired	Existing	Desired	Existing	Desired	Existing	Desired	Existing	Desired
Restricted Target/ Threshold (8,713 acres)	162	150–170	85	≤55	16.3	≥20	0.5	≥2.0	1.2	≥1
Restricted Other (67,378 acres)	137	70–90	69	25–40	11.5	≥20	0.4	2.0	0.5	≥1
Protected (36,455 acres)	155	NA	78	≤55	14.9	NA	.6	≥2.0	0.8	≥1

Forest Structure – Old Growth

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, USDA 1988). Given

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

[4] A ponderosa pine log 8 feet long and 12 inches in diameter, as described in the forest plans, is about 1/3 of 1 ton. Managing for greater than a ton should, on average, meet forest plan requirements.

the size of this project, scales of analysis based on existing divisions of the landscape developed specifically for this project were utilized. The smallest scale is represented at the stand level with stands averaging less than 100 acres in size. The ecosystem management area (EMA) is the restoration subunit. Subunits range 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 335,000 acres.

There are approximately 512,178 acres of ponderosa pine in the project area. Of this total, 194,804 acres (38 percent) are the closest to meeting old growth conditions. Currently, all restoration units meet or exceed the 20 percent minimum forest plan requirement. Table 8 displays ponderosa pine old growth allocations by restoration unit/forest for all the ponderosa pine within the 4FRI analysis area as well as ponderosa pine within other areas within the project area that were analyzed in separate vegetation analysis (see silviculture area of analysis discussion).

Old growth allocations are based on current conditions within the project area along with forest plan specific management direction. Most sites currently do not fully meet the minimum criteria for old growth conditions as listed in the forest plans. However, the habitat types noted below 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).

The old growth allocation acreage/percentage for ponderosa pine includes 100 percent of MSO protected habitat, 100 percent of MSO target/threshold habitat, 40 percent of MSO restricted habitat that is uneven-aged with low dwarf mistletoe infection, and 80 percent of MSO restricted habitat that is even-aged and mid-aged to old with low dwarf mistletoe infection. In goshawk habitat, the old growth allocation acreage/percentage for ponderosa pine includes 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.

Table 8. Ponderosa pine old growth allocation acres and percent by forest and restoration unit

RU	Ponderosa Pine Total Acres (4FRI/Other Projects) Total		Ponderosa Pine Old Growth Acres (4FRI/Other Projects) Total		Old Growth Percent (%)	
	Coconino NF	Kaibab NF	Coconino NF	Kaibab NF	Coconino NF	Kaibab NF
1	(145,793/46,952) 192,745	NA	(65,189/11,130) 76,319	NA	40	NA
3	(58,327/29,176) 87,503	(70,898/57,886) 128,784	(21,341/10,894) 32,235	(25,177/13,746) 38,923	37	30

RU	Ponderosa Pine Total Acres (4FRI/Other Projects) Total		Ponderosa Pine Old Growth Acres (4FRI/Other Projects) Total		Old Growth Percent (%)	
	Coconino NF	Kaibab NF	Coconino NF	Kaibab NF	Coconino NF	Kaibab NF
4	(56,981/5,941) 62,922	(77,320/14,089) 91,409	(17,718/1,965) 19,683	(30,342/2,140) 32,482	31	36
5	(61,671/40,686) 102,357	NA	(24,745/7,469) 32,214	NA	31	NA
6	NA	(41,188/7,450) 48,638	NA	(10,291/1,490) 11,781	NA	24
Total	(322,772/122,755) **445,527**	(189,407/79,425) **268,832**	(128,994/31,458) **160,452**	(65,810/17,376) **83,186**	**36**	**31**

There are approximately 23,316 acres of pinyon-juniper within the 4FRI project area and approximately 6,218 acres of pinyon-juniper that have been allocated in other vegetation analyses. The old growth allocation in pinyon-juniper totals 29,534 acres (table 9) and includes those sites/acres that are closest to the minimum criteria for old growth conditions (per the forest plan). The allocation equates to 68 percent on the Coconino NF and 58 percent on the Kaibab NF.

Table 9. Pinyon-juniper old growth allocation acres and percent by forest

RU	Ponderosa Pine Total Acres (4FRI/Other Projects) Total		Ponderosa Pine Old Growth Acres (4FRI/Other Projects) Total		Old Growth Percent (%)	
	Coconino NF	Kaibab NF	Coconino NF	Kaibab NF	Coconino NF	Kaibab NF
1	(1,141/2,135) 3,276	NA	(611/447) 1,058	NA	32	NA
3	(832/0) 832	(3,201/3,533) 6,734	(356/0) 356	(1,747/2,245) 3,992	43	59
4	(42/0) 42	(7,123/0) 7,123	(42/0) 42	(4,116/0) 4,116	100	58
5	(8,771/0) 8,771	NA 0	(7,302/0) 7,302	NA 0	83	NA
6	NA	(2,206/550) 2,756	NA	(1,452/110) 1,562	NA	57
Total	(10,786/2,135) 12,921	(12,530/4,083) 16,613	(8,311/447) 8,758	(7,315/2,355) 9,670	68	58

Figure 8 displays the general locations of ponderosa pine and pinyon-juniper in the project area that are closest to meeting old growth conditions. In both ponderosa pine and pinyon-juniper, the desired condition is to allocate sites that best meet old growth conditions and manage those sites

toward old growth structural attributes. Where management occurs within ponderosa pine and pinyon-juniper cover type, there is a need to maintain the old growth characteristics within the sites allocated as old growth.

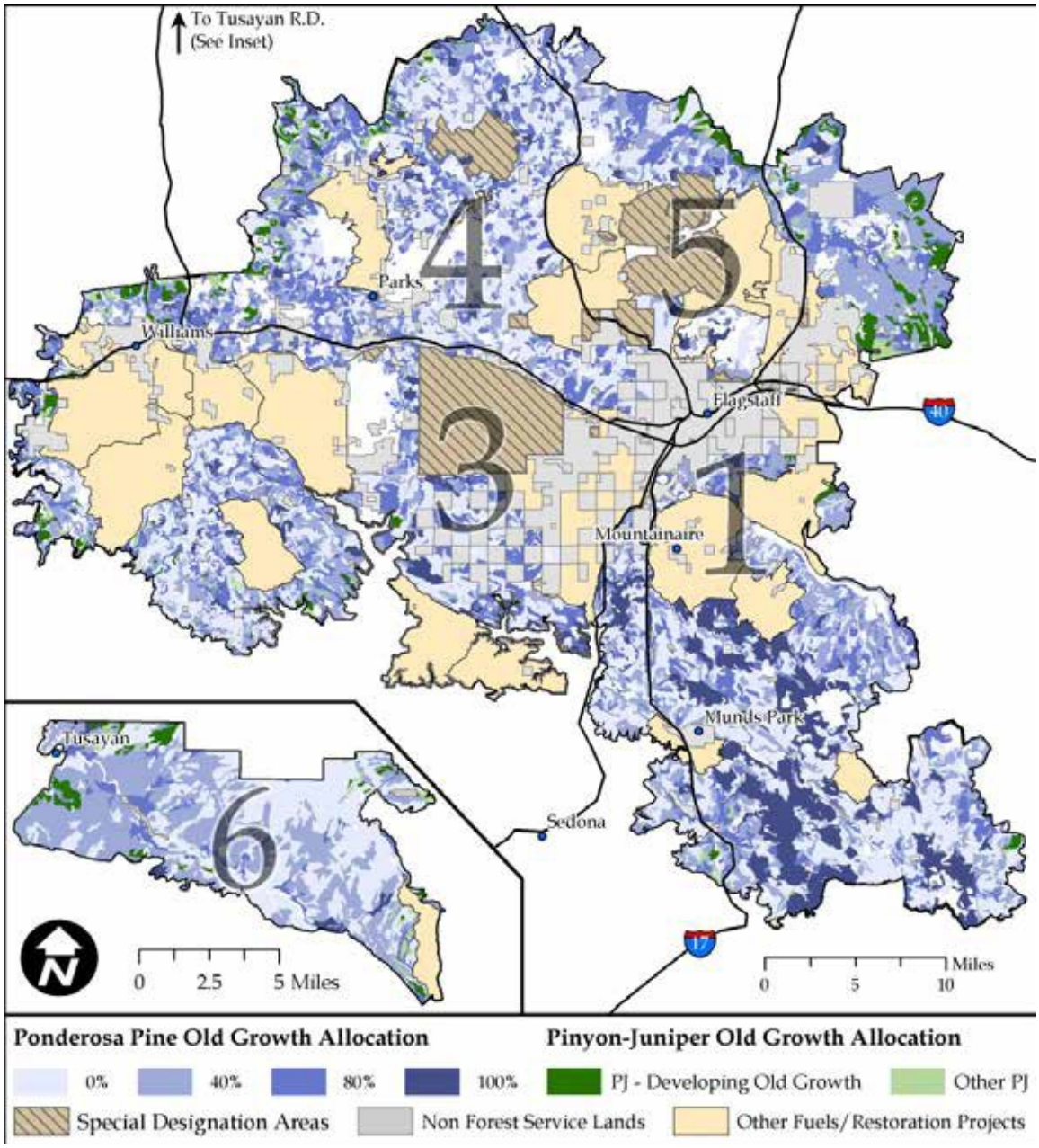

Figure 8. Ponderosa pine and pinyon-juniper stands that best meet old growth conditions

Forest Health – Insect and Disease

Bark Beetle

Forest health is defined by the vigor and condition of the forest stands (see previous discussion on stand density) and the presence of insects and disease that affect the sustainability of the forest.

Ponderosa pine is attacked and killed by several different bark beetles in the genera *Dendroctonus* and *Ips*. Approximately 8 percent of the ponderosa pine analysis area has a low bark beetle hazard rating, while 21 percent of the area has a moderate rating, and the remaining 71 percent has a high bark beetle hazard rating (table 10). Areas with a low or moderate hazard rating would be expected to be resistant to successful bark beetle attack and large-scale mortality.

Table 10. Existing ponderosa pine beetle hazard rating (percent of area in each RU)

Hazard Rating	RU 1	RU 3	RU 4	RU 5	RU 6	Analysis Area Acres/Percent of Total
Low	3	6	8	25	0	38,903/8
Moderate	12	11	27	46	25	106,734/21
High	85	83	64	29	75	366,542/71

Dwarf Mistletoe

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).

Approximately 66 percent of the area is not infected or has a low infection level (with less than 20 percent of the trees infected). Thirty-four percent of the area is moderately infected (20 to 50 percent of the trees infected) or heavily infected (50 to 80 percent of the ponderosa pine infected). The average range of infection is from 4 to 10 percent in the none/low infection level group and 33 to 42 percent in the moderate/high infection level group (table 11). Several stands have an extreme infection rating where 80 percent or more of the trees are infected.

Table 11. Existing dwarf mistletoe infection level by restoration unit (RU)

Infection Level	RU 1	RU 3	RU 4	RU 5	RU 6	Percent of Analysis Area
None/Low – Percent of Area	52	57	73	91	82	66
None/Low –Average Percent Trees Infected	5	6	4	10	5	6
Moderate/High –Percent of Area	47	43	26	9	18	34
Moderate/High – Average Percent Trees Infected	37	33	38	41	42	36
Extreme – Percent of Area	1	<1	<1	0	0	<1
Extreme – Average Percent Trees Infected	88	93	90	–	–	89

The desired condition is to move toward a forest structure that would allow beetles and dwarf mistletoe to function at naturally occurring or historic levels. There is a need to manage insect and disease in a manner that reduces, but does not eliminate bark beetle or dwarf mistletoe in order to provide nesting, resting, foraging, and catching sites for birds and mammals including Abert's/tassel-eared squirrels.

Vegetation Diversity and Composition

Gambel Oak

Vegetation diversity throughout the project area has declined. Gambel oak, a subtype within ponderosa pine, is important to many wildlife species as it provides important nesting and foraging habitat. A lack of fire led to increased stand densities of pine and resulted in Gambel oak becoming overtopped by fast growing ponderosa pine (figure 9) (Abella and Fulé 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 et al. 1979). There is a need to stimulate new growth, maintain growth in large diameter trees, and use management strategies that provide for a variety of shapes and sizes across the landscape.

Figure 9. Ponderosa pine overtopping of Gambel oak in the Bar-M (Coconino NF) portion of the project area

Aspen

There are approximately 1,471 acres of aspen in the project area. 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). 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. Figure 10 displays an unhealthy aspen stand within the project area. 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 10. Existing condition of aspen near Government Prairie, Kaibab NF

Grasslands

There are approximately 48,774 acres of montane/subalpine and Colorado Plateau/Great Basin grasslands within the project area. Only 2 percent of the Great Basin grasslands on the Coconino NF were historically comprised of very large shrubs, closed canopies, and very large trees. Currently, this percentage is 19 percent (USDA 2009). Within montane/subalpine grasslands, encroachment has increased from 0 to 33 percent (USDA 2009). Conifers on the Kaibab NF have invaded at least 8 percent of grasslands (USDA 2008).

Figure 11 and figure 12 display grassland encroachment within the project area over a 100-year period. On both forests, the desired condition for grasslands is to move toward the natural range of variability. Tree cover would range from 0 to 9 percent, grasses and forbs would dominate and fire return intervals would average 10 years (Weaver 1951, Cooper 1960, Swetnam 1990, Swetnam and Baison 1996, Fulé et al.1997a, Fulé et al.1997c, Heinlein et al. 2005, Diggins 2010). Fire would function within its natural fire regime across the landscape without causing loss to ecosystem function or to human safety, lives, and values. When fire does occur, it typically replaces more than 75 percent of the dominant vegetation type (USDA 2009). There is a need to reduce and/or remove tree encroachment, which has reduced the size and function of landscapes that were historically grasslands.

Figure 11. Fern Mountain (Hart Prairie) Grassland circa 1880s

Figure 12. Fern Mountain (Hart Prairie) Grassland circa 1980s

Pine-Sage

Based on review of the project area, ponderosa pine trees are encroaching and shading out the sage on about 5,261 acres. Without treatment, pine density is likely to increase and entirely shade out the sage component. The desired condition is to restore the historic pattern within the pine-sage mosaic and manage fire to enhance sage. There is a need to remove post-settlement pine that is currently overtopping and shading sage. Figure 13 displays the post-treatment desired condition. This figure portrays an area just south of the town of Tusayan, Arizona, approximately 6 years after a low severity prescribed fire.

Figure 13. Post-treatment pine-sage desired condition (Kaibab NF)

Forest Resiliency

Fire Behavior

Currently, over 200,000 acres (34 percent) of the treatment area has crown fire potential. Crown fire generally produces 100 percent mortality in ponderosa pine by consuming the crowns of trees. Additional acres, primarily within or adjacent to MSO habitat, are at risk from high intensity surface fire that can result in high-severity effects. A high intensity surface fire burning through this area could scorch the canopy sufficiently to cause widespread mortality (Van Wagner 1973). Figure 14 displays the current crown and surface fire potential within the project area.

Wildland-urban interface (WUI) areas are spread across the project area and are located within or adjacent to 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). Although past fuel treatments have been implemented in the 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, Rio de Flag, and Bill Williams watersheds. The Lake Mary and Rio de Flag watersheds are a source of water for the city of Flagstaff, Arizona. The Bill Williams watershed provides water for the city of Williams, Arizona. 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. Figure 15 provides a visual comparison between fire risk and some (not all) at-risk resources. Figure 15 displays the location of some resources at risk including the city of Flagstaff, the town of Tusayan, other non–Forest Service lands, watersheds, and MSO PACs, for reference with figure 14, which displays fire potential.

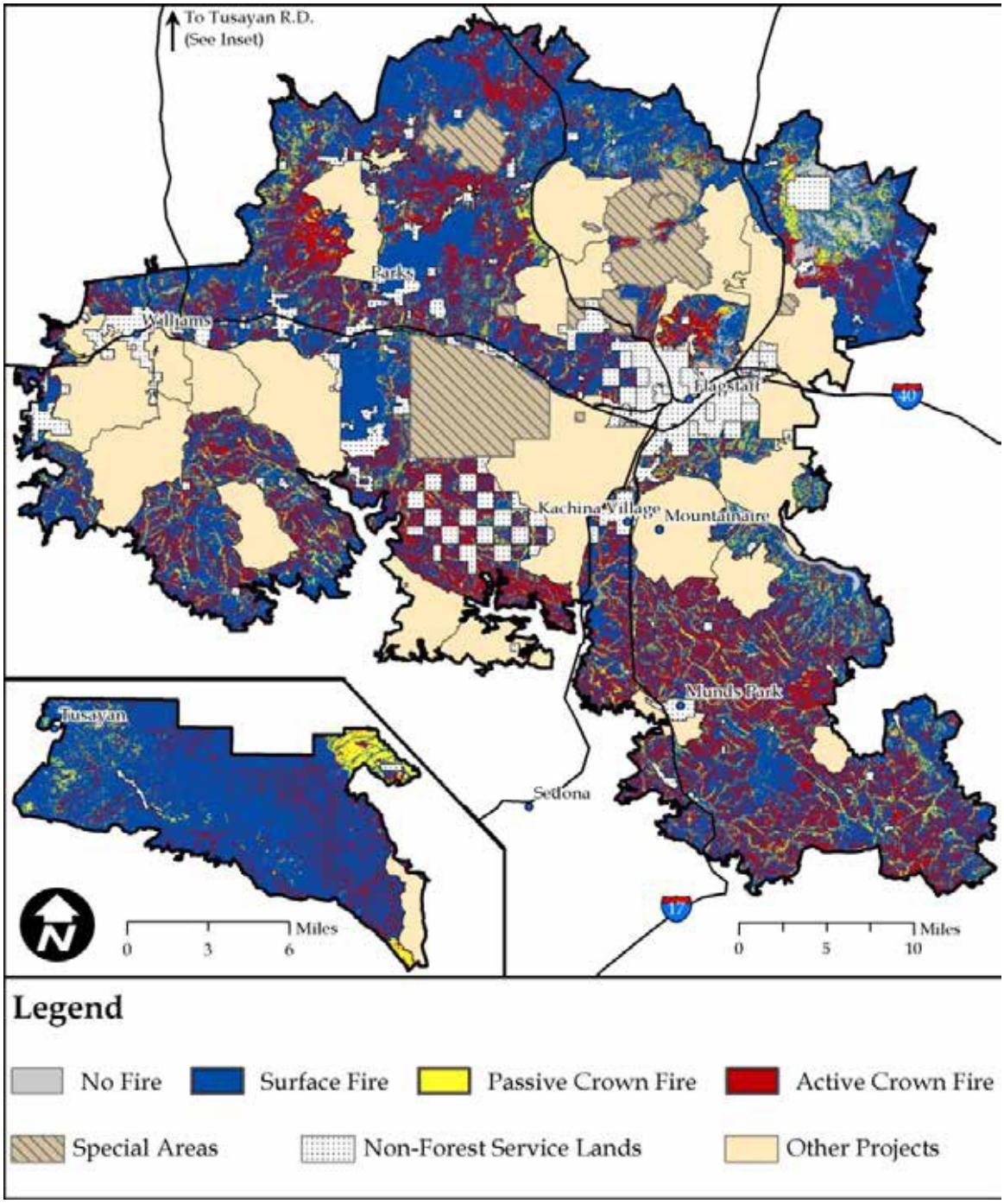

Figure 14. Current crown and surface fire potential in the project area

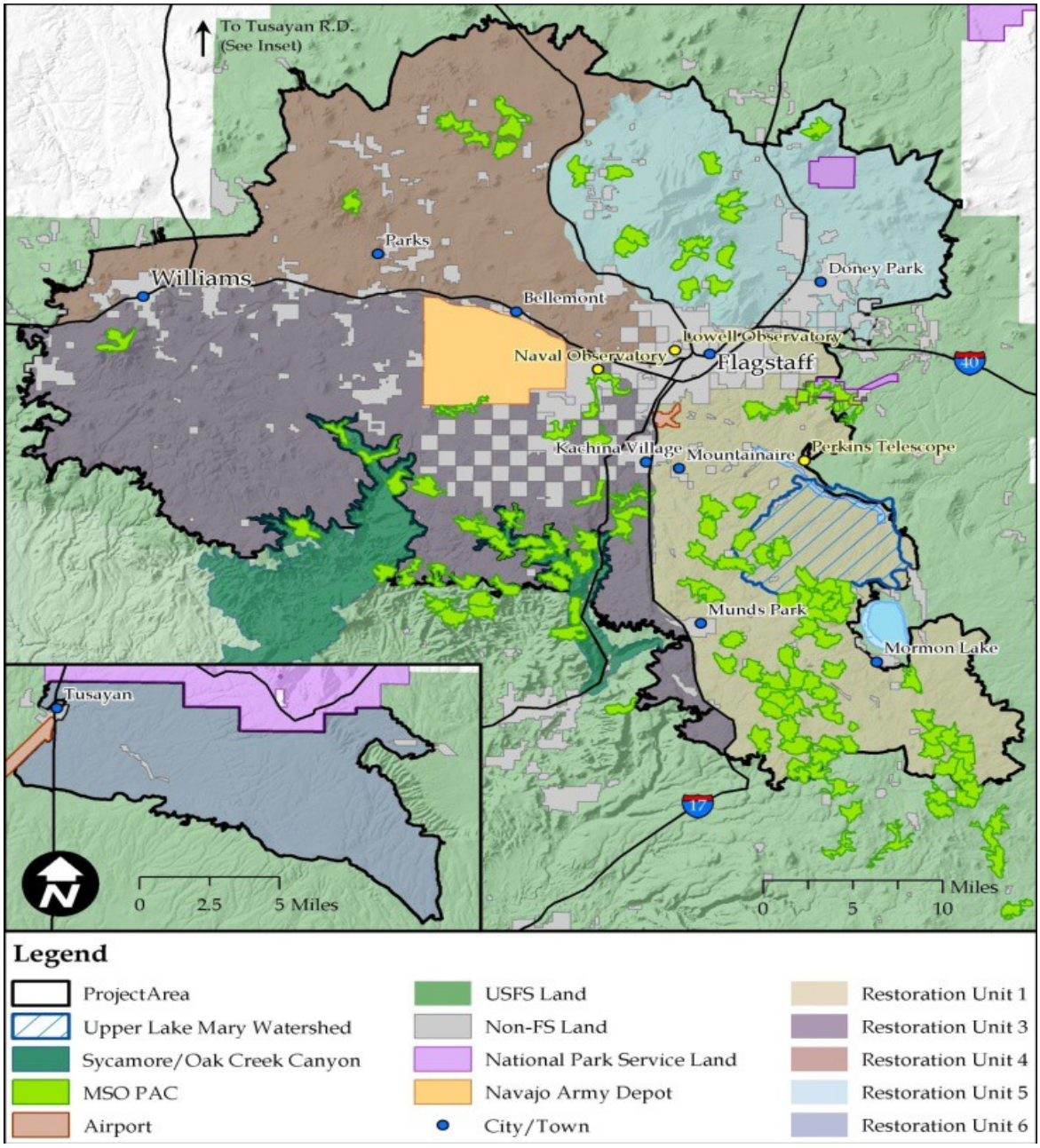

Figure 15. Locations of resources at risk (for reference with figure 14)

Canopy Characteristics and Surface Fuels Affecting Fire Behavior

Canopy bulk density and canopy base height are canopy characteristics used to measure the potential for crown fire. Higher canopy bulk densities means that fire can easily move through the crowns of trees. Higher canopy bulk densities means there are more fuels to burn. With more fuels, fire intensity would increase. Approximately 61 percent of the ponderosa pine in the project area has a canopy bulk density rating greater than 0.050 kilogram per cubic meter (kg/m3) . The desired condition in ponderosa pine to reduce the potential for crown fire is to have canopy bulk density below 0.050 kg/m3.

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 spread fire vertically into the canopy (Scott and Reinhardt, 2001). The lower the canopy base height, the easier it is for crown fire to initiate (Van Wagner 1977). Currently, canopy base heights in the project area average approximately 15 feet. To minimize the potential for crown fire initiation, the desired condition is to have average stand canopy base height above 18 feet. Table 12 summarizes existing and desired conditions for fire risk.

Table 12. Existing and desired fire potential in ponderosa pine in the project area

Evaluation Criteria	Existing Condition	Desired Condition
Potential crown fire (%)	34	Up to 10
Canopy Base Height (ft.)*	15	>18
Canopy Bulk Density (kg/m3)*	0.061	<0.050
Potential surface fire (%)	64	Up to 90

*Stand average across the project area

Surface fuels (as analyzed for fire behavior and effects) include litter, duff, and CWD greater than 3-inch diameter. High surface fuel loading can result in high-severity effects because they can smolder in place for long periods, transferring more heat into soil and tree cambiums. Mechanical treatments generally do not remove surface fuels from a treatment area, so they remain a potential source of heat (fire effects) and emissions.

Currently, litter, duff, and CWD average 11 tons per acre. When averaged, the existing surface fuels do not exceed recommended surface fuel loading (Brown et al., 2003). However, there are areas that exceed desired surface fuel loadings. Most of these areas are near, or associated with, MSO habitat (see the fire ecology report).

Overall, the desired condition is to have fire maintain a mosaic of diverse native plant communities. In ponderosa pine, no more than 10 percent of the project area should be prone to crown fire under modeled conditions, with high severity acres spatially distributed (Swetnam and Baison 1996, Roccaforte et al. 2008). In grasslands, no more than 3 percent should be prone to crown fire. In this analysis, “crown fire” in grasslands is a reference to crown fire in trees growing in the grasslands. In both vegetation types, 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.). High intensity surface fire should be rare with surface fuel loadings (including CWD, litter, and duff) ranging between 5 and 20 tons per acre (Brown et al. 2003).

The desired condition is to have fire function as a natural disturbance within the ecosystem without causing loss to ecosystem function or to human safety, lives, and values. Over time, conditions would allow managers to use 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. In order to reduce the potential for high severity surface fire, there is a need to maintain surface fuel loadings that meet desired conditions and reduce excessive surface fuel loadings in areas adjacent to and within MSO habitat.

Fire Regime Condition Class

Fire regime condition class (FRCC) is a coarse-scale evaluation protocol 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. It is scaled from 1 to 3, with 3 being the most departed and 1 being the least departed.

Approximately 59 percent of the project area is in condition class 3. This indicates the fire regime is significantly departed from historical ranges (table 13). In condition class 3, the risk of losing key ecosystem components is high. Approximately 27 percent of the project area is in FRCC 2, indicating the ecosystem is moderately departed from its historical range. The departure in fire frequency has resulted in dramatic alterations to fire size, intensity, severity, landscape patterns, and/or vegetation attributes.

The desired condition is to have 100 percent of the project area in FRCC 1. 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 2 and FRCC 3 and move the fire regimes toward FRCC 1.

Table 13. Existing and desired fire regime condition class ponderosa pine

Fire Regime Condition Class (FRCC)	Existing Condition (percent of total area)	Desired Condition (percent of total area)
FRCC 1	14	100
FRCC 2	27	0
FRCC 3	59	0

Soil Productivity and Watershed Function

Soils

Approximately 85 percent of soils and strata in the project area are in satisfactory soil condition and have the ability to resist accelerated erosion. Most strata in the ponderosa pine type currently have a closed stand structure and appear to have high canopy covers and densities. This has reduced understory forage productivity although there is generally sufficient vegetative ground cover to reduce accelerated erosion. Due to the closed stand structure, most soils and strata are at risk from the relatively high potential for crown fire (about 86 percent in FRCC 2 and 3). This also poses a high risk of moderate or high burn severity effects to the watersheds under normal or extreme fire behavior conditions. Fires resulting in moderate or high burn severity pose substantial risk to soil productivity, watershed function, and downstream water quality to connected stream courses on soils with moderate or high erosion hazard following storm events.

The desired condition is to protect long-term soil productivity by maintaining or improving soil condition and function (toward satisfactory). The vegetative ground cover would be adequate to protect against accelerated erosion resulting in maintained soil stability and vegetative productivity. Soil loss would be below tolerance, and no visible signs of excessive erosion are present. Surface soil hydrologic function would be in satisfactory condition with well aggregated, granular surface soil structure and tubular pores with sufficient porosity to effectively infiltrate

water. Soil nutrient cycling would be in satisfactory condition. Vegetative ground cover, including surface litter and plant basal cover, and herbaceous understory would approach natural conditions identified in the "Terrestrial Ecosystem Survey Potential Plant Community Ecological Processes and Function" (USDA 1984).

Watersheds at the 6th Hydrologic Unit Code (HUC) Scale

The project lies within 82 6th code watersheds. The Watershed Condition Framework (WCF) protocol (USDA 2010a, 2010b) was used to classify watershed conditions at the 6th HUC level including 12 watershed indicators. Overall, ponderosa pine vegetation types are dominated by functional-at-risk 6th HUC watersheds (about 451,500 acres, or 46 percent of the analysis area); with several impaired watersheds (about 316,800 acres, or about 32 percent of the analysis area) and a few properly functioning watersheds (about 220,400 acres, or about 22 percent of the analysis area).

The desired condition is to have watershed function maintained or improved toward functioning properly. Watersheds would exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Fire regime condition class and tree density would be reduced and moving toward FRCC 1 (historical range). Unneeded roads would be decommissioned or restored to their natural condition. Soil and riparian condition and function would be improved and moving toward satisfactory and properly functioning.

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).

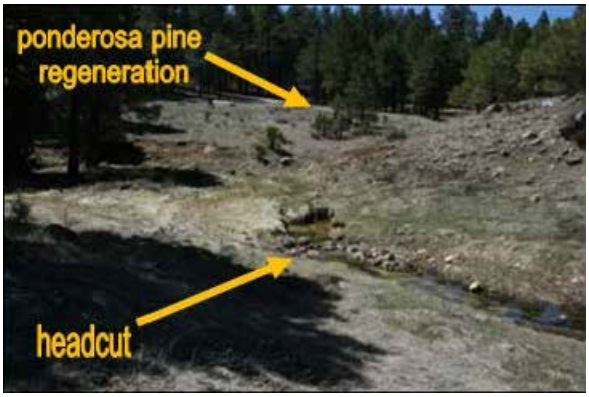

Figure 16. Degraded Babbitt Spring on the Coconino NF

Forty-nine developed springs on the Coconino NF are not functioning at or near potential and 25 springs on the Kaibab NF have reduced function (MacDonald 2013)[5]. However, springs are well represented throughout all the major watersheds on the forest. Spring function within the project area has been altered by human activities including flow regulation through installation of spring boxes and piping of discharge to offsite locations, recreational impacts, urbanization, and other construction activities, and grazing by domestic livestock and wildlife herbivores. As a result, many springs exhibit static or degraded conditions (MacDonald 2011). Excessive disturbance can also result in these features becoming nonfunctional (USDA 2009). Forty-seven developed springs on the Coconino NF are functioning below potential. On the Kaibab NF, 27 springs have reduced function (USDA 2008).

[5] Out of 78 total springs within the 4FRI project area, 4 springs were removed from treatment due to lack of information.

Figure 16 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) and is an example of spring conditions within the project area. 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 are indicators of impaired fu nction.

Figure 17 displays Hoxworth Spring in a restored condition. This figure provides an example of successfully meeting restoration desired conditions. Vegetative composition and spring outflow has improved. Bank headcutting in the spring's outflow has been addressed and tree encroachment that affected spring function has been removed. The purpose of figure 18 is to display protective measures (fencing) that have been successfully used in the past to attain restoration desired conditions.

Figure 17. Restored 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. Waterflow patterns, recharge rates, and geochemistry would be similar to historic levels and persist over time. Water quality and quantity would 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 would be resilient to natural disturbances (USDA 1987). 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 red uce 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.

Figure 18. Hoxworth Springs restoration

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 are categorized as riparian or nonriparian. On the Coconino NF, approximately 32 miles of

Figure 19. Degraded ephemeral/riparian stream (Coconino NF)

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 nonriparian streams. The Kaibab NF has approximately 7 miles (total) of degraded nonriparian streams. Figure 19 shows an active headcut and lateral bank cutting that resulted in accelerated erosion rates. This condition is common in the project area.

The desired condition is to restore the functionality of ephemeral streams (USDA 1987). On some of the total miles of stream, 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 20. Restored Hoxworth Spring drainage immediately post-treatment (photo on left) and 1 year post-treatment (photo on right)

The left-hand side of figure 20 shows the channel immediately after recontouring. The purpose of this figure is to display what restoration is likely to look like in the short term. The right-hand side of the figure displays the channel 1 year after treatment. This figure displays the desired condition for ephemeral stream restoration.

Roads and Unauthorized Routes

The Coconino and Kaibab NFs have identified the needed road system for public and administrative motorized use through the Travel Management Rule (TMR) process (see the transportation specialist report for details on forestwide transportation analyses). The TMR process identified a need to decommission approximately 770 miles of existing system and unauthorized roads on the Coconino NF. On the Kaibab NF, approximately 134 miles of unauthorized roads (often referred to as user-created routes) were recommended for decommissioning.

The desired condition is to restore decommissioned road prisms to their natural condition (USDA 1987, USDA 1988). 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.

About 2,820 miles of road would be needed to implement the project. Of this total, approximately 2,297 miles are existing, open roads. However, portions of these existing roads have resource

concerns, which require maintenance or reconstruction 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 utilizing existing roads and temporarily creating roads that can be returned to their natural state (decommissioned) at the completion of project activities. Maintenance, reconstruction, and restoration actions would be 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 preferred alternative (alternative C), select one of the other action alternatives (alternative B or 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 Planning Efforts

See pages 7 to 8 for the discussion on the relationship between the revised forest plans and the revised MSO recovery plan (USDI 2012) to this analysis. Other restoration activities (actions on private, State, and other non-Forest Service 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. This analysis tiers to each forest's final EIS (USDA 1987) (USDA 1988), as encouraged by 40 CFR 1502.20. Best available science was used to develop desired conditions that are consistent with forest plan revision.

Management Direction

The project area includes 23 management areas (MA) as described in the Coconino National Forest plan (pages 46 to 206-113). Table 14 displays the MAs located within the project area, forest plan MA emphasis, and the relationship between MA total acreage to the project. The MA direction for the Flagstaff/Lake Mary Ecosystem Analysis Area (FLEA) MA is displayed throughout the 10 MAs that make up the FLEA.

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 forest land) and 41,012 acres of GA 10, (Tusayan forest land) are proposed for treatment in the project area. About 8,353 acres of treatment are proposed within GA 1 (Western Williams Woodland), GA3 (North Williams

Woodland), and GA 8 (Tusayan Woodland). Treatments are proposed within about 1,049 acres of LUZ 21 (existing developed recreation sites). Table 14 displays the acreage associated with the MAs and GAs in the project area where the majority of restoration actions are proposed. Figure 21 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 Land and Resource Management Plan," pages 21 to 206-118; "Kaibab National Forest Land and Resource Management Plan," pages 16 to 114) where detailed descriptions of forestwide resource direction specific to management or geographic areas and land use zones is located.

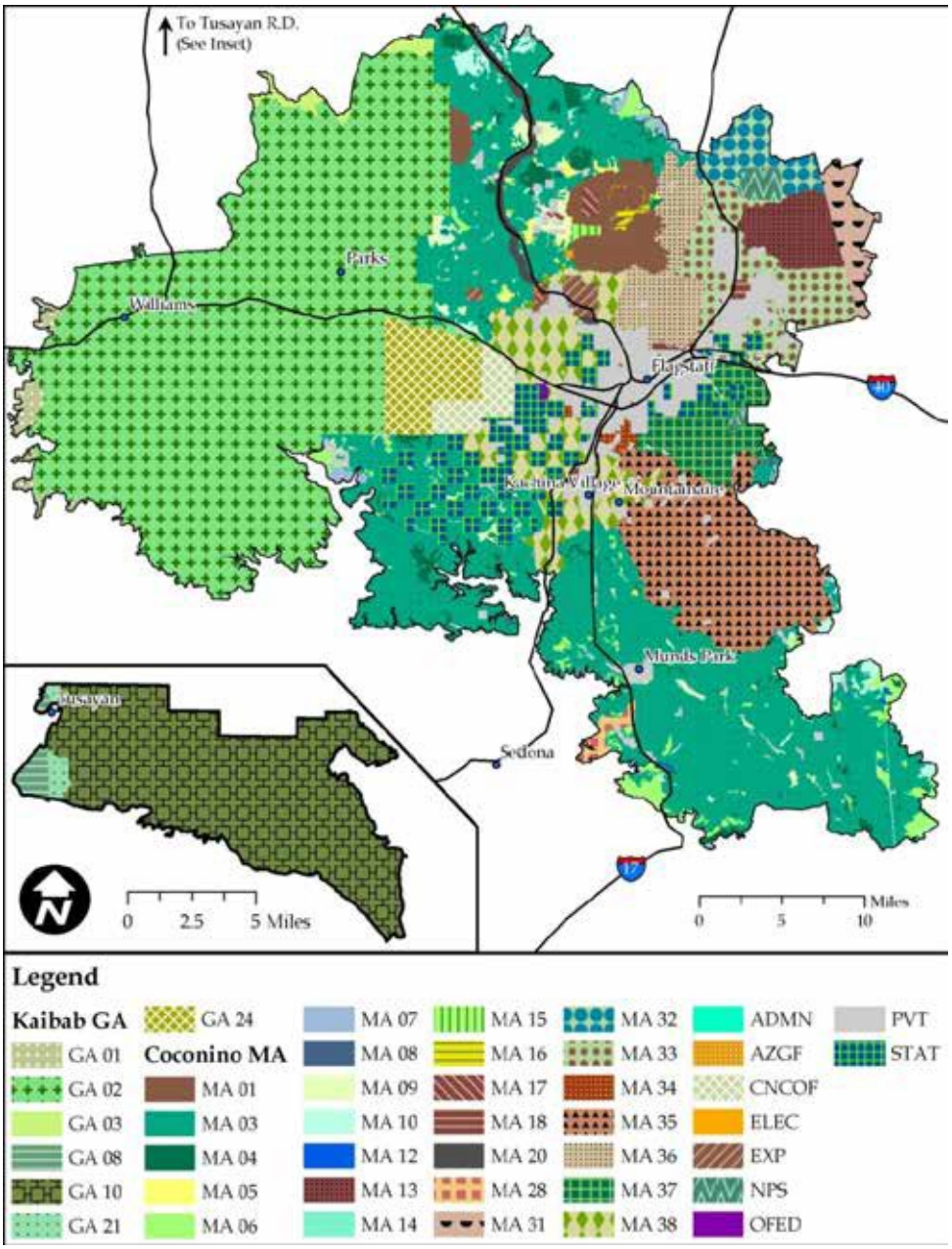

Figure 21. Forest plan management and geographic areas within the project area

Table 14. Forest plan management areas (MA), geographic areas (GA), and land use zones (LUZ) within the project area

Forest Plan MAs and GAs within the Project Area*	Description	Forest Plan Emphasis	Forestwide MA and GA Acres	MA and GA Acres within Project Area	Acres/Percent of Forestwide 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 toward 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, unroaded landscape, grazing, hunting	58,133	11,659	11,380/20

Forest Plan MAs and GAs within the Project Area*	Description	Forest Plan Emphasis	Forestwide MA and GA Acres	MA and GA Acres within Project Area	Acres/Percent of Forestwide MA/GA Proposed for Treatment
MA 31	Craters	Restore natural grasslands, reestablish 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	19,077	3,206	3,203/17
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 reestablished	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
MA 8	PJ woodlands > 40 %	Firewood production, watershed condition, wildlife habitat, and livestock grazing	273,815	451	248/<1

Forest Plan MAs and GAs within the Project Area*	Description	Forest Plan Emphasis	Forestwide MA and GA Acres	MA and GA Acres within Project Area	Acres/Percent of Forestwide MA/GA Proposed for Treatment
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 Forest land	Suitable timberland, recreation, grazing, wildlife habitat	308,394	299,842	181,371/59
GA 10	Tusayan Forest land	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 MA 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 comprised of MA 3, 4, 5, 8, and 9 which are included in the table.

Public Involvement

Collaboration

Collaboration has been integral to moving forward with a landscape restoration proposal. In 2010, stakeholders began refining their 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 (4FRI Stakeholders 2010). 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 responses were received through May 5, 2011. A scoping report that included a summary of the scoping process was posted on the 4FRI Web site 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 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 2-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, 2011, and again on December 5, 2011. The Tusayan and Camp Verde City Council received a project update on October 5, 2011.

The Sedona and Williams City Council was updated on October 25, 2011.Updates to local residents and communities were 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 in September of 2011 and 2012.

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

In 2012, monthly public meetings were hosted from March through July to discuss the status of the environmental analysis. Draft (working) documents shared at the public meetings and made available on the 4FRI Web site (http://www.fs.fed.usda.gov/main/4fri/planning) included: issues, alternatives, draft forest plan amendments, cumulative effects, scoping report (August 2011 scoping period), and version 5 of the modified large tree retention implementation strategy (alternative C).

Only a sampling of the public involvement effort is included in this summary. See the project record for complete documentation. The project has been continuously 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 Web site, http://www.fs.usda.gov/4fri since January 2011.

Cooperating Agencies

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

Tribal Consultation

The following tribes and tribal chapters who have historic ties and an interest in the Coconino and Kaibab National Forests were consulted with and include: Kaibab Band of Paiute Indians, Navajo Nation including Coppermine, Coalmine, Naness, Lechee, Leupp, Bodaway, Cameron, Tuba City, Dilkon and Tolani Lake Chapters, 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, and Fort McDowell Yavapai Nation.

Consultation began September 10, 2009, with the Kaibab NF supervisor sending an invitation to seven federally recognized tribes to discuss 4FRI and other forest projects. On January 27, 2011, the forests sent a letter to tribes and tribal chapters providing information and seeking involvement and comments. Two written scoping responses were received. The White Mountain Apache responded on February 17, 2011, and indicated no concern with the project. A response from the Havasupai Tribe on March 7, 2011, asked for additional information on what the expected outcome of the proposals would be.

On August 22, 2011, a second scoping letter was sent to the tribes. Tribes responded and provided additional input and voiced concerns during consultation meetings. Concerns include the following:

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

Tribes that have not participated in tribal consultation will continue to receive information via email and hand delivered mail. Information will be shared unless a tribe asks specifically to not be informed. See the "Tribal Relations" section in chapter 3 and the tribal relations specialist report for the complete consultation documentation.

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 tradeoffs for the decision maker and public to understand. In order to identify issues, the interdisciplinary team (IDT) reviewed and considered all scoping comments during both phases of the public involvement period. How scoping comments were addressed and were used to inform the analysis can be viewed in the final scoping report that is posted on the 4FRI Web site or in the project record. Following are the key issues identified by the public and used to focus the analysis or drive alternative development.

Issue 1: Prescribed Fire Emissions

Emissions resulting from prescribed fire activities 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 fires 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 use prescribed fire 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. Alternatives B and C propose using prescribed fire across the entire project area and alternative C adds acres on which prescribed fires would be used to restore additional acres of grasslands. Alternative D was developed to respond to the emissions/smoke issue by decreasing the acres proposed for prescribed fire. All action alternatives include design criteria aimed at reducing impacts to air quality (as practicable) and increasing 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 (NO_2), particulate matter less than 10 microns in size (PM_{10}), particulate matter less than 2.5 microns in size ($PM_{2.5}$), ozone (O_2), and sulfur dioxide (SO_2) pollutants that pose potential health hazards to evaluate compliance with the Clean Air Act as regulated by the 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 d.b.h. The LTRS was designed 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 are 16-inch d.b.h. 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 ecological conditions where large, post-settlement trees may (or should) be removed in order to move toward 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 MSO, goshawk, old growth, and VSS for goshawk habitat at the landscape scale (ponderosa pine vegetation type) to gauge movement toward restoration desired conditions, and
- Qualitative analysis of pre-treatment and post-treatment nonmarket 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 vegetation analysis addresses the interrelationship between canopy cover and old and large trees.

To address post-treatment openness and canopy cover where the desired condition is to move toward an open ponderosa pine (savanna/grassland) reference condition, a nonsignificant forest plan amendment was developed for alternatives B, C, and D. The amendment describes how canopy cover will be measured and met at the group level, includes language that defines and describes interspaces, and describes the relationship between interspaces, openings, and VSS classes. It would also 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 analysis discloses tree group stocking guides that would be used to meet tree group canopy cover requirements and evaluates the following within goshawk habitat: pre- and post-treatment distribution of habitat structure, overall habitat structure (VSS class), forest density metrics, and openness.

Issue 4: Increased Restoration and Research

Increased Restoration: Additional acres of grassland restoration treatments in the vicinity of Government Prairie and the proposed Garland Prairie Research Natural Area are needed on the Kaibab NF. The historic grasslands are being encroached upon by pine. Additional acres of prescribed fire and restoration treatments should occur within MSO protected habitat to further improve the quality of MSO roosting and nesting habitat and align with the MSO recovery plan (USDI 2012).

Research: Research that evaluates the effect of residual tree groups and treeless opening size on small mammals and bird species should be included in projects of this scale. Research that

evaluates the impact of landscape-scale restoration actions to water yield should be incorporated. Outcomes from wildlife and water yield research can inform future restoration projects.

Response

Alternative C responds to recommendations to include mechanical and/or prescribed fire treatments in the vicinity of Government Prairie and within the proposed Garland Prairie Research Natural Area (RNA) on the Kaibab NF to move this area closer to its historic reference condition. The alternative responds to recommendations from FWS to increase prescribed burning treatments within protected habitat by increasing the acres of prescribed burning to 72 protected activity centers, including 56 core areas. In target threshold habitat, the desired basal area in protected activity centers is adjusted to be in alignment with the MSO recovery plan. Alternative C adjusts vegetation (decreases acres) and prescribed burning (increases acres) treatments in order to incorporate two research opportunities. One study would evaluate the effect of residual tree groups and treeless opening size on small mammals and bird species. The second study would evaluate water yield from landscape-scale restoration actions.

The indicators used to evaluate this issue are:

- Acres of grassland vegetation moving toward desired conditions
- Acres of improved MSO nesting and roosting habitat
- Qualitative assessment of alignment with MSO recovery plan

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. Many commenters provided input and recommendations on identifying and prioritizing resources and infrastructure at risk from high severity fire. Treatment in these locations is reflected in the proposed action (and subsequent alternatives).

Another topic that emerged was the conservation of old trees. In response to recommendations, key concepts from the stakeholder developed old tree protection strategy (OTPS) were incorporated into the purpose and need (4FRI Stakeholders 2011). Treatment design criteria and mitigation (which are consistent with the OTPS) were developed and the OTPS was made integral to the revised proposed action as an attachment (appendix E, August 2011 proposed action document). An old tree implementation plan was developed and made part of the final proposed action alternative (and all subsequent alternatives).

As the analysis progressed, the need to better describe treatments within MSO protected activity centers (PACs) was raised by the FWS. 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, the concept of adaptive management was incorporated into the proposal 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 2011, 2012). 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 toward desired conditions. Related documents that are part of the final proposed action alternative (and subsequent alternatives) include the implementation plan (appendix D) and the monitoring and adaptive management plan (appendix E) developed in collaboration with the 4FRI stakeholders). The purpose of the implementation plan is to ensure that actions taken under adaptive management are consistent with the predicted effects and 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 (alternative B), as allowed by 36 CFR 220.7(b)(2)(iii). A summary of key changes includes:

- Incorporating the old tree protection strategy into the final proposed action, implementation plan, and monitoring/adaptive management plan
- Correcting acreages (and terms as needed) for vegetation types, goshawk and MSO habitats, old growth allocations, and road miles
- Identifying forest plan amendments, including adding an amendment for cultural resources on the Coconino NF and adding language to the draft MSO amendment to address population and habitat monitoring in MSO habitat
- Clarifying and finalizing road treatment type, amount, and definitions, including those proposed in MSO and goshawk habitat

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. Up to 45,000 acres of vegetation would be mechanically treated annually. Up to 40,000 acres of prescribed fire would be implemented annually across the forests. Two prescribed fires would be conducted on all acres proposed for treatment over the 10-year period. Restoration activities would:

- Mechanically cut trees and apply prescribed fire on approximately 388,489 acres. This includes: (1) mechanically treating up to 16-inch d.b.h. within 18 MSO protected activity centers, (2) cutting 99 acres of trees by hand on slopes greater than 40 percent, and (3) using low severity prescribed fire within 72 MSO PACs (excluding core areas).
- Utilize prescribed fire only on approximately 199,435 acres.
- Construct 517 miles of temporary roads for haul access and decommission when treatments are complete (no new permanent roads would be constructed).
- Reconstruct up to 40 miles of existing, open roads for resource and safety concerns (no new permanent roads would be constructed). Of these miles, approximately 30 miles

would be improved to allow for haul (primarily widening corners to improve turn radiuses) and about 10 miles of road would be relocated out of stream bottoms. Relocated roads would include rehabilitation of the moved road segment.

- Decommission a total of 904 miles of roads that includes 770 miles of existing system and unauthorized roads on the Coconino NF and 134 miles of unauthorized roads on the Kaibab NF.
- Restore 74 springs and construct up to 4 miles of protective fencing.
- Restore 39 miles of ephemeral channels.
- Construct up to 82 miles of protective (aspen) fencing.
- 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.

Three nonsignificant forest plan amendments (see appendix B) would be required on the Coconino NF to implement the proposed action:

Amendment 1 would add language to allow mechanical treatments up to 16-inch d.b.h. to improve habitat structure (nesting and roosting habitat) in 18 MSO PACs. The amendment would remove language that limits PAC treatments in the recovery unit to 10 percent increments and language that requires the selection of an equal number of untreated PACs as controls. The amendment would remove language referencing monitoring (pre- and post-treatment, population, and habitat monitoring). Replacement language would defer final project design and monitoring to the FWS's biological opinion specific to MSO for the project.

The amendment, which is specific to restricted habitat in pine-oak, would allow for designating less than 10 percent of restricted habitat on the Coconino NF as target or threshold (i.e., future nesting and roosting habitat) based on the quality of the habitat. Definitions of target and threshold habitat would be added.

Amendment 2 would add the desired percentage of interspace within uneven-aged stands to facilitate restoration in goshawk habitat (excluding nest areas), add the interspace distance between tree groups, add language clarifying where canopy cover is and is not measured, allow 29,017 acres to be managed for an open reference condition, and add a definition to the forest plan glossary for the terms interspaces, open reference condition, and stands.

Amendment 3 would remove the cultural resource standard that requires achieving a "no effect" determination and would add the words "or no adverse effect" to the remaining standard. In effect, management would strive to achieve a "no effect" or "no adverse effect" determination.

Two nonsignificant forest plan amendments (see appendix B) would be required on the Kaibab NF to implement the proposed action:

Amendment 1 would add the desired percentage of interspace within uneven-aged stands to facilitate restoration in goshawk habitat (excluding nest areas), add

the interspace distance between tree groups, add language clarifying where canopy cover is and is not measured, allow 27,637 acres to be managed for an open reference condition, and add a definition to the forest plan glossary for the terms interspaces, open reference condition, and stands.

Amendment 2 would allow for designating less than 10 percent of restricted habitat in pine-oak as target or threshold (i.e., future nesting and roosting habitat) based on the quality of the habitat. The amendment would remove language that limits PAC treatments in the recovery unit to 10 percent increments and requires the selection of an equal number of untreated PACs as controls. Replacement language would defer to the FWS biological opinion for the project. The amendment would also remove language that references monitoring (pre- and post-treatment, population, and habitat monitoring) and replace it with language that defers MSO monitoring to the FWS biological opinion for the project.

Figure 22 through figure 24 provide a coarse-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.

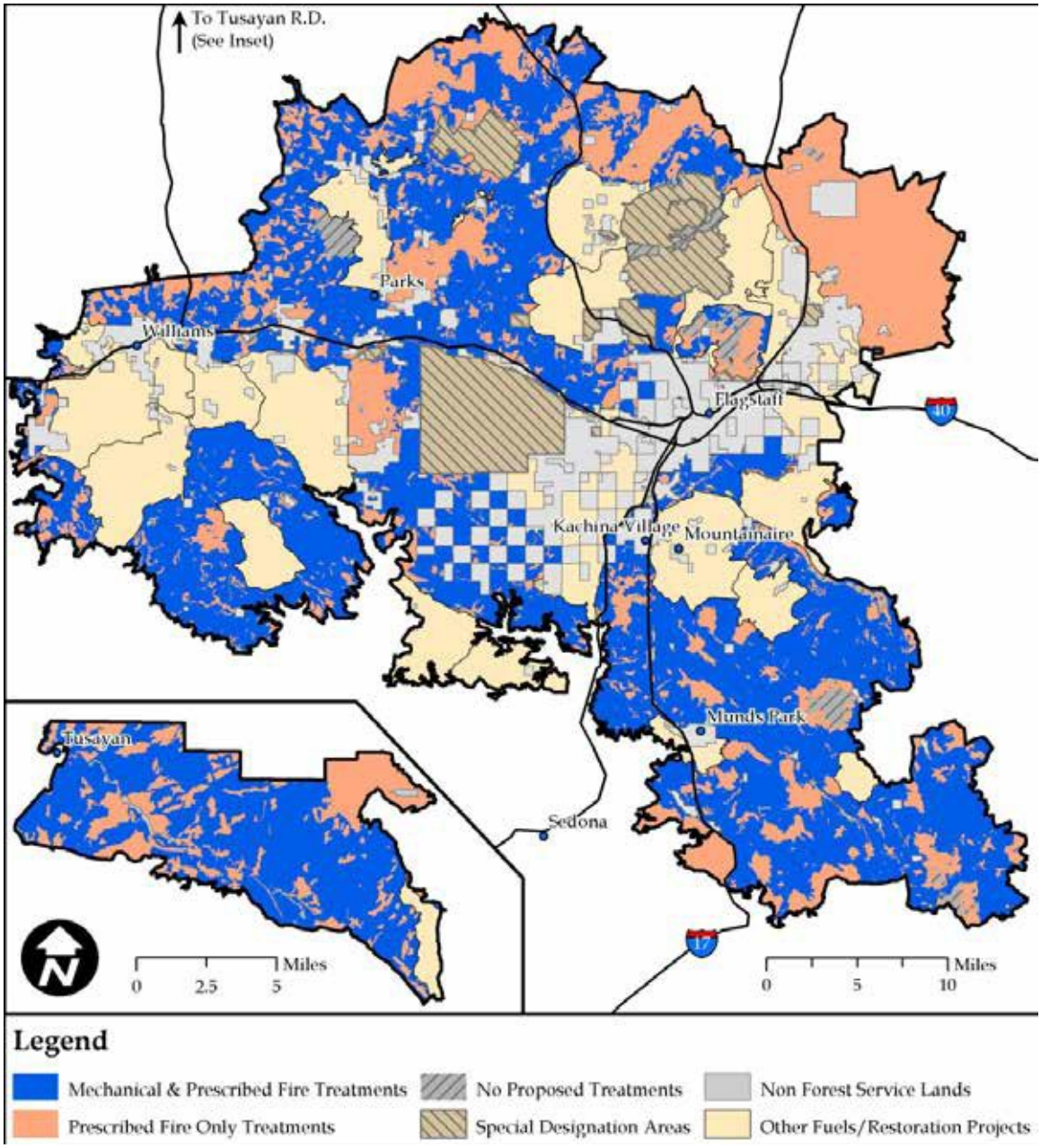

Figure 22. Final proposed action general locations of mechanical and prescribed fire treatments

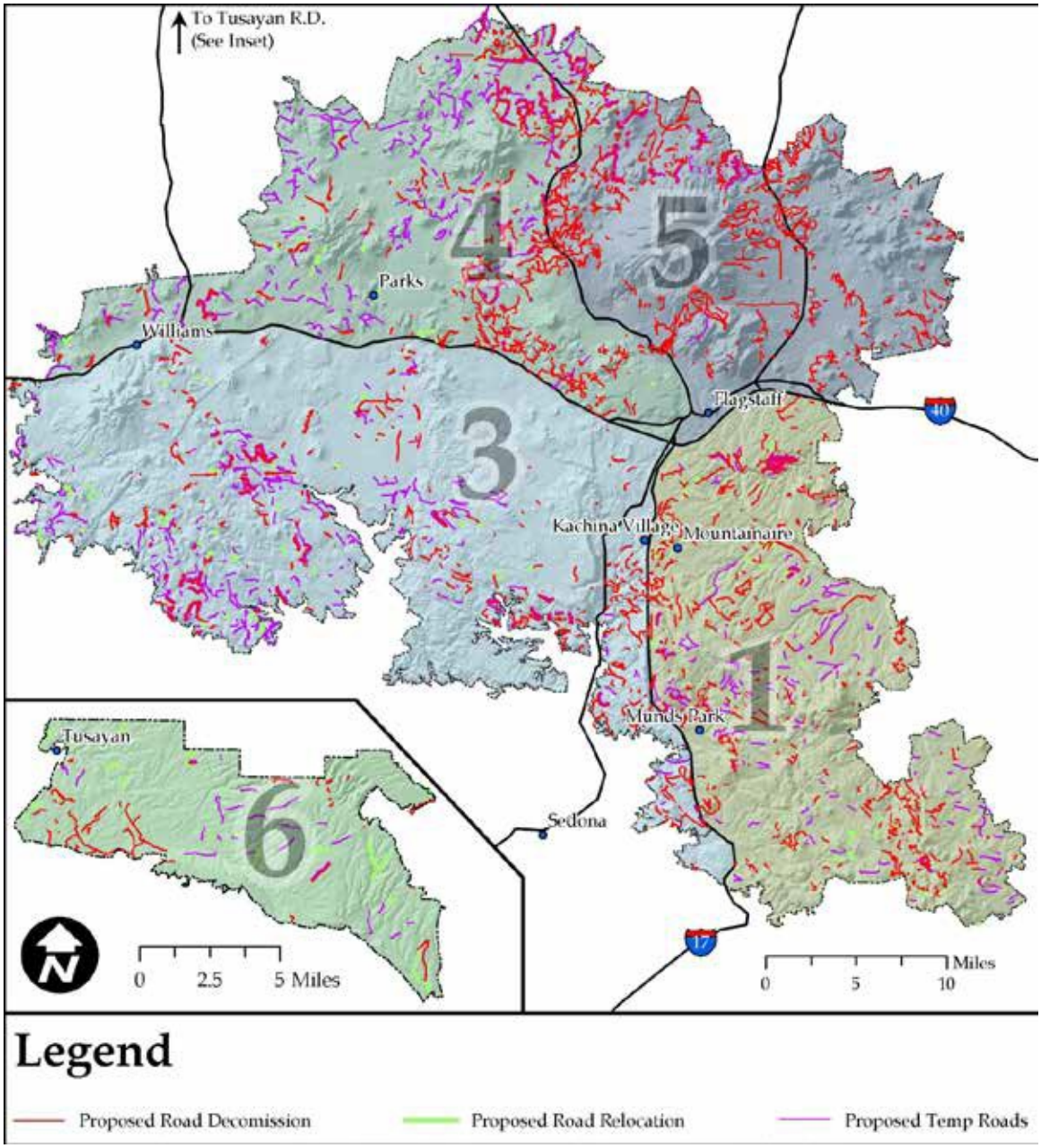

Figure 23. Final proposed action general locations of road activities by RU

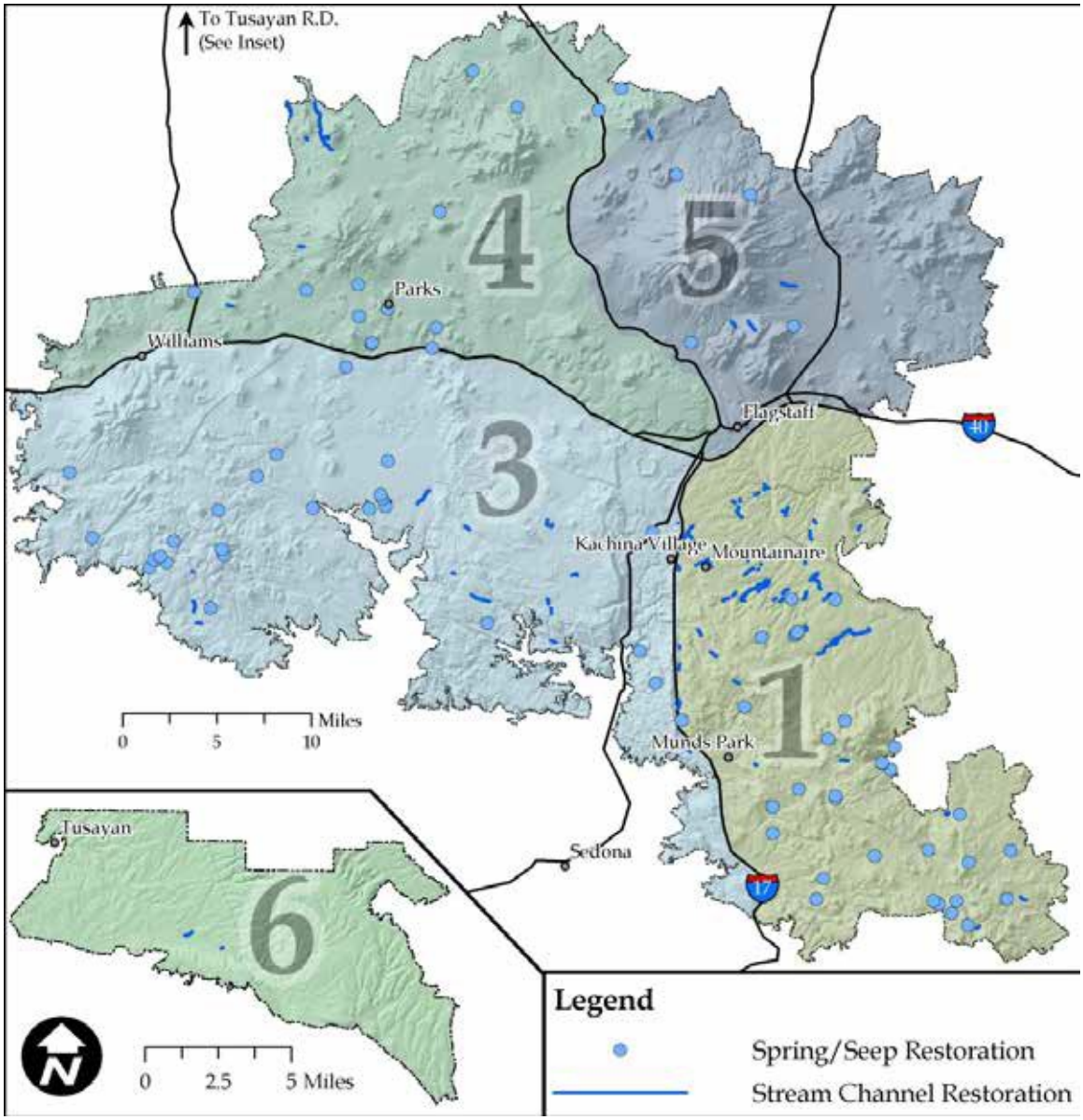

Figure 24. Final proposed action general location of spring and ephemeral channel restoration actions by RU