

Appendix F – Cumulative Effects with Objection Resolution Modifications

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Introduction

In response to comments on the DEIS, this appendix has been updated to clarify how this appendix is intended to be used. In addition, activities in the on-going and reasonably foreseeable category have been updated to reflect new information since the DEIS was released in March of 2013.

A summary of past, present, and reasonably foreseeable management actions and natural disturbances are presented here. See the project record for the comprehensive master list of all projects for additional information on each project. Electronic maps that display much more detail are available on the project's Web site or upon request.

This summary of activities and disturbances is intended to provide the reader of snapshot of those projects and events that have influenced the existing condition of the project area (in terms of vegetation structure, composition, diversity and function). It provides a summary of ongoing and reasonably foreseeable actions that may cumulatively affect specific resources. This appendix is not intended to serve as the project's cumulative effects analysis. This appendix represents the best available information made available to each resource specialist to determine relevancy to their specific resource. Each resource specialist identified the cumulative effects analysis boundary relevant to their specific resource. The direct and indirect effects of a resource are what drives the cumulative effects analysis. Each specialist reviewed the list (presented here) of actions and events and determined what was relevant to their resource. In some cases, they may have added other projects or events. See chapter 3 for the cumulative effects analysis by resource.

The information provided below for livestock management, timber harvest, post-1996 vegetation management and natural disturbances is intended to summarize past management actions that have influenced (contributed to) existing conditions.

Authorized Livestock Management

The information found in this section has been summarized from the range specialist report (Hannemann 2014), is incorporated by reference and includes science that was presented in comments on the DEIS. However, in response to comments on the DEIS, additional information on past livestock grazing practices has been brought forward into this appendix to improve clarity and context. A complete review of the science submitted as comments to the DEIS is located in the project record. Livestock grazing has occurred on the project area at least since the 1800s. Livestock (sheep and cattle) grazing can be traced back to the 1800s when roads within the forests were used to drive herds between New Mexico and California. By the end of the decade, many ranges were overstocked and by the time the first Forest Reserves were established in New Mexico and Arizona in the 1890s, most of the understory in accessible ponderosa pine forests had been intensively grazed (Scurlock and Finch 1997). Overgrazing was most severe in the 1880s and during the war years of 1916-18 primarily due to the demand for wool and beef during WW1 (Schubert 1974). By the early 1890s, overgrazing had resulted in changes to understory vegetation by reducing grasses and forbs. Research by Drake (1910) found heavy grazing resulted in trampling and browsing damage that removed the understory and inhibited the spread of low-intensity fire, and created conditions prime for natural regeneration of ponderosa pine. Early Forest Reserve management often exacerbated the problem by urging heavy grazing to eliminate the herbaceous fuels that allowed surface fires to sweep across the land.

Forest Service regulation and the post-war agricultural depression from 1919 to 1921 resulted in dramatically reduced grazing numbers. This trend of reduced numbers grazed and permitted continued into the 1950s when numbers were stabilized reflecting modern range management techniques (Scurlock and Finch 1997). Comments on the DEIS related to literature from Scurlock and Finch suggested that range management techniques had been improved but were not considered entirely modern. They were “more” modern. By the 1970s, the forests had assigned livestock numbers to allotments and rangeland improvements had been put in place to improve livestock distribution and avoid overutilization on sensitive areas (such as riparian). In 1987 and 1988, the forests’ land management plans were put in place addressing grazing capacity and utilization.

Managed livestock grazing can affect the spread of natural fire by the removal of fine herbaceous fuel. Historic unregulated livestock management from the 1860s to the 1920s removed a significant amount of forage plants and did not allow for much regrowth. Other science presented in comments on the DEIS referred to Belsky and Blumenthal (1997) and Bakker et al. (2010). Belsky and Blumenthal (1997) found livestock grazing decreases understory biomass and density, reducing competition with conifer seedlings and reducing the ability of the understory to carry low-intensity fire, thereby contributing to dense forests with altered species composition. Livestock also compact soils, decreasing the soils’ ability to absorb water and increasing erosion. Bakker et al. (2010) found the increase in small tree density has, in part, led to the amount of forest acres burned in recent history. Simultaneously, grazing increases the presence of exotic plant species.

The body of science that has evaluated the disruption of historical fire regimes includes Savage and Swetnam (1990), Swetnam (1990), Madany and West (1983), Leopold (1924) and Covington et al. (1994). The disruption of historical fire regimes by introduced ungulates has been well documented for southwestern ecosystems. Montane grasslands were utilized as summer range for large numbers of sheep and cattle (Leopold 1924). Grazing removed much of the fine fuels that had competed with pine seedlings for water, nutrients and light and had also allowed surface fire to regularly recycle nutrients, scarify seeds, reinvigorate shrubs, and thin seedlings/saplings. This unintentional fire suppression, initiated in the early 19th century through grazing by sheep and cattle, transitioned in the early 1900s to active fire suppression including the construction of fire lines and roads in the mid-20th century. By the early 1900s, fire exclusion had begun to alter ecosystem structure and fire regimes in Northern Arizona (Covington et al. 1994). Fire suppression allowed seedlings and saplings to survive that would have naturally been thinned out by fire. The disruption of fire regimes is an important variable in the composition of vegetative communities. Uncharacteristically long periods without fire may allow species to become established that could not under the historic fire regime (Swetnam 1990).

It is likely that the unregulated grazing in the 1860’s to 1920’s in the project area led to changes in vegetation. As heavy grazing was eliminated through time the plant composition responded. Other science provided in comments on the DEIS included Allen et al. 2002. Commenters summarized that Allen et al. found vegetation has not completely rebounded due in part to continued livestock grazing, and forest density has increased.

A review of other science and points of view includes Belsky and Bloomenthal (1997), Kerns et al. (2011) and Madany and West (198). Belsky and Bloomenthal found that overall, logging, grazing, and fire suppression are the primary factors that, when combined, have allowed landscape patterns to become homogenized, shifting fire regimes across much of the project area from frequent, low-intensity/low severity surface fires to infrequent, high intensity/ high severity

crown fires. Kerns et al. 2011 (USDA research) has found that releasing the vegetative understory from grazing can cause a more significant change than reintroducing fire to the landscape: “If a goal of ecological restoration in these forests is increased cover of native perennial plants, and the potential for increased native perennial grass reproduction, then cattle grazing exclusion, or a change in cattle management, could provide critically important options in restoration plans”. A study in southern Utah by Madany and West (1983) also found that livestock grazing was a more important factor than fire suppression alone in causing tree encroachment in ponderosa pine forests.

The range specialist report (Hannemann 2014) documents that domestic cattle grazing has the potential to affect soil and hydrologic functions that are important in the maintenance of long-term productivity and favorable conditions of water flow (Belsky and Blumenthal 1997). Specifically, changes in the soil’s surface structure and its ability to accept, hold, and release water are affected by compaction caused by trampling. The nutrient cycling function of the soil is interrupted by removal of vegetation that impacts above ground nutrient inputs into the system. Finally, the soil’s resistance to erosion is affected by changes in plant density, composition, and protective vegetative ground cover that are part of the organic components in the soil. Grazing significantly reduces water infiltration into the soil, and rest from grazing allows infiltration rates to recover (Buckhouse and Gifford 1976, Busby and Gifford 1979).

Since European settlement of the project area heavy tree harvest, fire exclusion, overgrazing and climate change has altered the trajectory of stand development, ecosystem function, and spatial pattern of ponderosa pine stands in northern Arizona (Moore et al. 2004). Many others have documented this as well (Pearson 1910, Arnold 1950, Cooper 1960, Stein 1988, Savage and Swetnam 1990, Savage 1991, Covington and Moore 1994, Swetnam and Baisan 1996, Heinlein 1996). In summary, historic livestock effects to understory vegetation follow the history of livestock management within the project area. Range trends within the project area follow this grazing history. Unregulated grazing from the 1860’s to the 1920’s led to declines in grass, forb, and shrubs and an increase in trees.

Tree density limits the amount of understory vegetation; as tree densities increase, the understory vegetation declines. The direct relationship between tree basal area and understory production has been widely studied (Moore et al. 2004, Arnold 1950, Cooper 1960, Pearson and Jameson 1967). In these studies the direct relationship between tree density and understory vegetation was observed. Some commenters who cited Allen et al. 2002 and Madany and West 1983 concluded there is a direct relationship between tree density and understory vegetation in areas impacted by historic grazing and in areas excluded from livestock grazing. This implies livestock grazing the main cause of excessive tree density.

Historically, grasslands had less than 10 percent tree cover. Impacts from grazing, logging, and fire suppression practices that started in the late 1800s are still discernable on the landscape today. These practices reduced or eliminated the vegetation necessary to carry low- intensity surface fires across the landscape, thereby altering the natural fire regimes and allowing uncharacteristic forest succession to take place. These conditions have been further exacerbated by soil erosion and increases in invasive, nonnative plants, low-density rural home development, and grazing. A review of other science provided in comments to the DEIS cited Belsky and Blumenthal (1997) who found that soil erosion and increases in invasive, nonnative plants can be caused by livestock grazing. The range analysis concluded that grazing is not the sole reason for soil erosion and invasive, nonnative plants in grassland. Overall, the grassland cover type has experienced some

degree of conifer (pinyon, juniper, and ponderosa pine) encroachment over the last 100 years as a result of fire exclusion, grazing, and agricultural use.

Most of the pinyon-juniper vegetation communities are currently younger and denser than they were historically, because of changes in wildfire occurrence and past grazing. Greater tree density has increased competition for water and nutrients. This, in turn, has caused a reduction in understory plant cover and diversity, a loss of ground cover, and subsequent increases in soil erosion.

Impacts from grazing, logging, and fire suppression practices that started in the late 1800s are still discernable on the landscape today. These practices reduced or eliminated the vegetation necessary to carry low-severity surface fires across the landscape, thereby altering the natural fire regimes and allowing uncharacteristic forest succession to take place. Ponderosa pine and other woody vegetation encroached upon or invaded the once open grasslands, savannas, and meadows due to disruption of the historic fire regimes and historic grazing patterns.

Past grazing has in part facilitated invasion by grazing-tolerant, less palatable weedy species by reducing native perennial grass cover. These exotic weedy species have displaced native perennial grasses in parts of the intermountain west because the native plants are not adapted to frequent and close grazing (Belsky and Blumenthal 1997). The Belsky and Blumenthal study was conducted in a relict grassland in California. The non-native grass was red brome which is sometimes grazed by cattle but not palatable. The range analysis for this project found these effects can be mitigated through sound range management practices and through regulation of cattle through legal instruments such as Annual Operating Instructions.

Past activities such as fire exclusion and heavy grazing have resulted in a shift in environmental conditions. These changes have resulted in decreased understory vegetation and alteration of the hydrological systems (see Understory, Silviculture, and Watershed Reports). Other changes include shifts to more frequent occurrences of fire intolerant species, increases in litter (Abella et al. 2007), changes in species composition and functional groups including shifts toward more shade tolerant understory species under denser tree canopies (Laughlin et al. 2011).

Grazing management practices have evolved through time to limit overgrazing by livestock and to approach a balance between conservative livestock utilization with forage production. See the range specialist report which provides details on how grazing utilization and pasture management is incorporated into a grazing authorization. With the improvement in grazing management, trends in understory vegetation has improved in areas where tree density does not limit recovery (see 2200 Range Files: Coconino NF Flagstaff and Mogollon Districts, and Kaibab NF Williams District; Hannemann Range Report).

Historic range monitoring data for the project area was reviewed in 2011 (Brewer 2011). Data indicates cool season species increased through the 1990s in response to an increase in cool season moisture. In the last 10 plus years, decreased cool season moisture and increased warm season moisture has increased warm season species like blue grama. Today, excessive tree density (related to past land management practices) is causing a plant conversion to more shade tolerant species (such as bromes and mountain muhly).

Timber Harvest

Information on past timber harvests is summarized from the silviculture specialist report and is incorporated by reference (McCusker et al. 2014). Past timber harvest practices influenced vegetation structure, pattern, and composition on about 90 percent of the project area. From the late 1880s to the 1940s, logging that facilitated construction of the railroads was conducted by several lumber and timber companies in the Flagstaff and Williams area. By 1940, the railroads had removed all the profitable lumber that could be easily accessed. In terms of vegetation structure, the largest and oldest tree sizes (VSS 5 and VSS 6) were removed from the project area (and across the Forests in general). Extensive regeneration with no large trees interspersed within the younger age classes became the norm. The pattern on the landscape no longer resembled the historic condition with historic tree groups and patch sizes ranging from 0.1 to 0.75 acre in size and with 2 to 40 or more trees (White 1985).

Past timber sales within the project area such as the 49'er, El Paso (1991), and Moritz sales (1985), all implemented prior to the Southwestern Region's 1996 amendment of forest plans, targeted the harvest of medium and large diameter trees. In some cases, all trees over 12 inches in diameter were removed. This affected the presence of pre-settlement trees. Today, at the landscape (project area) scale, pre-settlement trees are rare.

The focus on even-aged forest management continued until the mid-1990s, leaving the legacy of current forest conditions. Approximately 50 percent of the project area that received some type of regeneration or shelterwood harvest has regenerated. Many stands are even-aged, dense, and lack age class diversity. Today, at least 84 percent of goshawk non- post-fledging family areas habitat vegetation structural stage 3 (young-aged forest) and 4 (mid-aged forest) is even-aged (FEIS chapter 1 2014). Approximately 74 percent of the project area is classified as having moderately closed to closed tree canopies (4FRI Proposed Action 2011, FEIS chapter 1 2014). Figure 74 (next page) displays the general location of past vegetation projects that occurred prior to 1996.

Post-1996 Vegetation Treatments: Uneven-aged Management, Fire Risk, Restoration

After the region-wide 1996 amendment, vegetation objectives included uneven-aged management. A review of the FACTS timber database indicates that treatments designed to promote uneven-aged management began being recorded in 1991 on the Kaibab NF and as early as 1987 on the Coconino NF. However, acres treated in this category continued to be minor in comparison to acres treated with even-aged methods until about 2005 (McCusker et al. 2014).

After 1996, the objective of most vegetation projects in the project area was to reduce the risk of high-severity fire, improve forest health (stand and tree resilience and vigor), and improve understory diversity. Retention of snags and managing for coarse woody debris was further enhanced with the 1996 amendment and made part of project requirements.

The 1996 forest plan amendment also changed treatments in Gambel oak and the species was recognized for its role in managing for ecological diversity and high quality wildlife habitat. From 1996 to 2000, at least seven projects (Spring Valley wildland-urban interface, Upper Basin, Marteen, Ten X and Red Horse Mudderbach, Elk Lee, Beacon, and Parks) totaling 30,000 acres on the Kaibab NF, were treated with objectives including reduced fire risk, savanna and meadow restoration, oak improvement, improved age class structure and diversity, and to maintain industry.

On the Coconino NF, at least 68,800 acres were planned for treatment for similar purposes (Fire Data FY96 to FY99, 2011). Large projects on the Coconino NF that addressed fire risk included Mint Spring (7,778 acres of mechanical and 12,000 acres of prescribed fire, 1998) and the A-1 project (14,500 acres with mechanical and broadcast prescribed fire, 2000).

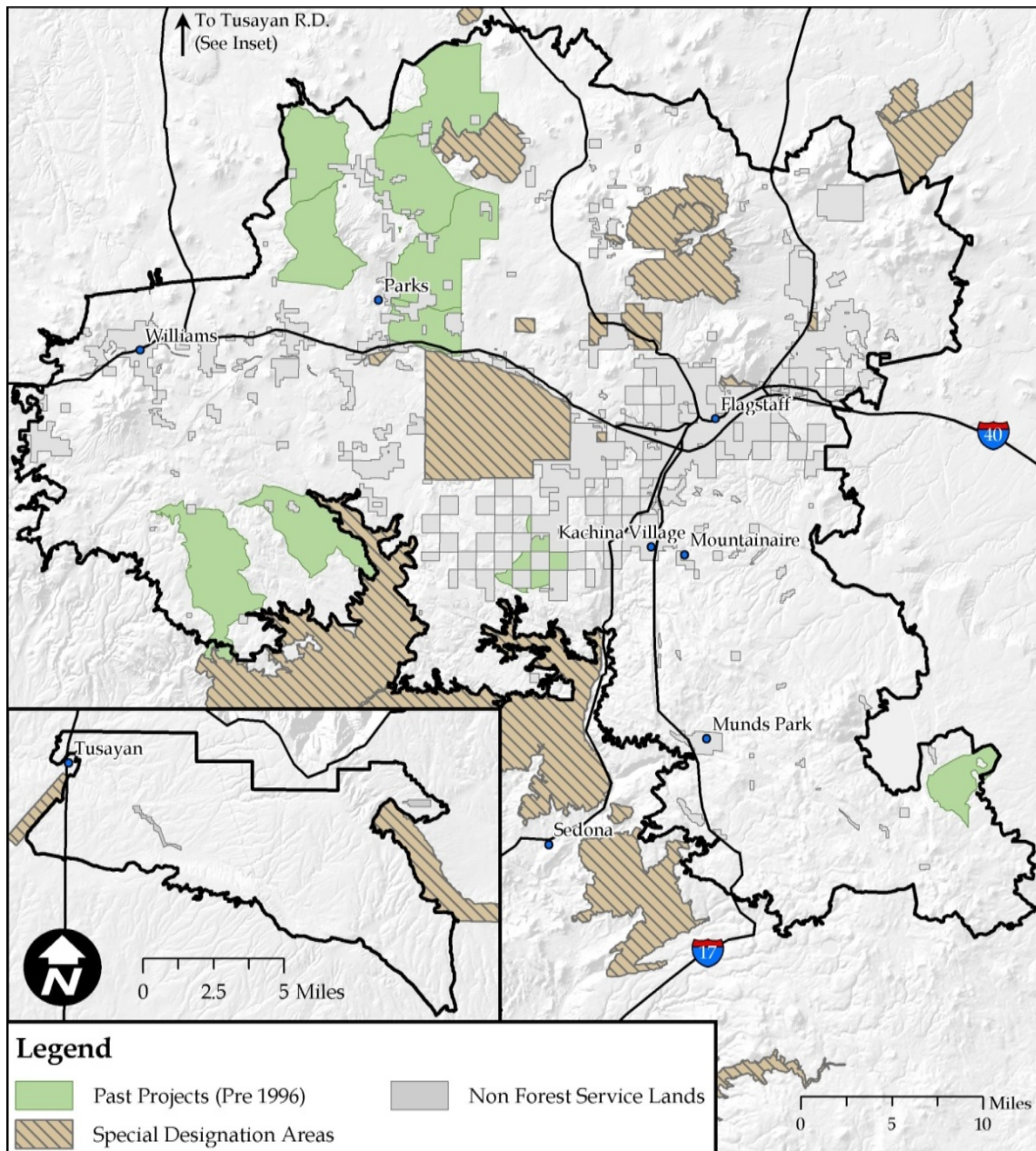


Figure F 1. Pre-1996 vegetation and prescribed fire projects within the project area

With the exception of older projects that removed large, old trees and promoted even-aged management, most vegetation projects that contributed to the current condition within the project area occurred from 2000 to 2010. Projects implemented from 2010 to 2013 have resulted in minor to no changes (less than 1 percent change) to the current condition as most vegetation and prescribed fire analyses have recent decisions and have not been implemented.

From 2000 to 2014, most vegetation project objectives have included reducing fire risk to communities, improving wildlife habitat in sagebrush (Tusayan district, Kaibab NF) and grasslands, improving winter range wildlife habitat, improving forest health and diversity (moving toward a balance of age classes, reducing mistletoe infection, promoting growth in old, large ponderosa pine, promoting aspen, and restoring ponderosa pine savanna conditions).

On the Coconino NF, examples of projects designed primarily to address fire risk in the project area include Rocky Park Fuels Reduction (13,651 acres, 2001), Kachina Village (11,029 acres, 2003), and Mormon Lake Fuels Reduction (1,820 acres, 2005-2013). Examples of similar projects on the Kaibab NF include Williams High Risk Precommercial Thin (756 acres, 2001), Dogtown Fuels Reduction (8,209 acres, 2004), and Pineaire Fuels Reduction (650 acres, 2004).

Since 2000, at least 6,149 acres have been mechanically treated and prescribed burned on the Kaibab NF to improve wildlife habitat, and 2,485 acres have been treated to improve/restore grasslands. Wildlife habitat improvement projects included Potato Hill Habitat Improvement Project (1,275 acres, 2003), Upper Basin Project (1,884 acres, 2000), and Moqui Antelope Habitat Improvement Project (2,990 acres, 2006). Grassland restoration projects included Garland Prairie (500 acres, 2005), Ida Grassland Restoration (1,800 acres, 2008), and Community Tank Grassland Restoration (185 acres, 2011). On the Coconino NF, almost 7,000 acres were treated (up to 2010) to directly improve wildlife habitat (habitat improvement was the treatment objective). Some of the larger projects (within the project area) on the Coconino NF designed to restore grasslands, woodlands, and wildlife habitats include Hart Prairie Fuels Reduction (9,815 acres, 2010), Elk Park Fuels Reduction (11,100 acres, 2007), and the Slate Mountain Pronghorn Project (2,250 acres, 2010). Projects adjacent to, but outside of, the project area include the Anderson Mesa Project.

Since 2000, over 13,829 acres of treatment on the Kaibab NF have focused on forest health and diversity objectives. Projects include Frenchy (9,319 acres of thinning that include savanna and meadow restoration and prescribed burning, 2003). On the Coconino, projects that addressed fire risk but also included restoration objectives such as meadow, riparian, and grassland restoration include Fort Valley (1,700 acres, 2000), Apache Maid Grass (54,528 acres, 2004), and Woody Ridge (8,599 acres, 2004).

However, even some of the more recent tree thinning projects (from 2000 to 2010) have focused thousands of acres of treatment on the removal of the smallest trees. Some of these treatments were limited in order to comply with the forest plans when treating in Mexican spotted owl protected and restricted habitats. This has produced results similar to treatments conducted in the 1980s – rapid regeneration and high tree density. Projects that focused on removing only the smallest trees (usually up to 9 inches d.b.h.) were primarily focused on reducing fire risk adjacent to public areas such as residential areas and campgrounds. Available data was reviewed and assumptions were made on some projects where data was incomplete.

From 2000 to 2010 on the Kaibab NF, about 3 percent of the project area (of the 596,000 acres proposed for treatment) was treated in a manner that resulted in prolific regeneration.

On both forests, vegetation projects have typically included the construction (and decommissioning) of temporary roads and have decommissioned roads (Fleishman 2014). From approximately 2000 to 2013, approximately 47 miles of temporary road were constructed (and decommissioned), 251 miles of existing road were decommissioned (117 miles on the Kaibab NF and 44 miles on the Coconino NF), and approximately 1 mile was relocated to reduce impacts on resources. Table F 1 displays past vegetation, prescribed fire and other ground-disturbing projects

that have influenced the existing condition. Figure F 2 displays the general location of projects post-1996. Table F 2 lists projects that are outside but adjacent to the project area.

Table F 1. Summary of past projects that have influenced existing conditions (2000 to 2014)

Project Name	Year (NEPA Decision)	Treatment Type	Acres* Mechanical /Prescribed Fire	Forest/District	
				Coconino	Kaibab
Williams High Risk	2001	Mechanical treatment and pile burn	756/756		Williams
Potato Hill	2003	Mechanical treatment, lop and scatter	1,275/0		Williams
Frenchy	2003	Mechanical treatment and pile burn	9,319/9,319		Williams
Dogtown	2004	Mechanical treatment and pile burn	6,509/6,509		Williams
Clover High	2004	Mechanical treatment and pile burn	385/385		Williams
Pineaire	2004	thin and prescribe, pile burn	650/650		Williams
Williams Followup Mistletoe	2004	Mechanical treatment and pile burn	368/368		Williams
Government Mountain/ Coleman	2005	Mechanical	75/0		Williams
Garland Prairie	2005	Mechanical treatment and lop, pile burn	500/47		Williams
City	2005	Mechanical treatment and pile burn/ prescribed fire	8,667/12,400		Williams
Kendrick	2005	Mechanical treatment and prescribed fire	Unknown		Williams
Flag Tank	2007	Mechanical treatment and prescribed fire	22/36		Williams
IDA Grassland	2008	Mechanical treatment and prescribed fire	1,800/1,800		Williams
Bill Williams Cap	2009	Thin and prescribe burn	10/10		Williams
Community Tank	2011	Mechanical treatment and prescribed fire	185/185		Williams
Upper Basin	2000	Prescribed fire	0/1,884		Tusayan
Tusayan West	2001**	Mechanical treatment and prescribed fire	549/850		Tusayan
Tusayan South/Boggy Tank	2000–2002	Mechanical treatment and prescribed fire	2,948/2,948		Tusayan
Ten X	2004	Mechanical treatment and prescribed fire	1,780/700		Tusayan
Topeka	2004	Mechanical treatment and prescribed fire	1,100/1,100		Tusayan
Moqui Antelope	2006	Mechanical	2,990/2,990		Tusayan

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Project Name	Year (NEPA Decision)	Treatment Type	Acres* /Prescribed Fire	Forest/District	
				Coconino	Kaibab
Scott	2001	Mechanical, pile, and prescribed fire	721/9,434		Tusayan
X Fire	2009	Mechanical	140/0		Tusayan
O'Connell	< 2009	Mechanical	500/0		Tusayan
Arboretum WUI	2000	Mechanical treatment and prescribed fire	602/602	Flagstaff	
Eagle Rock Reforestation http://www.fs.fed.us/nepa/nepa_project_exp.php?project=39790	2013	Tree Planting	300 acres		Williams
Fort Valley	2000	Mechanical	1,700/0	Mogollon Rim/Flagstaff	
A-1 East, West	2000	Mechanical, pile, and prescribed fire	5,517/8,638	Flagstaff	
Rocky Park	2001	Mechanical treatment and prescribed fire	5,651/8,000	Flagstaff	
Lake Mary	2005	Mechanical treatment and prescribed fire	1,845/3,245	Flagstaff	
APS Hazard Tree	2003	Prescribed fire	0/315	Flagstaff	
APS Powerline	2007	Mechanical	167/0	Flagstaff	
Blue Ridge 69kV	2005	Mechanical treatment and prescribed fire	50/1,300	Mogollon Rim	
Doney Park 69kV	2007	Mechanical	9/0	Flagstaff	
Kachina Village	2003	Mechanical treatment and prescribed fire	3,801/2,147	Flagstaff	
Apache Maid Grass	2004	Mechanical	54,528/0	Mogollon Rim	
Woody Ridge	2004	Mechanical treatment and prescribed fire	7,987/11,184	Flagstaff	
Mormon Lake Basin Fuels Reduction ¹	2005-2013	Mechanical treatment and prescribed fire	1,820/1,820 (of 2,388)	Flagstaff	
Skunk Canyon	2005	Prescribed fire	0/831	Flagstaff	
Elden ¹	2002	Mechanical and prescribed fire	200/200	Flagstaff	
Eastside	2006-2008	Mechanical treatment and prescribed fire	7,819/20,197	Flagstaff	
East Clear Creek	2006	Mechanical treatment and prescribed fire	83/14,500	Mogollon Rim	
Elk Park	2007	Mechanical treatment and prescribed fire	1,800/3,500	Flagstaff	
Little Draw Aspen	2009	Mechanical	107/0	Flagstaff	
Mormon Mountain (thinning around towers)	2007-2008	Mechanical	11	Flagstaff	

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Project Name	Year (NEPA Decision)	Treatment Type	Acres* Mechanical /Prescribed Fire	Forest/District	
				Coconino	Kaibab
Munds Park	2009	Mechanical treatment and prescribed fire	990/2,950	Flagstaff	
Slate Mountain	2010	Mechanical	2,250/0	Flagstaff	
Schultz Fire BAER	2010	Mechanical (snag removal)	150 snags removed/0	Flagstaff – Not included in acreage tally	
Other Ground Disturbing Projects					
Tusayan Flood Reduction Project http://www.fs.fed.us/nepa/nepa_project_exp.php?project=39791	2013	Construct 6 water catchment basins	6 acres of disturbance		Tusayan
Stone and Steel Interpretive Trail http://www.fs.fed.us/nepa/nepa_project_exp.php?project=34040	2013	non-motorized trail construction	less than 1 mile		Williams
124 Road Quarry Expansion http://www.fs.fed.us/nepa/nepa_project_exp.php?project=38561	2012	Pit expansion	2 acres		Williams
Acre Summary					
Total mechanical/vegetation treatment acres			138,486 (less than 1 percent change since 2010)		
Total prescribed fire acres			131,800 (less than 1 percent change since 2010 due to data refinement)		
Total “Other” acres			9 (9 acres added since 2010)		

*Some projects are still in the implementation phase. Acres included here only include acres that have been implemented.

**The decision for Tusayan West was 1998 and implementation was 2001.

1. Project information from the Flagstaff Watershed Protection Project (2013)

Table F 2. Summary of past vegetation and prescribed fire project acres (2000 to 2014) adjacent to the project area

Project Name	Year (NEPA decision)	Treatment Type	Acres Mechanical/ Prescribed Fire	Forest/District	
				Coconino	Kaibab
Williams High Risk	2001	Mechanical treatment and pile burn	756/756	data not available	Williams
Potato Hill	2003	Mechanical, lop and scatter	1,275/0	data not available	Williams
Frenchy	2003	Mechanical treatment and prescribed fire	9,319/9,319	data not available	Williams
Dogtown	2004	Mechanical treatment and prescribed fire	6,509/6,509	data not available	Williams
Acre Summary					
Total mechanical/vegetation treatment acres			17,859 acres (no change since the DEIS)		
Total prescribed fire acres			16,584 acres (no change since the DEIS)		

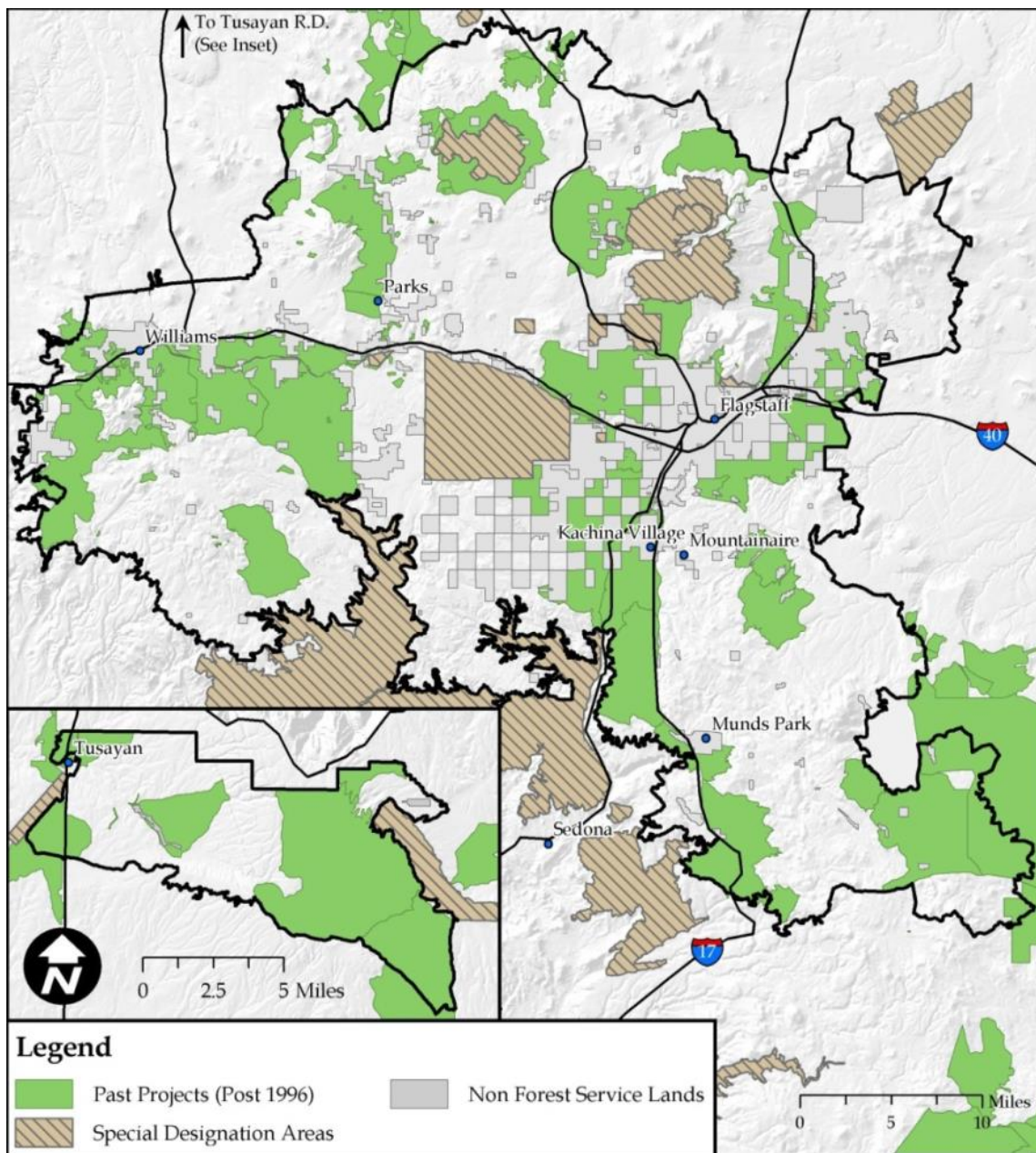


Figure F 2. General locations of past projects (post-1996) within the project area

Natural Disturbances – Fire

Information on natural disturbances (fire) is summarized from the fire ecology specialist report (Lata 2014) and the report is incorporated by reference.¹

Most of the vegetation types on the Kaibab and Coconino NFs are adapted to the frequent, low-severity fire that occurred periodically prior to Euro-American settlement. In fire-adapted

¹ Please note, the fire ecology report also considered projects outside of the project area. For this reason, the project list may vary.

vegetation types, ecosystem function is dependent on this regular disturbance. However, suppressing all fires was common practice, dating back to the late 1800s and mid-1900s. During this time, extensive livestock grazing consumed the abundant grasses with forest reserve management plans often urging heavy grazing to eliminate the herbaceous fuels that allowed surface fires to sweep across the land (Drake 1910). In addition to grazing, early settlers also suppressed fire to protect their livelihood and homes.

Organized fire suppression efforts by the Forest Service date back to the first decade of the 20th century, largely in response to unacceptable fire effects due to heavy slash loads left by railroad logging. In 1935, the Forest Service further instituted a policy that all fires were to be extinguished by 10 a.m. of the day following their detection (Pyne 1982). Throughout most of the 20th century, foresters continued to extinguish all fires regardless of ignition cause, intensity, or degree of danger to human safety or property. Widespread fire suppression efforts continue and a high percentage of Federal resources are focused on suppression (Covington 2003).

As noted in the vegetation management section, without fire, understory seedlings in pine and mixed conifer forests had unprecedented survival rates. White fir, Douglas-fir, and even Engelmann spruce seedlings became established under ponderosa pine stands. Juniper and pinyon seedlings invaded former grassland savannas. The increase in tree density and resulting buildup of woody fuels led to unnaturally large and severe wildfires, insect outbreaks, and reduced biodiversity (Friederici 2004).

Data on wildfire acreages from 1940 to 1970 was derived from Covington 2003. Data on past wildfires that have occurred within the project area from 1970 to 2010 was derived from the project's fire ecology specialist report (Lata 2014) and data from 2011 to 2013 was derived from the Forest's fire database using a Forest Service database query, Fire Family Plus, for those districts of the Coconino and Kaibab NFs that are located south of the Grand Canyon in (largely) ponderosa pine vegetation. Acres may include portions of some pinyon-juniper and some mixed conifer vegetation. In addition to this data, each forest's FACTS database was accessed to provide a subset of individual fires and acres for each forest (Lata 2014). In 2014, the 21,227-acre Slide Fire occurred on the Coconino NF. Burn severity was assessed via Rapid Assessment of Vegetation Condition After Wildfire (RAVG) and soil severity was estimated by Burned Area Reflectance Classification (BARC). Collectively, about 46 percent of the fire burned in the moderate or high soil burn severity class.

Table F 3 summarizes (estimates) acres of wildfire since 1940. Overall, wildfire has influenced at least 24 percent (239,433 acres) of the project area since 2001 to June 2014. Severe effects associated with past wildfires are attributed to about 20 to 30 percent (of about 240,000 acres) of the area burned within the project area. These fires affected structure, pattern, composition, and function by creating an even-aged plantation-type tree structure with grass and brush that are no longer contributing to a forested structure. The remaining 70 to 80 percent of the 240,000 acres of wildfires were low- to mixed-severity fires that provided beneficial impacts. These events affected structure, pattern, composition, and function by returning fire—a natural process—to the ponderosa pine system.

As noted in table F 1 and table F 2, thousands of acres in and adjacent to the project area have been (or are currently being) treated to reduce hazardous fuels or restore the Forests to more resilient conditions. Vegetation was thinned and residual slash reduced/removed through various methods including machine piles and hand piles, chipping, lop and scatter, mastication, and mowing. From 2000 to 2013, at least 47,747 acres on the Williams and Tusayan districts and 90,932 acres on the Coconino NF were treated within the project area.

Table F 3. Coconino and Kaibab NF documented wildfire acres 1940 to 2014

Time Period	Project Area Wildfire (acres affected)
1940–1960	10,139 (Coconino NF only)
1960–1969	1,090 (Coconino NF only)
1970–1980	49,631
1981–1990	7,399
1991–2000	63,397
2001–2010	180,499
2011-2013	37,707
2014	21,227 (Coconino NF, Slide Fire)
Total acres	371,088

Natural Disturbances – Insect and Disease

Information on natural disturbances (fire) is summarized from the silviculture specialist report (McCusker et al. 2014) and the report is incorporated by reference.

The Coconino NF experienced significant bark beetle outbreaks in the mid-1920s, late 1930s, mid-1960s, late 1970s through early 1980s, and late 1990s through the mid-2000s. The 1950s and 2000s outbreaks appear to be more extensive than other outbreaks, damaging at least 200,000 and 72,000 acres, respectively. Ponderosa pine needleminer defoliated over 9,000 acres of ponderosa pine on the Coconino NF in 1999 (USDA FS 2000).

On the southern portion of the Kaibab NF, western pine beetle activity was reported in late 1970s and early 1980s. The contemporary (2000s) bark beetle outbreak is probably more severe than past outbreaks. Ponderosa pine mortality approached 100 percent in some stands (Gitlin et al. 2006), but averaged only 3.4 percent in a limited number of plots distributed across Williams Ranger District (RD) and Tusayan RD (Negrón et al. 2009).

Southwestern dwarf mistletoe is dispersed throughout the project area where 2 to 31 percent of the commercial ponderosa pine type was infected in the 1980s on the northern half of the Coconino NF, and 25 to 38 percent of the commercial ponderosa pine type was infected on the Williams district (Hessburg and Beatty 1985).

Annual aerial surveys on the Coconino and Kaibab NFs in the summer of 2010 detected ponderosa pine mortality associated with bark beetles on approximately 6,500 acres within the project area. This mortality is most likely associated with the *Ips* beetle (USDA FS 2011). This survey indicates a tenfold increase in beetle mortality from the 2008 and 2009 surveys, although bark beetle activity in ponderosa pine is currently considered to be at endemic levels. Preliminary results of the 2011 survey indicate a minor reduction in ponderosa pine mortality from 2010. In pinyon-juniper woodlands, both localized and widespread mortality events have occurred over time on the Coconino and south Kaibab NFs. These events have typically been pinyon *Ips* outbreaks associated with periods of drought, such as occurred in the 1950s, and more recently in the mid-1990s and 2001 through 2003. From 2010 to 2014, saw fly defoliation occurred in the Bull Basin area on the Coconino and Kaibab NFs. Approximately 1 to 5 percent ponderosa pine mortality occurred (Cote personal communication with Gonzalez, 2014).

Juniper mortality from wood borers and *Phloeosinus* beetles has occurred in areas of poor site quality within the project area during the recent drought (Mueller et al. 2005, USDA FS 2002). Juniper mortality averaged 3.3 percent within an 80 kilometer radius of Flagstaff, with greater mortality on grassland versus nongrassland sites (Gitlin et al. 2006).

In aspen, mortality has been attributed to the severity of the 1999 frost damage, severe drought conditions, and western tent caterpillar defoliation in 2004 and 2005. Although dying trees sprouted, survival has been very low due to browsing by elk. Mortality has been greatest in the low-elevation range. In 2008, Faithweather et al. found that more than 50 percent of surveyed aspen sites below 7,500 feet elevation experienced 97 percent mortality (Fairweather et al. 2008).

In summary, as agents of change, forest insects and diseases have a significant role in forest ecosystem dynamics. Forest insect and disease driven change alters forest ecological processes, forest structure, and composition. At one time or another, all of the vegetation types within the project area have incurred extensive damage by one or more agents (table F 4). The transitory agents causing the most extensive and severe damage have been pinyon Ips in pinyon pine, Ips bark beetle species in ponderosa pine, and multiple biotic and abiotic agents in aspen. Each of the vegetation types shows distinct periods of increased insect damage that can be associated with droughts. The most extensive and damaging persistent agent is southwestern dwarf mistletoe in ponderosa pine. More detailed information can be found in Lynch et al. 2008a and 2008b.

Table F 4. Acres affected by insect and disease outbreaks by forest (within project area)

Time Period	Insect/Disease Type	Acres and/or Percent of Forest Affected	
		Coconino	Kaibab
1950s	Bark beetle (ponderosa pine) damage	200,000	NA
1950s	Wood borers and <i>Phloeosinus</i> beetle (juniper woodland) mortality	Unquantified – described as extensive	
1970s to 1980s	Western bark beetle (ponderosa pine)	NA	Unquantified
1980s	Southwestern dwarf mistletoe (ponderosa pine) infection	19,773 to 306,489 (2 to 31 percent)	247,169 to 375,696 (2 to 38 percent)
1999	Needleminer (ponderosa pine)	9,000	NA
2000s	Bark beetle (ponderosa pine) damage	72,000	NA
2000s	Bark beetle (ponderosa pine) mortality	100 percent mortality in select stands	29,660 (3 percent)
2002–2005	Wood borers and <i>Phloeosinus</i> beetle (juniper woodland) mortality	3 percent mortality within 50 mile radius around Flagstaff*	Extensive
2005–2008	1999 frost and 2004–2005 western tent caterpillar defoliation (aspen) mortality	97 percent mortality in greater than 50 percent of surveyed aspen sites below 7,500 feet (Fairweather et al. 2008).	
2010	Bark beetle (ponderosa pine) mortality	6,500	
2010-2014	Saw Fly (ponderosa pine defoliation)	Bull Basin Area - 2,000 acres with 1 to 5 percent mortality across both Forests	

*Accurate acreage number not feasible given the amount of non-FS lands included in the 50 mile radius.

Private, State, and Other Agency Activities

Since 2000, over 105,000 acres of treatments designed to reduce fire risk and/or improve forest resiliency have occurred on private, State, and other agency- managed lands in or adjacent to the project area (table F 5).

On the Kaibab NF, from 2001 to 2004, the Rural Communities Fuels Management Partnership thinned over 200 acres of trees on private property in the Parks, Sherwood Forest Estates, Williams, and Sherwood Forest Estates communities to reduce the risk of wildland fire and improve the forest (Kaibab NF news release, August 2004).

The Camp Navajo Army Depot borders both the Kaibab and Coconino NFs and is within the project area. Camp Navajo implemented post tornado recovery by removing storm damaged trees on 939 acres in 2011 and 2012. The project was completed in October of 2012, reducing the risk of bark beetle infestation and resistance to control of wildfires. In addition, pre-commercial thinning (159 acres) and prescribed burning (115 acres) were accomplished in 2012. Commercial thinning began in 2011 on the West Side Timber Sale, but no cutting units have yet been completed. This sale is expected to resume in 2013 (Camp Navajo 2013 data).

Approximately 78,429 acres of fuels reduction treatments were conducted on State and/or private lands from 2000 to 2013 through the Greater Flagstaff Forest Partnership (GFFP) and Arizona State Forestry Division cost-share program (GFFP 2010 Report). Of this amount, over 49,000 acres² of treatment has occurred within the 180,000-acre GFFP boundary and the GFFP boundary is within the 4FRI project area (GFFP 2011 Report). The GFFP Report (GFFP 2011) states, “The

Partnership continues to receive various grants from AZ State Forestry Division to provide cost--share assistance to cover a portion of the cost of treating private lands within the Flagstaff wildland/urban interface. To date, more than \$500,000 has been distributed to 132 property owners to treat 1,200+ acres of land.

Examples of projects include NAU (1,893 acres), Sunset Crater (316 acres), Arizona Department of Game and Fish (54,988 acres), Flagstaff Fire Department (9,203 acres) and 245 acres of fuels reduction on private lands (2013). Treatments were designed for the wildland-urban interface (WUI).

From 2011 to 2013, the City of Flagstaff completed 1,065 acres of thinning, 1,594 acres of debris disposal (pile burning and chipping) and 302 acres of prescribed burning (Summerfeldt 2014).

From 2000 to 2013, the Grand Canyon NP conducted approximately 22,990 acres of mechanical treatment (fuels reduction) and prescribed burning along the south rim. Activities conducted in this vicinity are adjacent to the Tusayan district, Kaibab NF.

Foreseeable hazardous fuels reduction projects (2013 awards from Arizona State Forestry) include 160 acres of treatment in Williams, 100 acres in Tusayan (Tusayan Fire District), 90 acres in the Saskan Ranch Subdivision (Ponderosa Fire District), <http://www.azsf.gov/WFHF-Grants> (March 17, 2014), 190 acres (4 to 10 parcels) in 2014, and 100 acres of prescribed burning through 2014 (Flagstaff Fire Department, personal communication, February 24, 2012). The Grand Canyon NP expects to mechanically treat 311 acres and prescribe burn approximately 2,862 acres in 2014 (Marks and Lata personal communication 2014).

² Total acres treated include treatment by USFS and all others within the GFFP boundary (GFFP 2011 Report).

Table F 5. Past treatments on private, State, and other federally managed lands 2000-2013

Years	Agency/Organization	Acres Treated
2000–2004	Rural Communities Fuels Management Partnership	200
2000–2013	Arizona State Forestry and Greater Flagstaff Forest Partnership (GFFP) ^a	78,429 ^b
2000-2013	City of Flagstaff Forest Treatment Activities	2,961
2000–2013	Grand Canyon NP – South Rim	22,990
2011-2012	Camp Navajo Army Depot	1,213
Total		105,793

a. Arizona State Forestry has been included in the GFFP category to display treatment acres that focus on the greater Flagstaff urban interface. ASF does fund and implement treatments separate from the GFPP.

b. Reflects completion of 245 acres in 2013 since the 4FRI DEIS was released in March of 2011.

Summary of Current and Ongoing Projects

Approximately 166,897 acres of vegetation treatments and 195,076 acres of prescribed fire (as of 2013) are in the current and ongoing category within the project area (table F 6 and figure F 3). table F 7 includes other projects considered.

The ongoing and current projects category focuses on those projects that have the potential to affect vegetation (structure, pattern, and composition), natural processes (such as fire), and movement toward increased forest resiliency and function. Specialists evaluated whether additional projects (not included in this list) are relative to their cumulative effects analysis. This category includes vegetation and prescribed fire projects that still have acres remaining for implementation. This list has been updated to reflect data up to 2013.

The Forests have been annually implementing a portion of the total acres specified in the NEPA decisions. It is typical for vegetation and prescribed fire projects to be implemented over a course of 1 to 10 years, depending on size and complexity. Only those acres that remain to be implemented are reflected in this category. Projects that included periodic (maintenance) prescribed fires are included in this category. The assumption for other projects such as power line maintenance conducted by special use permit holders is that the vegetation within the entire right-of-way could be maintained annually.

Table F 6. Current and ongoing vegetation, prescribed fire, and other ground-disturbing projects

Project Name	Treatment Type	Mechanical / Prescribed Fire (acres)	Forest/District	
			Coconino	Kaibab
Pomeroy	Mechanical and prescribed fire	1,740 / 1,740		Williams
KA		1,050 / 1,050		Williams
Russell		5,000 / 5,000		Tusayan
Community Tank		865 / 865		Williams
Bill Williams Cap		10 / 10		Williams

Appendix F – Cumulative Effects with Objection Resolution Modifications

Project Name	Treatment Type	Mechanical / Prescribed Fire (acres)	Forest/District	
			Coconino	Kaibab
Ten X	Prescribed fire	700		Tusayan
Airport		602		Tusayan
South Williams		290		Williams
Long Jim		1,300		Tusayan
Dogtown	Mechanical and prescribed fire	1,700 / 1,700		Williams
McCracken Project http://www.fs.fed.us/nepa/nepa_project_exp.php?project=18988	Mechanical and prescribed fire including pine and woodland savannah treatments 2012 NEPA decision	15,262 / 17,337		Williams
Aspen Restoration Project http://www.fs.fed.us/nepa/nepa_project_exp.php?project=24584	Mechanical and prescribed fire 2011 NEPA decision	402 / 402		Williams
Twin	Prescribed fire	1,400		Williams
Frenchy		6,529		Williams
Tusayan South/Boggy Tank		2,948		Tusayan
Tusayan East		2,600		Tusayan
Arboretum		602	Flagstaff	
Woody Ridge		11,184	Flagstaff	
Post-Tornado		Mechanical (tree removal)	18,756	Flagstaff and Mogollon Rim
Hart Prairie	Mechanical and prescribed fire	9,815 / 9,815	Flagstaff	
Munds Park	Prescribed fire	/ 2,950	Flagstaff	
A-1 East and West		/ 8,274	Flagstaff	
East Clear Creek http://www.redrockcountry.org/nepa/2005-06/east-clear-creek-watershed/dn-and-fonsi.pdf	Mechanical and prescribed fire	1,562 / 4,700	Flagstaff	
Marshall Fuels Reduction	Mechanical and prescribed fire 2012 NEPA decision	10,800 / 6,260	Flagstaff	
Upper Beaver Watershed Fuels Reduction (90 percent outside the project area)	Mechanical and prescribed fire 2012 NEPA Decision	15,807 / 31,162	Mogollon	

Appendix F – Cumulative Effects with Objection Resolution Modifications

Project Name	Treatment Type	Mechanical / Prescribed Fire (acres)	Forest/District	
			Coconino	Kaibab
Mountaineire (also covered in GFFP) http://www.redrockcountry.org/nepa/2005-06/mountaineire/mtnr-dn-4-15-06.pdf	Mechanical and prescribed fire 2006 NEPA Decision	13,780 / 15,256	Flagstaff	
Wing Mountain http://data.ecosystem-management.org/nepaweb/nepa_project_exp.php?project=33853	Mechanical and prescribed fire, road decommission 2013 NEPA Decision	10,190 / 10,767	Flagstaff	
Mormon Lake Basin 2	Mechanical treatment	568 acres / 0	Flagstaff	
Mormon Lake Basin 1 and 2	Prescribed fire	0 / 2,388	Flagstaff	
Skunk Canyon http://www.redrockcountry.org/nepa/2005-06/skunk-canyon/skunk-canyon-scoping-ltr.pdf		0 / 831	Flagstaff	
Eastside http://www.redrockcountry.org/nepa/2007-08-09/eastside/eastside_ea_dn_alvin_122606.pdf		0 / 20,197	Flagstaff	
Power lines, oil and gas lines, natural gas/FERC, meter sites, gas compression and substation sites*	Right-of-way vegetation clearing for maintenance purposes and to reduce fire risk	30,710 / 0	Forestwide	
Power lines, oil and gas lines, natural gas/FERC, meter sites, gas compression and substation sites*	Right-of-way vegetation clearing for maintenance purposes and to reduce fire risk	1,634 / 0		Forestwide

Appendix F – Cumulative Effects with Objection Resolution Modifications

Project Name	Treatment Type	Mechanical / Prescribed Fire (acres)	Forest/District	
			Coconino	Kaibab
Western Area Power Administration Glen Canyon to Pinnacle Peak http://data.ecosystem-management.org/nepaweb/nepa_project_exp.php?project=35015	Mechanical 2013 NEPA decision	4,584 / 0	Flagstaff	
Bobs (part of Woody Vegetation project) http://www.redrockcountry.org/nepa/2000-to-04/woody-ridge/woody_dn_fonsi_alvins_final.pdf	Mechanical and prescribed fire	2,000 / 2,000	Flagstaff	
Clark's (part of Elk Park project) http://www.redrockcountry.org/nepa/2005-06/elk-park-fuels-reduc/2007-dn-fonsi.pdf		1,600 / 1,600	Flagstaff	
Elk Park Fuels http://www.redrockcountry.org/nepa/2005-06/elk-park-fuels-reduc/2007-dn-fonsi.pdf		2,900 / 2,900	Flagstaff	
Jack Smith-Schultz ³ http://a123.g.akamai.net/7/123/11558/abc123/forestservic.dnload.akamai.com/11558/www/nepa/33456_FSPLT2_383267.pdf		2,000 / 2,000	Flagstaff	
Weatherford (part of Jack Smith Schultz and Eastside)		1,000 / 1,000	Flagstaff	
Railroad		250 / 250	Flagstaff	

³ The Orion Timber Sale (891 acres) is scheduled to be offered for sale in 2014.

Project Name	Treatment Type	Mechanical / Prescribed Fire (acres)	Forest/District	
			Coconino	Kaibab
Clints Well Forest Restoration http://a123.g.akamai.net/7/123/11558/abc123/forestservic.download.akamai.com/11558/www/nepa/55233_FSPLT2_375422.pdf	12,912 acres mechanical (includes 10,522 acres of wildland-urban interface) 3,987 acres no treatment 16,467 acres prescribed fire (includes 10,522 acres of wildland-urban interface) 2013 NEPA Decision	12,912 / 16,467	Mogollon Rim (outside project area)	
Kelly Motorized Trails http://data.ecosystem-management.org/nepaweb/nepa_project_exp.php?project=36911	Designate Motorized trails 2012 NEPA decision	95 miles of designated motorized trails includes 35 miles of motorcycle trail construction and 43 miles of OHV trail construction , 13 miles of road decommission – equates to approximately 49,920 acres of new construction and 13 miles of road decommission	Flagstaff district	
Summary of Acres				
Total acres of vegetation treatments (including powerline maintenance) and other ground disturbing actions		166,897 acres (increase of approximately 50 percent since 2010) 78 miles (49,920 acres) of new motorized trail construction 13 net miles (8,320 acres) of road decommission		
Total acres of prescribed fire		195,076 (increase of approximately 50 percent since 2010)		

Table F 7. Current and ongoing other projects

Project Name	Project Purpose	Description	Forest/District	
			Coconino	Kaibab
Coconino and Kaibab National Forests				
Treatment of Noxious Weeds-3 Forests	Direction incorporated into forest plans	Encompasses project area	Forestwide	Forestwide
Firewood collection	Forestwide policy			Williams and Tusayan
Tusayan Travel Management				Tusayan
South Zone Travel Management http://www.fs.fed.us/nepa/nepa_project_exp.php?project=42961				Williams Decision expected 09/2014
Coconino NF Travel Management				
Coconino and Kaibab NFs road maintenance	Annual road maintenance		500 miles per year on each forest	
Grazing	Continuation of authorized livestock grazing	791,250 acres / 80 percent of project area	47 active allotments within project area, see the range report for a complete list of allotments within project area	
Wildlife waters	Water development maintenance	24 water developments		Tusayan
Little Draw	Aspen exclosure maintenance	107 acres	Flagstaff	
Grapevine Interconnect (Grapevine Canyon Wind Project) http://a123.g.akamai.net/7/123/11558/abc123/forestsevic.download.akamai.com/11558/www/nepa/72690_FSPLT2_376210.pdf	9 miles of new 345 kV electric transmission line 2012 NEPA Decision (ROD)	9 miles vegetation removal	Outside the 4FRI project area	
Bill Dick Springs Enhancement http://data.ecosystem-management.org/nepaweb/nepa_project_exp.php?project=38507	Restoration of 3 springs 2013 NEPA Decision	9.3 acres	Mogollon Rim	
Other agency and private lands current and ongoing vegetation and prescribed fire projects				
Camp Navajo (2013)	Commercial Thinning Timber Stand Improvement 7 inch d.b.h. or less	951 acres 399 acres	Flagstaff	
Arizona State Forestry and Greater Flagstaff Forest Partnership, including private lands	See Past and Foreseeable Category			

*The numbers in this category are for the entire permitted facility and likely include acres outside the project area. Data that would have been specific to the project area was not readily available.

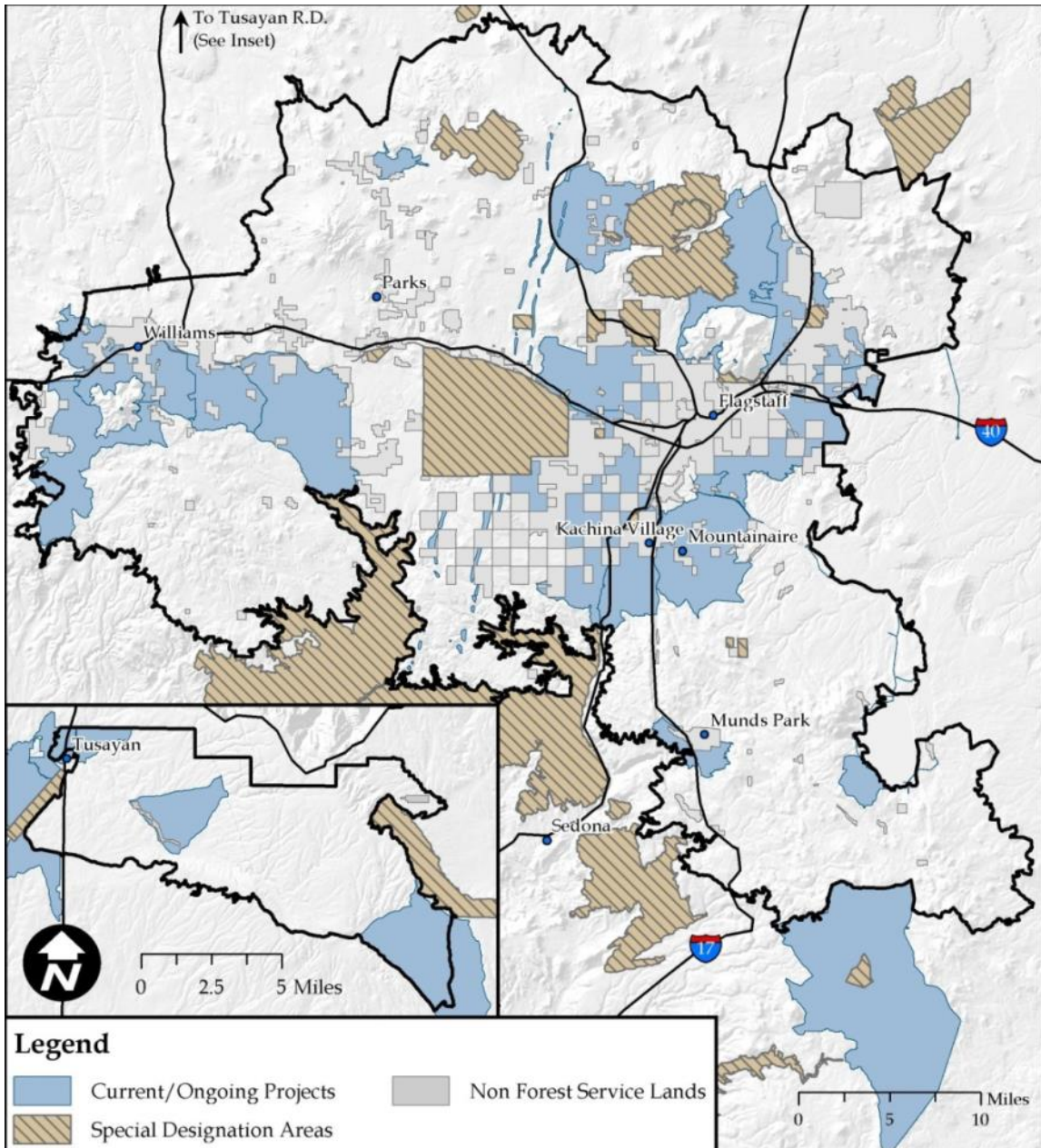


Figure F 3. General locations of current and ongoing projects within or adjacent to the project area

Summary of Reasonably Foreseeable Projects

Reasonably foreseeable projects for this analysis (table F 8, table F 9, and figure F 4) are defined as those Forest Service projects that have been listed in the forests' schedule of proposed actions (SOPA). The most recent SOPA for both forests was reviewed in March 2014 (USDA FS 2014). Decisions are imminent or decisions have been made and implementation is about to begin; or the projects are poised for implementation by other (non-FS) parties. The reasonably foreseeable category mostly focuses on those projects that have the potential to affect vegetation (structure, pattern, and composition), natural processes (such as fire), and movement toward increased resiliency and function. Some project, such as the rock pits analysis, would not affect vegetation

structure, spatial pattern, or composition. However, this project has been included as it may affect how road proposals (and their associated costs) are analyzed and implemented. Specialists also evaluated whether additional projects (not included in this list) would be included in their cumulative effects analysis. In summary:

- Approximately 43,041 acres of vegetation (mechanical) treatments and 58,714 acres of prescribed fire and maintenance burning would be implemented by the Forests in the foreseeable future (within 10 years) (table F 8). Table F 9 displays other foreseeable projects.
- Approximately 18,448 acres of vegetation (mechanical) treatments and 19,082 acres of prescribed fire and maintenance burning is expected to be implemented on State, private, and other federally managed lands within the foreseeable future (within 10 years) (table F 10).
- Projects that are foreseeable but located outside of the project area are displayed in table F 11.

Table F 8. Reasonably foreseeable vegetation and ground-disturbing projects within and adjacent to the project area

Project Name	Treatment Type	Metric	Forest/District		Project Objective Summary and Status
			Coconino	Kaibab	
Bill Williams Mountain Restoration	Mechanical, prescribed fire, roads	11,650 acres mechanical 15,200 acres prescribed fire 28 miles road decommission and 23 miles temporary road construction		Williams	<p>Reintroduce fire, reduce stand densities and fire potential, move toward balanced age classes, improve understory composition and productivity, includes 31 acres of cable logging in Mexican spotted owl PACs that would cause a loss of most snags and trees (including snags greater than 18 inch d.b.h. and trees greater than 24 inch d.b.h.) across approximately 15 percent of the area with this proposed treatment within the PAC in order to provide cable corridors and safe logging operations. Approximately 15 percent, or 5 acres, of the PAC area treated with cable logging operations would have most trees removed within these corridors under Alternative 2 (SDEIS, page 6). removes timber suitability on 8,954 acres, thinning above 9 inch d.b.h. in Mexican spotted owl PACs, burning greater than 1 acre in the AZ Bugbane Botanic Area</p> <p>Status: analysis underway, DEIS was released in 2012, SDEIS was released in October of 2013, a decision is likely in 2014.</p>
Coconino and Kaibab NFs Rock Pit Development http://a123.g.akamai.net/7/123/11558/abc123/forestservic.download.akamai.com/11558/www/nea/75515_FSPLT3_1445519.pdf	Existing pit expansion and new pit development	39 pits, 434 acres (new disturbance)	Forestwide	Forestwide	<p>Create source of materials for road maintenance and management for both forests. Scoping occurred in 2011. An initial assessment of materials occurred in the 1990s.</p> <p>Status: analysis underway, decision likely in 2014.</p>

Appendix F – Cumulative Effects with Objection Resolution Modifications

Project Name	Treatment Type	Metric	Forest/District		Project Objective Summary and Status
			Coconino	Kaibab	
Juan Tank Japanese Tank Brome http://www.fs.fed.us/nepa/nepa_project_exp.php?project=41566	Prescribed Fire	12, 133 acres		Williams	Contain and control Japanese brome Status: Scoping expected in March 2014 and decision in May 2014
Watts Vegetation Project http://www.fs.fed.us/nepa/nepa_project_exp.php?project=41569	Mechanical and prescribed fire	3,000 acres		Tusayan	Scoping 01/2014 with decision expected 05/2014
Turkey/ Barney Pasture Forest Health Restoration http://www.fs.fed.us/nepa/nepa_project_exp.php?project=37244	Mechanical and prescribed fire	Potentially 17,838 acres of mechanical and prescribed fire	Flagstaff		Reduce dwarf mistletoe, tornado salvage, improve Mexican spotted owl habitat Status: analysis underway, decision may occur in October 2014; however, 2014 Slide Fire resulted in changed conditions.
Mt. Elden/Dry Lake Hills Recreation http://www.fs.fed.us/nepa/nepa_project_exp.php?project=38239	Trail construction, reconstruction and relocation, trailhead expansion and/or consolidation and the decommission of unauthorized roads and trails in the Mt. Elden ESA and Dry Lake Hills area	Construct: 8 miles of horse trail, 3.5 miles of bike trail, 11 miles of hiking trail, 0.5 mile of climbing trail Relocate 10.5 miles of existing trail Decommission unauthorized trails and roads in Mt. Elden ESA Expand and/or			The purpose of the project is to provide enhanced recreation opportunities, mitigate impacts to wildlife habitat, archaeological sites, soil, water, and address community interests. Status: Scoping occurred in 2013 and a decision is expected in 10/2015

Project Name	Treatment Type	Metric	Forest/District		Project Objective Summary and Status
			Coconino	Kaibab	
		consolidate trailheads			
Flagstaff Watershed Protection Project	Mechanical and Prescribed Fire	10,543 acres (7,569 acres Dry Lake Hills and 2,974 acres Mormon Mountain)	Flagstaff		<p>4FRI treatments in Dry Lake Hills and Mormon Mountain removed – deferred to FWPP</p> <p>Treatments include 1,825 acres of PAC treatments in Mormon Mountain, 1,221 PAC treatments in DryLake Hills, 424 acres of Mexican spotted owl core area treatment in Mormon Mountain, and 396 acres of Mexican spotted owl core area treatment in Dry Lake Hills,103 acres of goshawk nest fuels reduction in Dry Lake Hills, 59 acres of grassland restoration in Dry Lake Hills and 1.733 acres of no treatment due to previous NEPA or site condition</p> <p>Status: Scoping conducted in April, 2013, decision likely in 2014 with implementation in 2015</p>
Acre Summary					
Vegetation treatments and foreseeable ground disturbance			43,041 acres (mechanical) 5 net miles of temporary road increase and 23 miles of net trail increase 434 acres (net increase in ground disturbance from pits)		
Prescribed fire (including maintenance burning)			58,714 acres		

Table F 9. Other (non-vegetation) reasonably foreseeable projects within the project area

Project Name	Treatment Type	Metric	Forest/District		Project Objective Summary and Status
			Coconino	Kaibab	
Highway 180 Antelope Crossing http://www.fs.fed.us/ne/pa/nepa_project_exp.php?project=42905	Fence setback to facilitate pronghorn crossing between summer and winter range	2 miles		Williams	Scoping will be conducted in March of 2014 and implementation expected in April of 2014
APS NO1 Youngs to Mormon Lake 69kV Powerline http://a123.g.akamai.net/7/123/11558/abc123/forestservic.download.akamai.com/11558/www/nepa/75515_FSPLT3_1445519.pdf	Existing aerial and buried cable lines – permit reissuance began in 2013	21 miles	Flagstaff		APS NO1 Youngs to Mormon Lake 69kV Powerline – Red Rock portion of project is outside 4FRI project area Status: Analysis underway, decision likely in 2014
Moonset Pit	Existing pit expansion	4.4 acres		Williams	County request – pit is located in Parks area Status: Decision likely in 2014

Table F 10. Other agency and private lands foreseeable vegetation and prescribed fire projects

Project Name	Treatment Type	Metric	Forest/District		Project Objective Summary and Status
			Coconino	Kaibab	
Camp Navajo	Commercial thinning and Mexican spotted owl target nesting (2014)	154 acres Stand 32 259 acres Stand 70	Flagstaff	Williams	Reduce fire risk, improve diversity of forest conditions, and reducing tree density in 5 inches to 18 inches d.b.h. Status: 2013 implementation
Department of Defense AZARNG Thin and Burn	Mechanical and prescribed fire	17,049 acres mechanical and prescribed fire			Ponderosa pine, pine-oak, and grasslands restoration to mitigate fire risk, provide diversity in forest conditions, improve ecosystem health, reduce tree density in 5 inches to 18 inches d.b.h.
Greater Flagstaff Forest Partnership (GFFP)	Mechanical and prescribed fire	535 acres mechanical and prescribed fire	Flagstaff		Reduce fire risk on private property Status: implement in 2013 and 2014

Project Name	Treatment Type	Metric	Forest/District		Project Objective Summary and Status
			Coconino	Kaibab	
Navajo Nation	Mechanical and prescribed fire	140 acres mechanical and prescribed fire	Flagstaff		Information provided via the Flagstaff Watershed Protection Project
Grand Canyon NP (South Rim)	Mechanical and prescribed fire	311 acres mechanical and 2,862 acres prescribed fire	Adjacent to Kaibab		Information provided by GCNP
Acre Summary					
Vegetation mechanical treatments			18,448 acres (less than 1 percent change since 2010)		
Prescribed fire and maintenance burning			19,082 acres (less than 1 percent change since 2010)		

Table F 11. Other foreseeable vegetation and prescribed fire projects outside the project area

Project Name	Treatment Type	Metric	Forest/District		Project Objective Summary and Status
			Coconino	Kaibab	
Mahan-Landmark Forest Restoration http://www.fs.fed.us/nepa/nepa_project_exp.php?project=37972	Fuels reduction and restoration	42,000-acre project area (there is a slight overlap into the project area but overall 50 percent is outside of the project area)	Mogollon Rim		wildland-urban interface treatments on 11,468 acres and 36,621 Acres of restoration treatments including 18,849 acre Of pine restoration, 4,799 acre Mexican spotted owl PAC treatment, 2,620 acre Mexican spotted owl restricted habitat maintenance, 3,183 acre Mexican spotted owl target/threshold maintenance, 1,0344 acres of goshawk post-fledging family areas maintenance, 958 acre Grassland maintenance, 4,730 acre Savannah maintenance, 247 acre Spring maintenance, 247 acre Powerline ROW maintenance.
Allen Lake Restoration http://www.fs.fed.us/nepa/nepa_project_exp.php?project=41762	Wetland restoration	17 acres	Mogollon Rim		Decision in 2/2014 – implementation will occur in 2014

Appendix F – Cumulative Effects with Objection Resolution Modifications

Project Name	Treatment Type	Metric	Forest/District		Project Objective Summary and Status
			Coconino	Kaibab	
Greater Flagstaff Forest Partnership (GFFP)	Mechanical and prescribed fire	535 acres	Flagstaff		Reduce fire risk on private property Status: implement in 2013 and 2014
Coulter Experimental Forest	Mechanical and prescribed fire	800 acres	RMRS		Removed from 4FRI treatment acres and analyzed as cumulative
Chiricahua leopard frog	Habitat	No specifics available	Red Rock		Rehab Sycamore and Walts Tank – pinyon-juniper removal Status: Decision expected in 03/2014

Reasonably Foreseeable Projects with Insufficient Information for Analysis

The Four-Forest Restoration Initiative, Mogollon Rim of the Coconino NF, Apache-Sitgreaves NFs and Tonto NF, as of March 2014, has no tangible information that would be meaningful for this cumulative effects analysis. No project boundary has been finalized, no decision has been made on the existing and desired condition of resources (no purpose and need for action); therefore, no specific activities have been proposed. For this reason, it was not considered in the cumulative effects reasonably foreseeable category.

Highway 180 Motorized Trails – This project proposes to construct up to 60 miles of motorized trails. As of March, 2014, the project is on hold. For these reasons, it has been eliminated from foreseeable cumulative effects.

Red Rock District (Coconino NF) Pronghorn habitat improvements - The project was to be scoped in 2012. No additional information is available. For this reason, it has been eliminated from reasonably foreseeable cumulative effects.

Mahan-Landmark Forest Restoration – In the DEIS the best available information was used to describe the potential for cumulative effects. Since that time the proposal has not been finalized. A notice of intent to prepare an environmental impact statement is expected to be published in September of 2014. A supplemental cumulative effects analysis will be completed as needed.

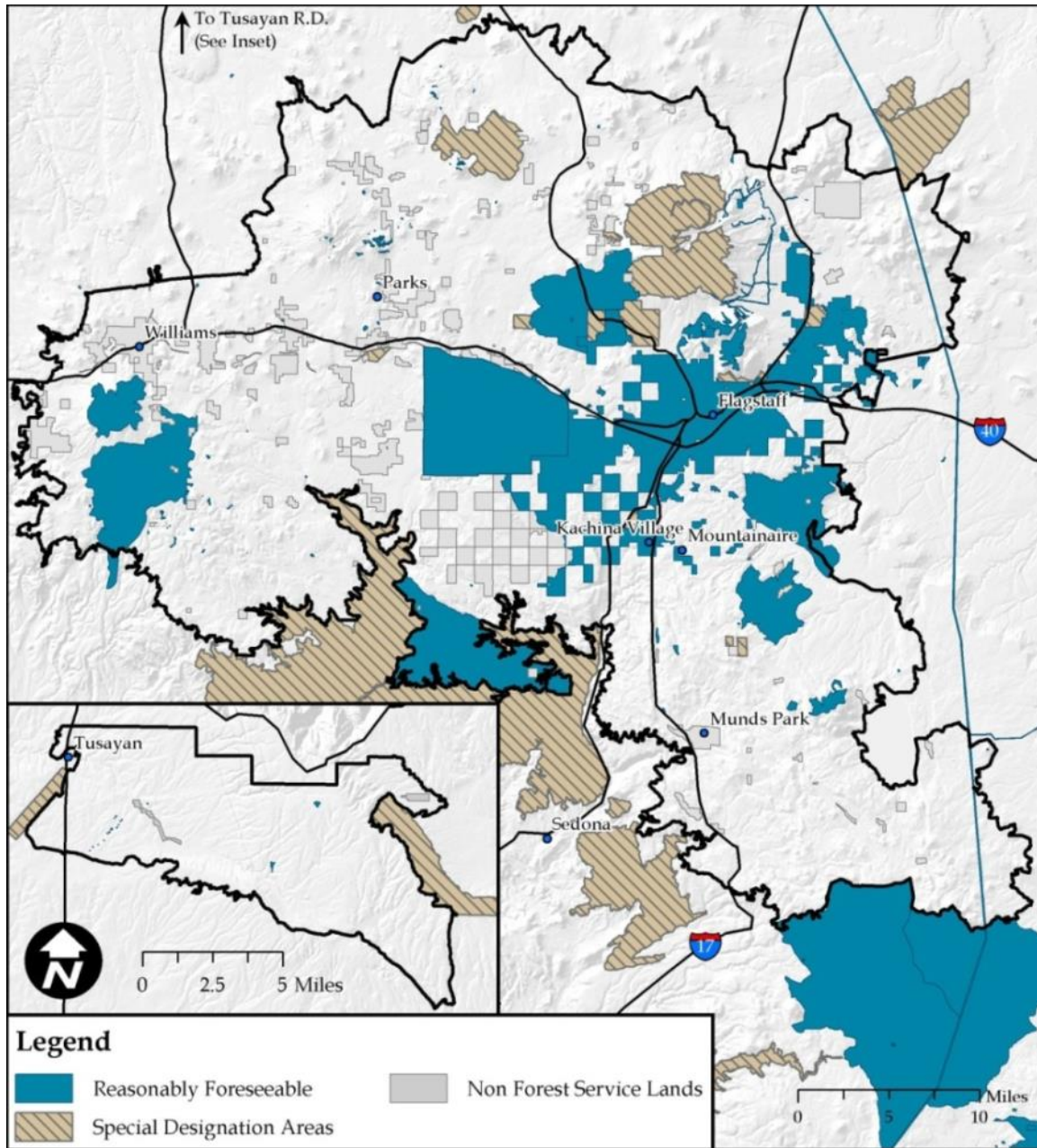


Figure F 4. General locations of foreseeable projects within or adjacent to the project area