Appendix F – Cumulative Effects

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.

Authorized Livestock Management

The information found in this section has been summarized from the range specialist report (Hannemann 2013). It is incorporated by reference. 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 early 1890s, overgrazing had resulted in changes to understory vegetation by reducing grasses and forbs. 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.

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 2013). 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 (McCusker 2013). 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, they 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 83 percent of goshawk non-PFA habitat vegetation structural stage 3 (young-aged forest) and 4 (mid-aged forest) is even-aged. Approximately 74 percent of

the project area is classified as having moderately closed to closed tree canopies (4FRI Proposed Action 2011). Figure 75 displays the general location of past vegetation projects that occurred prior to 1996.

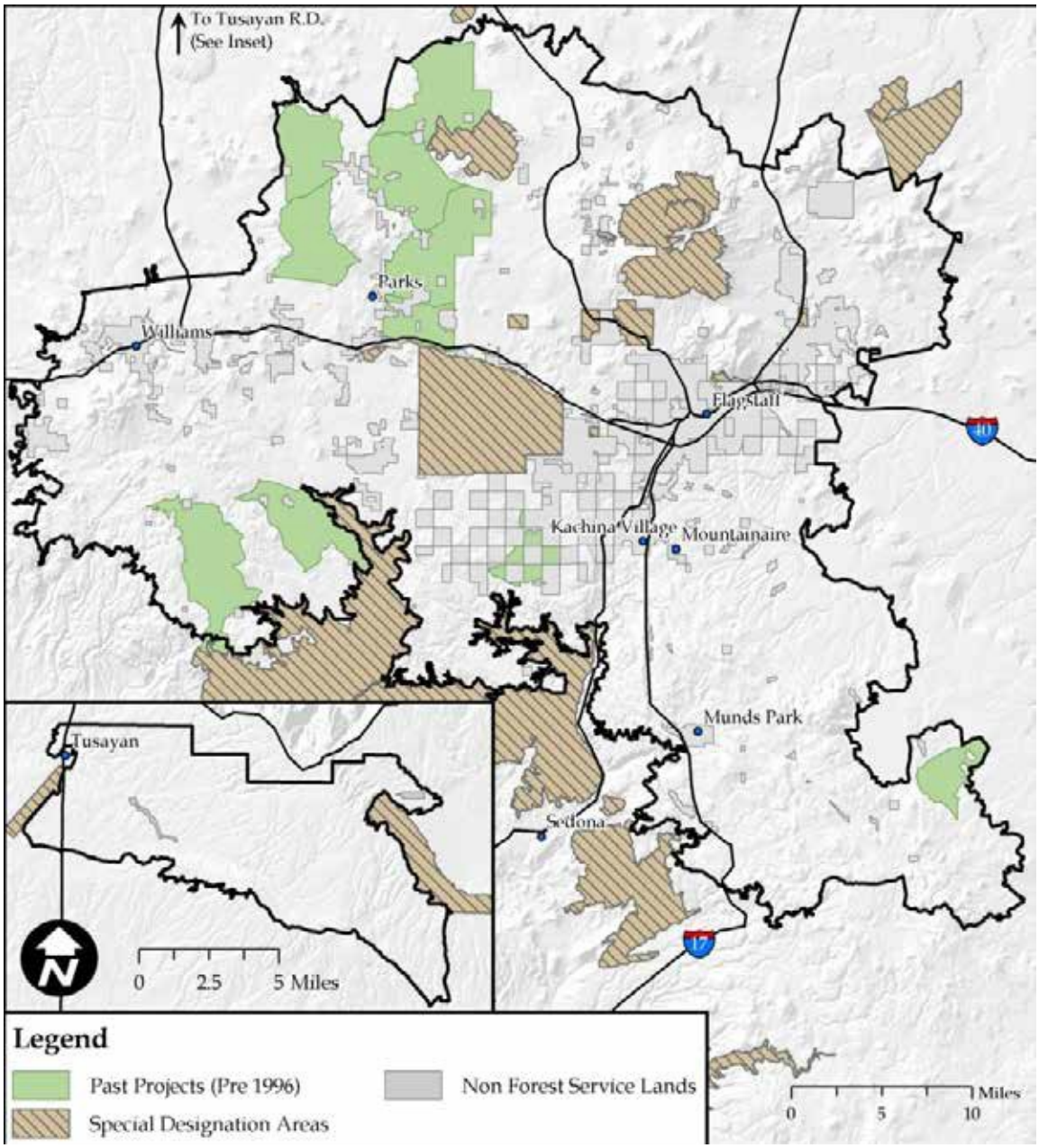

Figure 75. Pre-1996 vegetation and prescribed fire projects within the project area

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 2012).

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 WUI, 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).

With the exception of those 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 (or 2011 if data was available). Since 2000, 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, and 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, 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 (2,388 acres, 2005). 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 have been treated 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 most recent tree thinning projects (2000 to present) 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 MSO 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-inch 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 et al. 2013). Since 2000, approximately 47 miles of temporary road have been constructed (and decommissioned), 251 miles of existing road have been decommissioned (117 miles on the Kaibab NF and 44 miles on the Coconino NF), and approximately 1 mile has been relocated to reduce impacts on resources. Table 146 displays projects that have influenced the existing condition. Figure 76 displays the general location of projects post-1996.

Table 146. Summary of past vegetation and prescribed fire project acres (2000 to 2010)

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

Project Name	Year (NEPA Decision)	Treatment Type	Acres* Mechanical /Prescribed Fire	Forest/District	
				Coconino	Kaibab
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

Project Name	Year (NEPA Decision)	Treatment Type	Acres* Mechanical /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	
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	2005	Mechanical treatment and prescribed fire	2,388/2,388	Flagstaff	
Skunk Canyon	2005	Prescribed fire	0/831	Flagstaff	
Elden	2006	Mechanical	193/0	Flagstaff	
Eastside	2006	Mechanical treatment and prescribed fire	7,819/20,197	Flagstaff	

Project Name	Year (NEPA Decision)	Treatment Type	Acres* Mechanical /Prescribed Fire	Forest/District	
				Coconino	Kaibab
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	
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	
Acre Summary					
Total mechanical/vegetation treatment acres			**138,736 acres**		
Total prescribed fire acres			**132,168 acres**		

*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.

Table 147 lists projects that are outside but adjacent to the project area.

Table 147. Summary of past vegetation and prescribed fire project acres (2000 to 2010) 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**		
Total prescribed fire acres			**16,584 acres**		

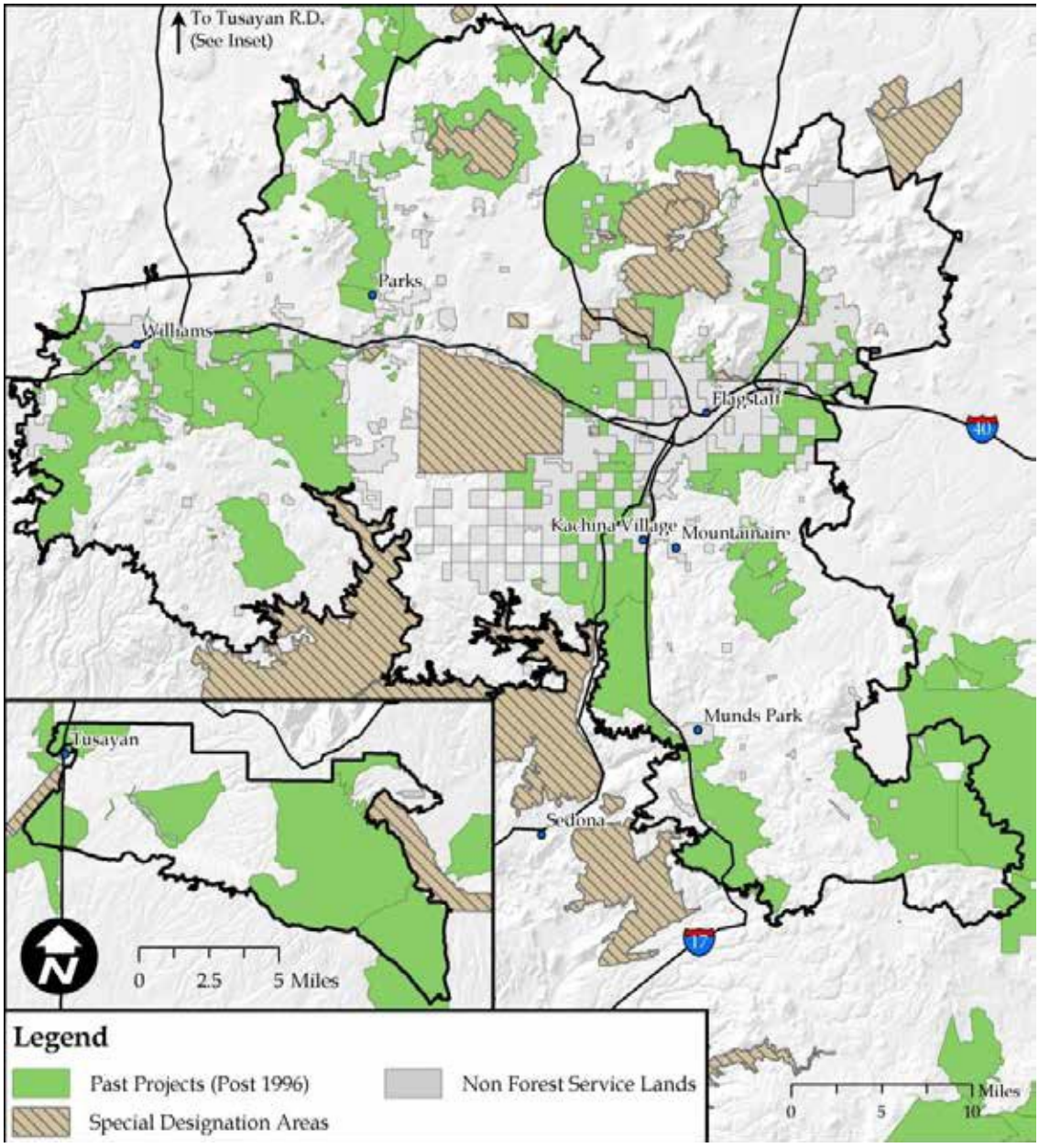

Figure 76. General locations of past projects (post-1996) within the project area

Natural Disturbances – Fire[12]

Information on natural disturbances (fire) is summarized from the fire ecology specialist report (Lata 2012) and the report is incorporated by reference.

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

[12] 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, ceasing 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. Data was compiled 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 (Latta 2013).

Table 148. Coconino and Kaibab NF wildfire acres 1940 to 2010

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
Total acres	**312,155**

Table 148 summarizes (estimates) acres of wildfire since 1940. Overall, wildfire has influenced at least 18 percent of the project area since 2001. Severe effects associated with past wildfires are

attributed to 20 to 30 percent (of the 18 percent) 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 percent of fires 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 146 and table 147, thousands of acres in and adjacent to the project area have been (or are currently being) treated to reduce hazardous fuels. Vegetation was thinned and residual slash reduced/removed through various methods including machine pile and burn, hand pile and burn, chipping, lop and scatter, mastication, and mowing. From 2000 to 2010, at least 56,146 acres on the Williams and Tusayan districts were treated to reduce hazardous fuels. On the Coconino NF, at least 83,979 acres[13] were treated within the project area to address hazardous fuels.

Natural Disturbances – Insect and Disease

Information on natural disturbances (fire) is summarized from the silviculture specialist report (McCusker 2013) 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 Forest Service 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 Forest Service "Southwestern Region Insect and Disease Conditions Report 2010"). 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

[13] Projects selected include those that had a hazardous fuels reduction component including Arboretum WUI, Fort Valley, A-1, Rocky Park, Lake Mary, Kachina Village, Woody Ridge, Mormon Lake, Skunk Canyon, Elden, Eastside, East Clear Creek, Elk Park, Munds Park, and Slate Mountain. Where both thinning and prescribed fire had been implemented, the higher, more inclusive acreage number was selected.

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.

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 Forest Service 2002, 2003). 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. During the past 5 years, 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 149). 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 149. 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 Phloeosinus 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%)	247,169 to 375,696 (2 to 38%)
1999	Needleminer (ponderosa pine)	9,000	NA
2000s	Bark beetle (ponderosa pine) damage	72,000	NA
2000s	Bark beetle (ponderosa pine) mortality	100% mortality in select stands	29,660 (3%)
2002–2005	Wood borers and Phloeosinus beetle (juniper woodland) mortality	3% mortality within 50 mile radius around Flagstaff*	Extensive
2005–2008	1999 frost and 2004–2005 western tent caterpillar defoliation (aspen) mortality	97% mortality in >50 percent of surveyed aspen sites below 7,500 feet (Fairweather et al. 2008).	
2010	Bark beetle (ponderosa pine) mortality	6,500	

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

Private Property, State, and Other Agency Activities (Table 150)

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 thinning on 350 acres in 2011to complete post-tornado recovery. Additionally, treating 349 acres is foreseeable in 2012 (Camp Navajo 2012 data).

Approximately 78,184 acres of fuels reduction treatments were conducted on State and/or private lands from 2000 to 2010 through the Greater Flagstaff Forest Partnership (GFFP) and Arizona State Forestry Division cost-share program (GFFP 2010 Report). Projects are conducted within the 180,000-acre GFFP boundary that is within the project area. Examples of projects include NAU (1,893 acres), Sunset Crater (316 acres), ADGF (54,988 acres), and Flagstaff Fire Department (9,203 acres). Treatments were designed for the wildland-urban interface (WUI). Current projects include vegetation thinning and prescribed fire on approximately 100 acres of private property made up of 20 parcels within the GFFP boundary in 2012.

From 2000 to 2010, the Grand Canyon NP conducted approximately 18,970 acres of prescribed burning along the south rim. Activities conducted in this vicinity are adjacent to the Tusayan district, Kaibab NF.

Foreseeable fuels reduction treatments include treating (mechanical thinning/prescribed fire) 245 acres (5 private land parcels) in 2013, 190 acres (4 to 10 parcels) in 2014, and 100 acres of prescribed burning through 2014 (Flagstaff Fire Department, personal communication, February 24, 2012).

Table 150. Past treatments on private, State, and other federally managed lands

Years	Agency/Organization	Acres Treated
2000–2004	Rural Communities Fuels Management Partnership	200
2000–2010	Greater Flagstaff Forest Partnership (GFFP)	78,184
2000–2010	Grand Canyon NP – South Rim	18,970
2011	Camp Navajo Army Depot	350
Total		**97,704**

Summary of Current and Ongoing Projects

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.

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. In summary, approximately 82,592 acres of vegetation treatments and 97,175 acres of prescribed fire are in the current and ongoing category within the project area (table 151 and figure 77). Table 152 includes other projects considered.

Table 151. Current and ongoing vegetation (mechanical) and prescribed fire 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
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
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	Mechanical and prescribed fire	1,562/4,700	Flagstaff	
Mormon Lake	Prescribed fire	2,388	Flagstaff	
Skunk Canyon		831	Flagstaff	

Project Name	Treatment Type	Mechanical/ Prescribed Fire (acres)	Forest/District	
			Coconino	Kaibab
Eastside		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	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		Forestwide
Bobs (part of Woody Vegetation project)	Mechanical and prescribed fire	2,000/2,000	Flagstaff	
Clark's (part of Elk Park project)		1,600/1,600	Flagstaff	
Elk Park Fuels		2,900/2,900	Flagstaff	
Jack Smith-Schultz		2,000/2,000	Flagstaff	
Weatherford (part of Jack Smith Schultz and Eastside)		1,000//1,000	Flagstaff	
Railroad		250 /250	Flagstaff	
Summary of Acres				
Total acres of vegetation treatments (including powerline maintenance)		**82,592 acres**		
Total acres of prescribed fire		**97,175 acres**		

Table 152. Current and ongoing other projects

Project Name	Project Purpose	Description	Forest/District	
			Coconino	Kaibab
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
Williams Travel Management				Williams
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% 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	

*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.

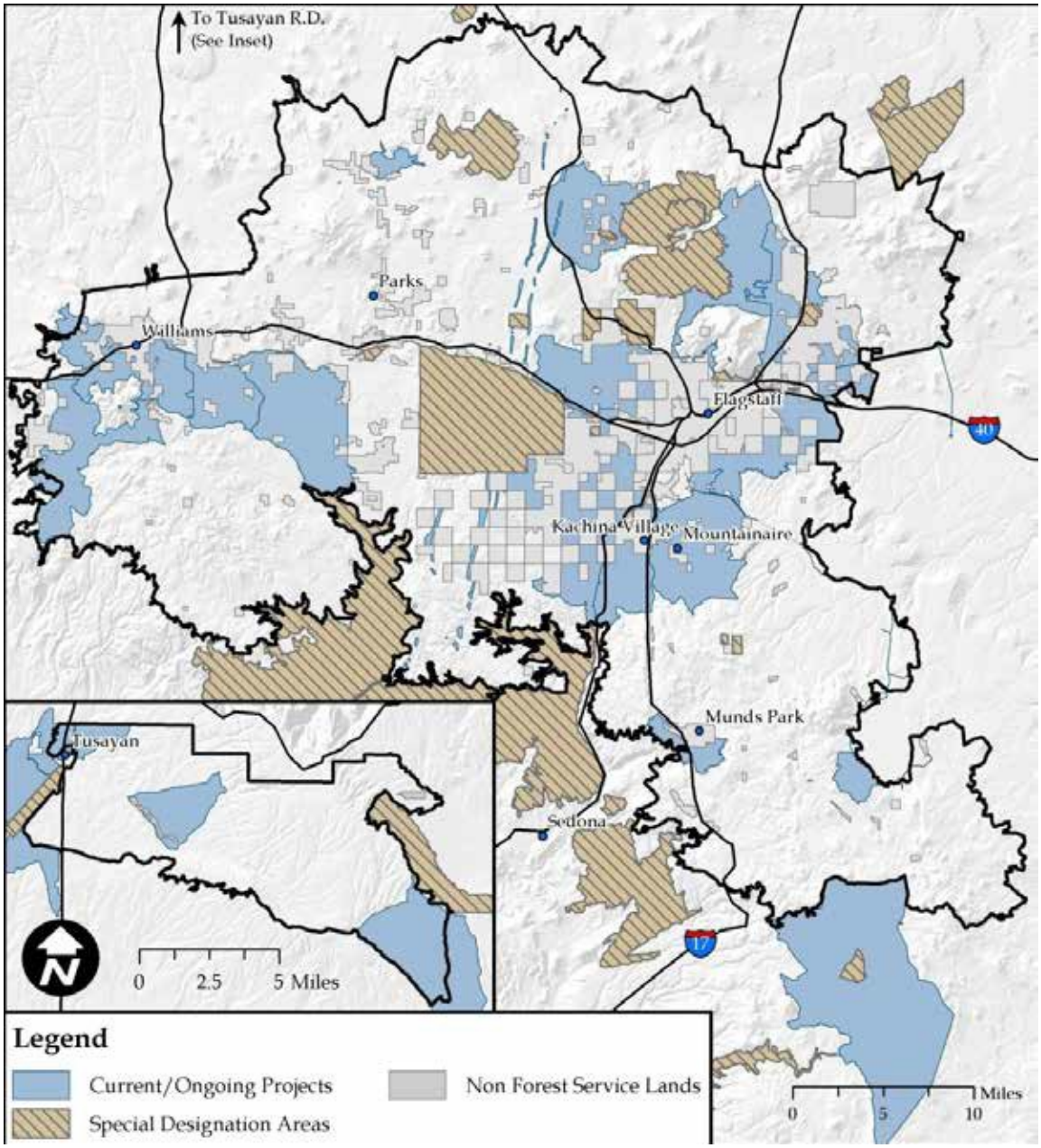

Figure 77. General locations of current and ongoing projects within or adjacent to the project area

Summary of Reasonably Foreseeable Projects

Reasonably foreseeable projects for this analysis (table 152 and table 153, and figure 78) 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 January 2013 (USDA 2013). 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 86,771 acres of vegetation (mechanical) treatments and 142,869 acres of prescribed fire and maintenance burning would be implemented by the forests in the foreseeable future (within 5 years) (table 153). Table 154 displays foreseeable recreation projects.
- Approximately 18,552 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 5 years) (table 155).
- Projects that are foreseeable but located outside of the project area are displayed in table 156.

Table 153. Reasonably foreseeable vegetation management/ground-disturbing projects within and adjacent to the project area

Project Name	Treatment Type	Metric	Forest/District		Project Objective Summary and Status
			Coconino	Kaibab	
Aspen Restoration Project	Mechanical and prescribed fire	402 acres mechanical and prescribed fire		Williams	Promote aspen by removing conifer encroachment, using prescribed fire, and protecting with fencing Status: analysis underway, decision likely in 2013
McCracken Project	Mechanical and prescribed fire	15,262 acres mechanical 17,337 acres. prescribed fire		Williams	Move toward uneven-aged forest structure, reduce mistletoe, restore meadows, savanna, and woodlands Status: decision likely in 2013
Ten X Fire Planting	Post-fire planting and fencing	12 acres (mechanical)		Tusayan	Restore vegetation within 815-acre high-severity burn Status: analysis underway
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	Reintroduce fire, reduce stand densities and fire potential, move toward balanced age classes, improve understory composition and productivity Status: analysis underway, decision likely in 2012

Project Name	Treatment Type	Metric	Forest/District		Project Objective Summary and Status
			Coconino	Kaibab	
Coconino and Kaibab NFs Rock Pit Development	Existing pit expansion and new pit development	39 pits, 229 acres (new disturbance)	Forestwide	Forestwide	Create source of materials for road maintenance and management Status: analysis underway, decision likely in 2012
Marshall Fuels Reduction	Mechanical and prescribed fire	10,800 acres mechanical and 6,260 acres prescribed fire	Flagstaff		Ponderosa pine, grassland, meadow, and water fowl habitat restoration (includes 900 acres of thinning up to 9-inch d.b.h. in MSO habitat), reduce fire risk Status: decision made, 2012 implementation
Turkey/ Barney Pasture Forest Health Restoration	Mechanical and prescribed fire	Potentially 17,835 acres of mechanical and prescribed fire	Flagstaff		Reduce dwarf mistletoe, tornado salvage, improve MSO habitat Status: analysis underway, decision likely in 2012
Upper Beaver Watershed Fuels Reduction (90% outside the project area)	Mechanical and prescribed fire	15,807 acres mechanical 31,162 acres prescribed fire 43,906 acres maintenance burning			Reduce fire risk within and outside of WUI Status: 2,000 acres scheduled for 2013 implementation
Western Area Power Administration Flagstaff to Pinnacle Peak	Mechanical	4,584 acres	Flagstaff		Remove trees that may impinge on power lines: 1,770 acres ponderosa pine, 8 acres aspen, 10 acres cottonwood/willow riparian, 25 acres wetland cienega, 35 acres montane/subalpine grass, 175 acres semi-desert grass, 810 acres pinyon-juniper evergreen shrub, 1,280 acres pinyon-juniper woodland Status: Analysis underway, decision likely in 2012
Wing Mountain	Mechanical and prescribed fire, road decom-mission	10,190 acres mechanical and 10,767 acres prescribed fire	Flagstaff		Restoration in ponderosa pine, mountain grassland, pine savanna, aspen and spring (Maxwell and Big Leroux) restoration, 8 miles of road decommission

Project Name	Treatment Type	Metric	Forest/District		Project Objective Summary and Status
			Coconino	Kaibab	
Acre Summary					
Vegetation treatments and foreseeable ground disturbance			**86,771 acres (86,542 (mechanical) + 229 acres (ground disturbance from pits)**		
Prescribed fire (including maintenance burning)			**142,869 acres**		

Table 154. Reasonably foreseeable recreation projects within the project area

Project Name	Treatment Type	Metric	Forest/District		Project Objective Summary and Status
			Coconino	Kaibab	
Kelly Motorized Trails	Motorized trails	73 miles of single track (motorcycles) and motorized trail (ATV, UTV)	Flagstaff district		*6 miles of road to single-track trail conversion *25 miles of new construction for single track *6 miles of user created trail converted to single-track system trail *17 miles of road converted to motorized trail *11 miles of level 2 road converted to motorized trail 8 miles of new motorized trail construction
Mt. Elden/Dry Lake Hills Recreation	No proposal exists at this time				The purpose of the project is to provide enhanced recreation opportunities, mitigate impacts to wildlife habitat, archaeological sites, soil, water, and address community interests. No spatial data
Highway 180 motorized trails	Motorized trail construction and conversion of user-created trails to motorized NF system trail in the White Horse Hills and Hochdeffer Hills area	Potentially up to 60 miles of motorized trail			No proposed action has been developed at this time No spatial data

Table 155. Other agency and private lands foreseeable vegetation and prescribed fire projects

Other Agency and Private Lands					
Camp Navajo Westside Thinning and Prescribed Fire Project	Mechanical and prescribed fire	968 acres mechanical and prescribed fire 530 acres prescribed fire only	Flagstaff	Williams	Improve forest health, reduce fire risk 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-inch to 18-inch 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
Acre Summary					
Vegetation mechanical treatments		**18,552 acres**			
Prescribed fire and maintenance burning		**19,082 acres**			

Table 156. 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	
Clints Well Forest Restoration	Mechanical and prescribed fire	12,912 acres mechanical (includes 10,522 acres of WUI) 3,987 acres no treatment 16,467 acres prescribed fire (includes 10,522 acres of WUI)	Mogollon Rim		Fuel reduction and ecosystem restoration over approximately 16,809 acres within and adjacent to the WUI of Clints Well including: 779 acres MSO PAC thinning <9-inch d.b.h. 3,778 acres MSO restricted habitat maintenance 1,043 acres MSO threshold habitat maintenance 412 acres goshawk PFA maintenance 184 acres goshawk PFA core

Project Name	Treatment Type	Metric	Forest/District		Project Objective Summary and Status
			Coconino	Kaibab	
					nest area 225 acres insect and disease 529 acres timber stand improvement 3,448 acres uneven-aged development and 2,200 acres uneven-aged maintenance 294 acres firewood cutting
Mahan-Landmark Forest Restoration	Specifics are unknown as no proposed action has been developed	33,747-acre project area	Mogollon Rim		Objectives: (1) vegetation structure and diversity with a mosaic of interspaces and tree groups of varying sizes and shapes; (2) forest structure with all age and size classes in goshawk and MSO habitat; (3) old age trees are sustained over time across the landscape; (4) improved forest health with reduced stand density-related mortality and reduced level of dwarf mistletoe infection; (5) improved vegetation diversity and composition in Gambel oak, aspen, pinyon-juniper, and grasslands; (6) resilient forest -reduced potential for undesirable fire behavior and its effects; (7) maintain a mosaic of tree groups and interspaces with frequent, low-severity fire; (8) springs and seeps function at, or near, potential; (9) restore degraded ephemeral channels; (10) restore select closed and unauthorized roads
69 kV Winslow Blueridge	Construct 11 miles of corridor on NF lands and construct a new substation in Blue Ridge	55 acres of vegetation clearing 50 acres of small timber products sale	Mogollon Rim		Construct a 69 kilovolt (kV) transmission line to connect the Winslow substation in Winslow with a new substation in the Blue Ridge area

Project Name	Treatment Type	Metric	Forest/District		Project Objective Summary and Status
			Coconino	Kaibab	
Grapevine Interconnect	9 miles of new 345 kV electric transmission line	9 miles vegetation removal			Approximately 9 miles of new 345 kV electric transmission line connecting a new wind park located on Flying M Ranch private property and State lands to the existing Western Area Power Authority (Western) 345 kV line
Bill Dick Springs Enhancement	No proposal at this time	Unknown No spatial data	Mogollon Rim		Enhance and restore water availability at a currently developed but marginally functioning spring to provide water for livestock, bats, amphibians, elk, and other wildlife
Blue Ridge Community Fire Risk Reduction	No proposal exists at this time, location is: Mogollon Ranch and Ponderosa Pines subdivision	50 acres – assume mechanical and prescribed fire Spatial data created	Mogollon Rim		Implement fuels reduction treatments in the Blue Ridge/Happy Jack area of Coconino County, AZ, about 50 acres of subdivision lots (1–5 acres in size) for the purpose of creating defensible space and improving and protecting forest health.
Cinch Hook Rock Pit Use	Rock removal from within the existing development limits		Mogollon Rim		Located near the junction of State Highways 87 and 260 Objective: material for road maintenance, administrative site improvements, and timber sale projects Incorporated into forestwide rock pit analysis
Allen Lake Restoration	Unknown		Mogollon Rim		Proposed action not developed at this time
Pronghorn Habitat Improvements	Proposal has not been developed at this time		Red Rock		Improve habitat for pronghorn Scoping began on 1/20/2012
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

Reasonably Foreseeable Projects With Insufficient Information for Analysis

The Long Valley Restoration Project (953 acres of mechanical and 706 acres of prescribed fire) on the Mogollon Rim is in "hold" status and no decision is expected in the foreseeable future. For this reason, it was eliminated from the cumulative effects reasonably foreseeable category.

The Four-Forest Restoration Initiative, Apache-Sitgreaves NFs and Tonto NF, has no tangible information that would be meaningful for this cumulative effects analysis. No project boundary has been created, 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 eliminated from the cumulative effects reasonably foreseeable category.

Flagstaff Watershed Protection Project: There are about 3,670 acres in the vicinity of Dry Lake Hills and Mormon Mountain that are likely to receive restoration actions in the foreseeable future (2013). The project is a partnership between the city of Flagstaff and Coconino NF. No purpose and need for action has been developed for the project; therefore, no specific activities have been proposed. At this time, this project has been eliminated from the cumulative effects reasonably foreseeable category.

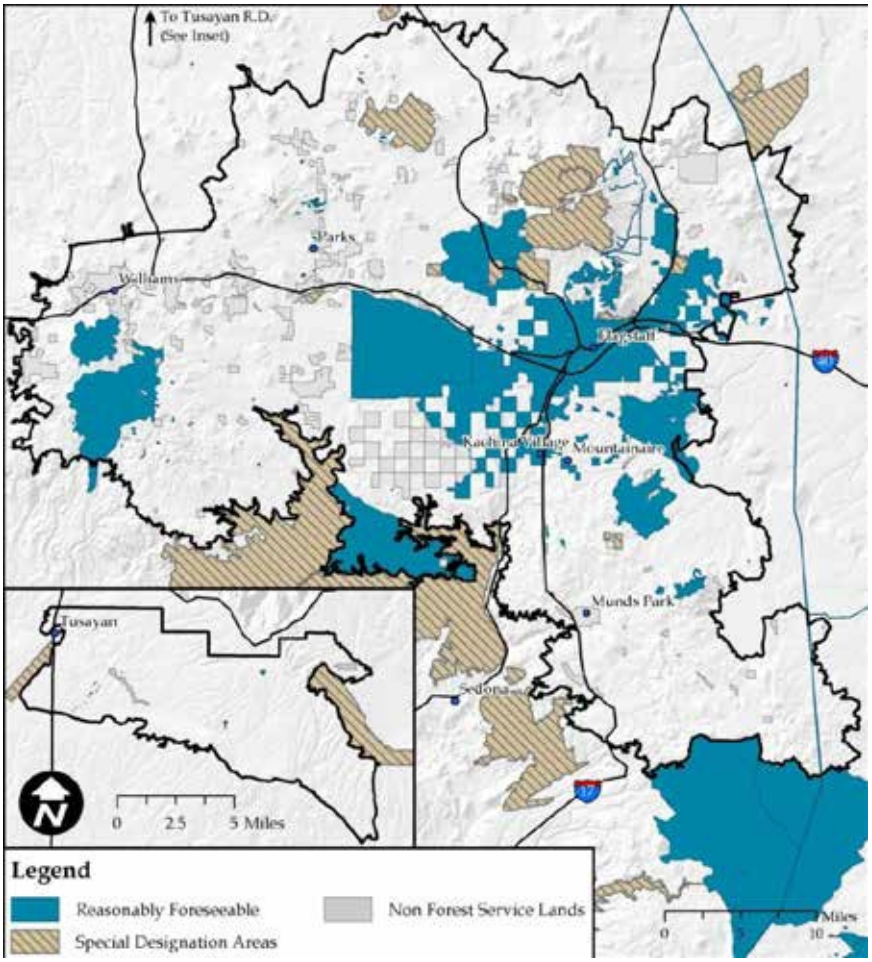

Figure 78. General locations of foreseeable projects within or adjacent to the project area